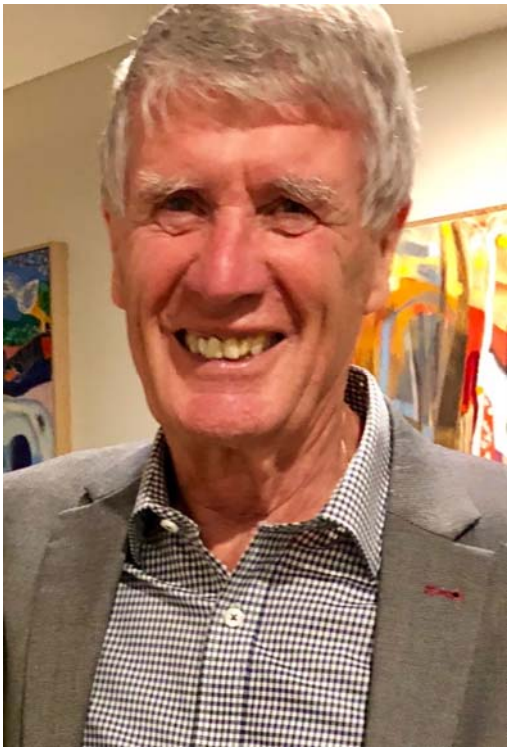
CSIRO Oral History Collection

Edited transcript of interview with Peter Robinson

Date of interview: 12th November 2018

Location: DATA 61, Sydney
Interviewers: Tom Spurling and Terry Healy



Dr Peter Mather Robinson AM, *BSc, PhD, DSc (Wales), FTSE, FIEA*

Summary of interview

Peter Robinson was born in Cheshire, England on 21 May 1935. In the first part of the interview, he talks about his experiences growing up in wartime and post-war Wales. He benefitted from the progressive social policies of the Attlee Government, in particular to the access it gave him to a sound secondary education. He talks about his tertiary education at the University College of South Wales and Monmouthshire and the influence this had on his career in research and education.

He recalls fondly his first experience in Australia. He had applied for a position with John Lysaghts, thinking that it was in their Cardiff operation, only to find that the job was in Newcastle, New South Wales! He went from there to a post-doctoral position at MIT, thinking that he would obtain a career position in a US manufacturing company. However, a meeting with Dr Walter Boas, then Chief of the CSIRO Division of Tribophysics, led to him returning to Australia to work for CSIRO.

He talks in detail about his first period at CSIRO, and in particular, how he developed close links to Australia's major metal mining and manufacturing companies.

Peter left CSIRO in 1980 to work for Metal Manufacturers Australia. He gives great insight into challenges of working in the branch of a large multinational company. He also discusses his interactions with CSIRO during this time.

Peter returned to CSIRO in 1990 as the Chief of the Division of Manufacturing Technology after being approached to fill other roles in the Organisation. He describes his achievements in that position and his reasons for serving only one five year term.

In the final part of the interview, Peter talks about his time as the Senior Deputy Vice-Chancellor at the University of Wollongong and his post-retirement activities.

NOTE TO READER

Readers of this interview transcript should bear in mind that some editing of the transcript, including additional material in the form of footnotes and endnotes, may have occurred at the request of the person interviewed.

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This is an interview with Dr Peter Robinson for the CSIRO History Project, Oral History Collection. It's the 12th of November 2018 and we are in an office at Data61 in Sydney. I'm Tom Spurling and with me is Terry Healy. Thank you very much Peter for agreeing to come to this interview. Could you please confirm your understanding that Swinburne University of Technology will own copyright in the interview material, and that access to the material will only be given in accordance with the instructions you give us in the rights agreement?

Yes, I do.

Thank you very much, and Peter thank you very much for sending us the Meanderings of a Journeyman, Basic Science, Transitional R&D and Industrial Implementation, your own recollections of your illustrious career. That helped us a lot in preparing for this interview. So I think what we'd like to do in this interview is just to start from the beginning. You were born in Altrincham, Cheshire on May the 21st 1935, but I always think of you as from Cardiff. So how did you get from Cheshire to Cardiff? Can you tell us a bit about your early life, your parents, siblings, primary school?

Well my family, grandparents, great grandparents all came from Cheshire basically from two small villages, one Holmes Chapel and the other *Altrincham*. My grandparents on my mother's side were in service, as was my mother. My grandfather was head gardener at a big house where the owners went back to Norman times, my grandmother was chief cook and my mother waited on tables. However, it was a pretty good life. The family had estates in Ireland, so my grandparents and my mother regularly went to Ireland every year to their other estates, and when the big-house was sold in the recession, actually my grandparents ended up -

The 1929 recession?

Yes, became caretakers there for a number of years. The other side of the family were really tenant farmers, seems to have been a lot of poachers and gamekeepers -

The Robinsons?

The Robinsons and the Mathers. So, my mother and father married young and left the nest, they both left. My father got a job as a salesman. Prior to the Second World War we left Cheshire, we went to Glasgow for a while, then to Edinburgh and then to Cardiff. Cardiff must've been about '38. My father then volunteered for the Royal Air Force prior to the outbreak of the Second World War, which meant he was in the RAF Reserve, which in turn meant he didn't get demobbed at the end of the war; he was kept on for another few years. So, dad was away all the time I was at primary school. So there was just my mother, my sister and myself.

So you have one sibling?

Just one sibling, yes. Wartime in Cardiff was a formative period. We had a lot of bombing and strafing, the former during the day and the latter at night. Our street, I realise later, had

the marshalling yards at one end for the coal trains coming down from the Welsh valleys with steaming coal to go to Cardiff docks, which kept the Royal Navy running. Prior to D Day, we had an American regiment on the Common and the Welsh regiments, the Fusiliers and the Welsh Guards. Towards the critical part of the war we were actually, looking back at it, in an armed camp so we got extensively bombed, which made going to primary school interesting. However, when that came to an end and the Attlee government got in power there was a revolution in education in Britain, and people from my generation started to be the first in family to go to high school. I was lucky enough to get into a high school, just scraped through the 11 plus.

And this high school was the Penarth County Grammar School in South Wales?

For Boys.

What year was that? Was that 11 plus?

That was 11-plus so it was what -

'47 to '53 -

Yes, '47. So that was quite a revolution. To start with, I got the magnificent outcome in the 11 plus, I think I got 38 out of 100, so I was at the bottom of the pile going to grammar school. Penarth was a very wealthy area, long established grammar school, so the Whitchurch boys who came at the bottom of the 11 plus had to go there to level up the demographics and the academic ability.

And was that a deliberate government policy?

Yes, it was Westminster policy and then the social equalisation of effectively bussing kids around, it was the local government, yes, Glamorgan.

Were you bussed to the school?

No, I went by train, so we all travelled separately which was a great social experiment in itself. So at school I was very interested in chemistry and physics in particular -

Can I just go back briefly to the primary school experience. At primary school, it was a struggle or you didn't have an interest in mathematics or science at primary school? So, 38 out of 100 meant that it wasn't a terribly good primary school.

Primary school only went to junior school, probably up to the age of six or something like that. At junior school, I did well in some years and not well in other years. My final two years were somewhat chaotic for some reason.

Was your father back from the war by then or was he still being demobbed?

He got back in '47.

So about the same time.

Yeah. He was away all the time I was in primary school, then junior school. I don't know what the reason for that was in junior school, when I got to high school, the reasons for my confusion I think I saw unclearly at the time, and I've seen more clearly since. I was very interested in science and all its aspects, but we had to rote learn all sorts of things. I can remember in chemistry being fascinated by the oxides. Why do you have MgO, and why do you have CuO, but you've also got Cu2O3, and why is iron Fe_2O_3 and Fe_3O_4?

And FeO.

Yes; and physics was even worse. We were taught in optics that light travels in straight lines. Well it seemed obvious to me as a young imbecile, well I can't see how it travels in straight lines. If it travels in straight lines there's going to be a dark spot there somewhere. If somebody had just told me about the Schrodinger equation at the time, I would've understood.

So you're saying in a way that the Penarth County Grammar School was a very old-fashioned education?

Yes, it was the education of its time.

And were the teachers at this grammar school elderly people who'd been there for a long time or were you starting to get new graduates coming out of the system?

Very much the latter. I was taught maths by Captain Saunders who insisted on using his First World War title. We all called him Captain Saunders. Yes, the new wave of teachers certainly hadn't all come through.

Can you remember any teachers who influenced you at that school? What you're saying to us in a sense is that your interest in science was sparked by your own curiosity rather than by a -

No, the physics and chemistry masters were actually very good. We did a lot of prac work, and the prac work I understood. Especially in physics, we did a lot of simple to complex experiments, which were observation and what you deduce. So, they inspired me, but the teaching method was entirely different than that currently experienced in schools. It started off with the assumption that it was better to make us see that we were dumb, that we were not bright; therefore, everything was to hammer you down. To get 50% in an exam was brilliant. You were constantly told you were dumb and you didn't understand and you've got to work harder. So instead of leading it was driving. But still the science masters I had were inspirational, it caught my interest.

That leading versus driving, was that a reflection of the school or society as a whole?

It was of a society as a whole, yes. There was nothing unusual about Penarth at all; it was the norm for the time.

You describe that you went to this school from the West -

Yes.

The lower socioeconomic area of Cardiff into a higher, can you describe how that social experience was for you? Were you looked down upon by the other boys, the richer boys?

No, not really. There were a number of things which counted how good you were at sports and how quick you were with your fists.

So you were quite good at sport?

I was quite good at sport.

What sports did you do?

I played rugby and cricket for most of the time. Welsh rugby at that time was pretty brutal and schoolboy rugby was brutal.

At the end of high school, Country Grammar School, did you do A levels or matriculation, or what was the system in those days?

The system was after the first five years you did Ordinary Levels, and you took about six ordinary levels. That had to include French and Latin - I think I took French, Latin, Geography, History, Chemistry, Physics and Biology.

Not mathematics?

And pure and applied mathematics. No at that stage. I think it was just mathematics, that was eight. Then you went into the Lower Sixth and then into the Upper Sixth. So that was one curriculum. So, in sixth form I just took pure and applied maths, physics and chemistry, so just those four subjects for two years.

How old were you when you went to university? You spent seven years at high school?

Yes.

That's a long time isn't it?

Well, again there were peculiarities of the time. When I went to what is now Cardiff University, which used to be University College of South Wales and Monmouthshire, the degrees were four year degrees, but if you passed the A level subjects at a high enough level you actually got exempted the first year. So, I actually ended up getting exempted the first year and did a three year degree. So yes, it was a long time at school.

So you scraped into high school but got into university quite easily?

The lead-up exams, the trial exams for me were disastrous. I got 21 in physics and I think 38 in chemistry, but I think that's just because they gave us lower marks to make us work harder. I passed the actual A-levels quite well.

And they were a national exam?

Yes.

And having passed the A levels you could've got into as you say Cambridge or – at that point what were your options for doing a tertiary education?

Go to Cardiff.

Was the University College of South Wales and Monmouthshire, was that an independent or was it a college of somewhere else?

It was a college of the University of Wales.

Was that at Aberystwyth?

There were University Colleges in addition to Cardiff; there was University College Swansea, University College *Aberystwyth and University College Bangor. University College Bangor at the time I was at university had the distinction of delivering all their courses, including physics and chemistry in Welsh. I can never work out who wanted a Welsh speaking physicist but -*

Did you have to learn to speak Welsh?

Yes, at primary school and junior school.

So you went to the University College of South Wales straight from school and into second year, did you have a scholarship or how was that funded in those days?

Yes I got a County Scholarship. The individual counties used to -

So were you dependent on your parents at that point or were you now pretty much independent?

When I finished high school, my parents moved from Cardiff to Leeds. I could've gone with them to Leeds and tried to get into Leeds University, but I decided to stay in Cardiff, which I think was a good decision. So I had a County Scholarship, my parents gave me a small amount of money, and I worked at part time jobs at university.

So what was your father and/or mother doing at that point in employment?

My father had started off as a clerk before the war. He'd worked his way up. Dad had had rather a good war actually, apart from being away from mum for seven years. He went ashore in the landings at North Africa against the Vichy French, was with the RAF all the way through the African campaign, then was sent to G Force in what was the Trucial Oman States, which is now the Gulf States, then to India before the troubles arose, and prior to that when the 14th Army was going down the Burma Road and the RAF and US Air Force were providing cover there. But dad always said there was a lot of downtime and one of the options he took through the RAF, there was one of the Oxford Colleges that ran extension courses. So, dad actually spent seven years educating himself when he wasn't on duty. So when he got back he joined a company called Roneo who used to make the -

Yeah, Roneos.

The Roneos funnily enough, yeah. So after the war he became branch manager in Cardiff and then he went to Leeds as branch manager there. So, things were getting better financially.

When your parents went to Leeds, where did you live?

I lived in Cardiff.

In a college or digs?

No, just digs.

Where was your sister at this point? Is she older than you or younger?

No younger, living at home. She was living in Leeds, but she left home and went to Glasgow to do physiotherapy.

So we're back now at the University in Cardiff, what was that experience like? You did engineering?

No I did science -

Sorry, but it was a physics course with metal – metal physics?

Yes. I went to university without really any knowledge of what I wanted to do. It was obvious at the time that the future, if you wanted a white collar job, lay in science and technology. That was obvious. So I wanted to do physics and chemistry and then I found out about metallurgy. I did a double first degree in chemistry and metallurgy, I'd taken subsidiary physics.

Was metallurgy a separate subject?

Yes, totally.

Was that unusual in universities at that time to have a separate course in metallurgy?

No. There was a subculture of metallurgy that I think chemists and physicists did their best to avoid and ignore. In England, Imperial College was strong, Sheffield, Birmingham, Manchester in particular, Leeds was strong in physics and physical metallurgy. In a way when you looked internationally, MIT was there in the 1860s, Cardiff as a metallurgy school was there in the 1890s, in Australia in the 1860s and 1870s there was the Ballarat School of Mines, Broken Hill School of Mines, and the Kalgoorlie School of Mines and those were all mining and metallurgy schools. So yes, it was somewhat specialist.

You say that interesting course material came from the CSIRO Division of Tribophysics.

Yes.

So CSIRO's Tribophysics Division was quite well known in circles in the UK, presumably because of the chiefs that they – Bowden and Boas.

Bowden and -

Walter Boas.

No, there was Bowden, then there was another chief, and then Walter Boas came straight from Germany, he didn't go through the Cavendish. But yes, Directors of the Cavendish were gods in UK scientific circles.

So you went into second year, so you had second and third year and then an honours year -

An honours year, yes.

