



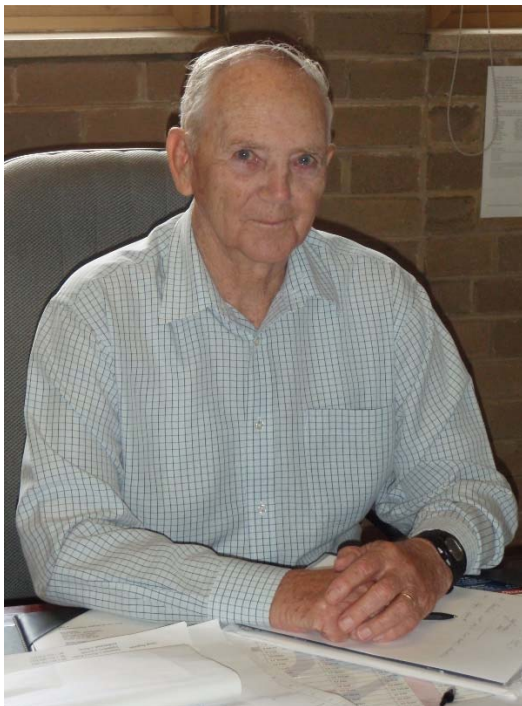
## CSIRO Oral History Collection

**Edited transcript of interview with David Solomon**

**Dates of interview: 12 January & 2 February 2017**

**Location: Hawthorn, Victoria**

**Interviewers: Professors Tom Spurling and Terry Healy**



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## **Professor David Henry Solomon AC, ASTC (STC), BSc (Hons), MSc, PhD, DSc (UNSW), Hon DSc (Melb), FRS, FAA, FTSE, FRACI, FICChemE**

### **Summary of interview**

Dr David Solomon talks about his childhood growing up during the Depression in Adelaide, Broken Hill and Sydney. He talks briefly about the death of his father when he was 16 and the fights between Australian and American troops on the streets of Sydney.

David then discusses his education at Ultimo Tech and the Sydney Technical High School and his decision to work at BALM Paints (which became Dulux) after finishing his secondary education. This enabled him, while working, to do his Associate Diploma at the Sydney Technical College and eventually degrees up to a PhD at the University of New South Wales. David moved his young family to Melbourne in the early 1960s to work in the Dulux Research laboratories at Clayton. This long industrial career stood him in good stead for his later career in CSIRO.

David joined the CSIRO Division of Applied Mineralogy at Fishermens Bend in 1963 after being rejected for a position in the Division of Organic Chemistry. He talks in detail about his research activities in that Division, and how he built networks and connections both within CSIRO and with the broader technical community.

A turning point in David's career was in 1968 when the CSIRO Chairman, Dr Jerry Price came to his office to ask 'how do you make a more secure banknote?' The interview canvasses many issues to do with the 'bank project'.

In the next part of the interview, Dr Solomon discusses his appointment as Chief of the Division of Applied Organic Chemistry and his vision for developing research programs closely connected to the needs of the Australian chemical industry

Dr Solomon was very much involved with the Royal Australian Chemical Institute and talks about the importance of professional societies in connecting public sector researchers to their industry counterparts.

In the final stages of the interview Dr Solomon reflects on his post CSIRO work and on the future role of public sector research in the national innovation system.

## NOTE TO READER

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## Introduction and early life

*Thank you very much Dave for agreeing to be part of this CSIRO history project. And in this interview we'll be talking about your early life and experiences, your career before and after CSIRO and we hope to get a good understanding of your views on the evolving role of CSIRO in the Australian innovation system. I think a good idea is to start at the beginning, can you tell us a bit about your family, background, where you were born, what you did before we all knew you?*

Yeah I'm certain Tom it's probably had a bigger influence on my scientific life than I realised. I was born in Adelaide and my parents had a really tough time during The Depression, they lost everything. Anyway we transferred to Broken Hill where my father got a job.

*What did your father do?*

He was a salesman, his life was tough too. His mother died giving birth to him, so there's another history so he had a tough time. My mother emphasised education always because during The Depression the people who had education usually were the ones that kept their jobs. And so I had this strong desire to be educated. And I think my mother before I went to school she taught me all of the early years, I must have been a terrible person to get along with at that stage. So when we transferred from Adelaide, or we went from Adelaide to Broken Hill for some reason they gave me a test and I jumped a year.

*How old were you then?*

Seven. But a lot of my time my father's not with us he's out looking for work or whatever he was doing. He was a very capable guy with his hands, and during the war he underwent one of these training things for people they wanted - a fitter and turner that sort of thing.

## Second World War

*Second World War?*

Yeah. And so as a result of that he got moved to Sydney, so I went from Adelaide to Broken Hill, I left Broken Hill when I was about 14 I think. But in moving to the New South Wales education system I jumped a year for my age so I was always a young person in the class. I don't know why but that's how it happened anyway.

*Curiously it happened to my sister, when she went from the South Australian education system to the Western Australia one she jumped a year.*

Poor old South Australia.

*They must have started school earlier or something, anyway go on.*

Whatever it is. But anyway I think that was a good thing, it meant that I was always interacting with people that were older than myself. And my brother, who was two years

younger, was actually more like three to four years younger because of the friends we had and so on.

*Was he your only sibling?*

I had a sister born in Sydney and she died at 14 months; it was pretty sad, sad for my mum, I was 14 or 15, 16 or something. And my father died when I was 16. When we came to Sydney we lived in one room in the city because it was wartime and eventually a house in Strathfield, they rented. So I went to Ultimo Tech and did my third year or Intermediate. And then I went to Sydney Tech High for the last two years. But he was away a lot because he was on civil construction work and then he did his training and came to work at Westinghouse Brakes during the war.

In Sydney during the war it was a sobering thing because I saw the Americans and the Australians fighting in the street and I just never understood, I thought we were on the same side. But the 9<sup>th</sup> Division coming back I remember terrible battles went on between the Americans and the Australians. And I still remember, well trivia, but the military police in the American Army apparently rotate and in the Australian Army they don't and that meant they treat them very differently. So our soldiers were getting a pretty rough time from the military police, and I could see all that because we looked down on the street. So I found that upsetting.

So I did my matriculation and I was interested -

*At Sydney Technical High School?*

Yeah. I passed everything but I was never going to have an academic career or that sort of thing. And I was always interested in chemistry.

## **BALM Paints and Sydney Technical College**

*Why did you say you were never going to have an academic career?*

It just wasn't in my thinking. There was only one university in Sydney and I just hadn't thought about that, I just thought you get a job somewhere. So I started work at BALM Paints it was then, that's British Australian Lead Manufacturers.

*So you did pretty well in your final - you got the final year, Matriculation so you matriculated?*

Yeah, I didn't have any problems passing but I didn't worry about how well I passed. But I didn't realise what I was doing there, I started work and I was actually employed -

*Go back briefly, you say you were interested in chemistry, why was that?*

I was just interested in why things worked. And I guess in those days we could go into Selbys in the city of Sydney and buy chemicals, and I used to use any pocket money and go and buy things and come home and do experiments.

*So you had a sort of home laboratory?*

Oh yeah. And at one stage we used to make gunpowder and have the cannons we were making.

*When you say 'we' used to make.*

My friends that I had from school.

*Did those friends become chemists?*

No. One of them was a teacher but the others didn't. I belonged to the Boy Scouts, I belonged to the Scouts in Broken Hill and then I joined in Concord West in Sydney. That was good, it gave me a foothold in Sydney and a lot of my friends were through there the scouts. And I did all the badges you can do in the Scouts, I had these things on my sleeves and all that stuff; hiking, whatever challenge was there I did it. Then I started work and I started at Dulux but I was employed by the factory, I didn't understand -

*You started, it was BALM Paints at that point?*

It was BALM Paints then yeah, it became Dulux later. So I was working a 48-hour week then and the guys in the laboratory were doing 40. We were all expected to do a diploma at Sydney Tech. So I passed in those years and we used to do three nights a week and the company gave us half a day to attend an afternoon class.

*When you started at BALM Paints what was your actual position?*

I was a trainee chemist or something.

*So you were employed as a trainee chemist in the factory, and a condition of that employment was that you had to go and get qualifications?*

Yeah.

*And so they gave you time off?*

They used to give us one afternoon off and we did an afternoon and three nights. It was pretty heavy because you're working 48 hours a week so it meant you start early in the morning, knock off at 5:00, charge in to Sydney Tech. And we did all the things growing up like sport. Now the first year at Sydney Tech in chemistry or whatever it was called, general chemistry, RK Murphy gave the first lectures. And he was a showman and he told us stories about chemistry, like the Hartung Youth Lectures as we have them today in the Chemical Institute. And so it was fun. I later was to give the Hartung lectures and they were influenced by Murphys teaching

*Was RK Murphy an Australian?*

No he's Canadian. He came out as head of Sydney Tech, or the chemistry part anyway the industrial area.

*And you won the RK Murphy medal?*

Yeah I have it.

*You have it?*

Yeah I've got the RK Murphy medal.

*You had won that?*

Yeah. Some of these medals mean a lot more to me than other people. But RK Murphy, and later on if we get to the Wark one I'll tell you about Wark because I had a very special relationship with him, and you might remind me to talk about that. So Murphy used to give a talk and I can still tell you he'd freeze mercury and drive a nail in with it or he'd freeze an egg and then he'd throw it up in class.

*Just go back briefly to the RK Murphy Medal, that's for chemical engineering?*

Yes, it was sort of industrial chem.

*What did you win that for?*

He was teaching us -

*No your medal what did you get the medal for?*

Bank notes.

*The bank note technology okay.*

Yeah. So Murph was Canadian and he came out and he was to lift Sydney Tech. Sydney Tech eventually becomes the University of New South Wales, and a lot of it goes back to Murphy's days because he set high standards. Later on I'll come to it, we did as much chemistry if not more than Sydney Uni up the road and we didn't think we were inferior to them in any way at all. And I'll tell you about the employment there later.

So Murph gave us these like Hartung Youth Lecture type things and then he'd tell us stories about chemical engineers how they in this -

*Was he a chemical engineer?*

Yeah. And the wheat was coming down the chute and it got up a harmonic motion and it drilled a hole in the steel and all this sort of stuff. And he told us how the night foreman used to be able to make the nickel plating bath work and no one else could and they found out he chewed tobacco and spat it in and it was due to a - I'm still telling you this and I go back to 1946 or whenever and that it was due to a nicotine complex in the metal bath and all this. So he told us all these great stories.

And then the second term we had Frankie Dwyer and Nyholm. So Sydney Tech had some really powerful people. Nyholm eventually went to London as Prof there. Anyway Frankie

Dwyer would come in a say right now we've got two terms to do the three terms work because we just had fun the first two. But it was good because Friday night you were getting pretty tired, I used to play football too so -

*When you say football, you mean rugby?*

Rugby. I played both, I'm not supposed to but I did. I played rugby union, which is rugby, and rugby league. But there was a very big difference, one's an amateur game one's professional and if you played the professional you weren't allowed to play the other. Not like that now. But BALM Paints had a Rugby league team and I played in that comp on Sunday, I used to play in that. So life was pretty full. I always got through my tech course okay. So when I'd done three years I was getting a bit tired of working 48 hours a week and these other guys are doing 40 and I asked -

*So after three years you got what qualification?*

Nothing, it's a five year course. But I passed all my subjects, which most people weren't because -

*It was very hard.*

It was pretty hard. And also in the early stages at BALM some of the students didn't care too much. During the war people didn't go into the tech at night because they were so busy and they didn't go in. And you can learn about paint without getting a degree but you can't do other things. So I said I wanted to get into more development, I was interested in polymers by then.

## **Early interest in polymer chemistry**

*Why were you interested in polymers, who was the person who interested you in polymers?*

No one interested me, it was me. My job in the factory was to test - the first thing I used to have to test what's called the mill base when they put pigment in and polymer in and grind it, they grind it overnight usually. And then you've got to see if it's dispersed. And that was my job to test that first thing. And I'd say yes or no, you have to run it longer or whatever. And then they add the rest of the things. And so I would do a lot of testing before it went down to be officially tested in the test department. And so I would see that we used this batch of alkyd resin, which was made down the other part of the factory. And it had an acid number of four and another one would come up with an acid value of eight and they both worked. And I thought there's such a variation here and they're such exciting materials. So I was interested in that. That difference in acid number told me one was twice the molecular weight of the other.

And actually there's so many clues in knowing what went on in the factory there; you can look at micro gel, people are now talking about it as though we always knew it. It was happening way back in those days and we didn't know it. Because you get a low viscosity and fast drying, they're contradictory because you'd think that low viscosity meant low molecular weight.



*What year did you become interested in polymers?*

I'm 18.

*Eighteen years old?*

Yeah and I'm interested in polymers. So I wanted to move out of the factory and into the laboratory. It was interesting the laboratory chief scientist, Steve Leech, he'd come back out of the army as a major and had his office.

*Had he been a chemist before he went into the army?*

Yeah. He didn't want me because he said -

*You were too smart?*

I knew all this stuff from the factory and I said it's better that I know what they do up there than - he said no you've learnt things we don't want you to know. And I could never understand this, as if the factory guys had some trick they used.

*You were 18 when you started at BALM Paints.*

No I was 16.

*So you matriculated pretty young.*

Yeah I'm young.

*At BALM Paints you started when you were 16 and by the time you finished three years you were 18 so you went into Steve Leech's -*

Entered it.

*Entered the thing when you were 18.*

Into the development lab there. I'm always a problem for Steve Leech because I'm young and he's got this salary scale, which is based on - oh age is in it. But with my age I'm not going to ever get paid much at all. And all through my career with him I'm in trouble because -

*Did you go to the laboratory with a drop in salary or maintained the salary?*

No but my salary is lower, another guy in the same year at tech is getting more than I'm getting because he's older than I am, so I don't like it. Anyway so I enjoyed that time there, I'm doing development of products. And by the time I was 21 I was formulating products for car companies, British Motor Corporation set up a factory in Sydney.

*In Zetland or something?*

Yeah Zetland, making Morris Oxfords and things. I actually put the paint line into Morris Oxford and I'm 21 and I was sent out to put it in. And I remember that even now.

*So BALM Paints was that a subsidiary of some British company?*

No.

*It was a joint venture or something was it?*

No hang on. I might get this broadly right Tom, British Australian Lead Manufacturers. And the history of it is interesting probably when we come to CSIRO even. The First World War we were exporting lead to Europe or Britain and importing back white lead. White lead is the main pigment that's used in making paint, white paint, in those days; we don't now. So in the First World War and the Second - the First World War they couldn't get white lead coming back so they decided they're going to make their own. And you make it in stacks.

So most of the factory there was this massive building of stacks where they put lead sheet in a stack with tan bark and acetic acid I think and they let it cook away for three months and then they take the stack apart and wash off the white lead and the lead goes back again, the unchanged lead goes back. It's a long process, I can tell you about that because I worked on a new one. They (Balm Paints) had a history of if we can do it here we're going to do it here. And that's vital to my career because we made everything.

*BALM Paints had some Australian interests and some British interests?*

Yeah.

*Because what was the company in Britain that it had -*

Hang on let me get to that because I go and work in Britain. So Barncastle who - Mr Barncastle was the Australian who drove that, and his house is still a heritage house at the Cabarita site. The Cabarita site has been reclaimed, it was one of the first where they did a rejuvenation of it because we made everything there from lead things to pigments to polymers, you name it. If you take a polymer we made it, we didn't import anything if we could make it ourselves. So I got fantastic experience during my time there, I made everything that you can think of in the coatings industry; it's not the same now.

British Australian Lead Manufacturers went through some changes, I don't know all the financial details but after the Second World War ICI got a share and DuPont another share. DuPont were around because Dulux and Duco were DuPont licence arrangements. So I often made polymers, alkyd resins, which are polyesters which I thought Carruthers might have had something to do with so I had a feeling for the inventor of nylon. So after the Second World War I think DuPont had to get rid of interests overseas.

*I think that was the anti-trust laws in the US.*

It was.

They had to, and they, ICI and DuPont divided the world. So going back to the British Motor Company in Australia we at Dulux had the formula that ICI were using in the UK to paint BMC cars. We had to adapt the formula to Australian conditions which are more challenging. I still remember out at the paint shop where the paint was mixed and circulated around the car production line the new foreman was very proud and when I looked in this big tank of paint there was a skin ( of paint) across the top. This could drop into the paint and cause lots of trouble. The foreman said it was a gasket, I am a kid and I say I don't think so so we cut it out of the tank .yes it is dried paint which would have wreched the finish on the cars

Back to ICI and DuPont. They just split the world up and so ICI got the controlling interest in what becomes Dulux then. So it went from BALM to BALM Paints to Dulux, it evolved through that. I didn't move, as usual. I changed labs, somewhere around 1949-50 Dulux set up a research lab.

*In Sydney?*

In Sydney yeah. And I wanted to go into that because I was into polymers, I didn't mind the formulation work but I wanted to go into the research lab.

*So Leech stayed?*

Leech was going to run that but he retired about that time.

*And by then had you finished your qualifications at Sydney Tech?*

Yeah.

*And what was that?*

I got an ASTC, which I'm proud of.

*Which is the Associate of Sydney Technical College?*

An Associate of Sydney Technical College, I got a credit which is all right but I should have done better but I didn't. So I got that and then at that time - see at Sydney Tech we had Nyholm.

*The ASTC what year was that?*

1950, '46 I started and I got it in '50. I didn't fail any years, that was unusual.

*So six years after?*

No five years.

It's a five-year course, okay.

And then about that time they were starting the University of Technology in Sydney. Now at Sydney Tech or whatever it is we've got Murphy, who's running the show, and he's

recruited Cavill who I did my PhD with. Steven Angyal went from Sydney Uni to there as head of organic chemistry. Alexander was there.

## **PhD at the NSW University of Technology**

*So Alexander came - he was in Sydney eventually or before?*

He was head of physical chemistry in there. I don't think he got along with someone there, maybe Murph.

*And then he went to Sydney?*

He went up to what they called the English Gentlemen's Club, which was Le Fevre. Alexander and another - Shoppee.

*Yeah the organic.*

So they were all the traditional British people. Alex went up there but - so there was a good physical chemistry school and the organic chemistry was going quite well too. And there was no employment for these guys like Ken Cavill was one of the first - they used to do master's degrees -

*So Ken Cavill was a graduate of?*

Sydney.

*Of Sydney University?*

No, let me finish. What they used to do was do a master's degree at Sydney and our master's degrees were nearly equal to a PhD, then they'd go overseas and do a PhD.

*Sorry, when you say Sydney?*

Sydney Uni.

*So Cavill did a master's degree.*

At Sydney.

*Sydney University.*

Yeah and he was one of the first, then over to Liverpool where they worked on -

*So Cavill wasn't taught at the Sydney Technical College?*

No.

*He was a graduate of the University of Sydney?*

Yep with a master's, then he was a graduate of Liverpool in England with a PhD. And he was one of the first to come back with a PhD.

*Did he come back to -*

Sydney Tech.

*Sydney Tech, and by then was Sydney Tech College, Sydney Tech or I think it was called became the New South Wales University of Technology.*

Yeah it was going through that transition, so the University of Technology.

*From the Sydney Technical College to the New South Wales University of Technology.*

Yes. It goes through University of Technology and then to the University of New South Wales and then they started another University of Technology again because industry wanted something like this.

## **Also working at Dulux**

*Let's get back to your progress. So you're now at what is now Dulux in the research laboratory, and who was the head of that research laboratory?*

It was a guy called Jack Lubbock, who was a Sydney Tech guy.

*Lubbock?*

Lubbock yeah. I remember it because - you can stop me if we're going too far out.

*No this is good.*

Because I'm learning all the time. I wanted to go up to the research lab and work on polymers and they said they couldn't let me go for a month because the work I was doing was so important.

*In the formulation lab?*

Yeah.

*When you say 'go up to the'?*

It was upstairs.

*On the same site?*

Same site, it was another storey up. I got a good rise when I got my Diploma mainly due to a new manager, Mr. Fischer I -

*A pay rise?*

Yeah because they have to pay me as a graduate even though I'm only 21 or whatever. So I'm young for that. But anyway it takes three months to make white lead in the white lead stack process but there's a quick process for making white lead, you can make it in 24 hours. BALM had decided, old Barncastle the fellow who'd been the white lead history, went and bought the process from overseas for making quick process white lead.

*Bought it from?*

From wherever, he licensed it. You make it by blowing carbon dioxide into a big column of litharge.

*At that point did the equivalent group in Britain make white lead this way or did we make white lead and export it?*

No we weren't talking about exporting it we were just going to make it our own. And so it was a 24-hour process. And they had shift chemists on there because you have to pick the end point, you have to titrate the basic lead carbonate. And anyway they wanted someone to work on that so I said I'll do it if -

I can then go to the research lab, not wait a few months as they were telling me.

You've got to go over the factory and you've got to run it and you're in charge of four guys, I'll tell you about it if you like. So I say I'll do that if I can then go up to the research lab. They said good, done. So I learnt - it was a lot of crap this I couldn't be transferred for a month, it was just playing politics, they were stuck for someone that - anyway what I learnt up there first thing is I'm 21 and I go up and I'm working night shift, 12 o'clock or something, midnight, it was a continuous process, right. And there's four blokes, and I can't find them I can only find two. So I say where's Terry and Tom and they say don't worry don't worry they're all right. Anyway it turns out that the plant if everything happens at the one time like the carbonate's forming and they've got to discharge this you need four guys. But it never happens at the one time because they run it so it doesn't. So they roster it, they say look just relax, just relax. And I say no, no give me a sample I've got to titrate this damn thing, you've got to pick the end point blah, blah, blah. Anyway you're blowing carbon dioxide through this litharge, which is PBR, and if it stops, if anything happens and the thing settles the whole thing sets like a rock.

So one night the pump broke down and I ring up the engineers, get one in and they can't get anyone to help them. So I get down there and I start helping them, of course I don't care I think I can pull motor bikes apart and so I get down there. And so they thought I was a good guy after that. So got the thing going. Anyway they say listen why don't you just relax, relax, relax and they said we'll tell you, we'll bring you up a sample and it will be right and you don't need to do all this titration stuff. So I say oh yeah tell me more. So what happens it goes through a subtle colour change from litharge, which is yellow, to just a slight pink and it's right on the end point, these guys knew it. So I never under-estimated these guys.

*They knew that intuitively?*

They'd observed it. And the quality of the staff in the factories was pretty good. When I went into the factory to scale up I never went down and said listen here I'm the guy with the degree and all this stuff, some of them did the Sydney Uni guys thought they could do it. You don't do that, you go down and say hey Terry and they'd say look watch it around the edges you'll see it starting to go, get it out quickly before it's gone to gel and all this stuff.

*You've been talking about lead for the last 15 minutes or so did you ever get any negative consequences from dealing with lead?*

Me personally?

*Personally.*

May be a little of it.

*So the safety precautions were good or you were lucky?*

Safety has changed a lot, not just with lead with the solvents we used. The safety was not bad in Dulux, for the times it was very good but now it's a lot better.

*And you'd never exposed a human being to that sort of stuff these days would you?*

No solvents alone. If you look at the industry the car industry, which was good from learning chemistry point of view, in the world there was a General Motors who used a lacquer, Dulon or Duco, and the rest of them used an enamel. The lacquer

Thinned in solvent like it's sprayed at 20% solids and the rest of it is volatile solvents, and they're expensive and possibly toxic. The other one's that is enamels are about 50% solids and a lot less solvent and usually they're more benign solvents, so these days they don't have these thermoplastics. Chemistry-wise a lacquer is better because where would you do chemistry in a film, exposed to the air and all the rest of it. And you can see that in cars if they have damage and they have to touch it up you can never get the same chemistry going on because you can't run it through an oven at that temperature. Anyway so the good thing is all of the chemistry I do later in life came out of these thermoplastics. But back to the scale up, buying the scale up of white lead was a mistake because that's about the time that we now have titanium dioxide as a white pigment and so it's a good example of a guy -

*Barncastle?*

Barncastle who was a white lead guy from way back making a decision from his old experience, and there was a massive amount of work done in the labs because the particle size of the quick process was different to the stack process -

*Was titanium dioxide substituted for lead oxide because of better performance or problems with safety?*

Everything.

*Better everything?*

Yeah.

*So it was a much better paint pigment?*

Yeah much, much better. And that's the white pigment now right through it.

*Was BALM Paints involved, I mean DuPont was very active in titanium dioxide wasn't it?*

Yeah.

*Did you license that technology in or did you develop the titanium dioxide yourself or did that come from BALM, the English Dulux in -?*

That came from whatever the company was called, we used to buy it. It was made down in Burnie. But there were two major ways of making titanium dioxide; there's the chloride process titanium chloride, hexachloride I think, and they hydrolyse that. And I think that's the DuPont method. And the other one is the sulphate process. The other one's a sulphate, which is what they did at Burnie.

*The point I was interested in was whether you Dulux Australia got some technology in or whether you developed all that titanium dioxide yourself and who owned that in the end. Dulux was now part of ICI ANZ wasn't it because ICI had taken over that.*

Yeah. With the Second World War anti-trust laws ICI get a controlling interest in BALM or Dulux, whatever it's called now. And so we are part of ICI in England, the paint department or whatever; Canadian Industries Limited in Canada; and Dulux Australia. They're the three big companies involved in the R&D, and I'm into that.

I told you about the titanium /white lead story because it was a good example of how you can make better and better wrong things. It cost the company a lot to go to this quick process white lead, when white lead was dead. But on that site there was another commonwealth red lead and litharge it was called, it was a site we weren't allowed access to it. They made red lead, that's PB304 I think, and they made litharge, so they sold the red lead.

*And lead compounds have gone out of industry now haven't they because of health concerns?*

Yeah.

*This was a period of time, were you then at all involved in education or had you - you'd finished your diploma?*

I go back to the University of Technology, so I've got a diploma and we can convert to a degree.

*So your diploma from the -*

Sydney Technical College.



*Sydney Technical College and during that time the Sydney Technical College had been converted to the New South Wales University of Technology and you could convert your thing to a degree from the New South Wales University of Technology?*

You can convert from your diploma from Sydney Tech to a degree from the University of Technology. But they couldn't just give us a degree, we didn't have to do any more chemistry, I had to do another subject like I did geology I think and I had to do English. It wasn't because I couldn't speak English it was just a token.

*A formality of some sort.*

A formality. So we did that and we did that of a night again and that was just something you had to do. So then I get a degree from the University of Technology.

*So you've got an ASTC and a BSc?*

Yeah. And Ken Cavill is there and during the BSc I -

*So Ken Cavill has got a master's degree from Sydney University, gone to somewhere to do a PhD.*

Liverpool.

*Liverpool, and then come back to the New South Wales University of Technology?*

Yeah as a lecturer or whatever. I worked with Ken, I must have done a project or something at some stage.

*As part of the project was on the oxidation using lead tetraacetate?*

I don't know how it was but anyway. Then they advertised a demonstratorship and I applied for that and I was going to do a master's so I started doing a master's.

*But you were still working for Dulux?*

Yeah, but I left Dulux for a brief period.

*To be a demonstrator in the university,*

Yeah, I can't remember quite this. And I started working with him doing a MSc. And then Dulux conned me into going back, offered me a deal to go back. They would give me a day a week off to go and do my research.

*It says on your CV Dave that you did a BSc Honours, so that the project you were doing with Ken Cavill was probably your honours graduate, the Oxidation of Some Active Methylene System.*

Yeah.

*So you got your BSc but in order to get a BSc Honours you had to do a project and Ken Cavill was the supervisor of that project okay.*

Yeah. Then I went there as a demonstrator for a short period of time. I'm not too clear about the detail of it, but I know Dulux conned me to go back pretty quickly and gave me a day off a week.

*It says that from '53 to '55 you were a demonstrator teacher at the University of New South Wales and then in '55 you went back as the leader of resin and polymer research. So you actually had leave of absence or something from Dulux?*

I left a few times, I didn't ever leave on bad terms with them. I think they humoured me. They probably knew my interests were in polymers. Universities weren't working on polymers

*You were sort of an academic for a short time from '53 to '55 as a demonstrator teaching Fellow and doing your PhD?*

No I was doing my master's.

*Doing your master's sorry.*

And I'll never forget Cavill - I spoke to him the other day, he's 93 or something. I handed him my master's and he said another year you could have got a PhD. And I said you didn't tell me until now. And that was the stage when they were just starting to issue PhDs in Australia. So I started to do a PhD with him during that period of a demonstrator and then I went back to - I think I might have got married about then sometime, and I went back to Dulux.

*You went back to Dulux in '55, you were a demonstrator '53 to '55, you got your master's degree in '55, you then went back to Dulux and was doing a PhD while working at Dulux with Ken Cavill.*

Yeah. So they gave me a day a week off to do my PhD, and I used to go in weekends.

*The PhD was about carbonyl compounds.*

That was with Ken Cavill. That was a drag because unlike other PhD students I was never going to work on what my PhD work was whereas most of the others saw themselves continuing on in that.

*So the PhD wasn't about polymer chemistry?*

No.

