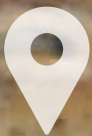
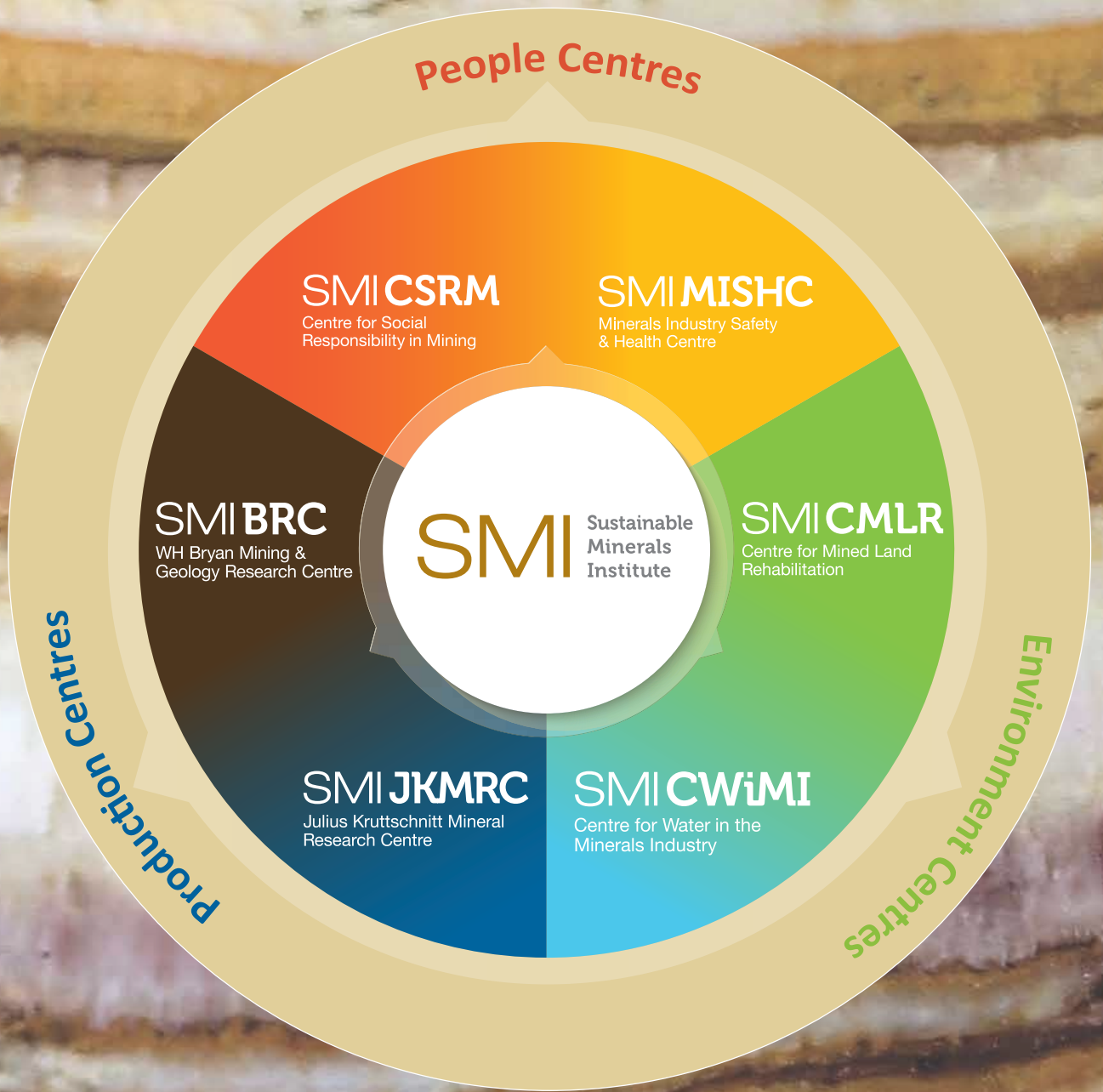


The cover features a large, abstract, diamond-shaped graphic composed of several overlapping, semi-transparent layers of mineral textures. The textures include wavy, layered patterns in shades of brown, tan, and purple, as well as more granular, speckled patterns in white, grey, and dark brown. The overall effect is a rich, multi-layered visual representation of minerals.

Sustainable
Minerals
Institute

2016

ANNUAL
REPORT



Sustainable Minerals Institute
The University of Queensland
St Lucia, Brisbane
Queensland, Australia 4072



Call us:
Tel: +61 7 3346 4003



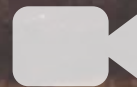
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Because SMI is committed to sustainable practice, we reduce the print run of all our publications. Please help us help the environment by viewing this report online in PDF format.

Designed and produced by Tyne Hamilton - tynehamilton.com • With Special Thanks to Melissa Glendenning, Karen Hendrickson & Jacqueline Ross-Hagebaum

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SMI 2016 IN REVIEW



THE UN ECONOMIC COMMISSION FOR AFRICA, THE UK, AND THE AUSTRALIAN DEPARTMENT OF FOREIGN AFFAIRS AND TRADE INCORPORATE INTO PUBLIC POLICY THE SMI-CSR RESEARCH FINDINGS ON HOW EXTRACTIVE INDUSTRIES IMPACT POLITICAL CONFLICT AND SETTLEMENTS IN EAST ASIA



ASSOCIATE PROF MAUREEN HASSALL COLLABORATES WITH ACARP AND RIO TINTO ON CRITICAL CONTROL RISK MANAGEMENT



PROFESSOR ROBERTO PARRA COMMENCED AS THE DIRECTOR OF THE SMI-INTERNATIONAL CENTRE OF EXCELLENCE-CHILE (SMI-ICE-CHILE)



MELISSA GLENDENNING COMMENCES AS SMI'S DEPUTY DIRECTOR - OPERATIONS



DR ANTONY VAN DER ENT COMMENCES HIS ARC DISCOVERY - EARLY CAREER RESEARCHER AWARD (DECRA) TO UNRAVEL THE WORKINGS OF METAL HYPERACCUMULATOR PLANTS

JAN

FEB

MAR

APR

MAY

JUN

RESEARCH INTO HIGH VOLTAGE PULSE (HVP) TECHNOLOGY COMMENCES WITH SUPPORT OF INDUSTRY INVESTMENT



DR THOMAS BAUMGARTL, IS PROMOTED TO ASSOCIATE PROFESSOR



PROFESSOR GIDEON CHITOMBO CO-CHAIRS THE SEVENTH INTERNATIONAL CONFERENCE AND EXHIBITION ON MASS MINING (MASSMIN 2016) - SYDNEY



FUNDED BY THE QUEENSLAND GOVERNMENT AND SUPPORTED BY INDUSTRY PARTNERS NEWCREST, ANGLO AMERICAN AND XSTRATA, THE SMI-BRC-GEOLOGY AND MASS MINING (GMM)



PROFESSOR CHRIS MORAN, DIRECTOR OF SMI SINCE 2007, DEPARTS SMI FOR APPOINTMENT AT CURTIN UNIVERSITY AS DEPUTY VICE-CHANCELLOR, RESEARCH.



