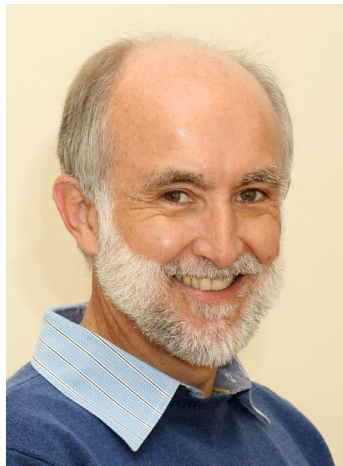


Rodney Trevor Jones: A Biographical Sketch

Abstract - The Rodney Jones Symposium on Chromite Processing is a part of the 59th Annual Conference of Metallurgists (COM 2020), and has been arranged to celebrate the contributions of Professor Rodney Trevor Jones to the pyrometallurgical industry and to the ferro-alloy industry specifically. Rodney's career in the Pyrometallurgy Division at Mintek spanned more than thirty five years of full-time involvement, and now continues on a part-time basis, along with his other consulting activities, and his involvement in the School of Chemical and Metallurgical Engineering at the University of the Witwatersrand, and as a Past President of the Southern African Institute of Mining and Metallurgy (SAIMM).

INTRODUCTION

This symposium at the 59th Annual Conference of Metallurgists (COM 2020) has been arranged to celebrate the contributions of Professor Rodney Trevor Jones to the pyrometallurgical industry and to the ferro-alloy industry specifically.



Consulting Pyrometallurgist
Senior Technical Specialist, Pyrometallurgy Division, Mintek
Honorary Adjunct Professor, University of the Witwatersrand
Past President, Southern African Institute of Mining and Metallurgy

PrEng BSc(Eng) BA MSc(Eng) PhD FSAIMM FIChemE FSAIChe FSAAE MRSSAf

EARLY YEARS AND EDUCATION

Rodney Trevor Jones was born on 9 December 1959 in Germiston, the foremost industrial city in South Africa, located on the outskirts of Johannesburg. His mother (Edna May Jones, née Hall) was South African - descended from the British 1820 Settlers. His father (Thomas Albert Jones) was born in Birmingham, England - the birthplace of the (first) industrial revolution. One of Rodney's great-grandfathers (Ernest Bagnall) was a silversmith in Birmingham. Rodney's father emigrated to South Africa in 1949 as one of five people who were sent to establish McKechnie Brothers (now Copalcor) as South Africa's leading secondary copper producer. Germiston was

originally a gold mining town (founded in 1886), but later became an industrial centre that was home to numerous industries of pyrometallurgical significance. These included the Rand Refinery (the world's largest refinery of gold, which has refined 30% of all the gold mined in the world since antiquity), McKechnie Brothers where secondary copper and brass was produced, Fry's Metals where secondary lead was smelted, Consol Glass where glass bottles were made, various foundries and steel manufacturers, and the national control centre for electricity distribution.

During childhood, Rodney visited the McKechnie Brothers copper plant a number of times, and was fascinated by the piles of gleaming copper and brass scrap, and by the extrusion mills producing brass rods, and the rolling mills producing rolls of paper-thin copper sheet. Rodney's interest in rocks and minerals was encouraged by an uncle (Arthur Searle) who was a geologist by training, and by an American close family friend (Jim Jensen) who was a consulting engineer for a number of large international engineering companies (and worked on the Manhattan Project during the Second World War). Jim Jensen worked on the Palabora Mining project in the 1960s, and Rodney got to accompany him while flying over the plant in a small plane. Jim Jensen worked closely with Alan Haines, Dave Boydell, and Henry James from the National Institute of Metallurgy (NIM, the forerunner of Mintek - an internationally recognized minerals research organization, now based in Randburg) on other projects, and that facilitated Rodney's early contact with Mintek.