And in that honours year is when you did this field of physical metallurgy -

Which was just emerging. Textbooks were just monographs, which were just starting to be written. There was a great one by Cottrell on metal physics. But in our Honours year, yes we went back to original sources papers, which were being published in the last few years. A lot of the papers were from Tribophysics and the Physical Metallurgy section of Melbourne University, because they were at the front of an early dislocation theory. The theory was that dislocations in the atomic lattice actually controlled physical and mechanical properties. Tribophysics, jointly with the Metallurgy Department in Melbourne University, had an early theory of how this worked which was later discredited, but it did form the basis, it was valuable input into, what eventually became the standard theory. So yes, Tribophysics was up there with the best in the world and well regarded.

So your supervisor in Cardiff was Richards was it?

No, Reece Rawlings for my PhD.

Was he a recognised scholar in this area -

No, no.

You were sort of developing it with him?

Yes. One of the great things about metallurgy at Cardiff was its culture. It was a very small Department, I think we had 20 in our undergraduate year but nine in the Honours year, and three of us started our PhDs together. There were five staff, they were all ex-servicemen who had been through the war and then had their education after the war because the Attlee government put great store on giving scholarships to those who'd served. So it was a culture whereby the staff never made any bones about the fact that they'd read the textbook the night before they gave the lecture, so they were at least 12 hours ahead of us. So it was a very inclusive culture and we all learned together.

When I started my PhD Reece had had one PhD student before, so it was all new to him. He was more of a senior colleague; there was little distinction between the staff and students. We all socialised together, which with Reece was rather disastrous because he used to make homemade elderberry wine. Got locked out in their back garden because his wife wouldn't let us back into the house on a couple of occasions.

Can you fill in briefly for me because of my lack of knowledge of the British economy at the time, but was Cardiff the centre of – did that have connections to the steel industry?

Yes -

Why was there such an interest in metallurgy at Cardiff?

South Wales was coal and steel.

Did it have iron ore or was the iron ore imported?

That is a very perceptive and good question. In the early days the ores were laterite ores which were mined in Britain, as they had been since the Industrial Revolution. That was certainly going on until the end of the Second World War and afterwards. Later on there came a predominance of imported ores, especially from places like Australia, but initially they were all domestic laterite ores. In South Wales, every little village had its pit and its tinplate works. I think when I was a kid there was something like 400 tinplate works in South Wales. In Cardiff, for steelworks we had Guest Keen and *Nettlefolds, Guest Keen and Baldwins and John Lysaghts, each of which would've been larger than BHP, Port Kembla at their height. A lot of fabrication –*

As well as those three, up the Ebbw-Vale valley was another big steelworks, then they built the Steel Company of Wales at Port Talbot, so that's five major steel plants. Cardiff was the major coaling port in the world. As I said before, it completely supplied the Royal Navy with steaming coal. Cardiff colliers used to go as far as Aden, and sometimes as far as Colombo, fuelling the fleet.

And were these underground mines?

Yes, underground.

No open cut mines?

In my course, one of the things I did was fuel technology, which is half mining. The Welsh coalfield is unique in the world as it goes through five types of coal going down five valleys. So you've got steaming coal which is for power station generation, coking coal for steel, anthracite and everything in between. The seams were generally six inches, had to be worked by a miner on their side with a pick, and faulted every few yards very often, but very, very high quality. Very, very difficult to mechanise so it was all very labour intensive, as were the steelworks. So if you were brought up in South Wales, the choices were, you go down the pit or you go into the steelworks; which for my generation meant trying to get a white-collar job was something very important. Didn't matter what it was, but to wear a collar and a tie was -

Was that university department connected in some way to the steel industry around it? Was the interest in metallurgy sparked by the industrial milieu or funded by it, or did Dr Rawlings decide that that was what he was going to do because he could see that it was of interest to people?

The metallurgy department was on Old College, which was the 1800s part of the university. Metallurgy had its own building. It had its own building since 1893 and the Department was setup with clear objectives. It was to turn out technocrats to run manufacturing in the empire, and it was quite straightforward. Even in our year, we had to do every summer break on the shop floor in industry. Some of the guys went to Northern and Southern Rhodesia and to Malaysia and places like that.

Even Australia?

I don't think for summer vacation - this was for the summer vacation training. The ethos was we learnt production technology in iron ore and steel production, non-ferrous production. In our practical classes we learnt to assay gold, assay silver, do all the things that you're likely to have to do in the colonies, and learn all the skills that you'd have to do it. As Prof, a gentleman, used to say gentlemen, "When you're in the bush by yourself lad you're going to have to do everything, so you've just got to learn how to do it."

So Peter in some ways what you're describing your early education was really great training for your later interests in the whole idea of a research organisation and its selection of research projects and technology transfer.

It was totally formative when I look back on it, and it's stayed with me all my professional career, all my life, that inclusive culture and the concept that the natural world and the industrial world are indivisible. You've got to look at the total picture, not just part of it, and to do that you've got to have a wide variety of skills and you will be excellent at some of them and you'll be a workman or a journeyman at a whole host of other things, but at least

you have enough skills to appreciate what's going on in various aspects of complex organisations which are changing with time and especially on a production floor, which is changing all the time. So yes, in retrospect it was a great education.

I think I'm hearing that at that point in time there was still an idea of empire and that England/Britain or Great Britain saw itself as driving not just industry and enterprise at home but also around the colonies, is that -

That's correct, yes. At the end of the Second World War, the troops didn't really come home until the mid '50s because there were a series of nasty little colonial wars all over the place. Those ended up really with many of those former colonies staying as part of the Commonwealth. What it meant in many cases was the commercial and industrial activities, which had been going on in Malaysia, Africa et cetera, just continued. So, I don't think the Department changed its cultural outlook at all. They were producing technocrats for the world, not just working in Cardiff. No matter where you go, these are what you've got to deal with.

And that would've dictated how many were produced. More was needed just to service the British Isles presumably?

No, the numbers were very small.

Like the leaven in the bread?

Yes. You raise an interesting question because at Old College, after the war, the National Coal Board built a big Department of Mining, which was run on a national scale and that was very much focused on South Wales, whereas the Metallurgy Department stayed small but stayed domestically and internationally focused.

And the other dimension I was wondering about was the workers versus the bosses which was still pretty strong back in those days.

It was.

And did that affect anything that you had to do? Were you seen as being trained to work on the side of the bosses?

Within the Department, what set it aside from chemistry and physics was that in chemistry and physics there was a hierarchy of the professors and senior staff and then the students. In metallurgy there was none of that, everybody mucked in together. We were trained to be technocrats, which meant in retrospect, I interpret as that we could move between the shop floor and the boss's office with ease, and we could understand both points of view. In a way, we were trained to be the technological facilitators, not to be bosses.

Can we speak briefly about Reece Rawlings. So he'd been in the Royal Air Force and had come back and done a degree, did he have a PhD from somewhere?

He did a PhD yes, he did first a degree then a PhD.

After the war?

Yeah.

So he did all that pretty quickly.

Yes.

And established himself as an academic at the University College in South Wales.

I think he was just a lecturer.

So he and you are sort of learning to be academics together.

Yes, absolutely.

So in a sense that was a very interesting experience for you wasn't it to -

Totally.

To be part of somebody else's developing career.

Yes. What Reece taught me was how to deal with issues, and that was a result of his war experience. Everything was very informal, but very structured. We worked together on my PhD. We talked every day, and not like what happens now, you see your supervisor once in a blue moon. I kept detailed daily logs, because that's what Reece told me to do. So we wrote everything down as we did it. There was no automatic recording or anything. Reece went through my logbook and signed it off every week on a Friday. On a Saturday morning, all the research students came in and with the five staff and Prof they would sit down and we would present our week's work, and what we'd done and what we'd learnt from that, and then for our program for next week to be critiqued. That was open-ended. Sometimes on a Saturday we didn't get away till three or four o'clock or something like that, but that was a very valuable day. That was just discipline and it worked. The result of that was I did my PhD in two and a half years.

Did the University College of South Wales and Monmouthshire have a PhD program from a long time back or was it a post-war program? When did PhDs start coming to those sort of universities?

That's a very good question. It was certainly pre-war. It was probably in the early 1900s I think.

Australian universities -

It was '56, yeah.

*in the late '40s, early '50s. There are many previous PhD graduates f*rom -

Oh yes.

Okay. Briefly, I'd like you to comment on your decision to stay in Cardiff and not go to Cambridge. That seems to have worked out all right for you.

Yes. First of all, it was a surprise to get an offer from Cambridge. I got the offer; I went to Cambridge for about a week to talk to people. Cambridge in metallurgy at the time had a mixed reputation, one might say. The project that I was offered was one to do with surface tension in molten sodium systems. It was really related to corrosion fatigue failure in nuclear reactors with molten sodium cooling fluid. Experimentally it was very difficult to carry out. The program that was suggested was a basic physics program of just taking different stainless steel substrates and putting a drop of molten sodium on them in a controlled atmosphere, measuring surface tension effects and then stress corrosion cracking effects on the substrate. It would be interesting theoretically, rather laborious, but what struck me was that it wasn't really addressing the issue.

The real issue was one of controlling turbulent flow in the molten sodium stream so that it didn't get cavitation on the interior of the stainless steel tubing, which would lead to cavitation erosion and then stress corrosion cracking. When I looked around the labs at Cambridge, the thought of pumping molten sodium around a big experimental rig didn't really attract me. The project I got offered with Reece at Cardiff was far more interesting from a basic metal physics point of view. After being inspired by the stuff out of CSIRO Division of Tribophysics that's the way I wanted to go.

So Peter you say that your external examiner was Alan Cottrell from Kings College Cambridge, what was the process for examining theses? Did you give an oral or was it a process like we have here or a different sort of a process?

It was a single examiner -

And that was Sir Alan Cottrell.

Yes and how the Department got him to read it, I don't know.

So he didn't come to Cardiff to talk to you, he got the thesis?

No, he didn't. He didn't just do my thesis, he did some others. If he felt an Oral was necessary, you had an Oral. He didn't bother giving me an Oral.

And he thought you'd done a pretty good job and you decided that you'd get a job after -

Well I thought I'd better get a job, that's the next thing.

So you didn't think then of getting a job as an academic, you wanted to get a job in industry?

It never occurred to me, a job as an academic, no. No. Never occurred.

So you finished your PhD and you started applying for jobs in companies?

Yes.

So can you tell us a bit about John Lysaght and Company. Terry and I have lived all our lives in Australia and we're used to seeing the Orb.

Yes, Lysaghts -

Galvanised iron. I always thought John Lysaght and Company is an old Australian company, but it turns out it was a Welsh company.

Well it was East Anglian actually. It started off treating the laterite ores out of the counties around East Anglia. I think it was founded in the 1870s, it was a family company so they had works in East Anglia, in Newport, Cardiff -

Bristol.

And Bristol, yeah. So they were very much a local company.

And you applied for a job there.

I saw an advertisement in the South Wales Echo, which is the local paper, and applied for that. Then belatedly, maybe I didn't read the ad. closely, probably didn't, found it was for a job in Australia, not in Cardiff.

So that was a bit of a surprise for you.

That was a bit of a surprise.

When we've been reading your autobiography you use the personal pronoun I and then after a while you use the pronoun we, so presumably at sometime during this period you got married? Were you married before you went to Newcastle or after?

We got married while we were at university. So it should've been – it's probably a mistake to have claimed personal ownership of some of those decisions. They were joint decisions definitely.

And you also mentioned kids fairly early on in terms of once the kids were in bed you -

It was six years before we had any kids.

So you got the job at John Lysaght, you came to Newcastle with Ann.

Ann, yes.

Tell us about the cultural experiences of going from Cardiff to Newcastle. Was it a culture shock in any way or did you just take it in your stride?

We just took it in our stride. The one enormous positive out of the first week we were there was when we did the washing and put it on the line it dried in 15 minutes, rather than still being wet a week later.

And it was white still.

So, after that everything was great.

The laboratory that you went to in Newcastle, was that a well-equipped industrial laboratory similar to what you were used to or were you there to develop it? What was your task as a young PhD from the UK coming out to Newcastle?

Newcastle research laboratories in John Lysaghts were extremely interesting; it was an extremely interesting place. The director Don Cameron was a real character. He was a man of towering intellect and his sole qualification for running a lab was an MA in Botany from Cambridge. He was a self-taught thermodynamicist and a bit of a kineticist. I was a bit of his favourite, he used to spend a lot of time with me in obscure discussions about thermodynamic theory and interactions with kinetics et cetera. Don was a person who was totally immersed in the abstract and the theoretical, which is why Lysaghts had a research laboratory and a big technical laboratory.

The technical laboratory and the research laboratory tended not to speak to one another because of clashes of temperament and outlook between Jack Hawkings, who ran Technology, and Don Cameron who ran Research. When I got there, I found out I had been recruited for special reasons, but it was never clearly enunciated to me. The main product of Lysaghts was galvanised iron. The whole reason for the Australian operation being established in the early '20s after the First World War was because Lysaghts, from the UK, they'd been exporting galvanised building materials to the Pacific Islands and to Australia since the 1890s and the market had got big enough to sustain in-territory operations. After the First World War, they did the magnificently "brave decision Minister' of dismantling the Newcastle works, putting that on a freighter and then shipping a lot of the workforce out to Newcastle to build a works and to get it operating.

So just before I arrived an equally big decision had been made to modernise the galvanising process on a Newcastle works. That consisted of first of all you'd take your low carbon steel sheet, you'd stack it up in coils in a vertical furnace, heat it from room temperature to 730C, to take it through the ferrite to austenite transformation, hold it there for a couple of days and then cool it down to get ready to galvanise it. That took five days, and then you batch galvanised. Now a number of companies around the world had tried to change this process. There was another two processes in the States, which were in their fledging stages, but the one that caught Lysaghts' attention was the one developed by Bethlehem Steel.

Bethlehem tried this revolutionary process, which entailed cutting down five days in the process to 30 seconds. That looked good, except Bethlehem could never get it to work so they abandoned it, and Lysaghts bought all the patents. Then Don Cameron in his magnificent certitude decided we could do it, and the company actually spent $14.4 million on that installation in the early '60s. However, when they got it operating they had all the same problems that Bethlehem had, in that product quality was intermittent and variable to say the least, and that controlling the process was very difficult. So when I arrived that process was just being commissioned.

Really I should've been there three years before because the only way to get that process to work was to use the latest metal physics techniques which were just being developed, and the two critical ones were internal friction measurements where you can follow the movement of atoms, the primary atoms, the iron atoms and then the carbon and nitrogen atoms from one lattice site to another and then look at their formation and dissolution in the annealing cycle and then re-precipitation of mixed carbo-nitrides, which you needed So we had to get that process right. Then in the galvanising stage you've got this much modified hot strip going straight into the galvanising bath and you get the zinc layer on the outside, then you get a layer of inter-metallic compounds between that and the base steel. You've got to control the growth of those, and you've got to control the size of the interface and the nature of each of those layers. You can't do it by just twiddling on the shop floor. When I arrived there was no internal friction apparatus. Maurice de Morton at DSL in Melbourne was the only other guy doing those measurements in Australia. We needed a transmission electron microscope; there were two of those in Australia, both at ARL. But Lysaghts had ordered one from Phillips, so Don had at least thought that far ahead. So when I arrived, about a month later the microscope arrived from Phillips in Holland, in seven packing cases and a pile of instruction books you could sit on, in Dutch. I'd never seen an electron microscope before -

So there wasn't an electron microscope at Cardiff?

