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**HOUSE OF
REPRESENTATIVES**

STANDING COMMITTEE ON PRIMARY INDUSTRIES AND
REGIONAL SERVICES

**Reference: Development of high technology industries in regional Australia based
on bioprospecting**

MONDAY, 25 JUNE 2001

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**HOUSE OF REPRESENTATIVES
STANDING COMMITTEE ON PRIMARY INDUSTRIES AND REGIONAL SERVICES**

Monday, 25 June 2001

Members: Fran Bailey (*Chair*), Mr Adams, Mr Andren, Mr Horne, Mr Katter, Mr Lawler, Mr McLeay, Mr Nairn, Mr Schultz, Mr Secker, Mr Sidebottom and Mr Cameron Thompson

Supplementary members: Mr Griffin and Dr Washer

Members in attendance: Mr Adams, Fran Bailey, Mr Griffin, Mr Lawler, Mr Secker and Mr Sidebottom

Terms of reference for the inquiry:

To inquire into and report on the following areas, with particular emphasis on the opportunities in rural and regional Australia:

- the contribution towards the development of high technology knowledge industries based on bioprospecting, bioprocessing and related biotechnologies;
- impediments to growth of these new industries;
- the capacity to maximise benefit through intellectual property rights and other mechanisms to support development of these industries in Australia; and
- the impacts on and benefits to the environment.

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Committee met at 9.38 a.m.**HARNEY, Ms Mary Cecilia, Operations Manager and Company Secretary, Cerylid Biosciences Ltd****WILDMAN, Dr Howard Geoffrey, Leader, Biotic Resources, Cerylid Biosciences Ltd**

CHAIR—I declare open this public hearing of the inquiry by the House of Representatives Standing Committee on Primary Industries and Regional Services into the development of high technology industries in regional Australia based on bioprospecting, bioprocessing and related biotechnologies. This hearing is the fourth for the inquiry and the first to be held by audio-visual link. We will be connecting first with Melbourne to talk to witnesses from Cerylid Biosciences. Later, we will be linked to Hobart to speak with the Australian Society for Microbiology, and then Botanical Resources Australia.

I welcome witnesses from Cerylid Biosciences. Although the committee does not require you to give evidence under oath, I should advise you that the hearing is a legal proceedings of the parliament and warrants the same respect as proceedings of the House itself. The giving of false or misleading evidence is a serious matter and may be regarded as a contempt of parliament. Before we begin our questioning, would you like to briefly make a statement in relation to your submission.

Dr Wildman—Yes, I will do that. You have got our rather brief letter, which outlines some of the issues that we thought were important. There are really three of those: one of them is access and ownership of resources; the second issue where we have concerns is in trying to get some consistency of approach to access resources; and the third one is to do with IP, intellectual property, issues and perhaps the focus or misinformation on the amount of things like royalties, monetary benefits and over-expectations and those sort of things. We have obviously seen other people's submissions on the web site and, whilst we agree with some points in those, we probably disagree with other points as well. In case you do not know anything about our company, would it be worth while me just spending say a minute or two –

CHAIR—Yes, if you could give us a brief description of the company and what your main focus is.

Dr Wildman—Okay. As we said in the letter, ExGenix is now Cerylid—we have had a number of name changes. The company started life as AMRAD Natural Products, which was a subsidiary of AMRAD here in Melbourne. We became AMRAD Discovery Technologies, then ExGenix and now Cerylid. Our basic core business is still the discovery of novel pharmaceutically active lead compounds that can be developed as new medicines. We do that based on the screening of extracts from microbes, plants and marine organisms, sourced largely from within Australia. Having said that, we do have some collaborative agreements with countries in South-East Asia, so we do have samples from Sarawak and New Guinea as well.

But, as I say, our core business is discovery of novel pharmaceutical lead compounds and we have a very extensive library that has been developed over the last probably six or seven years. That library now contains probably somewhere in the region of $\frac{3}{4}$ of a million extracts. So it is a very large library, it is probably the largest in the country, I would think. We have, and have had, a number of collaborative agreements for screening with large pharmaceutical companies

over the past several years as well. Some of this information is actually on our web site as well, which is now up and running, so you can now get a lot of this information from that. That is a brief introduction to what we do.

CHAIR—A good point to start would be the size of your collection. As you have said, it is a very large collection. We noted in your submission that you do have the right to collect in countries other than Australia. Is the bulk of your collection, though, from specimens collected in Australia?

Dr Wildman—Yes, it is. Probably 80 to 90 per cent would be samples from within Australia.

CHAIR—When you have collected those samples, have you approached the collection from just a simply generalist view or have you actually been going out into specific areas with a specific aim in mind?

Dr Wildman—With people who provide us with samples, when the collections have started, they have been fairly general collecting whereby people go out and do some collecting of as many different types of taxonomically diverse samples as they can. As the agreements proceed over a period of time, we tend to get more focused on trying to ensure that we are adding new samples to the collection rather than duplicating samples. They become really quite interactive, more so over time I think, because we are trying to expand the biodiversity or at least the taxonomy of the samples that go into the collection over time.

CHAIR—When you collect the samples, do you do a full taxonomy with each specimen?

Dr Wildman—As best we can. All of our plant collection agreements are outsourced—we do not go out ourselves and actively collect the samples—so they are all with state herbaria, indigenous peoples, who have the most appropriate resources and are involved in the agreement. They keep voucher specimens and we get as much taxonomic information as we can. Quite often, in the case of plants, it is definitely to genus and most often it is to species as well. With micro-organisms it is much more difficult; we do our own work but we also get samples from other people. In the Southern Hemisphere taxonomy for micro-organisms is very poor, just because of the number of people working in the area and general taxonomic information. So often in those cases, we do not have as much taxonomic information. On things like the marine samples, we have, again, a reasonable amount of taxonomic information, and our agreement for collecting marine samples has been with the Australian Institute of Marine Science, who you have already spoken to, so you probably got some information from them regarding that sort of thing. The collection is reasonably well characterised, yes.

CHAIR—Can you give us an idea what sort of matters are included in your contracts for collection?

Dr Wildman—You can help me out here, Mary, if I stumble. With respect to our collection agreements, usually the issues that are of importance to us are obviously that the people who are providing us with the samples have the legal wherewithal to actually provide us with the samples. So we try to make sure that the people are the correct ones who can provide us with the samples.

CHAIR—Could I just interrupt you there for a moment. When you say the legal requirements, by that do you mean that you are checking that whoever is providing you with the samples has the proper legal agreement with the owner of the resource, or is it with the manager of the resource? Can you give us some detail on that?

Dr Wildman—It is both. For example, in Victoria, the collectors who provide us with plant samples are the Royal Botanic Gardens in Melbourne, but our agreement includes them and DNRE here in Victoria as well. So it is the state government and the collectors there.

Ms Harney—So the agreements can have more than two parties on the other side—the manager and the owner.

Dr Wildman—Yes.

Ms Harney—So an indigenous body plus the relevant government statutory body.

Dr Wildman—For example, in the Northern Territory we have an agreement to collect samples on the Tiwi Islands, so that involves the Tiwi Islands Land Council, Parks and Wildlife Commission in the Northern Territory, Northern Land Council and any other people who either have ownership or would claim to have ownership of those resources. Quite often there are a number of parties that are signatories to the collecting agreements.

Mr ADAMS—Does that include benefit-sharing from that point of view?

Dr Wildman—Yes, it does. One of the points I would have come to was that our agreements do include usually something which covers the cost or some remuneration for the samples, but there is usually a benefit-sharing agreement in there —and it is usually some sort of royalty type of payment which is the normal way of covering that. That is usually based on the net profit from sales of a compound or product which would be developed from somewhere further along the line from one of those samples that has been provided.

Mr ADAMS—With respect to the contract you have with the Botanic Gardens and the collectors from there, you have got a legal agreement?

