



AMERICAN INSTITUTE OF MINING,  
METALLURGICAL, AND PETROLEUM ENGINEERS

## ORAL HISTORY PROGRAM

Cyril O'Connor

The Catalyst for Mining Engineering Research

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## Part 1

### 00:09 Introduction

Moudgil:

Today is Tuesday, February 26th, 2019. This is an interview with Dr. Cyril O'Connor, Professor Emeritus, Chemical Engineering Department at the University of Cape Town, Cape Town, South Africa. The interviewer is Brij Moudgil, Distinguished Professor, Department of Materials Science and Engineering, University of Florida, Gainesville, FL. He served as SME President-2006. This interview is being conducted as part of the American Institute of Mining, Metallurgical, and Petroleum Engineers oral history project. We are at SME's annual meeting, celebrating Professor Douglas Fuerstenau's 90th birthday.

### 00:45 The Early Years – From Ireland to South Africa

Moudgil:

Cyril, first of all, I would appreciate if you can tell us a little bit about your childhood: your family, early family, schooling, and how did you get inspired to be an engineer?

O'Connor:

Well, thank you, Brij, for the opportunity to be interviewed. All four of my grandparents came out from Ireland to South Africa in the late 19th century. And, I have on record that my grandfather was almost illiterate, which I think I am also, if you ask my secretary. My two grandfathers came out to work on the mines in Kimberley where diamonds had been discovered. On my paternal grandfather's side, my father was one of 11 children, of whom only four reached adulthood. My father was born in Kimberley in 1905. Gold was discovered in Johannesburg in the late 1880s, and my paternal grandfather moved to Johannesburg in about 1910 to work on the gold mines. It was then just a rudimentary mining town and he started working for a mine called Simmer & Jack. My maternal grandfather also moved to Johannesburg, which, as I say, then was just a town with corrugated iron houses. My paternal grandfather was killed in an underground accident from a rockfall when my father was ten, and my maternal grandfather died at a fairly young age of pneumoconiosis or psittacosis when my mother, the eldest of four children, was in her teens. My father left school at the age of 14. There is an amusing family story. After he left school, he went to work for what was called Rand Mines as an office boy. The big perk of being an office boy was that he got a bicycle, and he got an allowance once a month for the bicycle maintenance. Anyway, the bicycle got a puncture, and his mother wouldn't let him repair the puncture because she needed the money for housekeeping. So, he used to push the bike literally to work to clock it in and back home every day. His older brother fought in the First World War, and I'm named after him. He won a number of distinguished medals, but died at a young age from the effects of mustard gas poisoning from the First World War. My mother was much more educated than my father. She went as far what we would call today grade 10. Clearly, I don't come from a sophisticated or highly educated background. There were four children in our family. My father

worked on what was the largest mine in the world at that time, Crown Mines, from the age of 14 until he retired at the age of 63. His mother would never let him work underground; his father having been killed underground. So, he worked in a surface job, and he became what was in those days called the “chief timekeeper” logging the shifts worked by the almost 50,000 workers on the mine. The black workers in those days were contracted for nine months, and then they went to wherever they came from in the rural area for three months, and they applied again for a new contract. And, my father's job was also to manage their re-contracting.

#### **04:55 O’Connor’s Educational Evolution to University**

O’Connor:

We didn't know in our family what a university was and, in my childhood, I never knew anybody who went to a university. I had the advantage of being a white and with hindsight this was not a trivial advantage. I'm a Catholic, and we went to Catholic schools, and I mixed with Portuguese, Italians, Jews, Chinese, and so on. And so, looking back, I consider myself greatly privileged to have been brought up, not in an elite, but in a real-world environment. For example, my father never owned a motor car. We mixed with the green grocer's son and the bus conductor's son, and so on. I remember when I was about 14, we heard that a girl that lived up the road from us had gone to Witwatersrand University. We thought that was amazing. When I matriculated, I thought I'd like to study on, but my parents couldn't afford to send me to university. I then decided to apply for a bursary to study at a teacher's training college, because then I would get a bursary. So, I went to a teacher's training college, and became a high school maths and science teacher allowed to teach up to grade 10. In my second year my math lecturer asked me what I was doing at the college and not a university? I was pretty good in maths. So, I explained that this was my only chance for a higher education. She encouraged me to register for a BS degree via correspondence through the University of South Africa; it's a correspondence university with very high standards actually. So, I started out with that, and if I might blow my trumpet, I never dropped a first class for any course in my undergraduate degree. I graduated with distinction with a BS degree in maths and chemistry while I was doing full time school teaching.