No, oh no. Electron microscopes were really revolutionary at this time. They were the very latest. There were two in Australia, both in the Aeronautical Research Labs, and they'd only just got theirs. So we were faced with first of all assembling it, which when you haven't seen one before was quite difficult, and then commissioning it and getting it working. For that I did manage to get a young guy from a nearby migrant hostel by the name of -

Richard Hannink.

Richard Hannink yes, who later was CRS in CSIRO, but then he was an 18 year old who'd failed New South Wales leaving certificate twice and, therefore, he'd given up on education.

But he could speak Dutch?

But he could speak Dutch, and he became a bloody good electron microscopist actually -

He certainly did.

So we eventually got it going, but that was a really dicey period because if we hadn't got those tools, if we hadn't carried out the research, which should've been carried out previous to making -

By Bethlehem Steel?

By Bethlehem Steel, or at least Lysaghts before they committed $14.4 million, we'd have been in a mess, but that worked out well in the end.

So can you just briefly comment on the influence that Don Cameron had in your career? You say that he challenged you and shook you out of your complacency.

Yes. Life was extremely good in Newcastle. I gave up playing cricket because the beach seemed far preferable. Life was good; Ann had a good job, where she was earning more than I was.

What was Ann's job?

Well, Ann was a histo-chemist who worked at the Welsh National School of Medicine, while I was doing my PhD, which was handy because that was just across the road from the Department. The Department was the sort of place where all the girls came in at night and used to cook dinner in the chemistry lab. It was very social. So when Ann got to Australia there were problems with Newcastle Hospital and UK medical qualifications. So we looked round for a job in the Newcastle Herald for which Ann would be eminently unqualified. That was the only qualifications for looking for a job. So we found a job where she had to be able to drive, she had to have a car, she had to have training in fashion and colour consultancy and had to be able to type. She didn't qualify in any of them. She eventually got the job and thoroughly enjoyed it. So both of us were earning extremely well.

We bought a house. We were staying definitely, but Don kept niggling. First of all he would have me for hours in his office, and he was a towering six foot six Scotsman, and he used to sit with his hands behind the back of his head with his eyes closed when I'd make a point, and the longest I've sat, without any exaggeration while Don thought about a riposte to my latest thrust, was two hours. He was always niggling me to think laterally, to use the techniques and the ideas I've got in a variety of fields. I never had the temerity to point out to him that the real task at hand was that he'd committed $14.4 million to a production line that wasn't running. I thought we'd better get that running. Basically he made me realise that I might be good at my job – I'd never thought of myself as a professional, having a professional career, and Don opened my eyes to that. He literally said to me, "What do you want to do when you grow up?"

So he was a very influential figure in your life?

Look, he was totally influential. For goodness sake, he suggested I write to John Chipman at MIT. Chipman was one of the doyens of metallurgy, who Don must've obviously met in the past. But without him prompting me I -

You'd still be in Newcastle.

I'd still be in Newcastle, yes.

Just before we have a break Peter, you mentioned in your writing that you were very impressed with the nature of the cooperative research network within Australian metallurgy, but that the CSIRO Division of Tribophysics didn't appear to be terribly active in this network. Can you just briefly comment on what you mean by all of that? Who else was doing metallurgy in Australia?

The big ones - Defence Standards Labs, had a lot to do with them, Aeronautical Research Labs, Comalco, BHP, Rio -

Okay. Industrial labs as well as university labs?

Oh yeah. Look, the industrial labs were bigger than university labs, far more influential. There were a whole range of middle-sized entrepreneurial companies on a run – it was just a very vibrant community.

But the Division of Tribophysics wasn't really a part of that you were saying?

Look, they turned up at Institution of Metals Conferences, and it was always an entry led by Walter and then Leo Clarebrough and Max Hargraves. I always felt there was a royal entry. There were little things; when we got an electron microscope, when it was heard around the traps, ARL rang up and said, "Would you like to come down here", they actually said, "You'd better come down here and -

And learn how to do it.

"And have a look at ours and learn how to do it." So that sort of thing. Tribophysics, they were friendly but not intimately involved.

They got an electron microscope eventually though did they?

They did, yes.

Did they not try to make their own?

They may well have, yes. Tribo became big in -

Who was Alec Moody?

In Chemical Physics, Alec Moody was one who did try to build his own. I think the ones in Tribo were – but I hadn't thought about it in these terms before; in John Lysaghts we had an electron microscope before Tribophysics did!

So we're now going off to *Massachusetts Institute of Technology, but we'll have a bit of a break before we do that.*

[Pause]

Okay, so we're back from a short break talking to Peter Robinson, and Peter you've just decided to take Don Cameron's challenge and go to Massachusetts Institute of Technology. You and Ann, were there children by then?

No. We had our first son in Boston.

So how come you went to MIT with Professor Michael Bever.

Basically, what I said to Don Cameron, "I will go to the best place in the world for metallurgical thermodynamics and I'll come back and win a bloody argument with you." So that's why I went to MIT, although Don had suggested it before that I write to John Chipman who was then Head of Department.

Presumably, the laboratory at MIT was a very well equipped laboratory compared to the one at Newcastle. Were you going -

It was very specialist. It was liquid tin calorimetry for measuring the thermodynamic properties of materials, especially intermetallic compounds. We were working on three-five and two-six compounds, mainly those that were being looked at from – as contributing components in spacecraft actually. So there was very little known about the basic physical and chemical properties of these materials.

So when you talk about the thermodynamics of these compounds, these are essentially talking about the phase diagrams of the materials?

Yes, entropies, enthalpies, heat formation et cetera and further contributing to their phase diagrams.

Was MIT, that was the leading place in the world at that time for that work?

Yes, or at least one of the leading places. We were closely associated with the US Air Force Lincoln Laboratories who were interested in these types of compounds for the spacecraft. So I used to spend some time each week working there on different aspects, which was an interesting exercise in itself because as an alien I had to wear a lab coat with a big red A on the front and the back and had to be escorted when I crossed the corridor from one lab to another, or if I went to the bathroom I had to be escorted. But it was fun, we did some good work.

So it was a classified laboratory?

It was classified, yes.

Because you published quite a lot from that time didn't you?

Yes, that was the fuss. Getting in every morning used to take me half an hour, three quarter of an hour just going through the security checks.

I'd like to ask you two questions about Boston. You arrived in Boston in 1962 and left in 1965, that was a most interesting time to be in the US one would've thought.

It was extremely interesting.

Start of the Kennedy era and the moon landing.

Yes.

And the civil rights movement.

It had everything.

And the Kennedy assassination, so you were there through all of that?

I was there through all of that. It's hard to know where to start. The first general impressions; Boston is a beautiful place steeped in history and both Ann and I are very interested in history. It was an absolutely fascinating and exhilarating place to be. Socially we had a range of friends. Ann got a job soon after she arrived at the Boston Lying-In Hospital working in a lab which was associated with the Harvard Medical School. So she spent the three years really working with the Harvard Medical School and Boston Lying-In. So she had a range of friends from there, I had a range of friends from MIT, from all over the world because it was a very cosmopolitan environment.

The thing that struck us, and other people from overseas, was in all this history, culture and understanding, the blindness of people to the socioeconomic issues was enormous. MIT is across the Charles from Beacon Hill, the nicest part of Boston, the historic part. Mass Avenue runs between MIT and Harvard. Both are enclaves of living in affluence, and between them some of the worst coloured slums in the country and nobody seemed to notice. It was all so familiar that it wasn't noticeable. So it was a time of social upheaval.

And the President was from Boston?

Yes, Boston Irish. So in Boston having a President who was Boston-Irish sent ripples through the upper levels of society.

Yes, not very favourable ones -

Yes, yeah. Boston was a very aristocratic society. People went back to the Pilgrims -

And very WASP.

Yes, but very friendly. It was absolutely a great place to be.

So your training in Cardiff taught you this discipline that has stayed with you all your life, your training at Newcastle taught you this intellectual art of arguing and the thrust of intellectual debate, what is your memory of what MIT taught you Peter?

Insight, precision and especially the use of English, and getting everything just right.

So Michael Bever was a bit of a pedant was he?

Not a bit, he was a total pedant. Michael was a German Jew, he'd been admitted to the bar in Heidelberg, had practiced law in Germany, left in '38, went to the States settled in Manhattan, became senior counsel at Chase Manhattan. In the meantime married the heiress to the largest supermarket chain in the States, which allowed him the freedom to think about other things than law. He went and did an undergraduate degree in metallurgy at MIT and then stayed on and rapidly became a senior professor, but still kept on with his law work and with consulting work for a couple of big American companies.

He came to the US in 1938, you got there in 1962 so he was still establishing his career as a metallurgist or –

Oh no, he was very well established.

So he did that very quickly didn't he?

Yes, yes. He was working on, and I helped him slightly on it while I was there, I think it was an eight-volume encyclopaedia of metallurgy.

Mostly factual stuff?

All factual stuff yeah, with a lot of contributors. I've still got it on my shelf and it goes from one end of the bookshelf to the other. So he was very well established.

So your employment there was as a non-resident alien as you recalled, and you were a research associate/ postdoctoral fellow, was that a fixed appointment, or could you have stayed in America?

We went there on Green Cards. We intended to stay in America.

So how did you get a Green Card because of your birth?

No, I just applied for one from Australia. I just got given a Green Card.

By the time I went there in 1965 you couldn't do that, it was a development.

Yes.

So you intended to stay in the US?

Yes. With a Green Card I had to enrol for National Service, which I did, and because I was at MIT, I was Grade E, I think, which meant that my grandmother would've had to be called before me.

So you say you were intending to stay in the US, were you thinking then of becoming an academic or was your career plan to go from MIT to Bethlehem Steel or Westinghouse or –

Absolutely, yes. Throughout my career, I never had any intention to be an academic whatsoever.

So this notion of metallurgy was a part of manufacturing technology or a part of the industrial system was always uppermost in your mind?

Yes, it was always the top of focus.

And when you answer questions about being an academic do you mean I didn't want to be a lecturer or I didn't want to work in a university?

It was really neither. Being an academic actually never crossed my mind, I've just never thought about it.

Even as full time researcher in academia?

I never thought of becoming a full time researcher in academia. But you've got to remember I came through at a time when a full time researcher in academia was quite rare. One of the reasons, for example, for Division of Tribophysics being on University of Melbourne campus was to booster chemistry and physics research at the university. That was all part of the thrust. It goes back to what was mentioned earlier of the first PhDs I believe was in 1956 from Melbourne. There was not a research culture in Australian universities. So I would've thought it wasn't until the '80s or '90s where becoming a research –

Well it was probably in the Menzies here that – University of Western Australia had its PhDs in 1948; I think Melbourne was earlier than 1956.

I thought it was '56 –

Well the University of WA certainly had them in 1948 and research was gradually building up in the '50s and in the '60s after the Murray Commission which I think was 1957 and it had a huge change. We'll come now to your period of your post MIT career. So at the end of your postdoctoral work at MIT you had to make a decision what you were going to do next. So instead of staying in America and becoming an American citizen why did you decide to come to Melbourne?

Well given that Ann made it perfectly clear that she was willing to go anywhere in the world, except to Melbourne, the route by which we got to Melbourne was rather circuitous. During

our time at MIT we had our first child, Michael, who we immediately registered as a British subject at the Consulate in Boston. One of the factors about considering leaving the States was the question of whether we wanted to bring our kids up in the States or elsewhere. There were the social issues in the States. When I got back on the day that President Kennedy was assassinated, I was in the middle of a five-day experimental run on a calorimeter. There was to-ing and fro-ing in the day around lunchtime about whether the Institute would be closed or not and it was decided, quite correctly I thought, to close the Institute, so I aborted that run. But the number of people who objected to the Institute being closed quite surprised me. So there were divisions of opinion.

The thing that really stuck in my craw, and Ann's, was that if I was to continue with the work that I was doing, I would have to cease being an alien. The first three years at MIT and working at Lincoln were okay, but then we both had to become citizens, and we were both still young and idealistic and we both in our hearts of hearts balked at taking a pledge of allegiance to a country whose social laws and attitudes we weren't totally comfortable with. It seemed like being hypocritical for your personal good. The other pull was we both felt that we owed a debt to Britain, which was almost universally felt by the socio-demographic of graduates in the States at the time; everybody felt they should go back. So I looked at opportunities in the UK. I went quite a way down the path with people I knew in the Atomic Energy Commission, applied around in the States and I almost joined DuPont. As a matter of fact, I found out later one of the key guys thought I'd accepted his offer, but I don't think I did.

At DuPont in Wilmington?

Yeah, and General Electric was another possibility with Jack Westbrook. I'd already contributed with a chapter to his big tome on intermetallic compounds, and he was the head of the metallurgy lab there. Then there was coming back to Australia for lifestyle purposes, because we thoroughly enjoyed Australia. One of the good things about Australia in those days, the embassies kept close tabs on people so all during my three years at MIT, I was constantly contacted by the scientific attaches in the embassy –

In Washington?

In Washington, yes. On a couple of occasions I went down to talk to them, they invited me down and that sort of thing. They kept us; well I suppose I was counted as an Australian expat at that stage, up to date with what was going on, especially in the government agencies. So I think I got to the stage of I just left a CV with them and they used to pass them around, and if they got any bites they'd get back to you sort of thing. So coming back to Australia in some ways was very easy, especially compared with going to Britain. Time and time again dealing with people in Britain, "Love to see you old chap when you're next home." No concept of if they want to interview me they'd pay for the flight across or anything like that, it was always, "Oh yes, when you're passing."

So then, just on balance, the reason I came back was more - I was of the impression that I'd never applied for a job at Tribophysics. I've checked back on that and I find that actually I indirectly did, because the scientific attaché sent one of my form letters back to Walter, but

Tribo never got in touch with me. So when Walter actually came round MIT, I didn't know he was at all interested in me. We didn't have a formal interview. He was coming round –

But you had a conversation with him.

We had a conversation all day because I took him to see Chipman and other Professors, and took him from one lab to another, and what he was talking about just fascinated me. That's a good thing to do, and I'd be really interested in it because he was talking about what was the central theme of metal physics in those days, and that was to do with the work hardening of metals, which was a longstanding issue. If you take a teaspoon and bend it initially you can bend it easily then it gets harder and harder to bend it. Why?

And then it breaks.