PROFESSOR DAVID BRERETON RETIRES AS EMERITUS PROFESSOR AFTER 15 YEARS WITH SMI; DR DEANNA KEMP IS PROMOTED TO PROFESSOR AND APPOINTED DIRECTOR OF SMI PEOPLE CENTRES



AUSIMM & SMI CO-HOST LIFE-OF-MINE CONFERENCE, SEPTEMBER, BRISBANE



THE AUSTRALIAN GOVERNMENT COUNCIL ON AUSTRALIA LATIN AMERICA RELATIONS (COALAR) AWARDS FUNDING FOR SMI TO ESTABLISH A CENTRE FOR SUSTAINABLE MINING AT THE UNIVERSITY OF LOS ANDES, COLOMBIA



PROFESSOR MALCOLM POWELL SUCCESSFULLY DEVELOPS P9Q, AND DR MOHSEN YAHYAEI IS APPOINTED P9Q PROGRAM LEADER



SIXTH PUBLICATION IN SMI-JKMRC'S MONOGRAPH SERIES IS RELEASED: 'PROCESS MINERALOGY', EDITED BY DRS MEGAN BAKER, ELAINE WIGHTMAN & CATHY EVANS



PROFESSOR NEVILLE PLINT COMMENCES AS DIRECTOR OF SMI

JUL

AUG

SEP

OCT

NOV

DEC



THREE YEAR TRAINING AND RESEARCH AGREEMENT SIGNED WITH NEWCREST MINING LIMITED TO DESIGN AND DELIVER A TAILORED SOCIAL PERFORMANCE LEADERSHIP TRAINING PROGRAM



SMI AND JKTECH PTY LTD CONSOLIDATE THEIR EDUCATION AND PROFESSIONAL DEVELOPMENT RESOURCES TO DELIVER A NEW TRANSFORMATIONAL LEARNING PROGRAM, LED BY ROBIN EVANS



SUCCESSFUL ARC LINKAGE PROJECT 'ECO-ENGINEERING SOIL FROM MINE TAILINGS FOR NATIVE PLANT REHABILITATION' COMMENCES, LED BY CHIEF INVESTIGATOR ASSOCIATE PROFESSOR LONGBIN HUANG



P9P STUDENT PROJECTS DELIVERED A RECORD 12 NEW WORKING PROCESS MODELS COVERING MULTI-MINERAL AND MULTI-ORE SIMULATION CAPABILITY



PROFESSOR SARMA KANCHIBOTLA'S "ROCK BLASTING" CHAPTER ACCEPTED INTO SME MINERAL PROCESSING HANDBOOK

It is a pleasure to introduce the 2016 annual report from The University of Queensland's Sustainable Minerals Institute, an organisation which has again proven its capacity to respond to, anticipate, and influence change in the global minerals sector.

PROFESSOR PETER HØJ

Vice-Chancellor and President,
The University of Queensland



Backed by a commitment to high-quality research and education, coupled with a keen awareness of community and industry needs, SMI performed strongly in 2016. It weathered challenging market conditions and approached 2017 in fit shape to support industry to respond to any future market recovery.

Importantly, by sharing evidence-based knowledge with industry, government and the public, SMI continued to support a transition to technologies and practices that meet the changing requirements of communities and regulators.

SMI's contributions have been made possible by many people, not least being Professor Chris Moran, Director from 2007 until mid-2016. Chris oversaw necessary but at times difficult reforms, and was key to visionary initiatives including the SMI International Centre for Excellence in Chile. He remains connected to UQ in his new position at Curtin University (a frequent UQ collaborator).

Chris's successor, Professor Neville Plint, was recruited from Anglo American in South Africa. Neville's extended experience with the company, his participation in an international network of mining researchers, and his past chairmanship of AMIRA International, gave him knowledge of SMI's success as an integrated source of education, research, and solutions to wide-ranging sustainability challenges.

SMI clearly demonstrates the benefits of partnering with people and organisations who strive for high standards in sustainability ...

Neville inherited an organisation of focussed and committed staff, talented students and an expanding network of impressive alumni and industry allies. It is telling that, for two years running, UQ's main alumni awards have featured people associated with SMI. The 2016 International Alumnus of the Year is Professor Tadimety Chakrapani ('TC') Rao, who came to UQ in the 1960s for a PhD in mining engineering and remains a steadfast collaborator with JKMRC, a mentor to early career researchers and a link to the alumni community.

Long-term relations between UQ and alumni are grounded in memorable student experiences, which invariably involve dedicated teachers and supervisors. In 2016 a group of such people - Emeritus Professors Alban Lynch and Tim Napier-Munn, and Professor Alice Clark - partnered with students and industry to develop a placement program at three Mexican mines. This has laid the groundwork for future placement programs which will be valuable to both students and participating companies.

Alongside education, high quality research with practical applications is a pillar of SMI. Exemplary research helps distinguish the Institute as a leading provider of practical expertise in more areas than any other centre of its kind. It also contributes to UQ's global top-10 university ranking for mineral and mining engineering.

SMI clearly demonstrates the benefits of partnering with people and organisations who strive for high standards in sustainability, and who value evidence-based knowledge as the best platform for those standards.

I congratulate and thank everyone who contributed to SMI's work in 2016. Collectively you have enhanced the likelihood that the industry will be intrinsic to the wellbeing of local, regional and global societies, for the very long term.

Following the completion of SMI's strategic review and extensive engagement with our external partners, 2016 was a year of organisational changes that saw SMI re-structure itself around key programs of work, whilst preserving the particular discipline strengths of its Centres.

A further contraction during the downturn phase of the mining industry, particularly in the first half of the year, continued to significantly impact the revenue streams for SMI and as research work was curtailed, this unfortunately resulted in further staff reductions. Against this backdrop, it was a remarkable testament to SMI's researchers that they continued to produce high quality research work.

As the year progressed, there were finally sufficient signs of recovery within the mineral resources sector to instil confidence that a reshaped, refocussed SMI would be able to capitalise on a reinvestment phase in applied research in the mineral resources sector.

I would like to again acknowledge the visionary leadership that Professor Chris Moran demonstrated throughout his time with us – he leaves such an enduring legacy at SMI. With Chris' departure, Professor Neville Plint joined us towards the end of the year and has brought passion and his personal vision for the future of SMI. Neville and his new leadership team at SMI have been positioning us for full engagement with a resurgent resources sector as it recovers from its economic difficulties and looks towards meaningfully addressing technical and sustainability issues in the industry.



MR CHARLIE SARTAIN
Chair,
SMI Advisory Board

The role of the SMI Advisory Board is to provide advice and guidance to the Director and University on the strategic direction of SMI. For a full list of the SMI Advisory Board members see page 56.

A reshaped, refocussed SMI would be able to capitalise on a reinvestment phase in applied research in the mineral resources sector.

On behalf of the Advisory Board of SMI, I would like to express my thanks to the Vice-Chancellor and the Senior Executive group of The University of Queensland for their unwavering support of SMI through tough times. The leadership team of SMI also deserves special recognition and thanks for guiding the organisation through various challenges towards an exciting future.

And to my colleagues on the Advisory Boards of the SMI and the Centres, once again my sincere thanks to you for giving so much of your time to offer your knowledge and experience towards our shared goal of supporting SMI in delivering against its Mission.

Professor Neville Plint wants to make a difference, and, as the Director of SMI, he will have just that opportunity to create change for a better world.