That was a wonderful discipline because I also was appointed as a housemaster in a boarding school. And, once I put the boarders to bed at night, I went and started doing my assignments. So, I got used to sleeping on about four hours a night and, looking back, that was a great apprenticeship. When I eventually graduated, I really wanted to study further, and I managed to get a scholarship into the University of Cape Town honors program in chemistry. While I was doing it on this program, I was school teaching. So, I would teach till lunchtime and then go to university for lectures. At the end of that year, one of the professors of physical chemistry, was Ernest Prout, who became very famous for his work on the solid-state decomposition of azides which are primary detonators. He invited me to do a PhD, so I said, “You're mad!” But, he insisted that I do a PhD. If I talk about mentors, he was a fantastic mentor. In fact, if you read Octave Levenspiel's famous book on Chemical Reaction Engineering, you'll see the Prout-Tompkins equation which describes models for the thermal decomposition of solids. When I finished my PhD, a professor in chemical engineering came to see me, and invited me to apply for a vacancy in chemical engineering. They were looking for physical chemists, and he explained to me that in the United States it was becoming fairly common for a physical chemist to switch to chemical engineering.

## **09:13 A Trip Through Cyril O'Connor's Professional Career – Founding the Center of Excellence**

O'Connor:

At the end of my PhD, I had applied for jobs with AECL, a subsidiary of ICI, the National Institute for Metallurgy (NIM now called Mintek) and Sasol a company which pioneered producing liquid fuels from coal. I told the companies that I had applied for a position at the university in chemical engineering. And, they both told me that, if I got that position, I should contact them to do research with them. I got the job in chemical engineering and spent most of my career lecturing reaction kinetics, reactor design and thermodynamics. I started in two research areas at the same time. This was in catalysis (working with Sasol mostly on zeolite catalysis) and with the National Institute for Metallurgy (NIM now called Mintek) doing flotation research. I was unsure about starting two areas of research at the same time, but they had a common thread in that they both were based on surface reactions. So, that's about 40 years ago, and what's happened today is that the Catalysis Group, which I founded, is now a very large center of excellence and the Centre for Minerals Research has also grown significantly into arguably a serious global player in the area of minerals processing.

I ran the flotation and catalysis research groups for about 25 years until it became too much of a load. In 2005, we had a total of about 30 post-graduates. I was then able to attract back to South Africa one of my first PhD students from the US where he held a very senior position in Philips Petroleum. He is now Director of the Catalysis Centre. I continued to manage the flotation group until retirement, which by then had become the Center for Minerals Processing. In 2009, I handed this position over to another of my former PhD students who became Director. I have been very fortunate to have such great former students to attract back to take over these positions. In the meantime, in 1988, I became the head of chemical engineering until 1999, when I was appointed Dean. From 1999 to 2008, I was Dean of the faculty of engineering and built environment. This faculty includes all the engineering disciplines and architecture, geomatics, etc. with about 300 academic staff and more than 6000 students. In 2007, we got a new vice-chancellor, and I acted as a deputy vice-chancellor until I retired at the end of 2009. Anglo American had awarded me a personal Chair in 2003 and after retirement I was able to take up this Chair until 2013. It is now held by my successor, Dave Deglon.

## **13:04 Mentorship - Early Inspiration Drives Success**

Moudgil:

You mentioned about your interest in mathematics and chemistry early on, and that the mathematics teacher, I guess, asked you to go for higher studies work. How did you develop the interest, and was that teacher one of the early mentors for you who inspired it?

O'Connor:

I think my earliest mentor was my mother. My father was a hard worker, and he could run down a table of figures and add them up quicker than a calculator can do today. My mother was very good

with figures. So, I was blessed because there were four of us children, and we would come home from school, and my mother would sit with us watching over our homework and coaching us. And, I think we all fell in love with figures. My sister was eldest; she died, sadly, of a brain tumor when she was 28. But, my other two brothers never went to university but have done well in the finance sector. So, I'm still the odd man out in the family with a university degree, which they mock me about because I think they have done financially much better than I have.