And then it breaks, yes. In the 1960s, they still didn't understand that. It went back hundreds of years, Georgius Agricola in De re Metallurgica bought it up in 1556 in his tome of mining and metallurgy. In the early '60s there were papers being published on it still. So scientifically and technically it was a very difficult problem to address.

Can you remind us about what the industrial relevance of it was?

Well all of industrial practice is based on concepts like this. The work hardening of metals is the basis of blacksmithing; it's how you make horseshoes, it's how you make armour, how you make swords, it's how you make steel. It was indicative that scientifically, in a physics and chemistry of materials, we were still at the stage of struggling to explain observed phenomena. There was industrial practice which had evolved from the artisans and through the industrial revolution had been increased in scale and modified. It had been done in an empirical fashion by a lot of very bright minds, but we really didn't understand anything about the atomic basis of what we were doing. It's instructive that even in the mid '60s we were still struggling with the physical chemistry of steelmaking or –

It was highly phenomenological.

Highly, I would say totally, yeah. You try working out the chemistry of iron-making slags.

Very complicated.

Very complicated.

So the evidence is that you actually did apply for it through Mr Hartley at the –

Yes, it was Hartley.

Bill Hartley?

Bill Hartley, yeah, he was a great guy.

He was. I met him.

Yes, very good.

And you talked to Walter Boas - you say in your letter that you're happy to go over to England for an interview, did you do that?

No

You never had an interview?

Look, in retrospect I found out about that letter. Walter interviewed me while I was walking around. Bever dragged me out of the lab and said, "Walter Boas from Tribophysics in Australia is visiting tomorrow, have you met him before?" I said, "Yes", he said, "Will you show him around and take him around the department?" I said, "Yeah, of course." So I genuinely did not have - that was an interview.

So you get the job and you and Ann and Michael come to Melbourne to the Division of Tribophysics. What was your observation of the difference between the extraordinary work going on connected to the huge investment in science and technology in America at the time due to the space race and the various things that were going on to Tribophysics? You say in your notes that it was like a gentleman's club. Can you describe something of the culture change that took place between MIT and Parkville?

Yes. In some ways it was like moving up to another level intellectually.

Going to Tribophysics, mm.

At MIT, I was at one of the best environments in the world in my field and I learnt a hell of a lot. I dealt with a team of postgraduate students, which taught me a lot as well. With Michael Bever, I went through a lot of other rigorous training about experimental techniques, precision, insights et cetera. That was totally high level professional. Going to Tribophysics was like a gentleman's club. Walter Boas was one of the founders of the field of physical metallurgy or metal physics. The other senior people were international figures in the area. There was no discernible structure. Ack Daunt, who was the administrative secretary, ran the place. Walter never did any paperwork; if he got anything from head office or regional office, he just crumbled it up and put it in his wastepaper basket. We had one meeting of all research staff a year where we sat around in his office to decide how we were going to split up the meagre budget that we got from Head Office and that was all the administrative the work that was done. Walter led discussions and –

So when you arrived at the division were you given any guidance as to what you were going to do?

Yes, because on that day at MIT Walter and I had decided –

What you were going to do?

Only in retrospect can I say that, because he only offered me the job as he was getting in the taxi. We'd actually started to think through it. When I accepted the job, before I came out we decided we were going to work on certain molecular crystals. The biggest task in addressing that issue of growing very perfect single crystals with each atom on its lattice point, and then introducing a dislocation which means you break the connection between two atoms and then view how that dislocation forms and how it performs tangles.

Understanding that, was that using electron microscopy or x-ray diffraction or –

X-ray diffraction, neutron diffraction, a whole range of techniques.

Did Tribophysics have all the necessary equipment?

No, I did a lot of work at Lucas Heights. We got to the stage where we'd identified in talking things around that one of the biggest challenges was if we were going to go away from metals – and you go away from metals because metals are generally face-centred cubic, bodied-centre cubic and some hexagon. Face- centred and body-centred cubic are highly symmetrical, so when you deform the lattice you get slip on intersecting plains, and then you get dense dislocation tangles. By electron microscopy of the day, you could view those dislocation tangles, but it was very hard to interpret them. You had to interpret them by mathematical modelling which people like Alan Head were very good at. But the real issue was that like any mathematical models, your output is very dependent on the assumptions you make in your modelling. So there was a very big question of interpretation.

An even bigger question than interpretation is that in thin film microscopy if you've got a deformed material, it's highly stressed, internal stress is high, so when you take it down to a thin film you change the surface to volume ratio and the stress relaxes. The big question is, is what you see in a transmission electron microscope in a thin film anything like what you would see in a bulk material, and the answer's a really big question mark. Intellectually, the idea was to go to lower symmetric crystals, and the simplest ones were molecular crystals. The problem with molecular crystals is they've got a low tensile strength and high ductility, so handling them's a bastard without them deforming hopelessly.

When I left MIT the first thing I'd arranged, well Walter had arranged and I'd agreed to, is I went to Brookhaven National Labs in the States where they started doing some work like this for other reasons, but they were starting to grow large molecular crystals. I spent some time in Brookhaven before I came to Tribo. When I arrived at Tribo, I'd developed a complete work plan for what I was going to do, and I talked to Walter about it.

The resources to do what you wanted to do, did they just come to you or did you have to argue for them?

There was no such thing as arguing in Tribophysics, it was a gentleman's club. There was no organisational structure. People who wanted to work together, wanted to work together, and people went from one cluster to another and some people worked in more than one cluster. So it was very fluid. As I mentioned before, I started off doing some work with Leo Clarebrough's group because there were similarities with calorimetric techniques at MIT.

The molecular crystal group was just myself to start with, which is hardly a group, and then Henry Scott was finishing off some previous work he'd done, I'm not quite sure what that was, and then he joined me. Then Graham Ogilvie was likewise at a loose end, so he joined. Walter did offer me a position and I recruited Henry Rossell from Cambridge.

So Henry Rossell was at Cambridge, he was a university of WA graduate.

Yes, that's right. So that's how the group formed. But I started off with a plan. We had to build a hell of a lot of equipment to start with. Those days of being Tribo, Walter gave me a big lab opposite his office. He failed to mention until I opened the door that whoever had the lab before, and I think it was Ron Ham, had built apparatus in it to the stage where the end of the line of apparatus was at the door, and I literally had to start with an oxy-cutter and cut my way into the lab and empty it before -

So Tom's question about was there a plan and all that sort of stuff, you've answered that in relation to a research plan. Was there a component in that plan or an associated plan about applications and what are we going to do with this when we've got the knowledge?

No, absolutely not. That was not in Tribophysics' remit.

So your task was to publish this work?

Oh yes, absolutely.

On a similar vein your career at Tribophysics, you were spectacular in terms of promotion. So whom did you report to? Directly to Walter? Who organised your promotions?

I have absolutely no idea, I assume Walter -

So it was a mysterious process?

I assume it was Walter, yeah.

Basically it was a discovery laboratory.

Tribophysics was totally a discovery laboratory, yes. Tribophysics was about explaining natural phenomena, if you want to put it that way.

Did it have any connections with industry?

Not really. One's got to put this in a historical context of where the Division came from. The Division was initially formed before the Second World War as the Division of Lubricants and Bearings and it was very instrumental in providing support to the Australian aircraft industry during the Second World War and afterwards. Then there became the sea change and that was under Bowden. He was a distinguished academic, "lubricants and bearings" wasn't fancy enough so he coined the word for rubbing physics, Tribophysics, for the Division, and the Division's aim changed totally towards, I suppose you could say the explanation of key –

Solid state –

Phenomena, yeah.

As far as you're aware with no interaction with the government who were in effect at the end of the day supplying money or with the executive?

To my knowledge that statement would be correct. Walter was an independent character –

I think if I could just intervene slightly here, Stewart Bastow was a senior person in that Division and went onto the executive.

Yes, that was before my time.

Before your time, but I would've thought there would've been some possibly informal interactions between Stewart as a member of the Executive and the Chief of the Division of Tribophysics in general terms, but we have no evidence of that.

I was in no position to know whether that was true or not. Walter didn't go to Head Office very often, I was never aware of members of the Executive coming around the Division. I just don't know, I wasn't aware anything of that –

As I was saying, you had rapid promotion in CSIRO and by 1976 you were the Acting Chief. So you and Alan Moore seemed to alternate between being the Acting Chief of the Division. Walter Boas retried around 1970 so you were there for five years with Walter. He retired presumably because he was 65, age of retirement, he had to retire and you'd established yourself as a very important member of the Division with a new program on molecular crystals and had built up something of a group. What was the local impression as to who you were going to get to replace Walter? So what was the gossip around the tearoom about who the new chief was going to be?

Well the milieu was that two ex-chiefs of Tribophysics had gone on to be Director of the Cavendish Laboratory. A former member of the Division was Professor of Metallurgy at Cambridge. Another was Chief of Metallurgy at the National Measurement Labs in London. Tribophysics was one of three or four leading laboratories in metal physics around the world along with Cambridge, Oxford, UCLA and maybe Harvard. There was a coterie of distinguished ex staff members around the world, and the universal expert expectation was that it would either be an internal appointment or from one of those establishments. Internally there was some very credible candidates.

Was there a review of the Division?

Yeah, Hugh Muir.

So who did the review?

Hugh Muir from University of New South Wales.

And what did he say, do you remember? We don't have a copy of that review; do you remember what the review said?

Hugh's main thrust, I knew him before that and worked with him afterwards, was that the Division should become more balanced between applied activities and the basic work and that this shift should be managed over a period of time. The review was very complimentary about the standard of the academic work. I think Hugh said to me informally, I forget what he wrote in the thing, he said to me about my molecular crystal work, "It's an extremely interesting and elegant piece of experimental work, but it's essentially bloody useless", with which I readily agreed with him because there was no means of following through on it. It was a good brick in the wall of getting to grips with the atomic behaviour of materials, but it was far removed from the marketplace. So that was the main thrust of what was the formal Committee of Review, or of Enquiry, when a Chief retires and a new one's appointed.

What was the reaction of the Division when John Anderson became the chief? So he wasn't a metallurgist.

It was bemusement to say the least. Some of the chemists had heard of John Anderson.

Well he'd been at the University of Melbourne before he'd -

Yes, but the catalytic chemists, most of them were my year and hadn't been in the Division long. When I joined, there was a group of five of us who were largely from the UK who'd just joined. The catalytic chemistry group was only four people and they were three of my friends, became our friends, who were young catalytic chemists from -

And who were they Peter?

Margaret Sheridan, Alex Lawson –

Was Neil Avery there by then?

No, Neil Avery came afterwards.

And Peter – there was another one. Catalytic chemistry made up a very small proportion of the division's activity. It was somewhere, in terms of numbers, about 10%.

Why did the Division of Tribophysics have a catalytic chemistry group? What was that to do with, bearings and lubricants as its origin and then metallurgy, why did you have catalytic chemistry to start with?

I wasn't there at the beginning of that, but in the metal physics approach, surfaces were of the upmost importance. So we had people like John Nicholas who did a lot of work on the modelling of surfaces. All the work on field iron microscopy that Alan Moore was doing was surface orientated, and catalytic chemistry is related to surface reactions. So the rest of the

Division, they were interested in surface reactions with the atmosphere but more with the surface rearrangement of atoms which occurs when you've got a free surface and a relaxation of the stress systems.

Yes, I understand that.

So there was a vague connection, but it wasn't main theme at all.

So Peter, in the Walter Boas era, you developed a reputation of not only doing this pure science but you also started to have interactions with industry. So was that your own initiative or did someone encourage you to do it? It went against the general milieu of the Division of Tribophysics.

Yes.

How did that arise?

It was a mixture of both. I felt for my own sanity I needed to do something practical. It's just like doing a high stress job. Experimentally the molecular crystal work was very difficult and I felt for a few hours a week, "switch off and do something else".

Was that when Walter was still the Chief or did that come after?

I did a bit while Walter was the Chief. It started to build up. When John Anderson became Chief, I was already doing a bit of this and John encouraged me to do more. We had a divisional metallographer at the time and had a divisional glassblower. The divisional metallographer was Gus Perger, and Gus worked with me on a number of small things. So there was just an understanding that maybe it was worthwhile for Gus and I to have a look at what might be done in the area of more applied work, and that was with John Anderson's encouragement.

And John Anderson himself had quite good interactions with the ICI, Ascot Vale Laboratory through his catalytic chemistry work.

Yes, as we did later with production technology work I'd been running. We did a lot of work with Ascot Vale.

Could you outline, you started this informally talking to people, what contractual arrangements did you have and who managed those? Was that managed by you or by somebody from the regional administrative office or people from Limestone Avenue or not at all?

At the start of this exercise, I think my riding instructions from John were, "Let's see whether we can do something that's useful and based on good science." So I started actually just wandering around Collins Street literally cold calling on places. So Comalco, Rio Tinto, industry association –

So when you say cold calling did you ring up beforehand or –

Yeah. Sometimes I just pumped up to the front desk, but then you get contacts and then you start to call. One thing in Tribophysics, we had no networks like that at all, so it really was just cold calling, there was nobody to introduce you around.

Can I introduce a notion here from my background as a chemist, we have the Royal Australian Chemical Institute so we would have meetings and at our meetings, there'd be people from Monsanto and ICI and chemical companies, so we knew not that we did much with them but we knew the technical people from the chemical industry. Was there not such a professional society that you interacted with?

Well the Institute of Metals, yes.

So did that not supply a bit of the network?

The answer is yes, a bit of the network but not the main network. The Institute of Metals at the time itself was split. In Melbourne, we had an industrial wing and we had the physical metallurgy division. So there were two Divisions. Physical Metallurgy division was all our researchers. The other Division was mainly small business owners who were talking about the –

Tariffs and -

Yes, and the problems with running an electroplating shop and this sort of thing. What was missing was the contacts at the big end of town. What we found necessary was there that we had to go around and talk to people.

And by that you mean like BHP and CRA and –

And Comalco and the industry associations and, yeah. It actually was quite easy because quickly you found a few enthusiasts, and then the network began to develop, and then discussions began to develop and you got referred on. Then we started to get some idea of what the big end of town was seeing as problems in their customer chains and in their supply chains. I think that's where we started. Then of course afterwards we got intimately involved in the totality of the activities in both the supply chains and the customer chains.

One of the companies that you dealt with was Simpson Pope and you talk about the Simpson Pope episode, what was the Simpson Pope episode?

It was the only time in my professional life I've caused strike action on the shop floor. It was a delightful aspect, Simpson Pope –

That was a South Australian –

South Australian company, made a whole range of domestic appliances, irrigation equipment, stoves, washing machines, et cetera. As was the wont in those days, they made

all their own materials, so they made all their brasses and bronzes from the foundry through all the production processes, to then machine into nuts and couplers for all their appliances. They had an endemic problem with keeping production rates up to the requirement of the assembly lines, especially with their brass components. The problem was that as you go to higher machining speeds, even with free machining brass, the tool tends to dig into the work piece and the swarf doesn't come off as a proper curl swarf and the tool begins to chatter and you get very rough finishes on surfaces you want to be smooth.