PHOTO: With a PhD and MBA from the University of Witwatersrand in Johannesburg, over 20 years with Anglo American in South Africa, and unbridled energy and optimism, Professor Neville Plint (left) brings a profound understanding of the mining sector and extensive leadership experience to SMI.

As the new Director of UQ's Sustainable Minerals Institute, I believe that responsible resource development should be the goal for all stakeholders in the sector. By working together we can optimise the returns to humanity now and into the future.

I first joined the mining industry in South Africa after finishing school. After working in a mine in Rustenburg for six months as an operator and six months as a research technician, I was lucky enough to be offered a research scholarship with Johannesburg Consolidated Investment (JCI).

My PhD research was in catalysis and fine chemical synthesis. The greatest lesson it taught me was that failure is acceptable as long as you learn from it. The PhD was an excellent training ground in the study of surfaces, which lead into an early career in studying the fundamentals of flotation, and how the surfaces of particles attach to bubbles.

During my twenty years with Anglo American in South Africa, my focus was on developing and mentoring employees to deliver improved operational performance on mining sites, developing and implementing new technologies, while building a global network of research professionals in academic institutes, mining companies and research organisations.

I am driven by the desire to make a positive impact. I aim to work with all stakeholders to build a resource sector that is welcomed as a responsible development partner with the ability to improve the lives of all. It is important that all stakeholders in the resources sector work together to create a better world. Resources are instrumental to improved quality of life; a sustainable sector is one in which the benefits are distributed and experienced equally.

I aim to work with all stakeholders to build a resource sector that is welcomed as a responsible development partner with the ability to improve the lives of all.

At SMI, we have the capability to do things differently and look in unconventional places for new solutions. We do this by collaborating with many different disciplines across The University of Queensland to answer the sector's biggest questions. At UQ we have the deep technical expertise that can be integrated to create new knowledge, and find solutions to the greatest challenges.

I am proud that SMI conducts research in partnership with our stakeholders to deliver relevant outcomes and train highly sought, employment-ready graduates for the sector. Our aim is to produce graduates who are the next generation of game changers, with an anticipated thirty Master and Doctor of Philosophy degrees to be awarded to our Higher Degree by Research (HDR) candidates in 2017.

We at SMI are part of a larger research ecosystem that is building new global relationships in mineral rich areas such as South America, India and Africa. SMI has an engaged and supportive advisory board, chaired by Charlie Sartain, that ensures we remain current and well managed. With our active alumni and industry experienced associates to consult with, we will continue to maintain the strong, global SMI brand.

A personal focus of mine is to create a work environment that is fun, that has a supportive, inclusive culture in which diversity is celebrated every day. I firmly believe that to do our best work we need to be our best selves, and a large part of that is remembering our families, which is where we come from and who we are working for. As W. Edwards Deming said, "We are here to learn, to make a difference and to have fun."

2016 was a year of continuing transformation on many fronts for SMI. To ensure our relevance to stakeholders and our longevity within the industry, we re-engineered internal structures, strengthened our commitment to our students and future knowledge leaders, and focussed our research energies on interdisciplinary solutions and leading innovation.

Throughout 2016, SMI implemented significant changes to our operating structure: the six discrete centres evolved into pairings of Environment, People and Production; our key people formed 12 new programs of work and began the substantial task of establishing teams, and developing future project pipelines, all the while delivering on existing projects; SMI's professional staff transitioned to a centralised operating model; financial and project management transparency and accountability were improved by a new budget model and project lifecycle framework.

Notwithstanding the changes to our fundamental structures, our research staff continued their academic work of publishing and supervising Higher Degree by Research students (HDR). In 2016, SMI researchers improved upon their 2015 publication outputs: authoring a book, contributing 15 book chapters, presenting 23 conference papers and publishing 134 journal articles, a highlight of which was Professor Saleem Ali's paper being accepted by the prestigious journal Nature. SMI's researchers supervised 20 research higher degree students through to graduation in 2016; our 16 Doctor of Philosophy and four Master of Philosophy graduates join the ranks of the SMI alumni and leaders in their fields.

SMI's current Higher Degree by Research students proactively engaged with industry through networking breakfasts and evenings, a student-initiated international industry placement, a student-led conference and SMI's weekly seminar series. Our research students are outstanding representatives of SMI, as they travel and present at conferences, visit communities, lands, and production sites with their advisors, and conduct their fieldwork professionally and competently in all curves of the globe.

**PROFESSOR
NEVILLE PLINT**

**Director,
Sustainable Minerals
Institute**



July 2016 saw the end of an era as the Institute's long term Director, Professor Chris Moran, left SMI to take up the role of Deputy Vice-Chancellor of Research at Curtin University. I would like to take this opportunity to personally thank Chris for his commitment to and leadership of SMI. Chris's legacy is a wonderful research institute filled with outstanding individuals led by a stellar leadership team. I would also like to acknowledge the leadership of Professor David Mulligan, Director of Environment Centres, who acted as SMI's Director for a three-month period between Chris's departure and my arrival. David provided our staff, students, and stakeholders with much needed stability, reassurance and guidance during that transitional period.

Following an international recruitment process led by UQ's Vice-Chancellor and President Professor Peter Høj, I was appointed as the next SMI Director. After commencing the role in October 2016, I moved from South Africa to Australia with my wife and two daughters at the end of the year. I am thankful to the team at SMI and UQ for making me and my family feel welcome, and for assisting our smooth transition. I am excited about leading this unique and multidisciplinary institute; the calibre of academics and breadth of research is not duplicated anywhere else in the world.

A separate global recruitment process successfully recruited Professor Deanna Kemp as the new Director of People Centres, following the retirement of Professor David Brereton in June. Deanna has been with SMI since 2006 as a Program Leader, Deputy Director and Senior Research Fellow within the SMI-Centre for Social Responsibility in Mining. In a welcome effort by the Vice-Chancellor to further stabilise leadership at SMI, Professor David Mulligan, Director of Environment Centres and Professor Alice Clark, Director of Production Centres, were appointed to multi-year positions with a focus on stewarding their new program leaders, centres and SMI into the future.

In closing, I would like to thank Professor Høj, The University of Queensland, and Chair of the SMI Advisory Board Mr Charlie Sartain; their continuing support of SMI and their appreciation of its value positions us as a world-class, interdisciplinary research institute ready to engage with industry, government and civil society. I would also like to thank the professional staff and students of SMI for their resilience during 2016 as we responded to the significant changes in the resource sector. I look forward to creating positive change in the sector and working with all our stakeholders to create knowledge leadership and sharing for greater resource development.

Our staff are a multi-disciplinary group of scientists, engineers, anthropologists, sociologists, economists, and natural resource specialists. We have in-depth knowledge of the minerals industry, both at corporate and operational levels, built from years of practical experience and engagement.

Our directors are knowledgeable industry leaders, and our team is skilled to provide strategic or specialist advice, develop policy, and deliver world-leading research, education and training.

Our position within The University of Queensland, and our ability to link research and practice across several disciplines, sets us apart and adds unique value to our work.



