



CSIRO Oral History Collection

Edited transcript of interview with Keith Boardman

Date of interview: 5th December 2017

Location: Forrest, ACT

Interviewers: Professors Tom Spurling and Terry Healy



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**Dr Norman Keith Boardman AO, MSc (Melb), PhD, ScD (Cantab),
FRS, FAA, FTSE**

Summary of interview

Dr Keith Boardman was born in Geelong on 16 August 1926. In the first part of this interview he talks about his childhood in regional Victoria. He includes an account of his father enlisting in the First World War as Wilfred Nash, the family name of his girlfriend! He also describes his family experiences during the Depression and his early schooling. His chemistry teacher at Geelong High School stimulated his interest in chemistry and helped him to get the Rushall Scholarship to Melbourne High School where the teachers were 'absolutely first rate'.

Keith went to the University of Melbourne on a Dafydd Lewis Trust Scholarship where he was influenced by the German immigrant physical chemist, Dr Eric Heymann.

Keith commenced work for CSIR on 26 April 1949, as a Research Officer in the Wool Textile Research Section in Geelong. It was during his work into the physico-chemical relationship between synthetic resins and the wool fibre at Geelong that sparked his long-term interest in the study of proteins.

Keith talks about his growing interest in proteins and how, with the support of Dr Lipson (his Officer-in-Charge) he took leave without pay to do a PhD at the University of Cambridge. In this part of the interview, he recounts how he met Dr John Falk at a cricket game in Cambridge that eventually led to your appointment as a Research Officer at the CSIRO Division of Plant Industry in Canberra. He expands on his great contributions to plant physiology and biochemistry, particularly to understanding photosynthesis.

Keith was appointed to the CSIRO Executive in 1977 and in the talks extensively about his contributions to the management of the Organisation from that time, to his appointment as Chairman in 1985 and as Chief Executive in 1987. He discusses his interactions with Ministers, Commonwealth officials and CSIRO Board members. He outlines his major contributions to planning and research priorities.

Finally, Keith shares his views on the place of CSIRO in the current national innovation system.

NOTE TO READER

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Introduction and early life

So thank you very much, Keith, for agreeing to be part of this oral history project. We're talking today to Dr Keith Boardman, who was the Chairman and then Chief Executive of CSIRO during some of its most tumultuous times, and we're doing this interview in Keith's home in Canberra. It's 6 Somers Crescent, Forrest, and here doing the interview, I'm Tom Spurling and Terry Healy is with me. And Keith is going to tell us about his most distinguished career. It's the 5th of December 2017.

So Keith, once again thank you so very much for agreeing to be part of this project, and we were very – it's very fortunate for us to have not only access to your PH file, but also the marvellous interview that you did with Ralph Slatyer in the late '90s, I think. So some of the – what we have done, some of the discussions we've had with other people we've interviewed, we won't have to go into so much detail today because a lot of it is already recorded. But I would just like briefly to talk about your early life and your family background. Your father – your family was in Geelong. What did your father actually do?

My father was born at Steiglitz, which was a mining town about 40km from Geelong. His grandfather migrated to Australia from Lancashire in about 1851, at the gold rush period, and went to Steiglitz. His father, Samuel Boardman, ran the store at Steiglitz, and I think at times my father was working for him, but probably not a very good relationship because children were expected to work almost for nothing.

My father decided to enlist in the First World War, but he enlisted under the name of Wilfred Nash instead of Will Boardman. His girlfriend was a Nash, Margaret Nash. He said that he did that so that if anything happened to him his mother wouldn't know, but I think there was more to it than that. I think he had a bit of a fight with his father. Anyway, he went off to the war as Wilfred Nash, and he was at Gallipoli and then the Western Front. He was awarded the Distinguished Conduct Medal in 1917 for conspicuous bravery. My father had done an assaying course, I believe before the war.

Would he have done that at the Ballarat School of Mines?

At Ballarat, I think, yes. Yes, the Ballarat School of Mines. And he had all the books from that assaying course, which I had access to quite young, probably when I was at primary school. So that was my first introduction to chemistry because there was no chemistry in primary school in those days.

After the war many soldiers were employed on infrastructure projects. My father worked for a while on the construction of the Great Ocean Road. I remember he came home once, with an injured leg from his work on the Great Ocean Road.

Then he got a permanent job in the Victorian Railways, doing repair work. That was very convenient because the locomotive sheds at Geelong were only a short bicycle ride from our home in Geelong West. He was on a three shift basis, as was usual at that time. He was a fitter, assistant to the fitter, repairing locomotives and he did that till he retired.

Okay. So he worked for the Victorian Railways?

Yes.

And did your mother work?

My mother did dress-making. She had been a dress-maker during the war in Kalgoorlie. She lived at Boulder, which is about three miles from Kalgoorlie, so she walked to work every day. She was a great walker, she really was. My father and mother were married at Kalgoorlie after the war and moved to Geelong in 1921. I don't know whether they built the house or bought the house in Albert Street, Geelong West. I think they may have built it. Then the Depression hit in the early '30s, and my mother's dress-making assisted in paying the mortgage and keeping the house. I don't believe we were ever short of food, but there were no extras. We just lived on the basic things, but we did get by all right.

Geelong High School

And both your mother and father were interested in your education?

Very much so, particularly my mother. My mother was quite a strong character, dad was much weaker. My mother helped me a lot with spelling and writing, whereas I was strong on arithmetic.

So you went to Geelong High School, after primary school. Primary school was at Manifold Heights.

Yes, I went to the primary school at a new suburb, Manifold Heights, instead of going to the old school at Geelong West, which was one of those government schools in Victoria that had a very small concrete playground. The school at Manifold Heights was adjacent to a large sports field. I walked to school and was very happy there with supportive teachers and the opportunity for sport which we didn't have at the older schools. From there, I went to Geelong High School.

And it says in the interview with Ralph Slatyer that the chemistry teacher stimulated your interest in chemistry.

Yes

Can you remember what his name was? Or his or her name?

Mr O'Hara.

O'Hara?

Yes.

So he was an influential teacher?

Yes, he was an influential teacher.

And you did an array of Latin, English, geography

Yes

Yeah, I did Latin for five years -

And history as well as chemistry, mathematics and physics.

Yes. I thought Latin was very useful. It helped my English, particularly grammar but also vocabulary. Another subject I enjoyed was History of Art.

And it says that you were keen on sport, cricket and Australian Rules football, and athletics. What about tennis? Because I remember you as a tennis player.

No, I didn't play tennis at school— I didn't start playing tennis until I was about 15.

Oh, okay.

I didn't play it when I was young. When I lived at Kew while at Melbourne University I joined the Hawthorn Tennis Club, near the Hawthorn football ground, and that's when I really got keen on tennis.

So were you -

I notice that Keith's still got the tennis court out this window.

Yes, Mary was a very good tennis player. She was the champion of the Hermitage Girls' Grammar. But we used to have very good battles here on this court. We can't play anymore.

So in Victoria at that time, the system was that you could matriculate after five years of leaving, but you could also if you wanted, do a Leaving Honours -

Yes

- year and you chose to do a Leaving Honours year. Why was that? You chose not to go to university straight away. Can't remember?

Rushall Scholarship to Melbourne Boys High School

Well, at Geelong High School I got a scholarship called the Rushall Scholarship for two years. That was only for Protestants, but the best reference that was written for me was by the Deputy Head and she was a catholic. I can't really say specifically why I chose to go to Melbourne Boys' High School, but it proved to be a very good decision.

Yeah, so you went to Melbourne Boys' High School.

Yes, the teachers there were absolutely first rate. And the chemistry teacher, Richards, really was well up on the Linus Pauling presentation of chemical equations.

Okay, so he was really into modern chemistry?

He was

And the -

Richards wrote reactions with the electron flow as well as the symbols of the elements. He had a very big influence on me at Melbourne High School.

Mr Richards?

Yes, Richards.

Okay.

And I shared the science prize at Melbourne Boys' High. The other recipient was first in physics and I was top in chemistry. I remember going back to Geelong High for a social event and the teachers were amazed that I could do as well. I said well, it's just the teaching quality, that's what does it.

And it wasn't actually at the Melbourne Boys' High School building, you were at Camberwell.

No, it was not in the castle, as they called it. The castle was occupied by the US Navy. The Government had built a new high school at Camberwell in Canterbury Road.. It was to be the Camberwell High School, but they moved the senior school of Melbourne High into Camberwell High School and the junior school was moved somewhere else.

And presumably Geelong High School was a co-ed school -

Yes.

- and Melbourne Boys' they were all boys?

Yes, but even at a co-ed school you were separated in terms of the playing fields, you were separated in the classroom. So the boys sat on one side, the girls sat on the other, so there was almost a real separation.

It wasn't a proper co-ed school.

No.

And Keith when you were at Melbourne Boys' High School, did you board presumably?

No, I stayed with an aunt from Monday to Friday, and I went back to Geelong on the so-called Flyer.

And were you into sport at Melbourne High School?

I played a little cricket, that's all.

Right, because Melbourne High has a good reputation for sport.

Yes.

And so you obviously did very well in your Leaving Honours year.

Yes.

We don't have any – you won the prize, so you must have done very well in the -

I got first in chemistry.

Dafydd Lewis Trust Scholarship to Melbourne University

Yes. So then you were off to Melbourne University, straight to Melbourne University, and the Dafydd Lewis Trust Scholarship. The Dafydd Lewis played a big part in your life from then on.

Amazing thing in a way because he was a draper. Love and Lewis were the big drapers in Bourke Street. That was before Myer appeared on the scene. Dafydd Lewis left his estate, which was at that time 700,000 pounds, which was quite a sum for scholarships to Melbourne University. Lewis stipulated that the scholarships were for students from lower income families where the possibility of going to university was difficult because of financial circumstances. Secondly, he stipulated that it was only for boys, and thirdly, he eliminated some subjects like arts, music and divinity.

Oh okay, so he was very specific what he wanted to spend his money on?

Yes. You realise Barry Jones was a Dafydd Lewis Trust scholar too?

I didn't know that.

Yes, I think he was.

I'll find out about that.

I think he was. He did Law, of course.

Yes. So you could do Law with a Dafydd Lewis but -

Yes. You could do Law apparently.-

Okay. And he didn't fund girls, but he funded boys. But your interview panel had Essington Lewis on it.

Yes, I remember Essington Lewis at that, yes.

So was it a highly – how many of these scholarships were awarded? Were you the only one or -

Oh no, no.

There were a few of you?

They're still going, of course.

Yes, yes.

Over the years I think they've supported at least ten per year, initially all to Melbourne University. Now Dafydd Lewis scholars can go to other universities in Victoria.

And at Melbourne University did you do – was that the same living arrangement that you had at Melbourne High, or did you live in a student accommodation?

No, no, I lived in digs, first at Brunswick, and then at Coburg with a friend, Gordon Bell from Geelong High School who did Law at Melbourne University. So we lived in digs for a couple of years.

Gordon Bell?

Yes. Then I moved in with Alan Missen in his house, and so I was living with the Missen family for several years. They were at Kew and that was very convenient.

And also that was convenient to get to Melbourne -

Yes, a bus.

So we get you to Melbourne University, in the new chemistry building -

Yes,

- that is still being used. The lecture theatre there is still being used, the Masson Theatre, and what were your main influences? Who are the main people who influenced you at Melbourne University chemistry?

Eric Heymann, undoubtedly. He was a very good teacher too. The way he repeated things, he didn't let people fall behind. He wanted to bring everyone up. He was the main influence there. Hartung was the showman, he lectured Chemistry 1, and as I said in my interview with Ralph Slatyer I really didn't learn anything in the first year because we -

You'd already learnt it at Melbourne High.

Yes.

Yes. I mean curiously when I did Leaving Chemistry as it was called at Albany High School, my friend and I read Linus Pauling's College chemistry. And when we got to first year chemistry where Noel Bayliss was the first year lecturer, we didn't learn anything much either, because we'd learnt it all from Pauling, as indeed you had.

Yes.

So your fellow students at that time were John Swan and Ron Brown who -

Yes.

- ended up – John became an organic chemist, and Ron a theoretical chemist.

Yes, Ron and I were side by side in the practical work for Chemistry 1. He reminded me of that years later when we were both at the Government House for a function for the Academy of Science. He said "Oh, we were side by side in Chemistry 1".

And John Swan was a contemporary too?

Yes.

He went on to – I first knew John when he was professor at Monash, but he was also in CSIRO, Fishermen's Bend.

Yes, that's right, producing those dreadful smells in Parkville synthesising all those sulphur compounds.

Yes. So your student activities at Melbourne University had - curious for me to read this - to get a degree you only had to have eight subjects, but you could do an extra subject that didn't – you still got the same degree, but you had one – and you did that, Chemistry 3 and Chemistry 4.

Yes, all chemistry. Five days of chemistry.

Did that include organic chemistry?

Yes, oh yes. The whole lot.

Influence of Eric Heymann

And I know Eric Heymann mainly from his contribution to the development of surface chemistry in Australian chemistry -

Yes.

- but you did some surface chemistry but your then Masters degree was to do with the properties of molten salts.

Eric had two research areas, molten salts, and surface chemistry. Ross Gilby, who was a fellow student at Melbourne High did the clever surface chemistry, and I took the molten salt area. Heymann had two other students working on molten salts. One was Dorman, the other was Brian Harrap.

Oh yes, I remember Brian.

Harrap and I shared a laboratory. I started my research following on what Dorman had done, measuring the molar volumes of molten salt mixtures. Then Heymann wanted me to do surface tensions. That meant building new equipment. The allocation at the time for equipment was five pounds for the year. So naturally you had to build your own equipment. I built a hanging drop apparatus for measuring surface tensions of molten salts at temperatures of 700 degrees. It worked quite well.

So was Harry Bloom a student there at that -

Yes.

Yes, at that same time, a similar time to you, or a bit later? Because he kept on with the molten salts -

I think he must have been a little later.

Yeah, he kept on with molten salts and electrochemistry.

Yes, that's right.

Whereas the tradition of surface chemistry was continued in the CSIRO, Wark's Division of Industrial Chemistry with Bill Mansfield and Keith Sutherland and so on.

Yes, that's right. They tried to limit the evaporation of water from dams.

And also the whole flotation process for - that whole area came from that interest in surface properties.

That's right. The interest came from Heymann.

So Heymann was a highly influential figure -

Yes.

- in Australian chemistry, underestimated.

Oh I think so, yes. It was unfortunate he died so young.

Yes.

He went I think on a Carnegie grant to the United States and died in the hotel of a heart attack.

Yes, very unfortunate. So the period in your interview with Ralph Slatyer again you indicated, and you've already told us that you stayed with Alan Missen who went on to become a Liberal Senator for Victoria, and you were interested in politics at that time.