Dr Wildman—Yes.

Mr ADAMS—Where they collect is up to them?

Dr Wildman—Again, they would ensure that they collect in the areas where they are allowed to collect. As part of that, their responsibility is to make sure that they do their collections in the appropriate areas. It is a trivial issue; they do not sort of charge into somebody's back garden and do collecting just because they are from the Botanic Gardens.

Mr ADAMS—No, that is right, I appreciate that.

CHAIR—Can I just clarify something. You said that benefits were ‘usually’ included in the contracts for collection benefits; what do you mean by “usually”? Is that 90 per cent of contracts, is it 60 per cent?

Dr Wildman—Yes, that was me just covering myself. I think 100 per cent include benefit sharing.

CHAIR—What are some of the difficulties that you have had in getting access to collection?

Dr Wildman—Sometimes it is the issue of perhaps perceived benefits. The fact that we do not collect in Western Australia is a simple example; the reason being that we have never been able to come to any agreement with the bodies over there as to either the benefits that should flow on and the way of doing the collecting and providing the samples. There are a couple of issues. There is the perceived benefits and how much people should be making out of it, I think, for providing you with samples—that was something I raised right at the very start. The other thing is the fact that sometimes the physical access to samples can be quite difficult, but other times it is the way people might provide you with samples. They may, for example, want to provide you simply with extracts rather than with samples. We always prefer to get the sample so we can process them ourselves in the most appropriate fashion. We do not want to get extracts from people where they have processed them in the first instance, and that has certainly been an impediment to working in Western Australia.

CHAIR—In terms of access to the specimens, have you come across examples where the ownership of the specimen has actually been unclear and that has been a problem?

Dr Wildman—Not that I am aware of. We have not encountered any problems in any of our agreements, certainly at this stage, with either accessing or re-accessing samples, because there have been a number of instances where we have had an interest in something and we have needed to go back and perhaps do re-collections and get slightly more material, and we have not had any problems with those sort of things.

Ms Harney—You were asking about our standard collecting agreements: that ability to go back and re-collect—and that is defined with extra costs and so on—is written into all of them, because it is a basic part of the process.

CHAIR—There have been many people who have suggested to us that there should be a nationally consistent approach to the question of access and collection. Is this something that you would agree with?

Dr Wildman—I think so. Certainly a consistent approach across all types of organisms, I think, is useful because, for example, at the moment, micro-organisms other than fungi are not covered. For example, with the Wild Life Protection Act you could export micro-organisms out of the country now, but not fungi because, according to the act, fungi come the same as plants. But we do think a nationally consistent approach is a good one, it would certainly smooth access. Having said that, I have to say that in our case a nationally consistent approach would hamper us because we have already a number of agreements in place—

Ms Harney—Every state but—

Dr Wildman—in a number of states. In other words, we are already there; we have put in the hard yards to get those—

CHAIR—I do not think people are suggesting that access should be granted by one authority but that all authorities should reflect a consistent approach across the country.

Dr Wildman—I would certainly agree with that. It is important to do that because the biotic resources are something national; they do not necessarily belong to the states. That is certainly a personal opinion. In the case of many things—like some of the plants but certainly a lot of the micro-organisms—they do not really care where they live—something could be in Western Australia, on the border of the Northern Territory or South Australia. Having a non-nationally consistent approach could make things quite difficult and you could certainly, I think, end up with some acrimony between the states over ownership of resources and things, particularly if something of interest is found and then you are going back to collect—there is potential there, anyway, for some problems.

CHAIR—If such a nationally consistent approach was developed, what would be the main elements of that that you believe should be included, if it was to be used, for example, as a template?

Dr Wildman—What would be helpful would be to make it easier to know who are the bodies that you need to talk to so things can be speeded up rather than slowed down. One of the things that we were talking about before this meeting was the fact that, for example, there is a lot of focus in the submissions that people have made on metabolites, natural products and drug discovery and those sorts of things as the main issue of bioprospecting. But there is more to it than that. At the moment, certainly around the world amongst larger companies, there is much less interest in drug discovery from natural products than there was two or three years ago.

That is certainly an issue because it is one of the cyclical industries that goes up and down. There was a keen interest a few years ago; much less interest now. Being able to help access and speed things up so companies will have these samples and are ready to do things at the appropriate time, rather than being impeded, is quite important for when the industry hopefully does have an upturn again. Certainly from our point of view, knowing who it is you need to talk to and being able to sit down and hopefully get things done in a speedy fashion with the relevant bodies would be quite useful.

Mr SIDEBOTTOM—You mentioned that you have had some degree of difficulty dealing with Western Australia, and I would have thought that that might have been covered in looking at this nationally consistent access regime in terms of collection as well. Western Australia has been mentioned before—I am not being critical of Western Australia; they may well have their reasons—but you seem to have, let's say, less restrictive relations with Victoria and Tasmania in particular. Could you highlight a little more about the Western Australian instance, because there does seem to be this push towards a nationally consistent access regime. I was wondering how we might help facilitate that by understanding the Western Australian situation a little more in terms of your company.

Dr Wildman—Certainly, initial talks with Western Australia were started quite some years ago, probably five or six or more years ago. In that first instance there were difficulties with

agreeing on some issues—perhaps royalties may have well have been part of an issue but I think the other issue was they were very reluctant to in effect part with any samples. So their approach would be, rather than providing you with a sample which you could then process yourself, that they were only willing to provide an extract and you did not know what it was, so basically you are working blind with a sample, which means then that if you find something of interest and you want to go back you are really caught over a barrel, because you know you are interested in something, they know you are interested in something and it becomes very hard to bargain over something like that.

It has just been generally difficult with them from that point of view. There are probably a number of other issues that I am not actually aware of but, all in all, it was just too hard, basically. Other people were easier to work with, so we have gone for that and always thought, 'Well, when we run out of samples, we may try to go back to WA.' So far, as we have noted in our submission, we have not run out of samples.

Mr ADAMS—The company's capital: you must be turning a dollar or is it just pure research that you are into at the moment?

Ms Harney—We have some revenue from the screening contracts that Howard mentioned earlier with international pharmaceutical companies. Over the years, we have had contracts with a pharmaceutical company in Canada, a very large biotech company in the field of hep C and currently with a very large European multinational. Some of our capacity we put to screening our own research projects against the library, but a significant part of the capacity is taken up with screening for multinational companies. We do have some revenue but it is largely research and we are venture capital backed; that is the capital base of the company.

Mr ADAMS—You have got capacity with the screening machines and those things and that gives you some capacity to generate some income.

Ms Harney—Absolutely. We feel we are internationally competitive on that front and have headhunted internationally to lead up all of the various sections.

Mr ADAMS—Yes. I take what Howard said just a minute ago: that it is a bit of an up and down situation on what is the flavour of the month—I understand that—and natural products come and go in the marketplace.

Ms Harney—That is right.

Mr ADAMS—Then we come back to venture capital in Australia: is there good interest in this field and are we getting more capital in that area.

Ms Harney—Yes, there is a strong venture capital backing for biotechnology in Victoria; I cannot comment for other states.

Mr ADAMS—I would like to go through two other things: one is micro-organisms, there is a lot of work going into genetically modifying them to do certain things and what they can do. Do you do any of that work or do you use them to see what is their make-up?

Dr Wildman—No, we do not. Our interest is solely in pharmaceuticals or ethical pharmaceuticals for use in humans, so we do not do any genetic modification of our organisms at all.

Mr ADAMS—What about collecting them: what sort of agreements do you have with collecting them, or is it slightly different circumstances to plants and insects?

Dr Wildman—We have and have had a number of collecting agreements with people for micro-organisms, but generally they are along the same lines. They have a royalty built into the system, if something of interest comes out of it, but again, people provide us with the samples and some taxonomic information on them and, once the samples are with us, we retain ownership of those samples. Essentially, the agreements are really the same for plants and micro-organisms; there is no real difference.