*It was Ken Cavill's interest?*

Yeah, and Ken what he did he made me be thorough. I used to know the answer –

## First patent with Dulux

*But in '55 after your master's degree you went back to Dulux as the leader of the resin and polymer research section, was that a promotion?*

Well it was starting to do the research in polymers that I wanted to do. Pretty early on I filed a patent on a new way of making polymers for paint. At this stage the chemical industry is starting to churn out what we call monomers these days, styrene, vinyl, chloride all of these are starting to become available through the plastics industry. And what the paint industry does is they take these new building blocks and see how they can use them. The typical approach is to modify what we've already got rather than step back and say let's start from scratch. I worked out a way of making modified polymers, the traditional polymer modified with the acrylics, which I filed a patent on. So I learnt about filing patents through the ICI connection.

*This is of interest to me too, can you just expand a bit. I mean that was unusual back in those days to be filing patents so who decided to pay the money?*

*You were working for Dulux at that time, so it was a Dulux patent.*

*Dulux paid for it, Dulux owned it.*

Yeah, they paid me \$1.

*Of course*

And then took it out of my pay. They did.

*But it was still unusual for companies to do that sort of thing in the mid-50s, we're talking mid-50s is that right?*

Yeah it was unusual and that's why -

*Who persuaded them, you? And why?*

The culture in Dulux was we're going to get out there and be a leader in the field, that's why I'm running a research group.

*Okay so patenting was actually part of their policy?*

I filed the first one. And we dealt with the ICI ANZ patent group down here in -

*Nicholson Street.*

Yeah in Melbourne.

*So Dulux then was acting as a wholly owned subsidiary, it was fully owned by ICI ANZ.*

Not fully but they had the controlling interest, they didn't own it fully.

*And the patent was - so your patent could that be exploited by ICI Paints Division?*

Yeah.

*So it wasn't a patent that was exclusively owned by Dulux Australia, it was a patent owned by the whole of the group?*

*Did they file overseas as well, a US patent?*

Look I know it was a pioneering effort to do it but I had a lot of support to do it. Dulux wanted to do it because I think it allowed them to stand up with the big boys.

*Do you?*

Yeah.

*But that would have normally involved foreign filings as well, we need the bigger exercise with an Australian company.*

I don't remember any issues where they weren't going to file.

*But ICI might have done that.*

Yeah I would have thought so. Anyway they wanted me to get my PhD over with. I took four years because it was a drag for me, and it was weekends and a day a week or whatever. Ken Cavill went overseas for a year and I was having trouble synthesising what he wanted and I thought blow this it's not going to work the way he wants me to do it. So I knew if I told him that I wanted to do it a different way he would say no and he would say you stick to it and make it work, so I didn't tell him I just did it. And when he came back I said I've made it. We get along fine he and I, but he and I are so different he's a very traditional chemist.

*You went around the outside and -*

Yeah.

*And this was part of your PhD.*

I did it a different way to the way he wanted.

*Was it scientifically significant?*

Yeah.

*We'll get to that will we?*

Well it was just a matter of this is what I've got to make and these are the bits I can get. So what he's wanting me to do is not going to work.

*Let's just get this in sequence in my head properly. So on the one hand you're working as a research leader at Dulux and filed a patent on -*

It was acrylic modified alkyds.

*Acrylic modified alkyds. And simultaneously with that you're working for a PhD for something completely different chemistry with Cavill, and as part of that PhD you found a new method of synthesising your carbonyl compounds.*

I took new building blocks, I didn't discover any new chemistry I just took it another way. It was interesting because Ken, he's never going to do anything outstanding because he's not that sort of guy, he's very thorough and he taught me a lot of discipline. And I know that's what he did to me. Whereas I'd say let's go here. And I wasn't sloppy but he'd have that step. I've spoken to him as I said the other day, he and I get along fine.

*How old is he now?*

Ninety-three.

*He wasn't actually much older than you?*

No. We used to go to the pub of a night. And Nyholm was there and Nyholm was a political animal and they were on about the politics of getting this New South Wales University of Technology going, and so we're PhD students listening to all this stuff going on. And then Nyholm went off to London and Ken stayed and Angyal came in from Sydney. So it was a pretty 'go go' place.

*Did Cavill ever become a professor?*

Yeah.

*So he eventually became a professor.*

Yeah but he wasn't head of department. I think they might have been ahead of the wave for having a lot more chairs whereas when I went to Melbourne even in 1960 they had four profs and now they don't they have a lot more. But you couldn't get personal chairs much but New South Wales you could. Anyway so getting my PhD was a drag but I did it. Doug Ford, you've heard of Doug?

Yes.

Well Doug and I were two of Ken's students and he Doug was working on ant chemistry and he and I were both -

*Doug Ford became a board member of CSIRO.*

Yeah. He worked at Taubmans and I worked at Dulux, Taubmans was another paint company. And here we are Saturdays in there doing our PhDs with Ken, and we both reckoned we did them part-time but there's no such thing as part-time. And Ken actually

filled in our timesheets, we were doing as many hours as half the PhD students because we had to get in there and work and get out.

## **Working at the ICI Paints Division in the UK**

*So 1959 you got your PhD and you were obviously highly successful at Dulux, is that when they sent you to Slough to the paints division?*

Yeah, as soon as I finished my PhD they sent me to work at ICI Paints Division at Slough.

*Can I just ask another question about the Dulux research group, were you the first person with a PhD there?*

No. They actually had recruited someone who did a PhD, a guy Neil Heath who was a physical chemist.

*Neil Heath is a name that I've never heard of.*

No, - I had a background in chem -

*Was he a PhD from the Sydney University?*

I think he might have been Adelaide but I'm not sure. But he was a physical chemist, but he didn't know the paint industry so he didn't know where to go. He worked on things that they gave him to work on. He was a good guy whereas I had the advantage I'd worked in the factory for goodness sake and I knew a bit about what went on and how you made the things.

I had this new way of making methacrylate modified things, so even in those days I was working on methyl methacrylate because it was desirable polymer from that. So they sent me to England to work on scaling that up and introducing it. And I was very lucky because the research manager over there, I'll think of his name in a minute, Dr Snow he said no, no, no we can take that now, we know how to do it, you've told us how to do it and you're here. He set up a program for me and I worked in every group in the lab, fantastic.

*Scaling up?*

It was easier to scale it up.

*But turning your invention into an industrial process, so you led that process in Slough?*

No I just was there but they took it over and they called it the Solomon Process and I thought this is hotshot stuff. And he Dr. Snow said, "No, no not going to allow that." And I was a bit upset and he said, "No, no Dave listen if it works it's fine and if it doesn't work you don't want to have your name associated with it." And I thought okay that's fair enough. Anyway they called it the Solomon Process, which they were using. It was pretty straightforward chemistry actually.

But the ICI lab in Slough technically it was an outstanding lab but commercially they used to laugh, they would say we'll sell it to DuPont and buy it back; DuPont will scale it up and then we'll get the product back. I used to argue with them. We were painting Holdens with what's called Dulon, which is polymethyl methacrylate, and they were saying you can't do it and I said 'they're on the road in Australia for goodness sake'. And they say no the petrol dissolves the polymer and I said you just formulate the shape of the petrol cap, it's not anything else. General Motors are selling this stuff around the world. You can buy a Chev in the States painted in that. You buy a Jaguar from the UK and it doesn't last very long because you've got this crappy finish on it. And they just had no idea of commercialising and they don't exist anymore.

*What you were saying about Barncastle, were they perfecting the wrong thing or trying to do research on the wrong thing?*

At ICI?

Yes.

No, doing the right things but they didn't know how to commercialise it. And a good example was take methacrylate they were saying it won't work when it's actually in the field in other places. They were good guys scientifically - you'd probably know some of the names, they've written a few textbooks in recent years on dispersers and so on.

I filed a couple of patents while I was over there. Because it was good for me, I'd go into a group and start work on it and say why don't we do this so we'd do it. But I got experience in every sort of polymer they were making.

*Did you get any benefit from these patents or they were wholly owned by Dulux?*

The one I filed here they had to pay me and they paid me \$1 and they took it out of my next pay, the next pay they docked me \$1. I thought it's just stupid isn't it.

*It would have been a pound then. So Dave you went to ICI Paints Division in '59, were you there for two years?*

One year.

*One year, '59 and '60.*

Yeah.

*You were obviously married by then, did the whole family go with you?*

Yeah.

*So Val and -*

I only had Val.

*You didn't have any children at that point?*

No.

*Excuse my geography but where is Slough?*

Slough is outer London on the Bristol line, Sluff I call it.

*Is it called Slough?*

*Slough.*

Is it far from London?

No.

*So it's an industrial suburb of London.*

We used to go into London to plays and stuff of a night. We lived in Windsor.

*Near the Queen.*

It wasn't far, Slough is not far from Windsor.

*How do you remember that time there, was that a great time in your life?*

Yeah technically it was really terrific for me. But all the time I guess I'm learning. Because I come from Dulux, which was a bit out here, which is smaller, we had more connection with the real world like taking things through to the market. When I was at ICI their research lab is isolated whereas up in Sydney, in Cabarita that's where it was, even though we were a research lab we were all there together and we knew we wanted to get things through to the market.

*So the Dulux factory was quite separate, the ICI Paints Division factory was separate from the research laboratory.*

Yeah.

*In a different part of England?*

I don't even know where it was.

*So your research laboratory was isolated from the factory. Was it isolated from other research groups, Cambridge or Oxford? I mean what sort of academic linkages did that have?*

They had linkages with other ICI places. I went to plastics division and Dyestuffs up at Manchester. But they had bamboo walls between - ICI Dyestuffs sold to paint companies, which were in competition with their own paint company, ICI Paint Company. They had this



way of doing things anyway. It didn't really get in the way scientifically, if we wanted to talk we did.

*Was Taubmans - that was Courtalds wasn't it?*

They weren't part of that.

*British Paints?*

No. Up in Sydney at the time, up Parramatta River so all along the river because you'd ship things up and you'd dump in the river too. Dulux has got the big Cabarita site and then a bit further up there's Union Carbide and there's British Paints. I don't know where Taubmans were, but they were up in that area. Dulux was the only one that had a research attitude. I had only been in England about eight or nine months and they said we want you to come back and go to Melbourne and set up the research lab, the polymer part of that.

*What year is that? 1961?*

That's '59/60.

*You were in the UK from halfway through '59 to halfway through '60 and you came back to Australia in '60 and it was then that you came to Melbourne.*

Yeah.

## **Establishing the Dulux research laboratory in Clayton**

*And set up the ICI research laboratory.*

No the Dulux.

*The Dulux research laboratory.*

I set up the polymer part of it.

*And where was that?*

Out at Clayton.

*Where they still are now?*

Yeah but it's not the lab I set up, they sold to Pittsburgh and they sold all the automotive stuff.

*They sold it to PPL.*

Yeah. They had a policy decision to move their research lab down to Melbourne and I think Dulux moved their headquarters down here also. I think the tax laws were different or something, there was some advantage of being in Melbourne. And most of the Sydneysiders didn't want to come to Melbourne and so quite a few left and they went to

Wattyl, they went to British Paints, they went to Taubmans. So all of the chief chemists of those places came from the Dulux laboratory up in Sydney. Dulux were light years ahead of the others in terms of science.

*You came to Melbourne in 1960 at the Dulux research laboratories in Clayton.*

Yeah.

*Who was the head of the -?*

Up in Sydney our head of the lab was Jack Lubbock and we all thought he was going to be head down here, I'd say, "What's happening in Melbourne?" and he'd say, "I don't know".

*Jack Lubbock?*

Lubbock yeah, L-U-B-B-O-C-K. He was a bright guy but not a brilliant manager.

*Did he have a PhD?*

No, no.

*He'd come up through the ranks?*

He'd be a Sydney Tech yeah. The Sydney Tech blokes - there was a lot of rivalry in the lab, they recruited a lot of graduates when I was there, '48/49, and they would come in from Sydney Uni with a degree but they didn't know anything about paint so they'd have to be trained. So when we were working with them - and we would know a lot more about paint than they ever would so a lot of rivalry between the two. We used to get paid more than they did, which we knew what we were doing. So it would take us five years to get our degree whereas they only took three. So there was a lot of nice rivalry between them. So Jack Lubbock he was an old time Sydney Tech guy.

Sydney Tech was a great place because it had university standards before it became a university. I can point to other institutes where that didn't have - they had to be dragged up to the university standard.

*I think, just by the way, Swinburne Tech in Melbourne had that same reputation of having a very high standard.*

Yeah so as I said when I converted from a diploma to a degree I didn't have to do any more chemistry, I did whatever I did.

*Can I just ask now, we're shifting from Sydney to Melbourne we've been going for an hour, it's just gone 11:00, do you want to have a five-minute break or do you want to just keep going?*

*It would be good to have a five-minute break.*

Yeah okay. Actually I have a background that you're not going to find anywhere else.

*So Dave we're back on the record now so we'd just like to go back briefly to your visit to England and you were saying that you went to England via Canada, why was that?*

The changes that happened in originally Dulux or BALM Paints to Dulux and ICI's getting a controlling interest in it, we had collaborative research projects involving the three companies, BALM or Dulux here, Canadian Industries Limited in Canada and ICI Paints Division.

*Canadian Industries Limited in Canada was that a wholly owned subsidiary of ICI or was that a bit like the one in Australia or was it an independent company?*

I don't know. But we had these meetings of research and development and I had to go to the first one in CIL on my way to England and I came home via Canada. I was with Jack Graves going to England I think he was technical Director and he wasn't the research manager I think -

*This was on your way to London you went to Canada to be a member of a research managers discussion group, okay.*

Yeah and I'm travelling, Val is with me but I'm also travelling with this guy Jack Graves. He's the bloke, the technical director or some title like that in Dulux.

*In Dulux Australia?*

Australia yeah. He's in Melbourne now.

*And his name is Jack?*

Graves. He I think was in the same year as Cornforth at Sydney Uni, he's a bright bugger. And he'd been in the air force during the war.

*Did he have a PhD?*

No.

*So he was a graduate of the University of Sydney?*

Sydney yeah. He was in the air force, I think he was the amateur wrestling champion or something, and he was a surfer at Coogee. In those days flying was like 23 hours or something like that, so we stopped in Honolulu.

*You probably stopped in Auckland.*

No we didn't go to Auckland we went to Fiji I think, and then we stopped at Honolulu. And I remember he's swimming out and because I think I have to go with him, I don't know if there were sharks there or not and we swam right out surfing out to the breakers. And then we were going through the customs there - I may as well as give you some tit bits - the guy says, "What are you going to do in Canada?" And I said, "We're going to a conference on

paint.” And he said, What! What's there to talk about with paint! You guys have got rocks in your heads, paint’s paint.” Anyway so we go to the conference and CIL have got -

*Where is this conference Dave?*

It's at CIL.

*But where's that?*

Hang on, they've got laboratories in Toronto and also in Montréal. Montréal is more like a research area, and that's a French Canadian influence there. And they had recruited a whole lot of British postdocs working on acrylics. And other things, and they did a lot of good work on how you work out the durability of polymers. They looked for example at the way polymers degrade there's two main mechanisms; one's unzipping and the other's elimination. And if you control the ratio of those two you can sort of stop the unzipping.

*The climatic conditions around the paint would be quite different from Canada and Australian wouldn't they?*

Dramatically different yeah.

*Dave, can I just ask you were you principally concerned with automotive coatings or at this point were you involved both in automotive coatings and domestic paint?*

Anything.

*All paint?*

Yeah. Automotive was interesting because we had all of the General Motors business and we had virtually all the automotive business.

*In Australia?*

In Australia yeah. I was talking to Terry about supplying General Motors here was difficult because you had to get the licence from America. And that's where you and I have talked much about restrictive licensing. When General Motors here went to acrylics they specified molecular weight. And just for the record I object to that because that was a DuPont patent, DuPont had a patent of acrylics that would be 55 to 105,000. It turns out that's what you need to balance the molecular weight so you can spray it. It's a balance between spraying it and getting durability. You want high molecular weight for durability, you want low molecular weight to spray it. And the second thing they'd say they want two years production experience on the line in Detroit.

So we actually did field trials, we had alternate formulations, we did them in New Zealand because we could get into a paint line there. Here we are trying to get new paint system in and we can't try it here. So I learnt that early days, and I've always argued about that.

*Dave, was the product that you were selling to General Motors Holden called Duco?*

Yeah.

*So it was called Duco because of the -*

DuPont.

*DuPont world split up and ICI ANZ had the Australian right to use the term Duco?*

Yeah. And then when they went to acrylics it was called Dulon.

*But in the end that changed I think didn't it because DuPont Australia now sell or they have the Duco?*

They probably do because as far as I can tell with Dulux Australia now they're not in the automotive.

*They're not in the automotive business no.*

I don't know about industrial either, they mightn't be in that.

*Dulux in Australia starting off with DUCO does that have anything to do with DuPont and Duco?*

*Yeah, yeah that was Dulux, that's where it came from.*

*It was never a DuPont subsidiary was it?*

DuPont had some interest in it and they had to get rid of it after the Second World War with the anti-trust stuff. I reckon a lot of the formulas we had for making alkyds, which are fatty acid modified polyesters, probably came from DuPont.

*But the DuPont company in America got out of the domestic paint market a long, long time ago.*

They'd get out of any market that's got -

*So Dulux in America is not owned by DuPont either.*

No.

*Anyway going back to your visit to - we're now in Canada.*

We go to Canada. I had a really good relationship with the guys there, and they were good chemists and they did a lot of work on durability and formulation work. And they were able to do a lot, lot more work than the British were doing so -

*Why was that?*

They just worked harder. The British lab - bring me back to that. When I went to England, John Snow that's the research manager,

*John Snow?*

John Snow, he said -

*Like the fast bowler.*

I think it was John Snow. Anyway it was Snow. And he said we'll get them to take the Solomon Process and they can work that through and that's okay and we'll give you this training program. And then they say well we had this problem in Canada where they reckon we can't churn out as much work as they can so they give me this problem to do. And I'm the bunny who has to show in England we can work. So I've got to make melamine formaldehydes and modify with alkyds. So I've got a technical assistant and jeez they're going to churn six of these out a day it's pretty hard going. So I've worked out how I can do it.

*Sorry this is -?*

I've got to make different formulations that worked in -

*And in England they give you a technical assistant?*

Yeah. This is a joint project with the whole three, Australia, Canada and UK. And I'm the bunny who's got to try to do it.

*And was that project worked out while you were in Canada?*

Yeah we're going to look at different melamine formaldehyde things. To make six a day I say I'll put it on two that are going to gel quickly and then I get them out of the road and do the same. So I've got this going and the boss, Jack Wakeley, used to come down and have tea at a bench and they'd drink and that. So he's down there and I want to get the -

*So this is Jock?*

Jack Wakeley, he's in charge of the lab I work in, right, he's got an office up there in a mezzanine floor and he comes down to the lab floor for tea. We don't do that now. Any how he is standing in front of my bench.

*And he reports to John Snow?*

Yeah. And I'm supposed to report to him. I've got this kid and we're churning out these polymers and he's down there, Jack Wakeley is down there. So I said to the kid, "Did you get that thing on?" And he said, "I can't Mr Wakeley is at the end of the bench and in the road" and I said, "Ask him to move." So I went up and I said, "Jack would you mind moving?" And they just about sent me to Coventry, they said, "it's outrageous". And he never came back, never came back down there. And they all thought I was a bloody heathen from the colonies, but anyway we managed.

*That experience put you in good stead for dealing with the bank notes?*

Yeah. It was funny, the lab at Slough is on the train line and they used to walk some kid, not only kids they'd walk half a mile over from the factory there and stand and watch the train go by, the Bristolian went by. It's the one that goes from Slough - London to Bristol. And I think it was pulled by the diesel electric. They stopped work, they said, "The Bristolian is pulled by the diesel electric you know." I don't care it's a research lab get out of my way. It was another world. But anyway it was good.

Upstairs there were these offices and it was Jack Wakeley and there was another guy Harold Lily, I still remember these names, he had a bit of a beard and had dribble down his shirt and he'd come to work, he'd walk in the gutter kicking a tin along, and he'd be up there. And I said to someone at lunch-time, "What about this oxidation

What the mechanism?" And they said, "Go and ask Harold." So I go up and say, "Can you talk to me for a moment about oil?" Yeah sure sit down." So I sat down. And he was a phenomenal font of knowledge, and we don't have that. This guy you think he's a dong but he's not, you can go and talk to him, he didn't have any time restrictions at all.

*So he was like the DuPont fellow type of person who was able to do whatever.*

We didn't have computers and things in those days but we had him. But technically the ICI lab was terrific, commercially no.

*Can I ask you this question, you've been talking about your experiences in these industrial labs. There are no women involved in any of this, so far all of your references have been to 'he' and so on. So were there any women chemists around in those days?*

There were a few in Sydney Tech, mostly they were doing the more biological side of projects. And we'd come across them in subjects where they might be doing organic chemistry because of their biology courses. Later on in Dulux there were some female graduates came in. When we came down to Melbourne we had some females there including refugees in the lab. But it was difficult when they had to go to the factory, if they had to go down the factory to get something, get toluene or something. it just wasn't the culture for it.

*You asked me to go back to Canada, you had some more things to say about postdocs or something in Canada, what was that? You said to remind you to go back to Canada, or have you finished talking about Canada?*

I might have covered it, the guys there. But they were able to get a lot more work out than the Brits. And the Brits we used to call them the 'Spurling reaction' you put it on and watch it instead of doing something else.

*What did you call it?*

I just made that up.

*You were going to talk briefly about Dulux and its management and why it shifted to Melbourne and why it was innovative and at that time in Australia very few companies were. And was it Wilson who was behind that?*

Yeah our director. He was an ICI guy who'd come in as the managing director. He came around the lab and talked to us.

*The managing director of Dulux was Wilson.*

Norman Wilson I think it was.

*Was he a chemist?*

I don't know if he was. But I can remember talking to him about what we were doing. Because I was looking at prefabricated things, I can still remember it they weren't paints they were plastics. He came around the lab and talked to us, which was -

*Was his vision about invention?*

I think it was ICI's. But I know what I was going to tell you, ICI had always had this research culture but the ICI research lab here was not set up to do research, it was set up to recruit good people. So in those days if you joined ICI ANZ then they had a training program, you would go to the different divisions and then you'd move out to them. You don't have any of that now, you go in and straight away you work. And also ICI wouldn't recruit anyone, I think 28 was the cut-off because they worked out they had to train you for x years and then you had such and such a working life and for them to get their return for the training they needed that. All of that's changed and with it people don't have the background in the company that they had.

*So the entrepreneurial culture that drove Dulux and made it spend money on research and patents and that sort of stuff was driven from England or from Australia and was it just Wilson in Australia?*

At Cabarita, which is where Dulux was where the white lead plant was, I think there was a culture, during the two World Wars we couldn't get materials and so we would make it ourselves. There was just an attitude of we would do it.

*If we can do it we will.*

Yeah, and not only do it but we'd go to the factory and scale up was part of it.

*But somebody has to supply the money, these are commercial companies.*

If you think about it Dulux had virtually all of the automotive market when we had it and most of the - they had a separate company within the company that dealt with contract painting of industrial structures, say the Westgate Bridge or something that they would give it the paint system right from go to whoa. And they would have maybe a system that they would recommend and they would guarantee, and they would get good money for that.

*Was it a bit like do you think in the United States where you had the Bell Laboratories, which lived off the Bell Lab system and they had so much money they could afford to spend it on what these days would only be done by government.*



*But Dave, the Dulux research group was always highly focused on the paint business, the paint system and developing new solutions for the paint market.*

*So what Tom is getting at there is that you didn't do pure research like investigating the nature of materials and so forth. But at the same time you were doing stuff, which was quite innovative for the period.*

Yeah but take the free radical stuff, we would look at different initiators and why they were better and so on Academics were not doing that they often assumed all initiators were the same. But let me just backtrack a bit. Up at Cabarita -

*Cabarita how do we spell, I'm not familiar with the -*

That's a suburb.

*Suburbs of Melbourne is -*

Sydney.

*Suburbs of Sydney, Cabarita.*

It's on the Parramatta River.

*And is that still a suburb there?*

It's still there.

*It's still there but it's not an industrial suburb?*

No it's a magnificent site for dwellings because it had this beautiful point.

*It's right on the river yeah.*

And it had a swimming pool there, I used to swim in it when I was a kid. And then muddy water came out of the thing, there are now fish in that river where there weren't before. But they used to make pigments as well, they didn't just make polymers. So down the bottom here we've got I think it was called dry colour or something, they were making all these different Prussian Blues and stuff so they're doing inorganic chemistry. There were polymers being made, which are mainly just the flue went up in the good old days and we went through the stages of capturing the volatiles and recycling them to finally do a solution set up where you got solvent and you don't lose anything out the top. But it was pretty crude in the early days.

*The reason we got involved in this part of the story is that Dulux was funding you guys to do stuff, started off with the patent system, in the patenting business. Up sticks, shifted to Melbourne, did a whole lot of strategic stuff, which was criticised by the industry but actually turned out to be the right decision commercially and technically. That's all correct. But what we need to understand is why was this happening, was it being driven from England, was it*

*being driven from Australia, was it particular personalities or did they not interact with you at all it was just upstairs?*

I know the company made a profit, Dulux, and I know they paid ICI management fees and things off the top. All of those fiddles went on. But I always had the attitude if I was making something ultimately we want to make it in the factory and sell it. So we used to have to write a research proposal, this doesn't quite answer your question but I got used to writing a proposal. One of the interesting things we had to do, and I think CSIRO could think about it, is we had to assume it's technically successful. All this pie in the sky stuff you're talking about Terry forget all of that, this value of can do what you're trying to do, what's the outcome and do the analysis. So we had to know you can make money out of it or you can't. There's plenty of projects CSIRO could analysis just like that now. So before you even start we'll assume the technical part is done, now what. So we used to have to write this, and I used to find that sometimes a bit tedious but you learnt a lot.

*It was a good discipline.*

It's good.

I think just listening to what you've been saying Dave the answer to Terry's question is partly what you've been saying that this company going back to the 1916 the First World War had a long tradition of learning from the lessons of the First World War where we couldn't get the white lead. It didn't want to be in the position where it couldn't solve the same problems so it developed a tradition of research and research that led to products, which I think if we go and talk to Chris Such today Dulux still has that basic philosophy, Dulux is still like that. And it stood aside, it was a bit different from other parts of ICI in that it maintained this very good research tradition. But it also has, what you've been saying to us is that it had the Bell Lab's philosophy that you had a good multidisciplinary team, you had the ability to take your idea and test it in the factory and you also then had the ability to take that if it worked and implement it commercially.

Yeah. If we had something that we were scaling up we had to make the first three batches in the factory. I told you earlier how I got on all right with the factory guys, and you need to get on well with them because when you go to scale up they can help a lot. And so you would have to make the first three batches, and you learn a heck of a lot when you go up from a little pot to a big one. But the aim was to get something out on the market.

I look at Dulux today and I quite admire the company because they've moved with the market, they've got out of all the restrictive licensing stuff we talk about, automotive they've got out of that because they could never commercialise their research.

Let me tell you the Dulux story. General Motors they used to use nitrocellulose, which goes way back to Henry Ford, and so they were using nitrocellulose which wasn't very durable. (And the other cars were using a thermoset,) this is thermoplastic, dries with no chemistry evaporation of solvent. And when they were going to change to Dulon that was where we had this restrictive licensing coming in. What was I going to tell you, I've lost track of what I was -

*Dulon.*

Dulon yeah. Well when they bought that nohow there were a whole lot of issues.

*Dulux bought the know-how from DuPont.*

Oh I know what I was going to say. We knew that General Motors here wanted Dulon or Lucite it was called in the States, and the story on that, I digress like mad I've got all these stories, was that DuPont and General Motors went down in Florida looking at a car and the Dupont guy looks at - they're looking at it and the most durable thing is the tail light. So General Motors say, 'we want something as good as the tail-light mate'. 'Well that's perspex.' And so they went back and they had to break the molecular weight back because you can't spray it, it cobwebs. And so that's where all this control of molecular weight comes out of that. It's just a tiny wee story.

We know that General Motors here want the acrylic thing and the managing director, a guy called Eric Sanford, he's going to whizz over to the States and get the licence for it. So he said to me what can you do about if we can't get the licence so I'm fiddling around in the lab and we work out we could probably get away with a slightly higher molecular weight but it's infringing the spirit of the patent and all that. So I met him the night before he got on the plane and said this is the best we've got, and he said that's good enough. He said you know Dave we're never going to work on this, unless we've got the business we haven't got an outlet so we can't justify the work. All we wanted you to do is give us the rockets to fire. So he went over and of course he bought the Knowhow. But we learnt how they controlled molecular weight and all the basic stuff there. And some interesting things about solvent, they used a mixture of a high boiler and a low boiler in there and the low boiler was going to be all up in the top of it.

*'They' in this conversation is DuPont?*

DuPont yes.