Yes, well partly for the social reasons as well. The young liberal clubs had social activities and inter-club sport, including tennis. I was in the Kew Young Liberals in the Menzies electorate of Kooyong. Menzies was out of power at the time.

And did you know Menzies personally?

Yes. Menzies came and addressed the Kew Young Liberals. Talking recently to Heather Henderson, his daughter, she said he always said the future of the Liberal Party was in the young liberals. Following his talk to the Kew Young Liberals I was called on to give the vote of thanks. Menzies' son Ken and daughter Heather were members.

And one of his, his daughter was it? Or one of his relatives, was in the CSIRO Leather Research Institute. They did leather research. I saw her the other night.

And a granddaughter was in the CSIRO legal department, Edwina Menzies.

Yes. Edwina, the eldest daughter of Peter and Heather Henderson married a Menzies. Edwina is retired now.

She would be. Yes.

And did you continue your interest in politics, actively involved in politics after your period at university?

Not after I went to England. After my return I kept in contact with Alan Missen. He occasionally came for dinner here at Somers Crescent and we had discussions on issues.

So instead of going to a PhD – many people at that time went to do PhDs, although you may have been a bit – PhDs were just being introduced into Australian universities, weren't they? But you did a Masters degree.

At Melbourne, I think you had to have the Masters to do a PhD. -

Because you didn't have an honours year.

There were no honours years at Melbourne, unlike Sydney.-

Or WA.

No honours year. You got honours during your course, but there was no BSc Honours. So you did MSc, but there was no formal coursework. It was purely by research and thesis. It was a 2 year degree - you could do a substantial amount of research in that time.

Yes, and the papers that you produced with Eric Heymann are still – they're quite good papers still, they're still being cited.

Yes, in the Transactions of the Faraday Society.

Yeah. So Keith, after that you had to get a job -

Yes.

First position at CSIR Wool Textile Laboratory in Geelong

- and what made you go to CSIRO? Or CSIR, as it then was?

Well, if you go back to that period, the research environment at the universities was pretty grim. I mean the amount of money for research in universities was very small, and really that's why CSIRO was doing so well. I think why it was established too. And therefore CSIRO was able to get the equipment, they were able to attract the good people. And of course, a lot of people saw it as an advantage where they could do research and not teaching at the time.

So I think the CSIRO was streets ahead at that time, in terms of the facilities that they provided for one to do research. I applied for a job in wool protein chemistry with Gordon Lennox in the Division of Industrial Chemistry. Wark was Chief of the Division. But I lost out to a person from Leeds who had more experience than me in that particular area, because he'd worked on wool. During MSc we had lectures from, I've forgotten his name now, a person from Australian Paper Manufacturers on industries where chemistry was an important component. There were visits to industrial sites. I remember going to Lilydale to the Mitchell works there and to Yarraville to a fertiliser company.

Was that during your Masters degree?

Yes, I was doing Masters.

That was a sort of far sighted programme of Melbourne University, wasn't it?

We didn't have to do exams, but we had very enjoyable site visits. The lecturer from Australian Paper Manufacturers persuaded me to apply for a research position in his company. APM were building a modern research lab at Fairfield. And at the same time I applied for, as I mentioned, the protein chemistry job and then for an advertised position on wool chemistry at the CSIR Wool Textile Research Section at Geelong.

And you took the textile one.

Yes.

And that's where you met Mary.

Yes.

So that was a good move.

As I said in my interview with Slatyer, yes, that was a very good thing.

- Wool Textile Research, was that just being set up then?

Yes.

So you were there right almost at the beginning?

Yes. Mary was there as the Technical Assistant to Pip Lipson, but the Section at the time was located at the Gordon Institute of Technology, which was in the centre of Geelong. CSIR had bought land at Belmont on the outskirts of Geelong, but there were no buildings. And as Pip Lipson explains in the book 'Fields of Discovery' written by Brad Collis, CSIR got some huts but they blew down in a wind storm. So we were at the Gordon Institute until labs were built at Belmont. Setting up the Lab at Belmont meant a lot of work for the researchers because of the lack of support staff – we didn't get the research really going for a while.

Most of the research program originated from Pip Lipson's research at Sydney University. The equipment included a washing machine to test woollen jumpers like the one I am wearing.

It'd shrink.

It felted up. Lipson had worked with Freney in Sydney and they developed a method for the shrink proofing of wool. It was a chemical method, I can't remember it exactly now, but the industry wasn't very interested. They didn't see the necessity for it. And the method was a bit harsh on the wool, so that they felt it was destroying some of the best properties of the wool.

It destroyed the elasticity of the wool.

Yes.

That was the coating method.

No, it was a chemical method.

The one that blunted the little spikes on the wool fibre? Because you get the spikes which then ratchet like this as the -

Well, they were destroying the scale structure of the wool fibre.

And if you blunt those spikes, you can stop the ratchet effect.

Yes- that was the reason for the research using polymers to shrink proof wool by coating the scales. The aim of the chemical method was the removal of the scales.

Yes.

Pip decided when he came to Geelong that coating wool with polymer was one of the things he wanted to do. He had worked at Leeds for his PhD where attempts were made to put polymers on wool. He brought the ideas back to Geelong.

They were acrylic acids –onto

Beg your pardon?

Were they acrylic acid?

Yes, acrylic acid and methacrylic acid were polymerised onto wool.

And so the group at Parkville, the protein chemistry, was that working on wool proteins at that time?

Yes, purely on wool because they were all funded from the levy on wool. A greatly expanded research program on wool was seen as essential at that time because of the competition from synthetic fibres. Nylon was developed at Du Pont during the war. After

the war there was big expenditure on research in both United States and UK, millions of dollars, developing synthetic fibres. Australia was spending virtually nothing on research on the wool fibre. The Government decided to greatly increase the funding for wool research and promotion by imposing a levy per bale of wool. The Government, I think put in an equal amount. Professor Speakman from Leeds University was invited to advise on the setting up of wool textile research in Australia. It was decided that CSIR should establish a Division for research on the wool fibre. Originally, it was to be a single division but CSIR couldn't get anybody of quality and experience and international reputation to take it on.

So it was a second option that the Executive decided to split the research into three units at Sydney, Geelong, and Melbourne. Wool Physics was located in Sydney with Burgmann as Officer in Charge. He'd been in the Division of Radio Physics. Protein Chemistry with Lennox as OiC was in Melbourne and the Wool Textile Unit was in Geelong with Lipson as OiC. Lennox had worked on fellmasonry in the Division of Industrial Chemistry and Lipson had worked on the shrink proofing of wool.

Had Lipson done that at Sydney University?

Yes. I think so.

Yes. So it was a Division that was being funded by in a sense external funds.

Yes.

And was the research programme determined by some consultation with the industry, or did – was it – how much curiosity research was there?

I don't think there was much consultation with industry at all, to tell you the truth. The wool industry was so wealthy at the time, 1951, a pound a pound for wool, that a levy of two shillings a bale, or whatever it was, was miniscule. So I think the industry left it to the scientists to decide. Lennox decided to hire several physical chemists and an organic chemist, John Swan to research the chemical and molecular structure of wool.

And somewhere along the line x-ray crystallography became -

Yes.

- much easier to do, and so they spent a lot of time looking at the structure of the wool protein.

Yes. Well, the first biological material that was examined by x-ray was wool, done by Astbury in Leeds.

So why was Leeds - this was the University of Leeds, was it?

Yes.

Why was the University of Leeds so keen on wool? Was that because it was part of -

Centre of the wool industry.

- the textile industry?

The centre of the wool industry, yes. They made the best worsted fabric at that time. Before Italy competed with them, the best ones came from that area of Yorkshire.

And so then you, as we've mentioned, you met Mary there and got engaged. But you weren't married when you first went to England?

No. It was a year later. I left for Cambridge in August '51. We were married in July '52 at the ancient Round Church at Cambridge built by the Normans.

As a bit of an aside - thank you very much for giving us access to your PH file - perhaps you could just tell the story of your medical examination and your fight with your nemesis, Dr Fulton.

I had to go Dr Fulton for a medical examination when I first joined CSIRO. He said, "Oh, your blood pressure's high, I'm not going to approve you for superannuation. You'll have to come back. Otherwise I'll only approve you for a provident fund." Well, I was going to England anyway. Then there was a fire at the superannuation building in Melbourne and records were destroyed. I had the next medical examination in London at Australia House and passed for superannuation. Well the amazing thing is that I've had a very, very healthy life, I've never had any problems. I've never been away from work because of high blood pressure.

So Dr Fulton was wrong?

He was wrong. And now I'm 91.

Dafydd Lewis Trust Scholarship to Cambridge

So you say that you were going to England anyway. When did you decide that your career wasn't in wool research in Geelong, and that you wanted to go to England?

Well, I got interested in proteins very much and I read a hell of a lot about proteins while I was at Geelong, so it was protein chemistry that I was interested in. Lipson was agreeable. He supported me for a CSIRO studentship, but the Dafydd Lewis Trust generously agreed to support me for PhD at Cambridge.

So did the Dafydd Lewis Trust have many PhD scholarships?

No.

So you were one of a few?

I was probably the first.

The first, yes.

Probably.

And so you decided to go off to Cambridge University to do a PhD -

Yes.

- and you went to the Low Temperature Research Station. Could you just explain briefly to us

-

Why I went there.

- what the Low Temperature Research Station was? How was that linked to Cambridge University?

It was on the Downing Street site of Cambridge University.

Who funded that?

It was funded by the Department of Science and Industrial Research of the UK Government. It was built in 1922 to research the preservation of food- spoilage of meat and fruit had been a significant problem during the war. Sir William Hardy, a Fellow of Caius College and Biological Secretary of the Royal Society was influential to having the laboratory built on the University site. The ownership of the building remained with the University and after the UK Government transferred the research to Bristol and Norwich in the 1970s the University renamed the building, Sir William Hardy Building. Dr Franklin Kidd FRS was nominally in charge of the Low Temperature Research Station in the 1950s but he spent most of his time in London as Director of Food Investigation. He was a Fellow of St Johns College, which was my college as research student.

So it was a building that was used by many different groups of scientists, was it?

The scientists employed by DSIR were doing mainly basic research related to the properties of meat and fruit on storage or on snap freezing. For example, there was basic research on the contraction of muscle and the properties of connective tissue. Dr Miles Partridge was working on connective tissue, particularly elastin. There was some collaboration with scientists in university departments such as biochemistry, botany, the Chibnall protein laboratory and the Molteno Institute of Parasitology. The facilities of the Low Temperature Station were used occasionally by university researchers.

So Miles Partridge, he was a food researcher was he?

He had worked in London on blood group substances which are glycoproteins. At the Low Temperature Station his main research was on connective tissue, particularly elastin. He was elected FRS in 1970 for his pioneering research on elastin biochemistry. He was the first to separate sugars by paper chromatography. Partridge was also interested in the purification of amino acids and peptides by chromatography- it was for this reason that I went to the Low Temperature Station.

Pioneering chromatography

And just could you fill us in a little bit about the history of chromatography? Was this – this was right at the beginning of the use of chromatography in science?

Paper chromatography was discovered by Martin and Synge in 1943 for the separation of amino acids. They were working at the Wool Industry Research Association at Leeds.

But it was in the early days of -

Oh yeah.

You were one of the pioneers of chromatography.

Yes but for proteins. Partridge had extended paper chromatography for the separation of sugars. At Cambridge Partridge set up facilities for the isolation of ascorbic acid from plant material by large scale chromatography. When I got to Cambridge, Partridge was interested in protein separation by chromatography. But he also continued his research on elastin biochemistry. He was elected to the Royal Society mainly for his pioneering work on chondroitin sulphate and the synthesis of elastin.

And you mentioned the Molteno Institute.

Yes.

What was that?

Molteno was only about 50 yards away from the Low Temperature Station. The Molteno was again a lab set up by the University for parasitology. Keilin who discovered the cytochromes by spectroscopy was its most prominent researcher. It was considered unfortunate that he missed out on a Nobel Prize. Bill Slater, originally from the Institute of Anatomy in Canberra was at the Molteno and lectured with Keilin on the biochemistry of oxidative phosphorylation. Keilin was still interested in haem proteins, particularly the cytochromes and he had students studying cytochromes.

I started at Cambridge in October 1951. Partridge put me first of all on the nuclear histones from the sperm of cod. The aim was to separate the basic proteins of nuclear histones by chromatography on a column of an ion-exchange resin. The resin chosen was IRC-50, a cross-linked polymethacrylic acid, a weakly acidic cation exchange resin. Partridge went for two months to the administrative staff college at Henley. Ralston Lawrie, a research student with Professor Keilin came over to use our low temperature facilities and he said, "Why don't you try a coloured protein? The resin is white and you can see what's happening then." And he helped me make cytochrome c from horse heart. The cytochrome c was successfully purified by chromatography on IRC50- there were more than one component but the main component was of higher purity than any previous preparation of cytochrome c. I concluded that the successful chromatography of cytochrome c was a balance between the electrostatic forces between the resin and cytochrome c and short range van der Waal forces due to uncharged carboxyl groups on the resin. I then thought of trying to chromatograph haemoglobin, a more typical non-basic coloured protein.

Well Gilbert Adair had a lab at Low Temperature Station, he was a Reader in the Department Physiology, which again wasn't very far away. He had done the molecular weight of haemoglobin, in 1925 I think it was. But he also successfully explained the oxygen uptake curve of haemoglobin with the interaction of the four haems. And when Perutz later wrote the obituary for Adair he acknowledged that Adair had more or less shown the interaction of the haems that he then established by x-ray. Adair was a Fellow of the Royal Society. He gave me samples of haemoglobin and also helped me to prepare myoglobin from horse heart, because that was done at the Department of Physiology.

I then went on to successfully separate haemoglobins by ion-exchange chromatography and to purify myoglobin.

And was that part of your PhD or -

Yes.

Yes, so you did your PhD very quickly.

Well, because I had done two years of research with thesis for my MSc, the University agreed after I had been enrolled for one year that I could submit a thesis for PhD after two years of research. My research went so well in the first year that I could easily finish in two years.

And it was entirely by thesis?

Entirely by thesis.

And in Cambridge, was that examined by people at Cambridge? Not like - Australian PhDs are typically examined by external examiners. Was yours -

I had two examiners. One was from Cambridge, Kenneth Bailey, who was a protein chemist and the other was A J P Martin, Nobel Prize winner for paper chromatography who was working at the National Institute for Medical Research at Mill Hill in London. Martin developed gas-liquid chromatography at Mill Hill, paper chromatography at Leeds.

And were you on leave without pay still at that point from CSIR?

Yes.

But then you - by then it was CSIRO – then you took up a ICI fellowship -

Yes.

- and resigned from CSIRO.

Yes I should have written to Pip Lipson first, I -

He got a bit irritated with you.