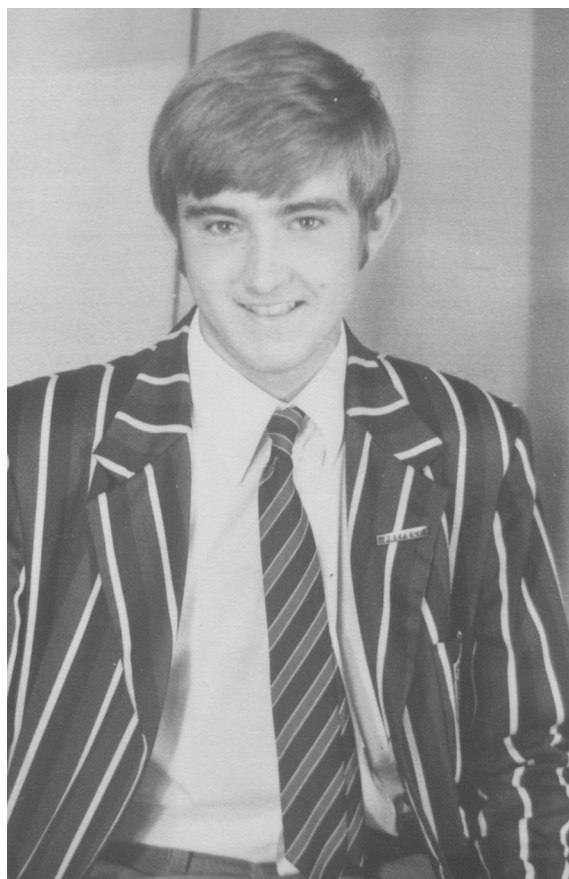


1967 flight over Palabora: Rodney Jones, pilot Dieter Kruger, and Jim Jensen



Jim Jensen and Rodney Jones, California, 1993

As early as during primary school, Rodney showed a strong interest in chemistry, and memorably gave some of his mother's silver teaspoons a wonderful orange colour by electroplating them in a copper sulfate solution. He also experimented with making his own fireworks. Rodney grew up in Germiston, and attended Germiston High School - interestingly, one of the very few schools in South Africa to have a Nobel Prize winner among its past pupils. During high school, his mathematical ability came to the fore, and he won the school maths olympiad competition. When it came to choosing a field of study at university, he was initially undecided between chemical engineering and nuclear physics, but eventually chose the former, as he actually knew a chemical engineer and the work sounded interesting.



Rodney Jones, Germiston High School, 1976

Rodney was awarded a Mintek bursary for his undergraduate studies for his BSc(Eng) degree in chemical engineering from the University of the Witwatersrand (Wits). He was interviewed for his bursary during his final year of school (1976) – which was also the year in which Mintek moved into its current premises in Randburg – and was allocated to the Pyrometallurgy Division. This led Rodney to choose an elective course in pyrometallurgy in his final year of study, and surprised his metallurgical classmates by being the only person to get a distinction for the course (especially as a student of chemical engineering, not of metallurgy). He also did well in thermodynamics, chemical engineering design, and mathematical elective courses during his studies. He co-chaired the Mathematical Society at Wits University during his student days. Rodney's mathematical curiosities and exploits included solving the Rubik's Cube and other related puzzles using group theory mathematics, and reciting the first 200 digits of pi on demand.

During one of his chemical engineering design projects (in the days before personal computers), he decided to attempt to simulate an entire flowsheet, rather than focusing on a single unit operation at a time. This quickly depleted his personal allocation of mainframe computer time. Because his metallurgical friends didn't use computers as heavily, he persuaded one of them to provide access to the metallurgical department's computer account. In a very short time, he was called to the office of Professor Peter King (the head of the department) to explain how and why the entire departmental allocation of computer time had been obliterated. Fortunately, Peter King was an understanding person and did not bear grudges, and some years later even supervised Rodney's postgraduate work for a master's degree.

Rodney obtained a BSc(Eng) degree in chemical engineering from Wits University, a BA degree in logic and philosophy from the University of South Africa, and MSc(Eng) and PhD degrees in metallurgical engineering from Wits University.