*DuPont is selling it to General Motors in America?*

Yeah they worked out how to make the polymer. General Motor's philosophy is they won't have a single supplier. Dulux got around that by having two factories that could make it so we could make it in Adelaide and Sydney or something like that. So you learnt a lot of interesting things like this, they say don't worry mate we'll stick a resin kettle up there. And that probably was a smart move all around because the science, any backup we needed was in Dulux not in the other companies. So I learnt that we could never - I was a bit upset that we couldn't continue work on acrylics but I understood why, because we couldn't get the market. And if you look at my Liversidge Lecture I laid this out in it. And Jerry Price came up to me afterwards and said, "Dave I didn't know any of this." And I thought Jerry you don't. When I was down at Fishermen's Bend, you and I Tom, remember Alan Dun from Monsanto?

*Yeah Alan Dun yes.*

He came in one day and we were trying to license - getting him to support some research. I knew about restrictive licensing and lack of export from Australia so I say to him, "Hey Alan if we gave you water would you be able to sell it?" And he said, "Stop being a smart arse." "Alan", I said, "I'm not I'm serious, if it didn't cost you anything to make this stuff could you make a profit out of it?" And the answer was 'no' because they weren't allowed to export from Australia. So any of this licensing innovative technology, which we did, which prohibited us from export we shouldn't allow it. And that's what a lot of the other countries did, I mentioned a few a while ago, India, Burma, Japan. But we didn't do it and we didn't do it because we're never going to be that bright that we'll have something new that we could export.

*So Dave what we were talking about in the last few minutes has been when you were in - you're now in Melbourne working at Clayton and this is in the early 1960s.*

They appointed a research manager from outside, who was John Pearce, and this was unexpected because they brought in an outsider-

*And John Pearce was a?*

He had a PhD.

*Was he an Englishman or an Australian?*

Australian. I don't know where he got his PhD but he worked at Kiwi, the boot polish people; they called him the 'boot polish guy'. But he came in, he was a mate of Derek Ziedler so I think that's how he came to -

*And Dirk Zeidler was then at Ascot Vale.*

At Ascot Vale yeah. So John Pearce came in and he was the best thing that ever happened not that we - at the time they didn't like it because they'd brought the guys from Adelaide and from New Zealand because we've got a New Zealand connection with Dulux, they brought guys over from there to this central lab. So you've got Sydney, the Melbourne lab and all of that.

*The company, the parent company, was called ICI ANZ.*

Yeah. So John Pearce comes in and he just straightened the place up. We started wearing white coats instead of overalls, because we looked like the factory blokes who wear overalls. And there was a bit of friction, which was unfair on John. Until we came to Melbourne Dulux did not encourage their scientists to belong to the -

*The professional societies?*

Professional societies like OCCA, well OCA chemists. And the reason is that - they lost because our people would go along to an OCA meeting, they'd give them a few grogs and then they would talk and information was getting transferred across, not intentionally necessarily but it was. And there was a big issue, when Dulux brought out a colouring system - you know you'd go along and they pushed levers and give you any colour off the

chart you wanted. The day before Dulux, I think I've got this right, announced that - they had these tinters which could go into water or into oil and that's a big technical challenge. The day before one or the other paint companies brought out a mixing system, just mix white and red and get pink or something like that. And it just took all the sting out of what was technically a much better thing.

*That incident that was after you'd left Dulux was it or was that during the 60s?*

I don't know when, the culture up in Sydney was not to –

## **The RACI Polymer Group**

*Not to join professional associations.*

When John came in he said no we get out there. And that was the RACI not OCA. And John was the treasurer or the secretary of the Victorian branch at the time, I'm not sure he was one or the other. He's very important in the history of the RACI. He gets us to go and I got back in the lab and I thought I'll put my feet up at last and he says no you don't. So I think it was the - we went along to the branch meeting and I think it was the Phys Chem group Tom?

*We didn't have a phys chem group at that point, there was an industrial chemistry group.*

There was a group that had run out of puff and was not going to be anymore. And we took over from that. So we started a polymer group there, which the way that started was John said to me "get active" and I said "okay". We had a meeting out at Clayton, out at Dulux, they paid for a lot of people to come for lunch and he had a guy from Monsanto, if you tell me the name I'll know. But all of those research managers from the different chemical companies.

*Not John Fowler?*

No.

*There was Alan Dun, John Fowler and there was another bloke whose name -*

Anyway they were all out there. So we decided or they decided we want to get a group going. And I've done all the organising. And so we decided to set up a group and whoever it was he's from Monsanto he mentions Geoff Hardy so Geoff Hardy becomes the -

*Who and where was he from?*

Monsanto.

*Geoff Hardy was from there?*

Yeah.

*And they were making polystyrene at that point were they?*

I don't know what they were making but they made up quite different polymers. So we've got ICI ANZ, we've got Hans Battaerd. So I end up secretary and Geoff is chairman of the group, and we start running meetings. And they're going pretty well but we can't get anyone to go on the committee so after two years, you can't hold office for longer so we swapped, I become the president and Geoff becomes the secretary. This is the time we want to have a national division.

*So you're still working at Dulux, so this was between 1960 and 1963.*

At Clayton yeah.

*And you formed the polymer group of the Victorian branch, were there polymer groups in any other state?*

No.

*So you were the first polymer group?* Let me go back. In 1957 Doj Jordan ran a symposium in Adelaide in the physical chemistry thing, I actually gave a talk at it. And if you look at the program you'll see, 'Author to be submitted by BALM', that was me. I'll tell you a bit about that. Doj ran this thing and I was given the title of 'Block of Graft Copolymers in the Paint Industry', and I didn't know of any, but I was given the title to talk to and I thought oh hell. So I made up a way of looking at the polymers when if you've got A and B they're blocks and you can vary the size of them, and we did. I remember John Irwin he and I clashed because he said they're not blocks and I said well -

*John Irwin was?*

Physical chemist at Adelaide Uni. He was working on the kinetics of ionic polymerisation or something that's not going to go anywhere commercially. Anyway Doj ran that symposium and nothing else happened, but he claims that was the first symposium.

*Of the polymer division?*

Yeah.

*As an aside people are writing bits and pieces as you've done Dave for the history of the RACI, the piece the physical chemistry division we claim in this history to have started when John Lane and I at your urging started the physical chemistry section of the physical chemistry group of the Victorian branch and then we went into a division. I don't think that we recognised that there was a physical chemistry division before that. We might have to go back in and look at it. So Doj had the meeting in the 50s and then you started the polymer group in the Victorian branch in the 60s and the polymer division as a nationwide division emerged from that.*

Out of that. But Doj didn't do anything. But in his obituary someone wrote that he founded the polymer division, that's not true he ran a symposium but he didn't go through all the hassles, we had to fight to get divisions. Because we were involved Tom in changing the Chemical Institute from a state focused thing to a national thing.

*Yes, and to be fair to the history of this Jerry Price was a major influence in this.*

Fantastic.

*He was the one who transformed the institute.*

Yeah, and that's how I know Jerry and my connection we're going to come to with CSIRO because it's through the Chemical Institute that he's seen me otherwise he probably wouldn't have eventually offer me a Chiefs job.

*So Jerry Price got to know you because of your involvement in the polymer group and in the polymer division.*

Yeah.

*From 1960 to 1963.*

Yeah and we were fighting all the way to get - for Terry's benefit some of the states did not want to have divisions because they saw they would lose power. And it was quite interesting, it was the big states and the small ones that didn't want it to happen. So Tassie was against it and New South Wales was against forming these nationwide groups. Victoria supported us strongly and probably Western Australia because Western Australia was the one that asked me to be president later on, they must have thought I had a vision of the institute as a national thing. But it was interesting to see how the Chemical Institute reflected a lot of other things about Australia, the state-based.

When I went to Melbourne Uni, all over the place here, to Masson Chair of Chemistry, Masson was an Englishman and he was much more committed to Australia-wide than Liversidge (up at Sydney) for example. Liversidge packed up and went back to England when his time was up and he didn't have a vision for doing things in Australia whereas Masson did.

*We're now still in 1960 to 1963 when you're at Clayton, you say that you were the leader of the resin and polymer research section and that's what you remained until you left, you were the leader of that group. Did that group grow while you were there?*

Oh yeah.

*You ended up at Clayton with a group of people.*

And that's the lab that they sold to Pittsburgh by the way.

*And do we know any of that, the people in that group apart from Dave Solomon did any of those other people become famous?*

You probably know at least one of them, because I was recruiting postdocs, Graham Melrose?

*Oh yes, so Graham Melrose so he went back to - I knew him as a student in Perth and he went back to Western Australia, so he was there too was he?*

Yeah he worked in my group. So I had Graham Melrose, he had a PhD.

*I think he had a PhD from the University of WA.*

He could have, he had it when he came to Dulux.

*He was an organic chemist.*

Yeah that's right. And he was always trying to get something useful out. Geoff Caldwell was the other guy I had, he had a master's degree from Australia somewhere. If I gave them both a problem Graham would get it to work. I could predict what they were going to do. Geoff was a good sound scientist but he was usually had problems getting things to the market. On the other hand Graham would rush to the market. Graham would tell him 'get out of my road'. And as you know he went and set up what's it called the company? You need both types in a lab

*I've forgotten the name of it Dave.*

They're making this thing out of poly - out of -acrolein I think

*He set the company up in Western Australia. You and I got back to that because of our involvement with Seb Marcuccio. Graham Melrose - the company that Seb started being involved with when he left Boron Molecular was connected to Graham Melrose.*

Was it?

*I believe so.*

*Just before you leave the RACI for significance particularly on a national scale of actually getting an Australia wide division can you reflect on that at all, did that do good things?*

Oh yeah because I mean science is not state, it's not national it's international. So 1968 I'm president of the polymer division and we have our first international speakers out, we hadn't brought any out before. They might have come just coincidentally. So we have two, and the Victorian branch committee deserve great recognition because the polymer group and then the polymer division wanted interstate speakers and we were asking for funds for interstate speakers and they were always supportive. So we started getting - otherwise speakers were all from within the state, it was all pretty inbred. And then 1968 we decided that we want two international speakers, and we have Okamura and Ken O'Driscoll.

*So Okamura came from Japan?*

Yeah. This is the bank story, Okamura gave me a visiting card printed on polymer paper, it's fibres not film that's it. And Ken O'Driscoll has been a long-term supporter of Australia, people have gone over there and done postdocs and PhDs and he's come back out later on to - he stayed with me actually, came to my home.



*He was an American?*

Yep, he came from -

*An American academic?*

Yep, from Waterloo. So both of them were very good contacts that we had.

*Waterloo is in Canada.*

Yeah.

*So was he Canadian?*

He was on that border. I think he was a yank, an American. I'm not sure I think he died recently. Anyway so as a story - we get to my recruitment later on for CSIRO. And Jerry Price came in and said Dave have you got any ideas how to make a new bank note, and I was like yeah look at this. And that's what got me into the bank project, it was through Okamura. The early stages of that project before we went up to Thredbo - you probably know the history there.

*Some of the story.*

I showed this to Jerry and he said, "Oh good can you get some?" I said, "Yeah". And he says, "Right get it and we'll get some printed." So I wrote to Okamura and asked him. In this Japanese relationships they often have with the companies that he had a dealing with he organised from Sanchou, a company that airfreighted out, in those days airfreight was a pretty big deal and email doesn't exist and telephone calls are - So I get airfreighted out sheets of this paper, which I give to Monty Brown to print and he takes it up to Thredbo. So that's what got me involved.

*That was one of the spin-offs from the RACI?*

Yeah.

*I think that that's an important thing because Dave got to know Jerry Price through this RACI connection. My recollection is that this meeting took place before the April 8<sup>th</sup> meeting so Jerry went in - this is the bank project, Jerry went into the meeting, the first meeting of Nugget Coombs' group armed with the knowledge that he's got the possibility of having a plastic bank note. I think the interesting thing is that information wasn't particularly useful to Jerry at that meeting, he didn't seem to say much. The notes of that meeting don't reflect Jerry's knowledge. But Jerry then said to the bank if we're going to have another meeting Dave Solomon needs to be at that other meeting.*

*We get onto the bank note?*

*Later.*

*I think there is some stuff that if it's true we would want to know about, and this is just part of the history project, and that is how important was the RACI and therefore how important was it to Australian science? So you were able to create this polymer division.*

The first thing is if it hadn't been for John Pearce I probably would have come back from England and said I can take life easy. And instead of that he says no you're not and get out there. And I need that anyway. So through John who got not only me but - let me go back. I set up this research lab out at Clayton and I recruit Graham Melrose, Geoff Hawthorne, we had -

*Geoff Hawthorne was there?*

Not Geoff Hawthorne sorry Caldwell. And also we got Polga, Olivia Polga who's a Hungarian refugee with a degree.

*And that's the first female that's appeared in the story.*

Let me go back, I keep going back. So this guy I got to know in England, I must get on all right with him, anyway I didn't have any hang-ups with the Brits and I was fine. So he gave me this terrific training course and I filed a couple of patents on the way through that and I can still remember them. And then when I was coming back to set up this lab he said how can we help you. And I say, I knew a guy called Clive Cook who was an analytical guy and he could come out and help us set up the GCs and things.

*Clive Cook was from ICI Paints Division.*

Yep. I met him in England, I knew him and his wife and all that. So Clive came out to our lab at Clayton here and we set up gas chromatography and stuff like that.

*Was the ICI, the Dulux lab chromatography was that ahead of the university department's.*

Oh yeah in terms of polymer analysis and that.

*So you had equipment at that lab that the university chemistry departments didn't have?*

No because they wouldn't work on polymers, they're trash. There's so much chemistry there they didn't know. So we got this guy from England here, Clive who was a mate of mine until he died, and we've got Caldwell and Melrose and we've got this lab starting, we're starting to look at other monomers to build cheaper polymers, better polymers whatever. And then in 1963 there's a credit squeeze and Dulux management decided bang we're going to cut back –

## **The 1961 credit squeeze**

*The credit squeeze was in '61.*

Well '61 to whenever yeah. I remember, the managing director I won't mention his name saying everyone's shoulders to the wheel, everyone make products. And I say you can't do that, I said Graham Melrose doesn't know how to make products yet right he's come from a

PhD and I'm just getting him going. We got our lab set up - I spent 13 years getting a PhD and okay you want me to change all this. So I got upset. There were a lot of ructions in the lab and John Pearce - some of them didn't like John but that was not fair on John. So I decided I was going to leave and I told this guy Jack Graves who was the guy I went to England with - he's actually a relative of mine I find out way back in South Australia, small world Australia. So I told him I was going to leave. And when I finally did leave they offered me the research manager's job and I said I don't want it.

*Too late.*

No it was a chopping block.

*This is because of financial cuts in Dulux?*

Yeah. And they wanted to stop research, the long-term research.

*Totally?*

Yeah.

*Well probably temporarily.*

Yeah but you can't do it.

*But you can't do it.*

You can't turn it on and off and they don't understand that, this guy. The guy who did it he had a diploma. They were going to send me down to Mt Eliza for some training thing and he was talking about his class at college and I said you mean the Sydney Tech College, Sydney Tech guys are proud of being -

*There was a management college at Mt Eliza, did you go to that?*

I went for an interview and I left before I went there.

*But that was a very important part of the development of managerial groups in Australia, a lot of people went to that college.*

Yeah I know. I had my interview and they asked questions like 'are you a smoker, do you want to be in a room with a smoker or not'. These days you'd never ask that. There was a lot of stuff like that. But I said I was going to leave. But what upset me with Dulux was that they got all this build up, build up to this lab and they decided that they want to reduce the funding. And it doesn't make any sense to use these guys to make products. There was something else I was going to tell you.

## **The RACI again**

*You were talking about RACI.*

Yeah well the RACI -

*Can I just get back to this, we've now reached the point in your career when you decide to leave Dulux and you then start to apply for a job in CSIRO, we'll come back to that later but can we just go back to now talk briefly about your - not necessarily briefly about your professional activities. You start off telling us that you were highly instrumental in setting up the polymer group at the Victorian branch and the polymer division. The first polymer division meeting was the one that you organised and then eventually that had international people and Okamura and Ken O'Driscoll came about. And you eventually became the president or whatever, the chairman, of the polymer division.*

There's one part of it here that I might want to be a little bit careful about how much we let people hear it. The polymer group didn't come from Doj Jordan because you can't just have a conference and think it's all going to happen you have to do the hard yards. And with the Victorian branch help and was Jerry president of the institute?

*Jerry was the president of the institute in 1962, and that was the turning point in the institute because in an unprecedented way he was the president for two years and the council encouraged him to be the president for two years so he could implement this new plan to have national divisions.*

This is important because this is how I ended up getting a job in CSIRO I think, we'll come to my interview there later. With the polymer group in Victoria we're interacting - Jerry's around in the background as president and all that. We've always got this international attitude, it's strange we didn't ever start off with a focus so we've got Geoff Hardy who's the president and me and Hans Battaerd from ICI. So we run a couple of symposiums that are good. I don't know when we went to Mildura, do you know when the first one - I've written all this down, I've down a history of the polymer division elsewhere that I can get. Anyway so the bank connection with RACI is there and we'll come back to that. Then we decide that we've got Jim O'Donnell up in Brisbane who can't get anything done up there but this mate of ours so his very -

*So how was Jim O'Donnell a mate of yours, he was at ICI for a while wasn't he at Ascot Vale?*

He might have been I'm not sure.

*With Peter Wilkinson.*

I'm not sure where I met up with Jim, but Jim was active in the polymer group. But he knew that we had to do the hard yards in Melbourne. So we then decided we had to have a symposium at Mildura because it was equal distance from Sydney, Melbourne and Adelaide and the polymer guys would be neutral. It's actually equally hard to get to from all of the places. So we went up there, Geoff Hardy and I and Hans probably we went up to the Grand Hotel and talked to the guy, checked the whole joint out; we did all this in our own time. We had Flory up there you know, that was later on.

*That was later on, I was at the Flory meeting.*

So was I. Anyway so we decided to have the meeting up there and we decided to have a polymer division. Jerry was there, he gave a talk at the end of it on something. And Peter Strasser did magic tricks.

*Peter Strasser was at Albright & Wilson.*

And this was a symposium, no chicken feed stuff we had to work.

*But you were still at Dulux at that point?*

Yeah I think so, yeah I am.

*The interesting thing is that Hans Battaerd was at Ascot Vale with ICI research and in a sense was doing work completely independently of what you were doing at Clayton.*

Yeah. And we used to talk, I could ask him polyethylene what's the density and how do you measure it blah, blah, blah. And he did Don Weiss' Sirotherm polymers, and we can talk about that later because we did that at Fishermen's Bend. And Hans came to make water treatment using radiation and chlorobenzene. 'Ooh Hans you don't do that'. Anyway so we went up there twice. The first time we formed the polymer division and Jim O'Donnell and I got our heads - we think we need a professor because they're hotshots in those days, I'm not sure about this here, we get Fred Ayschoff from New South Wales, he's a professor of industrial chemistry. They flew in a DC4 from Sydney and he was sick all the way, he hated Mildura. So we got him because he can give us a Sydney connection up there. I was secretary I think, anyway after the first year Jim says to me we need to rotate the Chairman and set a procedure to move it around. The next symposium we held up at Canberra because we interacted with Howard Bradbury and that group, we had the biochemists we were trying to go wide and not be restrictive. We approach Fred and told him we would like to move the president around and he agreed. But he had already been nominated for re-election. Fred tried to get his nominator to withdraw his nomination but the guy refused, no one knew why. We had an election. Good old Fred he even voted for me. Geoff Allen was at the meeting, he was on Sabbatical with Fred and I met up with him.

*He was at the University of New South Wales. He would be important when my work was reviewed at CSIRO. Fred and I were colleagues.*

Yeah we were both up there together. And I used to live not far from him [Fred] and see him and so on.

*So you become the president?*

I become the president and Geoff Allen is there from England so Geoff is -

*Geoff Allen he was an industrial person?*

No, he was a prof in England but he also had strong connections with Unilever working on water I think. He and I have been mates ever since.<sup>i</sup>

*We catch up with Geoff Allen again in the CSIRO story.*

Yeah because he reviews my work, Sefton gets him to review it. He's a mate of mine, good on him. So Geoff was doing a sabbatical with Ayschoff.

*Oh I didn't realise, so he was at the University of New South Wales. So he came to the second one in Canberra?*

He was at the symposium yeah.

*In Canberra?*

Yeah. And I remember Jim O'Donnell's PhD student, the guy that went to work at the Bell Labs, a bright in your face guy because I remember him asking questions about NMR and Geoff says who's giving you all these questions to ask or something and shut him up. Then I became chairman there and the polymer division went on. The counting in the polymer division is all over the place because they don't know when to list the first symposium, and I've written about that elsewhere so there's a history of the polymer division if you want to annex to this.

*We would like to get that, I'll put that in the email that we send you after this.*

I'm not sure where it is.

*We've got the history of - this is by the way, I have the manuscript of the history of the RACI including your accounts of your period of president of the polymer division.*

*Is this the same as the paper that Dave was talking about the polymer division?*

*That comes into this history yeah. Whether what Dave has written is in what we've got is another thing but we'll sort that out.*

I've got it somewhere, I've got a folder on all the early history. Because we don't count the Mildura ones, they don't count a lot of those early ones. But the polymer division really started at Mildura when we elected. I'm sure Jerry spoke at the end of the symposium and Peter Strasser was doing his magician tricks. And Peter was fantastic, he had Hans Battaerd - you had to know these characters really, Hans was a Dutchman. And he Peter gets Hans and he shows him a card and he says now you get this eggbeater and you've got to tell this guy what the card is. Peter's standing behind Hans with a tray with the number on the card holding it up, and Hans is going faster, faster, faster, faster with the eggbeater and bang that's it. And everybody laughs and then Hans says, "I know how they do it, it's a stroboscope and when it gets to a certain speed it predicts it." And it was a terrific example of how you complicate things. Peter did a whole lot of tricks and stuff. And he reckons we're the easiest bunch of the lot because we're always looking for some logical thought and he's doing something like holding this bloody tray up. Anyway it was a pretty good symposium, that went fine. I know Jerry through RACI and he knows what I've done there. And with the RACI it's a connection to Okamura, which gets these sheets which Jerry -

*Before we go back onto the bank thing though can we just finish talking about the whole of your involvement with the RACI and reflect on the importance of the professional society to the development of science in the country. My first dealings with you I think you were*

*becoming the president of the Victorian branch, so after you'd gotten into the polymer division. And you remained active in the polymer division for the rest of your career but you were only the chairman that first - you had one period as chairman of that but you weren't the chairman anymore but you became very active in the Victorian branch of the institute as I recall.*

Yeah I did, in those days you used to go through I think you became vice-president or president-elect and then the president and then the past-president, so that was the three years. So I went through that.

*When was that?*

I don't know, that's on the record somewhere. So I did that. I don't know when it was but Don Watts came up to me and asked me would I be chairman, put my name up to be the president Australia wide.

*President-elect. And at that point I think that you were the chief of the division so I think you were the president of the -*

I don't know.

*Yes I think that by then you were the - and you were the chief of the division and so it was - I think that your time as the president of the Victorian branch and then you became the president of the institute that didn't take very long. I remember you came to me and said - rather like Ken Cavill or somebody came to you and said this. I can remember this distinctly that you came to me and said, "Look we've got to get a certain person out of the education group". And I had to work out a way of doing that, which I did.*

*Reflecting back on those times when you were president or chairman, do you have any recollection of major things that you wanted to achieve in those roles?*

First of all I wanted the RACI to be international.

*Take it from being Australia focused?*

From being state focused. The first challenge we had was to form the division, which was Australia wide, and that was a fight. I can remember whoever put me up as president.

*Don Watts.*

Don Watts.

*Don Watts was an important character in West Australian chemistry.*

Yeah and I was nominated not by Victoria but by Western Australia. And I think I did do a fair job of looking after the other states because I visited most of them. I always felt it was Australia wide the whole bit. But when I went to Tasmania they got stuck into me, they reckon it was their turn and I shouldn't have - I didn't know about it, who's it Harry Blume or something?

*Yeah but I think that this is a case where yours and my memory is slightly different. I think that you were blamed for something in Tasmania that it was actually me that did it, but I think they blamed you Dave.*

We all know what that feels like Tom.

*I think that was the next time when - you were the president, Don Watts got you. I think the next round when it was Tasmania's turn they wanted to have somebody, Harry Bloom, to be the president. Watts rang me up and said we don't want this we want Andy Cole to be the president because Harry had got into some - I mean Harry was a very good chemist, very good guy, but he got into some trouble with the Electrolytic Zinc Company and metal pollution in the Derwent River. And the West Australians didn't think this was a good idea and they wanted Andy Cole to be the president. So they enlisted me to get you to nominate Andy Cole. So when you went to Tasmania you were blamed for something that I in fact did.*

That's okay, anyway they -

*We've been going for over an hour.*

*Let me just get back, so you became the president of the institute and during your time as president of the institute what do you think your main achievements were?*

I wanted to make it more national and international. And I visited most of the states that I could. I went to Broken Hill as well, places like that. Also in the Victorian branch we started having meetings in the country areas, I can remember doing that because we'd hire a bus and go to Warrnambool or somewhere. And we'd do a visit to a factory and then have our meeting down there. But trying to involve people other than the capital cities but also overcoming this entrenched idea of the power bases of the states, certain states New South Wales is one. And I think we got that, the polymer division was the first of the modern divisions with an international focus.

I think by the way Jerry didn't come to me and ask me about using polymers, he came to me and asked me about bank notes. I can remember I thought you have to have some idea. And I happened to have Okamura's card as I've said a few times. In those days to be able to get those sheets out to the bank in that short time, Okamura got it through up there and all the rest of it and I went to Thredbo at least with something. And according to the ex-Governor Bob Johnstone that's what saved the day from the pessimists at Thredbo.

*Minor miracle.*

Yeah.

*Was there anything else that you did as RACI president that you remember, that you were actually focused on doing. There was the reform of the RACI's internal structure and its focus and its move towards being more international, were they the main things?*

The divisions had their own budgets, which has got a good and a bad side to it I think. But it meant that at the stage I was there we could bring out overseas speakers and at least partially fund them. Now there were other problems, the divisions having budgets meant



they were a legal entity and all this stuff. I'm not aware of what went on with all of that, but it was good that the divisions could plan ahead with international speakers and so on.

*Was it growing through all this period in numbers, membership?*

The polymer division had big numbers. And with the polymer division we set about trying to involve people that wouldn't necessarily qualify to be Fellows or members of the RACI.

*They would be chemistry graduates presumably?*

Yeah, but biochemistry for example. And that's how we came to involve Howard Bradbury and people, trying to involve areas that were peripheral to polymers but maybe not to the chemical side. So we tried to broaden that. And that was getting people interested in the Chemical Institute that weren't going to qualify through the chemical route.

*And what about political influence, making submissions to parliamentary enquiries and that sort of thing?*

I didn't have a lot to do with that. Coming back to your question, the other thing I did I set up the Solomon Lectures. The way it was structured when I was doing it the divisions had - the secretary of the groups in each of the states were automatically members of the committee. So you had the chairman of the division and then you had the chairman of the groups in the states, so that kept the whole lot together. And the idea when we have international speakers was that they would go to the states and the states would look after them in the states and find the money through their state branches, and that would happen.

Now in between the national symposia, which were about 18 months apart, there was a gap with nothing much happening. And I talked to a group of people at Geelong conference and said what do we need and the answer was we need something in between the symposium. So I set up, I gave money for a polymer lecture, it was called the Solomon Lecture, which was really to try and bring out international people at that time.

*That was in 2001. That was a long time after this that you were president of the RACI.*

Yeah I'm still doing things yeah. Now there was a hiccup with that, I don't want to labour that.

*You're the president of the RACI and at that point were you already a Fellow of the Academy of Science or did that come after?*

1974 I was a Fellow of the Academy of Science.

*So that was after you were the president.*

I was also a Foundation Fellow -

*Can you talk briefly about the Academy of Technological Science, which is now the Academy of Technological Science and Engineering but at that point it was the Academy of - you were heavily involved in the formation of that were you?*

Yeah I was involved in it.

*And why, can you go briefly into this.*

Not so much heavily but Don Weiss was more heavily involved than I was, I was supportive of it. And I'm a Foundation Fellow and there's only about four of us left now. In Australia the input into the government was going through the Academy of Science. And that was a Canberra central thing, it probably still is, and also it probably didn't have the industrial focus that you probably would want it to have.

*It would have had almost no industrial focus.*

Yeah. Most of the presidents of the Academy of Science, I'm not including Andy Holmes, but most of them would be pretty academic and university focused. To get into the Academy of Science, if you were an industrial person you had to go through a section, I forget what it was called, and it meant that the managers of the research groups in Australia had no hope of getting in.

*In the industrial research groups.*

They just didn't make it. And so you've got Monsanto, ICI, Albright & Wilson, all of these big companies and big research labs by our standards -

*And BHP at that point had one too.*

Some of them might have had PhDs but they were just not going to cut the mustard with the Academy of Science. And I know because in my nomination I had to go through chemistry and this other thing, whatever it is. The chances of getting in aren't that great because the chemistry don't want to put you up as their main candidate anyway. It was people like Bill Whitton, and Don Weiss was very active in it; Kraft, a guy from Kraft cheese. And they were people with a lot of political influence, BHP people for example. And so they decided to set up this Academy of Technological Sciences, and I was the Foundation Fellow of that that same year '74/75. I think that's been very good, their submissions I quite like they put a point of view that doesn't necessarily get put by the other academy. I felt always that a lot of people talk about doing applied research who've never done it and they just don't have a clue what it's like to take things right through to the factory.