Yes. But they didn't say don't come back though, as you saw in the PH file, but I should have written to Pip.

So what was your career thoughts at that point? You decided you'd do a post doc, what were you thinking that you might do after that?

Oh, I was thinking I'd get more into the developing area of molecular biology. Cambridge was a great place to be in the 1950s. Sanger was doing the amino acid sequence of insulin, Porter had elucidated gamma globulin and had just left Cambridge, Perutz and Kendrew were doing the x-ray structures of haemoglobin and myoglobin. Watson and Crick published a double helix structure for DNA. It was a tremendous research environment— it was the beginning of molecular biology. So that's what I was interested in, proteins mainly. I was interested in the molecular structure of the a protein from the point of view of its surface, because of my work with proteins and ion exchange resins, I had realised in some cases proteins were getting denatured on the resin—was it due to the unfolding of the protein.

So the – can you sort of contrast to us briefly the difference in the atmosphere from the laboratory in Geelong to the laboratories at Cambridge?

Well, two aspects. One, the younger researcher were given a lot of scope.

At Cambridge?

At Cambridge. In other words, at that time there weren't big teams. At the Cavendish for example several researchers had the freedom to pursue their individual research and it was the same in the Chibnall protein laboratory. It was felt people, particularly the bright post-docs should be given scope for new lines of research. Of course a senior professor usually had a number of PhD students but even a PhD student could be given the freedom to pursue an individual line of research

The other big difference which I explained to Professor Trikojus when I came back – he said, "What's the difference?" I said, "You're just not equipped for it here at Melbourne." I said, "Over there, they're using the latest physical and chemical equipment to study complex biological molecules. We haven't got the equipment here."

See at the Low Temperature Research Station we built a Moore and Stein apparatus for the analysis of amino acids. Moore had spent a year on sabbatical at Cambridge. So we used his expertise to build the first amino acid analyser in the UK. And that's what I used to do the amino acid analysis of myoglobin. We'd purified the myoglobin by chromatography on IRC-50 and showed that the molecular weight wasn't a quarter of haemoglobin. Adair and I measured the molecular weight by osmotic pressure, but we also calculated the molecular weight from the amino acid analysis. Perutz and Kendrew came over to see my lab, because they were interested in whether they could get better crystals for their x-ray studies. Kendrew was doing myoglobin and Perutz was doing haemoglobin. This shows the interactions at Cambridge.

Can I just ask what sort of equipment you were lacking back here? In other words, electron microscopes, that sort of thing?

Well CSIRO had the best available electron microscope and Hodge, McLean and Mercer did some pioneering work.

And that was due to the foresight of Lloyd Rees.

Yes.

Rees was aware of the big advances being made on biological molecules with advanced physical and chemical equipment. He came back from London and established a well-equipped Division of Chemical Physics. Hodge was eventually seduced to go to America.

So Keith, in Australia at that time, were the chemical parts of CSIRO equipped to do chemistry through Lloyd Rees and Ian Wark and so on getting chemical equipment, but the biology labs were still much more traditional?

Yeah.

Was that the -

Yeah, in biochemistry they were still working on metabolic pathways, following on Krebs and Trikojus. They hadn't really got into even a vision of molecular biology.

So in a sense the chemistry part of CSIRO was more modern than the biology part, through the work of Rees?

Yeah.

That's interesting.

That's right.

Cricket with John Falk from CSIRO Plant Industry!

Going back to Cambridge, and you played cricket with John Falk. That was fortunate.

Yeah, that's right. He came up from London with a team from his lab. I remember after playing cricket that day I could hardly walk I was so stiff. I hadn't played cricket for so long.

Were you a batsman or a bowler?

Mainly a batsman.

And so what was John Falk doing?

He was in London with Rimington working on porphyrins at University College, and so he was a porphyrin chemist.

Had he been appointed to CSIRO at that point?

I am not sure.

So this was a transition?

Yes.

He was transitioning from -

Yes, that's right.

- University College to Canberra?

I think he may have been appointed after the cricket match, but before he came and talked to me at the Low Temperature Station.

And so he wanted you back in Canberra, and there's a whole – when you read the PH file there's a whole lot of discussion about what to do, but it was all a fait accompli.

Provided the position was available, yes, that's right.

Otto Frankel was sort of powerful Chief was he?

He was appointed about 1951 I think, by Fred White who was aware of the need to modernise plant industry research.

The plant industry research?

Yes, it wasn't keeping up with the advances in plant research.

So what field – what was Otto Frankel – what was his -

He was a geneticist. He developed all the wheat varieties in New Zealand, for which he was made a Fellow of the Royal Society. Frankel wanted to expand the basic sciences because he could see we didn't have the spread of disciplines in order to make big advances in the efficiency of plant growth- nutrition, water efficiency, genetics. I understand that Frankel consulted eminent scientists overseas, including James Bonner from Caltec. The disciplines expanded by Frankel included biochemistry, physiology, microbiology, genetics. And that all happened in the 1950s.

So Keith, was that - we discussed briefly the funding of the wool research laboratories. Was the division of plant industry funded by any industry funds -

Oh yes.

- or was it a -

Some of it was wool.

Some of it was wool funds?

Some was wool funds.

Because of the importance of pasture?

Yes, because of pastures.

And what -

You see Alf Anderson discovered manganese deficiency in certain areas of the Southern Tableland. That had a big impact.

Was that from the Division of -

Plant industry.

Plant industry.

Yeah. Plant Industry did much of the early work on introduced pastures, clovers. Before the war the wool and meat industries relied on native pastures as far as I know.

But did the wheat industry give any funds, or was your work funded by appropriation funds and some wool funds?

Mine was appropriation. Other people in the Division were funded from wool. For instance, Don Spencer was funded from wool at one stage. With John Possingham he showed that photosynthetic electron transport was inhibited by a deficiency of manganese. Plant Industry was partly funded from wool, whereas the Division of Animal Physiology, I think was funded entirely from wool.

Research at the Division of Plant Industry in Canberra

And when you came back to Canberra, was part of your role building up the equipment that you needed?

First of all I was appointed to set up chromatography facilities but that didn't take very long to do.

You were able to buy things?

Yes.

Buy equipment?

Yes, but for setting up paper chromatography, the Plant Industry workshop made a lot of it. We had a good workshop at plant industry.

- you had to make a whole lot of stuff.

That's right. We had a good workshop. And the other big advantage- we had in the biochemistry section a critical mass of colleagues working on unrelated projects but requiring access to the same expensive items of equipment like the Cary spectrophotometer. Cyril Appleby was studying the cytochromes involved in nitrogen fixation by legumes. Both Cyril and I needed to analyse for cytochromes in tissues containing chlorophyll or other pigments. This could not be done at the time. The skills of the plant

industry workshop were critical in developing a light scattering attachment for the Cary spectrometer and a device for examining spectra at liquid nitrogen temperature. We were successful in measuring cytochromes in the presence of chlorophyll. The workshop was very important in building the devices to do spectra at liquid nitrogen temperature, and not lose the signal by scattering. We also got a Spinco analytical ultracentrifuge for Plant Industry via a grant from the Rockefeller Foundation. I was responsible for setting it up and its operation.

How did the Rockefeller – how did you get that? Did you apply for that?

I think CSIRO applied, and at the same time the Division was successful in obtaining via the Rockefeller Foundation a machine for producing radioactive cobalt for producing mutant plants and new varieties.

Keith, we've been going for an hour, so I think it's probably time for us to have a break.

All right.

Okay, so Keith we're back after our short break, and you've now arrived in Canberra with a wife and a number of children.

So what year are we?

We're in 1955, wasn't it that you -

One child.

With one child, okay.

Yes, the daughter that was born at Cambridge.

Okay, and so what greeted you in Canberra? How did you -

As we drove into Canberra, early January, we were horrified by the new development in O'Connor, no trees, no vegetation. But at least they'd hired a house for us on the south side, so we thankfully got a different view. From the point of view of general living, it seemed very, very isolated. After coming from England, with the newspapers reporting events from around the world, it seemed here that you were completely shut off -

Parochial.

- Yes. There were a few local groups. The repertory was good and they used to put on some well-known plays. We didn't have a commercial theatre, so the repertory was popular. I remember Robert Menzies being at a rep production of Tartuffe. He had one inconspicuous guard with him at the time. It wasn't like it is today. So that was the initial impression.

But did you think that you'd done the right thing, or did you have misgivings?

No, I didn't have misgivings. I felt I had the facilities and support for my research and as it turned out cheap land for housing.

And back in those days when you came back here, did you have much to do with the ANU?

Yes, a little, because we were using some of the equipment at the ANU.

Because they were being built up as well weren't they, at that point?

Yes, they were being built – yes, that's right. I used to get the liquid nitrogen I used for low temperature spectroscopy from the physics school and I had some interaction with the John Curtain School and the Research School of Biological Sciences.

But not close professional relationship.

Not me, I didn't, but John Falk had a PhD student linked to the biochemistry department at the John Curtain School.

So just before you came back to Australia, the Division suggested that you visit a few laboratories in England. What was that a useful thing to do? What did you learn from that?

Two things. They did that because they couldn't get me on a ship early enough. And it was useful because I was able to visit the National Institute of Medical Research and Richard Syngé in Scotland. In other words, I could see the developments that were happening in chromatography, particularly gas/liquid chromatography by James and AJP Martin. I learnt what was happening in the protein area outside of Cambridge.

So you came back to – sorry, I've got a bit of cramp in my leg. You came back to CSIRO, I think we – you joined the organisation again in October 1955, but you didn't actually get back to Canberra until the 4th of January, 1956, and then you started your research. Could you just give us an indication of what – how you decided what to do? Was it a – in terms of the direction of the research, were you given a free hand or did Otto Frankel or John Falk direct your – was there much consultation with industry or something?

First of all I had to do what I was appointed to do, set up the chromatography facilities. After that I was interested in protein synthesis in plants, but also the state of chlorophyll *in vivo* - at that time no one knew why the chlorophyll spectroscopic properties *in vivo* different from chlorophyll in solution. Was it aggregation of the chlorophyll or complexing of chlorophyll to protein. Having worked with haemproteins I decided to study the state of chlorophyll and attempt to isolate chlorophyll protein complexes. It fitted in with the interests of John Falk, a porphyrin chemist, but there was no direction to me at that time. It was the Cambridge philosophy to let people have a go and see how it worked.

Yes. Employ good people and give them their head.

Yes, at least for a while.

Collaboration with Jan Anderson

Yes. And so in those early years you made great advances in that – looking at the cytochromes in green material, and Jan Anderson came on board. Where did she come from and -

Well, she had -

- what contribution did she make?

Jan was a New Zealander. She had been given a scholarship by the New Zealand Government and she went to Berkeley for a PhD with Calvin. She worked on the separation of carotenoids of plants. Then she had to go back to New Zealand because under the terms of her scholarship she was required to work for the government for three years. She was working at the Ruakura animal research centre, which she didn't like.

In the early 1960s, there was great competition for the few new positions at the Division of Plant Industry. I had a fight for a position but originally it was for an experimental officer and I wanted a research scientist. Frankel said, "Well, we'll see what the quality of the applicants are." Well, of course there was no way you could appoint Jan as an experimental officer. She was appointed a research scientist in 1961 I think.

What did she contribute? Well, Jan was a co-worker in much of my research at plant industry. She was an excellent experimentalist and an independent and creative thinker. She was a great colleague and worked very well with people. Later on Jan established an eminent international reputation for her work on the structure of the chloroplast and the role of grana. She was involved in most of the work characterising the fractions from the digitonin treatment of chloroplasts, including the cytochrome work which depended on the adaption of the Cary spectrometer with Cyril Appleby.

So what was Cyril – was Cyril Appleby, was he the – what position did he have in the Division?

He was a research scientist. He'd done his PhD with Bob Morton at Melbourne, working on cytochromes in yeast. So he was interested in cytochromes and at plant industry he was studying the role of haem proteins in nitrogen fixation.

So he was the one who introduced the Cary spectrophotometer.

The Cary, yeah, that's right.

And so Keith, the next decade or so of your work in the Division of Plant Industry, was very, very productive indeed, about characterising the photochemical systems of photosynthesis and photochemical activity during greening of plants. So can you just reflect a bit on that? It's very well done in this interview with Ralph Slatyer, but perhaps you could just tell us a bit about what you did and your most important contributions to knowledge in that area?

Initially, as I was interested in proteins, I set about purifying a protochlorophyll protein complex from dark-grown bean plants. Smith at the Carnegie Institution at Stanford California had obtained a soluble extract from dark-grown bean plants which contained protochlorophyll. Shining red light on the extract converted protochlorophyll to chlorophyll. I thought I've had a fair bit of experience in protein purification so I attempted to purify the protochlorophyll protein complex using ammonium sulphate precipitation and column density gradient electrophoresis. All experiments were done in a room fitted with weak

green light which is ineffective in converting protochlorophyll to chlorophyll. The transformation is driven by red light.

The protochlorophyll in the purified complex was convertible to chlorophyll in red light. The molecular weight of the complex, determined in the Spinco ultracentrifuge was roughly the same as Fraction 1 protein or ribulose diphosphate carboxylase. We could not be sure this was the molecular weight of the protochlorophyll protein or it was being adsorbed on some Fraction 1 protein.

We then decided to examine the development of the photosynthetic process during the greening process of dark-grown bean plants- the development of the structure of the chloroplast, the appearance of oxygen evolution and the components of the electron transport system.

So you studied those with various analytical techniques -

Yes.

- that the Division had or that you'd developed?

Mainly they were the techniques which had been developed overseas, for example, the use of an oxygen electrode for measuring oxygen evolution. As I mentioned earlier we adopted a Cary spectrometer for the detection and determination of cytochromes in plant material containing chlorophyll. For their work on plant nutrition and the role of manganese Possingham and Spencer had set up the methods for examining electron transport in different parts of the electron chain. They showed that in severe manganese deficiency the part of the electron chain involved in oxygen evolution is inhibited. John Thorne, an electronics engineer in the biochemistry section designed and built a sophisticated spectrofluorimeter for the accurate measurement of chlorophyll fluorescence. A commercial instrument suitable for chlorophyll fluorescence was not available. The division acquired an electron microscope that was used to examine chloroplast structure along with other divisional projects.

So you had your own electron microscope?

Yeah, David Goodchild, a research scientist in the Division set up and operated the electron microscope. He was very interested in the fine structure of chloroplasts and made an important contribution to our study of sun and shade plants and C4 plants.

Our work on the development of photosynthetic activity and chloroplast structure on transfer of dark-grown bean plants to light produced some surprising findings- the rapid appearance of chlorophyll *b*, the early development of photosynthetic electron transport and oxygen evolution. The cytochromes destined for electron transport in photosystem 1 were already present in the dark-grown plant.