They were having problems in that their production rates were too low because they couldn't machine faster, and "why can't we machine faster?" They were employing some good young graduates at the time. I got a team of three of their young graduates together and we had a look at this from the foundry right though all the production processes to the end extrusion stage. We found out that the problems were at the end extrusion stage. Although the problems were building up at every stage, but they showed at the end extrusion stage. One way around it was reconfiguring the production cycle on the big extruders, which meant getting a balance between extrusion speed and temperatures, that meant changing all the machine settings and all the production protocols. We explained various parts of the plan, and then we explained it to the extrusion crew on the shop floor and it was met with an absolute tirade of foul language by the leading hand, which is okay, we can take that. But before I could stop him, one of the bright young graduates just said, "Sir, you have just summarised the situation completely. For 30 fucking years you've been making fucking brass and you should've been making screwing brass." It didn't go down well. So they just downed tools and walked out. Then on the spur of the moment, I decided really we should join them in the Woodville pub across the road from Simpsons Pope and buy them some beers and get them back to work.

And you were right.

Yeah.

So when you say you described this process, did you take stuff back to the laboratory or did you go to the factory and do the experiments –

Yes, we went on the shop floor.

So it was not experiments done in Parkville –

In this case no. I got the young graduates to do it at Simpson Pope, yeah.

So in a sense you were being a consultant to this company, did they pay you, was there some contractual arrangement?

They paid us for some things, yes.

And that was when John Yates –

That's when John Yates decided he –

He'd better find out what was going on.

Yes, which he did in his usual very suave fashion.

So in some ways this was one of your first forays into technology transfer in the organisation.

I wouldn't have said it was technology transfer; it was solving a problem by getting other people to look at it in a different way and attack the problem in a systematic fashion.

And the problem being one that came from industry.

Yes.

Not one that you made up yourself.

Yes. It was a major issue for the company and they just asked have we got any ideas about –

It's a classic example of the way that when we say or other people say technology transfer you say, "Well you've got to do the right research." It's not a matter of doing the wrong research and then trying to sell the result.

Absolutely, yes.

So Peter, all during this time the Division of Tribophysics I think was now renamed Material Science.

It eventually became renamed Material Science.

It started acquiring bits and pieces of other Divisions in a mysterious way which was partly because Applied Mineralogy went to Perth and some people didn't want to go with them, and the Division of Applied Physics, the National Measurement Laboratories group in Melbourne wanted to become part of Melbourne division and part of the group in Adelaide I think became the Defence Standards Laboratory became part of CSIRO.

Yes.

So the Division of Tribophysics, or Material Science, became a much broader Division and you seem to be one of the people who was involved in some of the research around that. Can you tell us a bit about your memories of how all of those acquisitions affected the division, because part of the division is still very high science and other parts of the division were production technology or welding and doing things quite different from high academic research into the structure of metals.

Yes. Number of ways of viewing this. Times were changing. The Tribophysics model of old was unsustainable and it was unscaleable. There was also the issue that, in my opinion, a very large percentage of the good work that could be done in that area had been done and

that increasingly people were going further and further down individual rabbit holes. Now that was not a popular opinion to be expressed in the Division and I didn't very often express it, but the general thrust from the Muir Committee was that we should broaden out. I was encouraged by John Anderson to do that. I don't think my summation of where the other work was going was unreasonable. John Nicholas, for example, abandoned all the surface modelling work he was doing and decided he was better off going to Building Research, and the younger guys were feeling that as well.

I think what should've been done was that part of the Division should've been taken out and put into Chemical Physics, where Moody and others were. It could've been rejuvenated in a different environment. When Manufacturing Technology eventually became full-on out of the Production Technology group, Engineering Ceramics should've come into Manufacturing Technology, and the rest into a new Division with Chemical Physics. That didn't happen and I think the legacy of those wrong decisions lived on for the next decade in subsequent suboptimum arrangements of resources in this sector, none of which operated –

So you became obviously well known to head office by these activities because in 1979 you were appointed a member of the CSIRO Manufacturing Industry Committee which was a committee set up to advise the executive on how the organisation should interact with –

Yes.

There's not much evidence in the records that we can find of the activities of this committee, did it do anything?

There are not that many records in my memory either. I think there were a few meetings, I think there was a general exchange of information and the way we were doing things –

Do you remember if it had a secretary?

I think Graham Warden was the secretary.

I remember the name Graham Warden. Look, my memory is that it wasn't very influential.

It was the time when the Organisation – it was just after the Birch Report, the organisation had been asked to do more applications oriented research, the Institutes had been set up and I think the Division of Material Science was in the Institute for Physical Sciences, rather than the Hill Warner Institute of Industrial Technologies.

Yes.

And so it was a time of change in the organisation.

A time of change, yes.

Where the government was urging the Organisation to be much more relevant to industry and the organisation was struggling to work out how it was going to do it.

I think at the time I had my hands full with trying to grow Production Technology group from a disparate range of resources and people, which we'd gathered from all over the place, and to implement a new strategy of working closely with industry; of bringing industry into the beginning of research projects not at the end, by having them as active partners during the project et cetera. I sat on boards like that CSIRO Manufacturing Board, but that only took a small fraction of my time and I'm afraid a small fraction of my attention. I was one of those at the workface trying to make it work, rather than sitting on a multitude of committees.

I think that brings us up to about 1979-80 when the whole business of the Production Technology group, the formation of the Division of Manufacturing Technology and a whole range of changes in the organisation. So I think we'll stop here for lunch and come back afterwards and talk about that.

Okay, yeah.

Thank you.

[Pause]

Okay, thank you very much Peter for spending all this time with us talking about your career in CSIRO and the very interesting time that you were involved with the thinking about technology transfer in CSIRO. I think this probably started when all of those different parts of CSIRO came into the Division of Material Science and you developed the Production Technology laboratory. So can you tell us how that worked and what was your vision for how the production technology group might become a division in its own right or independent of the division of material science. You'd had some successes; the die casting technology was a high success for a scientist then.

Yes, but probably concentrating on the die casting technology activity, which was only one of a number of very internationally successful streams of research development and implementation work carried out in the Production Technology group, but it highlights many of the issues that you've raised. From the beginning of these activities within the Division, the initial discussions up and down Collins Street and then with people in operational roles in manufacturing industry and with a number of colleagues, the philosophy that became central was that to make a socioeconomic impact and get ideas translated into reality in industry you've got to take a holistic view of the whole research development and implementation process. That it's not sufficient to just have good intellectual and scientific ideas, you've got to develop through to proof-of-concept.

Then when you reach proof-of-concept, you've got to have input from different angles, you've got to have commercial and market socioeconomic inputs et cetera, and all these inputs change in balance as you go up the development curve. Also, as you progress up to the development curve, which to get into market is often 10 years, the composition of your team has to change because you need changes in expertise et cetera. Then to get ultimate implementation into the marketplace you've got to develop manufacturing industry

technology platforms, not ideas or components of a production process, but it's got to be a technology platform which can then albeit be customised to certain outputs –

So the research group where it is has the technology platform that can be customised to customer's needs, is that what you're saying?

Yes. So you start off with a strong base, a basic science. You then develop from that pillars of technological capability. You then integrate those pillars of technological capability into an integrated platform.

And Peter, in this model who decides what the nature of the platform technology is, you the scientist or the market?

No. If we take the example of the die casting activities, we started off in the Division knowing nothing about die-casting. The first work we did was simple work on surface tension –

So did your walks up and down Collins Street lead you to believe that die-casting was an important thing to do?

Yes. The big metal manufactures, EZ and Comalco, and we were also talking to the car companies, pointed out that in the automotive industry and in a large section of other manufacturing industries –

Including Simpson Pope.

Yes, that die cast components are becoming increasing popular because you can go from molten metal to net shape formed in couple of seconds and then you carry out finishing operations. So it is highly cost effective. The problem that was emerging was that with the increasing engineering specifications in automotive engines and in drive trains et cetera, the die casting process was falling behind in attaining the required mechanical properties. So the suggestion was that we talked to die casting companies. We started talking to die casting companies and everybody was in roaring agreement that the industry needed an injection of technology, a change of technology to meet higher product performance standards, higher productivity and reduced costs. So the question is how are you going to attack the problem?

Well, we were very fortunate that because, it was mainly through myself wandered up and down Collins Street, and I got to know a lot of people and a number of us began to meet informally. The informal group was really led by Alan Cope who had been the General Manager in Australasia of Lucas Automotive Die Casting, and had joined the Australian Zinc Development Association which was backed by all the major miners, Hans Oxenbein, who was the Regional Director of *Bühler* Die Casting Machines of Switzerland and a couple of CEOs of die casting companies; and we used to have a lot of lunches. It was the year of long lunches. We used to kick all these issues around and eventually we came up with a strategy of trying to attack the problem. We did a lot of laboratory work to start with on aluminium and zinc alloys, then we got a few ideas.

We got to the proof of concept stage and then one of my colleagues, Alan Davis, really had the breakthrough brilliant idea. By this time, we'd reached the stage where we'd decided we had to get a die casting machine because we've got to go through laboratory scale to industrial scale. So we got an old Lester die casting machine from Dohler Bros in Sydney. We refurbished it totally. We turned it into what ended-up being one of the most highly instrumented die casting machines internationally. We put a lot of effort into that, but then we started doing casting trials and we started spewing out data–

And you rented a factory in Kerr Street.

We rented a factory in Kerr Street. That was because the Division in the University of Melbourne threw us out. We tried to commission the die-casting machine in the University of Melbourne in the old brown coal research laboratory, but we were noisy and dirty so we went to Kerr Street. But essentially, when we started casting trials we were producing an enormous amount of data and we had no way of analysing it. Then Alan came up with the idea of if we started plotting some of the data on a PQ squared diagram, pressure/velocity diagram, we might start to be able to describe the whole of the production operation of the competing liquid metal and oil flow systems mathematically. That was really the big breakthrough. That started to give the entire program its focus and drive.

And that developed to become what you call the Australian Technology.

Australian Technology.

Peter, was there any IP associated with that? How was that technology transferred? Did you give it away or what was the story there?

If SIROTECH had been in charge, we would've undoubtedly done it differently. However, it worked out very effectively. We were feeling our way and we really had no direction. The thrust of the die casting work was that we worked very closely with industry.

When you say you worked with industry was that working with a company or with representatives of a die casting association or some group of companies?

Yes, we worked through ADCA [Australian Die-casting Association], AZDA [Australian Zinc Development Association] and with the Society of Die Casting Engineers, both in Melbourne and Sydney. Those were the umbrella industry organisations. We worked with a wide range of die casting companies on an individual basis throughout the country.

What we did in this process, was we thoroughly analysed the entire operation mathematically, we proved the concepts that we'd got. The way forward entailed developing a very innovative range of sensors and electronic monitoring equipment, where we were well ahead of the world. The molten metal feeding system, in die-casting injects molten metal through feeder systems at high volume and high pressure into a complex die, and the whole process is over in five milliseconds, for something like a transmission housing, five to 10 milliseconds. During that time you've got to control fluid flow, you've got to

control solidification, and then the grain growth and dendritic growth, to control mechanical properties. So we analysed all this mathematically; got all that under control.

We could do that in Kerr Street, then started working with companies to work on their shop floor, because there's a great leap from doing it under controlled conditions on a pilot plant. So typically, we'd work with companies a day or two at a time, we'd look at their main machines, we'd take our instrumentation, we'd analyse the performance of their machines, we'd work with their engineers and their guys on the shop floor to optimise their production process, gather all the data at the same time –

So they kept their machine, they didn't have to buy a complete new machine?

Oh no.

They optimised their machine?

Yeah. For a number of years we had to gather data from the shop floor. As part of gathering data from the shop floor, we optimised the performance of their machines for that particular product. We then developed to the next stage where you design your product and you design the die and tooling for your product, along with the capabilities of your machine, and you match die and machine capability. Doing this, we got leagues ahead of the international competition. Our production rates went right up, our quality went right up.

So this is a very good example where a technology could be spread across a number of companies and they could all benefit from it without actually – they're competing in different markets.

They're competing in different markets, and typically, for Ford and General Motors in particular there were three or four suppliers. But more importantly, that was in-plant work. We did a hell of a lot of what would be called in CSIRO extension work. Every three months we would address industry meetings on what we'd done in the last three months. These were full day or half-day meetings, half day running into the evening if it wasn't full day. AZDA in Melbourne used to do that at the Swiss Club, AZDA would pay for that, pay for the drinks and nibbles afterwards. All of us in the Group would present a part of the work. So for the young guys in the group that was tremendous training. We did the same with the Society of Die Casting Engineers. Every other month we would give them evening presentations down here in Melbourne; –in Sydney it used to be the Bankstown Businessmen's Club.

All this was free to industry?

It was all free to industry. The Die Cast Association would pay for it or AZDA would pay for it. It was all free, and it was the very best of audiences. You would get the CEOs, the owners, guys from the shop floor, senior people. It was far better than written publications, you've got honest feedback and some of it was brutal. I can remember in the early days I gave a talk at the Bankstown Businessmen's Club on some of the theoretical backing of what we were doing. The chairman Les Bentley, bless his heart, was the CEO of one of the largest of

the American companies operating in Australia. Halfway through my talk, Les just got up and said, "I've heard enough of this bloody bullshit, I'm going to play the pokies, is anybody coming with me?" Les after that became one of our greatest defenders. But it was very useful. We learnt a lot of what of the industry's apprehensions were, what they needed to do, et cetera. As a result of that further in our extension work, we wrote the shop floor manuals for die casting operations.

And TAFE courses.

TAFE courses –

And this is hardcopy?

Hardcopy yeah.

This is before the software?

Yes. Some of us went around delivering these courses. We just did the entire thing.

I'm not sure that I've ever seen this written up anywhere Peter, it's a very interesting story.

I don't think it has been. It was well known in the industry, those that knew. It was known around the world, but not really within CSIRO.

So Peter, this brings us onto your growing reputation in head office as somebody who knew what he was doing. So in July 1978 in response to the Birch Report the head office set up a committee which you were a member with Michael Tracey who was the Chief of Division –

Yes, Michael.

And the secretariat was Graham Warden and Malcolm Robertson, and this was to look into how research associations could be used to support manufacturing industry. There was the Australian Welding Research Association and presumably your AZDA was like a research association but –

Well they were an industry body.

Industry body. So in some ways research association in 2018 seem somewhat anachronistic, but why were we interested in research associations in 1978?

If you take the die-casting model, what the industry said they had was a research association. The die casting industry in Australia did not refer to CSIRO's work, it was our industry work and everybody kicked in.

Very interesting.