#### **14:42 The Verge of a Big Boom: The Sasol Project - Opportunity with a Bit of Luck**

Moudgil:

Really good. Okay. So now, with regard to your profession, you covered quite a bit of it, that you had opportunity to work in industry and then got an opportunity to teach in the chemical engineering department. So, you must have seen a lot of changes through your years as a faculty, then as a Dean, and then deputy chancellor.

O'Connor:

Well, if I go back to how I started my research, serendipitously, as I said, I joined the department, we had a very good professor who had done his PhD at the University of Philadelphia in biochemical engineering. He has passed on now, but he recommended to me that I get involved with the industry. That was excellent advice! So, I've always told my young colleagues today to get out and visit industry. I was quite lucky when I started out, since industry was funding universities quite strongly (as opposed to today when it's often difficult to attract significant industry funding). And, I think I chose the right areas for research at that time namely in the area of fuels and minerals. I also think hard work is a key ingredient for anyone's success. Today, I think that I can fairly say that the two research centers that I founded both enjoy excellent global reputations. All of our masters and doctoral projects have someone from industry involved in supervising them. This is great value to the students. I've always been of the opinion that you shouldn't do any project in engineering unless you know that there's somebody out there who would be interested in it. This even applies to quite fundamental research. I also strongly believe that university researchers need to be sure that they deliver quality outputs, on time and within budget. If you do this, you'll never be short of funding, at least that has been my experience.

#### **18:09 Breaking the Law - The Emergence of Black Students in Engineering**

Moudgil:

During your career there were a lot of political changes that came through. Tell us how did that help you to grow as a professional and also how you implemented those policies?

O'Connor:

Well, it's interesting that in the early 1980s chemical engineering at the University of Cape Town (UCT) was approached by Shell, the global petrochemical company, who wanted us to take on what became known as the "black Shell scholars". These were super bright black students often

mostly from rural areas. Shell would go to the rural schools and ask the school principal to identify top students who then were sent to excellent schools and then to UCT chemical engineering. Actually, it was against the law at the time to accept black students, but we had a fantastic Vice-Chancellor, Stuart Saunders, who is still alive today, who just decided to break the law, accept them into the chemical engineering programme. And, in fact, he set up a special residence so that they wouldn't have to live in the, so-called, white residences. And, it has been an eye-opener, Brij, to see how well they have done today occupying top positions in leading companies around the world. They were, and still are, wonderful role models. We have a strong transformation agenda in the country, but nowadays, I think, we are thankfully getting to a point where we no longer see people for their color but rather for their ability. But, we have to accept that the scars of apartheid will take many years to heal notwithstanding all the progress made since the day when Nelson Mandela was released about 30 years ago. Today in chemical engineering at UCT, we have more than 50% black students and also more than 50% women. And, UCT is still ranked as the top university on the African continent and among the top 200 in the world by most ratings. So, notwithstanding all of the above interventions, standards haven't dropped at all.

So, what did it do for me as a white? As I said to you earlier, I wasn't born with a silver spoon in my mouth, but I had the advantage of being a white. There's no question about it. But the transformation of our student cohort in terms of race – and gender by the way – has helped me to understand that, in fact, we were missing out on such a rich reservoir of talent in our country for so many years. Fortunately, although formal apartheid only existed for about 40 years it can be argued that it was there for more than 300 years since the mid-17<sup>th</sup> century when South Africa was colonized by Europeans. And so, you can say that it was only about 30 years ago in 1990, when Mandela was released, when we began to turn the corner. So, in some regard these are early days for the new dispensation. In the Center for Minerals Research, at the moment, we've got 55 postgraduates, viz. masters and doctoral students, of whom about 70% are black. There's also an amazing phenomenon. Zimbabwe is a total basket case as a country that was virtually destroyed by Mugabe. But the Zimbabwean students are among the best we have; somehow, they have managed to keep the education system going so well in the schools. Whereas, in South Africa, the school system, especially in the areas where black students are predominant, is somewhat broken. In engineering at UCT, we established a scheme called ASPECT, Academic Support Program for Engineers. Many black students, especially those who had done well in the final school exams but came from impoverished areas, are encouraged to go into this ASPECT where they are put on a five-year programme for the 4-year degree. We give them three years to complete the first two years of the degree programme. But what has been interesting is that frequently there are students arriving from rural areas, put into the ASPECT program, and, after a week or two, it becomes clear that they should be in the mainstream programme. There have been many cases of such students who went on to do excellent PhDs. This just showed that it was nonsense to think that intellectually there was any difference in ability based on race!! If the opportunity and right environment is provided, academic ability is color blind!