PROFESSOR NEVILLE PLINT

Director, Sustainable Minerals Institute



MELISSA GLENDENNING

Deputy Director, (Operations)



PROFESSOR ALICE CLARK

Director of Production Centres



PROFESSOR DAVID MULLIGAN

Director of Environment Centres



PROFESSOR DEANNA KEMP

Director of People Centres

JKMRC

Julius Kruttschnitt Mineral Research Centre

BRC

WH Bryan Mining and Geology Research Centre

CMLR

Centre for Mined Land Rehabilitation

CWiMI

Centre for Water in the Minerals Industry

CSR

Centre for Social Responsibility in Mining

MISHC

Minerals Industry Safety and Health Centre

Our Work at SMI

Our projects focus on strategies and practical solutions for sustainability. We have a team developing technologies for reducing energy in the areas of mining with the highest energy consumption. We have a team dedicated to minimising the impacts of water extraction, use and release. We have a team for efficient blasting and approaches to ore sorting leading to significant changes in mineral processing optimisation.

We have community relations specialists who produce industry benchmarks and guidelines that are adopted into public policy by foreign governments. We have a team that facilitates productive relations between industry and indigenous communities through local employment and cultural education programs.

We create global teaching and implementation materials to effectively improve risk management and safety performance. We continue to work with industry and government on improving land rehabilitation and mine closure standards.

We work closely with JKTech Pty Ltd, our technology transfer company. JKTech commercialises our research and delivers world-class solutions to the global minerals industry by providing products, services and process improvement across the life of mine. Like SMI, JKTech is committed to a whole-of-mine approach ensuring more effective operations now, while planning for a more sustainable future.



SMI is the world's largest and most diverse research and education group for sustainability in the minerals industry.

SMI's team of engineers, scientists and social scientists work together to deliver sustainable development research, technological developments and community solutions to address minerals industry impacts.

SMI researchers work across the life of mine, resulting in unique capabilities and collaborations available at no other research institute in the world.

SMI is committed to transferring research outcomes to all stakeholders in the mineral resource sector. Our projects span a range of research areas related to current issues in sustainable development for the minerals industry.

Our research covers mining, mineral processing, water, communities, risk, human factors, safety, and environment.

SMI's Centres are paired together to reflect their research focus. Below are the research program leaders within each Centre.



Professor Sarma Kanchibotla
Program Leader
 Next Gen Mine-to-Concentrator



Professor Malcolm Powell
Program Leader
 Rock: Ore Processability



Dr Kym Runge
Program Leader
 Separation



Dr Mohsen Yahyaei
Program Leader
 Advanced Process Prediction and Control



Professor Rick Valenta
Program Leader
 Geology for Mining



Professor Gideon Chitombo
Program Leader
 Mass Underground Mining

JKMRC

BRC

Production
Centres

Environment
Centres

People
Centres

JKMRC **BRC**

CMLR **CWiMI**

CSRM **MISHC**



Dr Glen Corder
Program Leader
Life Cycles of Mines and Metals

Associate Professor Peter Erskine
Program Leader
Ecosystem Assessment,
Restoration and Resilience

Associate Professor Longbin Huang
Program Leader
Ecological Engineering
of Soil-Plant Systems

CMLR



Professor Neil McIntyre
Program Leader
Regional Water and Land Resources

Dr Kathryn Sturman
Program Leader
Development and Governance

Associate Professor Nick Bainton
Program Leader
Extractives and Communities

CSRM



Professor Robin Burgess-Limerick
Program Leader
Human Factors

Robin Evans
Program Manager
Transformational Learning

MISHC

To learn more about our work at SMI, or to discuss working with us at the Sustainable Minerals Institute visit us online at:



www.smi.uq.edu.au

Director of Production Centres SMI-JKMRC & SMI-BRC's Report

2016 saw the reinvigoration of the WH Bryan Research Centre and the Julius Kruttschnitt Mineral Research Centre following the industry down-turn of the preceding years. In the later half of 2016, the SMI-BRC geological team relocated to the Indooroopilly site to enable closer collaboration with mineral processors at SMI-JKMRC. We have the opportunity to rebuild these two internationally recognised, research Centres with strong ties to both SMI People Centres and SMI Environment Centres. Our integrative relationship enables us to provide industry with solutions that inherently consider environmental and social impacts.

2016 positioned SMI Production Centres to deliver expertise and innovation in the fields of geometallurgical research. We are ready to meet the challenges of optimising productivity while reducing environmental impact and increasing community satisfaction.



**PROFESSOR
ALICE CLARK**

Director of Production
Centres

Key Appointments in 2016

Dr Kym Runge – Program Leader, Separation

Dr Runge brings to SMI a strong research background with expertise in flotation and mineral separation. Her team finished 2016 well positioned to embark on industry applied research initiatives in 2017. Dr Runge's program of work, Separation, targets the development of novel or improving existing mineral separation processes to achieve improved profitability, resource utilisation and minimise environmental impact. It also aims to develop the modelling capability required to enable these technologies to be evaluated in the context of a circuit flowsheet.

Dr Mohsen Yahyaei – Program Leader, Advanced Process Prediction and Control (APPCo)

In addition to his strong technical background, Dr Yahyaei brings to the position a global industry reputation, a strong track record in technology transfer and a reputation for enabling innovative research outcomes. His program APPCo, aims to transform unit process modelling and simulation, moving on from the steady-state models previously developed at SMI-JKMRC, to develop and apply new techniques that make greater use of data generated on-site. This includes sensor technologies in combination with advanced process control, computational analytics and modelling techniques.

Dr Travis Murphy – Acting Program Leader, Geology for Mining

We thank Dr Travis Murphy for his leadership in the role of Acting Program Leader, Geology in Mining, while recruitment efforts were underway. Travis completed the deliverables on the Deep Mine Queensland project and assisted in developing a series of projects aimed at positioning SMI-BRC for growth in 2017.

Professor Rick Valenta – Program Leader, Geology for Mining

Towards the end of 2016, Professor Rick Valenta was appointed Program Leader, Geology for Mining, and brings a global reputation in the geoscience field where his achievements span both industry and academia. Upon taking up the role Dr Valenta commented that "Travis and the team have worked hard to deliver on the Deep Mine Queensland Project and through their efforts the SMI-BRC is well positioned to assist in Queensland's exploration and near mine resource extension endeavours".

Initiatives and Achievements

International Visits and Academic collaborations

The SMI- JKMRC was proud to see the initiative taken by a group of RHD students from the JK JACKALS who organised and self-funded the placement of 5 students at Mexican mining operations owned Grupo Peñoles and Grupo Fresnillo in Mexico for Industry work placement from May 2016 through to July 2016. Their experience involved visiting mine sites and working on mineral processing plants to survey operations and provide reports on how the operations could optimise their circuits. This initiative has set the benchmark for international collaboration and reinvigorated a long held JKMRC tradition of students gaining on site experience as part of their HDR studies at the University of Queensland. The students who worked at Mineral Fancisco I. Madero, Mineral Fresnillo owned by Grupo Peñoles and Minera Saucito Owned by Grupo Fresnillo were German Figueroa (PhD), Yogesh Reja (MPhil), Djoan Kate Tungpalan (PhD), Erica Christina Avelar (PhD) and Juan Jose Frausto (PhD). Acknowledgement must be given to the supervision provided by SMI-JKMRC and JKTech staff. Special thanks is also due to Emeritus Professor Alban Lynch, who was instrumental in liaising with the Mexican company staff.