*Were you active in the Academy of Technological Science?*

Yeah.

*Were you on the committee of that?*

Yeah, I haven't been president or anything but I've been on the committee for quite a while, I forget what I did.

*But pretty soon after that you became a Fellow of the Academy of Science?*

The same year.

*And did you have much to do with the Academy of Science?*

Not a lot. Even now they're in Canberra whereas the Academy of Technological Science at least get out into the open - they're focused in Melbourne, as you know. But I also think their functions are not necessarily in Canberra or they're not in Canberra. And also the chief scientists came through, the last two of them, from the Academy of Technological Sciences,

*Batterham yeah. So Dave, my recollection of you, just going back to the RACI, was when I was the Victorian branch president you were gave the Hartung Youth Lecture.*

Yeah.

*So you had quite a bit of involvement in schools, in trying to interest school children in chemistry.*

Yeah. I put a lot of time into that lecture. And we took that to the country. I had a lot of demonstrations, and I can remember showing step growth and chain growth reactions and all that sort of thing. So yeah I gave the lecture series. And the last year I gave a lecture in Sydney, I forget -

*Going back to your time when you were president of RACI was education of school children important to RACI?*

*I can answer that because by then I was part of Dave's division and Jean Swift was also - Jean Swift was one of Dave's -*

Experimental scientist she was.

*- experimental scientists and Dave I can recall you getting Jean -*

To give an experiment.

*And Jean and I and Neil Galbraith we started on Dave's - I'm pretty sure Dave's encouragement this chemist in schools program. I think that Dave is probably under-estimating in his memory the influence that he had on this school, trying to interest kids in science.*

*To the extent that anyone funded that was it RACI or CSIRO?*

*It was all basically funded by the employer, CSIRO, ICI, the universities.*

*It wasn't an RACI activity?*

*It was an RACI activity but it was -*

*But the funding came from -*

*There was no funding in it. It was just that people in those days - Dave as the chief of the division said to people like me and Jean, 'you do that and take time off'. So we did it as part of our professional activity in CSIRO.*

The RACI got a lot of support from CSIRO and various places. For example with my Hartung Youth Lecture we had an old van we'd take around with all the displays in it. And I had a guy from the workshop used to come with me and someone else because we set up these displays. And that was quite an effort.

*I was the branch president at that time.*

Yeah. But also when we were starting the polymer division, I was in CSIRO now not in polymer I'm in applied mineralogy - we'll come back to my history there later. And so with Jim O'Donnell and probably Hans Battaerd we decided we were going to run a workshop, and we had lecture series and prac work.

*For school students?*

Anyone that wanted to come. We'd give a series of lectures on chemistry and physical chemistry. And then we went down to Fishermen's Bend and they did experiments we set up for them to do. And we charged them to go to this, we actually had the lectures down at Fishermen's Bend too I recall in the lecture theatre there. And then the profit from that, which was written down somewhere it was 1100 dollars or pounds or whatever, that was funding for the polymer division. I was allowed to keep it, my chief said he didn't realise what he was doing, said 'mate if you'd asked again I wouldn't have got it'. But the original funding for the polymer division came out of a workshop that we ran at Fishermen's Bend.

That was a tremendously important happening. It enable us to bring Okamura and Odriscoll to Australia for our meeting.

*The polymer division of the RACI?*

Yes.

*Is it a good time to break?*

*Yes. So we'll have a break for lunch now Dave and come back. And after lunch we'll start talking about CSIRO.*

*[music]*

## **CSIRO Division of Applied Mineralogy**

*We're on the record now.*

*Back on the record now Dave so let's go back to 1963 and resume the story of your career and how you - the story about how you transferred from Dulux to CSIRO and what was that process.*

With the credit squeeze in 1962 or '61, that period, Dulux certain people wanted to cut back on the research group that we'd just built up. And people in that group such as Graham Melrose and Geoff Caldwell I think his name was they were being trained to work on coatings, but they weren't skilled at doing formulation work. So this was really not a long term, in the long-term interests of us, and I told them that. And it really made it pointless the fact that we'd been trying to build up a research group.

On the other side of the coin I'd spent 14 years or something at tech getting a PhD and I was rapt in chemistry, polymer chemistry so I didn't want to move away from that. In Dulux at the time if I'd been promoted they were talking about promoting me to research manager. It was not a research manager in the sense that I wanted it was a management type thing. And I didn't want to do that, and I told them that. I applied for a job in the Division of Organic Chemistry at CSIRO Fishermen's Bend, I didn't get that job. I'm pretty sure Jerry Price was involved somewhere there it was his Division.

*He was still the chief.*

He was the chief and Claude Culvenor, it must have been, very much a part of that decision making. Because later on when I met him he was very embarrassed and I kept telling him what's going to transpire is actually for my good. I just assumed that CSIRO was like any company and I'd applied for a job and didn't get it and that I didn't need to apply for other divisions, I didn't understand that structure. And the next thing it turns out George Walker, who was in the Division of Applied Mineralogy had found out a process for separating the platelets in a mineral called vermiculite and he wanted to look at the use of those as coatings and so he wanted someone who could do applied research.

*Coatings for?*

Any sort of wood coating or as fireproof coating for example, it would bubble up and give you protection. And George used to talk about his organic chemist and that was a bit of a joke apparently around fishermen's Bend. And he was talking to guys like John Swan and so on and they happened to say to him look we interviewed Dave Solomon the other day and he might be interesting to you. And George rang me up and I went and had a look. I wanted to leave Dulux because I wasn't happy about leaving the research component or that part being changed. And so the only thing I could see in what George was explaining to me I knew about was coatings. It was a long shot and it was a big step for me because I had three kids and I dropped salary about a third, a lot. And also I didn't know the potential for the Mineral side of the work. So it was a big decision, but my wife always supports me thank goodness and if I wasn't happy at work then it's not much fun. In my life I was changed Jobs twice both times for a lot less money, but it has been worth it.

So I was interviewed by applied mineralogy. And my work there was to look at these mineral vermiculite and make dispersions of it and look at it as a fire coating. So I joined that division. That's where I was when Jerry came to see me about the bank project. And the chief of the division was Arthur Gaskin and he at no stage had any problem with me talking to Jerry and working on bank notes. So I started a bank note project in the Division of Applied Mineralogy.

*Can we just go back to the time when you joined the Division of Applied Mineralogy? You had the interview at the end of 1962 and you started there some time in the middle of 1963. I think Dulux enabled you to go earlier than you thought so I think you actually commenced work in CSIRO early in 1963. When you got to Fishermen's Bend what were you told to do, I mean when you got there what did you think your job was?*

Let me explain about leaving Dulux. I was on a contract, which I had to give six months' notice. That was to prevent me and others going to a paint company and taking some latest secret or something, but I wasn't doing that I had never left Dulux to go to a competitor. So the first thing is they said they were going to make me work out the six months and I said that's fine CSIRO are okay with that. And the second was they agreed to second John Hopwood to come down and work with me on some work to do with making polymers, they're called alkyd resins. John was seconded to work with me and so on. I don't remember any formalities involved in his secondment, issues of who's covering the workers comp and all that sort of stuff, it just seemed to be fixed. So John came down to work with me, I'm very proud of John he's had a very glorious career in Adelaide and I think he's to do with children's health, and he's a Fellow of the Academy of Science now. So John came down and we were doing that polymer work, which we published. Anyway when things calmed down I was allowed to join CSIRO after a few months and I agreed to go back to Dulux and give a series of lectures on polymers. Actually they formed the basis of my first book

And at CSIRO also I had an office and a lab and so I started making these dispersions and applying them as coatings and looking at the fire resistance and fireproof on it. But the other thing is I decided I would look at minerals and other organics were interesting and that's what I was supposed to do. So being a chemist I decided I would dry the mineral because then I would control the water content. So when I dried kaolinite, which is an aluminium silicate, when I dried it and put styrene on it it boiled. And I'd spent all my life up until this point looking at surface coatings as the pigments and fillers were something you had to put up with but they didn't do anything to the chemistry. And here I am I can polymerise styrene and I can break down catalysts and initiators with dry kaolinite. So I started to look at polymerisation on that.

*Had anybody else in applied mineralogy looked at kaolinite, you initiated that as part of your job?*

Yeah I started doing that. And I started with other minerals too, with montmorillonite. And so I had various ways I could polymerise things on minerals, which I hadn't -

*Did you have somebody helping you?*

Not initially.

*Not at this phase and then you got Jean or somebody?*

Jean I get later on. I was active in the polymer division, polymer group, and I was - Brian Harrop over in wool research wanted to modify wool or something and I had a go at putting functional groups on that. I knew the chemistry of cross-linking reactions and isocyanate

reactions and so on, so I had a go at that. That wasn't strictly mineral work but it was through my RACI connections. No one ever said anything to me not to do it. And then the mineral work was going well, I was also polymerising between the layers of aluminium silicate like clay montmorillonite. I'd actually found out a way of making some of the minerals have a better colour about them, whiteness, and I filed patents on that too, so I knew the patent guys at CSIRO.

*So that would be '63 so they would be the ones who were in Albert Street?*

Yeah I think, Paul Grant I used to know and I'm not sure if he was in Albert Street.

*He was but I didn't think he was there that early.*

When he was I was a good friend of his, I played him in squash whenever I went to Canberra. And also he's a connection I made with some other things. So I've got this going. Then George decides I should have someone to work with me and we advertised an experimental officer position and I got Jean.

*George was obviously happy with what you were doing?*

Yeah. But he was happy I was doing this other work as well not just his film work. I always did his film work, but it wasn't going anywhere that I could see by the way. Anyway I did what I had to do there. So that was going well and then, I think this is the right order, a Ken Ferguson was the assistant chief of CSIRO animal production up in Sydney out at Prospect, .

*Yeah.*

What's his first name?

*Ken Ferguson.*

Yeah Ken Ferguson. Ken had given a talk I think in Geelong about limiting amino acids in sheep. And the guts of it is this; say there's eight amino acids in wool, they're excreting seven of them because they lack the eighth one -, they lack the one which is called the limiting amino acid. So the theory goes if you add that one part of that, that limiting amino acid, you can get eight parts of wool. And he gave a talk and disclosed this. And I thought it was Paul came to me and said, "We need to cover this with a patent quickly, have you got any ideas?"

So I got involved with Ken and I found out quickly that the sheep's got four compartments in its gut and that varies in pH. So I made polymers, which would be resistant to pH in their own rumen, which is six and were released in pH2 where wool is made. And we'd use those as a coating. And I had two weeks to do it because Paul said that's about the time we could fudge the disclosure date. So I remember doing it.

*Were you in the Division of Applied Mineralogy then?*

Yeah, I never did a lot in applied min. And I think this is what we want to talk about the chief. He didn't care I was doing stuff, and everyone was happy.

*Doing good stuff, he knew about it but was happy.*

Yeah and not only that he gets me staff, he starts recruiting. So Geoff Hawthorn we're going to talk about and Max Rosser, I had Max fairly early on.

*I can remember Max.*

Anyway so I got involved with Ken in this release for sheep. I remember going up there, and the division were stuck into him because we'd done the work in pretty much a hurry and we hadn't characterised everything as we might. And they were talking like we're trying to publish a paper. Jeez you guys we're trying to save a bloody disclosure and the fact that we whacked them through and did it. So Ken and I got along fine but some of the academics up there weren't impressed. So I got interested with them in sheep identification. They were looking at why sheep recognises its offspring and that sort of stuff. So I worked with Ken a bit. So I did that work. And then the guys in chem eng were looking at boiler scale and they wanted a polymer made which would give you self-cleaning in a boiler.

*Who was that?*

It was one of the chemical engineers.

*So that would be as a paint that you put on the inside of the boiler before you filled it with -*

No you actually put it in the water I think and it formed a salt with a calcium deposit and it peeled off the coating. I know what it was, we made a polymer with acid groups in. I'm not sure whether we put it on or put it in the water, but any deposit came off as a film, which was tracked and came away so it didn't build up. Then we patented that, Rolf I think was the TA's name. So we made that, that looked all right. I'm not sure where these ever went but it wasn't my part of the deal.

Don Weiss then came to me with Sirotherm, which was being made by Hans Battaerd out of ICI using irradiation polymerisation of triallylamine in chlorobenzene. And that is shocking to use for water purification, chlorinated solvents you're getting bis biphenyls - ooh it was terrible. And so we worked out a method of doing it at room temperature in water with a redox system and we got away from triallylamine, there's a good technical reason for that. And we started looking at what's called cyclopolymerisation, which is these compounds have got two allyl groups and they cyclise that, and the way they cyclise is actually very important. What I was talking about earlier with Don, Don didn't want to know what it did I did. And actually it goes against what the textbooks were saying because it's not under thermodynamic control it's under kinetic control, which is what radical reactions are. And that made sense. This was a major finding in our work on radical polymerization

But it was interesting the literature at the time, the guy who first discovered this cyclisation of two allyles George Butler at Florida published in the Journal of American Chem. Soc. He didn't have to prove the cyclisation size of the ring because everyone knew it would be six. In other words the referees didn't even ask for it. In fact it's not six it's five. And there's a good reason for that and it's part of the changing understanding of the theory of free radical polymerisation, which we eventually write books on.



So during this time my chief is getting me more staff, I got Geoff Hawthorn who was an organic chemist from Melbourne, he came to work on just making polymers and things.

*I've recently written his obituary, he actually came to work with George Walker and George Walker died and you got him. So he didn't work for George Walker for very long because he died soon after Geoff came.*

I don't remember him ever working with - Geoff just joined our group. In fact Geoff did a lot of this cyclisation work because he's a fantastic organic chemist.

*I get the impression from what you're saying that your impressions of CSIRO when you first joined were fairly positive as a scientist because of the freedom that you were given to pursue things that you thought were interesting and -*

I thought were useful. And also I think the patent guys probably Paul Grant and people like that would put people in touch with me. I wouldn't go looking for it but they'd come and see me because I could make these things like polymer.

*But my impression from what you're talking about is that you didn't actually have a lot of contact with the end-user of these things?*

No I wasn't responsible, for example with Sirotherm I just told them how to make it. We had the patent on that. And it's very sensible what we did scientifically actually. That was all going fine and –

## **Time spent at Georgia Kaolin**

*But you started, getting back to your promotion, in CSIRO at the top of the SRO, CRS scale. You pretty soon would have been promoted to PRS, and in 1969 you got promoted to SVRS and in 1970 you transferred to the Division of Applied Chemistry. Can we get you to talk a bit about why you went to Georgia Kaolin?*

What happened, the general feeling around was that polymerisation on minerals was not the normal thing. There was some published work where a guy in the States was publishing on montmorillonite and reckoned it can control the molecular weight by the size of the particle and all this stuff. I'd published some work on that. I went overseas I had a CSIRO - I funded myself on one overseas trip but I think I had a CSIRO funded trip. And I went to the American Clay Mineral Conference and gave a talk on reaction on minerals, and that was a pretty big deal for me because I'm not a mineralogist. And I remember a question, there was a guy called Blumstein in the States who didn't like me and what I was doing and his first question was how pure were your monitors. That's a stupid bloody question, what am I going to say, oh they're the crappy stuff in the bottom mate. So he didn't like what - because we were not agreeing with what he said.

After that evening they were having drinks over the piano and Hayden Murray from Georgia Kaolin said, "Want to come and work for us?" I said I was looking, wouldn't mind doing a postdoc but I didn't want to come permanently. And he said, "No good that's fixed". It's

true. And I said what about, what's the deal, what's taxation and all that and he said, "I'll fix all that don't worry." And I remember talking to a friend of George Walker's and I said, "Hayden has offered me this job, I haven't got anything in writing." And he said, "If Hayden said it was right it's right." So I took off for the States with three young kids and a wife and went to work at Georgia Kaolin. I said to him, "What do you want me to do?" And he said, "Just go around and give a few talks that's all."

*For a period?*

Well I said a year, but he reckoned he was going to get me to stay.

*Do you know what year that was?*

*We know that, that was -*

*In the CV?*

*Yeah.*

That was '63 or '64 or something.

*So it was still pretty early in your time at CSIRO?*

Yeah I actually -

*1968 to '69 you were seconded to Georgia Kaolin.*

And by the way when I did it I said to him it's not reasonable that you should get the benefit of my work at CSIRO. Because I'd filed patents on what I'd done, and he wanted access to those. So he said he'd teach me about the clay industry and also we would get free use of the stuff in Australia. So whenever I went anywhere I had the intellectual property issues, which I talked about. So I had that deal. Jerry didn't want me to go and he said I suppose you're going to go anyway are you, and I said probably because it's a pretty good deal the guy offered me and it will help my work.

*Why was Jerry involved in this? That was '68; it was the time of the bank thing so he'd already got in contact with you about the bank.*

I actually kept that going while I was in the States. But anyway so I went for a year and my wife wasn't going to stay, she liked the States but we weren't going to live there.

*What city were you in?*

We lived in Summit, New Jersey, which is not far from the Bell Labs. And it's a beautiful place to live. I could have stayed there five years and retired, I was on a pretty good deal compared to Australian salaries. But I didn't. And in retrospect it was great because the American scene is much more fluid than here and Hayden Murray for example, who was the executive vice-president, when the company was taken over by relatives and so on he just went back to Indiana as Prof of geology.

*So Georgia Kaolin was a private company was it?*

Yeah. And the guy who owned it he had Washington's map table and all this stuff and he fed the bloody stray dogs and imported tulips from Holland, and if you trod on the tulip bed you got fired. It's true, you couldn't walk across there. I went over there one evening and they're drinking whisky and I don't drink, and they've got bits of dry bread and feed the dog and eat a bit and it was crazy; and this guy is worth millions. Anyway he made his money out of real estate.

But anyway coming back, I went down to Georgia to their clay deposits and I know how they mined their clay. And it was very interesting because they mine it for particle size distribution, they don't just dig a hole and take the best lot out like we do out here they mine it with different sites and it's all blended to give a particle size distribution. And the big use is in paper coating. So we actually make polymers, which worked in paper coatings because what we showed when you dry clay it becomes acidic so you make a polymer with basic groups in it and it bonds the paper coating better. So we did that.

*Was that technology commercialised by Georgia Kaolin?*

Yeah.

## **Start of the Bank Project**

*Can we get back now to 1968, so we've just had the second annual conference of the Australian Polymer Symposium as it's now called, the second or third, in Mildura and Okamura has come down from Japan to give a talk. And sometime early in 1968 Jerry Price comes to your office and says "What do you know about bank notes?" or something.*

Said how do you make a more secure bank note. By the way for that other thing we're writing he didn't come and suggest polymers he just came to ask me.

*He came to ask you, but presumably he came to ask you because he knew you were a polymer scientist.*

No I think he knew that I was interested in the industry and that I look at the end use whereas a lot of his blokes didn't, they wanted to publish a paper and it was done.

*He'd been to Mildura - this is an argument between you and me and not part of your oral history. But he'd been to the polymer symposium in Mildura, he'd seen this Okamura's talk so let's give him some credit to thinking that there was a bit of polymer in the back of his mind, but anyway he came. No he had not heard Okamura but he said he needed someone with Industrial experience*

He came and asked me if I knew anything about bank notes and that's when I said about polymer paper but I meant fibre because I had seen that from Okamura. I was interested in polymer papers but not specifically, I just had a scientific interest in it. And we'd been looking at other papers too just because they've got coatings on them.

*And at this stage did you know Sefton Hamann?*

I think I might have published with Sefton before then on step growth or polystyrene polymerisation with acids. We had a visit from the cationic bloke, he's a nutcase he used perchloric acid to polymerise styrene, were you involved in that?

*No I wasn't involved in that.*

And he had this weird mechanism.

*I didn't join CSIRO until 1969 so anyway - So Sefton - we reckoned the guy was wrong, and he was. I did some work with Sefton on step growth polymerisation or he did with me, I was on the one who wanted to do it and looking at the kinetics of it. I actually had vac students in applied min. working on the kinetics of step growth polymerisation. The significance of that is that in polymers some people think that it's different chemistry to everything else and that a functional group like an hydroxyl or an acid loses its activity as the molecule gets bigger; bigger, slow and doesn't react as fast. And Florey showed, this is the Nobel Prize guy, that it's not a function of a size it's a function that if it's in the same stereochemical arrangement, electronic arrangement as a small molecule the reaction rates are the same you've just got allow for concentration differences. Because if you had a big high molecular weight thing with one hydroxyl you haven't got many hydroxyls there and that just gets - so we looked at the kinetics of that too and decided that Florey was right in what he published. And so we were looking at the theory of polymerisation step growth and I was still in applied min. I had two vac students I think did that, and I think I published some of that with Sefton.*

*I believe you did yes. And Tony Murphy was one of them, and he was Sefton's offsider.*

Yeah.

*Was Walker the chief?*

When did George die?

*Oh no Arthur Gaskin was still the chief. George was never the chief.*

George never worried; I did the work on vermiculite that he wanted.

*So Gaskin was the chief.*

Gaskin was the chief. And I got on all right with George, I never published anything with him looking back; he just let me loose. And Gaskin didn't care, I just kept getting staff for me. And in those days you got on the phone, you got a number and you got a staff member.

*It wasn't a big deal.*

Yeah.

*So Dave, Jerry came to see you, you started all this. You went to Thredbo and soon after Thredbo - Thredbo you told us Monty Brown pinched your paper and didn't tell you what he was doing. But that was in a sense the start of your deep interest in the bank project but you went off to Georgia Kaolin almost immediately after that. So this was in '68/69 and -*

George was worried about me going, he didn't want me to go. And I said initially I'd come back every three months because I was keeping the research group going. And in fact I didn't do that but I kept in touch with the research group, Jean Swift was there. And so I kept the bank thing going and also the mineral work.

I was never going to stay, oh I was tempted a bit but Val is a big part of my life and she wanted to live her life in Australia so that was that. But I'm very pleased because if I'd stayed there I would have earned a lot of money but when the company changed hands I would have had to go somewhere else and all that and I would never have had the freedom that I had in my career here.

*You come back to Australia, that was in the middle of 1969 and by then the contract between CSIRO and the Division of Forest Products was continuing. And you then went to a meeting and decided that it wasn't going very well and you had your own work and reported that separately to the forest products, so what was that?*

Sefton wanted to work on looking at papers with other fibres, natural fibres. And he wrote to the bank I think and asked them or asked somebody how you're going to get funding. And Sefton got the money anyway, it was his idea, and Muncey, who was chief of forest products, would do the work. And I was, or Gaskin my chief was invited to be on this committee but he sent me along. So I used to go to the meeting and I didn't agree with what they were doing. And Muncey and I - he wasn't happy with me being there because I thought it was a waste of bloody time working on that. And I read it again today and I don't understand why Sefton wanted to do it because it doesn't make any sense.

*It didn't make any sense to me and it also seemed to me that Sefton was also then working on his optically variable devices independently of this project.*

Yes he was. But he needed a clear film. And I don't understand, and we have to watch what we say in that thing we're trying to write Tom because he - his idea ain't going to work on a natural fibre, it's not going to work on any fibre. Anyway that project stopped and I'm starting to make things with holes in them and clear films, so I'm making reinforced polymers and doing bank sort of things. And then that division was reviewed I think, applied mineralogy.

*I think the sequence of events as I remember them was that it was at that time it was politically expedient for CSIRO to set up divisions in - set up much greater activities in Western Australia. They'd sent Wilf Ewers over to Western Australia to start this and they set up the Western Australia regional laboratory and the divisions that were listed to go over there were the mineral divisions, and the Division of Applied Mineralogy was the first one to go. Arthur Gaskin was transferring to Perth with all his people going with him and Bill Barker I remember went there.*

Garret, not Garret it was a tall guy, anyway I thought there was a review of the division of some sort anyway and they were going to Perth. I was never going to go to Perth, it was never even mentioned to me. Jerry told me that I was doing too much chemistry to be in that division. This is terrible for the chief who let me do it, doing too much chemistry and I was going to applied chemistry. I was happy enough about that but I thought it was pretty rough on Gaskin in that he allowed all this to happen. And he ought to get a lot of credit as a guy I think. I thought that what the organisation wanted, if they needed a polymer for boiler scale I'll make it, I can make it for you. Up until then they would go to industry and ask them. And industry didn't give a stuff, it was just a distraction for them.

*From a governance point of view do we have here Jerry interfering right down inside a division?*

Yeah. Well Jerry comes to me about the bank project, I don't know if he told the chief he was coming to me or not.

*And he's deciding where you should go?*

Yeah.

*By talking to you primarily?*

I don't know if he told the chief but no one seemed to be too worried that I was going to applied chemistry.

*Do you happen to know whether that was a unique experience with Jerry interfering down to that level?*

It wouldn't surprise me because when Jerry came to talk to me about the bank I don't think he cleared it with the chief but he might have.

*Was it just because he knew you?*

*I'm almost certain that it was because he knew Dave through the RACI, through the polymer division and that -*

But it was industrial, I think he said it was industrial experience someone was going to be needed.

*But wouldn't be doing the same thing with equivalent officers?*

*No I don't believe so.*

But see this is industrial experience that people at Fishermens Bend, or as we say in the book there's hardly any of them know what industry is about. And if you look at Jerry's division he had chop down trees or whatever, extract them, publish the paper. And I can remember talking to the guys and I said what about testing the things, they said no, no we just get the compounds out first. I said but if you've got a lead it gives you a lot of support for your project. But they don't think like that. It's similar to Peter Wailes' group and they

say stage one make the compound, stage two do this, stage three test them. I say no, no try to get a lead, try to get that. They don't think like that because they don't understand what industry is all about and what funding is about.

*But Jerry did?*

I don't know that he did, I think he thought the bank project was going to need someone with industrial experience.

*Which he didn't have but he at least recognised - yeah.*

But I think he recognised - see I'd given the Leighton Lecture I think by that stage had I?

*I don't think you'd given the Leighton Lecture by that stage Dave no, the Leighton Lecture came in. So I think that you'd been given the Archibald Ollé prize.*

I got that yeah.

*But I don't think that Jerry would have been - I think that this Jerry connection is what Dave said earlier that it was to do with his knowledge of Dave from the initial interviews where he didn't give Dave the job and the discussion that Dave had with him at the polymer division conference in Mildura, and Jerry's notion that he needed a chemist with industrial experience in the bank project. But the other thing is I think that he didn't want to send chemists over to Perth, he wanted the group in Perth to be a mineral division. So I think the start of the bank project, the interaction that Dave was having with Sefton, made it very convenient for Dave's group to come to the Division of Applied Chemistry.*

Tom's got this long-term plot that it was all part of plot for me becoming chief you see.

*No, no I think it was the -*

He figured that I can be the chief.

*I think that Jerry could see that having Dave and Sefton working together on the bank project was better than - in the same view it was a good idea.*

It fitted his plan to have the mineralogy people, the genuine ones, go over to Perth.

*Yes. And I think that Jerry was very happy with the interaction with the bank, I think he thought that was a good thing for CSIRO.*

My report, mine was an addendum to Sefton's when was that?

*That was in 1969.*

So my work was reported, what I was doing with Jean and others that was reported to the bank along with this other stuff from forest products. And they eventually came back and said they were interested in that work, something more happening with that but not the other stuff with the fibres, which was sensible comment. So I reported, even though I'm in a

different division I still reported through them. But those things didn't fuss me, we were all down at Fishermen's Bend, this is CSIRO.

## **Transfer to CSIRO Division of Applied Chemistry**

*You came to the Division of Applied Chemistry in 1970. Did you notice any difference between the general attitude to company direction and industrial commercialisation when you transferred from applied mineralogy to applied chemistry, what was your impression of the change?*

I didn't change, I didn't even move labs I stayed at the same one.

*You didn't even physically change?*

No I didn't physically change. But the people I would talk to I didn't think understood what was involved in translating something through, and they certainly didn't understand the legwork you have to do later on to hang in there. The bank is an extreme example of it, you've just got to keep at them and at the time we were not dropping it. So Peter Wales' group if I can remember talking to over the telex? and things that they should have had them evaluated early days but I forget the guy working with him.

*Bob Coutts.*

Bob Coutts yeah he was saying stage one, two and three stages and it's not like that. So I don't think they understood. They didn't understand, for example they'd have a meeting with industry and they're not interested in what we're doing and you say well did you talk to them. And I said look if I was in Dulux and the General Motors paint line stopped you better get it fixed. Forget about I want to do this experiment, the experiment you've got to do is fix that. So these guys have got a lot of other pressures on them and you need to understand that. But they don't, they think we've got to go back and they haven't done their part of it and blah, blah, blah. I don't think - we've touched on this Tom there's very few of them had ever worked in industry. And not only that some of them had letters telling them they could do their own thing.

*Within CSIRO?*

Yeah.

*Did they?*

Yeah.