### **23:45 With the Likes of Nelson Mandela**

Moudgil:

So, with regard to the switch over, when bringing black students, breaking the law, did you feel that the rest of the faculty members were as supportive as you were of those policies?

O'Connor:

Oh, yes. The University of Cape Town had a long history of liberalism and struggle against racial discrimination. During the darkest days of apartheid, the University of Cape Town, and especially its student body, played a leading role of opposition to the government of the day. The story I have told you of the Shell scholars is but one example of many such interventions.

Looking back the most significant event was, of course, the release of Nelson Mandela and the amazing role he played in promoting harmony in our country. His second wife, Graca Machel, is the Chancellor of the University and will stand down in 2020 after 10 years. She has also been a wonderful role model for the country. From a personal point of view, we were also very fortunate to have a wonderful vice-chancellor in the early 2000s. She is Mamphela Rampole, who's still a close friend of mine, the first black vice-chancellor at the university, who's late husband Steve Biko, who became very famous in the struggle history of South Africa. Mamphela was a Vice-President of the World Bank for 5 years. She was banned under the apartheid government, during which time she added to her medical degree with a PhD in social science. She was a very close friend of both Nelson Mandela and Graca Machel, both of whom were frequent visitors to UCT. The recent tragedy in our country has been the appointment of Jacob Zuma as the President of our country in 2009 and the massive corruption that followed his appointment. Fortunately, we've now got a new president, Cyril Ramaphosa, who seems to be trying to fight corruption, but that is a tough challenge.

### **27:17 The Tales of Harry Irving**

Moudgil:

So, you were going to mention about another mentor.

O'Connor:

I was speaking earlier about when I joined the department of chemical engineering, which was 1978, and I had done my PhD in physical chemistry. A wonderful gentle old man, who had been the professor of chemistry at Oxford University for 30 years, had retired and decided to come and live in Cape Town. This was Harry Irving. He was responsible for Irving-Williams order in the transition elements. In my very first year in chemical engineering, I had to run four final year projects, and I went to see Harry for project ideas. He then told me that during the Second World War he worked while at Oxford University for a company called Tube Alloys, Incorporated. He never knew at the time that Tube Alloys, Incorporated was part of UK's contribution to the Manhattan Project. What he did know was that there was an idea that you could recover uranium from seawater by using foam fractionation. So, he suggested that I start some work on foam fractionation, which, essentially, eventually led me to become in flotation research.

### **31:07 Overcoming Challenges – Surrounded by Good People**



Moudgil:

You were a faculty, you were Department Chair, Dean, and then Deputy Vice-Chancellor, so I'm sure you met some tough cookies during your time. So, you have a lot of successes to your credit, and there must have been a lot of challenges, too. Any challenge that stands out in your mind, and how did you deal with it?

O'Connor:

I think in those days dealing with racially-related problems was tricky because, although as I said earlier there was great buy-in by everybody, the terrain was still tricky. Let's say we were in rehab mode? We started a scheme of appointing black academics through a special program in which we would create an extra post in a department on condition that, when the net permanent vacancy arose, it was filled by that black academic. This often resulted in some tension, if say a strong white candidate was overlooked for the position. It also created a lot of pressure on the black appointee. However, overall, I think we did the right thing, and today we have many excellent black academic staff and many excellent black applicants for academic positions so that there is little need for affirmative action.

#### **34:04 What is a Logarithm? – The Flawed Educational System**

Moudgil:

You've been training students for a long period of time, and at all different levels, undergraduate, graduate, PhDs, and so forth. Have you seen any transitions coming through in the preparations of the students, which has really stood out and is very positive and then maybe some areas which perhaps are not so positive?

O'Connor:

Well, let me say, unfortunately, I would say we've got quite a lot of challenges, and those relate to the quality of the high school graduate arriving at university. Chemical engineering, after medicine, is the most difficult program to get into at our university. So, we get excellent applicants. Presently, I'm not that close to the undergraduate program, but I see them as they graduate because they come into the master's program. And, they often don't seem to have basic understanding of the fundamentals of mathematics. For example, I enjoy asking a master's student to explain to me, "What is a logarithm?" They have no idea. For them, it's a key on a calculator. The same holds for pH? For them, it is a number read off an instrument, and they've just become chemical engineers. So, I think we're missing a few tricks here. We're assuming that they're learning these things at school, but that may not be the case.