SMI-JKMRC hosted Professor Dongyang Dou, a visiting academic from the University of China, who is collaborating with Dr Frank Shi on the Australian Coal Association Research Program (ACARP) Drill Core project. Their research progressed our understanding of slurry and solid transport in tumbling mills in order to model the comminution circuit for optimisation. They studied with a lab-scale transparent mill so that the flow could be observed and measured. Transport models will be established for input into the dynamic model for optimisation of the comminution circuit.

In late 2016, SMI-JKMRC hosted a delegation from the Indian School of Mines to showcase the Indooroopilly site pilot plant capabilities and establish a base for future engagement and partnership.

Awards and Prizes

Two of our students were awarded prizes during 2016; Riza Mariano won the prestigious Oz Minerals Prize and Maedeh Tayebi-Khorabi was awarded the sought after Ian Morley Award for 2016.

A number of new students joined the SMI Production Centres in 2016: Pia Lois (PhD) is studying the linking of ore characteristics and comminution behaviour; Constanza Paredes (PhD) is modelling the impact of ore feed characteristics on mill performance; Raphael Picorelli (MPhil) is investigating the application of blast fragmentation and movement models to predict and optimise the downstream crushing, grinding and flotation performance of mineral processing plants; and Peter Legge (MPhil) is studying the rheology of Lihir grinding circuits for Newcrest Mining.

A total of 14 Higher Degree by Research (HDR) were conferred upon SMI-JKMRC students in 2016 comprising three MPhil degrees and 11 PhDs. Congratulations to Narendrakumar Vijayakumar, Tamsyn Parker, Pablo Gandara Moreno, Dr Nestor Cruz, Dr Eugene Louwrens, Dr Jocelyn Quinteros Riquelme, Dr Ashleigh Collins, Dr Md Maruf Hasan, Dr Djoan Kate Tungpalan, Dr Jun Meng, Dr Chao Li, Dr Gregory Wilkie, Dr Riza Annieli Mariano and Dr Baris Yildirim.

Industry Placements

The Production Centres' Student Field/Site Placement Program has been formalised and is ready for roll-out in 2017. Dr Cathy Evans, Senior Research Fellow in the Separation Program, has stewarded this Placement initiative following on from the student placements in Mexico. Our site-focussed approach of applying leading-edge research at operational sites develops graduate students into future industry leaders. Our over 250 alumni work in all corners of the industry, in technical and management roles, a testament to the quality of their training at SMI.

Today SMI-JKMRC and SMI-BRC continue to attract high-quality people from Australia and around the world to study and work alongside experienced research staff to solve challenges in mineral processing, mining and mining geology. Undertaking an industry placement allows students to showcase the skills they have gained in a research environment.

The Rock: Ore Processability Program focusses on the link between the intrinsic primary rock properties (strength, mineral association, texture) and the processing outcomes when the rock is comminute to produce mineral liberation for recovery. The relationship between strength and fragmentation into particles with a range of mineral associations is being embedded in the new suite of mechanistic models-linking energy, equipment performance and recovery potential.

In 2016 the Rock program has changed considerably, splitting into two programs, the new half shifting under the capable leadership of Dr Mohsen Yahyaei. Dr Mohsen Yahyaei has worked over the past six years at SMI-JKMRC under the leadership of Malcolm Powell. With this change, the iconic P9 project, with the P9Q iteration developed and marketed by Professor Powell as the outgoing leader, shifts to Dr Yahyaei's new program.

Professor Powell took over the P9P project in May 2015 and ensured that it was delivered on time in December 2015. An agreed extension of student projects was completed as an addendum report in August 2016. The project successfully delivered a record 12 new working process models covering multi-mineral and multi-ore simulation capability. These feed forward into the P9Q phase to deliver end-user validated versions through the Integrated Extraction Simulator (IES) platform – providing the latest in industry process improvement tools.

The Rock Program had a bumper student output in the second half of 2016 with six theses submitted for examination, two students graduating in December and four others currently finalising thesis corrections post examination. Professor Powell presented invited keynote lectures at Comminution 16 in Cape Town (April) and the 28th International Mineral Processing Congress (IMPC) in Quebec (September), where he focussed on the new research direction of integrated process prediction – the measures, maths and language to connect the entire mining chain.

The Anglo American Centre for Sustainable Comminution remains a significant source of funding, with activities focussed on delivering process improvements through circuit simulations across the main Anglo American operations: Mogalakwena North (MNC) and South Concentrator (MSC), as well as Minas Rio (iron ore Brazil). Dynamic process modelling at MNC and the first process simulation of the Minas Rio circuit had significant impact on current operations. The delivery of the Process Improvement Toolbox (PIT) for metallurgists provides a simple, consistent and user friendly web interface of 26 key technical models and diagnostic tools to the workforce – forming a new technology transfer channel that may set the tone of how we deliver research outcomes. The 5-year span of the Centre is due to wrap up in June 2017 with a report to summarise the extensive outputs and value of the Centre. A concerted effort is being made to renew this funding following a request



Professor Malcolm Powell
Program Leader
SMI-JKMRC

from Anglo American to expand activities across the wider processing chain. Strategic funding from the UQ Vice-Chancellor, leveraged off the Anglo Centre, has provided an opportunity to develop important areas of fundamental research. Tremendous progress has been made in developing novel and coherent rock strength testing techniques that will replace many of the traditional tests used.

The understanding of and ability to measure the driving forces behind rock breakage, led by Dr Ben Bonfils, will feed into the new generation of comminution models, allowing greatly improved and consistent quantification of multi-mineral response across diverse equipment, through more accurate energy, breakage and liberation descriptions. The new suite of dynamic process models link into Dr Yahyaei's program and utilise the new ore characterisation outputs that can be applied to geological drill core.

Dr Dion Weatherley took over the Unified Comminution Model (UCM), building on the challenges and knowledge gained to redevelop the mathematical platform and contact energies, to provide a powerful new process modelling tool. We see this leading to a new modelling paradigm in mineral processing.

From late 2016, Professor Malcolm Powell has been integrally involved in establishing a long-term advanced mine-to-mill and process digitisation project with Professor Kanchibotla at Barrick Cortez mine in Nevada based on three sets of site visits and funded preliminary work.

Dr Grant Ballantyne has further developed the internationally-supported comminution energy curve tool which is hosted on the Coalition for Energy Efficient Comminution (CEEC) international website, and widely used by industry for energy benchmarking and the optimisation of comminution circuits. Based on Dr Ballantyne's work and research proposal, CEEC won additional development funding of \$300,000 from the Australian Federal and Queensland State governments. Dr Ballantyne ran a further two successful industry workshops in 2016, facilitating the application of the energy curves by industry.

Dr Ballantyne developed three other high-impact models and inventions: a new breakage model providing a wider prediction range with two instead of 16 parameters; a coarse grinding simulator to assess reduction in water and energy consumption; and the cyclone emulator to overcome historic laboratory testing limitations.

Dr Marko Hilden is in the final stages of upgrading the iconic JK SAG mill model with a new version providing long-overdue improved usability and predictive capability. Dr Hilden has published his ground-breaking new approach to modelling and rapidly simulating mineral liberation – a tool that is underpinning our future integrated circuit simulation capability – placing SMI-JKMRC firmly in the forefront of all simulation and predictive capability worldwide.