MINTEK

Rodney's first two projects at Mintek involved a comparison of "computer simulation of process routes for producing crude stainless steel" (which led to his MSc(Eng) degree in metallurgical engineering at Wits University) and the modelling of "platinum group metals (PGM) smelting of UG2 ores". In retrospect, these set the scene for Rodney's long-term involvement with the ferro-alloys and PGM industries.

In his first thirty years at Mintek (and even as a vacation student worker before that), Rodney worked for only two bosses – Nic Barcza and Tom Curr – whom Rodney regards as real authorities in ferro-alloy pyrometallurgy. They provided many opportunities for professional growth, and remain greatly respected colleagues and friends. The mid 1980s and early 1990s at Mintek saw many comings and goings of young metallurgical engineers, and many former colleagues from those days went on to become leaders in the profession in many countries around the world. The high calibre of former and present colleagues provided a stimulating and challenging work environment, and many long-standing friendships were built on this.

Rodney's primary interest was in the development of personal computer software, so he spent much of his time developing a generalised computer framework for what became Pyrosim software for the modelling of steady-state pyrometallurgical processes. He used free-energy minimization for calculating chemical equilibria of complex

multiphase systems (at a time when F*A*C*T, the forerunner of today's leading FactSage system, was able to do calculations with only five elements), and also made good use of the 'ideal mixing of complex components' approach for modelling non-ideal solutions such as slags and alloys. He also included a generalised approach to empirical models that allowed the specification of either ratios between phases or absolute percentages of a particular component in a particular phase. This software was used widely for calculating mass and energy balances for pyrometallurgical processes, and has been used at 97 sites in 22 countries around the world. Rodney also co-authored Thermo software, together with Wolf Meihack, and this also remains widely used.

Rodney is now a chemical engineer and metallurgist with over 35 years of pyrometallurgical experience in a wide variety of processes that have been taken from concept to industrial implementation. His career in the Pyrometallurgy Division at Mintek progressed from Engineer in Training (1983), to Engineer (1987), inexplicably skipping out Senior Engineer, to Principal Engineer (1990), Chief Engineer (1994), Specialist Consultant (1997), and Senior Technical Specialist (2015; part-time semi-retired from January 2020). He has been a registered Professional Engineer since 1988. Rodney's main research interests continue to be in the field of computer simulation and design of high-temperature processes.

Rodney has been part of the team that developed processes for the large-scale industrial application of direct-current arc furnace technology to the smelting of chromite in South Africa and Kazakhstan, ilmenite smelting in South Africa, cobalt recovery from slags in Zambia, battery recycling in Switzerland, and ferronickel production in New Caledonia. Other international consulting assignments have included nickel smelting in Botswana and Zimbabwe, zinc fuming in Canada and the USA, copper processing in the Democratic Republic of Congo, slag treatment in Japan, and carrying out modelling work for many international mining companies.



Infacon plant visit to the four 72 MW DC furnaces at Kazchrome, Kazakhstan in 2013
Isabel Geldenhuys, Nic Barcza, Rodney Jones

Rodney is one of the inventors of the internationally patented ConRoast process – an environmentally friendly way of recovering platinum group metals from ores that are otherwise very difficult to process. The demonstration of this process involved DC arc smelting of over 50 000 tons of PGM-containing materials at Mintek. Patents have been granted internationally (including USA and Europe) for the 'Smelting of dead-roasted sulphide concentrates in a DC arc furnace' family of processes including PGMs, nickel, and zinc, 2000-2004. Rodney's particular contributions to base metal smelting involved a new approach to modelling the selective recovery of cobalt and other base metals versus iron; and the development of a design methodology for specifying the electrical parameters of the power supply (arc resistivity-based predictions of voltage versus arc length and current; coupled with the current distribution in slag to provide resistivity-based prediction of bath voltage, as a function of arc depression shape), based on his photography of plasma arcs interacting with molten slags. Unsurprisingly, Rodney's PhD work dealt with "Fundamental aspects of alloy smelting in a DC arc furnace".