*From their chief?*

Tom Mole has got letters saying come out and just do what you want. And other guys we had -

*That would have been Jerry, Jerry was the chief at that point. Not sure may have been back in Ian Wark's days*



Yeah. They were just recruiting good scientists with an open remit. It was worse than that Terry because we had people that were recruited to do project x and when that stopped, either it's finished technically or it's no longer viable, they'd say that's what they came to work on and they're not going to work on anything else. Where do these guys come from! So they didn't have a culture of what's involved in transferring.

I got on very well with Ian Wark, I used to take Ian to meetings and drive him home and all that stuff. And I got a note from him the day before he dies about how we're both going to be worse off when he's no longer with us and all this stuff.

*But he'd already retired by the time you got there hadn't he?*

Yeah but he and I just clicked, he was like a grandfather sort of thing. And this letter I got from him was written by his offsider, beautiful script isn't it, this was the day before he died. But he and I had a similar attitude to working with industry.

*Was that based on the fact that he had experience in industry?*

I don't know what his experience was.

*Yeah he as with Electrolytic Zinc.*

When he set up industrial chemistry it was the wool things. And I think when we went from Sefton and Jerry - like I was the fourth, in the family tree as we talk about I'm the fourth generation of that family tree from Wark. But in some ways the project Jerry had of looking at our flora and the way they did it didn't give them that industry interaction because they didn't take things through to completion. And I don't think they thought they should, I think they thought they should identify the compounds. And that was not good enough.

The fact that that project was so big and as Tom said so successful it had all the universities collaborating, and everyone had a big column - you'd walk into an organic lab there's a bloody big column and a bundle of bark or something off a tree. I had two guys full time, our division had it I inherited it, their job was to go out and chop down trees and supply whoever wanted it. So that project recruited people that were the academic research types. And that was the majority of Fishermen's Bend, organic chemistry anyway. I had a different background to that. My chemistry is still all right but I -

*So you joined the Division of Applied Chemistry in 1970, and my memory of this is that the main thing that you did there was a lot to do with the bank project but you also had the group doing fundamental polymer science.*

Yeah.

*What was Sefton's role in determining what you should do. Because he was then part of the bank project, what did he think about the other stuff?*

He didn't know what to think about it, and he reviewed it with Geoff Allen. Geoff was out there - that's the guy I met back in -

*Your mate.*

Yeah he's my mate now. He's the bloke I met when he was out on a sabbatical with Aschoff. And Geoff thinks I'm all right. So we were starting to query the chemistry of step growth and starting to nudge into the free radical stuff as well. And Geoff said to him, "I'd let Dave have his head." So Sefton just let me go, and that was it. So Sefton didn't really have a feeling for polymers much. We'd published on kinetics I think.

*And Sefton and you and I published some papers on that between 1979 and 74.*

Sefton didn't have any input into that. The project was mine and what to work on and I respected his opinion on the kinetics and we talked about that. And then the other thing - the bank meetings in retrospect were strange because I would sound off on the way back to Fishermen's Bend about what I thought of the bank because they're mucking us around. And Sefton never once argued with me but he didn't agree underneath it all we know. And as we've said in our book, the bank never understood the position between Sefton and I. No one understood it let's face it. And it probably wasn't fair to have Sefton on the bank project later on when it was going commercial because he had no idea about that.

I remember the day we were meeting with the governor and they decide to set up this next committee, the C&RD committee, and there's going to be two from CSIRO and two from the bank and a chairman and so on. And Jerry said - it was obvious who the two from CSIRO are, Dave and Sefton that's it don't even take a breath. And I thought Sefton doesn't agree with what we're doing for God's sake.

*Technically, as in was he unhappy with the science?*

In the sense of our testing yeah, he was unhappy he said the polymer wouldn't last.

*Sefton was very much interested in optically variable devices, I mean he had gotten various people, Charles Johnson -*

*Before Bob Lee?*

*A long time before Bob Lee. He'd got a lot of people and me [Tom] to do some of the algebra connected to some of these things. And Charles Johnson in 1968 or '69 has an early example of a moiré pattern that he'd made. So Sefton had this view that the trick was to get optically variable devices, he had no concept of how any of these were going to be incorporated into the note.*

He couldn't, we still don't how to do it.

*On paper no, because the fibres are too big.*

No we don't know how to put moiré into the clear film. The only way we could put them is make them and insert the bloody things. And Sefton - we say he's optically variable but he really was only interested in moiré. And he used to get back there and he'd get these big A4s and show them this thing, and it looks great so we'll bring it down to size. And when you do it you've got to align the things and all the rest of it. And he needed a clear film for

God's sake to do it, and yet he's knocking plastic all the way. We don't have a CSIRO point of view we have Sefton's point of view and mine, which mine is the project report and then Sefton tables his out of the blue. So what they do, Sefton says I want to quit as being chief and they say -

*So we've now gone from 1970 to end of 1973. The bank project and CSIRO are interacting in this story, so the bank project is going very well because in 1972 the bank had funded a lot of stuff to go on and to some extent this was - I mean Dave knows more about this than me but Sefton I think had got a number of things interacting. The Whitlam government had put pressure on CSIRO to be more involved with industry. And the notion of CSIRO actually just not doing research for the sake of it was taking hold and I think Sefton didn't like that development.*

No, well first of all Sefton publicly stated, and it's in writing somewhere. One, he doesn't believe in CSIRO commercialising anything, they shouldn't be doing commercial stuff. Two, it shouldn't get any bigger than it was, this is about 6,000 people or something. That's what he believes in, and therefore he says I'm going to quit, I'm going to resign as chief. So they say what in the bloody hell are we going to do with this guy, this ex-chief. So they decide to split the division as we've talked about between Don Weiss and myself and they say what do we do with Sefton.

*I think we need to go back to this process of Sefton deciding that he's going to quit. By that point the Division of Applied Chemistry was a very big division.*

Three hundred and fifty I think it was.

*It had taken over parts of the Division of Forest Products and some parts of the Division of Building Research -*

And organic chem in there.

*And organic chemistry and physical, so it was the Division of Applied Chemistry had expanded to take over, the water - some forest products things and building things. So Sefton instead of being in charge of a small division was now in charge of a very complicated division.*

For a guy who wanted a small division and didn't want to commercialise anything they've now made him in charge of everything just about.

*And he put Don Weiss as the assistant chief in charge of the forest products part of -*

Don's got IFPI, Integrated Forest Products Industries.

## **Chief of the Division of Applied Organic Chemistry**

*What year did Sefton finish?*

*He finished being the chief at the end of 1974. He announced he was going to retire in 1973 but he was the chief until 1974. And so what were they going to do. What was the process?*

I don't know all these things, Sefton offered to go somewhere else if they wanted to shift him, he shouldn't be a chief in the same place.

*But before you get onto Sefton what happened, did Jerry ring you up and say apply for the job or how did that recruitment process turn out and why was the Division of Applied Chemistry broken up into two divisions?*

They advertised the chief's job and I assumed I would be left alone to do what I was doing, and I had a visit from two people who - do you want me to name them?

*Yeah.*

You and John Lane, who said are you going to apply for the chief's job and I said I was happy doing what I was doing. And they then pointed out that the other candidate would probably be Don Weiss. Do and I have a very different approach to research. I want to understand why things happen, Don just wants to solve the problem and stop there. And Tom can give you the quadrants that we fit in. So I felt that was going to be - probably life wouldn't be as good as it had been so I applied for the chief's job.

At the interview they asked me what I thought of the division and I said it's far too big, 360 something people. And it also covered a spread that I didn't think one person could cover, not the way I expected to be chief anyway. And I think history will show that I could walk around the lab half past five at night and talk science to anyone in my division, and that's what I expected to do. I think I was at an IPAC meeting or RACI meeting in Melbourne somewhere and Jerry called me down to Albert Street because that's where they were in those days, I'm repeating this for the records, and said that they had decided to split the division into two and what did I think of that. I said, "That's great, suits me fine". And they said, "Good". So I went home to Glen Waverley and told my wife. And I got a phone call from Jerry saying we didn't have nearly the same reception from Don as we got from you. And I said, "What do you mean?" And he said, "Don's rejected the idea." I said I don't understand, I've come from industry for goodness sake. So Don was missing for three or four days, no one knew where he was, and he then rang me up and asked me to come and see him. Do you want me to put this down?

*Hmmm.*

I wasn't that happy about it, I was playing pennant squash anyway so I told him I'd come after pennant that night. I went over to his place about 10 o'clock at night and Don pulled out this big sheet of paper, which had the division all re-organised into I think four sections under him and I would run the polymer section and he would be the chief. He wanted me to write to Jerry and tell him that I agreed with Don and I wouldn't be the chief. So I said I'd think about it, but I didn't think there was much in it for me to do that so I didn't agree to that. There was a period of a week or two while they did whatever they had to do. And so then it was agreed it was going to be split in two and who's going where.

*What role did Sefton have in this?*

Well Sefton was -

*He wasn't part of your selection process was he, was he on the interview?*

I don't know.

*You were interviewed?*

Yeah but I know Doug Ford was.

*But Sefton wasn't, didn't interview you?*

I don't think so no. I knew Doug Ford because we did our PhDs on Saturday together.

*And he was on the board, he was on the part-time executive.*

Yeah. And Doug knew me and knew my attitude. He was Taubmans chief chemist, opposition to Dulux but he also was on the CSIRO executive; he was older than I was. But I had a lot to do with him on Saturdays, you always had to have two people in there the lab at least for safety and often I'd be conning him into going or him conning me into going so we could work on the weekends and get our PhDs done. So Ken Cavill had a pretty good run because Doug was interested in the chemistry of ants and he and he showed they follow an odour trail and all this. He was doing that and I was making compounds, which had the same structure as the Argentine ant, which sprays its enemies with this stuff, aldehyde, that paralyses them, so we were making that. So Ken was just lucky.

*Back to CSIRO.*

So we say who's going into where, and they came up with this handwritten list from Sefton with crosses and ticks. The crosses and the ticks one was mine and one's Don's. And Don played the numbers game but I wasn't I wanted good guys; it seems to me there's no point in having people if they're a problem. So I ended up virtually with Jerry's old division, a lot of it, but I had the good scientists.

*The Division of Applied Chemistry, organic chemistry, had the old division of organic chemistry and most of the old Division of Physical Chemistry.*

Yes. And we had to choose names that hadn't been used before, that was hard. Don came up with chemical technology or whatever. He got a bigger chunk of the split up but that didn't worry me. I think it worked pretty well except for poor old Ted Jefferies who nearly had a nervous breakdown because he was going to Don. We did a deal somehow and got him to me. And Don knew the ropes I didn't, he knew that some of these positions were on soft money and all that stuff, but he played those games good luck to him.

Now we came to what are they going to do, 'they don't trust either of us' is the rumour so they split the division so only half gets mucked up. And then they said what do we do with Sefton, so they say Sefton has got to bring them together so Don and I talk. So twice a year we meet in Sefton's office and we put our budgets in through Sefton and I'm not kidding you, Sefton has a big stapler and he takes my budget and he takes Don's and he goes bang, staples them together and sends them up to head office. And he listened carefully to ever - he is chairman of the Applied Chemistry Laboratories Committee but the poor old bank

blokes have got - history-wise Sefton used to be my chief right, now he's not now I'm the chief but he's chairman of this committee which -

*Has no executive power.*

No power at all, but they don't know that and they don't understand it and Sefton doesn't straighten them out either. So Sefton through the bank project and everything else now - I told him he could keep his office I didn't want it. His office was isolated, near the top floor, and I wanted to go downstairs where the people were and where I could go and talk to people and not be away in a corner. So I let him stay where he used to be and provided him with some assistance and also just looked after the place. But in the bank project they didn't know how to handle us, he always submitted his report separately I didn't see them. I got a copy of them after he -

*Where did his information come from?*

He'd be fiddling around doing something and -

*Talking to the staff?*

*He had his own staff.*

He had his own staff.

*Talking to the bank project staff?*

No.

He also talked to the bank project staff and now and then he'd come across there. But normally I had the whole project firstly to production line the stuff and Sefton would come up with something. And Sefton was the boffin, he would do this sort of stuff - you can describe that.

*Yeah I know.*

And it was all right until the day he produced a pocket test, he had this test in his pocket where he had the keys and fiddled and mucked around where he reckoned the whole thing was a failure, going to fail. I think that was the day, it probably did Sefton a lot of harm that day.

*In the eyes of the bank?*

Yeah.

Yes.

Because Hill Worner was the executive member at the time, he was on the committee and Hill and others they all waded into Sefton about the tests weren't controlled. I didn't say anything I didn't have to. But it was unprofessional what he did and he was wrong, which is

worse. But the point is if he was right the whole bloody project's dead because that's all we've got. So that was a shocking arrangement, CSIRO management didn't understand that in a project going towards production you can't have that sort of thing going on, that's got to be sorted out within CSIRO. That was a ridiculous thing. I was easier on Sefton than Tom was, in the book he wades into him because it's just - you wonder how a person working, a senior scientist could even think that you do that.

*Yes. Absolutely, in front of external people. So it's 10 to three, we've got another hour after this do you want to have a break now or a bit later?*

*We'll have a break now.*

## **The role of a CSIRO manager**

*So thank you Dave for up until now. I'd just like to ask you about management in CSIRO, in your role as a manager. So to some extent you'd come into the organisation as a scientist, you'd been a manager of a small group. You'd not gone to the Mt Eliza management training when you were in Dulux and you became the chief of a division, which was 100 people. When you became the chief did Jerry Price or anybody give you any instructions as to what you should do or did you have any training as a manager, or what responsibility did the organisation have to help you in this new role?*

I had had training as a manager at Dulux by the way even though I didn't go to Mt Eliza. So in Dulux whilst I worked - I was always close to what was going on and I mean with my own hands as well. And I've always had a high regard for the tradesmen technical sort of guys who from my experience in Dulux I knew often were highly intelligent, just their interest was somewhere else or they hadn't had the chance or whatever. I mentioned when I was on the white lead plant how they knew the end point better than the scientists knew. But it was the same when you went down into the factory making the polymers or the resins, the guys there knew little things to look for. So I always had a high regard for them.

I never went, I don't think I did, to the workshop guy and said I want this made, I always went to them and said this is what I want to do what do you reckon, how do we do it, and got their input. I think you get a lot more out of people by doing that, and that was a bank -

*The organisation didn't provide you with any training or any sort of -*

No management courses.

*- management course or anything -*

I've done some of those through ICI by the way.

*- to fit you to be the chief but you did - I mean my recollection is that once you became the chief there was a whole lot more of consultation and meetings where we tried to work out what we were going to do, was that just your intuition that that might be the right thing to do?*

That's how I worked. I used to have regular meetings with the staff, the whole division. As you know Allen Foe used to always ask me lots of curly questions and so on. Look in CSIRO people are going to know about it, it's better they hear it from you.

*Was there any sort of view from Jerry Price as to what was the purpose of this Division of Applied Organic Chemistry?*

No nothing. I was virtually left with an open sheet. I mean I had the bank project going and that wasn't the only thing. And our free radical work and our mineral work always we were looking for applications from those. I liked to do the fundamental work, which we did on free radical stuff, we've written the textbooks on those, but also along with that where you can use that. With the nitroxide work if you go back to that, when Geoff Allen reviewed that he said we should feed that out to the universities to do because we'd made the breakthrough in it and it was ideal for thesis fodder if you want to call it that for PhD students to try different nitroxide, try this try that. Now we tried to do that but the universities weren't very receptive to it, they felt we were telling them what to do. But in fact it's a good model of how CSIRO could work. The breakthroughs we made you probably wouldn't find them in a PhD because of the uncertainty about it; they were tough things. But once we had the breakthrough and you want to look at as I said different nitroxides or different conditions - they're still doing PhDs on it.

*And if CSIRO back in those days had said these are areas we think would be suitable for PhD and here's some money would that have made a difference?*

It probably would, and we did actually supplement some of the scholarships to get people - San Thang for example is one who we supported, and there were others that we supported. But it wasn't as big an uptake as I would have liked. And in other cases they didn't want to keep involvement with us. And so people like Ezio and myself e didn't want to dominate it but we wanted to not just throw the idea away. So that didn't work as well as I would have liked in Australia.

*We might come back to that on that last point. So who was your immediate boss when you were first chief?*

When I was first chief, I suppose Jerry Price I regarded as -

*As Dave has pointed out Sefton's role was a non-executive role, so Dave would have reported directly to the chief executive.*

Sefton was never my boss, he was my chief for a while but when I was in applied mineralogy he wasn't. And when he was chairman of this committee -

*Was Hill Warner your boss?*

Yeah he was at one stage.

*When would that have started?*

When he became the director.



*The Division of Applied Organic Chemistry started in 1974, the Birch Report had the institutes in 1978, so 1978 Hill Warner -*

*It would have been '79 probably.*

*Yeah, Hill Warner became the Director of the Institute of Industrial Technology and Dave would then have reported to Hill.*

I'm not sure where Sefton was in all that.

*Once the institutes performed Sefton's position became redundant and he -*

Went back to chief 2 didn't he?

*He went back to becoming a chief research scientist Grade 2. I mean I remember this conversation quite clearly, he said to me, "My position's become redundant I'll just wait and see how long it takes anybody to wake up to it."*

*So this is the 70s and you probably -*

*'78. Sefton didn't actually - I mean he resigned when he was 65 because you had to but we kept him on in the place until he was -*

*Into the 80s?*

*Into the 90s.*

*Nineties, my God.*

I think in a way the universities know how to use ex-profs and that a lot better than CSIRO does. But if I had stayed at CSIRO I wouldn't be working like I am now whereas I've been retired 20 something years.

*So Dave can we just clarify the involvement of Geoff Allen in this. In 1982 you had what co-research describes as the first chief's review at a Melbourne laboratory and Geoff Allen came out to that, and he was part of the review of the division in 1982. Had he been before that?*

Yeah I think so.

*So that was an informal -*

Sefton asked him, I didn't know about it at the time, when I went over to applied chemistry what was all this stuff I was doing. Sefton didn't know whether it was good or not.

*I think this was -*

<audio ends abruptly>

*There's no record of this anywhere?*

No.

*So this was an informal thing?*

Yes I think it was probably a pub discussion of -

Yes.

No I don't say that about Jeff. But I don't think I knew about it for a while.

*Anyway, so he came back in 1982.*

Yes. I probably invited him back then though, did I?

*You certainly did.*

Yes.

*You invited Geoff Allan, Brian Booth, Don Cameron, Bob Durie and Peter Mueke from head office to be part of this chief's review.*

Yes.

*So Dave, you have told us that you came in to be the Chief of the Division of Applied Organic Chemistry.*

Yes.

*It was quite an academically oriented group.*

Yes.

## **Changing cultures**

*So how did you go about changing that? Changing the atmosphere of the division? Clearly the Bank project was a very big part of that but what other things did you do?*

Well, there was the work George Holan and I was very active in that. And I actually used to chair the committee which involved George and Nippon Kayaku. That was interesting, the way we had to handle a Japanese collaboration because often we didn't understand what we'd agreed to and what we hadn't. And so Bryan Loft, who was the secretary to those committees, he and I used to write the minutes of a night.

*So was the commercialisation of George's insecticide, was that initiated before or after you become the chief? The interaction with Roche -*

Roche. And Nippon.

*- and Nippon Kayaku. Was that your work or was that done before that?*

I don't want to claim it as mine if it wasn't. But I can't imagine Sefton doing it.

*It was certainly around that time?*

Yes.

*So have you finished with the questions about the chief's review?*

*No we're not quite up to that yet.*

Yes.

*Okay. All right.*

*So I was sort of building up to that. So 1974. This first chief's review was 1982. So between 1974 and 1982, the division changed a lot and part of it was the Bank project. Part of it was George's project. What other ways did you use to influence the people like Peter Wales and me and people to -*

Well we stopped a few projects.

Yes.

For better or for worse. We stopped the solar energy -

*That was a long time after though.*

Yes.

*That was in 1985. I think you stopped Peter's -*

Peter Wailes.

*Peter Wailes, the metal organic project.*

Yes. And is that when he started the pyrolysis work with -

Yes.

Yes. So that would have Peter's work on mineral organic – no – metal -

*Metal organic.*

Metal organics. And then they went on to looking at well that pyrolysing brown coal.

*Hydrogenation of -*

Coal.

*- coal. Coal hydrogenation.*

So we had a pilot lab on that running.

*And that was partly driven by the government of the day. The oil crisis forced the organisation.*

*So that as a plus to invest in energy.*

Yes.

Yes.

*Were there also budget cuts that forced you to cut something, they didn't care which?*

No. I actually – the first budget cut I had was the day I became chief. And at the meeting, - chiefs used to meet with the executive. We used to meet the day before.

*The committee of chiefs?*

Yes.

*Or the council of chiefs isn't it?*

And I said that the budget I was given wasn't enough to pay the staff I had. Because in those days you'd spring up and get a number for staff and so on. And John Anderson was the same. He didn't have enough money. So it was decided that we would be the spokespeople for the meeting with -

*The new boys?*

Jerry and the executive. And as you probably know, they used to have a square in the room. They'd be there -

*Oh yes.*

- and the chiefs would be here. And you know the story about what I did.

*Well tell us.*

*think you spoke up.*

Well – so I got up and I said that the budget didn't allow me to have a division. And I think I had 106 or something of 106 and I could only afford 100. And Jerry lost his temper with me. He told me I was -

*In front of everybody?*

Yes. Told me I was a no hoper. And John Anderson got up and said he didn't have enough money either. And the place broke up in uproar because the people didn't think about their budgets in those terms; what was their salary and what wasn't. And so I said to Jerry – I had

106 I think. I said I can only afford 100. If I transfer six people to other divisions. And he said, "Yes it's about time you got responsible." So I said good. So I didn't fire anyone.

*You transferred them.*

I transferred them. Which, I knew full well that -

*On someone else's budget?*

It doesn't make any bloody difference to the budget. And that's how much they understood budgets in CSIRO. They didn't understand at head office. And at the division level I don't think people thought enough about how much operating you need.

*To manage?*

You haven't got – no operating money. You don't want the staff because you can't do it properly.

*Sure.*

And Geoff Wunderlich and a couple of others transferred. They were the bushfire group I think. But we didn't fire anyone.

*Well number one. Number two -*

Yes.

*- the rules became that if you transferred staff then you had to transfer the budget for them as well.*

That's not what was told to me. And head office said that's what Jerry said so we honour it.

Yes.

Yes.

*So you transfer staff and no budget?*

I transferred Bob Lee with his money by the way.

*But the division transferred the bushfire group of atmospheric physics -*

*But no money?*

*Oh I don't – Dave says there was no – I don't remember that. I was a junior -*

I don't know about those details.

*I was a junior functionary at that point.*

Yes. Anyway -

So Dave –

But I think it indicated that the organisation didn't understand. And I can remember a meeting at head office with the Australian Research Managers' Group and they asked us how much operating money we had. And most of us didn't know how much we had. And then start to think about each research person I need certain amount of expendable money and if I haven't got that, I don't want the people.

Yes.

And the organisation needed to come to grips with that.

*But it is also fair to say that in that period from 1974 onwards or 1974-75, the division got quite a lot of money from The Reserve Bank.*

Yes.

*So a lot of the more pure research was funded by The Reserve Bank.*

*They didn't get the 1988 money though did you? The 10 million. Nine million.*

The Bank project was great for my division while I was chief. And some people, Ezio for example, had a dream run in CSIRO because of the Bank project. But I took the view that -

*Even though he was not at -*

No but he was able to do what he did. But I said that I would only do things like the Bank project if it wasn't at the expense of my other research. Because blow that for a joke if some people are away doing their pie in the sky stuff and the rest of us are at the coalface. So Ezio and Graeme Moad and others were all recruited on Bank money. I had an agreement with the executive, and with the Bank by the way, that the people that worked on the Bank project wouldn't be the ones we recruited because we couldn't have security on those with tenure. They'd be on limited tenure. And so, I didn't have restriction on staff ceilings and I didn't have restrictions on something else. Maybe travel.

*Promotions? No.*

Travel but I don't -

*Well this Bank money, Dave didn't have to transfer any of that to head office. And Dave could use the Bank money in whichever way he liked.*

So -

*So it was a very -*

*Where did you put it? Did you have a trust – slush fund?*

No no.

No no.

*It was just in the -*

No I'm not like that. I didn't have any money.

*It just was in the division funds.*

But the division got it.

*You didn't have your separate bank account?*

No.

No.

*For the division? So it was held by head office?*

Yes.

*But for your benefit?*

Yes.

Yes.

## **Fostering polymer chemistry in CSIRO**

Oh whatever the mechanism of it was. But the Bank project was actually a godsend for a lot of people in that division. But partly I was doing the fundamental work too. I used to get in early and go around the lab before – I used to talk to Jim Peacock by the way, who's another chief I hope similar, we were similar. And you couldn't get Jim of a morning because he was doing his research. And I used to do it of a morning or after work at night and go around and talk to them. So I was very close with the free radical work that was going on. Holy smokes, the frustration of the Bank project. I'd come back and it was a relief to talk to these guys. And with Tom we published a paper on the controlled radical polymerisation and how the molecular weight distribution would be that, that sort of stuff. We were doing that.

*So were you demonstrating, like Jim Peacock, scientific leadership within the division, do you think?*

I think I was similar to Jim. I could beat him at squash too.

*But the Bank project -*

*He challenges that.*

*- the Bank project money provided the division of applied organic chemistry with a lot more flexibility than some other divisions because of the way that it came in.*

Yes.

*So the division was able to buy a new NMR. -*

Yes.

*- machine that -*

*Back in the days when -*

*Well when other divisions couldn't afford it.*

I don't think people appreciated how much our applied work, if you want to call it that, benefited the other work in the division.

*So it's a bit like Dulux. Dulux had plenty of money and could set up laboratories and could do some forefront research.*

Yes.

*And likewise -*

*Yes. But it was also the case that the – I mean this is not really supposed to be my opinion. But Dave had a flexibility and a flexible approach to who was doing what. So people were able to come in and out of, for example the Bank project and not devote their whole life to the Bank project. So I was able to take part in the Bank project but also do other things.*

Yes.

*And I think a large percentage of the people in that division at some stage or other worked on the Bank project.*

It's probably because I was pretty close to it technically – I mean I know that project, I knew the division too. And as I've said earlier, I only wanted a smallish division because that's all I can handle. So -

*Well providing scientific leadership, was that your main purpose?*

Yes. I want to know what's going on. And I've been to a meeting -

*And lead as in -*

Yes, asking the right questions and challenge what they're doing.

*And give suggestions as to where to go?*

Yes.

*That sort of thing?*



I have been to a lecture by one of my successors at Melbourne Uni it was where they brought someone along to answer questions. I thought that was a disgrace.

So -

*Technical questions presumably?*

Yes.

Yes.

They gave the talk and said I've got so and so and so and so here to answer questions. I think that's bloody awful. Pardon me. And I would never have done that because I feel I needed to be able to talk about -

*It's part of the job of chief?*

Yes.

So Dave, how did you maintain the standard of science in the division? Was it in your *opinion a good international science* -

Yes.

*- standard? And so we've talked briefly about the chief's review. What was the purpose of that chief's review?*

Oh to look at what we were doing and being assessed by outsiders. The panel I had there would have been a fairly critical panel, of what we were doing. And it got universities –

*It was Jeff Allan was the researcher at Unilever.*

Yes.

*Brian Booth's a manager at Wellcome Australia. Don Cameron, Professor of Organic Chemistry, Bob [Urey], Chief Scientist, R W Miller and Company.*

Yes. So -

*So it was a mixture of industrial and academic people.*

Sure. Geoffrey's works with Unilever but he also ran the UK – like the ARC sort of thing, over there.

*Yes that's right.*

He's a Sir Geoffrey now.

*Yes. He was Sir Geoffrey then.*

Was he? Oh okay. Sir Geoff. He calls himself Geoff. So he's an FRS. I'm not sure if he was then but he is now. He has been quite a while. We've got two FRSs in the division. That's not bad.

*So that was an important aspect, in your view was it? The international -*

Sure.

*Did that help you in a management sense, dealing with CSIRO upper management, that you'd done that review?*

I don't know about the upper management.

*Did it help you justify what you were doing?*

*To Bill. Bill Whitton was the Director by then.*

Yes – Bill wasn't a scientific leader. He was an industry director type.

Yes.

I know he got the shock of his life as a director in CSIRO versus director in industry.

Yes.

They're nothing like the same. Nothing like it.

*Was he any use to you or was it a just a problem?*

Sorry?

*Was he any use to you or was he just a problem?*

Neutral. He didn't worry me. He worried -

*And Hill Worner?*

Hill was just always very supportive. He just -

*Didn't direct you? Didn't -*

No. No. No no. Scientifically they're not -

*Of course.*

- up there where we are. And I don't mean that nastily any way at all. But they haven't – Bill Whitton had been in ICI and they move away from the detail more than I wanted to or want to. Or if I were in ICI, more than I would have moved away. And Hill, he was a Prof from a university but I don't think he worked like I do.

*So Dave, what do you think were the main achievements of the division of applied organic chemistry?*

I think scientifically it's a world leader in terms of the quality of the science that it does.