PHOTO (left to right): Professor Malcolm Powell, Professor Sarma Kanchibotla and Dr Barun Gorain (Senior Manager - Mineral Processing, Strategic Technology Solutions, Barrick Gold Corporation) at Barrick Cortez mine, Nevada, 2016



PHOTO (left to right): Director of SMI - Professor Neville Plint, Dr Grant Ballantyne - Research Fellow at JKMRC, Professor Alice Clark - Director of SMI Production Centres, Alison Keogh - Chief Executive of CEEC International Ltd and University of Queensland's Emeritus Professor Tim Napier-Munn.



Dr Kym Runge
Program Leader
 SMI-JKMRC

Dr Kym Runge was appointed program leader of the Process Prediction program within the SMI-JKMRC in 2016. In 2017, the program name will become Separation to better reflect the nature of the research projects. The Separation program aims to develop novel or improve existing mineral separation processes to improve profitability and resource utilisation, and minimise environmental impact. It will also develop the modelling capability required to evaluate these technologies in the context of a circuit flowsheet.

Comminution is often the bottleneck of an operation and thereby limits throughput. It is also an energy intensive, expensive process. If separation can be achieved at a coarser size or through preconcentration prior to comminution, then significant economic advantages will result. Processing at a coarser size would also improve water utilisation and reduce downstream environmental impacts. In 2017, the Separation program aims to develop research projects using technologies that have the potential to achieve this aim.

High Voltage Pulse (HVP) is a technology that can make an ore amenable to preconcentration, pre-weaken an ore to reduce downstream comminution energy use and improve liberation to enable separation at a coarser size. SMI-JKMRC is leading the world in applying this technology to mineral processing. In 2016 two major mining companies sponsored research into this technology. In 2017, SMI-JKMRC will seek to develop a multi-million dollar collaborative research program to improve the process and overcome the challenges associated with its full-scale industrial application.

There are also opportunities for the mining industry to improve comminution throughput by floating at a coarser particle size. Conventionally, flotation efficiency drops significantly when particle size exceed 200 micron, however, Eriez's Hydrofloat cell, for example, is reported to be able to recover 600 micron particles with very little mineral surface exposure. The Separation program plans to undertake research on the Hydrofloat technology as well as aerosol reagent addition and flotation cell suspension, and all have the potential of improving coarse particle flotation recoveries.

Novel reagents in flotation will be another key research focus area. Xanthates have been traditionally used in flotation applications but are relatively unselective when it comes to separating sulphide minerals. With recent advances in molecular science, it is believed chemicals can be developed that significantly improve flotation separability, or alternatively, coarse particle flotation.

To accelerate the uptake of new separation technologies, their effectiveness needs to be simulated to quantify their benefits.

There will be a focus within the Separation program on developing models of both novel separation processes as well as conventional processes to enable integrated circuit simulation. There are tremendous opportunities to combine new technologies and make a step change in the profitability and efficiency of mining operations. The Separation Program aims to be at the forefront of enabling these initiatives.

The Separation program currently comprises six researchers with internationally recognised expertise in flotation, comminution, dewatering and other separation processes including: Dr Frank Shi, Dr Elaine Wightman, Dr Cathy Evans, Dr Christian Antonio, Dr Francois Vos and Program Leader Dr Kym Runge. This team manages a suite of state of the art mineralogical equipment and currently advises, guides and trains ten HDR students.

Highlights of 2016 include: the publication of *Process Mineralogy* due to the significant efforts of Dr Cathy Evans and Dr Elaine Wightman, (pictured); the conferral of four PhD degrees to Dr Chao Li, Dr Jun Meng, Dr Riza Mariano, and Dr Fatemeh Saeidi; the recognition of Dr Frank Shi's pioneering work in High Voltage Pulse comminution through the SMI Innovation Award; and the presentation of the prestigious SMI-JKMRC Ian Morley Postgraduate Prize to Maedah Taebi Khorami.



Professor Sarma Kanchibotla
Program Leader
SMI-JKMRC

The main aims of the NextGen Mine to Concentrator Program is to achieve a step change in metal production, capital effectiveness, Operational Expenditure (OPEX) and energy signatures of the mine to concentrator value chain by developing and implementing novel feed preparation methods at the mine, and novel comminution, classification and separation processes at the concentrator.

Research progressed in several projects under this program in key areas of mine planning, ore characterisation, drilling, blasting and mineral processing. Notable achievements during the year included significant industry interest in some of the key projects- New Cyclone, Integrated Blast Model and Mega projects. Three RHD students in the Program submitted thesis for examination.

Professor Sarma Kanchibotla contributed a chapter “Rock Blasting” for the Society for Mining, Metallurgy & Exploration (SME)’s Mineral Processing and Extractive Metallurgy Handbook to be published in 2018.



PHOTO (left to right): Authors Dr Cathy Evans, Dr Elaine Wightman celebrating publication of *Process Mineralogy*



Professor Gideon Chitombo
Program Leader
SMI-BRC

Professor Gideon Chitombo leads the Mass Underground Mining (MUM) program. MUM aims to provide practical solutions to enable the future sustainability of mass underground mining methods, and more specifically cave mining methods, to address technical, economic, and licence-to-operate issues.

Deep Earth Mining

During 2016, Professor Chitombo was approached by senior technical members of two mining organisations: China ENFI Engineering Corp and Beijing General Research Institute of Mining and Metallurgy (BGRIMM). The former is incorporated in China directly under the Chinese central government and is a leading institute providing innovative technology, diversified products, and process-orientated engineering services in mineral and material industries worldwide.

Industry engagement

During 2016 and in order to develop and promote the three Mass Underground Mining initiatives, Professor Chitombo engaged with a number of the major mining companies in Australia and overseas, delivered keynote addresses in major mining conferences and gave invited seminars in Chile, South Africa, Sweden, Finland and Australia. A key 2016 achievement was the MassMin 2016 in Sydney, Australia which was co-chaired by Professor Chitombo and the successful conclusion of the Mass Mining Technology (MMT3) research series on the mechanics of caving.

The proposal is to help establish a collaboration with Cave Mining 2040 but focussing on deep earth mining for the range of underground metalliferous mining methods used in China. There is increasing interest in applying modern cave mining methods in China. An alternative proposal is to form a China - Australia Deep Mass Mining Collaboration which is independent of Cave Mining 2040.

Management of Geo-Hazards in Hard Rock Mining

During 2015 and 2016 Professor Chitombo, in conjunction with Associate Professor Philipp Kirsch, the past project manager of RISKGATE Coal Application, saw the opportunity to adapt the current RISKGATE Coal system (www.riskgate.org) into a comprehensive platform of risk management knowledge for hard rock mining. The current system enables site-based personnel to source broad knowledge from across the industry.

The original idea was to develop RISKGATE Hard Rock with an initial focus on cave mining systems where mining hazards such as major extraction level collapses, large magnitude seismic events, which manifest themselves in the form of rock bursts and inrushes (wet muck, mud rushes and air-blasts) have become endemic to cave mining. The cave miners would none-the-less still benefit from other attributes currently in RISKGATE for coal applications.