But the real advance came when we were looking at fully green plants. The soluble protochlorophyll(ide) protein complex of dark-grown plants was converted to chlorophyll *a* on exposure of the plants to light but it was no longer extractable in aqueous solutions.

I attempted to extract a chlorophyll protein from spinach leaves using a number of detergents but the spectrum of the extracted chlorophyll was different from chlorophyll *in vivo*. And as I said in the Ralph Slatyer interview, I was fortunate Fred Collins, a lipid biochemist at the ANU John Curtin school, who was secretary of the Australian Biochemical Society when I was treasurer, suggested to me that I try digitonin, since it had been used to separate the retinin from the rods of the eyes in a native state. Incubation of chloroplasts with 0.5% digitonin did not change the *in vivo* spectrum of chlorophyll. Differential centrifugation of the incubate gave a surprising result – the physical separation of the two photochemical systems of photosynthesis.

So could you tell me, some of your papers indicate that you worked on C4 plants -

Yes.

I've had a lot of discussion with Hal Hatch about C4 plants. Could you tell me your contribution to understanding C3, C4 plants?

Well let's go back a little bit, what was the significance of that separation? Two photosystems had been proposed based on electrochemistry and light induced absorbance changes. Partial separation of the photosystems confirmed the concept.

C4, Hal Hatch with Roger Slack had elucidated the carbon cycle of C4 plants. My contribution related to the photochemical properties and composition of chloroplasts of C4 plants. C4 plants contain two distinct layers of chlorophyll-containing cells, a mesophyll layer and an inner bundle sheath layer. Jan Anderson and I showed that mesophyll chloroplasts from C4 plants had good photosystem 2 activity whereas bundle sheath chloroplasts were deficient in photosystem 2 activity. Bundle sheath chloroplasts and mesophyll chloroplasts both had good photosystem 1 activity. Hal was continuing to work on the differing carbon pathways of C4 plants.

So was that simultaneously with Hal? So you and Hal were working on this at around about the same time?

Yes, the same time.

Okay, as part of the - as part of the Divisions?

Yeah, well I think I was very much responsible for getting a position for Hal at plant industry when CSR folded their lab in Brisbane. Hatch and Slack had discovered the carbon pathway of C4 plants working for Colonial Sugar Refinery. A well-known chemist was responsible for recommending the closure of the lab.

Was it not Keith Sutherland?

Yeah, that's right.

Keith Sutherland had gone from – he was the Chief of the Division of Physical Chemistry at Fishermen's Bend, and he went to CSR.

And I think he was responsible for shutting down the C4 work.

Because it was discovered that many of the food crops were C3 and many weeds were C4, but unfortunately not all weeds are C4 and not all food crops are C3.

Sugar cane and maize are C4

So there are two curiosities in your PH file. One was the one we've talked about, your discussions with Dr Fulton about your health. The other one was your appointment as the library liaison officer in 1967 and that was the – the PH file has a lot of fanfare about this position. I think you succeeded Ralph Slatyer in that. So that was a curious thing to read from a modern point of view.

Well, there were several Divisions at Black Mountain and it was a question of where do you put a new library to serve the Black Mountain site? Doug Waterhouse wanted it right next door to Entomology, but Land Research was at the top of the site. My view was to place it centrally on the site, more or less equidistant from all divisions. That was a big issue at the time.

And is that what happened?

Yes that's what happened. And I remember after it was built I was visiting Fred White after he moved to Canberra to the AMP building in Hobart Place before they built head office.

Hobart Place.

He moved first.

Right. Before they built Limestone Avenue?

Yeah. And I remember going into his office. Fred could see the new library and he didn't like the architecture.

So Keith, as you built up your research and eventually became a Chief Research Scientist in the Division of Plant Industry, did you start having some managerial responsibility? I notice that -

No, not much.

- in the early days, when you look at the annual reports of the Division of Plant Industry, the early days there are Chiefs and Assistant Chiefs. When you were a Chief Research Scientist there was only a Chief, and so what – and you were head of a section. Did you have any sort of managerial responsibilities at that point, apart from managing your own group?

Well, first a time Otto did have several Assistant Chiefs, but they sort of came and went. Then when John Falk died, that was in 1969 I think, we rotated Head of the Biochemistry Section. So I had managerial duties for the section for the period in which I was Head. No one really wanted it permanently. There wasn't much management or administration to do at that time. Resources were still reasonable so that you didn't have the hard decisions to make when resources are very tight. So I didn't need to spend much time on management and administration.

So who was the Chief? Was John Falk for a lot of that time when you were there -

John was Head of the Biochemistry Section from 1955-1963 and Chief of the Division from 1963-69. Otto Frankel went on the Executive in 1963. I was in the Division from 1956-1977.

And who succeeded John Falk.

Lloyd Evans.

So when the position of Chief of the Division of Plant Industry became vacant and Lloyd Evans got it, you didn't think of applying for that?

No.

No, you weren't interested in -

No.

You were very, very happy being a research scientist?

Yes.

So in your group, which the annual report indicates was quite a big group -

Yes.

- under that, how did you run that group? Was that run on the Cambridge lines at that point?

To an extent- Yes. Many of the researchers in the section either had their individual programmes or joint programmes. They were assessed on their research productivity-its originality and importance to the Division's overall programmes. At that time we didn't have a large number of people working on one programme. Usually there were a couple of researchers plus their technical assistants plus visitors. We got many visitors from overseas, a few from Australia, so that expanded the research effort.

So why did you – that was because of your international reputation?

Yes, that's right.

Your international reputation, and other people in the -

And the other people, yeah.

- in the Division?

Yeah.

And starting and stopping projects, was that part of your role as a result of the reviews?

Was the Division of Plant industry reviewed in any way during that period?

There was a review by an external panel at one stage, but I don't recall whether it got down to the individual projects. I think it was more concerned with broader issues - the major programs of the Sections which were mainly disciplinary, for example, genetics, microbiology, physiology, agronomy.

It was a big division.

Yeah.

But I thought you mentioned that there were reviews of the individual projects, and that's how people were evaluated?

Individual projects were evaluated at the sectional and divisional level. Outputs were an important part of these reviews.

Publications.

Not only publications but also products of the research, for example, the development of a more compatible strain of rizobium to improve the productivity of clover plants or an improved variety of cotton for the Australian environment. The strength of the Division of Plant Industry was the balance between the basic and applied research.

And my recollection when I joined CSIRO is that people were obviously very concerned about promotions, but head office and the personnel section at head office was quite influential on the question of promotions. So if somebody was going from PRS to SPRS there would have to be a case made and a list of publications and that sort of stuff, and it wasn't a decision just made in the Division. It had to be proven.

The Division made the decision to put up or not put up a researcher for promotion. If the Division did not send a recommendation for promotion to Head Office it was not considered by the Executive.

You weren't promoted.

I don't think the bureaucrats at head office had much say in the promotions. The Executive took promotions very seriously and considered their consideration as one of their most important activities. When I became a Member of the Executive in 1977 I was comfortable considering promotions because of the breath of my experience on the Australian Research Grants Committee (ARGC). Unsuccessful cases for promotion were sent back to the relevant Division via the secretariat but the Executive made the decisions.

And you had in front of you at those times weight for age charts and those sorts of things -

Oh yeah, we had all of that.

- and they were prepared by the secretariat -

Sure.

People like Dennis Young.

Yeah. We had those and where a researcher was on that chart.

So in other areas of CSIRO they had a reputation of being very powerful. Your impression is that those individuals in the secretariat were not powerful in any sense.

I think individuals in the secretariat had an influence in the distribution of resources, particularly funds that needed to be expended by the end of a financial year. The secretariat was the messenger of views or decisions or queries of the Executive or a member of the Executive and, I think, its influence in decision making by the Executive overrated.

The secretariat.

Yeah.

Back to the Division?

Back to the Division.

Through the secretariat.

Yes, yes.

And with some queries, but those queries usually came down from the executive. That was my recollection.

Professional society activities

And that was certainly my impression from the bench, as it were. So just before we stop - it's probably getting around lunchtime now Keith - but before we do that, can we just get you to talk a bit about your experience outside CSIRO, from before you went onto the executive? So your work with the ARGC, I think it was called then, and your work in the Academy and other activities outside the organisation.

Well, first of all my first outside activity was with the Australian Biochemical Society, which was set up in 1956, and I was treasurer from 1957-61. I was on their council for several years and president for a couple of years. My outside activity as treasurer was trying to grow that organisation, because it was very small at the beginning.

Compared to the Royal Australian Chemical Institute.

Very small. The fee we charged was minuscule. We built the society by increasing the annual subscription, charging more for meetings and inviting overseas biochemists as key speakers. I worked closely with Tony Linnane over several years including the organisation of the 12th International Congress of Biochemistry in Perth in 1982.

And you probably know that Tony Linnane died the other day?

Yes. I wrote to his wife, Daryl. I would say Tony was one of the most effective of the presidents of the Biochemical Society in raising its international reputation.

The Biochemical Society was my first outside activity. The second was ARGC. I followed, I think, Ralph Slatyer on the biology panel of ARGC. That was a great experience because the biology panel handled applications across the whole of biology.

So what year was that Keith, roughly?

1971-75.

In the early '70s.

Yeah, and then I became chairman of the biology panel. We were always running behind the other panels in our assessments, because we had to deal with so many. So that's when I recommended molecular biology be split from the remainder of biology. At that time we did site visits everywhere. So you learnt a hell of a lot from the groups you visited, and I think the site visits were a very big advantage in terms of making the decisions instead of just reading referee reports.

And when you say 'we made site visits', how many people were we? How many other people were involved in that activity?

Normally there'd have to be at least two in each site visit, and sometimes there'd be three. But the visits were divided up on the basis on the projects being reviewed.

And you would have gone all over the country doing -

All over the country, yes.

And learnt a lot about what was happening in universities?

Yeah, sure.

And that was the time when university research was building up in Australia.

That's right, that's right. Well, you see when I first went on ARGC we had a big pool of money for equipment. The majority of grants were going to well established researchers. It was a time when it was worthwhile getting ARGC grants because they were substantial often with major items of equipment. So it was a great time to be on a funding body, as distinct to now when successful applications are down around the 20% mark. One enjoyed being on the ARGC from the point of view of what one learnt, but one enjoyed being able to give the resources so that research could expand.

And was that an important part of your later toolkit, in a sense, of understanding priorities and who are the people that you wanted to support and so on?

Yeah, very much so. And also particularly if new areas were needed to be expanded, because we saw that on ARGC. That's why I pushed for an expansion of recombinant DNA research in CSIRO, because CSIRO, except for Plant Industry, were doing so little of it. I suppose that has been the problem with planning, if we come to that later in relation to the Birch review. Our planning didn't really look ahead enough, I think. We didn't perceive the big changes that were coming. At the time of establishing the first Institute structure after

Birch, there was no Institute of Information Technology. All we had was Sironet, but that was a service organisation.

All right, well I think that that's a convenient time to stop for a lunch break.

Yeah.

Member of the CSIRO Executive

So thank you very much for that very nice lunch, Keith. We're back talking about Keith's career as a scientist, and now as a leader in the organisation. So in March of 1977 you were appointed as a member of the executive, so could you just briefly outline to us how did that come about? In a sense, you hadn't been the Chief of a Division so you hadn't had – many of the other people who were appointed to the executive had come from the group of Chiefs in the organisation. How was it that you were tapped on the shoulder to become a full time member of the executive?

I really believe that it was related to my experience on the Australian Research Grants Committee. I don't know, I can only presume, but I have a feeling that Jerry Price had talked to Bob Street about my time on the ARGC. I was a member of the biology panel but I interacted with the chemistry panel about setting up the NMR.

NMR.

Yeah, that's right.

The NMR centre in Canberra.

In Canberra with Jones -

With Alan Jones.

I was coming to the executive to replace Max Day and I was from the biological area. Jerry was very much of the view that a chemical background was a good background.

As indeed, it is.

And of course he was interested in biology in his chemistry research.

Well, Jerry as you know, he was a distinguished organic chemist, but he'd spent a lot of time in his early career in agricultural – the John Innes -

In isolating compounds and -

Yeah, and in the John Innes laboratories in England. So he was very interested in chemistry applied to biology.

So that's my only perception of why I was asked- ARGC mainly.

And you were at the sort of peak of your career as a scientist, possibly going on to earn the Nobel Prize for discoveries in photosynthesis. Why did you decide at that point to become a science administrator? Why did you accept the offer?

Well, firstly let me say, as I said to Ralph Slatyer, it was a one year appointment, almost like a sabbatical for one year. I said if Jerry had asked me to go on for five years or seven years I wouldn't have done so. So it was the one year.

The reason, I felt that I had been treated so well in the CSIRO, I had all the resources I wanted and a lot of freedom, little interference in what I did. And I felt that, having had the experience on the ARGC, possibly I should give something back if I had something to offer.

But I also felt that, as happens in science a lot, you do your most creative work in the 30s and 40s, and this has been so true at Cambridge.

And why was it a one year appointment? Was that because of -

The Birch inquiry into CSIRO.

- the Birch inquiry? So the government wasn't appointing full time people until they knew what was going to happen?

That's right, I think.

So who appointed the executive? Was that a governor in council appointment or -

Yeah, that was a governor in council appointment.

So it was a government appointment?

Yes, the Minister had to agree -

A Ministerial appointment.

- and then it had to go to the Governor General, yes.

Okay. So you started at the executive on the 1st of March 1977. The Birch inquiry was being -
Still being done.

- still being done, so did you have any input into what CSIRO said to the Birch inquiry?

Only a little. The substantial submission from CSIRO to the inquiry was in 1976 before I joined the Executive.

But can you remember what your actual thought was? If the government was going to change the organisation, what did you think should happen?

Oh well, at that time I suppose I thought, a little like Birch, that CSIRO had expanded into so many divisions.

I think they had 46.

- all reporting to this one body, the Executive, not a usual or ideal organisational structure. So it was felt there should be some changes in the structure. We didn't consider Institutes with their own staff at that time. The majority of the Chiefs were opposed to a management layer between the Divisions and the Executive. We were opposed to the splitting of CSIRO.

From the point of view of the research there was a role for government supporting research for the national benefit as well as for industrial development. I understand that the types of research in CSIRO were in the CSIRO submission to the inquiry.

So this was a time of change in Australian science, so ASTEC, the Australian Science and Technology, was formed in 1977 but wasn't given the task of – I don't know the timing of that, but the ASTEC wasn't asked to review -

I understand that the Chair of ASTEC, Geoff Badger and Deputy Chair, Bob Robertson wrote to the Prime Minister suggesting that ASTEC should conduct the inquiry but the government appointed a committee of three headed by Professor Birch.

- CSIRO. It was an independent committee headed up by Professor Birch, and so we'll come back to ASTEC later in this discussion, but we'd like to ask you now about when the recommendations of the Birch report came out, and the executive – the government accepted the recommendations, as I recall -

Yes, they did.