1.5 MW DC arc furnace at Mintek, 2007



Rodney Jones and Steve McCullough inside a pilot 3 MW DC arc furnace at Mintek, 2008



ConRoast team: Rodney Jones, Tom Curr, Isabel Geldenhuys, Glen Denton, 2010

ACADEMIC LIFE

Another significant influence in Rodney's career was David Robertson, who invited Rodney to spend a few months at the Center for Pyrometallurgy, at the University of Missouri-Rolla (now Missouri University of Science and Technology) as a Visiting Professor in 1996. This opened up many opportunities and introductions to a network of some wonderful and helpful people in the pyrometallurgical world, including Phillip Mackey and Eric Grimsey.



David Robertson (centre) with students Dhiren Panda, KN Swamy, Adrian Deneys; and Debbie Jones, Rolla, Missouri, 1996



Phillip Mackey with Rodney Jones during a visit to Mintek, 2011

In 2002 and 2003, Rodney also lectured in pyrometallurgy at Murdoch University, Perth, Australia, as an Adjunct Associate Professor. He has delivered invited lectures and seminars at the University of the Witwatersrand (Johannesburg), University of Pretoria, Drexel University (Philadelphia), the University of Missouri-Rolla, Missouri University of Science and Technology, Murdoch University (Perth), Akita University (Japan), and the Vaal University of Technology. He has also served as an external examiner for the School of Process and Materials Engineering (Chemical Engineering and Metallurgy) at the University of the Witwatersrand, 1990–2002 (courses examined include Pyrometallurgy, Metallurgical Thermodynamics, Process Engineering, Design Project, and Transport Phenomena), and for a Master's thesis from Stellenbosch University. Rodney is a member of the Editorial Board of the Journal of the SAIMM. He has refereed technical papers published in metallurgical journals (including the Journal of the SAIMM, and Met.Trans.B) and numerous conference proceedings.

In 2017, he was appointed as an Honorary Adjunct Professor in the School of Chemical and Metallurgical Engineering at the University of the Witwatersrand (Wits) in Johannesburg.

PLANT VISITS

A characteristic feature of Rodney's career has been the numerous plant visits that he has undertaken to smelters all around the world. This has often provided inspiration for various process developments, where techniques used in the production of one commodity can be modified and used for another. One particularly memorable trip was to see as many as possible of the base metal smelters in Zimbabwe, with Adrian Deneys. Travelling in the old family Landrover with Rodney's young family, and camping in some very interesting places, made this a trip never to be forgotten. Some years later, a similar trip (this time with Nick Welham of Murdoch University) took place to see the smelters of Western Australia. Plant visits also made it possible to publish or contribute to smelter surveys of a particular industry.

PROFESSIONAL CONTRIBUTIONS AND RECOGNITION

Rodney is a Fellow of the South African Academy of Engineering (SAAE), the Institution of Chemical Engineers (IChemE), and the South African Institute of Chemical Engineers (SAIChE), and a Member of the Royal Society of South Africa. The South African National Research Foundation rated him in 2009 and 2015 as an 'Internationally Acclaimed Researcher'. Rodney is a member of the Board of Trustees for OneMine.org, and serves as a member of the Advisory Council of Mining Dialogues 360°. He was appointed as Secretary General of the International Committee on Ferro-Alloys (ICFA) in 2013, and as Chairperson of the International Committee on Ferro-Alloys (ICFA) from 2015. Rodney has been the recipient of a Mintek Technology Transfer Award (Gold category), a number of APEX (Acknowledgement of Performance Excellence) and Achievement awards from Mintek, as well as an SAIMM Silver Medal. He served the Engineering Council of South Africa (ECSA) as a member of the Professional Advisory Committee for Metallurgical Engineering from 2010 to 2017.



Apex award, 2006, for recovery of cobalt at Chambishi, Zambia
Paul Jourdan (Mintek President), Quinn Reynolds, Isabel Geldenhuys, Rodney Jones, Glen Denton

Rodney has been a member of the Southern African Institute of Mining and Metallurgy (SAIMM) since 1988, a Fellow since 1997, and a Council member since 2005. He chaired the Metallurgy Technical Programme Committee from 2007 to 2015, and also serves on the Publications and IT Committees. He is a member of the Editorial Board of the Journal of the SAIMM. Rodney was awarded an Honorary Life Fellowship of SAIMM in 2010. He was President of SAIMM from 2015 to 2016.