Cave Mining 2040

Cave Mining 2040 is a collaboration of industry mining companies, mine owners, and mining equipment and explosives manufacturers and suppliers generally referred to as Mining Equipment, Technology and Services (METS). The objective of the collaboration is to transform cave mining to ensure that the five current cave mining variants (block, panel, inclined, front and sublevel caving) continue into the future as viable, safe and low-cost mining methods, and that the future demand for increased production from underground mass mining is satisfied by a new and adaptive type of cave mine. The aim is to address known mining challenges in several caving projects presently being constructed and, in projects that are in advanced stages of planning and are expected to become operational mines within the next 4 -10 years. During this period, new ways or processes, including disruptive technologies for cave mining that will ameliorate much harsher conditions than those that presently exist, will be identified and progressively addressed through applied research and development.

It is anticipated that Cave Mining 2040 will be run in four-year Horizon projects with each four year project comprising a number of industry-defined and agreed sub-projects, with clearly defined goals and performance milestones. The need for this research and the number of subsequent projects will be determined by the mining industry sector.



Professor Rick Valenta
Program Leader
 SMI-BRC

Geology and Mass Mining Project (GMM)

The GMM project was completed in 2016 with knowledge transfer occurring through a workshop on aspects of geotechnical risk associated with block-cave mining at the 7th International Conference and Exhibition on Mass Mining in Sydney, Australia (MassMin 2016).

The Deep Mining Queensland Project (DMQ)

The Deep Mining Queensland Project (DMQ) project continues to contribute to the understanding of copper and gold deposits in the Cloncurry district, Western Queensland; in terms of exploration potential and viability constraints around any discovered deposits.

Progressive results of the project have been presented at separate industry-focussed forums hosted by each of the Queensland Exploration Council, Geological Survey of Queensland, and James Cook University. This project is due for completion in May 2017, and has resulted in a number of important insights in an area of high geological complexity and world-class mineral endowment.

The Geology for Mining program aims to maximise the understanding of geological information and knowledge on the mining value chain. Developing tools and methods to extend the ability of geological datasets in predicting and modelling key mining and processing parameters will increase the success rates of in-mine and district exploration.

Project Development

After a strategic review of research priorities, the future focus of the Geology for Mining program will be to build on the established SMI-BRC vision of 'Total Deposit Knowledge'. The program will focus on research aimed at maximising the effectiveness of geological information as it applies to world-class mineralised districts, ore deposit modelling, resource estimation, rock mass characterisation, and the use of geological observations and measurements to contribute to mineral processing activities. The program will explore fruitful areas of synergy with other mining and processing programs within SMI-BRC and SMI-JKMRC.

Higher Degree by Research Training

SMI-BRC PhD candidate Matthias Klawitter is progressing the geological understanding of natural cave systems and how this information can be used predictively in block-cave mine design and operation. His thesis title is 'Enhancing mining induced caving predictability by transforming preserved natural caving systems data'. In May 2016, Matthias won the best student poster award at the 7th International Conference and Exhibition on Mass Mining in Sydney, Australia (pictured).

In June, Matthias was awarded the Geological Society of Australia, Queensland (GSAQ) student travel award to attend and present at the Australian Earth Science Convention 2016 in Adelaide, Australia. In September 2016, Matthias presented his research at the 2nd Virtual Geoscience Conference in Bergen, Norway, and subsequently was invited to publish his results in the Photogrammetric Record. We look forward to Matthias's thesis review in October 2017 and thesis submission in January 2018.



PHOTO: SMI-BRC PhD candidate
 Matthias Klawitter



PROFESSOR DAVID MULLIGAN

Director of Environment
Centres

The Environment Centres, SMI-CMLR and SMI-CWiMI, came out of a fiscally-and structurally-challenging 2015 and into 2016 with an increased recognition of the need to improve the diversification of both funding sources and project partners. By the end of 2016, and despite further loss of staff and some specialised expertise, the Centres have stabilised and are now well-positioned for growth and opportunity-capture. SMI-CMLR and SMI-CWiMI have a strong base of core skills, knowledge, experience, agility and resilience.

A successful ARC-Linkage application “Eco-engineering soil from mine tailings for native plant rehabilitation”, led by Associate Professor Longbin Huang, with co-investigators from two other UQ units (School of Earth and Environmental Sciences and the Advanced Water Management Centre) and two other universities (Curtin University and The University of Western Australia). The primary sponsor, is an iron ore operation in Western Australia. This is an example of a positive outcome from a broadening of relationships. During 2016, another three ARC-Linkage, two ARC-Discovery and an ARC Research Hub application (on “Integrated Value Chains to Transform Mineral Wastes” led by Glen Corder) were under development, all with collaborators from across the UQ Faculties.

An ACARP proposal on “Using an ecotoxicological approach to validate the DGT technique for the measurement of bioavailable metal concentrations and deriving water quality trigger values for the ANZECC guidelines” led by Trang Huynh (now working with consulting company, Hydrobiology), and Dr Sue Vink was successful. An ACARP project that delivered the latest update of a coal mine rehabilitation bibliographic database ‘DIG’ was completed, and a wiki-based Mine Rehabilitation and Closure (MRC) knowledge platform was another ACARP project being finalised for completion in early 2017.

New industry relationships and projects captured included Rodinia Resources (bauxite refinery in Jamaica) and McArthur River zinc operations in the Northern Territory. The long held research relationship with Mount Isa Mines (MIM) continued with projects related to site water balance commenced. Reviews of the final component of the MIM Lead Pathways Study were completed and a public release of this report examining the health risks of lead exposure via the air pathways is scheduled for early 2017.

Internationally, the Environment Centres continued to be most active in South America and China, although relationships in South East Asia and the Pacific expanded, and engagements and connections in Europe continue to be prospective. The Centres played a major role in project development and delivery for the SMI-ICE-Chile Environment line of research in 2016, and co-organised two international conferences in Santiago - ‘Water in Mining’ and ‘Planning for Closure’. An application led by Professor Neil McIntyre to the Council on Australia Latin America Relations (COALAR) to establish a Centre of Excellence in Sustainable Mining in Colombia was successful.

In China, Longbin Huang has been pivotal in strengthening and fostering both ongoing and new relationships and has been working with colleagues in the Faculty of Engineering, Architecture & Information Technology (EAIT) on the development of a “Joint Centre for Benthic Sludge Dredging and Recycling Research” between UQ and Hohai University (Nanjing, China), in partnership with Juhui Tech (China) and EnviroPacific Pty Ltd (Australia).

We positioned the SMI to be the Global Alliance partner and Australian representative for the International Network for Acid Prevention (INAP), a relationship led by Dr Mansour Edraki. We also co-hosted with AusIMM, and chaired, another successful Life-of-Mine Conference in Brisbane in September 2016.

Our warmest congratulations to our HDR graduates who successfully achieved the final milestone, and to Thomas Baumgartl and Peter Erskine who were promoted to Associate Professor in 2016 and 2017, respectively, a great achievement and recognition well deserved.

On a personal note, I would like to thank all those who carried the extra burden in the Centres for a few months while I was in the Acting Institute Director role during the transition time; your support as always is so very much appreciated.



Associate Professor Peter Erskine
Program Leader
SMI-CMLR

2016 allowed the newly formed Ecosystem Assessment, Restoration and Resilience Program to clearly establish research directions and structure. The program focussed on two key areas: the discovery and utility of metal hyperaccumulating plants; and, the recovery and sustainability of disturbed land.