*All right.*

The Bank project's the obvious one that people talk about. And I think that's a project with a lot of lessons in it. I'm very happy with the way I involved the workshop and the way that those guys just responded to that. And I know that they don't have workshops in CSIRO as far as I know now. But I think it indicates there's a lot of latent talent around that people don't always use. So I think the science is good.

*The Bank project and the development of controlled radical polymerisation -*

Yes.

*- is a clear achievement. The other parts of the division, so the whole synthetic chemistry and the crop protection chemical stuff.*

Yes. All of that.

*That was quite interesting stuff.*

Sure. I think all the drug delivery and discovery work and the way they go about it with Dave Winkler and modelling and so on.

Yes.

I think they're up with it there. So I think equipment wise we were able to fare reasonably well because we had a bit of flexibility with money. I don't think we were extravagant or wasted anything much. So even though I had a bit of money I think we spent it wisely. And I think there was a pretty satisfying group of scientists there. We had our problem guys and all that but that's part of what you've -

*Absolutely.*

*- got to do.*

*And in terms of the scientists themselves.*

Yes.

*There were constraints in CSIRO about promotions.*

Yes.

*And a lot of it was actually the personnel group in head office had a fairly big say in who got promoted and when.*

Yes.

*Was that something which was of concern to you or were you involved in huge battles over that?*

It was difficult. I don't like the CSIRO promotion system in that they ask for a listing of publications for example.

Yes.

And yet that's not what we're about. It's part of it but it's not as important as it's made to be.

*It's easy to count.*

So I find that people publishing papers that have got not relationship to what they're doing or anything at all, should be a negative: why are they wasting their time on that?

Yes.

But they're doing it. Some of the funded PhDs I think could be more directed.

Is this now or then?

Now.

*Yes but what about then? When you were the chief, what -*

I wasn't aware of anyone publishing work for the sake of publishing it.

Yes.

*Back in the 70s when you were -*

I wasn't aware of anything like that and I wouldn't have been happy about it.

*So you put up cases for promotion and they would be approved?*

Yes. Mostly. I know a couple I missed out on but eventually got. But I don't think they understand the difference between patent applications and full patents and that sort of thing.

*They being?*

Being head office, yes. So they get a bit removed. And so people say they filed a patent application, well so what?

*Exactly.*

That costs you nothing. And if you file too many of them and they don't get rolled over, you want to question what's going on. And getting industry to support a patent is a big challenge. If you can get that, you've -

*Absolutely.*

*When you inherited the division of applied organic chemistry.*

Yes.

## **Technology transfer**

*Technology transfer and all of those sorts of things were the last thing that the typical scientist thought of.*

Well -

*By the time you stopped being the chief it was a very important part of it*

Well.

*So what do you think that your contribution to that was and what lessons do you think that your experience could have on CSIRO now?*

Well first of all I had a patent guy, intellectual property guy, Bryan Loft.

Yes.

Who was a scientist. He'd worked for me as an EO and then I wanted someone to do intellectual property and so Bryan took that on. So I think you need to be aware of intellectual property and protecting it, and when. Most scientists don't know about disclosure. They want to rush out and they shouldn't do that. So even -

*So were you able to get this knowledge into other divisions a bit, through the Institute?*

I don't think so. Because the Institute had a lot of conflict within it because of the textile industry division, Don Taylor. Don used to fight with Bill Whitton over what the aims were of his division. Don argued he works for the wool producers and Bill argued he should be working for Australian secondary industry. And what your aim is determines a lot about how you go about it. So they didn't even agree on their aim. So we, as you notice, reckoned we work for the Australian chemical industry as broad as you want to make that. So when you do that it's a challenge to find out where you can commercialise things because it's not always appropriate that someone from here will take it up. But what did we have in that lecture I gave, that CSIRO stood for -

*Something or other, yes.*

Something or other. They stopped me halfway through. We were saying how we were there to help them and want to interact with them. And we tried to talk to all of the Australian

Industrial Research Group, their managers and so on. And I think I might have mentioned earlier, I said to Alan Dun from Monsanto, "Can you sell water?" And he thought I was being smart. And I said, "No if I gave you a compound that cost nothing, could you market it." And the answer is no because of the overheads that they've got, imposed by their company overseas. Then once you get that answer you can forget about working with them because they're not allowed to export. If you ask them that question, first of all they say, "Oh yes, yes." But in fact, you'll probably find they can't. So you need to sort through these things and if you don't know about them, you don't know to ask the questions. So some parts of CSIRO, that's difficult to see how you're ever going to commercialise an outcome. Here, other parts you need to protect the IP.

*Yes and is it a chicken and egg problem? You don't even know you've got a problem until you roll up your sleeves and start getting stuck into the work because until you reach that point, you can't even ask the right questions?*

That's true. But you can also – you can ask the question up front, "Are you free to export?" You can ask them that. And if they claim that they are and they're correct in saying that, then fine, you can work with them. But it's difficult to work with some of them. I think as a country we ought to get rid of any of these restrictions. And I don't see why we shouldn't.

*If you want to come and do things here or sell stuff here, you can't have these restrictions?*

You want to bring technology into here, you can't have these restrictions. And the first one is if we make improvements you can't stop us exporting.

*To some extent the reduction of tariffs has helped fix that problem. The restrictions were often associated with the tariff protection of the company's Australian -*

You need to make sure that you don't forget about it though. And it seems to me we ought to have a blanket ban on those things as a country. And Tom knows I'm on about it all the time. But restrictive trading and restrictive specification are things that no smart, modern country would allow.

*So Dave, did you work -*

If you want to put that in.

*What could Israel do?*

Israel? I bet they don't allow it. And yet they still get the technology going in there.

Yes.

Yes.

*Talking about collaboration, so you've mentioned that you worked closely with the division of animal production when you were part of applied mineralogy. What's your view on the way that parts of CSIRO should collaborate and what role should CSIRO be playing with university departments? Should -*

*So first of all, CSIRO. Collaboration within CSIRO across divisional boundaries?*

*How did you go about that?*

I'm trying to think where I had any.

*And did it matter?*

Well if you take the famous Bank project, I recruited the people I needed into my division, Bob Lee for example. And I think if it's critical to your project you need control over it. And you either second them from the other division or – but you can't have lip service to, "We'll work with you," if it's critical in your delivery path but you don't have authority over it. So collaboration between divisions carries with it – there's got to be a willingness to meet the deadlines and so on. So with Bob, he probably had a dream run with Sefton. I think Sefton could have focused him better but he didn't. But I don't think that would have worked if he was in chemical physics. Well we went to chemical physics actually didn't we?

## **Interdivisional collaboration**

*The division of applied organic chemistry had a number of highly collaborative projects.*

Yes.

*So Peter Wailes' coal hydrogenation was part of a larger project.*

But -

*But in those days, the division of applied organic chemistry controlled its bit of that project.*

That's right. So that's the same as I'm saying.

Yes.

*And a collaboration committee was enough to make sure it all worked?*

Yes.

Yes. Because there was no-one that would stop Peter from delivering on his part.

Yes.

And the chief's got to be understanding that he has to resource that.

Yes.

But redirecting those projects wasn't easy because people weren't familiar with changing their field. And as we know, one of the guys on that just said I was recruited to work on so and so and that's what I'm here to do. Well you've got to change that attitude. I don't know what our employment letters say but they certainly need to -

*It says that you do what you're told to do.*

Yes.

*Yes that's what my employment letter said.*

So I think you need to get that pretty clear if it's not already. And I guess cross divisions depends a lot on the chiefs and their philosophy of the organisation and so on.

*So if you get on well with the chief it will work?*

Yes. And I reckon the chiefs I had to deal with were pretty good. Yes. But -

*Dave's letter, written in 1963, said, "You will be located at the division of Applied Mineralogy, Fishermans Bend, and will carry out your duties under the general direction of the chief of the division, Mr A J Gaskin."*

Yes. But I think it's – I need to understand what the science is Terry. And I think if you do that, you get respect from the others.

Yes.

But if you're an administrative type chief, I don't know how you go with a tough science project.

Yes.

If you look at the divisions I've had, I've had good scientists.

Yes.

And I reckon if you go right back to the start of the split up, I had the best scientists, by a mile.

*Yes. So back in those days, we had a division of maths and stats.*

Yes.

*And they were supposed to go around and provide mathematical and statistical services to other divisions. Did you use them?*

*We did actually.*

Tom might have.

*Yes we did. And we actually, Dave and I and Graeme Moad have published a paper with one of those mathematical people. And we had quite a lot of interaction with the division of computing research. I don't think we published many papers with them.*

No.



*But the divisions that were providing services were very useful to us.*

*And that worked okay from the point of view of – I mean Dave talked a little while ago about if I need someone I'll appoint them under my control. As opposed to accessing them from another division.*

Yes.

Well if you look at them, there was a guy called Alan Wilson who was involved in the Bank project. He and I had met in applied mineralogy and we became friends. He wasn't a research scientist. He was a technical assistant. But I got along fine with him personally. So we actually did work on polymers together, that when I wanted him to work on the Bank project, oh it was easy. I just had to ask his chief and the chief said yes and Alan was quite happy to do it. So a lot of -

*The divisions are – all the people in Fishermens Bend tended to work with each other, regardless of divisional affiliation.*

*So co-location's important as well?*

Yes. But we also -

Well it's more than that. It's -

*Not so much at Melbourne University*

They had their tea group. When I went to as Head of , the head of chemistry there, boy did I have split groups. And so I'd try to get them to have tea together but they don't want to. They have their own tea groups. And that's bad news. So in a CSIRO division I wouldn't like two or three different tea groups. Fishermens Bend, tea was great wasn't it? And then, we knew we had a problem with the post docs who didn't know where they were going to go. Tom or me, one of us, would go and just sit with them and make them talk to us.

*So I think that my recollection is that when we were at Fishermens Bend we didn't interact all that much with universities but -*

No.

*- that changed a bit when we were shifted to Clayton. So Fishermens Bend was a bit isolated.*

Yes.

*Perhaps might put this in context a bit. I mean there's a theory of CSIRO which is that it should be sort of like the leaven in the bread and be helping universities to develop and grown and CSIRO keeps moving along at the forefront. And so a part of your job as chief is to make sure that your scientists are working appropriately and helping scientists in universities?*

You could postulate the opposite model where the universities are at the forefront and CSIRO's picking it up and trying to bridge the gap to industry.

*That transition may already be happening in some universities.*

Well if it does you need to look at a lot of other things.

*But then the question would be - in that scenario CSIRO probably should get out of that area.*

Yes. So -

*So Dave -*

The universities have changed a lot.

*They have indeed.*

And if I look at the guy I work with, they've got to get research grants come hell or high water. And once they've got them they're right of course. There's no accounting for them, which is another thing.

*And they tend to get renewed, yes.*

Well who comes and gives them a grilling on what they – they said they were going to do this and what did they do? No-one asks the question. So I think the universities are now a lot stronger than they used to be. And they're certainly a lot more worried about interacting with industry than they used to be.

*Are they any good at it?*

No because I don't think that people have got the experience with industry. I worked in the States for a year. And that was back in 1968 or so. And the interaction with the universities was easy. Someone asked me why. And I said well they don't have CSIRO in the middle. But the movement between the two. I gave you the example of the guy that was the executive vice president of Georgia Kaolin He went back as Prof of Geology because he hadn't given up those skills and he still had the network. So I thought the interaction across their scientific disciplines was a lot smoother. Now that goes back a long way, I know.

*Could I just ask you a bit about a completely different topic?*

Yes.

## **OH&S issues**

*We were involved in occupational health and safety issues at Fishermens Bend with the Ron Bergamasco stuff.*

Oh -

*What's your overall impression? I mean you said you worked in a lead factory. What's your lifetime reflection on occupational health and safety issues in scientific laboratories in Australia?*

Well I worked in industry, I worked in CSIRO, I've worked in the universities. I think people would like to acknowledge safety but sometimes there's a lot of traditional history. For example, the Prof walking around in a white coat coming into the tea room or so on, which goes back to the good old days. And it's absolutely stupid. You know, why are you wearing a white coat? To keep the chemicals off me. Now I'm going to cart them into the tea room. So I think some of those elements are still around. But I think the modern people are better. As you know, the Chemical Institute had a survey of why chemists are not being employed. This is years ago. And I think you might have been involved in it Tom. And the things that industry criticised scientists for – and industry is probably the leader in safety – were first of all they didn't know how to work in a team because doing a degree you work for yourself. Secondly, in terms of safety they're bad news, a liability in the lab. And thirdly, they don't know about intellectual property. I regret to say that – I introduced those courses in Melbourne by the way. But the intellectual property one's gone because none of the Profs supported it. And I think that's a reflection on the academics that we've got. They don't understand the process of going from an invention through to that. So I think education wise we could do quite a bit further back, in the universities in other words. But it's important these days and we -

*And it's becoming socially more acceptable. So for example, when I first started with CSIRO, scientists said we are the experts, we know what's safe, get out of our hair, don't impose rules on us, we know much more than you and if we want to work with bare wires live on a bench, bugger off, we can because we know what we're doing.*

Yes.

*And that attitude has definitely changed.*

But the students are a big driver in that. But you need someone at the higher level that can implement it. Well for example at Melbourne – I can talk about that. The student write up desks were in the lab and I put them in a room.

Yes.

That didn't get the support of the Profs, to do that. And the white coat was actually in Melbourne. A certain Prof would walk around with the white coat on and if we weren't going to allow his white coat into the write up area, he wouldn't walk around. So there you go. But I think generally the students are much more safety conscious than they used to be.

*But I think that Ron Bergamasco issue and the awareness of -*

Oh -

*- was a big – a very big, certainly for me – taught me a lot about the importance of occupational health and safety. I think it was a -*

Oh I reckon that -

*- major influence on CSIRO.*

I think that and that Evans thing as well.

Yes.

Had a big effect on safety. And someone actually said, flattering to us Tom, that just as well it was our division that got the review because we were probably better than most. But it's hard to know. You know, there's radioactivity all over the place down there.

Yes.

And this goes back to the gung-ho days of people. But I don't think science is like that, not now. And when you get a thing like the Bergamasco fiasco or the John Evans thing, you get – jeez you know – you get into court. Here's a little laser we want to show you. Aaaagh! That's a judge.

*Over the period that you've been within industry and CSIRO, we've had a number of different governments in power with different views on the role of CSIRO, the role of industry policy and a whole range of different attitudes. As the chief of a division of CSIRO, do you have any input into the way that governments think?*

*About science and -*

*Science and technology and technology transfer?*

No.

*Did anyone ever talk to you or consult you?*

No. The closest it came was I was at head office one day and they needed someone to go over to a Senate inquiry and they just asked me to go over. And I had no briefing, nothing.

*Was this a lost opportunity for the country not to have the benefit of your experience?*

Yes. I hear – we talk about innovation and how we're going to be the lucky country and the smart country and all that. But underneath it all they don't understand what it's about and the timescales. The Bank's an exceptional case that was a forever project. And I don't know what the virtue of that is towards the financial return of the country. I have a feeling Innovia might have done all right out of it. And – bit sad that the Bank sold out on that because we had that as an Australian entity. But -

*Compare to most things it did very, very well for Australia.*

Yes.

*And Innovia is now sold for an American company.*

Yes.

*But it's still here, operating in -*

*Yes it still operates in Craigieburn, yes.*

Yes it's still – while they're out there – and as I said 40 of them clapped me. And it's good that they've got jobs. And it's a very well run factory. They run that factory with four people I think. It's just incredible. But now and then you get a glimpse of politicians who have an inkling of what's involved but I don't think they really know.

*Did any of them visit your division?*

Yes. In the early days I had most of the treasurers. What's his name? Cairns? Was it Cairns?

*Jim Cairns.*

*Jim Cairns.*

Jim Cairns. He came down.

*He came by.*

*And Barry Jones.*

Barry Jones.

*Senator Webster visited the division.*

*And were they just sort of friendly cup of tea type of -*

Yes.

*Or did they talk about anything important?*

No. They were cup of tea type. But with the Bank project for example, they were more interested in what they could say about it. And usually it was nothing because we didn't want to disclose it. But I don't know if they understand what's involved in translating things from the idea.

*But on the other hand, were they sufficiently impressed as they walked out the door, do you think, for them to continue supporting CSIRO?*

Yes. I think they were usually impressed with the quality of what's going on.

*And the staff?*

Yes. I think our show and tells were usually fairly good.

*And Senator Webster certainly had some –*

Oh fantastic.

*- input into the notion of commercialisation of the Bank project.*

Yes. But -

*So I think that his input was quite useful for the -*

I'm pleased you mentioned Webster because he was probably a good example of what you would like. He lived in Melbourne I take it. And he used to come down and drop into Parkville or down to Fishermens Bend. And he wanted to know what was going on. He was very interested -

*He was a very strong supporter.*

- in the Bank project. A strong supporter. And I think generally that people respected him. I forget the politics but -

Yes.

He was there. We've got some photos of him.

*Yes. And when you first joined CSIRO, CSIRO was about 40% of the country's R&D.*

Yes.

*And now it's about five percent. Universities have now risen up to be – taken together, a bigger research effort than CSIRO as a whole. What effect has that had on the role of CSIRO? So you've seen this both from the university point of view and CSIRO point of view.*

I'm hesitating to answer because I think the universities grew up – if they ever grew up – with an environment where they weren't expected to interact with industry. And in fact, I know, because when I went there I was regarded as having dirty money because I didn't take any government money. I had all my own industry money. And some people thought that research was second rate because of that. So the universities haven't got that culture that industry money and translating is good. They talk about it but I think they're worse than CSIRO in understanding what's involved. So I don't know how we get our universities – the best I've felt about the universities was probably in the States when I worked there.

*Different tradition.*

Yes. Yes. And I thought I could go and – I didn't do it. But if I had been an American and knew the system I probably could call in and get collaboration with a university without much trouble.

*Did you have enough contact with UK universities to form a view?*

There was a lot of networking in the UK.

*More positive attitude towards industry?*

Probably, yes. So it was a bit sad in that – this is a long while ago I worked there. But one part of ICI were recruiting graduates, not one university but one college within a university. That's true.

*Yes I can imagine. It was the one that the chief executive went to.*

Yes. And that all of them – I went there with a guy from Paints division who was an Oxford graduate. And in joking, "You still recruiting from such and such a college?" On God! They're broke. They went broke. But I think there was a lot of networking in the UK. Different social structure to here, but -

*And the red brick universities tend to be more industry focused.*

I would never have been appointed a Prof at Melbourne except as head of department, right? So the university system wouldn't allow somebody like me in there. Even though I reckon my science is up to theirs. But it's because I don't have the tradition that they have and they would look for. I wouldn't get through the selection process.

*So you left CSIRO in 1990 to go to Melbourne University and been essentially associated with Melbourne University in one way or another ever since.*

Yes.

## **View from the University of Melbourne**

*So you've seen CSIRO from the inside and recently from the outside. What's your impression or advice to the organisation from the outside?*

Well one thing I ask people, I think it needs to differentiate itself from the universities and at times I can't see any difference. Some of the collaborative projects, you can't say why they're employed with one entity or the other. So I think that CSIRO needs to get a bigger interface at where it's going more towards the industry sector than it is. But on the other hand, most of the training of people doesn't fit them for it, does it?

*Most of the training – PhD training doesn't fit people to interact with industry.*

Yes so we don't have as -

*CSIRO's recruitment is not -*

Yes.

*- appointing people who have the kind of experience they should have.*

Yes.

*In your scenario.*

Yes. So just by fate or whatever, I took to CSIRO an industrial background. It just happened I had kept my science up to speed. But I'd been through the – I knew what it was like to translate something from the lab to a factory and I knew that success was when you did that. I knew that there was a lot of science in the industrial process and I was quite happy with that.

*Well that's the whole point of CSIRO, yes.*

Tough call. Yes.

*Yes. All right well -*

You're not on the board now are you?

*No. I'm no longer on the board. I'm an academic at Swinburne University.*

Yes.

*And an honorary fellow at CSIRO.*

*Yes. All right. Well thank you very much Dave. That was a very extensive interview. And so we thank you very much for participating in it.*

Interesting. Thanks Tom. Terry.

*Thank you.*

*[music]*

## **Ian Wark the mentor**

*So this is Terry Healy and we've got Dave Solomon and Tom Spurling. Today is Thursday the 2<sup>nd</sup> of February, 2017. And it's day two of the recording of Dave Solomon for the purposes of the CSIRO History Project. Tom?*

*Thank you very much Terry and thanks Dave for coming in again. We certainly enjoyed our discussions on January the 12<sup>th</sup> and we covered most of the things. But there are four broad areas that we want to talk about today. And a fifth including your relationship with Ian Wark. So perhaps we could start with that.*

Yes. Thanks Tom. On reflection there are a lot of things that I would like to expand a little bit on. I think it's worth looking at the history of Fishermens Bend because it started off with Ian Wark setting up industrial chemistry. And I think you've written about this Tom in detail.

Yes.

But I came into it sort of from the outside a bit. But Wark had industrial chemistry. And he always had an interest in Fishermens Bend as it expanded from the divisions. The divisions were all discipline based divisions that I can recall, like organic chemistry, chemical



engineering and so on. And Wark used to joke and say that we, the descendant chiefs were descendants of or sired from his intellectual loins. So in that sense I think I'm his great grandson. And Sefton would be his grandson or something. So we had a family tree.

*Yes so it was Wark, Sutherland, Price -*

Yes.

*Hamann.*

Yes.

*Solomon, Spurling.*

Spurling, yes. And so there's a family tree. And Wark regarded that. Now when Wark set up his industrial chemistry, his aim from the government of the day, was to replace imports, right? And that's what he was about. And so it's interesting that he and I had this -

*Well it was to replace imports but it was also to process minerals. There was a strong mineral processing -*

Sure. But the emphasis was import replacement. And that wasn't necessarily a reflection of Ian but it was like the culture in Australia, that we were the colony sort of thing. Now you have to remember, before I joined CSIRO I'd spent a year in England and I knew that we could hold our own or I could, in the ICI research lab. And I'm not bragging but I'm just saying that we had nothing to feel we're second rate. So Wark, when he retired – this leads me to CSIRO polity. He's done reviews for the government I think on education and so on.

*Yes which led to the setting up of the Colleges of Advanced Education.*

Yes. So he'd done those reviews and things. And he was just left. And he wanted to keep contact with CSIRO and industry. And so Dave Koch and I – Dave was chief of mineral chemistry -

*He'd also – excuse me – he'd also been involved with the Australian Film Commission with Barry Jones and Phillip Adams.*

So he's a very prolific guy.

Yes.

He's got a terrific background and very nice fellow. So he's just left. And what I want to get to here is I don't think CSIRO make use of their retired people like they could. And the universities are much better at it. And I know that from my time at Melbourne where, if I look at chemical and biomolecular engineering, there's about four or five retired Profs there. And they don't interfere but they're there. And for example next week they're having sessions on their ARC grants and Tom Healy from chemistry, he's there as the mentor. So anyway, Ian was left and -

*I think – can I just interrupt there? I think this varied across the organisation.*

Maybe.

*So I think plant industry, for example, had many, many people there – still do, who are -*

Probably do. And they were closer to the academic environment in Canberra.

Yes.

But I'm talking about down Fishermens Bend way. And anyway Ian was left. And so Dave Koch and I, Dave had some space and we actually had to fund, the Secretary for Ian. The organisation didn't do it. We paid for that. And I think that's outrageous that the organisation didn't see that. And Ian was terrible valuable. He used to have a luncheon and he would invite you along maybe once every couple of months. And he would always have someone there that I should meet. And we would talk about things. And he was introducing me to people at a level that I wouldn't have easily accessed otherwise, directors of companies and stuff. And he knew a lot of them from his mineral work and so on. And he was very valuable. And it was interesting, you asked me last time did anyone tell me what to do? Ian never did but what he would do, and he was great at it, he would ask me a question and just leave me to ponder it. He didn't want an answer at the time but he would ask me something. And we agreed on a lot of things. In fact I reckon I was closer to a Wark than either Hamann or Price in our attitudes. Because the difference between us was he was replacing imports and I wanted to go to exports. And -

*I don't think that Sefton would have had much to do with Ian Wark.*

No. He wasn't. And so Sefton didn't have the industrial network that Ian had and neither did Jerry. And I would like to talk about Jerry's division too because of the influence on the interaction with industry, or lack of it. So Ian would first of all introduce us to useful people and secondly he would pose these questions which I found very, very interesting. I used to take him to lectures of a night, drive him and take him home and so on. And, as I was telling Terry before I knew ... that his secretary wrote me this note the day before he died which is very moving. But he was very valuable and he was like a grandfather to me if you like, in the scientific sense. And I don't think we make use of people like we did with Ian. Anyway, so that's that.

*And you had the Ian Wark room?*

Yes.

*At Fishermens Bend.*

Fishermens Bend.

*And my memory is that you had to argue with somebody at head office -*

I didn't -

- to be able to name -

- Tom -

- something after someone who was still alive.

I didn't have to argue Tom because I didn't tell them.

## **Act first-see permission later!**

*That's right.*

The story is that Ian's secretary said to me exactly what you just said, "Isn't it nice that they've allowed you to name this after him when he's still alive?" And she looked at me and just said, "And you didn't ask did you?" And I said, "No I didn't." It didn't occur to me that I would have to ask permission to do something as obvious as that. But we have Ian Wark labs and so on.

Yes.

## **Personnel policies**

And we named those. With a lot of effort from you. But I think things like that, the organisation could do better in. And if we're onto personnel policy, in CSIRO when you and I were trying to run the division and get it to what we thought it should be, there were people that were difficult to fit. And not all scientists can be expected to want to do science until they're 65. And some of them might get to 45 – 50 and they've done their science bit and they want to do something else. And where do they go from CSIRO? And I can recall a conversation we had with a part time member of the executive on this, you and I, you Tom Spurling.

*With Bails Myer.*

Bails Myer.

*Yes I remember that, yes.*

And we were talking to him about this very subject. Like it's not reasonable to expect every scientist to be wanting to fire on science when they're 65. And so we need a mechanism of getting them across to industry and places. And that's difficult in Australia because, generally speaking, they come out of the universities and they don't have an appreciation of industry. And they weren't getting a lot of it in CSIRO. So how do you go? And we mentioned this to Bails Myer. We don't have a mechanism for people. And he said oh well they just shift them to another company, which I won't name. Or can I name it? But -

Yes

- he just said, "We send them to Buckley's." And you actually said, "We don't have a Buckley's" And that's true in many ways. We had Buckley's chance. But we didn't have a -

there was no pathway whereby scientists could go if they wanted to. And maybe the organisation could think about that. For example, you may be able to give them some early retirement incentive because salaries in CSIRO were pretty good by that stage. And for them to go into industry they'd have to go at a pretty high level. And so there were issues like that. But no-one sits down and thinks how can we get through this and help people. They were genuinely wanting to go. And quite often what they did, they would be difficult in the division because they didn't want to do science anymore and we were expecting them to do it and so on. So there was that. And I have two examples I'll quote you where the organisation doesn't look at the overall picture. And one of them was a junior graduate who applied for a job and he didn't get it. And then, a few weeks later he applied for a different job which was quite different.

*So he was in our division?*

In our division, yes.

*Say who it was.*

It was Jeff Cullnane

*Jeff Cullnane, yes.*

And he applied for I think an EO's job and then the next time he applied for something quite different.

*In a different division?*

Yes.

*Yes.*

And that was okay. So I got him in and I said, "What do you want to do?" And first of all he was defensive. And I said, "No no no no no. Come on." And he actually wanted to be a photographer. So I said, "Well where would you do that work?" And there was a division that needed a photographer. So I talked to the division and I arranged for him to go and paid his salary for a year on the understanding at the end of the year they would take him. And he went fine. At the end of the year they wanted to take the position and everything. And I said, "Come on. I've given you a year." But the organisation as a whole wasn't helping that. It was up to chiefs to do deals and things. Now he was a good guy. He just wanted to move to a different area. And there was no overall – like I was used to ICI where they had an overall policy of the company. And when I get to the university, it's – they don't have an overall control like that at all. I brought in a business manager there and as soon as they get there everyone's trying to pinch him off you. It's not a company attitude. And the other one was Bob Lee who was on the Bank project. And at the end of that time, I spoke to Bob and I think you might have too Tom, and said, "What do you want to do?" And we said, "You can do statistics and mathematical stuff in our division." And he said no he wanted to go to chemical physics. He thinks I just – he just transferred over. He asked and it didn't. Chemical physics didn't want him. And he went there with the position. So we lost a position. And he

was a great guy and went on to do things for them. So there's no organisation attitude among the chiefs about that sort of thing.

*I think that, in those days, as I understand it, positions were numbered positions. That doesn't exist now.*

No. But I'd like to think that there's more collegiate attitude to staff matters. And the organisation makes best use of the talents they've got. I don't think there was much help in that. But anyway, it was different because I came from a big industrial company where they had career pathways and things for people.

*So Dave -*

*So Dave, Terry here.*

Yes.

*Can I just ask you to elaborate on one small aspect of that?*

Yes.