By the way, let me just say that my wife and I both married in our late 30s. We were both career people. My wife is a pharmacist specializing in pharmacokinetics. We haven't got children, but I've got loads of nieces and nephews. But, what I see today in much school work is that they spend their lives doing projects, and all they do is go to Google for material. Many university students

think that literature only began when Google was invented. Some of them have no idea of where the university library is. Well, that may be the way we're all going, but don't ask a student to quote the early work on flotation because that journal may not yet have been converted into an electronic version.

## Part 2

### 00:20 Keeping Afloat - Black Students Eagerly Maintaining the University of Cape Town's Prestige

Moudgil:

So, did they also change the expectation the professors had from the students in the sense of a standard which they were held to earlier times that also could affect them?

O'Connor:

You know, it has been very interesting for me that the black students, in particular, keep on saying, "Don't drop standards." The University of Cape Town is still regularly placed in the top 200 odd in many global rankings and is the top-ranked university on the African continent. So, it is considered to be prestigious among black matriculants to get into the University of Cape Town. And, they themselves campaign hard that standards do not drop. Of course, there are many naysayers who will tell you standards are dropping. But I take strong exception to that, and I've got MScs and PhD students of all colours and races who are as good as their white equivalents of many years ago, and, in many cases, they have a much stronger work ethic because they really do appreciate the opportunity that has been given to them. I'm very excited about where we are heading. We're coming out of a dark period in the history of the country with the rampant corruption that I mentioned, but I think that we've also got some incredibly exciting opportunities. Now I look at some of the former graduates of mine who have gone on to become top people in, for example, big mining companies. They've done well, and they are the role models for the future.

### 02:21 Mobil's Magic Catalyst – One of O'Connor's Favorite Contributions

Moudgil:

You have made a number of notable contributions to the field of flotation, or mineral processing in general, and also the catalysis. Is there anything which stands out in your mind, which you really enjoyed making that contribution?

O'Connor:

Well, let me start with catalysis. One of the big projects that Sasol got me to work on was conversion of low chain-length olefins, such as ethylene and propylene, into distillate fuels. We had a shortage of such fuels in the early 80s, and Sasol, through its oil-from-coal technology, was able to produce a wide range of liquid fuels but insufficient diesel/distillate fuel. We had a serious

problem in the country for the balance between diesel and petrol gasoline. At the time, Mobil had a catalyst, which was really the magic catalyst called ZSM-5. The top people in their research facility in Princeton, NJ, were Paul Weisz and Werner Haag. Both had left Europe just before the Second World War. They were really helpful to me, but we were never allowed to get the sample of the ZSM-5 catalyst. So, I decided that we would be brave – or silly – and attempt to make it ourselves. To cut a long story short, we succeeded, to the extent that a Germany based company called Sued-Chemie (later bought out by Clariant) began using us as an off-shore research facility for some of the zeolite catalysts, which they were making for the global market. This was a very fulfilling experience. Interestingly, at that time, South Africa made many outstanding technical advances which were a result of the global sanctions applied against the country because of the apartheid policy. A sort of story of unintended or unexpected consequences.

#### **04:26 The Hidden Art of Thermodynamics: Working in Minerals Processing**

O'Connor:

In terms of my minerals processing side, I think it is quite interesting because my catalysis work, I was able to transpose the surface chemistry knowledge that I got through catalysis into flotation. In fact, if I look at my CV today, I probably have as many publications in catalysis as flotation. Out of this has come some of the developments we have made using microcalorimetry as a better indicator (we think) of hydrophobicity than contact angle. And, I've been using excess Gibbs energy to show how, in fact, we can predict how a reagent's hydrophobicity is affected by the hydrocarbon chain associated with a collector. So, I think what I've benefited from having two different research thrusts, both of which, however, are fundamentally based on surface reactions. It speaks to the importance of looking at cross-fertilization of research ideas from one discipline to another. In our centre, we have groups focusing on hydrodynamics, comminution modelling, molecular design of reagents, and this makes for an exciting research environment.

#### **06:24 Nothing in Life is Free: Researchers Earned Their Paychecks**

Moudgil:

You have very closely worked with industry, and they have been benefitting from your research over the years, and I'm sure they have provided quite a substantial amount of funding for your research. Has that scenario changed in the recent years?