In kind?

In kind, and really enormous amounts of money in kind. If you take two or three hundred tonners die casting machines out of production over two days you've committed a lot of money. We never bought metal. We would run at Kerr Street sometimes a six-hour shift and sometimes an eight-hour shift. When we'd wanted metal, one of the companies would just send a truck around and we'd unload, and because we'd also got a sand foundry there, we used to just re-pig and actually sell it to the scrappy around the corner. That was our slush fund. In those days, there was a lot of things which didn't occur in CSIRO records. But that was an industry association.

Your group recommended that CSIRO should continue to support research associations, but not much ever came of it.

No. One of the issues in research associations is having sufficient expertise and capital to carry out the final implementation stage. When I got back to CSIRO the second time, in Preston we managed to build up a very large suite of capital equipment which was the original concept about having revitalised research associations. You need access to capital equipment that's too much for one research group, but if you have it properly managed, and have a range of users, it does facilitate the implementation.

So this was part of CSIRO's response to the Birch Report, and simultaneously with that or maybe because of the interest arising from the organisation, we had the CSIRO, the Academy of Technological Science and Engineering of which you were about to become a fellow with particularly Mr Jan Kolm, from ICI, thinking about how CSIRO could further assist the manufacturing industry. We're not sure who started that or what happened, but you were a member of this committee because I've got the names of the people who were on this committee. It was a committee that had Jan Kolm, Dr Worner who I'm assuming was Hill Worner, Dr Nixon from –

Oh yes.

Was he from an aluminium company?

He was from Comalco.

Comalco, Dr Taylor who was a member of CSIRO, Bill Whitton who was I think at that point – he's still in ICI but he became a CSIRO member, Mr Lattimore as secretary and you were members of this committee. You wanted to see how the organisation could develop a manufacturing industry development laboratory. So it seemed taking from the notion of your Production Technology group, develop a laboratory in the organisation that could take results from the bench and prove them in a production sense. Do you remember anything about this committee or discussions with Jan Kolm about what you might do?

I remember very little about it. In retrospect, it appears to be a very difficult concept to implement within an organisation as diverse as CSIRO. I think the best you could do would be to have certain sectoral facilities, which we undoubtedly did have in the agricultural areas but we didn't have in the physical sciences and the manufacturing area. I think it was more a

plea for the Organisation to actually organise itself in a reasonable fashion and get away from what then was a rigid Divisional structure. To have a more fluid structure whereby resources could be pooled for the common good instead of having everything cut down to Divisional budgets, which in effect hampered everybody, especially when you're attempting to get close to the marketplace, because you hadn't got sufficient resources to do the final stages.

As far as we can understand Don Weiss' concept was for an engineering development laboratory –

Yes.

Which was a mixture of problem solving, contract research, undertaking specific tactical studies, technology development and engineering development in Australia. So it was a laboratory that would take ideas from anywhere I think and try to develop them into practice.

It's very much the Fraunhofer model, like why we never had Fraunhofer-like Institutes, rather than CSIRO Divisions? ; A variety of socioeconomic and political differences.

So all of that activity seemed to arise out of this CSIRO Manufacturing Industry Committee which you were a member of, but you left the organisation in 1980 so you weren't particularly involved internally in that, but the next thing we hear about you is that you're invited to be the chair of the review of CSIRO's commercial activities and that was in 1983. So from 1978 to 1983 the organisation appeared to be churning over ideas of how to do all of this, and it was in September 1983, or presumably earlier in 1983, but September 1983 where you submitted your report.

Paul Wild was by then the chairman of the Organisation, and when you read this 1983 report it has quite a sophisticated overview of innovation models or technology transfer models where you outline the two predominant views that you were told. You come down on the side of thinking that the organisation should operate not according to the linear view, but according to what you call the interactive view. So could you recall if you can some of the discussions, the input that you had to this committee, and how you arrived at your conclusions?

This was a very interesting review. We took input from a wide range of people and organisations. I think there was 60 submissions overall from I think 19 of the CSIRO Divisions, from individuals within Divisions, from the Executive and Commercial Group, from the CSIRO Officer's Association, from the Technical Officer's Association, a wide range of government departments including DSTO, and all the usual government departments with an interest. In addition, as a Committee and as individuals, we took written and verbal submissions from a wide range of industry groups, individual companies, major companies, SMEs and individuals. So there was a very wide range of consultations. As a group, we met every other Friday for a three or four-month period, then submitted the report for review by the CSIRO Executive, and I think it was sometime in September we got the Organisation's response back.

Our view was that research, development, innovation and implementation was an iterative process where every stage informed the other stage and the commercialisation issues and the route to commercialisation had to be an integral part of the initial research planning, not an adjunct at the end, whereas the linear model says it's something you do after you've finished.

So technology transfer in a sense is a concept that doesn't appear in the interactive model?

No, because it assumes that you – the phrase technology transfer is presumptive in that you have carried out something in isolation which you now want to throw over the wall to somebody who might be willing to catch it and find it useful on the other side. It was fashionable for a while, it's actually a nonsense. That nonsense led to the perception within CSIRO, that CSIRO had a lot of interesting valuable stuff on the shelf that just needed to be transferred. One thing that came out of all our consultations from both internal people and outside people, outside the organisation, especially in corporate life, that it was utter nonsense and that shouldn't be a driver for anything.

Could I just intervene to say that this review committee that Peter is talking about had Dr Peter Robinson as the Chair, you were then the Group General Manager of Metal Manufacturers Australia, Bob Brown, Mr Robert Brown who is the Chief of the Division of Manufacturing Technology, Ian Cameron, Managing Director of Repco, Trevor Scott, Chief of the Division of Annual Production, Jim Stobbo, Manager at Repco Research and Sam Lattimore, the Director of the CSIRO Bureau of Scientific Services was an observer and David Kimptom was the secretary. So it was a high-powered committee.

Yes.

And you say it received a lot of submissions. Notably of the CSIRO divisions, notable by its absence was the Division of Applied Organic Chemistry.

And Materials, Science and Technology, my old Division.

That's true.

Peter, do you recall the actual workings of the production of the report? So for example, did you work closely with David Kimptom, did he do a lot of the writing or did you do most of it?

I was trying to think about that. I certainly worked with him, that language is my language. I'm pretty sure that's my phraseology -

That you wrote it?

Yes.

So as I said it's a very succinct writing where it describes these two models. The major recommendation as we can see it, it had 62 recommendations but it seemed to me the main

recommendations 19, 20 and 21 which was how should CSIRO organise its corporate support for commercial activities, and your main recommendation is that the organisation should adopt the interactive model and set up an innovation support service which was going to provide the sort of assistance you might need which is market and techno economic analysis, identification of appropriate strategies, discussion and negotiation with prospective collaborators, partners and licensees, patenting strategy, what sort of commercial arrangements you might have, and commissioning of commercially rated studies by outside experts. So your recommendation was that this interactive research model is best conducted within the divisions, but the corporate research should be around these higher level issues?

Support activities.

Yes.

Have I summarised your thinking on that?

Yes, that if you want optimum efficiency in entering the marketplace these have to be integrated as one bundle of activities within the Division. To do that effectively, you need specialist skills and help from time to time. It may be for three weeks, it may be for three months, it may be for three years, and you need a central group to manage that group of specialists.

The specialists being specialists in what disciplines? Are you saying patent specialists, commercial specialists –

It depends on the issues. You might need market analysts, you might need patent lawyers, you might need people to carry out detailed commercial analysis of routes to market, of cost structures et cetera. So it's really impossible to say at any given time what mix of specialists you want in a Division. But the essential thing is that those people are embedded in a Division for a period and work closely with the people who are there. It's not a customer/client relationship. I think once you turn it into a customer/client relationship, you begin to have problems. You erect barriers to start with.

So the Executive issued their decisions and they in fact didn't adopt your recommendation but they adopted the slightly different strategy in that they said they'd establish a technology transfer company called SIROTECH which would subsume a lot of the activities that were currently being done in Head Office in the Bureau of Scientific Services.

Yes.

And they did this in order to attract commercially oriented staff of the required calibre to provide an atmosphere that will engender confidence and receptivity of industry. So in a sense they rejected your model in terms of more of a customer/client model. So there was an outside customer, SIROTECH, which was the bridge and SIROTECH's customers were both the CSIRO Division and the outside firms.

Yes. Well in effect, what they did was adopt the iterative model as to how the Organisation would work, and then adopted the administrative Organisational structure of the linear model, and the two don't go together terribly well. I think that was the issue. Having the central organisation will work perfectly well as long as you bring about the required organisational and cultural changes within the Divisions. We went with the iterative model and the dispersed expertise on the grounds that in a very diverse organisation, like CSIRO, with a variety of operating procedures, markets and challenges and scientific issues, it would be far more cost-effective and effective from a market point of view and an innovation point of view. Have the dispersed model, and that was a consensus opinion both internally within CSIRO from the Divisions, and especially from the marketplace. Could you make the other model work? Yes, but it's more difficult.

You put it in the context of CSIRO at the time. CSIRO Limestone Avenue was perceived as being remote from the Organisation in general. Other groups within CSIRO Head Office, Occupational Health and Safety, at the time had very little impact on the operations within the Divisions. So there was a cultural barrier there already, which had to be overcome. Setting up SIROTECH, the big plus was putting it in Melbourne rather than in Canberra, and that was a plus. It was closer to the operations. If the CEOs of SIROTECH had been so inclined, they could've implemented from there a dispersed model and made it work. So when the Executive decision came out I wasn't particularly concerned or upset. There's more than one way of skinning a cat. It depends how much effort you want to put into it and how flexible you are, and how good the people are that you hire The majority of people who were hired into SIROTECH were first rate.

So let's stop talking a bit about the higher policy business of the organisation and go back briefly to the Production Technology group and the formation of the Division of Manufacturing Technology, and your leaving of CSIRO to go to Metal Manufacturers. Can you recall briefly, about how the Division of Manufacturing Technology eventually emerged from the Production Technology group?

In a word, chaotically. The Division grew by acquisition. We ended up with three groups; production technology –

You had the ceramics group.

Yeah, engineering ceramics and surface science and the traditional work within Tribophysics. That third group was the smallest by far. There were problems. The problem was we'd grown rapidly, we'd grown in three different areas, we were scattered amongst sites. Production Technology group was on the Kerr Street site and on the Adelaide site and Engineering Ceramics was still at the Bend. The rump of the Division was on the Parkville site, and we had common facilities, especially workshops. So you had three independent entities going their own way. We had a Senior Executive which consisted of three of us; John Anderson as Chief, myself as Head of Production Technology group and Neil McKinnon as Head of Engineering Ceramics. That group was dysfunctional, and it was dysfunctional for one organisational reason. There were three of us, and the Chief had two votes, one as Chief and one as the leader of the catalytic chemistry group.

We got around most of those issues, except with the workshops, and the workshops became a real issue. It became an issue with us in Production Technology because in effect, to be fair to John, we had almost taken over the engineering labs and the electronics labs. The rest of the Division called them the electronic workshops, we called them the electronic labs because the innovative work that they'd done on sensors and control systems was really world leading. We were measuring transients in production processes which were in a fraction of a millisecond, blink your eye and it's done, and nobody else was capturing the sort of data that we were. That was applicable across a whole range of industries, so this was good.

But John had this small catalysis group and he kept bringing postdocs through. All their equipment was very high vacuum, custom made equipment. The trouble was the mechanical workshops, the electrical workshops, were clogged with building that equipment and we'd reached the stage where the backlog was two and a half years and postdoc's appointment was three years. I had the temerity to point out that maybe we should contract out some of the work, and that the work that should be contracted out was the Chief's work, because although lot of it was very high vacuum, there were plenty of shops around town that could do that, and the control systems in particular, while they were sophisticated, you could build them from existing commercially available components, whereas we were building our own sensors and our own control system, they were all one-offs.

I think that got under the Chief's skin a bit so I ended up being escorted out of the Division by a member of the Executive, which was quite an interesting experience. It was nothing terribly serious. Greg Tegart was a member of the Executive that I knew quite well. He was the CEO of BHP Research Laboratories, and Production Technology and them were close.

So the Division Manufacturing Technology was set up after some of these discussions about what to do, presumably what to do with the engineering development laboratory, the whole response to the Birch Report.

Yes.

And it was essentially your group, but you didn't become the Chief.

No.

So why was that?

That's a good question. First of all I went into semi-exile in the library at Albert Street.

After you'd been escorted from the Division?

Yes, but then I was appointed Executive Officer, Executive Officer Manufacturing to the CSIRO Executive. So I was responsible for doing all the work –

So you were appointed to the CSIRO Manufacturing Industry Committee, that is when you were appointed the Executive Officer?

Yes.

I understand that now.

Okay yes, you understand where that comes from. I didn't make that connection. So I worked on the submission for government for Manufacturing Technology and the Minister was interested, and we got things rolling. Now in the meantime, I'd been told to stay clear of the Division. However, while I was in that position – as I said the Division was operating as three separate entities and nobody had been placed in charge of Production Technology, so I just continued to run it, although I made sure I didn't go near Parkville. So we ran for 12 months like that.

So let me just say what the evidence about this is. CSIRO's executive has established a manufacturing industry committee to provide advice to the executive concerning CSIRO's research which is of relevance to Australian manufacturing industry. This committee is to be chaired by Dr WJ McG Tegart, member of the executive. Dr P M Robinson has been seconded from this division to be a member of this committee and to be its executive officer. This appointment is effective immediately. For this purpose, Dr Robinson will be located at 314 Albert Street but he will continue to keep a working relationship with the laboratory at Kerr Street, Fitzroy.

Am I allowed to say that I think that was a retrospective piece of paperwork. I had never seen that until I saw it in a personal file, which you provided.

So that's this manufacturing industry committee, and what did that do?

The main thing we did was get the –

Get the Division going?

Well to get it through the political sphere and through the CSIRO Executive Board. I had nothing to do with that, but I prepared a lot of the stuff as Executive Officer. Creating a new Division is not something you do overnight, it's got to go through a whole series of hoops.

Do you remember much about the relationships between yourself and the various members, decision makers on the Executive around that time? Were you talking to them about the proposal and developing it in consultation with them?

Yes, yeah. I was the Executive Officer; I was doing as I was told by then.

Told by whom –

Who were you interacting with do you recall?

I was interacting with Greg Tegart.

Who was probably the most important member of the Executive in this space.

Yes, yes.

Was Geoff Taylor there then?

Yes, I remember interacting with Geoff Taylor.

And Keith Boardman?

Yes. Let me put it two ways; I was the office boy, but I was also the one that knew all the detail of what was going on and what had to be built. So I was interacting on that basis.

So the Division of Manufacturing Technology was formed, you applied to be the Chief, but Bob Brown got the job because you say in your notes here that you weren't an engineer, somebody thought you needed an engineer to be the Chief of that Division.