Mr ADAMS—I just want to go back to the Convention on Biological Diversity of 1993 and the doctrine of common heritage of mankind, which seems to have been rejected in world terms. What did that doctrine actually mean?

Dr Wildman—It was to do with the ownership of the samples—I will have to just quickly refer to my notes. Initially there was a thought that it just a common heritage of mankind, which meant that you could collect samples wherever you went. When I first started in the industry, people would go on holiday and take plastic bags and bring back soil samples or small leaf samples; whereas now it is recognised that countries have ownership of their samples and intellectual property. The difficulty in Australia is having a federal system where you have a number of states which would all claim ownership of resources, and I think that is certainly an issue to consider.

Mr ADAMS—We are modernising from Banks's and Darwin's trips, are we; we are moving on from there?

Dr Wildman—Yes.

Mr ADAMS—I will just ask one more. The value adding capacity of Australia: after you have finished doing your screening and you have got your chemistry, do you then pass that on to a pharmaceutical company and they make a decision on what they do with it?

Dr Wildman—Yes. We try to retain some ownership or intellectual property in conjunction with the large company, so we try to retain some ownership of the samples. We do not simply collect and then provide chemicals to other companies and have them disappear offshore. As a number of people have pointed out, the real value in these things is in the intellectual property; that is where you are going to make the money in the longer term. If you can do as much work as you can in Australia, within the country, to value add to the resource, then that is the way to go.

Ms Harney—All of our screening agreements are set up such that if the other party has an interest in the compound they can take a licence from us to develop that compound. If they then inject some of their own time and development and decide that it is or is not of interest, all of the compounds fully revert to us.

CHAIR—Some of the statements that you have made in your submission indicate that you do have a level of concern about protection of your IP. Has this been a problem?

Dr Wildman—No. We have been in business for a period of time, but we are not at the point where we have perhaps large numbers of compounds being taken up by other companies. As a number of people have pointed out, it is very much like a lottery, and you have probably got as much chance of making money in a lottery as you have in this business. We are not really at the point now where we have had any IP issues; it is something to be aware of. Sometimes people who criticise companies that bioprospect do not realise the amount of money that has to go into doing that work and getting a product to market and that the only way companies, such as large pharma companies, are going to work with companies such as ours and actually do work over here is if they can retain some IP. If they are going to invest \$500 million or a billion dollars in a new product, they are not going to do it unless they know that they can get some licence on IP or they have got some IP themselves. They are not that generous.

CHAIR—How many patents do you actually hold?

Ms Harney—That is slightly complex. Because of the history of the company, we have a lot of research collaborations here in Melbourne and we have patents out of some of those that are not related to natural products necessarily; some of them are in the gene area. But we have one patent on a natural product that is one we are developing ourselves.

CHAIR—There is always speculation about much of the real commercial success from developing from the original screening of a specimen to the development of IP not being held here in Australia. What is your experience in this, and do you think that the real value of the intellectual property that is being developed from specimens collected here in Australia is actually going offshore?

Dr Wildman—That is a difficult one. I am not really aware of much that has happened in Australia where the IP has travelled overseas. In the area we work, natural products, there are not any real natural products from Australia at this stage where you could really say that the IP has disappeared overseas. It may be different in other bioprospecting areas, but certainly in the drugs industry I do not really have any experience of it to say. It is a relatively new industry, I think, in Australia.

Ms Harney—That is a good point: it is a new industry and the pathway from the discovery to drug on the market is a very lengthy one, in addition to being quite expensive. Given the timeframe, you would not really expect to have seen much of that.

CHAIR—We are right on track and we are just about out of time. If my colleagues have no further questions, are there any key issues that you would like to refer to that we have not covered with you?

Dr Wildman—You have probably questioned us on most of the issues that we have raised. The only thing that we could say is that if you have any further questions or if any or all of the committee want to visit, you are more than welcome to come down and see what we do and have a look around, because we do represent one of the largest in Australia of the organisations bioprospecting for new drugs.

CHAIR—Thank you very much, and thank you for your contribution here this morning.

[10.14 a.m.]

McMEEKIN, Professor Thomas Alexander, Member, Australian Society for Microbiology

NICHOLS, Dr David Scott, Member, National Scientific Advisory Committee, Australian Society for Microbiology

SANDERSON, Dr Kevin, Associate Member, Australian Society for Microbiology

CHAIR—I welcome representatives of the Australian Society for Microbiology. Although the committee does not require you to give evidence under oath, I should advise you that the hearings are legal proceedings of the parliament and they warrant the same respect as proceedings of the House itself. The giving of false or misleading evidence is a serious matter and may be regarded as a contempt of parliament. Having got through the formalities, could I officially welcome you. This is the first audio-visual link that this committee has embarked upon, so we are all novices in this regard. Could I ask you, firstly, if you would like to make a brief statement to the committee and in that perhaps just tell us a little about the background of the organisation.

Prof. McMeekin—Yes, thank you. Perhaps before I do that can I just say we have also got Dr Mary Penny, who is from the Department of State Development in Tasmania, and Mary is here to observe the proceedings.

CHAIR—If I could ask you to stop for a moment. We are having a lot of difficulty hearing what you are saying this end. We will try for a re-run.

Prof. McMeekin—Thank you for the opportunity to speak to the committee and to expand on our submission, because we are quite excited about the prospects for bioprospecting and related downstream activities as to the basis for development of opportunities. To put the submission into context, I should emphasise that we are making this on behalf of the Australian Society for Microbiology and not on behalf of a single state or institution. It is also important that we emphasise that our submission is focused on microbial bioprospecting, and that is an activity that in many ways is different from bioprospecting for plants or animals. One of the important differences is that microbial biodiversity is not well described. The estimate is that less than one per cent of bacterial species have actually been described to date.

Another major difference is that there is a minimal need for recollection from the environment. The samples that we take are typically a few grams of soil or a few millilitres of water, and from that small sample we attempt to isolate novel micro-organisms. We can target particular types of micro-organisms in the same sample by using techniques such as selective media or other techniques like micro-manipulation or enrichment that allow us to find very minor components of the total biota in the sample.

Having isolated an organism, we characterise it. We characterise it phenotypically, we look at its chemical make-up, and we also characterise it genotypically. Indeed, when we have that knowledge, that then allows us to go back and do some very, very targeted screening for similar

organisms which we believe would have biotechnological potential. The very important thing is that we can preserve these micro-organisms either by deep-freezing or freeze-drying, so we have a situation where the organism and its capabilities are in effect in a state of suspended animation, from which we can release the cells at any time in the future.

In summary, microbial bioprospecting is potentially a triple bottom line activity where environmentally it has minimal impact, and it is socially responsible, at least in my estimation that we should use biotechnology to improve conditions for mankind in general. There is an opportunity to make a dollar from this activity and also to create employment and, importantly, that opportunity is not restricted to the big city but rather it can be centred on a critical mass of expertise in bioprospecting with access to selected ecosystems. The resources required for successful bioprospecting are the people and the location.

I would like to stop at that point, but I would also like the opportunity to come back to emphasise the need in Australia, as a nation, to preserve the biotechnological potential of novel micro-organisms in a culture collection. That is a point that we really would like to return to if the opportunity arises.

CHAIR—Could you tell us, firstly, how much bioprospecting is being carried out in Antarctica and how much of that is being conducted by Australia?

Prof. McMeekin—There is now a significant amount of bioprospecting in Antarctica. I would imagine that most of it is being carried out by Australia, but any country that has access to Antarctica can collect samples and attempt to find novel micro-organisms in those samples. Of course, when you are in Antarctica, the plant and animal life is very restricted, and the novel biota is really centred on micro-organisms.

CHAIR—Some of the micro-organisms that are being collected or being researched: do these fit into the category of what we have been told are extremophiles?