O'Connor:

I've always had the experience that, as long as you're doing high-quality research, the next check will be in the post. You have to produce top quality research, on time, within budget, and with great respect to academics around the world; we are, in general, not good at achieving that. The other important factor in my view is to avoid putting all your eggs into one basket, so to speak. And so, in our Centre we work with companies: mining PGMs in South Africa, iron ore in Brazil, copper ores in Zambia and so on. I think it's important to diversify your source of research income. Just about all of our research income comes from industry. In fact, we get very little from the university apart from one or two salaries (most of the staff are funded from industry grants).

Government is also a very minor contributor, mainly through post-graduate bursaries for students. However, one has to be careful and not just chase funds without having a longer-term strategy. If you don't pay sufficient attention to fundamental research, you will soon lose the cutting edge in your industry-oriented research.

**09:11 To Research or Not to Research: Which Model is Best Financially?**

Moudgil:

Has there been any downside to this model of funding?

O'Connor:

I think this comes down again to ensuring that you have a good balance between industry oriented research and fundamental research. And, our experience is that enlightened industry will appreciate the need to have this balance. This also speaks to the importance of developing long-standing relationships with companies and persuading them to stay in for the long haul.

Moudgil:

Moreover, the industry has been going through tremendous change, globalization, mergers, acquisitions, so on, so forth. So, how do you keep up with those kinds of changes and keep the model still robust for funding purposes?

O'Connor:

One of the more interesting recent phenomena has been the general downscaling by many large companies of their in-house research capacity. This has also had an interesting unintended outcomes in that they now need to go to the universities to get their key research done. And so, we have indirectly benefited from that policy. However, the problem it has created, at the same time, is that there is often a huge vacuum in terms of serious researchers in these companies. And so, there is the temptation for them to short-term project type projects. These can be attractive to a university in terms of bringing in funding. But, in the long run, as I have already said, this may lead to your losing your cutting edge expertise and, eventually, will lead to the quality of the research becoming questionable.

**13:34 The Tendency to Say Yes: O'Connor's Impact on SAIMM**

Moudgil:

Considering your career, you have been a very dedicated member of several professional societies, and I'm sure you have received a number of honors. So, I would like to hear from you, when did you start it? Who inspired you to become a member of these professional societies, and what your contribution has been, and how have you benefitted from being a member of, like, South African Institute of Mining and Metallurgical Engineering?

O'Connor:

Well, cynically, I think I'm a bit of a sucker. I suppose, in various walks of life that I've been involved in, I've often felt the urge to get involved. Even now, I find it hard to say no when I get a call asking me to become involved in one or another project. I'm still actively involved on a number of university committees as well as being the CEO of an industry initiative called SAMMRI (South African Minerals to Metals Research Institute), which disburses industry funds around the country for post-graduate students in the area of minerals processing. In the 9 years of its existence, it has produced almost 60 masters and doctoral graduates at 6 universities and also empowered many young research leaders. Being involved with such activities is very fulfilling. Another interesting phenomenon is that, in the Cape Town area, we are far removed from the mines and, yet, we unquestionably have the strongest research activities in minerals processing at the Universities of Cape Town and Stellenbosch. I think this is because we have never been tempted to become heavily involved in consulting type work, which has been the case in many universities which are only a short drive away from the mines.

#### **17:07 Catalyzed Growth: The Creation of CATSA and IPCAT/ APCAT**

O'Connor:

Then, on the catalysis side, I did a sabbatical in 1995 at the University of Delaware with Bruce Gates. And so, I started making a lot of contacts in the United States, and then I told you about Mobil, and so on. And, people asked me to organize a national catalysis meeting. So, we did this, and I then established the Catalysis Society of South Africa, which is very active today with many global associations. I also set up what we called the Indo-Pacific Catalysis Association (IPCAT) which involved South Africa, India (the group of NCL in Pune), Taiwan, Hong Kong, Singapore, [and] Australia. Eventually, it merged with APCAT (Asia-Pacific) but served a good purpose to bring together these countries' researchers in annual meetings.