*To the extent that you'd be suggesting that CSIRO have a more collegiate approach, I'm assuming that that would either have to be driven more by head office or by some sort of committee or college of chiefs, acting above divisional level. Is that what you're saying?*

Probably. There can't be a penalty for chiefs to do the right thing. But I don't think there's any head office – I think it probably should be someone at head office – has a look at talents and how they might move. But I don't think the normal attitude, when I was a chief anyway, is that the staff felt that they could move to another division easily. And certainly if there was any training involved. But in the case of Geoff Cullnane, he actually was a good photographer to start with when he went there. But I don't think it's reasonable to expect the chiefs to be able to know where all those options are. Whereas, take ICI when it existed. They would have a personnel director who would be looking at the overall career paths of people.

*That's right. But there's a lot of CSIRO politics to involve with power -*

Yes.

*- between division and head office.*

Yes.

*And between division and division.*

Yes.

*Which would need to be addressed. Maybe it was addressed in the context of Institutes.*

Possibly. In my day they had position numbers as Tom's referring to. And that was probably a difficulty. I remember a meeting with the Australian Research Group. And they asked us what our budgets were, the chiefs. Most of us only had a small part of spending. And the challenge was to keep your spending in your budget so that you could operate a good division. But we didn't have a one line budget in those days and the first time we got it was 1974. And it just reflected head office. They didn't know that the amount of money we were getting wasn't enough to cover our positions.

*So before we leave personnel policies, I'd just like to cover two things that we want to talk to you about Dave. One was your approach to the recruitment, promotion and so on of support staff. So can you elaborate a bit on that? I remember that we had a number of people like Jack Ross -*

Yes.

*- who went from engineer to research scientist and -*

Principal Research Scientist.

*And other things. So can you just say how you developed that and how that was different from other places? Other divisions.*

Different from other divisions. Yes just remember, my background is I start work at 16 in a factory and I was doing factory testing of a paint systems in the first stage were you grind it, you have to test it, this version. And so I'd have to do those tests. And so I had a close interaction with the factory guys. And also that's where I got exposed to polymers and got interested in it. You learn very quickly that some of those fellows had got a lot of knowledge. They may not be able to draw the chemical structures but they know about exotherms and they know about this and they know about that. So I had a pretty high regard for good, skilled tradesmen. And it just happened to be fortuitous that Fishermens Bend – and we were the last division to move – and the other divisions had moved off and left their workshop staff. So I had a massive workshop compared to my division. And the Bank project came along. And it was ideal for them. And I think I probably was different to other chiefs in that when I had a session off-site, I took the workshop guys along. They have abilities. They're not science necessarily. But they have other skills. And you treat them accordingly. I was very happy with the work on the Bank project because – Jack Ross is a good example. He became a principal research scientist. He did a fantastic job on that. And most of the workshop staff who were on it did. They just thrived. So I never go to the workshop and say, "Make me this." I go and say, "I want to do this. What do you think?" And I get them to be involved. And often they can come up with a much simpler version than you do. So I regard their skills as there to be developed. And I had a good working relationship I would hope with the workshop staff. In fact, as you know on the Bank project, one of them called me aside at the first meeting and said, "Listen Dave. You can't punch holes in that." And I said, "Thanks that's" was the end of the fabric reinforced laminate and accelerated the move to plastic film -

*Yes Geoff Ralston wasn't it?*

No. Laurie Julius.

*Oh Laurie Julius.*

Yes.

Yes.

Gee that was a test of memory.

Yes.

And that was it. From that day on it was going to be polypropylene. But he felt he could talk to me. And I'm no different to anyone else. So I think I had a good relationship with him. But I also – I hope – developed their skills. And the workshop weren't always treated like that. They were treated like – in the Fishermens Bend days you'd put in a form and maybe six months later you got whatever you wanted. But you didn't have connection with the workshop in that sense.

*No because the workshop was a corporate workshop.*

Corporate thing, yes.

*Owned by the Central Research Laboratories. But when we became the Division of Applied Organic Chemistry, the workshop became -*

Was left.

*- our division's workshop.*

Yes.

*I remember the time when we got Bill Lakey promoted.*

Yes.

*And we organised a huge scam basically, wasn't it, where the committee went around to see all these different things that Bill Lakey had done and Albert and you may not know this David. We had the committee visiting various parts of the organisation and between going from one place to the other, somebody was charged with carrying the glassware that he'd made from one place to another.*

Oh the glass blower. Yes well I -

*And the rule said that he couldn't be promoted because there weren't enough people underneath him. But he was the only glassblower we had.*

Yes.

*And it seemed to us unfair that he was doing a good job and could never be promoted.  
Anyway -*

Well with Jack Ross, we had to work the system. The Institute was good for me in that I had a couple of chiefs who were sympathetic to the same sort of thinking we're discussing here. And with Jack Ross for example, how do we get him up the PRS or the – PRS I think it was.

*Yes PRS. Yes it was.*

Into research scientist. And we did it by bringing in chiefs. Got external chiefs to have a look at what he was doing. And the system was able to cope with that. There are ways of doing it if you've got confidential work. There's too much emphasis on publications. There are other things that you can judge people by. And I think if the organisation wants to be dealing with industry, then they have to start to realise that confidential reports can be as valuable as a publication. And patents are important, if they're viable patents. And I don't mean provisionals. I mean ones that are granted and you pay the fee. But they don't count in universities and I think CSIRO may not regard them as highly as a paper.

*Can I just ask you Dave to expand a little bit upon your dealings with head office in relation to promotions? You say that -*

Yes.

*- typically you had to have staff and/ or you had to have publications but you could find your way around it. Did that mean that you personally spoke to people in the head office personnel branch and, if so, could you mention some names?*

Yes. I used to be very active myself in talking to the head office. I found playing squash was always a good thing. And so I used to play squash with most people up there. Kevin Thrift was one guy I had a lot of dealings with. And if I could involve them in the projects and they knew what we were doing, then life was a lot easier. And I think they probably weren't consulted in that way by some others. But you have to spend time.

*Dennis Young?*

Dennis Young. Yes.

*And did that change when the Institutes came in in 1978 or 9? Some of the promotions were devolved to the Institutes.*

Yes.

*So that made it a bit -*

That made it a bit easier -

*- easier didn't it?*



- because you were dealing with chiefs a bit, who you could take and show the scientific side of the work. That was interesting because the chiefs had different views and I know Gordon Crewther found that we didn't always see eye to eye on promotions. That was more academic issues I guess there. But the head office guys, if you spent time with them, they were all right. The difficulty is when you strike some stupid rule that says you've got to have publications or something. And with a project such as the Bank, you're not going to get many. We used to joke and say no papers but plenty of notes. Ha ha. That's supposed to be funny.

*Yes. So Dave -*

*Yes. People didn't walk out with them?*

*No.*

No. No-one on the Bank project suffered in promotion – career at all. And in fact, most of them did better.

Oh I think the Bank project was actually very good for all of the people who -

Everyone.

*- were involved in it.*

Yes.

*We all did pretty well out of it.*

Yes. But there was a lot of work went into making sure that that was recognised.

Yes.

So -

*So Dave, could we just go back briefly to your original discussion? And it occurred to me that when we formed – when the organisation broke up the Division of Applied Chemistry and made the Division of Chemical Technology and Applied Organic Chemistry -*

Yes.

*- there were some people who didn't fit into either division like Bill Mansfield and Tony Evans and Charles Johnson.*

Yes.

*They went to the Division of Atmospheric Research.*

Yes.

*And Charles to the Division of Chemical Physics. How did that work? Do you remember – I mean that was announced I think at the time. Did you lose – that was a mutual agreement between you and the divisions or what happened?*

I'll tell you what happened. I don't know if you want to edit this later on. The chiefs used to meet with the executive at head office and the chiefs used to meet the day before and we would discuss issues that we were having. And then we would get spokesmen who would present the case to the executive. And in 1974 the budget we were given didn't cover the staff we had. And in the good old days you've got a position and you've got the money with it.

Yes.

And in 1974 we got money. And you have to look at the money and also -

*Sorry can I just interrupt here? So Charles Johnson, Tony Evans, that occurred after the breakup did it? So you were then the chief -*

Yes.

*- and then you did this negotiation that you're about to tell us about.*

Yes. I was never worried about numbers in contrast to, say, Don Weiss who wanted a big division. I didn't. Because I always felt I should know what was going on scientifically, and be able to present the work. And I digress a bit but after I left I actually, on occasion, went to a function where a chief spoke and had brought along people there to answer questions. I thought that was disgraceful. Anyway, so a couple of the divisions were in the same boat as we were and we didn't have enough money. So I was elected to speak to the executive and so was John Anderson. And I got up and told the executive that. The Chairman was not amused.

*The Chairman was Jerry Price.*

Yes. He told me I was a no hoper actually. And I said to him, "I've got 106 and I can only afford 100." And I said, "If I transfer six to another division is that all right?" And he said yes. Now that tells you that they had no idea of how the place runs. They don't. Because transferring people doesn't make any difference. But I'd been in industry and I knew. And so he said yes. So head office said that they had to honour what Jerry had – given me. So I transferred off – who was the guy who went to Mineral Chemistry?

*Jeff Wunderlich.*

Jeff Wunderlich, yes. Jeff and a couple of other guys went to Mineral Chemistry and a few others that wanted to go places -

*So Jeff went to Mineral Chemistry. Charles went to Chemical Physics.*

Yes.

*And Tony Evans and Ian Weeks and -*

Went to the bushfires.

*- another and Bill Mansfield went to Atmospheric Research.*

That's right.

*Or Atmospheric Chemistry, whatever it was called in those days.*

Well we didn't fire anyone.

No.

In the cuts of 1974. But we transferred people. And that made no difference to the overall budget but it fixed my problem. I don't brag about this simply to say CSIRO had a lot to learn about budgets-

*You didn't have to transfer the money?*

No. So I came out of that. And head office said certain things to me. And I just laughed. I mean it was an indication that the Australian research managers were trying to get across to CSIRO that we had no idea of how to run our budgets. And you can't have a place where all your money goes on salaries. You have to run the place. And so you have to have a certain percentage of your salary available to run. And that's the thinking that started about then.

## **Technology transfer issues**

*Yes. So Dave can we transfer our attention now to your experiences in developing collaborations and licensing with firms and other external bodies?*

Yes.

*So probably your experience as the chief of the division in doing that?*

Yes. Well I was chief and you were the assistant chief, Tom, as you know.

Yes.

And we worked very much together on this. But what – I mentioned earlier that Ian Wark was after import replacement and we were after export. And when you do that you pretty quickly find that most of the Australian companies were licensed in a way that they couldn't export from Australia. And I've discussed this at length with you. Other countries didn't allow these restrictive licensing arrangements. And I got very involved with it. In fact, the Leighton lecture which I gave to the Chemical Institute was about the restrictive licensing and the effect it had on who we could work with. Because many of our projects, like George Holan insecticides, you can't market them just in Australia. And yet that was what, for example, when we talked to Monsanto, they were trying to recover all their costs from the Australian market. That's not reasonable. And so restrictive licensing is something that I was

very active about. And at the Leighton lecture people just said, “And you don’t know the whole story.” And Jerry Price for example, Chairman of CSIRO was absolutely shocked that we had this restrictive arrangement. But CSIRO need to understand. They may still have it. You need to upfront ask companies do they have any restrictions on licensing export?

*Presumably the changes in tariffs affected that in the ensuing years?*

Yes. It did. But it was a matter of working out who you could work with and we did that eventually. But it’s something you need to ask upfront. Now with you, Tom, we organise to meet with the Australasian Industrial Research Group who were the research managers from the major companies in Australia. We had meetings with all of them and we actually gave talks to them as a group, in how we could interact with them. I think that was very useful. We were out there trying. It was difficult because of licensing arrangements and so on. But we explored changing staff. That went to the stage where we were all set to do it and then who was going to pay for what came up and I thought the industry were a bit unreal. They expected us to pay for everything because we were a government set-up. We had some exchange arrangements that we were going to work at. They didn’t come off.

*Did any of those ever come off?*

No. One guy went – was it Keith Watson?

*Keith Watson, yes.*

Did he go to ICI?

*Well Keith Watson, he was employed by ICI.*

Yes.

*But he resigned from CSIRO and went to ICI and then he came back to CSIRO.*

Yes. He was -

*And San Thang also went to ICI.*

Yes. I didn’t have any dealing to get San there though. He got the job.

*He got the job himself.*

But with Keith Watson, we were trying to do an exchange.

Yes.

And it was all set for Keith to go and, oh - I think they wanted us to pay him and also pay their guy. But Keith ended up going anyway.

*So when we had those meetings with the AIRG, were we pioneers in any way in that or -*

Yes.

*- had other divisions done it?*

I think we were pioneers because we talked to them. And we also knew a bit about licensing for example. Also, as a side thing to that, I realised that they were not getting a voice in Australia that they should be getting. And for example, they were never, or rarely were they elected to the Academy of Science. And that's one of the major reason the Academy of Technological Sciences started to happen.

Yes.

It happened at 1974 -75.

*Yes that's right. And you were a foundation fellow?*

I'm a foundation fellow of the Academy of Technological Sciences and Engineering. And that was my experience with that group because there were some very capable fellows there. There was Keith Farrer from Kraft Cheese, the BHP people.

*And Keith Neill I think was part of that too.*

Keith Neill. Bob Ward.

Yes.

I had another name in my head. Oh Bill Whitton, that group were around. So they were very senior and capable scientists but they didn't feel they were getting a say in Australian science and I think they were right. Oh Ian McLennan and those guys were not having the voice that they eventually did have.

Yes.

So I think they thought we were a reasonable group to work with because we understood a number of these things. I think we tried probably better than most divisions Tom. We at least fronted them and had them visit and we tried to explore exchanges and so on.

*So Dave -*

Well we explored it but we – yes.

*I remember you recruited Max Jordan.*

Yes.

*He was an integral part of that whole interaction wasn't he?*

Yes.

*How did that come about?*

I was very active in the Chemical Institute and we'd formed a polymer division in the Chemical Institute before I joined CSIRO. And so I'd met Max Jordan and other people.

*And who did Max Jordan work for?*

Dunlop or Olympic. One of the tyre companies anyway for sure. I think it was Olympic. And also Hans Battaerd who was at ICI.

*Right.*

Hans was involved in the Sirotherm collaboration. And I'll talk about that in a moment if you let me. So through the RACI we were both involved actually in trying to make -

*You and Max?*

Yes all of them.

*Yes.*

We had the polymer division. And you too Tom. We were trying to get it from a state focus to a national and international focus. And as you know, through that international focus - I'll digress again, the first overseas visitor I had as chairman of the polymer division was Okamura who gave me a sample which got me into the Bank project.

*Yes.*

So it was very useful to me, and helpful. And the RACI was where I met Max Jordan and -

*Because he was the secretary wasn't he when you were the President?*

He was a branch secretary at one stage I think.

*Was he?*

And I ended up being branch President then President of the RACI. The RACI was good and I think it's something I try to encourage even now, that people should support their professional societies. And a lot of people don't. They graduate. They expect to continue to work and I don't know how they think they're going to keep up to date. And I don't particularly like those who think they can benefit from the Society but not belong to it. It's not a lot to do. So I try to encourage people to belong to the Chemical Institute or the Chemical Engineers. I belong to that as well. They accept me as a chemical engineer. And I had to be interviewed and all the rest of it by the way to become a fellow of the Institute of Chemical Engineers. So anyway, coming back to Max Jordan, I wanted someone to help with the interaction with the industry people and also about intellectual property, how we would cover patents and things. And then Max and then Bryan Loft - Bryan was an experimental officer. He's a good example of how someone could build on his career. He came from ICI, Bryan, and he became our patent attorney. So from the time I was chief and even at the university, I had someone who was more like a business manager type and I think -

*So my recollection is that Ron Hinde went with -*

Don Weiss, yes.

*- Don Weiss. And we recruited Max soon after that?*

Yes.

*Or -*

It would be somewhere -

*My memory's a bit vague on that.*

I'm not sure when but -

*Yes. Anyway -*

Don had someone or had Ron Hinde.

Yes.

But I don't think a lot of other divisions had people like that.

*No.*

And certainly they were useful when we started to get an agreement together. And also, worrying about intellectual property. Because scientists aren't very good at protecting intellectual property. They want to get up and talk about what they've just discovered, often before they file the patents. In fact, that's how I got involved in a lot of my polymer service work at CSIRO. I knew Paul Grant reasonably well through filing patents. I don't know if they were -

*Paul Grant was the -*

I thought Terry might know him. Did you know -

*Yes yes Terry, no just for the record.*

For the record yes.

*So he was the intellectual property person in head office.*

Yes.

*He was the assistant secretary under John Shelton.*

Yes. That's right. He could play squash too. So Paul was involved. But I must have got in contact with Paul through patents I'd filed at Applied Mineralogy when I first joined CSIRO and from some of the service work we were doing. I might talk about some of that

afterwards because I want to talk about how I think you should do that. So I knew Paul. And Paul came to see me one day and said Ken Ferguson, who was assistant chief at Animal Production, had given a talk in Geelong at which he'd disclosed that in sheep making wool, you have what's called a limiting amino acid. And so say there are nine amino acids in wool. They've got eight of them but they lack the ninth one in enough to get your balanced structure for wool. And so Ken had discovered if you fed them that limiting amino acid, then you could get, for one part, you'd get nine parts of wool. And when wool was very expensive that was attractive to do that. But you had to get it into the fourth component of their digestive system. They have – they're a ruminant, so you've got four components in their digestive system. And he was banging it into the abomasums which is the fourth one I think – have I got that right – and then you get this –increase in wool growth

*Was he injecting it?*

He was injecting it or into fistulated sheep. They have got a plug in the side and they stick a bag containing the amino acid into the hole. And so what we wanted is a way of feeding it to sheep. And Paul somehow worked out we could delay the publication of his [Ken's] speech for two weeks. We'd have to file a patent in that time. And he came to see me and said, "Can we make a polymer or something? What can you do?" And I had a talk to them about it and the PH changes. So it goes in the rumen and it's PH of six and in the abomasums – I think its four in the abomasums – it's three or four. So I thought oh we'll make a polymer which has got basic groups in and will resist PH six and not the other one. So I had two weeks and I was making six a day and banged them out and we coated a pill and it worked. And so we filed a patent on it. It was an interesting experience because some of poor old Ken's colleagues criticised us for the lack of our scientific standards in doing the work. I said we had two weeks or we were going to lose this patent and you get cracking. Anyway that gave me a relationship with Paul Grant which was good for the Bank project because he was very useful on that. He used to write a lot of the speeches for both Jerry and sometimes me.

*That sheep stomach story, I think my name is on one of the papers that resulted from that.*

Yes.

*So Dave, could we just come back, before we get onto the third topic.*

Yes.

## **The Cycloprothrin story**

*Could we just come back? It would be very interesting for me to hear you reflect on the interactions that the division had with Nippon Kayaku and Ciba and then the interaction we had that led to the development of Cycloprothrin and then the whole Dunlena exercise.*

Yes. Cycloprothrin was originally supposed to be designed for – I think it was sheep blowfly.

Yes.

But it didn't work for that. But it was -



*So what happened when George had invented this series of insecticides? I wasn't the assistant chief at that time so I don't actually remember how we got onto Nippon Kayaku and Ciba-Geigy.*

The cycloprothrins were active against rice water weevil.

*Yes. But we didn't know that then.*

That's what they were interested in. That's why they were interested.

Yes.

So I'm not sure when we knew it. So we had an agreement with Nippon Kayaku and Roche -

*But – sorry it was Roche not Ciba, so Roche sorry.*

Roche. And that was a group in Sydney with -

*Joe Baker.*

Joe Baker, yes. Played inside centre.<sup>ii</sup>

*But how did we get into them? How did we get onto those two companies? Did we advertise or – how did that come about?*

I'm not really sure. We must have – I had Bryan Loft there then and I guess we advertised for a collaboration which is what I expect to do.

*And we got various people replying?*

Yes. Roche had a lab in Sydney with Joe Baker and I don't know, we had a license agreement. Somehow Roche ended up -

*Roche got out of it and Nippon – was Nippon Kayaku there at the beginning?*

You're testing my memory Tom. Roche and Nippon Kayaku were involved at one stage together.

Yes.

Both of them because I recall we had a meeting in Sydney and the Nippon Kayaku people were out here. And the day before Roche had fired about a thousand people worldwide.

*At RIMP, yes.*

Yes worldwide. From Switzerland.

*Yes including Roche RIMP.*

Yes. And we had a meeting scheduled for nine o'clock and Nippon Kayaku didn't turn up. And by midday we went looking for them. And they wouldn't sit in the same room as Roche. A company that fired people like that, they – Japanese didn't like it. So we're stuck with this problem. We eventually got them into the room, Bryan and I. And Roche must have pulled out of it not long after that. It wasn't good. But it was a very difficult time because George was wanting to go his own way a bit and the agreement which we had – for example, we went to Japan to meet with Nippon Kayaku again and they brought Nippon Roche in to the meeting. And I said, "They're not part of the agreement and we're not going to talk while they're here." And they said, "In Japan we don't want to put them out of business so we share the knowledge." I said, "Well that's not how the agreement is." It's just a learning curve on how things work. I forget how we got out of that but it was lucky Bryan and I were there because the scientist involved, George, wasn't so worried about who owned what as getting it on the market. But -

*I think we had a series of compounds that were being tested for various things.*

Yes.

*And the one that became Cycloprothrin I think was GH three – three four or something.*

Yes

*They eliminate all the ones and concentrate on that, which was the one that was very good in the rice paddy market.*

Yes.

*Non-toxic to fish.*

Yes.

*Okay so that got on the market and we got royalties. And then we – this is where I was now the assistant chief. What do we do next? And I remember saying to you – you may not remember this, "We could close it down." Why would we keep developing insecticides that were competing with our successful product? And you said, "No let's not do that, let's see what else we can do."*

Well -

*Then we advertised – I can remember advertising. And what happened after that?*

I sort of left about the time when the royalties started coming in. I wasn't there when that happened.

*No but the – okay the royalties came in a bit later.*

yes.

*But the interaction with DuPont started much earlier.*

Yes.

*After we'd -*

I was involved in that. Oh we were talking to another group, a government group in Sydney.

Yes -

Australian – there was a very competent lady there.

Yes.

*Yes. The Australian Industry Development Corporation.*

Corporation.

*AIDC.*

AIDC.

*Oh okay.*

Yes.

I was talking with them about trying to commercialise things.

Yes.

And I'm not sure if the Bank project was involved in that or not but we were talking to AIDC and it evolved I think, that we ended up talking with DuPont anyway somehow.

*My recollection -*

*I'm so sorry. AIDC is actually of interest historically. My recollection is that they were given about 100 million by the government.*

Yes.

*And so they actually could do things. Can you remember who introduced you to AIDC?*

*It was Don -*

*Woods?*

*No no. The -*

*Don Gibson?*

*No. We got only the AIDC through Dave's contact with the Bank.*

Yes.

*Because the AIDC was part of some discussions about setting up a new – an independent body to commercialise the Bank. So we knew the AIDC people through that, or Dave did.*

Yes.

*And the guy who we dealt with was an official of the AIDC, Don – who went to the University of WA. I've just forgotten his surname. But let me go back to the DuPont story.*

Yes.

*I think that we advertised for people to collaborate with us.*

Yes.

*We got a reply from DuPont.*

Yes.

*And we said we didn't want to deal with DuPont for some reason. And the next thing we knew a whole lot of people from DuPont had said they didn't like being rejected, they wanted to come down and talk to us and see. So they had a group of people from Wilmington and Sydney come down.*

Oh yes. Tom, this is a memory test. I'm usually better than this but we were getting some testing done out at Orange. There was some group up there that could test -

*I think that was after this.*

No I remember the DuPont guys, they wouldn't go there because they wouldn't fly on a small plane.

*Right okay. Okay.*

They also wouldn't fly on the same plane.

Yes.

*Yes yes, that's right.*

They had a very strict rule.

*Yes yes.*

DuPont's safety conscious at number one. But they wouldn't fly on the same aircraft.

*That's right.*

But they wouldn't fly to Orange on a -

*On a -*

- twin engine -

*Single engine plane.*

- because – anyways I was interested in that aspect of it. And I went to DuPont to talk to them.

## **Dunlena- CSIRO and DuPont**

*Yes and we ended up having Dunlena which went for a long time.*

Yes. We set up Dunlena and that was, as I understand it, the first – the only example where DuPont weren't the controlling interest. We had the controlling interest in Dunlena.

*It was 50/50 wasn't it?*

Sorry?

*It was exactly 50/50 was it not? In other words, the two parties had to agree?*

*Yes I think it was exactly 50/50.*

Yes but that was a – maybe that, but it was a better position than any other deal that people had.

*Yes, they typically wanted to have a majority.*

*Exactly. Better than 40%.*

Sure. And it was interesting, talking to their chemists about the compound to make it. They'd just stick the molecule up and say clunk clunk, "We've got these feed stocks. We're going to put them together." You say, "How?" They're just going to find out how. And they don't come at it from the chemistry, like we know where to build. They came at it from what feed stocks they had. And oh – they were impressive guys. And they would make it work too.

*I think that was, from my point of view, a very good learning experience for me because I could see that simply looking at the academic literature about crop protection chemicals, you missed out on what actually was going on because the companies only ever published anything that they didn't want.*

Yes.

*So in order to know what was going on with crop protection chemicals, you did have to interact with the company.*

Yes. And they'd tell you what they'd failed often – they'd publish.

Yes.

And DuPont was interesting. I had a lot of contact indirectly with them because when I worked at Dulux, which is from DuPont, that's where the name -

*Yes yes.*

So BALM Paints and Dulux had the license to make Dulux and DUCO which is the nitrocellulose based thing. So I sort of had formulas that were coming from DuPont when I was at Dulux. And we'd see what they were making and how they were going about it. And then over the history you see DuPont don't stay in the fields that are controversial – 2,4-D, 2,4,5-T, they were out of it. There are too likely to be legal issues with toxicity.

*And also it's a highly ethical company, DuPont.*

Yes. And they don't want to have dealing with marginal chemicals. So they're very, very careful. When I wrote my book on chemistry of coating, I went there, visited them and gave them a talk. It was pretty tough going because they are very good. Scientifically they're great. But also, their attitudes to if it's a dicey compound in terms of legal issues, they don't want to – so they're not in the commodity areas much. They were up in the high value stuff. And so with coatings, we had - poly methyl methacrylate was used on Holdens in 1960. And the story goes they were looking at a car in Florida and the General Motors guy said to the DuPont guys, "Look at the tail light. That's the most durable part of this whole car, because it's made of Perspex, and that's what we want as our coating." Because the DUCO with nitrocellulose didn't last long. And so they went back and they got Perspex and it's got a high molecular weight, so difficult to spray so they started to break it up <cracking sound>. You know, a machine, just break it. And then they wanted to control the molecular weight which they did and the whole free radical stuff chemistry started.

*And that's how the whole RAFT -*

Oh well not RAFT but -

*Well well -*

RAFT's a long way.

*Eventually -*

RAFT's way down the track.

*Over the years it went into RAFT.*

Yes but that was great. And see I got exposed to all of that while I was Dulux and that's where all the free radical stuff that I did, and CSIRO, came from. We don't have that industry now so you're not going to get exposed to that sort of chemistry. So the overseas companies here indirectly brought in some science that we were able to build on. But I was lucky, in a company which provided the ability to do that. So RAFT indirectly came from there.

*From the interest in free radical polymerisation?*

Yes. It goes back to that. And we knew from that or example, that the initiator you used influenced the durability. Now that's not in any textbook. Because the initiators are 0.1% of the structure – forget about it. But they have a big effect. And so we knew that, whereas the academics were looking at polymers and properties and with no history of where it came from and what it was made – and how it was made. I'd just think, well come on. So there was a massive gap between the academics that still were – still is a lot. So polymers were often regarded as just different, like polywater it is. It's – they're big molecules so they've got a different chemistry. It's not that at all. So anyway, that was good.

*So you were the chief of the division from 1974 to 1989.*

Yes.