Somebody of considerable influence thought that, yes. Mind you, it's all water under the bridge.

But it is an interesting development of your career because you then leave CSIRO and get a job at Metal Manufacturers Limited. By then because of the activities of this Production Technology group, and the fact that you were a Fellow of the Academy of Technological Sciences by then, you were pretty well known amongst the metal manufacturing industry in Australia?

And most of the milieu, yes.

Yes, so you didn't have any trouble leaving CSIRO and getting another job?

No.

So why did you pick Metal Manufacturers Limited, and I don't think Metal Manufacturers Limited exists now.

No.

What was it and what attracted you to them? What did they manufacture?

Metal Manufacturers was a large conglomerate in Australia with 25-26 major manufacturing plants, heavily into the electricity supply and distribution business with products, water reticulation, transport –

They made wires and pipes.

All the infrastructure products. All the copper and bronze products in the Opera House were MM, Sydney Harbour Tunnel, all the major tunnels in Australia, all your high performance electrical contracting. We had a construction group which built power stations and thousand kilometre transmission lines. We did as a company 90% of the work on the electrification of the Queensland railway system which was then the largest in the world.

So it was a subsidiary of British multinational, BICC Limited, which I looked up, is British Insulated Callender's Cables. So it was a company that wasn't making gearboxes and metal parts for cars, it was making large-scale infrastructure metal pieces. So out of copper and -

Copper, brass, bronze, aluminium. Essentially non-ferrous.

Non-ferrous metal manufacturing?

Yeah.

So you were telling us what attracted you to that company amongst all the offers that you had.

What attracted me was the diversity of activities both domestically and internationally. BICC had operations in the UK, Europe, North America, South Africa, and China, all throughout Asia as well as Australasia. One thing that attracted me was the position I was offered at the time was one of the iconic positions in Australian metallurgy. MM had been established just before the First World War, I was the fourth person to hold that position.

Who was your predecessor?

Bob Pearson and his two predecessors, they were all icons of Australian metallurgy. So in my field this was – it had history and it had status. I think it was the historical value as much as anything. Also, it was an interactive environment. The CEO, David Stewart, was a very dynamic personality and an excellent engineer. He'd started off in one of the group companies, hands-on engineer on the shop floor, despite the fact that he'd been a Rhode Scholar and a Fulbright Scholar, and worked his way up through the company extremely rapidly. There was a small head office staff, very compact, worked very well together. So it was a very attractive environment and there was a spread of activities. We had big polyurethane foam operations; we were the biggest fabricator of polymer products in the country, bigger fabricator of copper, biggest fabricator of aluminium. So I'd morphed from a metallurgist into a materials engineer anyhow, and it was a great broadening of experience. We had our own research laboratories –

In Sydney was that?

Vinidex Tube Makers, which were the polymer division, had research laboratories in Sydney, Metals group were in Port Kembla, and then we had other research laboratories in Melbourne and in Brisbane, and then very strong technical operations. So we carried out a lot of research in Australia actually.

And were you in charge of that research?

Yes, that was firmly in my portfolio.

So Peter, I meant to ask you this earlier but I'll ask you now. So you became the Group General Manager of this company, before that you'd been in various management positions in CSIRO in charge of the production technology laboratory, had you at that stage had any formal training? You'd had a lot of informal training I imagine, had you actually had any formal training in management or did you learn to be a manager by observing?

Very much the latter. In CSIRO, the issue at hand was leadership not management, and I think that's true in any research organisation. There are administrative systems that have to be dealt with. I've never been a great one for administrative systems. CSIRO gave me the freedom to be a leader, to talk to people, to interact with people, to get to know the ins and outs of the research projects, of every aspect of where we were going, of what we needed, to make sure we got the right people and the right equipment and the right ideas in place at any one time. So going to MM I did have to learn, I had to get up to speed with a whole host of things. But the things I was good at when I went there, scientifically, technologically I was very good. I'd worked a lot in the marketplace and on production shop floors in die-casting and the welding area and other areas. I was used to working with people throughout the hierarchy of a corporate structure as an outsider, so it was an environment that I was familiar with.

And can I suggest that you also had the language to operate at various environments with different people in different areas of speciality, and you also had very good person-to-person skills?

I think all of those are a necessary attribute, yes. Essentially, for this type of environment you've got to be able to operate in a variety of ways, at a variety of levels, in an appropriate fashion. One of the things that I learnt along the way is always listen to everybody, because in many of these complex issues, it's like a large jigsaw and everybody concerned has got a few pieces in their pocket, and half the time people don't know that the piece they've got in their pocket is very valuable. The job of a good leader, or a good manager, is to try to tease out all those bits of the jigsaw and collectively get them together to see the big picture. So that needs all the approaches you just outlined.

And in the nicest possible way positively influence the priorities of the people you're talking to and interacting with.

Yes. It's reaching a semi-guided consensus about where we're going, but at the same time having your own ideas initially about where you want to go but be willing to modify them all the time, while still keeping the distant objective in focus, but are we going to get there?

So your experience of Metal Manufactures is similar to a number of Australian scientists' technologists' experiences about working for a company in Australia that was a wholly owned subsidiary of an overseas company, and having to negotiate the relationship between the colonial outlier and the main board, so I'd like you to reflect a bit on that. But secondly

you were operating still between 1980 and 1989, a period of very high tariff protection of Australian manufacturing and that all disappeared in the next decade. So obviously, the tariff protection affected the interaction between the local company and the parent company, but how did you manage all of those complex issues around different company cultures, different tariff protections between us and the UK and so on? Were you ever involved in arguing with the commonwealth about tariffs?

No. As a company, tariffs weren't really an issue in that most of what we produced was high volume, high value added, but shipping costs from abroad were absolutely prohibitive. If you're doing something like building a power station, and we built a number of power stations while I was with MM, where we supplied a very high percentage of the product. If you're onsite, with factories producing product going into the plant to be built, for an outsider not to come in you don't particularly need tariffs. So that was not an issue. BICC were a very flexible organisation, very hierarchical at the top, but operationally there was a lot of flexibility left to the operations and to the people in the operations. So cooperation was very good. We had very close cooperation with the Canadians, the South Africans in particular, also with the Subcontinent, and with the technology intensive companies in the UK. We used to do a lot of inter-firm comparison studies.

Where we were producing similar products on similar equipment, we'd have technologists move around group companies round the globe. When I was on the board of BICC Research and Engineering, we carried out our pilot plan work around the globe, with big capital investments. That was never hindered by anything, it was just a question of if we want to spend a few million on a pilot plant where is the most appropriate place to put it, where have they got the best technical staff for this? Nothing else was really considered. We were first into a lot of areas. We were the first into optical fibres. We built the first integrated optical fibre cable plant in Europe, we built the first in Australia, we built the second in the States. So in various parts of the operations we were cutting edge and tariffs didn't mean a thing, it was inter-firm competition to take the lead.

You obviously learnt a lot about management in that company –

Enormous amount, yes. From the shop floor to board level, I was very involved, especially in London. I used to spend at least three months of the year in London.

Why did you leave then?

Because we lost the war.

Middlemen lost the war, the internal corporate war?

Internally there was a corporate struggle that broke out. BICC was one of Britain's biggest commercial companies because literally we had operations in every old empire country. There were legacy operations. In Australia we got rid of the legacy operations, we'd highly automated. We actually ran in Campbelltown outside Sydney, a fully automated factory which ran totally unmanned on a 12-hour dark shift. We were leaders in automation; we had high profitability in the Australasian region. In the new plants that we built in the UK, they

were similar. There were big optical fibre plants like that and new technology plants. But we had a lot of legacy operations. We tried to address these, but there was resistance in the UK from Executive Management in the individual companies and from senior operational management.

They in effect wanted to continue to run the plants in the way they'd run them since the industrial revolution, which was a bit of an oxymoron. We repeated the mantra time and time again, "first you simplify then you automate". "Simplify, automate". They wouldn't have any part of it. The big obstacle in the UK was traditionally that all the companies had paid production workers piece -rates and they wanted to continue paying piece-rates. When you try to automate an operation and reduce numbers and get a plant running effectively on its own, with supervisors, piece-rates are an oxymoron, but no, they decided to go ahead with it. That caused consternation in the technocrats' ranks because funnily enough we got blamed for the legacy upgradings not working. Everybody agreed they wouldn't work, except the accountants. But then the main Board decided in their wisdom that the future of the company, what we were really good at, was managing legacy assets and getting the final ounce of flesh out of capital invested, which flew in the face of reality. MM was the most profitable company internationally, we were producing 36% of the global bottom line profit on about 30% of capital invested. So we were doing very well, the UK operations were doing well, Canada, South Africa were doing very well and Asia was doing well. But the UK legacy operations weren't, but they decided what we will do as the first move is buy up the majority of the power cable businesses in the US, which were also legacy operations. The very big American companies were selling up. We bought up about 65% of the US market, which was an utter financial disaster. So you'd think the Board would've learned from that. No.

When the Berlin Wall came down, they decided in their infinite wisdom they'd buy up legacy East German industrial assets, then they bought up legacy Russian industrial assets. So it reached the ludicrous stage where Australia and the majority of the operations were highly profitable and producing very strong positive cash flow, but the accountants in London were pissing it against the wall quicker than we were making it. So the Board then eventually made the decision that what they really needed to do was sell off all the group companies. So all the group companies were sold off, except the construction company Balfour Beattie. Most of those group companies, all the ones in Australia, are still running under other names. So the company didn't go bust, it was just the Board lost its way, and during that journey everybody started to leave.

David Stewart, who I reported directly to in the Australian operations, was a BICC Main Board Director. I also reported directly to David as BICC Main Board director. I was on the Board of BICC Research and Engineering for most of the time, which was bigger than the CSIRO Division, with 350 staff. The Chair there was George Moore. George Moore was also a BICC Board Director. So I reported directly to two of the BICC Board Directors. While David and George were on the Board, we could hold the accountants at bay. Then David retired, George was on his own, we started to lose influence on the Board and then it just started looking - and also George resigned from the Board and I resigned with him. The thing was the good technocrats started leaving in droves.

I think that's the end of Metal Manufactures, so we'll have a brief break.

[Pause]

Peter, you leave Metal Manufacturers under the circumstances you've been talking about and you join Invetech Operations and there I think I can summarise in a way. You learnt how to be a technology consultant, is that right? We don't want to spend too much time on it if you can.

A technology and a business consultant, I would say a business consultant with a technology bias. Somebody who can come in and understand the totality of the business environment and the market environment and then how the technology that you're using impacts on the bottom line and how we can improve your total operations to improve your operational profitability. So the main emphasis was on the total package, the business as the whole.

Did Invetech have a technique for dealing with that? I'm thinking here of McKinseys –

No, we were the antithesis of that. Invetech was founded by two partners of a major international consulting company, one from the Cambridge operations in England and one from the Melbourne operations, and they'd left for that very reason. So our entire market stance is we have no preconceived ideas, we have no preconceived methods of attacking your issue. We will come in and talk with you extensively initially, then we'll put a proposal to you about what we see your issues and opportunities are, and this is how we will deal with them. So every approach was custom made and that was our great strength.

And that was your marketing –

That was our marketing -

And did you have a skill set that you could sell as well? In other words, why would people even invite you in the door?

Eventually because we had a damn good track record.

Word of mouth?

Yes. We never answered any call for expressions of interest or ads or anything. We'd never bid for anything. We'd cold call. We'd sit down and talk with the CEOs or the board of the company and do that maybe a few times, build up commonalty of interest, build up trust, talk about their issues, and then just take it from there. But everyone was customised. That was what was interesting about it, every job was different.

I don't want to get growled at by Tom for time but what skills did you learn as a result of that?

To be diplomatic at board level - it really built on all the skills I'd got. It comes down to listening to people and asking questions and don't impose solutions. Don't start off with any preconceived ideas, just let everything evolve.

During your time at Invetech you started being approached by people in CSIRO to do various jobs in the Organisation. So you were clearly well known amongst the senior management of the Organisation.

Yes.

The first one was the Division of Applied Physics to succeed John Lowke, but you didn't want that?

No. Nothing against Applied Physics, I was having too much fun at the time. I knew a lot about Applied Physics and I didn't think that was an ideal fit with me. If I'd been Chief, there were a number of things that I wanted to do. I would've split the National Measurement Laboratory off from the Division again, because that in my opinion wasn't working. It's not that it wasn't working; there was no synergy between that and the rest of the Division, and the Division did need more focus.

And then there was a brief time when you thought you might be the Chief Executive with Graham Spurling, Bill Mansfield and Kevin Foley.

That was absolutely strange. That was the fleeting moment that I never really thought about – I never placed much weight on that. As I said until I started talking to you today, I've never talked to anybody about that at all. It was interesting.

So you got two interviews but John Stocker eventually became the Chief Executive, and while he was the Chief Executive, Bob Brown retired as the chief of the Division of Manufacturing Technology and you decided to apply for that job or you were encouraged to apply for that job?

I was encouraged to express interest in that job.

And you eventually got that, and I was the Chairman of the interviewing panel.

I don't remember that.

I was. So we appointed you the Chief of the Division of Manufacturing Technology, and you were there for five years. Just served one term.

Yes.

You left the organisation in 1980, you came back in 1990, a decade of great change in the Organisation, and did you notice a great change when you came back? What was your impression of the CSIRO of 1990 compared with the CSIRO of 1980?

I think mainly that there was more stability. When I left CSIRO the first time, it was a period of change to say the least. So stability. Had much else changed? My overall impression was the opposite, that not much had changed. The main thing that had changed was the formation of Institutes, which I thought it was a very large step forward.

The Institutes had been there in 1980 and you were in Neville Fletcher's institute, but clearly, that didn't have any effect on your life.

No, none at all. My impression of that earlier period was that those structures were a figment of Limestone Avenue's imagination. I never saw any influence in the Division whatsoever.

We the Division of Applied Organic Chemistry were part of Hill Worner's institute, and Hill Worner was quite an interactive character.

Yes.

So that did have an influence on our life. Anyway, getting back to the Division of Manufacturing Technology had that evolved in the way that you thought and what changes did you think you needed to make in 1990 in order to establish the Division of Manufacturing Technology in the way that you wanted it?

Number of facets to that. The Division had grown modestly over the decade. External earnings were not very extensive. They were somewhat above what we were doing in the die-casting group a decade earlier. During the period, there'd been the recruitment of a few good staff, new programs had got underway. The Division had been re-established out of temporary premises in Brunswick into Preston. That was still in a transient state –

Because the state government owns some of it.