#### **19:26 Climbing the Ladder of Life: Becoming Cricket Chairman, a Congress Winner, and a Wise Mentor**

O'Connor:

Then, I suppose, you know, in terms of what other bodies, professional bodies? The institution of chemical engineers, I have been active as a President, at one stage. I have a lot of interest in cricket. And so, I was Chairman of our local cricket club, which is a top cricket club in Cape Town. And, then one thing led to another, and I served on the executive of regional Western Province Association for 23 years and served as Vice-President for about 8 years. Similarly, after we hosted the IMPC in Cape Town, I became a member of the IMPC Council until, one day, Eric Forsberg asked me to succeed him as Chair. That was in 2005 and was supposed to be for 4 years, but this has turned into about 14 years. I've enjoyed the challenge of professionalizing the Council and its activities and working with great people such as yourself.

#### **23:35 Opportunities Are a Privilege: Linking Community Involvement to Profession Development**

Moudgil:

I know that you have won numerous awards, and you mentioned a few of them, and very recently, you became a foreign member of the National Academy of Engineering in the USA. So, how has your involvement, because you have done a lot for the professional societies, but how did it help you in advancing your career?

O'Connor:

Well, I think there are two aspects to get promotion in a university if you talk about my career. As you know, all over the world, you're evaluated on your teaching, your research, and your contribution to administration, and what we call social responsiveness, which relates to the contribution to bodies active in your discipline. And so, my involvement with IMPC would be a good example of that. However, if the truth be told, the overwhelming basis for any promotion at a university, as you know, relate to your research and teaching activities. And so, I suppose it is fair to say that my involvement with professional societies have not actually contributed to my career advancement. They have, rather, contributed to a sense of contributing, which is very fulfilling.

### **26:22 The Key to Attracting Students into the Industry – Change the Paradigm**

Moudgil:

You mentored a huge number of students in your career, and, as you mentioned, that great transformations have happened on the technology front, manpower requirements, training, and as an IMPC chair, you see education commission for training of young professionals, so on and so forth. So, what would be your advice, how do we go forward in attracting talented young professional students into the profession?

O'Connor:

Well, that's a huge question. Years ago, at UCT Anglo American asked us to set up a specialist programme in minerals processing. However, we decided that we would prefer to remain as a classical chemical engineering Department with various specializations in, for example, mineral processing, bioprocess engineering, catalytic process engineering, control engineering, etc. But, the core programme is a classical chemical engineering programme. I think we got it right, because we produced one-third of the country's minerals processing engineers. But, they are called chemical engineers, and they are attracted to the department because they want a degree which is flexible in its career options. Specialization can come in the postgraduate programmes or in optional courses in the senior undergraduate years. I think, in this way, we can attract talented young students. Programmes which offer a specialist programme in minerals processing at undergraduate level are struggling around the world to attract sufficient numbers of students. This, of course, except in China, but then, is an exception in most things!! The recent survey by the IMPC Commission showed this up very clearly.

### **31:48 A Pact with my Wife: Keeping a Healthy Work- Life Balance**

Moudgil:

You have worked really hard; you spent a lot of hours in the office. I'm sure you did. So how did you maintain a work-life balance?

O'Connor:

Okay, well, I'll tell you. I love my sport. So, Saturday was for sport, playing cricket, and then I took up golf. When I retired, I said I'm not in on Wednesdays. So, I play golf every Wednesday and Saturday. But, before I retired, golf was important for me. And, the second point is that I would work every night except Friday night and Saturday night. I had a pact with my wife that, on Friday night and Saturday night, I would not be at my desk. I was lucky that I had a wife who understood that and herself was actively professionally engaged in the department of pharmacology in the medical school at UCT. I think I had to watch the balance. I've seen colleagues of mine who retired but never got off the treadmill. I have a position at the University of Senior Research Scholar which involved co-supervising postgraduate students, mentoring younger academics on the tricks of research supervision, running workshops, and so on. I also think that it is important as an academic to mix with people from outside the university so as not to be trapped in this academic bubble. Those people help to keep you down to Earth.

### **34:34 A Prestigious Nomination: The National Academy of Engineering**

Moudgil:

Is there anything else would you like to add?

O'Connor:

Because you're an old hand at this, you mentioned the National Academy of Engineering. I think you were asking me about that. Of course, I didn't know that I was nominated. I was greatly honoured to find out later that it was Doug Fuerstenau who nominated me. It took me totally by surprise. I was the only foreign member from the African continent, which I thought was crazy because there are so many people more deserving of this than I am on the continent. But, let me say, that that was actually a real high point in my career. And, it was humbling at the induction ceremony to see what incredible are members of the Academy.