Prof. McMeekin—Some of them certainly do. My colleague Dr David Nichols has been working in Antarctic sea ice for many years, and Antarctic sea ice is populated by organisms that are called psychrophiles, that is, those that really like to grow at low temperatures. They may have, for example, an optimum temperature for growth of perhaps six, seven or eight degrees Centigrade. So they have learned to adapt and to live in very harsh environments.

An example of an extremely harsh environment on the Antarctic continent is Deep Lake. Deep Lake never freezes because it is as salty as the Dead Sea, and yet it supports the growth of at least one bacteria and one type of alga in that lake. It is not difficult to make a connection between the ability to grow under extreme conditions and the biotechnological potential of those organisms.

Mr ADAMS—What work is the CRC at the University of Tasmania doing in Antarctica?

Prof. McMeekin—The CRC has a subprogram called the Antarctic Biotechnology Program, and part of the work at the university is centred in that program. There is also another part of the work that is housed within the School of Agricultural Science, which has been supported since

the mid-1980s by the Australian Research Council. The two groups, in effect, work very closely together.

Mr ADAMS—Have we got anywhere near commercialisation yet? We have had some evidence to this committee of what is starting to occur with micro-organisms for industry and the production of certain things via genetic modification. Is there anything from your end yet which would look like it would be going on to commercialisation?

Prof. McMeekin—There are a number of opportunities that we are looking at at the moment. Perhaps the first thing that I should mention is the contract we have with Cerylid Biosciences, and I think you have spoken with them already this morning in Melbourne. That has been going on now since about 1995 and that has delivered well over a million dollars into the economy of Tasmania. The situation is that we collect and characterise the organisms, preserve them, send them to Cerylid, and they screen them for human pharmaceutical activity.

There is a double benefit here: one is that we get the money up-front that provides us with the opportunity to create employment; it provides us with some slack in the system to carry on our research and, if Cerylid actually commercialise something, then there will be a royalty stream from that that will flow back to the Antarctic CRC. That is one opportunity.

Mr ADAMS—There are others. I was interested in the polyunsaturated acids concept with the PUFAs. Do you want to tell me about those?

Prof. McMeekin—I will get David Nichols to talk to you on that because David is the person who has taken this from the beginning into something that has probably got very significant commercial potential.

Dr Nichols—The research in polyunsaturated fatty acid production really sprang out of basic research we were conducting into the adaptations of bacteria from Antarctic sea ice. We were probably one of the first groups in the world to discover a large number of bacteria with the ability to produce polyunsaturated fatty acids. The biotechnological potential of that discovery and subsequent ones is that the world resource of polyunsaturated fatty acids is really coming at the moment from either fish oils, which are a finite and decreasing resource, or from the culture of micro-algae in many aquaculture industries.

Bacteria really offer a new and cheaper, more reliable resource for the commercial production of polyunsaturated fatty acids, as a biomass. There is also the potential to expand further biotechnological applications and to look at the enzyme systems of these bacteria, and also to look at the unique genes which are involved in polyunsaturated fatty acids production from these micro-organisms. The CRC, and lately the university, have been involved in following up a number of those lines of research and we are coming to a stage where there has to be a close look at the potential for a commercialisation in that particular area.

Mr ADAMS—Is the CRC involved in the air link discussions for infrastructure to Antarctica, and what opportunities would that increase for any research that is going on down there?

Prof. McMeekin—The CRC will be involved in those discussions although most of the carriage of that activity is taken by the Australian Antarctic Division. The opportunity for

people to get to Antarctica quickly, do the research and get back fairly quickly is going to be a real advantage, I think, in developing research programs, but it could be a double-edged sword if lots of people have access to that resource—other companies, other research organisations.

Mr SIDEBOTTOM—Congratulations on the work you are doing. I raised that in parliament recently, particularly on the air links question to Antarctica, so it is great to see that you are consolidating so much Antarctic research in Hobart and Tasmania. I was particularly interested in how long it took you to obtain your permit to bioprospect in Antarctica. I wonder if you could talk to us about that and, for instance, to whom you were applying for those permits, the difficulties that you may have had—leading on to the next logical conclusion from that about perhaps the potential for introducing a nationally consistent access in collection regime and what features you think this regime might include. I would be very interested in your chronology on events and also your suggestions for assisting people to do a better job in that area.

Prof. McMeekin—This was the first test of somebody I think wanting to commercialise an opportunity in Antarctica. As a result of Australia's international commitments, it took about two years to arrive at a decision which would allow us to collect the samples and for those samples to be passed on to AMRAD Discovery Technologies, as Cerylid were in those days. The major difficulty was the notion of exclusivity and the fact that Antarctica, under the Madrid protocol, is a world resource and no-one is supposed to have exclusivity of the resources from Antarctica.

Most of the negotiations were with the Department of Foreign Affairs and Trade, and eventually it went to the Attorney-General's Department. I think it was an international lawyer, called Henry Burmeister if my memory serves me correct, who made the decision that the actual soil or water samples that we took from Antarctica could not be given exclusively to a commercial organisation. But if we used our skills, our expertise, to isolate micro-organisms from those samples, then that was not infringing the Madrid protocol and those micro-organisms that we isolated from the samples could in fact be given to a commercial organisation.

One of the impediments that we see to bioprospecting in general is access to the resource; and ownership of the resource. I think this is one of the very difficult questions. I believe that some states already tie up their biological resources. I think Western Australia is a state that has done that. I understand that the minister in Tasmania is also considering similar activity in Tasmania. I do not believe it is something to which there is an easy answer.

If you are dealing with plants and animals and you are dealing with a resource that is finite, is restricted to a particular area, I think there really is a danger of perhaps bioprospecting being overdone and that resource being destroyed or diminished. One of the great advantages of microbial bioprospecting is that we really only need to go once, get the soil sample or water, and then isolate those organisms, preserve the organisms, and use them in perpetuity. That is a big advantage in microbial bioprospecting.

Mr SIDEBOTTOM—Thank you.

CHAIR—In terms of difficulties of access, a number of people have made the suggestion to us—and I know it has been discussed nationally—about taking a nationally consistent approach. Is that something that you would agree with and, if it is, what would be the elements that should be included in taking a nationally consistent approach?

Prof. McMeekin—I most certainly think that there should be a nationally consistent approach. Having different rules, different legislation in each of the states has increased the level of difficulty in accessing the resource. Sorry, I have lost the second part of the question.

CHAIR—If we were to develop a nationally consistent approach, what would be the elements, for example, that would be included in the contract that would be giving access for collection? For example, would you think that it should be spelled out as the question of ownership of the resource and whether the person who was applying for access should be dealing with the owner of the resource directly, the manager of the resource; should it be specified what benefits should be flowing further down the line? What are the elements of a nationally consistent approach that you want to see included?

Prof. McMeekin—There would obviously need to be details of access—who has access to that resource, what they plan to do with that resource, who is going to benefit from the resource.

CHAIR—Could you tell us who in the work that you do with Cerylid holds the intellectual property resulting from the Antarctic CRC and Cerylid's work?

Prof. McMeekin—At the moment the important part of that contract is the collection of organisms that we have provided to Cerylid. Those organisms are held and exploited by Cerylid for the production of human pharmaceuticals. When the contract with Cerylid ends—I think it is three years after the end of the contract—those organisms revert to the ownership of the Antarctic CRC and, if Cerylid have not commercialised an opportunity from the organisms, then all the information that they have collected on those organisms also comes back to the CRC.

We have provided Cerylid with organisms; Cerylid have exclusivity on the use of those organisms for the production of human pharmaceuticals, but we also in the CRC at the moment have the opportunity to use those organisms for other purposes. For example, if there was an agricultural vet company who wanted to develop some veterinary applications from the organisms, then we could supply those organisms to that vet company with Cerylid's permission. So the exclusivity that Cerylid have is only for human pharmaceutical development.