- and said to CSIRO, you have to implement them.

Yes.

Influence of the Birch Report

How did you go about implementing them, and what was the sort of processes that you used, and how did the final Institute structure -

Well, let's rethink of what were the issues. One of the main issues was the recommendation of up to six Institutes. How were we going to do that? Where would the Divisions fit? What would be the role of Institute Directors versus the Executive and the Chiefs of Divisions? Another issue was the interaction of CSIRO with industry, how could we improve that interaction?

Do you remember the main kind of research that they recommended that CSIRO conduct, strategic, mission-oriented research?

Oh yes, strategic mission-orientated.

Yes, mission-oriented research was it, or -

He kept saying mission-orientated research.

Yeah. I don't think we had any problems with that. A problem was how do we balance the longer term basic research with shorter term more applied research? Previously CSIRO was doing a lot of the fundamental research because without CSIRO there was only a small amount being done in Australia. The balance between the different types of research varied between different fields and was influenced by outside resources. As far as I remember one division was funded almost entirely from the wool levy. The main issue initially was the setting up of the institutes.

So the first – did you divide – I don't remember whether the Birch report said what Institute structure should be -

Birch did not make a recommendation on a particular set of Institutes but listed a number of criteria to be considered in allocating Divisions to Institutes

- said up to six, and eventually there were five in the -

And it didn't specify how they were to be serviced.

The responsibilities of the directors of institutes was in the Birch report but not the servicing of the institutes.

So how did you work out what they were? I think in the end there was an Animal one, a Plant one, an Institute of Industrial Technology, Institute of Physical Sciences -

And Minerals.

- and a Minerals one.

Well, let me go back. First of all we had a look at the sizes of the Divisions, and we knew at the time that agriculture was a pretty big component of CSIRO. First, we looked at an Agricultural Research Institute, Minerals Research Institute, Industrial Research Institute and a type of Natural Resource Institute. Have I left one out? Yes, a Physical Sciences Institute. Now the trouble with that structure was the Agricultural Institute; it had the Plant and the Animal Divisions but it left out Soils, Entomology and Forest Research. If all were included it would have been half of CSIRO.

Half of the organisation, yeah.

From the division point of view, a division like entomology was relevant to an agricultural institute and a natural resource institute. I think many divisions saw that their interests were across institutes. The first institute structure did not last very long, but the unusual thing about it was the Institute of Physical Sciences which seemed to go against a national sector structure.

Against the Birch report, yes.

The next institute proposal split agriculture into an Institute of Animal Production and an Institute of Biological Resources, which contained the plant divisions as well as the entomology and soils divisions. It had an institute of minerals and earth resources and an institute of industrial technology. It retained an institute of physical sciences-it looked as

though you were throwing together the divisions that didn't quite fit in a national sector. John Philip was a supporter of an institute of physical sciences and I think Paul Wild because of radiophysics and radio astronomy. The suggestion from Birch for a Scientific Services Institute was not supported.

And that was agreed to by consensus in -

The proposed structure went out to all Divisions and I got comments from the Chiefs. My memory of the responses is vague and I am unable to comment on individual ones. I think there was good support for the structure.

So in this discussion about what the Institute structure would be, you say there was consultation within the organisation.

Yes, very much so.

Did you have a consultation with the public service -

Not as far as I remember -

- and with the outside customers?

Not to my knowledge, not to my knowledge. A primary concern of the Executive was to fit the divisions into a five institute structure. The Birch inquiry recognised the obvious problems in allocating divisions to institutes which may require restructuring of some divisions but it didn't recommend the removal of a division or amalgamation of divisions. The main reason for the institute structure was the large number of divisions and independent units reporting to the executive.

I don't remember the sequence of these events. The Act had to be changed to have the Institutes -

Inserted into it.

- inserted into it.

Well, it didn't have to be, but -

But it was changed, and so was this process that we're talking about, was that done after the Act was changed or simultaneous, happening simultaneously?

They were happening – because the Act didn't specify which Institutes.

No, it just said there had to be Institutes.

Up to six Institutes.

Yes, that's right, but Birch recommended that one of the institutes should be a scientific services institute which would provide organisation-wide services. This institute would include Sironet and Ciles. The Executive decided against an institute of scientific services.

The question of the placement of these services as well as services for the institutes received much discussion. It was decided to form a bureau of scientific services.

Within the head office.

Yeah. That's where Sironet was placed, but as far as I can remember none of the Chiefs were really happy with that.

So once you now have decided on the five Institutes and this service group, how did you then go about deciding who should be the Institute Directors, and what resources should the Institute offices have?

First of all we had to decide what would be the role of the Directors, compared with the full time members of the Executive. And I think, it's my recollection, it was felt that the executive was responsible for broad policies, setting of priorities, the allocation of funds and senior promotions. The Director would be responsible for the priorities within his sector, recommending the resources needed by the institute, allocation of funds to the divisions and for promotions, except for the senior level.

A big issue was the number of administrative staff in an institute. Some staff would transfer from head office but we didn't want a build-up of five head offices and an increase overall in administrative staff. In fact what happened, the Institutes gradually built up administrative staff which was many times greater than the cut back from head office.

Another issue from Birch was the commercialisation or implementation of research results. That led to the establishment of Sirotech. Sirotech wasn't very popular in the organisation. I don't think it worked all that well because it was removed from a close interaction with the relevant scientists.

So whose idea was Sirotech? Where did that idea come from? Was that an internal idea, or was it imposed by the government or the outside? Where did that come from, Keith?

I think it was implied in the Birch report. I don't know who were the main supporters of Sirotech?

Within CSIRO it was supported, was it Paul Wild?

I think Paul Wild was the main proponent of Sirotech, yes. I think you're right, but I think Sirotech had support from the part-time members of the Executive. I was the member who sat on the Sirotech board.

Can I just get the sequence of events here clear in my mind? Were the – Jerry Price resigned from being the Chief Executive in -

Chairman.

Being the Chairman in 1978, wasn't it?

No Jerry resigned in March 1977.

So was he involved at all in the implementation of the Birch report or -

No.

Working with Paul Wild as Chairman of CSIRO

- was it entirely Paul Wild? So Paul Wild became the Chairman, and was the Chairman of the executive during the implementation of the Birch report?

I don't think there was any implementation until Paul Wild became Chairman in Dec 1978. Victor Burgmann was Chairman from March 1977 to Dec 1978. Birch submitted the inquiry report in Aug 1977. It took some time for the government to accept the report, draft a new act and change the upper structure of CSIRO to three full-time members of the Executive (Chair and two others). Of course that meant that some full time members prior to that were in the offing for appointment as institute director.

Yes. So we now have the Institute structure, and the beginning of Sirotech. How did you go about then – the executive then appointed the Institute Directors. How did you go about doing that? You mentioned that some of them were the full time members of the executive, and I think that's where Hill Warner became the Institute Director of the Institute of Industrial Technology.

Well, I'm a little bit hazy there, but we did, prior to that have some people, I think Hallsworth was one, appointed as chairman of a group of divisions.

Yes, and Ivan Newnham.

Yeah, and Ivan Newnham.

He was also -

So it was I suppose it was natural that people like Ivan would become Directors, but I don't remember any formal process calling for nominations.

Because Neville Fletcher – was Neville Fletcher already in the organisation? My recollection was that he was the only external person.

He was at the University of New England - he'd previously been in radio physics and then in cloud physics.

Yeah, but he was then a Professor of Physics at New England.

Yeah.

So he was brought in wasn't he?

Yes- I think the executive more or less just decided. I can't remember any competition – people didn't apply for a director position.

More tapped on the shoulder.

Yeah. And it needed to be done reasonably quickly.

So how did that change the dynamics of the executive? So the executive, you had the Chairman, the three full time members -

The Chairman, plus two.

Chairman plus two full time members, plus the Institute Directors met in some way?

Well, there were two committees. There was the executive committee which had the three full time, including the Chairman, and five part time members.

Then we had a management committee which included the three full time members plus the Institute Directors, plus two from head office administration, including the head of finance and I think the director of the Bureau of Scientific Services. So that was the management committee.

Now how did it change the dynamics of the executive. Well quite significantly. When I first went on the executive I had responsibility for a number of Divisions and they were spread across the sectors. I remember one of my responsibilities was the Division of Soil Mechanics. The executive decided to review the division soon after I went on the executive and I got Hill Warner to chair that one – we had to go Mount Isa and look at their rock wall mining.

The responsibility for divisions disappeared with the appointment of institute directors. Paul Wild and I who had been appointed as Chairman and full-time Member agreed to recommend to government Greg Tegart as the other full-time Member. Greg Tegart was appointed and looked after the industrial institutes with a more physical bias. I was responsible for the biological institutes. It changed the way the members of the executive interacted with the divisions. Of course we still visited divisions to keep up with the research and meet with the Chiefs and researchers but were no longer into those divisional matters which became the responsibility of the institute director. I must say that I found divisional visits very rewarding and enjoyable.

So how did that affect the role of the Chief of the Division? Because let me give you my recollection that in the days when the executive member was in charge of a Division, I don't recall the Chiefs meeting together. But when the Institute was formed, the Chiefs in that Institute typically met together with the Institute Director. So in some ways the activities of the Chief changed in that -

The creation of the Institutes caused Chiefs to be more involved in meeting with each other and making joint decisions about -

Yes. Was that intended by the Birch report, and the executive, in setting up the Institutes?

Well it was, I think. It was very difficult to manage the interaction of Chiefs with the previous structure.

That very flat structure.

There was an annual meeting of all the Chiefs with the full-time members of the executive but with very limited opportunity for Chiefs to interact. The meetings did not achieve very much.

They were more of a -

A talk fest.

Talk fest.

and hearing some news.

So the issue of the staff of the Institutes, you say that you didn't want them to be very big, but they weren't very big, really, were they? The first Institute offices -

My impression is they were very poorly resourced. Your impression is that they were resourced, and then grew.

But my impression, I was an Assistant Chief by then, was that Hill Warner and then Bill Whitton had almost no resources. So if Bill Whitton wanted to do something, he had to like give a talk, in order to get any materials for that talk he had to come to the Division. So my impression was a bit like Terry's, was that they were poorly resourced. But your impression was that they were okay, resourced adequately?

Well, to answer that question you have to ask what were the duties of the Directors? These were outlined at the first meeting of the management committee in Dec 1978. It was envisaged that Institute Directors would be located at head office although they may also have offices closer to their Divisions. The Directors were given dedicated staff resources and the personnel in the science branch (science secretaries) were transferred to the institutes. I think that the resources provided to the Directors were adequate at the formation of the institutes but more resources were needed as the Directors assumed the spread of their responsibilities. Only some of the Directors were located at head office. I think there was much jealousy on the part of the people that had controlled all the administrative area of CSIRO.

Oh, in head office?

Yeah.

Not from the Divisions?

No, in head office. Oh, not from the Divisions.

To head office?

To head office. If you go back to the beginning of CSIR (Schedvin's history- Shaping Science and Industry) there was tension from the beginning between the public service type Secretary of CSIR and the Chief Executive or Chairman. Rivett, the Chief Executive was determined not to run CSIR like the public service. He wanted a small bureaucracy. Of course the administration secretariat at head office expanded with the growth of CSIRO. It

build up a substantial power base in the financial, human resources and communications areas but it also established a science branch with secretaries for biological sciences and physical sciences. As far as I can remember, staff in the science branch were not responsible for particular Divisions or directly involved in research decisions.

Can I just check that with you? So I'm thinking of Gurnett- Smith.

Yeah, Gurnett- Smith for biological sciences and Shelton for physical sciences.

- and Peter Butler.

Yeah and others.

They seemed, just to me as an independent observer, to be more supporting Divisions rather than controlling or directing them in any way.

Yeah, but that role had gone with the appointment of the Institutes.

That's right, but -

The personnel in the science branch were transferred to the Institutes as support for the Directors.

Provide that support.

- support the Director in his responsibilities, including his request for resources to the Management Committee and the Executive.

But just while I'm talking, I also detected that there was some resistance on the part of Divisions for Institute Directors to have substantial staff, because what the Divisions knew was that the more powerful the Institute Director was, the more likely he was to interfere in their business.

You're probably right there Terry, my memory's a little vague there.

So we don't – we can't really at this point assign too many -

Motives?

Motives to people, but the three of us have three different perspectives it seems <phone rings> so we'll just pause for a second. Get it back on board.

You're probably right that the Divisions were worried that if the Director built up staff in areas like strategic planning or commercialisation of research results, it could impact on the division's role and the interaction of the researchers with industry. Of course the Institutes did exactly that, they built up staff in various areas. But I don't know whether in retrospect you could say that that was a big disadvantage to Divisions.

Yes, except of course if you've got a Divisional Chief who wants to do his own thing without interference from anybody, then -

Oh yeah, sure.

And there were some like that.

Yeah, sure.

So during this period, which was the period of the Fraser government, you as the executive interacted with two ministers, Senator Webster and Mr Thompson.

Yes.

Can you recall – and you interacted with the Department of Science, so they were the Minister for Science -

John Farrands was the Secretary of the Department of Science.

Can you recollect what sort of interactions you had with the Department and the Minister, and what influence they had on the direction of CSIRO and this implementation of the Birch report, and the changing of the structure of the organisation? Were they supportive of the organisation?

Yes, because you must recognise that both Webster and Thompson were National Party Ministers, and therefore they were very supportive of CSIRO, as the community was, because of the enormous spread of our activities around Australia- field stations in every state. The CSIRO was known because it was interacting with the people in all states. Paul Wild interacted with the Minister on a regular basis – I don't recall whether the interaction with Webster and Thompson was as great as it was later on when Barry Jones was Minister. I recall that Farrands was reasonably supportive of CSIRO. I was deputy to Farrands on a high level visit to Japan.

But you're saying that the Minister was pretty happy with the organisation -

Yes.

- and just let the executive do its work?

Yes. We never got any direction from the Minister at that time.

Okay.

Have we finished, Tom, with the Birch -

No, no, I'm just going to talk about the planning. So one of the strong recommendations of the Birch report was that the organisation should have a better planning process.

Planning in CSIRO

And set up a small planning and evaluation advisory unit.

So can you – and Don Weiss became the head of that planning unit -

Yes.

So can you explain how Don became appointed to that, and how you saw that operating?

I think Don might have offered to do planning. It was at such an early stage in the executive's consideration of the Birch recommendations. What did we want from planning? I don't think that as an executive, part time and full time members that we had any clear idea on how the planning would operate as a separate unit. I mean planning has to be pretty much closely involved with the people that are making the decisions, so in a way I think possibly Don did -

Sorry, can I just intervene? You keep telling us that structure has to follow function, that's the biological way of looking at things, and now you're telling us in a sense that we had the structure without actually understanding the function.