CONFERENCES

Rodney has represented Mintek at many local and international conferences, sometimes as an invited keynote or plenary speaker, and has delivered invited lectures and seminars at universities in South Africa, the USA, Australia, and Japan. He was the invited keynote speaker on pyrometallurgy at the 25th Mineral Processing Conference in Cape Town in 2007. Rodney delivered invited plenary lectures at the European Metallurgical Conference in Weimar, Germany in 2013, and in Leipzig, Germany in 2017. Rodney has been selected for the TMS 2021 EPD Distinguished Lecturer Award, following in the footsteps of some of the previous inspirational pioneers of extractive metallurgy.

Rodney convened, and edited the proceedings of, the Southern African Pyrometallurgy 2006 and 2011 international conferences (the second of which included a slags

workshop by Ken Mills). Rodney also convened a conference on 'A constructive response to the power crisis' in 2008. He has been a member of the organizing or scientific committees for the SAIMM 'Platinum' (2006, 2008, 2010, 2012, 2014, 2017) and 'Base Metals' (2007, 2009, 2011, 2015) series of international conferences, the International Ferro-Alloys Congress (Infacon), and the European Metallurgical Conference series, as well as the TMS conferences on Nickel-Cobalt and the 'Celebrating the Megascale' pyrometallurgical conference in the USA. He is also a member of the international organizing committee of the 'Copper / Cobre' series of conferences. Rodney chaired the 15th International Ferro-Alloys Congress (Infacon XV) in Cape Town, February 2018; attended by 450 people from 32 countries. Rodney is well known for his efforts in making information openly accessible via the Internet, and has championed the digitization of a number of old journals and conference proceedings.



Covers of two conference proceedings edited by Rodney Jones

PERSONAL LIFE

Rodney is an enthusiastic person who respects people as individuals, and places a high value on personal relationships. He aspires to follow the teachings of Jesus Christ, and to be an unpretentious, caring person of integrity and loyalty, who cares about justice and freedom.

Rodney is married to Debbie, and they have two children - David (married to Vutomi) and Sarah (partner to Stephan) - and two grandchildren, Benjamin and Nicholas. Rodney's wide-ranging interests include photography, trail running (he has run the Harrismith Mountain Race more than ten times, and has completed more than 300 parkruns on over 80 different courses in 5 countries), hiking, travel, reading, computers, genealogy, mathematical puzzles, philosophy, history, and playing the

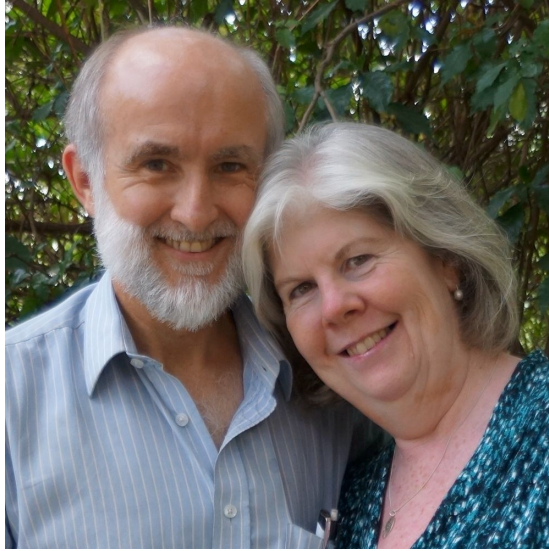
guitar. Rodney is a member of the Photographic Society of Southern Africa, the Internet Society (a founding member of the ZA chapter in 1997), the Philosophical Society of Southern Africa, the Genealogical Society of South Africa, the Johannesburg Heritage Foundation, Mensa, and the Cloud Appreciation Society.



Rodney participating in a trail run in Johannesburg



Rodney completing his 250th parkrun



Rodney and Debbie Jones, 2015

PUBLICATIONS

A list of Rodney's publications can be found online at the link below.

<https://www.pyrometallurgy.co.za/RTJones/>