CHAIR—Just to develop that point a little further: if we are going to have this nationally consistent approach in developing a contract, is that something that you would want to see—that the area of research and development of IP that could be conducted from a particular specimen collection would have to be spelled out very clearly?

Prof. McMeekin—Most certainly, because we can value add the same organisms by giving them to different people for the development of different applications. It is the same if you go back to the soil sample, we can value add what is in the soil sample by targeting different types of organisms. If we can find the actinomycetes and fungi that Cerylid are particularly interested in, from the same soil sample, and we have done this recently, we can also discover new yeast

strains. Those yeast strains are then value added at the University of New England in a project looking at stress proteins. So all along the chain we can add value to it by just being a bit clever about the types of organisms we target and the types of activities that those organisms might have. So specification of the opportunity is very important. We do not want to tie up everything in one hit with one company.

Mr ADAMS—The ownership with the international convention: what sort of difficulties is that posing for you in relation to taking the samples, and what contribution back does Australia have in that area?

Prof. McMeekin—Having had the ruling from the Attorney-General's Department that Australia was not breaching the provisions of the Madrid protocol, we really have not had a problem in sample collection since then, except that that sample collection must be tied to a legitimate science program. You cannot get to Antarctica using the services of the Australian Antarctic Division to collect a for purely commercial purpose; your activity in collecting must be aligned to a scientific program through ASAC, the Antarctic Science Advisory Committee.

Mr ADAMS—Who is the actual owner when we talk about samples from Antarctica?

Prof. McMeekin—The Commonwealth of Australia still owns the soil and water samples that come back. If we use our skills and expertise to isolate particular micro-organisms from those, then the ownership of those organisms is vested in the Antarctic CRC unless we provide those organisms to a company such as Cerylid. When Cerylid decides that there is no commercial future in a particular organism at the end of our contract, then those organisms come back to the Antarctic CRC.

Mr ADAMS—With this committee's work we are dealing, of course, with more than just the micro-organisms that your CRC is involved in, and ownership is a little different there with your circumstances from what we are coming across in other areas. We feel that we are going to have to make some recommendations in that area.

Prof. McMeekin—Ownership can also be an issue when we collect samples from Tasmanian locations. We are currently looking at some of the remote Tasmanian locations, but that is an activity in which National Parks and Wild Life is involved which at the moment is concerned with the conservation values and the impact of ecotourism and adventure tourism on things like Tasmanian caves and the microbiota that one finds in those locations.

Mr ADAMS—Yes, Macquarie Island and those areas are other areas in which you would have some interest.

Prof. McMeekin—We have collected at Macquarie Island.

Mr ADAMS—You are collecting on Macquarie Island?

Prof. McMeekin—We have done and there, of course, because it is Tasmanian territory, we would require permission from the Tasmanian government as well.

Mr ADAMS—They have not quite got their protocols together yet?

Prof. McMeekin—I think the issues were the same as they were in Antarctica and, again, the opportunity to go to Macquarie Island and to derive samples is related to being involved in a science program.

Mr ADAMS—You mentioned taking organisms out of caves in Tasmania: have you been involved in any of that work?

Prof. McMeekin—Yes, we have just begun our work, and I can bring in one of my young colleagues, who has been in the caves, to talk about that.

Dr Sanderson—We have just started a program with a PhD student looking at the ecology, the microbiota of Tasmanian caves. It is not currently aimed at a bioprospecting exercise, it is purely a conservation exercise looking at Tasmanian caves to see what is there, as they are now the focus of some developing tourism industries. As part of that process we are isolating bacteria and they are going into a culture collection, so there is some potential later on that they could become the focus of bioprospecting.

Mr ADAMS—Can we come back to you, Professor, in relation to collection and libraries; you wanted to talk to us about that. Is that an issue for your CRC: building a library of micro-organisms or other matter that you want to store?

Prof. McMeekin—Yes. I think that is a very important issue; it is not only an important issue for the CRC and the work that we do at the university, but it is an important issue in microbial bioprospecting for Australia. Essentially, what a culture collection is is a repository of microbes in a state of suspended animation. We either freeze these things or we freeze-dry them, and at any point into the future—10, 20, 30 years or more into the future—we will be able to go to those freeze-dried ampoules, break them out, add the nutrient media that the organism needs to grow on and get it to grow again.

So it is like a herbarium except that the organisms are not dead, and they can be grown at any time into the future. The excitement, I think, in culture collections is not what we know about them—not the fact that they produce polyunsaturated fatty acids or enzymes that operate at really low temperatures—but what we do not know about them. So opportunities may arise. Somebody may make a connection between a particular type of organism and a biotechnological opportunity for the production of antibiotics or anticancer compounds; there is an organism that would be good at bioremediating soils in cold climates and so on. Yet, we do not have a national collection in Australia. At the University of Queensland we did have what was virtually the national collection, and my understanding is that collection is now just about moribund; it is very difficult to keep it going.

The best example of perhaps a valuable collection in Australia at the moment is the Australian Starter Culture Research Centre at Werribee, where the Dairy Research and Development Corporation some years ago decided that they would fund research for cheese and yoghurt starter cultures. It operated well in Australia, and this starter culture centre now provides most of the Australian dairy industry with the cultures that they need to make cheese and other fermented milks. That apparently has saved the Australian dairy industry millions of dollars.

The situation that culture collections throughout the world face at the moment is that many of them are under threat, even some of the really big ones like DSM in Germany. We have some difficulty in keeping our own little collection of Antarctic micro-organisms going, because it is very difficult to convince people that these are a real biotechnological resource. We have got 4,000 strains tied up with Cerylid at the minute; they will come back to us into the future. But without a culture collection, these will simply go into hibernation, you could call it.

There is one collection in the world at the moment that seems to be doing very well—the National Collection of Industrial and Marine Bacteria in Aberdeen in Scotland—and that offers a range of very specialised services, not only in identifying organisms but in depositing organisms for patent purposes. Perhaps one of the reasons that they were successful was that they were able to tie in with the oil industry in the North Sea, and I guess commercially that put them on their feet. That organisation is now assisting endangered collections around the world, so they in effect are building up a very nice repository of biotechnological potential in the UK. In fact, last week their curator wrote to us and said, ‘Look, we are going into robotic screening: would you send us your Antarctic cultures.’ The answer is, ‘No, not at this point,’ but we could perhaps come to some commercial arrangement where they could screen our cultures for particular activities.

It is our contention that Australia should look at a model, perhaps similar to that in the UK, that we have a national repository of organisms for biotechnological opportunities that allows us to protect the investment that has been made in collecting and preserving those organisms and to maintain their unknown potential.

At the outset, I said I was not here to represent Tasmania, but of course Tasmanians always take an opportunity when it arises, and there is a particular opportunity here, I think, for Tasmania because there is a critical mass of researchers in Tasmania working on microbial biodiversity and bioprospecting. For example, we have the micro-algal collection at CSIRO’s marine labs; we have the ACAM collection at the university and the CRC; we have the collection with Cerylid; and we now have activity in Tasmanian locations looking at organisms like actinomycetes in fungi that are well known to have biotechnological potential. Lots of those activities actually arose from the fact that there are more marine and aquatic biologists in Tasmania than you can poke the proverbial stick at. We have a critical mass of marine biologists in Tasmania that rivals anything in the world. That provides us an opportunity to develop a culture collection to support that marine and aquatic biology activity.

If something derives from that that is commercially useful, then it is some payback for the very considerable federal government investment that has been made in Tasmania at the CSIRO marine labs and the Antarctic Division. We think the whole business of marine and aquatic biology in Tasmania and Australia will be enhanced by the establishment of that culture collection, and we look forward to the probability of more bioprospecting, not only doing the bioprospecting part of it but leading on to bioprocessing and perhaps to bioindustry opportunities in Tasmania and for Australia.