Yeah. Understanding the function of planning and how any recommendation would be implemented. How do we eliminate certain areas of research and put on new ones? Because that was, in essence, what was happening then under the Fraser government. We were getting cuts each year. Later, as Chief Executive I went to the expenditure review committee of cabinet with Barry Jones. Ministers don't get new money for new activities unless they can identify activities to be cut. So that was the message to CSIRO. If you want money, say to expand Information Technology, take it from somewhere else.

The expenditure review committee came in with the Fraser government, did it?

I am not sure of the name but the process was the same.

Yes, and so that was the time then when resources started not to be so freely available as it was in the '50s and '60s.

Well, we had this enormous inflation effect, remember? 18%(?) inflation and it was more or less stagflation with no growth in the economy. So the government was keen to cut expenditure.

So was this the first time in your experience that CSIRO actually had to work out what it was going to do, what it was going to cut out, and not just expand?

Yeah, that's right. Also other aspects came along with the cutting of programs - how did it affect our policy on staff tenure? And particularly when a little later, during Paul's chairmanship, treasury decided CSIRO should earn 30% of its funds from outside sources. Paul and I decided to seek from treasury a timeframe for that requirement. If appropriation had been reduced in the following financial year by the amount that our funds from outside sources were deficient, it would have meant some severe cuts in the research. Fortunately, treasury agreed to a timeframe of five years, I think, to build up to the 30%.

Seeking outside funds raised the difficult question of staff tenure. I mean tenures had always been a great thing with CSIRO, but here for the first time external money came in for a term. So how do you have tenured people, unless you're pulling them from other programmes to put on the external funded programme and then they go back? If you

appoint new staff, are they on a termed contract? And that's when the big dispute with the unions arose about tenure versus fixed term appointments.

So going back to the planning, so Don Weiss was appointed to the Planning and Evaluation Unit, it was called, PEAU. So how did Don interact with the management committee? Was he a member of the management committee, or did he report to a full time member of the executive, or report to Paul Wild? And what role did he have in the sorts of discussion that you then had with the government about resourcing?

I think he may have attended the management committee. I don't think he reported to any specific member of the executive.

Probably directly to Paul Wild.

Don was very much a free hand in what he did. I don't think people were saying to him 'we want this, we want this'. Maybe to be honest, Don wasn't the best person to be appointed as head of PEAU. Maybe we should have looked outside the organisation for a strategic planner, but there was not much support for a planning unit as in the Birch report.

And when you appointed Don as the head of the Planning and Evaluation Unit did you give him staff, or was he pretty much a one-person band?

I can't answer that.

My recollection is that he either had one, or none.

That's probably right.

So it wasn't a well – in retrospect you look back and say it wasn't a well-executed...

Well, can I put it to you that it was something that was imposed upon CSIRO as a minor decision from the Birch report. So CSIRO said yep, we've got to have a Planning and Evaluation Advisory Unit, here it is, and we appointed Don without an inquiry.

You are probably right but I think it goes a bit deeper than that. When you look at past research which has had the biggest impact on industry and then the community, it was not planned by a planning unit.

The Planning Unit.

- As examples, the transistor development at Bell, nuclear magnetic resonance, nylon at Du Pont- strategic planning would not have foreseen the impact of these discoveries.

The double helix, and everything else.

Yes

On the other hand, CSIRO's achievements that people think about, didn't come out of planning, but they did come out of somebody understanding the needs of the people that CSIRO were interacting with so -

Oh yes, certainly. I give an example-in the Keith region of South Australia, the graziers said to the scientists, 'look at this terrible wool, this steely wool. Hedley Marston perceived something wrong there with the pasture and research showed that the pastures were cobalt deficient. The steely wool problem was then solved by giving cobalt pellets to the sheep. There was interaction with the community but it wasn't planning.

No, it wasn't – well you say that it wasn't planning, but it was implementing a process of some sort. So I think that the success of CSIR, CSIRO were maybe not due to having a strategic planning unit, but were the organisation having some -

Okay.

- process for finding out what the country needed.

Yes, a process to identify the needs of the different sectors of the country and assess the feasibility of research providing significant benefit. The availability of resources and research expertise are crucial factors in determining research priorities. Divisions contended that they are better placed to interact with industry or the community and determine the priority of projects. There wasn't support from scientists for a central planning unit. I think Terry's probably right. PEAU was imposed on CSIRO.

So can I ask you a completely different question, but related to advice? At the time of the Birch report and right up till the implement of the ASTEC report, CSIRO had a very large advisory structure. So there were state advisory committees, and I think that the state advisory committees fed people into a national advisory committee and that was serviced by – that had somebody in head office servicing that. That's the first -

And around the states and the regional administrative offices.

And that was the first job that Ted Cain had when he came into the organisation was to be the Secretary of the Advisory Council. Can you reflect back to us now what role, that quite elaborate advisory mechanism, had on determining the priorities of the organisation?

I don't think it had a big impact. I think the advisory state committees and the Advisory Council were more seen as a great mechanism by which the organisation communicated and interacted with the community. The state committees were responsible for organising events in their state which portrayed what CSIRO was doing. They facilitated links between CSIRO and state government. I think they were seen as a very useful mechanism to publicise the value of CSIRO research and help maintain the iconic reputation of the organisation.

I don't think that the Advisory Council or the state committees had a big influence on policy except when we wanted to close down a regional station. Then there would be action, and they'd bring up the people and arguments why it's necessary to keep the station. I don't think the Advisory Council had much influence in terms of broad overall priorities. We wouldn't have got a recommendation that we should expand enormously Information Technology for instance. In some ways, members of the Advisory Council were looking after their own interests.

And I think what you've just – if I paraphrase what you've just said, they were more not advising CSIRO what the organisation should do, they were advising the governments and the local communities what value CSIRO was?

More or less.

So they were very good political support?

I don't really think they had set up the mechanisms or staff support, to be able to provide reasoned advice to the executive on strategic issues. Considerable time and effort by the Advisory Council would have been required and they did not have the resources.

So before we get off this period of the organisation, can you remember that - you had the three full time members of the executive and five -

Part time.

- part time members. What role did the part time members play in the running of the organisation? I think my friend David Craig was a part time member, so they were a quite distinguished group of people, the part time members.

Yes. CSIRO was very fortunate in having a distinguished group of part-time members of the executive drawn from academia, industry and commerce. They played a significant role in the discussion and approval of policy and broad areas of research. If they had serious doubts about a proposal they might say "well that's not right, we think it should be this way" and the proposal would be sent back to the management committee to look at. One of the wise part-time members was Michael Kirby- he didn't talk a lot but when he made a contribution he always honed in on the crux of the issue with his keen legal mind. Another valuable non-academia member was Rod Carnegie until he took leave due to a serious car accident. You mentioned David Craig. He made a great contribution over several years- he was a great supporter of CSIRO. The part-time members brought outside views from the community.

Was thinking about, yes.

Yes, and they would bring criticisms to us and suggest how we might change. The part-time members varied in their contributions as you might expect, but on the whole their contribution was valuable and appreciated. Most part-time members refrained from trying to manage the organisation.

So the time that you were on the executive with Paul Wild as the Chairman, how did sense, doing your job? What was the different roles of the Chairman and the two full time members of the executive?

The Chairman had the responsibility of all communication with the Minister and also with heads of key departments like finance. I remember a big dispute with the Department of Finance over the identification of the full costs of programs when Ian Castles, head of finance wrote to Paul. The individual institute directors reported to a full-time member of the executive. The head of the human resources branch in head office reported to me and I

was chair of the consultative council where CSIRO personnel met with representatives of the staff associations on staff matters. I was chair of a committee on animals in research- an outside member of the committee was Peter Singer then at Monash University and later Princeton University.

In some ways I was more the deputy to Paul than Greg Tegart. I had been there longer and Paul consulted me on most matters relevant to the biological sciences, such as the request of Prime Minister Fraser for CSIRO to transfer a major research activity to Tasmania. Another major issue was the establishment of a highly secure animal health laboratory at Geelong and the importation of foot and mouth virus. Paul relied on a lot of support from me because he had to take the brunt of the attack over the Geelong laboratory.

So what was that attack?

Was that about the importation of foot and mouth disease virus?

Yeah, but it was also about building such a costly lab in the first place.

Oh, the big expensive -

Because people like Bede Morris at the ANU saw this huge amount of money devoted to a building. They thought it would be better directed to supporting research. The decision to build the laboratory was made by Fraser himself. I'm told that he was ill with 'flu in bed when he made the decision.

But the dispute went on, even after the government decided to build it. Then it became a dispute about whether we'd import live foot and mouth virus. And there were good scientific arguments against importing it, because no building is absolutely secure. You've got the human element, and things have got out of Geelong. Why import the virus? It's in England, we can work on it there or we can work on killed-virus. So we didn't import the live virus. I think the main argument was about building the lab with live foot and mouth virus a side issue.

But it turned out in the end to be a very good decision to build it.

I think so. Some very valuable work has been done at the lab such as the development of a vaccine against Newcastle disease in poultry and now a vaccine against Hendra in horses. The high security laboratory at Geelong is not only an insurance for the animal industries but also for the environment and the protection of native animals.

Well, it's the bats that spread the Hendra.

Yes.

It was, yes.

So I think it's a valuable national laboratory. It was expensive to build, no doubt about that, and expensive to run.

But a good decision. So we're now coming to the end of the Fraser years, and as you say the end of the Fraser years were a time when the resources given to CSIRO are starting to tail off, and the relative resources given to the universities was starting to increase.

The rise of University research

Yeah, sure. Well, the changed environment for CSIRO came with the Murray Commission which was set up by Menzies. Resources were provided by the federal government to expand the universities, including long term fundamental research. CSIR was set up because there was little scientific research in Australia in the 1920's. The UK government had closed laboratories of the Department of Scientific and Industrial Research. The Fraser government started to think about the role of CSIRO and decided to set up an independent inquiry to examine the role of CSIRO. In a sense the Fraser government was asking that question of Birch, and Birch's conclusion was that we should keep CSIRO and that it should have applications oriented research.

And ASTEC's came to the same view.

Yes, but we're not up to ASTEC yet.

No, I know. I know, but I'm just saying that it's a constant thing. And when we get towards the end of the interview, I've just highlighted something that you said to the board when you were being thanked for your service after you finished, and it's the same thought. In other words, potential threat of CSIRO being broken up. But if you don't mind, what I was trying to say Tom is we'll get to this.

Yes, yes. We'll get to this towards the end.

Now there's an issue that I just want to raise about Jim Allen.

Yes, okay.

You remember Jim?

I remember Jim. I think he had the support of an influential parliamentarian.

No, I don't know that.

I think he was a Labor Minister.

Who was that?

He was from South Australian.

Not Schacht?

Not Chris Schacht? No.

No.

Before that.

More well known.

Okay, so sorry I don't know but we can find out. But so do you have any comment – Jim Allen was actually a very powerful figure while he was there for a while -

Yes.

- and was given a lot of authority

And what was his title? Something like, not Chief Operating Officer, but quite an important sounding title.

Yes.

So how did he become to be appointed and what was his role?

I don't know how he got appointed but it was during Jerry's chairmanship.

Did you have much to do with him?

No.

He re-organised head office and did all sorts of things -

One of the Ministers wanted him appointed Chairman.

He came from University of Newcastle, was that right?

Yes.

So was that Senator Webster -

No.

- or Mr Newman?

Neither.

Yes, okay, well we'll find that out.

He was quite a powerful Labor politician.

Oh, Cameron?

Cameron.

Clyde Cameron got him appointed did he?

I think so, I think it might have been Cameron. {Note added to transcript: Clyde Cameron was Minister for Labour in the first Whitlam government. In 1975 Cameron lost the Labour Ministry and became Minister for Science and Consumer Affairs and therefore Minister in charge of CSIRO.}

Oh, so was he appointed during the Whitlam era? Was Jim Allen appointed during the Whitlam era?

I thought it was after.

My recollection is that he was appointed during the Whitlam era. I think Jim Allen had strong views and he liked to get things done. He and I were made Honorary Doctorates at Newcastle on the same day. I can't fill you in very much about Jim Allen. I know that he caused a lot of waves, there's no doubt about that, and I suppose in some ways he was too dogmatic for a scientific organisation.

He was a scientist himself.

Yes.

Like you and me, Keith, he was a physical chemist.

Yes.

And my interactions with him was during the bank project -

And it was during Labor, so he was there in '74, so pre-Birch.

And he was very helpful to us in the bank project because he was quite a good interactor with industry and other people.

It's just I don't know how he got appointed, I've got no idea how he was appointed.

So we'll need to find that out.

You say he was appointed before my time on the executive.

Yes.

Yes. Well, he was there in '74 according to my documents.

How long was he there for?

I haven't got the dates. I think it looks like '74 to '76.

Yeah, see that's completely outside my time-

Barry Jones and the Hawke Government reforms

Outside your time. Yeah. So in the period now, towards the end of the Fraser government, the economy wasn't performing very well. There were various reports of what should be done and the Fraser government wasn't doing it. And in 1983 we had the election of the Hawke government, and Barry Jones appointed the Minister, and at this point Paul Wild was still the Chairman -

Yes.

- and Barry Jones came in with a strong agenda about the importance of science and technology, and the future of the country, and his sunrise industries -

Yeah.

- and his great interest in information and communications technology, and the rise of what he called the sunrise industries. So can you now tell us a bit about how that affected your operation as the executive and your interaction with the government, and how that all ended up with the ASTEC report?

First of all, when did we change the Institute structure and get we got rid of the Institute of Physical Sciences?

We did that in 1988.

'88.

A long time – so we had – the Hawke government came in in 1983, and the new Institute structure didn't come until the 1st of January 1988.

I see.

Because we had the ASTEC report and then the McKinsey stuff.

Yeah, the McKinsey review.

So we start in 1983 with Barry – Minister Jones coming in with his new ideas.

I think Barry was always very supportive of the organisation. If there was a dispute between the Department and us, Barry tended to see our point of view. So he was supportive of science. He was Minister for Science partly because he was on the centre left group in Victoria and Hawke needed -

He was on the -Barry was the – John Button and Barry were in the independents. So the Victorian Labor Party had the left, the centre unity and the independents, and they were a very small group of people.

And I think Hawke relied on Barry and Button -

Certainly did.

- for support. So Barry got good support for that. But on the other hand I don't think he was good at persuading Hawke on priorities for science. I think Hawke's view of him was he had all this knowledge, but how do we utilise it.

And certainly when I went into the expenditure review committee with Barry later on, he was tackled very mercilessly from Walsh and Keating, and neither Hawke nor Button said anything. Barry provided arguments for support for his proposals for additional resources. He would emphasise the importance of a particular area of science to Australia, but he failed to make any impression on Walsh and Keating.