The State Government owned the only good building onsite and the Division was in a small brick building and a big warehouse. So we took over. The state government had the big building there custom built for technology transfer in the northern suburbs of Melbourne. That hadn't worked out, so the initial thrust in CSIRO was that we should buy that building. Well, we prevaricated and eventually got it for a dollar with the promise that we'd carry out the technology transfer activities, which we did. That changed the whole situation as far as operating the Division was concerned, because we could get administration and some of the labs into that building, refurbish the old building as labs and then have the big warehouse as a pilot plant and heavy laboratory space. So that was the first big thing to do. Staff numbers hadn't gone up a lot. Adelaide was still operating as a separate entity with pretty well no joint projects whatsoever, and I think there were two staff sitting in Applied Physics.

Yes Milan.

Yes, Milan –

*Milan Brant and his offsid*er.

That's right, yeah. The die casting work was –

Are we onto magnesium yet?

No, no. It was living off its –

It's reputation.

Living off its laurels and its reputation, yes.

And you had the Preston group scheduling software stuff, that was going all right wasn't it?

Miles Harding was one of my early prodigies. He was the first person I hired into the Production Technology group and he did marvels with that and then became CEO with the Preston group, and then when the Preston group were bought out by Boeing he became the CEO of the Boeing subsidiary. My first big task with Miles was to get him to wear shoes when he came into the lab, then getting him into a three-piece suit was another triumph. That was starting to go well. So things were going well, but there was a lot of latent potential. So the first thing to do was to reorganise everything into five separate groups, integrate Adelaide into programs, build up Sydney and build up Brisbane, because we only had two people in Sydney and one person in Brisbane. Brisbane went very well because we worked closely with UQ, University of Queensland, because they were part of the CAST CRC that we set up.

When CSIRO/ Queensland Government built QCAT out at Pinjarra Hills, we moved all our heavy pilot plant work there to QCAT. We then went in with Queensland Manufacturing Institute which was a State Government initiative, which was very similar to what we were talking about previously of having a heavy engineering research centre. So they put money into latest equipment and a variety of fields for prototyping of products and processes et cetera. So we were also one of the main occupants there. We had operations in Queensland at UQ, QMI, and QCAT at Pinjarra Hills in the end, a big presence there, and we built up the Sydney base to about 20 people. But what we did was make sure that the vast majority, and I think all of our programs were integrated across sites so that we started to operate as a Division, and instead of having specialist clusters, which had been a tendency in CSIRO, we had specialists embedded in one or other or a number of groups and have them more flexible.

That worked well. Then with Melbourne and Queensland Universities we came to an agreement in the four CRCs we'd got up because I took the view –

So the four CRCs were the car CRC, the welding CRC, the advanced manufacturing CRC and the fourth?

It was mining.

Mining, okay.

I viewed that as an essential strategy for the Division to get-up a number of CRCs in our core areas to underpin –

So in some ways a lot of CSIRO Chiefs were against CRCs weren't they, but you embraced them?

Totally, because it was a combination of previous experiences in a variety of workplaces about this is the way to do it.

Cooperative research is the way to do it.

Yes, and you've got to have everybody concerned throughout the entire development and innovation chain in the tent to start with, not coming in as visitors occasionally. So that worked well. So the CRCs also gave us the flexibility of saying to the universities, "You enrol the graduate students, we'll pay them part of their stipend to work full time in our laboratories, and we'll have joint supervision." The Queensland guys used to go to UQ twice a year, but the rest of the time they worked in our laboratories. That gave us enormous flexibility of people coming in and out all the time, an infusion of new blood. So that worked well. What we had to do was just weld and lead the Division to operate, and think as an entity.

Can you comment on pressures from within CSIRO firstly to make money, bring money in, and secondly what was happening to your client base in industry at this time? The cold winds were starting to blow, was it very noticeable when you first came back?

No. The way the need to, the desire, to raise external funds in CSIRO I think it was badly formulated and the selling of the concept was clumsy to say the least. In various Divisions, it was interpreted that it was what, 30% of every researcher salary. We never had any of that nonsense. That was not the model we operated in manufacturing technology –

Nor in Colin Adam's institute, we didn't really operate like that.

No, it wasn't an issue. We were an entity. The focus was not on raising funds, the focus was on identifying tasks which need a substantial amount of scientific and technological input to solve, and to do that we take everybody inside the tent who's concerned and everybody makes a contribution. So we weren't raising funds from the companies, we were working with the companies and they were paying for part of the effort in a variety of ways; people seconded to the Division, use of their equipment, supply of equipment, marketing information. So there was a whole host of inputs. I think I'd be fairly safe to say in my tenure as Chief of Manufacturing Technology nothing that we did was driven by a Head Office policy decision to raise money. I agree with Tom, the rest of the Institute didn't work that way. It was common culture that that was -

And in the days before, more recent times closing down the car industry and all sorts of things happening, manufacturing dying right, left and centre in Australia, no sign of that when you first came back?

Yes, yes. You had to be able to read the tealeaves. I spent a period where I was reasonably closely involved with John Button and his policies, so I had reasonable insight into the car plan. Now in the first time round in CSIRO we'd done work in that area did even more work when I was at Invetech, because we were bloody good at automation in Invetech. The essence of the Button plan for the car industry was that we should be in flexible small volume manufacturing. So, we should manufacture a wide variety of models in short runs. To do that, you've got to be technology intensive and you've got to be automation intensive. So I was involved in both CSIRO and in Invetech, and also in Metal Manufacturers where we created the leading automation specialist in the car industry in Australia, well as in the automation industry in Australia.

We built the first fully integrated production lines at Ford and General Motors where you could build a big truck, a family sedan or a Statesman one after another automatically, everything done automatically, and we went a long way down that track. Where things went wrong was when the international car companies started saying, "we will standardise on one or two platforms domestically and internationally", that cut our base enormously. Then when a series of governments started doing deals with the unions whereby the federal government was putting increasing amounts of subsidies into the car companies, and increasing amounts of those subsidies were featherbedding the workforce, which reduced the incentive to continue with the automation that we'd started on and that was the slippery slope that we went down.

So yes, when I was in CSIRO the second time we could see which way it was going. In the companies we were working with, they were already starting to look that way. So, when you see the good die casting companies that have survived they are the ones which took the early signs. You've got a number of companies producing into automotive supply chains who are Australian-based supplying 100% of their product into international markets. Nissan in Melbourne is one of the biggest. So yeah, one could see the changes, people in the industry could see the changes. The public and the politicians were always the last.

So you decided at the end of your five year contract as the Chief of the Division not to renew it and –

That was a very difficult decision.

Were you headhunted to go to Wollongong?

No, it was a culmination of many things. I'd had 10 years of spending three to four months of the year in London and being on the road a lot of the time. The plus of that was Ann could come with me whenever she wanted and travel first class, and be looked after very well, so that wasn't too bad. Invetech, I was away all week and worked all weekends. CSIRO, we had operations all over the countryside and I had to go to Canberra quite often as well. We were living in Sydney and the kids were at school and getting towards HSC et cetera, Headquarters in Melbourne, and the strain was beginning to tell. Could we have done it differently? Yeah maybe, but I'd been travelling for too long. That's what it came down to.

Also I could see CSIRO was starting to be more bureaucratic, I could see the Chief's job was changing. I've always enjoyed trying to be a leader and I'm not an administrator, I'm not good at pushing paper or attending nebulous committee meetings and things like that. That was just not what I enjoyed. Maybe that was an incorrect perception, but it was my perception at the time.

So you went to Wollongong as Senior Deputy Vice Chancellor and in charge of research at Wollongong.

Well I wasn't in charge of research; I had a Pro Vice Chancellor of Research reporting to me. But my background strength was in research, and both research and teaching performance had to be increased quite substantially. So naturally I focused a lot of attention in the research area, but I worked closely with two Pro Vice Chancellors of Research during that time.

And with the Vice Chancellor presumably.

Oh yes.

He was very keen on research –

Yes. Well the whole Executive realised we've just got to move further up the growth curve.

And so what were your main achievements at Wollongong do you think?

Growth, certainly enhancing the collaborative research areas, inculcating a research culture into the place, and a lot of intangible things. In organisations, people have got to feel they belong to the organisation and that they're belonging to something that values their input, and they become involved. In the case of universities, I found it was almost corny; it was trying to encourage people to dream. When you've got organisations in the beginning of growth periods, a lot of people see what is viewed as impossible, not as what is possible. So holding the status quo almost becomes a criteria of success. And it's not my success; it was the success of the entire Executive, because we worked together as a very integrated team to get a feeling of excitement. The excitement in the place when we won our first ever award for anything, which was for Collaborative Research. That had a powerful effect, "Christ, we're that good, are we?"

You tell an interesting story about you becoming the Dean of the Faculty of Arts for a short time.

Yes, that was funny, that was serious. The Faculty of Arts, like most Faculty of Arts, was undergoing a historical serial crises of identity, a flying apart. By their very nature, Faculties of Arts contain a whole divergent range of views, and that's one of their strengths and it's also one of their weaknesses. You can end up shouting at one another, rather than talking to one another, and deriding one another rather than collaborating with one another. That inevitably then morphs into unintentional intimidation, into bullying, into the formation of

cliques - you've got the Trotskyists who won't talk to the Stalinists –and every issue becomes a prolonged discussion. We had two Deans of Arts resign in quick succession. It obviously wasn't going to work to put in a temporary Dean internally by rotation, so the decision was I should take over and just –

Fix it up.

Yeah.

And that worked well. So you retired from that position but you've been associated with the university ever since.

Yes, I've been doing things with the university ever since. I spent three or four years with postgraduate students, did that once but it was a bit too much like hard work actually. It was very, very interesting and I had a great time, but I didn't feel up to taking it on again.

And you continued working in CRCs, so I caught up with you when you were the Chairman of the CAST.

Yes, I continued to do a lot of work with the CRCs. I continued a lot of work because when I was in CSIRO I worked very closely with AMC's Board on the Australian magnesium project. I continued to work with Ian Howard Smith and advise the Board when I left CSIRO, and when I went to Wollongong, I did a lot of work with the Queensland Government on the Smart State initiatives and all their programs. I ended up working with ANSTO for many years, first of all three years on the Board, then I was about 12 years as Chair of the International Technical Advisory Committee, which was handy because they were just up the road from Wollongong. So kept on doing a lot of things, working with senior professors and more junior staff on research proposals and papers and then working on large national research centre projects, the ARC Centres and Centres of Excellence and that type of thing.

As you know, I had quite a lot to do with the chemistry department there with Leon Kane-Maguire and John Bremner and Gordon Wallace and Margaret Shiel. So a highly distinguished group of chemists you had there.

Yes. Unfortunately, Leon died but we're still very close with his wife Barbara; we go out to dinner and the theatre with her regularly. I've seen Margaret quite a lot. We had a big dinner in Wollongong for her when she got appointed to QUT, which was nice. John, I see around the traps and the coffee shops.

Just going back to ANSTO, what sort of role did you play on the board of ANSTO? Given all the experience that you had up to that point in time were you quiet or were you vociferous or selective?

I would like to think quiet and reasoned. One of the issues at the time was radio-pharmaceuticals, and that was an organisational mess with two separate units, one being the production unit, the other being the research unit, and relationships between the two

had been fractured to say the least with a lack of clear market input or market knowledge of what they should do next. That was something that had to be solved.

So did you wade in?

I think I had my say

And was it solved? I think so.

Eventually yes it was. That is one of the world's large producers of radiopharmaceuticals and that's getting a lot better, market position is good. They now are going to develop their own Synroc facility to treat the waste from that facility, which is 30 years too late but better late than never. The whole of Synroc was another big –

Area of interest because it's high tech, well medium tech. But the role of a part-time member on a Board is one where you've only got limited opportunities to make input, you can see a lot of things but you're only one of a number of people, it's not an easy thing to make a really valuable contribution in that context.

I would agree. As a general sentiment, I totally agree. During the time I was on the Board, I did have contacts within the Organisation itself, so I did know something about the operations and the people in the Organisation, more importantly about the people. So I wasn't a typical external Director who was being dropped into an Organisation they knew nothing about. I did know quite a lot about ANSTO.

And did you do for example anything like what Tom did, as a board member of CSIRO he actually went around and talked to people in CSIRO a lot, and in fact was often accused of knowing more about what was going on than other people in management of CSIRO.

Yeah, absolutely because one of the things we set up was the Technical Advisory Board. Now this was a lot of work. I Chaired the Technical Advisory Board, which is the ANSTO Technology Advisory Board, but we also set up under that a Board for each of the Institutes which held multiple meetings during the year and it was the role of the domestic members of those Boards, and the international members, to have continuous input into the activities and the strategies et cetera of those Institutes. So in that period I worked very closely with George Collins who was the –

He was the Deputy wasn't he?

Was the Deputy yes, but he was also the Chief of Materials Engineering. So I actually spent a lot of time there, as did the other Technical Advisory Committee members. In some ways, because I was so interested, you could you ended up as being an unpaid part-time staff member of ANSTO.

We of course got to know George very well because he became the Deputy Vice Chancellor, Research at Swinburne.

Yes. I poached him from ANSTO to lead-up CAST.

So Peter, if you were starting from scratch today and setting up Australia's national innovation system, whatever that means, would you have CSIRO?

That's a very difficult question to answer off the cuff. I think you would have something like CSIRO, whether you would have CSIRO in its present configuration, the structure I'm not sure. I think there still needs to be a greater integration of effort between all the relevant sectors. So I still see a bit of fragmentation between government agencies, and I don't think there's a lot of competition, but there's some duplication, and there's still a lack of connectivity, if you like. I think if you were starting from scratch you would configure CSIRO in somewhat of a different way and I'd like to see a lot more activity in economics, in market dynamics, and the key discipline areas which interact with scientific investigation and innovation and application being an integral part of the activities.

So you'd like to see your 1983 report implemented?

Basically, yeah, yes.

Would you involve the ARC in your consideration of any major restructuring of the Australian system?

From the start when I arrived in Australia, I've always viewed the funding mechanisms for research in this country has been totally byzantine, and they'd become more and more so, especially with the introduction of metrics as a means of deciding on research excellence's relevance. I think the funding mechanisms for government instrumentalities and the universities need reviewing thoroughly or overhauling, and I think they need to be integrated. They are not separate activities, they should be integrated activities. There should be far more CSIRO/University interactions, I think that should be in continuum. There should be an interchange of staff; there should be a flow of students into CSIRO especially postgraduate students, staff from CSIRO into universities.

That in itself dictates that you have an integrated funding mechanism where you can implement programs which attack large national requirements and initiatives, rather than when something occurs you look around for what is the most appropriate authority to carry it out.

So you'd have a national research organisation of some sort, but you'd have a government funding of research and development in Australia that was much more coherent than it appears to be now?

Yes. Yes.

Well Peter, thank you very much for all the time you've given us today, and the great insights you've given us in your long career in Australia in both the public sector and the private sector and the tertiary education sector, a unique experience really. So thank you very much.

Agreed, thank you very much Peter.

Thank you, thank you both.

[End of interview with Peter Robinson]