CHAIR—Can I say to you that you have got a couple of Tasmanian champions here as members of this committee. The concepts that you are putting forward to us: how could they be achieved when we have to consider that the funding for the collection of all of these species has come from both the public and the private sector?

Prof. McMeekin—I think the model that has been set up in the UK at the National Collection of Industrial and Marine Bacteria is one that we could draw on. Within their organisations there are organisms that are obviously tied up by commercial interests. For example, somebody may pay them to deposit a strain on which they have taken a patent for a particular purpose. Lots of public money has gone into isolating many of the organisms that we have. The organisms that have been worked on were mainly from ARC, and the Australian government in general; those organisms we can make available in a publicly available collection. We do not make them available free of charge but, having preserved them, we can sell them on to other people for scientific purposes or to look at their potential as biotechnology organisms.

Mr ADAMS—What ballpark costs would we looking at with such a library, if ‘library’ is the term that is used?

Prof. McMeekin—I would imagine you could be looking at anything up to a million dollars a year. It really depends on the size and extent of the collection; it depends on balancing the investment that you put into it against the potential that exists with the organisms that we would have in that collection. The sensible way to start it would be with some sort of seed funding that would allow the thing to get up and running, to be established as a national collection, and then to seek the commercial partners that we need to develop the biotechnology opportunities. Perhaps all the money would not come from the public purse.

Mr SIDEBOTTOM—They are very interesting ideas. You have answered my next point. I am asking you more of a generic question now in terms of bioprospecting: what role or roles do you believe the Commonwealth can play—and I do not mean the federal government presently, I mean the Commonwealth as such—in bioprospecting and assisting bioprospecting in Australia? You have already given us one interesting example, but could you elaborate on some further roles you see the Commonwealth playing in assisting the bioprospecting industry and potential in Australia and thereabouts.

Prof. McMeekin—I would think that the Commonwealth’s role in this is absolutely crucial; that the Commonwealth should have an overarching responsibility for bioprospecting in Australia. If we are really going to act as a Commonwealth instead of a group of states and have six or seven different types of legislation, then that is really going to muddy the bioprospecting waters. One would look forward in a new activity like bioprospecting to the Commonwealth taking the lead in developing the legislation and rules and regulations that pertain to access and ownership of the resource and so on. I think the Commonwealth’s role in this is right at the top of the pyramid.

Dr Nichols—If I could follow on from what Tom was saying, I hope now that we have been able to demonstrate to the committee that there is a strong linkage between microbial bioprospecting and the need for investment in preserving the outcomes from it. The real outcomes for value is not in the collection of the soil sample or the water sample itself, but from the bacteria that comes from it through the application of skills and knowledge, and it is those things that are valuable. If the framework is not put in place to preserve those for future applications, then there is not much point collecting the samples in the first place.

To follow up another point: in terms of issues that perhaps may be addressed from a Commonwealth level in terms of commercialisation outcomes from bioprospecting—we have talked about the need for a national strategy in terms of sample permits—perhaps there may be a role for the Commonwealth to provide a national strategy in intellectual property management, because we feel that that is a strong issue as well as in terms of the potential for commercialisation from bioprospecting outcomes.

CHAIR—What suggestions do you have to make in that particular area of the Commonwealth developing the strategy?

Mr ADAMS—It is an area on which we have had quite a bit of information given to us and it is something we are certainly considering.

CHAIR—Do you have any specific examples that you would like to make to us?

Dr Nichols—Yes. Most of the commercialisation opportunities, and we have given you a couple of those in our submission, have come from research output, and members of the Australian Society for Microbiology are active in such research endeavours in a number of organisations nationally, some of which are nationally controlled, and at obviously a range of universities. However, the real potential commercialisation opportunities are perhaps hindered in a number of cases where intellectual property management policies differ between organisations, and perhaps there is a role for the Commonwealth to be proactive in suggesting an intellectual property management framework which would level the playing field, if you like, for the development of commercial opportunities, regardless of the institution which may be involved.

Prof. McMeekin—Perhaps also there may be a role for the Commonwealth in that very delicate stage of getting a really good idea from the laboratory door to the point of proving that the concept is commercially viable, and possibly that might be done through an organisation like Biotechnology Australia.

CHAIR—Thank you very much indeed. If my colleagues are done with their questions, I would like to thank you very much for your input into this morning's hearing.

[11.04 a.m.]

CHUNG, Mr Brian, Manager, Reserach and Devlopment, Botanical Resources Australia Pty Ltd

CHAIR—I welcome Mr Chung from Botanical Resources Australia. Do you have any comment to make on the capacity in which you appear?

Mr Chung—Botanical Resources is a private company based here in Hobart.

CHAIR—Although the committee does not require you to give evidence under oath, I have to advise you that the hearings are legal proceedings of the parliament and as such they warrant the same respect as proceedings of the House itself. The giving of false or misleading evidence is a serious matter and may be regarded as a contempt of parliament. Having got the formalities out of the way, Mr Chung, I welcome you again. Would you like to start by giving us some introductory remarks and some background about BRA and the sort of business that you conduct—for example, how many people are employed—and we will take it from there.

Mr Chung—Botanical Resources Australia are involved in the pyrethrum industry in Tasmania. We contract growers to grow for us; we harvest and process the product and we export our pyrethrum extract overseas. The bulk of our exports, 85 to 90 per cent, goes overseas and most of it goes to America. Currently, we are the second biggest producer of pyrethrum products in the world, and we are in a reasonably rapid growth phase, so we expect to be the biggest producer within the next two, three, four years.

We are very much an R&D driven company, we want to be the best in the world, we invest a fair bit in the R&D. We see biotechnology as the next step in the future and we would like to think that we have a role to play in biotechnology—in the growth of crops and so forth. We think our strengths are that we are very good at growing crops, handling, processing and quality control, chemical analysis—that sort of work. We would like to have a role in bioprospecting and bioprocessing activities of new crops and opportunities that come along. We think we are in the right place to be able to actually do the work. When someone finds a new opportunity, they will need a factory, processing capabilities, and skills to grow, process and export the product. We see possibly a role for us in that area. We are currently a reasonably small-ish company. We have some 30 full-time staff working with us, half of which are uni graduates, and we have full-time equivalent of about 60 to 80 working for us during the year; so about 30 full-time staff and another equivalent 30 part-time, seasonal staff.

CHAIR—I understand that the company had a fairly rocky period in its early stages and that you were successful in attracting some seed government funding to take you to the next stage. Could you give us an indication of how important it was for you to get that support and where you see that level of funding for the future?

Mr Chung—The pyrethrum industry, from our perspective, was initially started by CIG gases, a big company, some 15 years ago. It was early, mid-80s that they started working in the university, and CIG was a big company so the funding was not a real problem there. About five

years ago, CIG or BOC—CIG was taken over by BOC—decided that pyrethrum was not a core business for a gas company, so it was a local management buyout of the pyrethrum business. Because of the small business, there was not that much capital available. But because our concept was good, we were able to attract substantial Commonwealth funding support, predominantly from the Horticultural Research and Development Corporation for our agronomy research, and then, as we were moving in to the processing area, we were also fortunate in attracting research support from AusIndustry. So we have been very fortunate; we have had good support from HRDC and good support from AusIndustry, and we are currently still have good support from HRDC and AusIndustry in our research work. Our current annual research budget is a million dollars or thereabouts. So research is very productive and very worth while, and the Commonwealth government support through research bodies has been very useful and almost essential.

CHAIR—You have certainly developed the market for pyrethrum and the company has been very successful. Are there other industries in Tasmania that are producing pyrethrum? What competition do you face in the market?

Mr Chung—No, at the moment we are the only pyrethrum industry in Australia. The other major producers are in Kenya, in East Africa. They have been the traditional industries in that part of the world since before World War II. So we think we are by far the most technologically advanced business in pyrethrum, and we can grow from where we are.

CHAIR—Are there any plans for you to take advantage of the range of native Australian plants to develop into a similar industry? Are you going to branch out or are you going to stick with your core business?