I can recollect that when Barry came in as Minister of Science there were more interactions between the Chairman and the Minister. Barry never forgot anything. If he asked you to do something, six months later he'd ask you whether you'd done it. He just had an extraordinary memory.

As I said, Barry was very supportive of CSIRO. If the Department wanted to support a new area, then Barry had to find resources, and of course CSIRO with its big budget was seen as a bit like a milsh cow by the Department. That's where I think Barry again was supportive of CSIRO. I think Barry created a good impression when he visited around the organisation. He seemed to get on pretty well in his discussions with the scientists.

Well, he'd made it his business to get to know people within the organisation when he was in opposition.

And he wanted to get to know about the science too. Sometimes it was a bit superficial but on the whole he got to know about the science, whereas Jim Webster wasn't really interested in the science. Sleepers Wake, Barry's keen perception of the role of technology and computers on the future of work was published the year before he became Minister for Science. He therefore showed great interest in the state of computing research in CSIRO. There was no Institute of Information Technology but we were building up research in information technology under John O'Callaghan. There was enormous disputes with Claringbold on the research role of Sironet that went on year after year. They were a stumbling block to building up research on information technology. Barry's influence plus what was happening world- wide meant we had to consider more support for information technology. I'm sure Barry was instrumental in his meetings with Paul Wild, asking what are you doing about information technology?

So Barry came in with these ideas of how the economy was going to be worked into the future, and what role CSIRO may or may not play in that. But it took a while for this interest of Barry's to result in any change, and that came about through the ASTEC review. So can you tell us how that came about?

I recollect that Paul Wild did propose and I don't know who he proposed it to or whether it got back to Barry, that it would be more appropriate if CSIRO reported to the Prime Minister because CSIRO covers research relevant to many government activities. But the problem with that is the Prime Minister's Department isn't an administrative department. I think the proposal did get back to Barry, and I think he was very upset. It affected the relationship between Paul and Barry.

Then Barry proposed that CSIRO have a full time Chairman and a full time Chief Executive. He never specified in any letter I saw what the role of the full time Chairman would be, and the role of the full time Chief Executive. But he had discussed the proposal with the Prime Minister without, I think, discussing it with anyone else. The Prime Minister sent the proposal to Ralph Slatyer, Chairman of ASTEC.

So Ralph Slatyer, he was the Chairman -

ASTEC.

The Director of ASTEC?

Ralph wrote to Barry and said, "Well, you know we shouldn't be doing this until we know exactly what's the function of CSIRO? Why do you want a full time Chairman and full time Chief Executive? I don't actually agree how you could – there'd be a conflict of interest there."

Slatyer was quite keen that ASTEC should look at CSIRO. Barry's proposal was a good excuse to push the ASTEC review faster. It probably would have happened anyway, but it probably happened much more quickly.

And it was also a general at the time - ASTEC had a general sort of review of the Australian science as well. The one into CSIRO was a part of a larger suite of reviews that ASTEC did into the national innovation system.

I think ASTEC was a bit anti-CSIRO. I'll tell you why, on the one hand members of ASTEC were from the universities, on the other from industry. Apparently, Ralph Slatyer had persuaded the Prime Minister that there shouldn't be anybody from CSIRO on ASTEC. Michael Pittman was on ASTEC, joined CSIRO. He was forced to resign from ASTEC. It is hard to understand how ASTEC could be a representative body if you completely exclude anyone from CSIRO.

Hard to understand.

Yeah, hard to understand. I used to go along as an observer in the open sessions of ASTEC and I'd comment on their papers. Most of the confidential items never came to the open session for discussion. I think ASTEC was a much freer organisation under Geoff Badger when it was set up than it was under Ralph.

So the ASTEC review was formed and made recommendations, and by then you were the Chairman.

Yes.

How did all of that work out?

The crucial recommendations of ASTEC were that CSIRO remain a single organisation and its role should include the performance of environmental research as well as research in support of Australian industry. ASTEC recommended a change in the top structure. It did not support the proposal of Barry Jones for a full time Chairman and a full time Chief Executive,

but recommended a part time Chairman and full time Chief Executive and that the Board should act more like a board of a company.

So in a sense the board replaced both the advisory committee structure that existed under the old -

Yeah.

- and the part time members of the executive?

Chief Executive of CSIRO- McKinsey restructure

Yeah, they recommended the abolition of the advisory council and state committees. The part-time members of the executive were replaced by members of the board. It took a while for the ASTEC recommendations to get to Cabinet- over a year I think before approval by Cabinet. Whether the recommendations were debated or whether the ASTEC report didn't get any priority in the government's agenda, I don't know. But it was quite a time before it was approved.

And you were appointed the Chief Executive, and in your letter to the Minister accepting it you say, "After a period of uncertainty of almost two years, it is indeed a pleasure to receive your letter informing me of my formal appointment as Chief Executive CSIRO, by the Governor General for a period of three years."

Yeah.

So this was obviously a period from 1983 to your appointment as the Chairman in 1986 I think it was, no, '85 -

September '85.

Yes. It was obviously a period of great upheaval in the organisation and uncertainty that you had to preside over.

That's right, until the ASTEC review was done. CSIRO was reasonably confident that it would remain a single organisation but it could have gone a different way. I mean, over the years there's always been the odd department that wanted a section of CSIRO. I had handled some sensitive issues with the Bureau of Meteorology. CSIRO and the Bureau had a combined unit at the Bureau, which I supported. But there were other departments that felt that they wanted the research component that was in CSIRO. ASTEC recognised the advantage of a single statutory body like CSIRO, not controlled from a department.

a department

Yeah.

And do you remember representations being made by CSIRO to the ASTEC review in order to help them to come to the right conclusion?

Yeah, I've got a letter there.

From?

From me.

From you to Slatyer?

To Slatyer.

Right. And was that an omnibus letter setting out all the things that were an issue?

I can go and find it if you like, later.

It'd be good for us to see that, after the interview.

I don't think it discussed all the issues. I think it discussed mainly the management issues. I can't remember now.

And do you remember who you were working with in CSIRO -

To produce it?

- to generate that?

No, I've got no idea who I worked with.

You might have written it -

No, I don't think so. I must have been working with somebody. Might have been you.

Could have been.

So I think we'll have another break now if nobody minds?

Ready?

Yeah, okay.

So I think - I don't know what's going on with this Terry, but I hope that I'm recording it. So we're back again, we're back again now thank you, after a short break in which Keith has found a letter that he wrote in 19 - it doesn't have a date on it, but presumably in 19 - in the 1983 -

Just before.

1983 or 1984 or '5, to Ralph Slatyer talking about his views on the top management of CSIRO. In fact something like what you wrote here was adopted, except that the board consists of the Chief Executive plus all part time members, with a part time Chairman.

Yes.

And that was implemented. And the first board meeting was in December 1986, and that was a board meeting in Melbourne where Barry Jones came down. It was in December of 1986 and Barry Jones addressed the board, and that had some new people on it and some members who were part time members of the old executive.

Which was the meeting that I attended and where the board recommended I be appointed Chief Executive.

At the first meeting you were the acting Chief Executive, and they had some process to determine who should be the Chief Executive.

They asked you to leave while they talked about it.

Yeah- I went outside and walked around the Fitzroy Gardens.

And then you came back in and they said that we're going to recommend to the government that you be appointed Chief Executive.

Yeah.

You had been appointed as the Chairman of the organisation on the 25th of September 1985

-

Yeah, that was when Paul retired.

Yes, but you were only appointed for a nine month period because of – “the administrator and council have approved your appointment to this position for a nine month period.”

The appointed must have been extended.

Yes, and then it was extended. “Your appointment as Chairman was to have ended in 1986. However the government has now made decisions on the ASTEC review and it may be some time before the new board can be appointed. To avoid a hiatus in leadership, the Governor General has appointed you until December 1986.”

Oh yes, right.

And then in December of 1986 -

The Board meeting.

The meeting took place and the Minister wrote to you on the 5th of January 1987 in which - the Minister wrote to the Prime Minister saying that he wanted them to hurry up with your appointment. “There’s no doubt that your previous written assurance given as former Chairman et cetera could be considered to still apply. However as this is a new position created under the amended Act, I think it’s best if you make a new declaration before you” – before they do it. And that was when you wrote to the Minister saying that you were very pleased that this period of uncertainty had ended.

So can we just ask you now about this new – the board with a Chairman, Neville Wran, as the Chairman, met in December and made a few – had a bit of discussion about various things including priorities and how the organisation was going to run. How did you then react to this new position of you being, instead of being the Chairman of the organisation, being the Chief Executive reporting to the board? How did that affect your day to day operation and -

I don't think it affected it at all. That was partly because Neville Wran, I think, recognised his role as Chairman. He didn't want to interfere at all in the management. If he had a concern he'd mention it to me, but unlike some of the board members he was very much of the view that the board is not the manager of CSIRO. It approves or modifies policies and overall strategies brought to the Board by the Chief Executive but implementation of board decisions is the responsibility of the Chief Executive. That's how it is in a private company.

Did you have any say or any input into the appointment of the new board and the new Chairman, or was that all done without -

I had no say.

So that was an entirely political process?

Yeah, I don't know how that happened. I really don't know how that happened. I don't think I had any say, unless I've forgot.¹²

My recollection is that it was a surprise to get Neville, to get Neville Wran.

Yeah, it was a great surprise we got Neville Wran. I was pushing for – oh, I must have had an input, yeah. I made suggestions. I was pushing for Gus Nossal. Who was -

Was he on the board? I don't remember. He had been –

He was on the executive, yes.

And he was certainly on the board, yes.

Yes. I have in the back of my mind that Gus Nossal was quite supportive of Neville Wran, but who suggested Neville Wran? It must have been the political circles.

Anyway, he turned out to be a very good Chairman.

¹ In a personal communication with Tom Spurling on 28 December 2022, Barry Jones recalled that he did discuss selection of the Chairman of CSIRO with Dr Boardman including proposing Neville Wran. He had not come under any pressure to make a political appointment but sympathetic Ministerial colleagues agreed that the Board was strong on science, but weak on politics and that a political heavyweight would have far more influence with Hawke and Keating than a scientific star such as Gus Nossal. Jones' clear recollection was that Keith Boardman agreed with this approach.

² The appointment of Neville Wran as the Chairman of the Board of CSIRO was not without controversy. It was the subject of a Matter of Urgency debate in the Senate on 4 December 1986, when the Opposition argued that Wran was unfit for appointment to high federal office because of his past record. The motion was defeated on party lines. Mr Wran was appointed Chairman on 5 December 1986.

He turned out to be a good Chairman. He had the name, and when he did go to Divisions he was quite interested in the research and supportive. He didn't go all that often.

And he was also quite influential in the Labor Party with the government.

Working with Neville Wran

Yes. Well, except when we attended the expenditure review committee of cabinet. I remember Wran coming to Canberra, I think it might have been on a Saturday. Neville and I went over to Parliament House and sat there, sat there, and sat there. And after about five hours Keating came out to apologise that they wouldn't get up to us that day, so we had to come back the next day.

And was Mr Wran there with you?

Yeah.

Okay. So you came back the next day?

Yeah.

So we have read the minutes of the first couple of board meetings, and the issue that seemed to us to dominate some of those proceedings was this issue of how does the organisation set its priorities? And Tony Gregson had some ideas on that and you came back with a paper, some ideas of how you thought priorities should be set, and that seemed to be a dominant theme of the first few meetings of the board.

Well, that was their role really, wasn't it?

Yes.

But then they didn't quite know how to do it.

You say that was their role. How did you resolve all of that? How did you resolve their questions of priority setting? What was the management input into the board about priority setting?

I don't know how we went about that. We must have had a group that looked at it, but my memory's too fuzzy there.

Because my memory some or other McKinsey was brought in later -

Yeah well I brought in McKinsey -

You brought McKinsey in?

- which wasn't very popular in the organisation, at all.

That was a gradual process wasn't it? You started off with rare earths.

Yes, so this is my recollection of this, because I'd come back to the organisation from spending some time in Gareth Evan's office and David Solomon was the acting Director of the Institute because Bill Whitton had gone off on sick leave -

Sick leave, yeah.

- and so I was – Dave Solomon came back from the meeting of the executive committee, was it? Or whatever the -

Management committee.

- management committee was called, and said to me that he'd suggested that I be part of this McKinsey review of the rare earths. So how would the – the question was, how would the organisation go about deciding what it was going to do with respect to rare earths, both in the mining, processing, and use of rare earths in magnets?

So I spent three or four months on that project, which was very interesting for me, with McKinsey looking at that issue, looking at those things, and we came up with some sort of framework of how you might do that. And it was soon after that that McKinsey and company was appointed to look into how would the organisation be restructured?

Yeah, but they had a look at function first.

Yes, they had a look at function first, yes, yes. And then you were clearly part of that whole process because in the end when you look at the board meetings, what McKinsey proposed wasn't dissimilar to what you'd proposed to the board.

I'm a bit hazy on that. I didn't keep any of those papers. But it's a very difficult for a board, and it's difficult whether you're a board of a corporate like CSIRO, or the board of a company. How do you look ahead? What's the Myer board doing now? I'd hate to be on the Myer board. And the message from the shareholders that the future dividends could be extremely vulnerable if Amazon comes.

Well, they came today. They opened their website today.

Did they?

So relations with the government once the board was in, we talked already about Neville Wran having excellent relations with various people. What about relationships with Barry Jones, for example? Was that harmonious?

Mine was. I think I got on very well with Barry. I still see Barry at least once a year, recently at the National Library for the presentation of the film about Barry. He invited me and Mary to his AC investiture. So I got on very well with Barry. Barry tells everyone he understood the science and I understood the politics.

So if you're now looking back on your period as the Chairman/Chief Executive, what do you think your major achievements were in that period? What did you do for the organisation? What are you proud of?

I suppose what I'd be proud of was that I was still a big supporter of the concept of finding good people, appointing good people, and providing them with the flexibility to plan and conduct the research in the agreed area. And I followed that philosophy with the appointment of the director the Australia telescope.

Ron Ekers.

Yes, Ron Ekers. In my interview with Ron I indicated that his main role was the performance of high quality science in the study of the southern hemisphere. I said, there would be valuable spin offs from the science, like wifi, but the main role is the study of the southern hemisphere. ASTEC had considered transferring the radio astronomy to the ANU but it remained a national facility within CSIRO.

I generally supported that philosophy throughout the organisation- finding good people and giving them flexibility, but of course the research must be assessed from time to time for achievement as well as quality.

Now that doesn't just apply to doing the long term research. That applies equally well to the application of the research. ASTEC used the term application oriented research for the main role of CSIRO. Actually, I suggested the term in my submission to ACTEC. There was pressure with some justification to transfer some research resources from the primary industries to the secondary industries. The balance of research effort for the primary and secondary came up again and again during my terms as executive member and chief executive. As much as we tried, much of secondary industry either were not interested in longer term research nor capable of utilising the results of the research. They wanted more or less day to day problem solving. It's all right to do some problem solving usually for payment, provided you've got the skill base lacking in industry.