*Obviously the banknote is a major achievement of that division. But apart from the banknote, what do you look back and think was your legacy to the organisation, particularly in terms of this commercial interaction?*

Well in the early days at Fishermens – let me go back to the division that we inherited – I inherited first and then you Tom. It was predominantly the organic chemistry and some of the physical chemists that were in there. And when they set up what was the organic chemistry division – oh at Fishermens Bend, the divisions were all discipline based divisions, like there was organic chemistry, chemical engineering -

*Chemical physics, applied mineralogy, mineral chemistry.*

Applied mineralogy – yes. So they were those. And I'm in applied mineralogy for reasons which – well I applied for a job in Jerry Price's division. I didn't get it. And one reason was I was running a group of about 18 people in Dulux and they were worried that I wouldn't be able to work on my own. I didn't have a worry about it. But also, I think there was an element of I was industrial and not an academic. The point is I had industrial experience which they really needed. I assumed – and probably right, that it was a big organisation like ICI and the fact that I'd applied there and didn't get a job meant that that was it and that the organisation was – no I was just lucky that John Swan I think it was met George Walker, who was in applied min and George was after this organic chemist who had industrial experience. So that was to be me. And John mentioned me to him. And so George rang me up. And I decided – the reason I went, one I wanted to go. I wanted to get out of Dulux and stick with science. They wanted me to be research manager and I didn't want to do that at that stage. And the only connection I could see with what George was doing – he was making films out of vermiculite, which is a clay mineral. And he had a way of separating the sheets and forming a film. You could pour it and form a film. And the idea was to use it as fire proofing, right? So you'd put it on and it actually foams up because it holds a lot of water. So that was the only connection I could see. I had no training in minerals chemistry. So I decided to go. I took a heck of a beating in salary, about a third I think it was. A lot. And that was pretty big at the time for me. But I wanted to stay with science. And I left Dulux. I had a six months' contract. I had to give six months' notice. First of all they were a bit nasty. They said we're going to make you stick to it. And I said okay. CSIRO were prepared for that. And then they calmed down and I left on good terms. And they seconded a guy, John Hopwood to come and work with me on polymers. John has actually gone onto great things

in South Australia, not in the polymer field. So I had a good arrangement with them. And there was no difficulty with CSIRO by the way in arranging this at Fishermens Bend. So I had John. We were working on polyesters. And that actually -

*So John Hopwood was a Dulux employee working with you?*

Yes.

*So in a sense, from the 19 – this was in -*

1963.

*- the 1960's.*

Yes.

*It was easier to make these collaborative arrangements then -*

Yes. A lot easier.

*- than it was later.*

There was never a question about it. I don't remember any issues.

*Okay. So we covered a bit of this previously. But you've now become the chief of the division of applied organic chemistry.*

I want to just go back to applied min because in applied mineralogy I had John Hopwood seconded. We had a letter or something about workers comp and that sort of stuff. And also, while was at applied mineralogy, I ran a polymer workshop in which we ran a series of polymer lectures and then practical work, which you don't normally do.

*Did you do that in conjunction with the RACI?*

Yes.

*Polymer division.*

Yes I was trying to start the polymer division and we wanted some money. So we charged people to go to this workshop. And Jim O'Donnell came down and he gave lectures. Hans *Battaerd* and I gave lectures. And we had the lectures at Fishermens Bend and then we had prac work in the lab. And we made I think 1100 pounds and we kept the lot. And Gaskin didn't make an issue of it before that but I think he said if we did it again he'd want -

*He's want his cut.*

But that's how we started the polymer division.

Yes.



That's our original money. And so the RACI was pretty good to us but it was working out all 'round. Now we were doing – John Hopwood, now he, in that work we found these microjelle particles with Alan Wilson who I got to know in applied min. And Alan Wilson becomes a critical guy in the Bank project.

Yes.

Because I get on well with him and he was prepared to do things with an electron microscope that others weren't. And so Alan drew the early gratings for us o the Bank project. Then – I don't know how it happened Tom, but I just got staff. George at one stage said you need an EO, experimental officer. And Jean Swift got that job. And then I just got Max Rosser and other people. I don't remember ever asking for them but things were going pretty well. And I wanted to mention tea clubs because at Fishermens Bend the big thing about it is we all had tea together down in the canteen. And so all of the divisions interacted. Like you would have morning tea with Joe Blow from Chemical Engineering. So one of the guys from there had trouble with boiler scale. I mentioned this before I think. And he wanted a polymer. I thought how do we fix that? So I worked out some ideas which worked and we patented that. And that's probably how I developed interaction with Paul Grant and people because we were patenting some of these things. And also I had patents on work I was doing on minerals. I did the work George wanted me to do, which was look at these fire resistant coatings. But I also, being a chemist, the first thing I did, I wanted to look at the effect of minerals on the polymerisations. And I dried them. And when you dry kaolonite out it becomes highly acidic. And you say why is it acidic? You stick styrene on it - it boils. You get an exothermic reaction. And you break down peroxides and do a whole lot of things. And actually, this is the start of my nitroxide work, this work. So I filed patents on that and then I – I want to come back to the service work in a minute. And I went to the States and I gave a talk to a mineral convention. And that's when I got invited to go and work at Georgia Kaolin, which I did for a year. And that was great experience. While I'm on the States, I thought in the States the interaction between the universities and industry was a lot easier than in Australia and a lot different. I think it was because the academics only got employed for nine months and then -

*Yes they had to -*

- the three months they went consulting.

*And they were allowed to keep their income.*

Yes.

*Whereas in CSIRO we weren't. And universities in Australia were still at baby level.*

The universities – what?

*Still at baby level. In terms of interaction with industry and -*

Oh yes and I think they still are. I mean -

*Anyway keep -*

- the thing about the interaction with industry is that you really need to go and have a contract with them or something, and see how things work. Even now.

*So let's get back to the story. You've got interactions with industry through the division of applied mineralogy.*

Yes.

*And the Bank project comes along and you become part of applied chemistry.*

Oh Jerry comes to me -

Yes.

But coming back to the tea club. I want to mention that. So tea clubs are important I reckon. And we don't make enough use of them. I think CSIRO's lucky at Clayton. They've got a central place.

Yes.

But the university was terribly difficult. The Profs wanted to keep their own groups and there were often groups within the groups. Whereas I tried to get them together. The reason that tea club is important – for example, when I worked in industry in the UK, they were expanding ICI so they had their central lab. But they also had another site about 10 minutes away by bus. They used to bring people down for morning and afternoon tea by bus.

Oh right.

And we talked over things, you know? And one thing I learned there, one meeting I remember someone said IPA and I couldn't follow what they were talking about. I thought it was *Isophthalic acid* and it was *isopropanol*. *Never again do I use abbreviations like that. And at Dulux I found people – everything had a number. So you didn't say toluene, you said key number 21 or something in those days.*

Oh.

And they started, after a year or two, to think like that. They didn't think it's toluene. They thought it was key 21. You say why does that work and they – so I don't like using numbers and I don't use abbreviation. The tea clubs are very important. At ICI it was great. And at Fishermens Bend it was great. And it was great because we had interaction between divisions there. But also, the other thing we could do there is, on personnel lines, Tom we used to do this with me I hope – when the post docs were there in the 70s, they were often very experienced people and they were on temporary jobs. And so they were all sitting, talking. And we could go and get in there and talk with them. In fact we changed the policy in CSIRO because of that. Because you could employ, on limited tenure, people with nine and 10 years' experience. And they should be getting into tenured positions. And so we made it that when you advertised those jobs, they were for people in the early years after a PhD, not nine and 10 years out. But anyway, so I think the tea club's very important. And

that meant I did quite a range of polymer work in applied mineralogy. I had a chief who – Gaskin should have got a lot of credit. He had the Bank project in applied mineralogy for goodness sake and there's all these other projects where I'm able to interact. And I want to talk about two of them. Oh first of all, Don Weiss and his Sirotherm . He asked me to make the polymers for that and he had a contract -

*Did he do that when you were still in – were you in applied chemistry then or were you in applied -*

Applied mineralogy.

*You were still in applied mineralogy?*

Yes.

*Okay.*

Applied mineralogy. And he's got a collaboration with ICI and -

*With Hans Battaerd?*

Hans Battaerd. Hans wants to make a case for his radiation source so he's using radiation polymerisation. I told you this before I think. And he's using a solvent chlorobenzene and he's using *triallyllamine*. You look at that and you say that's crazy to do that. For one thing you're getting -

Yes.

- Bisphenols, chlorinated phenols and so on.

*Especially when you're going to use it for purifying water.*

Yes. So anyway, Don wanted a method to make it. And I knew -

*So when you say he was using that. Was Don using that or Hans using that?*

Hans was making it for them.

*For them – using that method?*

Yes.

*Which is unusual for an industrial chemist.*

Yes.

*To be doing that. Isn't it?*

Yes. And the reason is, Hans was playing games. The reason why – he's got a cobalt source out there. So when Don came to us I thought oh you can't use that. And allyls are bad news

when you're talking free radicals by the way, except when you've got two allyls. Then they go a strange reaction which had been reported just a few years before. And it's got two unsaturated linkages in. Normally when you have unsaturated linkage like that you expect to get a cross-linked structure and a great network. But you don't. You get a linear saturated polymer and it's called cyclopolymerization. And that was published by George Butler and I can remember talking to Hans about it. And he said, oh you know they get cyclic structures and all that. So you have a look at it and you say well it was published in JACS and they showed that it was saturated, they showed that it was linear and they just drew the structure: six membered ring. Because that's what you expect to get because that's the more stable – question mark. And they didn't have any experimental evidence for it. And I say this because the scientific community was so convinced that radical reactions would go on stability grounds, and they're wrong. So I wanted to use diallyls because I knew that went easily. And I made a bis diallyl which meant I could control the network and everything else. I did this with Colin McLean. And we did it in water at room temperature with a redox catalst. So you just stir it and you got the polymers out and you can control the cross-links and everything else. Don's happy as a lark, right? I say, "Right I want to look at the structure of it." Don says, "No. We know how to make it. That's all we need." I'm not going to take notice of him. So that's the start of the free radical work.

*You were now in applied -*

Still in applied mineralogy.

*Not with Colin McLean? He was in applied organic. Anyway -*

Well later anyway -

*Whatever.*

Well he did the work – well it must have been – and this is a difference between Don and I that's very important because I'm prepared to do service work but you have to keep your science going, otherwise you're on limited tenure. And that's one of the reasons I applied for the chief's job because I knew that if Don were the chief, and he wanted to be, then I wouldn't be able to do any decent science. And that's actually the start of – all this contributes to our free radical stuff and RAFT if you like.

*So this is an important bit of your philosophy running the division.*

Yes.

*That you wanted – I mean I think what you're saying is that you wanted to solve the problem but you wanted to then go on to understand the actual -*

The chemical -

*- basis behind -*

Yes.

- *the solution of the problem.*

Understand the theory and write it.

Yes.

Now two big points – the cyclopolymerisation is one. And the other is, when I was in the States at Georgia Kaolin, we wanted to treat clay and make it organophilic and also we wanted the clay to act as a reinforcing filler like Carbon Black does. And the theory on Carbon Black was that you get a higher cross-linked density around the particle. So we were treating clay with oleic acid which gave us a reactive site, made it hydrophobic and gave us a reactive site there. And sometimes the thing would catch alight. Now that's strange. Why should that happen? And this is another example for you Thomas Tom Spurling). In Georgia Kaolin we could fix the problem by the way we dried the clay because you just dry it for a bit longer. But why? That's a strange thing to happen. I knew about autoxidation of oils from paint days, but not oleic acid it does not normally catch alight. And this is where Ezio started and we wanted to look at the chemistry of that. And I set up some model systems. Instead of clay we used – I knew it was acid so we used sulphuric acid. Instead of – we wanted to have a trace of a peroxide which we thought was the mechanism for the spontaneous combustion. And I wanted a trap which would pick up free radicals and that's how NMP came about. So both of those big points are part of the entry into polymer science. But they come from wanting to understand what goes on. You could solve both problems without understanding them. But you don't go any further than that. So cyclopolymerisation and decomposition of peroxides with acids – you know some of these Tom. You were involved in them.

*Yes I was just going to say that I think that Sefton and I, together with you, wrote a paper about some of the steric effects on that.*

We wrote the steric effects ones.

Yes.

And we did a lot of work on different steric effects.

*I think Colin and you published a couple of papers together. 1974 was the first one, with Julie Kearns – Kearns, McLean, Solomon, "Polymers and Copolymers of Unsaturated Tetrahydropyranyl esters."*

Yes.

*And then eventually there are a whole range of cyclopolymerisation ones and he was on "Cyclopolymerisation VI: Preparation and Properties of Crosslinked Polyamines by Cyclopolymerisation."*

Yes. That's about the time I was transferring, anyway. Yes.

*Well you – no you came -*

Oh no. No no. No no.

*You were the chief. That was when you were the chief.*

It was when I became chief, yes.

*Yes you were the chief.*

Anyway, so both of those are what I want to cite as the reasons that if you don't get into understanding, you don't find all these things. So that led to controlled free radical stuff and all of the -

*Yes. I think that that was in a different discussion we've had about – your approach was always to be in Pasteur's Quadrant in the area that wanted both advancement of knowledge and utility.*

Yes.

*Don tended to only be interested in utility.*

Yes. And you knew that, Tom.

*I think it's probably a good time to have a bit of a break. We've been going for an hour and a quarter.*

I want to talk about you as assistant chief too.

*And we'll come back after our little break.*

Yes okay.

*So I'll stop.*

*Okay. Recording's going off now.*

*[music]*

## **Managing the Division of Applied Organic Chemistry**

*Okay thank you Dave for this morning's talk. So this afternoon we wanted to finish off your impressions of managing the division and then talk a bit about why you left CSIRO and your post-CSIRO experiences. So what are your memories of managing the division of applied organic chemistry?*

It was an exciting challenge because I had a history of – the scientists I had were very good scientists and in the split of the division of applied chemistry, my emphasis was on good intellectual scientists and that's what I got. I didn't get half the division. I didn't want it. But I was very happy with the quality of the staff I had. And the challenge was to try to find areas where they could interact in way which would help manufacturing industry. Now the Bank

project was good for us because it took up a lot of people and a number of projects came out of the Bank project. For example, a compound within the note which is a detectable compound, but which is not available to a lot of people. So we'd have a unique feature. That involved people like yourself and some others. And there were other aspects of the Bank project which fed off into various people. But then there's the rest of the division. There was the work on drugs like Cycloprothrin, which George Holan was doing. And the challenge there was to try to get that focused on something which was going to benefit Australian, and particularly export industry. The other interactions. We tried hard to interact with Australian companies. And it's not as easy as you think it might be to find a project which will give you play in chemical drugs and things, which will give you an export industry. But that's a challenge that, if the country is good at medical research – so in broader terms, the country needs to find a way of getting some return for that. I was unhappy with the initial government money for medical research without strings attached to it. I'm a lot happier with the fact that they're going to support medical type research where there's a possibility of companies here. And they're high value things. Bank notes are an example of that. And high value compounds which are not bulk commodities are good for that. So I think the division came a long way. I reflect on it. It's still there. But basically it's the nucleus of what's out at Clayton. And I think the scientists now have got a better understanding of what they're supposed to do. I think in broader terms the country, we don't really train people to work in that intermediate area like CSIRO. The universities don't have a component of that in their training. And I did work in the States for a year. I mentioned that earlier. And my recollection of the States is the easy transition between universities and industry. And an example of that the guy who I went over and worked with over there ran the company as vice president. When the company was taken over – you know, company takeovers – he was able to go back to the university as head of geology. While I was there we had a research retreat. He gave the first talk. And he's the vice president. In Australia, with ICI for example, the emphasis wasn't on that. It's if you get out of the lab you go into management. Whereas in the States I thought they were still technical guys. And I think we've got to get that sort of culture through. And I think the universities have got to play a part in this too because they need to turn students out who have got an aim in life which is what I just mentioned. If we want to move on to the university? So

*Sorry do you mind if we just go back to the division?*

Yes.

And your thinking about how to use science, how to use chemistry for the benefit of Australia and Australian industry – sort of in a very substantial way? Did you go through any formal process with your staff or surveying or looking for opportunities, trying to identify what might be useful?

I think Tom and I were involved a lot personally in trying to find the problems. Some staff just don't have the understanding of how to interact with industry. And I think Tom was pretty good at that and perhaps myself. You don't need too many people that can bring in projects. But you need receptive staff to do it. I think most staff would want to do it but they don't always understand what our industry's about. Sorry?

*I think that we started the idea that the breakup of the division shouldn't be along disciplinary lines. So when I first went to CSIRO and in the early days of the division of applied organic chemistry, the division was essentially broken up into the physical chemists, the inorganic chemists, the synthetic organic chemists, the polymer chemists. And so we evolved the system where we had groups who were collected together, focusing on a particular industry. It wasn't very sophisticated when we started but that was – the notion of programs and programs being directed to particular areas of industry, we started thinking about.*

*And can you remember what those were?*

*Well they were – well you're now interviewing Dave and me in a way.*

*Yes.*

*We looked at the synthetic chemistry industry, you know insecticides, herbicides and to some extent the pharmaceutical chemicals. We had the group to do with the plastic industry. We had a group that was essentially an energy – a coal transformation industry. And we had a group – the bushfire group had gone.*

*Yes and we had -*

*But the -*

*They were sort of -*

*I know, the other group was the surfactant, the specialty chemicals – surfactant industry.*

*Yes. And the biological area. Some of them reflected their university experience because when they'd come to – like back in the early days when people were recruited to CSIRO, some of them have got letters – I've seen them – which virtually said you come and you can do what you like. That's what they said.*

*Yes.*

*- I seen a letter which virtually said that. And some scientists think that they can work in this field forever. To t stop a project, which is pretty hard but one scientist refused to move and argued that he was recruited to work on so and so and that was it*

*But you're the chief.*

*Yes.*

*And you have to decide -*

*Yes.*

*- about who you have and who does what.*

*Yes.*



*And so I'm just wanting you to focus a little bit on the processes that you did to scan around for opportunities to do things. So an obvious one for you would have been paint.*

Yes.

*Would you have thought about doing work to support the paint industry and then realise that there was no way you could get into the paint industry in Australia?*

I knew the paint industry because I'd worked in it and I had good relationships with them. But I didn't see that CSIRO could do the sort of work that could give us an advantage over what they could do in-house. Because the companies that I knew were setting up their own in-house research development type things.

*Which you could have worked with.*

I could have worked with them.

*If they were interested.*

Yes if they wanted to. I think there was still a gap between CSIRO and what the paint industry would be doing, even a good one like Dulux. There were some established groups in CSIRO which had projects which sounded good but were not. For example, highly competent scientists were working on splitting water: hydrogen and oxygen. And that sounds good and if you apply the concepts I talked about from Dulux where let's assume you can do it, what's the outcome going to be? Now with that project, how the hell are you going to separate the hydrogen and oxygen and how are you going to store it? And I actually stopped that project. It wasn't easy and there were letters to the press about me. Because it sounds good. But you have to look at whether the feasibility of the outcome in a reasonable timeframe – I'm talking 10, 15 years or so. But the rub's on me if you like.

Yes

Because out of that project came a compound we used in banknotes.

*Right. But you're the chief.*

Yes.

*And you've got to make -*

I stopped it.

*- decisions about priority.*

Yes.

*And that's one that you stopped.*

Yes.

*But there's the other scanning process that takes place over all the years that you were there as chief, to look out for new opportunities.*

Yes.

*And who did you consult and who was involved in that? You and Tom you've mentioned.*

Mainly Tom and I.

*And Bryan Loft and Max Jordan.*

And the commercial guys that we had.

*And the senior people in the division were involved: Stan Johns and -*

Yes.

*In a formal way? In other words were there -*

Yes.

*- formal meetings about this topic?*

Yes.

*Yes yes.*

*All right.*

And either Tom or I gave lectures to them about what we could do, what our skill bases were.

*But within the division we had – when you say were there formal lectures – formal meetings, there were meetings. Neither Dave nor I were great at taking minutes of meetings or actually documenting very much. So the division of applied organic chemistry and the division of chemicals and polymers was run on a fairly informal basis where we arrived at a consensus and we went ahead and did it.*

I -

*There's nothing wrong with that. It's just bad for historians.*

*Yes that's right.*

I was probably a lot more – contrasted it with the previous chief, in many ways. And I was very much more involved. I wasn't on their backs or checking up on them attitude. I just wanted to know and was able to talk to them. And – digressing again – more recently I happened to meet someone in an airport and they said, "When you were chief Dave you'd come and talk to us about what we were doing." And they appreciated that. And Tom was the same. So number of projects we reacted to, for example, the oil from shale whatever it

was that we were doing. And that was a reasonable priority which Peter Wales and others were doing.

*Can we just stop for a minute?*

Sure.

## **The University of Melbourne**

*Can you –*

There was a review of chemistry at Melbourne University in 1990 or something like that. And I was on the panel as the staff representative. So Melbourne Uni staff asked me to go on as their rep. And -

*Were you the chairman of the review?*

No I wasn't the chairman. I forget who was chairman. It was a pretty high powered review panel. And it went for a week. There were submissions made to it. And you only had to read the submissions to know that Melbourne Uni needed a lot done to it. There were three departments: organic, inorganic and physical that made up the school of chemistry. And – oh the reviews were shocking documents. They should know better than to write that sort of stuff down. But it told you screaming things. That's big issues. And so on day one, the panel had decided we've got to do something drastic with Melbourne. And they decided that they would unite it into a single school, not three departments but one department and that they would create a head of department which would be the ICI Masson Chair. That came about because ICI were going to partially fund it. We had ICI in those days. And Masson was the first Professor of Chemistry.

Yes.

So we had the review which highlighted all sort of problems with the academic side of things. I got invited to take that Chair. I didn't take it up at first. I didn't go on the panel to get a job at the Uni. That was the last thing I had in mind. And eventually things happened in CSIRO which made it easier to go. I was very unhappy about the way things were handled with the Bank project. It's where we had just sold the technology to the Bank for nine million. And it was also about the time that material science were claiming the project was done by them. And there was a promotion case put up which indicated that's what they believed. I can't believe – sorry I repeated the word – I don't have respect for the chief who signed that document knowing that that wasn't the fact, nor the person who was being promoted. So I was pretty unhappy with that and I thought the division of chemicals and polymers got a rough deal. The procedure for handling external funds was clearly laid out. The chiefs at the Institute on two occasions passed a motion that there'd be a big moral problem if the funds that were coming in weren't handled in the way that they were supposed to. And they weren't so I wasn't happy about that. Plus there was the case with the – the court case and claims in the press that it had all been done by material science. Certain things – they upset me, those things. So I also had views about the University. I felt the University could do much more to educate the students in preparation for industry

because most of the students that go to uni do a pass or Honours degree. They're not all doing PhDs and the staff get the maximum benefit from someone doing a PhD because they get papers out of their work. They get work done. And the courses often were directed towards the PhD students not the general students. So I had some views about that. And I also felt that chemistry was a whole. It wasn't inorganic, physical and organic. And polymers are a great example of that. So I eventually went there. I had no idea what I was in for, had not a clue. The first thing is I didn't have control because I didn't control the budget and if you want to control university departments, you're going to have to do something different to the way the budgets are handled there. It was a challenge getting them together. We tried to do it by teaching polymers in the Honours year and I had a couple of staff members who were in the same mind as myself. So we taught them about polymer science for their Honours course. I also introduced the things that industry said were lacking in graduates from the universities. And the RACI had done a survey on what industry thought and that survey – I think you might have been involved in that Tom.

*Oh I was the Chairman of it.*

Yes.

Yes.

So great, I've put that down Tom. And so I said first of all safety, that the students are a liability. The second is they haven't got a clue about intellectual property. And the third thing was they don't know how to work in teams. Now you can address the first two. The team one's a bit more of a challenge because a PhD, you're essentially working for yourself. So for the Honours course I introduced a safety – I had no support from the staff, the other Profs. And so the best I could do was a hurdle; you had to do the course. And I got a young – graduate from Melbourne that worked at, ICI. She came and taught them how to put on gloves, how to do the – etc related to safety. The students liked it. The second thing is – again I didn't have any support. But I'm prepared to stand up if I have to Terry. I got a chemist who worked at Dulux and was a patent attorney, Don Berryman – did you know him?

*Oh yes.*

I got Don to come in and teach them about intellectual property. Because if you asked a student, "What do you plan to do?" "Oh I'm going to make a compound and cure cancer." I say, "How are you going to do that?" "I'm going to publish a paper in the Journal of American Chem Soc and that's it." I said, "That's the best way I know not to cure cancer." And so they get upset -

Yes.

Right?

It would be a revelation then.

Yes. And they think I'm terrible to file a patent. And so I say the patent literature is where do I look up that, where do I do this? That's where all the big advances are. The big advances – polymers certainly – are not in the academic literature. They're in the patent literature. That's where Dow and the companies put their big inventions. Look at the polyethylene stuff there. So -

Refer to Professor Doctor, Doctor Karl Ziegler.

Yes.

*Do you remember him?*

Yes. I know – knew of him. Anyway -

*A very strong patent.*

- so Don taught that. The students liked it, but again, the staff didn't like it. The other Profs thought it wasn't right. But I said that our graduates go out, their science is good, we've got to give them a start on the other universities. And I thought if they were good at safety and good at intellectual property, they'd have a start. So that's what I did. I regret to say that they don't teach that anymore and they don't do the safety any more. So it lasted for a while. And I did that. I'm happy about that.

*Well I think, to be fair to universities, the notion of safety in laboratories is much more pervasive now than it was in those days.*

Oh yes.

So -

Yes. But for example, I had a tough time there. One of the Profs I said you can't wear your coat to tea, .You go into the lab. You go around and talk to the students in their write up lab, you have to take your coat off or if you go in the lab, you've got to wear safety glasses and all the rest. And he said, "I won't go." So I said, "Well don't go." So – It was like the old days when the prof walked around in a lab coat even in the tea room.it makes no sense

*And he didn't?*

Yes. So I didn't have a good time with that.

*So you were there from -*

1991 to 1995, yes.

*You had a five year contract?*

*Is that when you started working with Greg?*

Greg was a post doc with me.

*Right. In chemistry or in -*

It was about the -

*About the same time.*

About the time I was transitioning.

*So that was in 1995. And you've been there ever since?*

Yes. So Greg post docd and then he took over. And he does his own thing. And I just talk to him about one or two projects and that's it. And so chem eng were much more receptive to the idea of working with industry and commercial than chemistry were. When I discussed it with the organic Prof – we know who it is – I said our graduates need a – we need to give them the best chance of getting a job. And so if they've got safety on there as well and intellectual property and understand that teams are often what you have to work in. And the attitude wasn't that. It was well that's industry's problem, you know, I just train them. But I think the universities can do more than just train them. You can train them in a way that – well for example, I can teach you kinetics using polymer kinetics. Just as good as you can teach using a simple organic reaction. And so I can argue other things with big molecules and so on. So now of course they all teach polymers and they're a basic part of chem eng for a start. Chemistry are probably receptive to that sort of work now. So chemistry was hard going and – oh I was pretty much on my own there.

So I wanted Profs to be called Professors of Chemistry and the new Prof coming in – there were two. One was Frank Larkins who's a Prof of Chemistry. I was a Prof of Chemistry – there were three actually. And Tony Wedd came in. In the past he would have been – inorganic -

*Inorganic.*

- but he came in as Prof of Chemistry. But the other two didn't want to be changed. And it was interesting

And from your position at the University of Melbourne. Looking back at the University of Melbourne

Oh that now, thanks – I'm happy about that. And the good thing is Melbourne Uni, not in chemistry but in chem eng, have a good polymer program. So they've got a lot of commitment there. There's Greg. There's also a student that Greg and I had who's on the staff there too,

But chem eng has got more the attitude of working with industry that I'm used to. And I had good support from particularly Comalco. And Greg Quia worked on a Comalco project.

*And from your position at University of Melbourne -*

Yes.

*- looking back at CSIRO or looking in parallel at CSIRO as it was evolving at the same time, what were your impressions of CSIRO?*

That CSIRO – it's a different challenge. You see at CSIRO, Tom's the chief or I'm the chief. You've got your own budget. At the university you don't. So I don't see how the universities can control their science or direct it. The university science is directed by ARC grants or grants that you get. And they go to the individuals, they don't go to the chief or the head of department Prof. Whereas at CSIRO, you've got a lot more responsibility with the budget. But you can control a budget. So I think a chief's technically got a lot bigger challenge than the Profs have got.

*But also a bigger opportunity to do good?*

Much bigger. Much bigger. I didn't realise how little power I had as head of department. So what we tried to do with Melbourne was we tried to present Melbourne to industry. And I had some people there who were happy with what I was doing, by the way and the Profs were the ones giving me trouble. So we had, like 32 projects. 32 staff and 32 projects. I said well we have to be able to consolidate and come up with three or four areas in which we've got a skill base. And they don't have that sort of thinking, they're individuals. And what worries me, from the country's point of view is that when you can't present a university department to industry, how the hell are we training students that most of whom are going to go out and work in industry. They're not going to be university Professors. The good old days when the aim was to be like the Prof, next was CSIRO and then next was industry. I think that's farcical these days. Most of them are going to go to industry. The CSIRO can't take too many and the universities are not going to take too many either. So I think the universities have to realise they're training – most of their students are going to go and work out somewhere else. And that's what they should be training them for. So they need to know the sorts of things that Don Berryman would have taught them. The students like the intellectual property courses. It wasn't the students who stopped it. It was the staff, particularly the organic people. They think it's a waste of time. By that's how the world works, you know? And even now the pressure on people to publish and then file a patent – like the day before, and then find out we want to roll the patent over and we can't or we shouldn't have and we've lost it. Those sorts of things need to be in the courses, not learning them later on. So anyway.

*Anyway I think we've probably exhausted our topics for discussion today.*

Yes.

*Thank you once again for taking part in this project and we'll look forward to the transcript.*

[End of transcript]

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<sup>i</sup> Geoff is on Sabbatical with Fred and this is my first meeting with him. He and I share among other things a sense of humour. He is to be important in later years when CSIRO want to review my work.

<sup>ii</sup> Rugby league.