Mr Chung—No, we are looking at better opportunities in a whole range of products. At the moment we are looking at medicinal herbs as another crop type that could fit in with our operations. We are aware of the potential in native Australian plants for insecticide or pharmaceutical products. We think there are opportunities for us there to grow and process those crops. Bioprospecting on our own is rather difficult because we are a pretty small company and the capital investment required is very high. So we are conscious of the need for us to work in with the other companies to do bioprospecting work, looking at whatever products. Maybe a place for us is to work with a bioprospecting company when they are getting close to finding something that has got potential, because our skill is to be able to grow, harvest and process the product. Whoever finds a new opportunity will need to build facilities to grow, harvest and process whatever product it is. If we are there, then there are opportunities for the synergies to work together.

At this stage we are not really involved in any bioprospecting work ourselves, because we think there are a lot of people out there and we are clearly not big enough or strong enough to invest too much funding in that area. Another big opportunity for Tasmania is that in the north-west coast of Tasmania there is probably the best farming country in the country. That sort of environment—good soil, good farmers, mild climate—can virtually grow almost any crops in that part of the world. That is where our factory is located—in Ulverstone, on the north-west coast of Tasmania.

Mr ADAMS—A lovely spot too, Mr Chung.

Mr Chung—Yes, it is.

Mr ADAMS—And well represented by my colleague here who is on the committee. Where did your seeds come from to begin with; from Yugoslavia?

Mr Chung—No, initially they came from India, years ago. Initially, pyrethrum work was done by the University of Tasmania and a researcher who came from India. So I understand the plant came from India, although it could have come to India via Yugoslavia; we are really not sure of the original source of it.

Mr ADAMS—I understand that they grow wild in Yugoslavia.

Mr Chung—Yes, they do.

Mr ADAMS—How much does your company spend on R&D per year?

Mr Chung—About a million dollars—just over \$750,000 in the last couple of years. It is about \$1.2 million this year—we have got a major project this year.

Mr ADAMS—What percentage is that of the company's capital make-up?

Mr Chung—I do not know what part of the company you take. Our grower payments to our growers for harvesting and growing the crops is about \$8 million. We tend to be a little bit confidential on that because our competitors overseas are watching us very carefully on how much we sell and what products we sell, so it is a little hard to give a real figure on that.

Mr ADAMS—Do you do any genetic manipulation yet?

Mr Chung—Yes. We have a breeding program linked in with the University of Tasmania. We are looking very closely at GMO, genetic engineering, at this stage. It is probably a little early for us. We know the political climate in Tasmania is not too inductive to GMO work, but we are not quite ready for it yet anyway. There is a lot of background work you have to do before you actually get a GMO—like working out the biochemical pathway for pyrethrum production by the plant and so forth. We are working in that area. We are not quite ready for GMO, but we realise the potential for it.

Mr ADAMS—You have about 180 growers, and payments to them are about \$8 million a year?

Mr Chung—Yes. We have close to 200 growers now and payment to growers and harvesters is about \$6 million to \$8 million, yes. It depends on the season.

Mr ADAMS—What does the company turn over?

Mr Chung—As I say, it is a little sensitive at the moment. Being a private company, we are conscious of what our competitors would know about what our sales are, so we are a bit reluctant to go into that at this stage.

Mr SIDEBOTTOM—Congratulations on your processing plant at Ulverstone; it looks very good from the highway there. I live in the Forth Valley, so I am very close.

Mr Chung—You know it well then, yes.

Mr SIDEBOTTOM—I do, and I would not mind a bit of a visit in the near future.

Mr Chung—Any time, yes.

Mr SIDEBOTTOM—I am particularly interested in the value adding side of the industry, and I know you are as well. I wonder if you could expand a little more in terms of what you see as a future in value adding in that area, and I was particularly interested in the comments you had to make about diversification into herbal. I think you were talking about potential there.

Mr Chung—Yes, that is right.

Mr SIDEBOTTOM—I wonder if you could elaborate a little more for us on that area. I was going to ask you about genetic engineering as well, but Dick raised that and you are quite right: the atmosphere in Tasmania at the moment on that issue is fairly electric. I would value your comments on value adding and diversification.

Mr Chung—The product we are looking for is the pyrethrum oil that is on oil glands on the surface of the flower seed. We harvest the crops and we store them in the shed—you have probably seen the big shed there; it is about an acre of shed; that is full . We harvested 8,000 tonnes of the product this last year, and that goes through a two-stage process: one is a hexane extraction plant process which extracts the pyrethrum oil and a lot of the other plant products, as a first stage; then we are able to develop a world first, I suppose, a carbon dioxide-base refinery plant to finally extract the just the pure pyrethrum oil. What we sell is a pyrethrum oil which is 50 per cent; we export that. That is extremely high value—many hundred dollars a kilo—and we export that by air to America, Europe and so forth.

We have got another accredited laboratory which does a lot of high quality analytical work, so we have a hexane extraction plant, a CO₂ refinery plant, plus a NATA accredited laboratory to support these processing facilities. These facilities are suitable for processing a whole range of crops. We would look at chamomile, for example, as a potential crop which we could grow. It grows well but the harvesting times for chamomile clashes with the pyrethrum plant so we have given that a bit of a miss.

The one we are looking at at the moment is echinacea as a potential crop. Echinacea, as you know, is a medicinal crop, good for colds and flus and so forth, and is one of the faster growing herbal products in the world. We think there are potential markets for that, and we think our strength is that we know how to grow crops, so we can grow it reasonably cheaply on a broadacre basis. But also the processing extraction of the echinacea oil is similar to pyrethrum, so we can use the same processing factory we have to process the echinacea. We could potentially export the extract, which is a high value part, rather than just exporting the dry roots, which is what commonly happens in Australia at the moment.

Having those skills and facilities, we think that when a new biotechnology plant comes along with a product in it that has got whatever beneficial pharmaceutical, health or insecticidal products, then we have the skills to grow, harvest, process and export that product. We think that is where we would probably have a good opportunity to fit in in the future in biotechnology.

Mr SIDEBOTTOM—Thank you.

Mr LAWLER—Thanks for talking to us, Brian. Can I just clarify: my understanding is that there was some grant money established in the early days but you are pretty much self-resourcing now and, while you stay in the industry you are in, that would continue; but if you needed to go into something else—echinacea or Chinese herbs—then you would have to rely on some R&D funding there, or do you have enough resources? Are you able to do that sort of expansion yourselves?

Mr Chung—No, we are still being supported by R&D funding; we have got a major AusIndustry grant at the moment. We have also got matching research grants from the horticultural development corporation. We think these Commonwealth R&D funding bodies are very good: they are very useful, very effective, in assisting research. As we move on to other crops and opportunities, there is still R&D funding support for these other opportunities as well. The R&D research funding support available, especially from the Commonwealth, is very effective, very useful and almost very necessary for small companies like us.

Mr LAWLER—Leaving aside expanding into other areas, in your pyrethrum area, when do you see yourselves being self-sufficient in that particular track of investigation, if you like?

Mr Chung—Maybe five years—three years, five years. We are still in a major growth phase. We have got about 2,000 hectares of crop in the ground at the moment. We think 3,000 or 3,500 hectares is not the plateau but is the area where we would like to be in a few years time. We think by then we will be the major producer in the world and we will have sufficient critical mass in three to five years time, by which time we should stand on our own feet and be able to look at the other things as well. So that is the timeframe—three to five years possibly.

CHAIR—Brian, I obviously do not want any commercial-in-confidence details, but is your R&D focused more on the processing rather than harvesting technologies, and are you looking, perhaps in the future, to using enabling technologies that have been developed out of bioprospecting to enable you to process your plant more efficiently, to get a greater quantity; to reduce some of the overheads perhaps in the processing stage? Is that an area of R&D you are looking at?