So I think I'm proud of the fact that I saw that CSIRO should continue under the philosophy that we need to do the longer term research, we need to appoint very good people and not have much bureaucratic control.

Concerning the application of the research, my view was that we should interact with others very much, particularly when trying to get an impact in the world market where we cannot do it alone. And my view was that we need to have strong patent protection, and then we interact with somebody else or a company to do the commercialisation, rather than trying to do it ourselves and fighting the legal battles.

So that's a very, very good legacy and it's clearly the model that's been the most successful for the organisation in the long run. So Keith –

What else did I do. PM Malcolm Fraser requested that CSIRO transfer a major activity like our forestry research to Tasmania. I convinced Paul Wild that our forestry research covers many different environments and a better option was the transfer of our marine research (fisheries and physical oceanography).

I just wonder whether you want to mention in this context the CRCs.

That was what I was going to ask you next. In the Slatyer interview you do talk a bit about CRCs and your involvement with CRCs. After you left CSIRO you became involved in a couple of CRCs. What did you think of the Slatyer proposal for CRCs, and did you think at the time that it was going to be helpful to CSIRO, or against the interests of the organisation?

Well, Ralph proposed CRCs initially to the Prime Minister, you know why? At the opening of the Questacon Science Centre, for which the Japanese Government had given a big donation as their bicentenary gift, the Japanese top wigs were there. Mary and I were there among the invited guests, PM Hawke was the host. It was a dinner jacket occasion but outside in the rain there was a demonstration by people in white coats, including Sir Otto Frankel, complaining about the cuts in science. It was a great embarrassment for Hawke- the Japanese had given a substantial donation to promote science. It's my understanding, whether it's right or not, that Hawke in his typical sort of language said to Ralph Slatyer, who was then Chief Scientist, "Propose something to me to get these bloody scientists off my back."

Now Ralph had seen the operation, which I had too, of the CRCs in France when he was Ambassador for UNESCO. The French CRCs were working reasonably well. And I think the French CRCs were in Ralph's mind when he proposed to Hawke the establishment of cooperative research centres to stimulate research cooperation between universities, CSIRO and industry. I supported the CRC concept.

The Government agreed and the resources were made available but they needed to be committed reasonably quickly. A CRC committee was established and Ian Ross and I were appointed as chairs of a physical sciences panel and a life sciences panel to assess the applications. When we went around to all states we realised that many university people just saw the CRCs as another bag of money. An important role in the first round was to explain to applicants the purpose and function of a CRC and to suggest to unsuccessful applicants how they may revamp their proposal for the second round application.

So Ian and I were instrumental in interpreting the criteria for the first round of CRCs and promoting the requirement of cooperation. I think, provided each of the partners put in an appropriate contribution the CRC concept worked well. But it didn't work if one partner was expected to put in most of the resources.

So I chaired the life sciences panel for the first four rounds of CRCs. CRCs changed over time to include different areas. The government didn't want an individual CRC to become permanent- it didn't want another CSIRO, so that's why a CRC had a limited time span generally two terms.

And some of them went on for many more than two terms.

Yeah, but they changed their names and got different commercial partners. From the CSIRO point of view one could argue that the government money for CRCs might have gone to CSIRO. I don't know how the organisation viewed the CRCs. CSIRO was involved with many of them of course.

With the majority of them, I think. I think the attitude to CRCs varied across the organisation, so some -

They were a mixed blessing.

- Divisions, like the Division of Chemicals and Polymers participated successfully in a number of them. Other Divisions weren't as keen.

I saw as one big advantage of CRCs is that it gave a lot more opportunity for PhD students in the CRC, whether they were working in a university laboratory or in CSIRO or industry. Students working on projects of particular interest to the industrial partner had wider prospects in job applications. I thought that was one of the big advantages of the CRCs. We know that all PhD students can't end up in universities.

And it made available the facilities of the organisation for PhD students, so it certainly helped that. And can you also reflect back now on the – you've talked about it a bit during our discussion, but during that term that you were the Chief Executive and beyond, the amount of the percentage of the Commonwealth's expenditure on research and development that comes to CSIRO has dropped considerably -

Yeah, so's the staffing.

So when you started as the Chairman, CSIRO probably had about 20 to 25% of the government's -

Well, we had 7000-7500 staff.

Now it's 5% and the organisation's got about 4500, or 5000 staff.

Yeah, it's a big drop, yes.

Future role of CSIRO

So how do you think the role of CSIRO needs to adjust now to reflect this relatively smaller amount of money that it gets, compared to what the universities get?

Well, you've got to look at the changing nature of the areas that CSIRO support. And also where does the external funds come from? In my time funds from wool were the major component of external revenue. Direct appropriation in real terms has been reduced but external funds can come from government departments for additional research in particular areas. For example, the minerals department could fund some work on the survey of the continent, the department responsible for building standards could fund additional research on fire behaviour of new materials and the agriculture department on invasive diseases. And I suppose there's some government bureaucrats who think that wouldn't be a bad idea.

But the big problem with external funds is you've got to have appropriate tenured staff to supervise the work, or appoint experienced temporary staff which can be difficult in research. Governments tend to support mostly tenured staff in the bureaucracy, don't they?

Yes, yes.

The universities and CSIRO are using far more temporary staff.

Temporary staff.

Three year appointments. These are not attractive once researchers move into their 30s and have family. The decline in CSIRO staff numbers is not due to the private sector doing significantly more research. The expansion of university research may be a factor in less government support for CSIRO but I don't think it's the main reason.

I think that the percentage of the GDP that goes to research and development has increased slightly. I mean it fluctuates, but it increased quite a lot and it's now levelling off. It's hard to estimate how much work research has done, but the R&D tax concession which is counted in the government expenditure on R&D is a large proportion of the support that government gives to industry. But the universities and the - so the ARC and the National Health and Medical Research Council funds have grown considerably -

More than CSIRO.

More than CSIRO. So the organisation has had to adjust to that, I think.

My thought is the problem we're now facing is in terms of the application of the research. If you're a government looking at newer high-tech industries to be a bigger contributor to the Australian economy, does it put more funds into CSIRO or give more incentives to the private sector for R & D, for example, to small companies in the medical area. I'm just thinking aloud, if you're a bureaucrat and thinking where should government resources for research go? Now the problem for Australia is not so much the level of government support for R&D but the percentage of R&D being done in the private sector. Comparison with countries like Sweden and Switzerland with high levels of business R&D are striking. Australia does not have enough industrial companies doing research or interested in developing appropriate research results from CSIRO or the universities. We should be giving more research support to the newer high-tech industries. The philosophy of most established industries is to import technology.

What is the reason for the significant decline in appropriation funding for CSIRO? Perhaps the government was slow in recognising the potential of new high-tech industry for the Australian economy. The potential in the medical device area is enormous. Now CSIRO could be very effective in that area – it requires multi-disciplinary teams; physicists, chemists, engineers, medically oriented biologists.

And in fact that's one of the directions that CSIRO manufacturing is going, into the medical device area, at Clayton. So if you were setting up Australia's national innovation system from scratch today, would you have CSIRO? Would you agree with Birch and ASTEC that we need CSIRO?

I think we need a CSIRO, but whether we'd want it exactly how it was set up originally and whether we would want such a diverse range of activities – it's such a difficult question to answer.

I was interested in your comment a few minutes ago where you said that if the Department of Health wanted, or the Department of Resources wanted something they should get CSIRO.

So is one of your thoughts that CSIRO could act more as the government research – doing research to assist the government more rather than assisting -

Well both really, but you don't want bureaucratic control of the research, as emphasised in the Coombs report. You don't set up a research organisation within a department of state. The federal department would fund CSIRO to research a particular area or problem.

If you were setting up CSIRO today, first of all the government would look at their responsibility for research in national interest areas such as the environment-oceanography, atmosphere, ecology. For example, research on the Introduction of feral pests needs support from government. Much of the research is interdisciplinary and long term so you need a research organisation like CSIRO. What about agriculture? Well agriculture can't do its own research because of the diversity of the recipients, although it can contribute to the funding.

Although a counter point to that would be that in the intervening 40 or 50 years agriculture has become much more corporatised than it was.

Oh yeah, but only to a limited extent.

Well, you know, farms, there are big -

Cotton perhaps, yeah.

And big corporations own large sections of wheat farming now, they buy -

Yeah, crop production is changing in that aspect, but it is important in the national interest that advances in crop production from research be available throughout the industry. There should be a contribution from growers for the research, but there is still much potential from basic plant research which should be a government responsibility. Gene editing in plants has the potential to modify crops for climate change.

What about minerals?

The one area of minerals that government should be very much involved in is the survey of the continent. It is a government responsibility, even though industry does it. They'll only survey the areas where they think there's a reward.

Well we own all that, we ought to know what we own.

Yeah, since the government owns everything in the ground, it's not owned privately in Australia.

So you'd have a CSIRO but it may not be exactly the CSIRO that we've got?

That's right. And that's anyone running an organisation would love to say, well let me start from scratch tomorrow. Which activities would I retain and which ones would I not? I mean, isn't that true of any organisation?

Certainly is, and some private organisations can do this more easily than a Commonwealth Authority can.

That's right. Although in the last few minutes I have emphasised the role of government in research in areas of national interest, a major role for an organisation like CSIRO is longer term, multi-disciplinary research for the development of new or existing industry.

So looking back presumably as you do now, looking into the organisation from the outside, from the time that you left it in 1990, what is your impression of your -

Well, I think -

- life's work really wasn't it in CSIRO?

Yes. Well, I think the recent decision to get rid of Divisions worries me. I mean, good Divisions with good Chiefs has been the essence of CSIRO, so why have they suddenly said we don't want Divisions. But you've still got the same issue, you've got to coordinate activities. You haven't eliminated the people, you haven't eliminated the buildings, but now you haven't got Chiefs-good Chiefs have been hugely influential in CSIRO. Maybe you could argue that in the past we haven't got rid of the ones that weren't so good. We did, but probably not as much as we should. I keep out of the politics of CSIRO, so I don't know what the reason was to eliminate Divisions. It's like having a director without Divisions. But -

I think, without wanting to impose my opinion into this interview, which is to you, I think what has happened is that whatever structure is in the organisation at the moment that the unit that does things looks suspiciously like a Division.

OK.

So it's not called a Division -

They've not called a Division.

- but it has somebody in charge of it, and it has scientists, and it gets resources, so it looks a bit like a Division.

Yeah, maybe. I haven't been in contact to know. I just was worried that they'd been sort of eliminated. I think certainly the important issue of how the research gets applied somewhere, whether it's in the public scene or whether it's in an industrial scene. I think there must be various modes by which the nation benefits from the research.

In your – the other thing which I have somewhere here, is your very good input into the 2001 yearbook where you discuss the nature of the organisation and in that - I can't find it now - but in that you say the task of the organisation is to constantly review its purpose. So that's really in a sense what you're saying now, that the organisation has to constantly work out what its position is and change to adjust to its new role.

Yeah.

So this is the structure – you have to understand the function before to do this.

And you've got to understand the nature of the whole global scene too, don't we?

Yes. All right, well I think that that's – we've pretty well covered everything that we wanted to talk to you about. We've taken nearly four hours so –

Yeah, it takes a while.

- thank you very much for spending the time with us.

All right, nice to be able to make the input. I think you must be getting some very interesting responses in your interviews.

Yes, so thank you.

Yes, we're inundated. So have we sufficiently discussed that highlighted point there, which was the main point that you made to the board when you were at that last meeting?

Well, I think it is important to maintain CSIRO as a single organisation. It gives the flexibility to make changes, even if you can't make them in the next year or two. But at least you can plan to make them. Now, if you've got several different research organisations in different areas they'll be restricted in how to move from one area to another. I think CSIRO as a single corporate entity can make changes better. But secondly, it's the expertise too.

Including the expertise in managing science in Australia, in our environment.

Yes.

I mean, the whole point of having let's say six, seven, eight Institutes all lumped together in a single organisation under a single management with nowadays a board and a Chief Executive is still a fairly heroic decision, to have something as big as that and difficult to manage. But the advantages of having it offset, you hope, the disadvantages, and so CSIRO has got to maintain the capacity to keep adapting itself, utilising its -

Exactly.

- powers as an organisation and its skills in managing people and resources, capital resources, et cetera.

Yes, it's a different era, and really as you say from a management point of view you have to build in a situation that people will have to change during their research lifetime.

Yes, and that's got to be planned for and -

Yeah.

- hopefully dealt with.

And then people should get rewarded when they change too. There should be an incentive for them to use their skills if you need to build a multi-disciplinary team.

But to manage that is yet another part of a very complex management issue.

That's right, and I don't know whether we've ever really addressed that in CSIRO.

We address it in a haphazard way in some ways, so the – and it's contrary to how research careers are judged in universities. So in universities you get rewarded for staying with the same area and keeping going in it.

Yeah, sure.

In CSIRO, various Divisions and various areas have rewarded people for changing, but this hasn't been as consistent as it should be.

No. But then you've got to change the philosophy at the beginning, you're not going to work in that particular area in CSIRO for the rest of your career.

No.

Whereas in universities you can.

You have to. So what I was quoting was not from your yearbook article but from the Ralph Slatyer one where you say, "The issues we were facing" – that is, when you became the Chief Executive – "at that time concerned the future role of CSIRO. And right from the days of Rivett the view was that although the organisation was directed to applied outcomes you must do the strategic work." And in some ways this is the issue that faces the organisation in every era, doesn't it?

Sure it does.

That's what you're saying to us I think.

Absolutely. Why did I come back to Australia, to the Division of Plant Industry of CSIRO. It was partly because of the spread of activities in that division. Otto Frankel was trying to build up the basic sciences, but there was a big input into agronomy, plant breeding among others. I think each Division or each big section needs a balanced effort. But it's a new era in some ways, with the changing nature of the Australian economy.

And the changing nature of the way science is done, and the changing nature of the disciplines that are emerging and the inter-disciplinary work that is going on.

And once you get to the stage of wanting to develop a technology to complete worldwide you need a big effort in collaboration with others. You can't say I'll do it in five years, you've got to do it in one otherwise you can't compete. I think it's a different situation now. When CSIRO was set up, when I joined it, you had probably 70% of the research related to the primary industries, agriculture and minerals. Maybe 75. I don't know how much CSIRO is doing today in those areas with the advent of information technology and artificial intelligence, that going to change the lives of people.

Well, I think that the organisation known as CSIRO Data 61 is doing some work on that, but it's going on across the whole of the research areas in universities and CSIRO. All right.

Okay.

Yep, thank you.

Finished.

[END OF TRANSCRIPT]