Mr Chung—Yes, we are. The process that we have at the moment—I mentioned the hexane extraction and the CO₂ refining—are R&D projects we developed ourselves. For example, the CO₂ refining is the first ever in the world to be used on pyrethrum and we think we have probably got the best possible facilities for that. That was all developed in-house, so we do have good R&D and chemical engineering skills in that area. As new opportunities come along, we are pretty confident our people are good enough to be able to adopt our equipment or develop new equipment to efficiently process whatever new products we are going to look at in the future. So there is a good skills base.

CHAIR—Have there been any obstacles in protecting your intellectual property in this developmental work that you have achieved so far?

Mr Chung—Yes. The best way to protect what we have got is to grow it fast and get ahead of anyone else. We know pyrethrum itself is a pesticide product, so it is not an easy product to get R registration and permits to use. For example, in the American market, we and a number of other pyrethrum user companies in America contribute to a major taskforce to satisfy the American EPA on the registration of pyrethrum. This taskforce has spent many, many millions US developing data to justify the safety of using pyrethrum, and a new competitor coming into that would have to buy this data or generate their own data, such as your costs. So as far as the pyrethrum market is concerned, we are not aware of any major competitors threatening us at this stage and it would be hard for a new competitor to come in, unless they have got a lot of resources.

Mr ADAMS—Do you protect your intellectual property with a patent? You said you did work with your production processing, you have done new work there and you produced new vessels and things to do that. Have you patented those processes?

Mr Chung—No, we have not patented that process. We think probably a safer way is not to advertise it too well, the process we do. If you patent it, you have to describe all your technology and whatever, and when the patent is ended it is freely available to everybody. At this stage we are more comfortable for us not to advertise too well the process we are using, and it is probably safer that way. Also it would be better for us to continuously improve our process so we are a step ahead of any potential competitors or interested parties.

Mr ADAMS—You are a private company, aren't you, at this stage?

Mr Chung—Yes, we are a private company.

Mr SIDEBOTTOM—Brian, I was interested in your comments about your investment in the skills of local people and also the scholarship system that you have developed with the University of Tasmania: are you confident that the skills development is available locally; are most of your graduates at the moment Tasmanian graduates or have you had to bring them in from the mainland; and how do you see the potential in terms of developing the skills base even further in your business? The other question, on a more local level, particularly in the Forth Valley is in terms of your grower requirements: I assume that there are plenty of recruits for that area. Also in terms of the geography being suitable for further development, I would be very interested in your comments on that.

Mr Chung—Yes, it is a pleasure answering it. We are very conscious of the importance of good quality staff. We have initiated a scholarship program with the University of Tasmania; it started two years ago. We allocated funding of about \$50,000 over three or four years for funding a series of scholarships—\$3,000 per year for a scholarship. Currently we have got two ag science students and two chemistry students on a \$3,000 a year scholarship.

This current year we are going to look at a market analyst scholarship, somebody in economics. So there is an ongoing scholarship program, \$3,000 per year per student. This current year we just paid \$12,000 to the university for the four students we got this year. We

think there are very good quality people out there if we can encourage them to be aware of the opportunities in Tasmania, by providing scholarships—we meet with the students two or three times a year and offer them employment during their Christmas vacation in our factory with us. We get to know them; they get to know a bit about us and they know there are opportunities for quality work in Tasmania.

The other thing too, in working with the university, is that we recognise that science is not that well recognised as a career path by students, as such, and we have really got to get to the students reasonably early and make them aware of the importance of science. Working with our grower community and the university, we have instigated a scholarship program for science students and teachers at the matriculation level. We started this last year and then we did a scholarship. It was not big money, but I gather it was quite substantial for matric students—\$1,000 to the top group of students who did a science project and \$1,000 to the top science teacher at matric colleges. We did that as a pilot project last year on the north-west coast and that was very successful. We are repeating that matriculation science intensive scholarship for the whole state this year—to get young people interested in science, aware of the importance of science in the community. In that respect we think we are looking at trying to promote the importance of science to young people.

The other part of your question was the importance of growers and the growing environment on the north-west coast. The north-west coast, the rich soil around the Ulverstone-Burnie area, we think is the best growing environment in Australia. It is good soil, good climate, mild climate because of the Bass Strait effects, and that climate and the experienced grower base should be able to grow almost any crop. We think there is opportunity to value add the type of crops they are growing in that area.

Mr LAWLER—Are there any constraints on your organisation in the sale of any of your intellectual property? My question is: how should the government protect Australia taxpayers' investment in the intellectual property that you guys have developed?

Mr Chung—Good question. I have not given that much thought. We are conscious of not selling our technology. We are very aware what we can grow and a lot of places around the world can grow. We know there is a group looking at growing pyrethrum in Chile; we know the French in the southern part of France are planning to look at pyrethrum as well. We are very conscious of not providing technical information to anyone who could potentially be interested in our crop. As to a formal protection of technology, no, there is not. Obviously, we do not tell anyone what we do; we have a pretty low profile on the equipment and processes we have. But no, we have not looked at it. We do not think there is a need for patents or that sort of thing on our process, because we are continuously improving it and we do keep a reasonably low profile, so we do not tell anyone in detail the certain things we do. Good question, Tony. I am not really sure what other things we could possibly do in that area.

CHAIR—Brian, I am interested to know whether your growers: are all under contract.

Mr Chung—Yes, they are. The grower base in that area is traditionally contract vegetable growers. All the processing vegetable companies in Australia are based in that area, for example, Simplot and McCain grow peas and beans, potatoes, French fries and so forth in that area, and they all have contract growers.

The other big industry in the same area is the poppy industry. There are two poppy companies there and they contract growers to grow for them as well. We are just another contracting company in the area. Our crop fits in quite well with the vegetables and the poppies as a rotation series for crops in rotation. When a new biotechnology crop comes along, we think we will fit in very nicely in that part of the rotation for growing peas this year, beans next year, poppies, followed by pyrethrum and followed by something else. A whole range of crops can be grown in rotation in this good cropping country.

Mr ADAMS—Because pyrethrum has been grown in that cycle, does that help?

Mr Chung—Yes. Pyrethrum is a perennial crop, so it is in the ground four or five years, and it does fit in very well as part of rotation with peas, beans, potatoes and poppies.

Mr ADAMS—It does keep down nematodes and other pests?

Mr Chung—No, not necessarily. I think the improvement is in the soil structure and soil fertility. Because it is a perennial crop, we do not have to whip it up and plough it up every year, so there are environmental benefits in that; you are not going to have the risk of soil erosion every year because you cultivate and that affects the soil structure. In fact, it is in the ground just like a pasture crop for four or five years, no soil disturbance. So you would be able to build up your soil fertilities and soil structure improvements and so forth. In many ways, pyrethrum replaces the pasture phase in the heavy crop areas.

Mr ADAMS—Better than spuds, Brian?

Mr Chung—No, I do not think it is a case of competing spuds versus pyrethrum, I think there is a place for a whole series of crops growing in rotations in that good country.

CHAIR—We have finished with our questions from this end, Brian. Were there any other points that you wanted to make to the committee at all that we have not covered?

Mr Chung—No. I think our reason for appearing before the committee is to maybe let the committee know that we do exist, we do have this skills base and this processing facility is a delivery system, I suppose. When new opportunities come along in this rural regional area of Tasmania—we are not big enough to initiate any bioprospecting ourselves—we think there is a place for us to fit into the system.

CHAIR—Thank you very much indeed for your input into today's public hearing. We wish you continued success and especially in the development, perhaps, of the echinacea.

Mr Chung—Thank you very much.

Resolved (on motion by **Mr Adams**):

That pursuant to power conferred by section A of standing order 346 this committee authorises the publication of evidence given before it at public hearing this day.

CHAIR—Thank you, members, and thank you, Hansard.

Committee adjourned at 11.37 a.m.