Two projects using X-ray fluorescence technology (XRF) on herbarium collections in Malaysia and New Caledonia found new plant families and species of nickel, manganese, zinc and cobalt hyperaccumulators. A growth trial, using previously identified nickel hyperaccumulator plants in Sabah, Malaysia, was developed in collaboration with Sabah Parks and Université de Lorraine in France. Philip Nkumbah (PhD scholar) spent several months at a remote station within Kinabalu Park, Malaysia to establish the trial using a selection of soil and nutrient treatments to inform future phytomining efforts.

“One of the highlights of innovation and global networking of **Associate Professor Peter Erskine’s Program** that will continue to strengthen is the research on metallophytes, and specifically *hyperaccumulators*. These plants are highly unusual in their ability to achieve extreme metal tissue concentrations. In the case of nickel, we have been working on the development of phytomining or agromining (“metal farming”) wherein these plants extract nickel from the soil into harvestable plant biomass. The team were involved in a science documentary by a French-German TV network called ‘Superplants’, filming our work in New Caledonia and at the Australian Synchrotron in Melbourne where Dr Antony van der Ent has received a number of grants to use the X-ray fluorescence microscopy beamline.”

- Professor David Mulligan

Dr Antony van der Ent commenced his ARC Discovery Early Career Researcher Award (DECRA) in 2016 to unravel the ways in which metal hyperaccumulator plants work. Several research projects at the Australian Synchrotron in Melbourne allowed the team to further elucidate the cellular distribution of metal tolerant and hyperaccumulator plant species collected from a wide range of habitats.

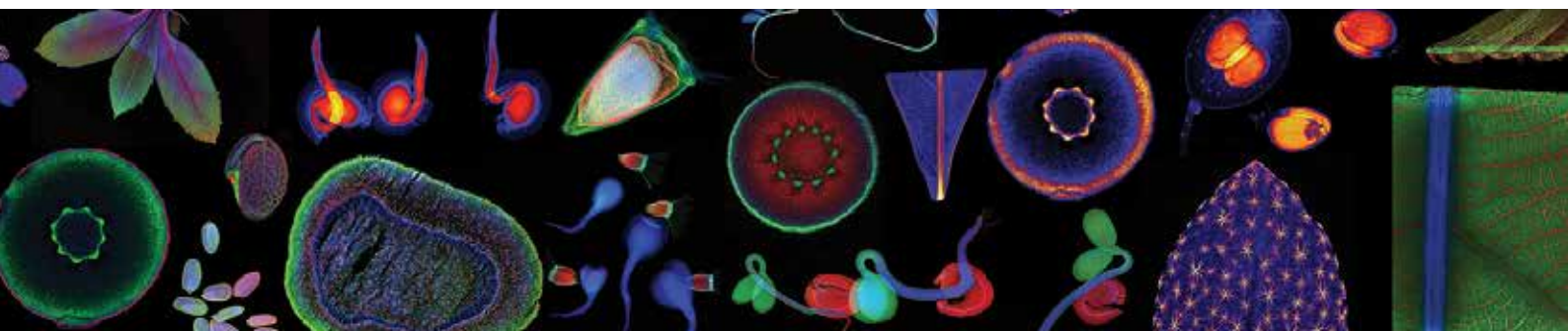
Projects on mine rehabilitation and closure using unmanned aerial vehicles (UAVs) to capture high-resolution remote sensing data continued to find interesting results. One ACARP funded project, using UAVs to collect datasets across a number of coal mine rehabilitation sites, investigated the application of an object-based image analysis procedure to automate rehabilitation status based on mapped landform, land-cover and vegetation biodiversity and structural information. These datasets are being assessed to ensure there is high confidence in the stability and sustainability of final rehabilitation outcomes. A set of process tools using remote sensing technology, field plots and XRF were also used at Century Zinc mine to measure the rehabilitation performance of two permanent waste rock structures.

Phill McKenna, as part of his MPhil studies, continued to assess the first large scale coal mine rehabilitation fire at Wesfarmers Curragh operations. Field data has been collected before and after the fire, in parallel with high-resolution satellite (WorldView 3) and UAV captures, to assess the rehabilitation recovery response. Into the future these areas of work are expected to continue at existing sites and expand to new locations.

Opportunities to assess metallophyte plant communities on greenfield sites are emerging and several potential locations have been identified to progress the use of metal hyperaccumulating plant species as a novel remediation or rehabilitation strategy.

Experimental assessment of rehabilitation options for post-mine landscapes using fire experiments across multiple sites is being developed. Work on the closure of Ranger Uranium mine linking ecological factors with UAV captured data to inform mine rehabilitation design will also begin in early 2017.

PHOTO CREDIT: Antony van der Ent, Hugh Harris, Martin de Jonge, Peter Erskine, Rachel Mak, Jolanta Mesjasz-Przybylowicz, Wojciech Przybylowicz, Emmanuelle Montargès-Pelletier, Alban Barnabas, Guillaume Echevarria, David Paterson and Daryl Howard.





Dr Glen Corder
Program Leader
 SMI-CMLR

The Life Cycles of Mines and Metals program has an integrative research focus on environmental impacts, social implications, technical innovations and economic factors along the metal value chain and over the life of a mining project or operation. Our core expertise and capabilities include geochemical processes applicable to environmental management, industrial ecology related to mining production and recycling; geo-metallurgy and mineral processing knowledge; environmental and socio-economic impacts of closure and legacy mines; and contaminant issues related to human health.

In 2016, the program undertook industry relevant projects as well as established a foundation for larger multi-disciplinary research initiatives. Successful research projects included:

MRC-Wiki, a Mine Rehabilitation and Closure Knowledge Management Platform:

The aim of this project is to gather and make accessible, knowledge of good rehabilitation and closure planning, implementation, review and improvement practices in Central Queensland.

Prediction of Long-term Salt Generation from Coal Spoils:

The overall aim of this project is to develop a process for estimating long-term salinity generation rates from different classes of mine spoil and spoil pile configurations these can be used in conjunction with water balance models to predict long-term final void salinity levels or the residual risk to receiving surface water or groundwater environments.

The Smarter and Cost Effective Acquisition of Coal Quality by Semi-automatic Analysis of CoreScan Images:

The project's objective is to test the CORESCAN core imaging technique and the Regional Estimation of Geoscience Information (REGI) method as a rapid, non-destructive method for characterising the processing attributes and the product quality including rank, type and grade for drill core samples.

The Wealth from Waste Cluster project:

www.wealthfromwaste.net is a major 3-year research collaboration with the University of Technology Sydney, Swinburne University of Technology, Monash University and Yale University and is aimed at identifying economically viable options for the recycling of metals from existing products in Australia.

In 2017 the Program will continue to focus on developing research agendas for industry-defined problems that require disciplinary expertise from a range of backgrounds to produce holistic solutions. A prime focus for the program is developing an application for an ARC Industrial Transformation Research hub on extracting greater value from mining wastes, currently called "Integrated Value Chains to Transform Mineral Wastes".

A complementary project focusses on developing an integrated strategy for reprocessing tailings for mineral recovery and enhanced rehabilitation. Another key research initiative is productivity improvement through enhanced business integration processes by combining SMI technical know-how with business process improvement expertise from the UQ Business School and the QUT Business School. The Program will also contribute to SMI Transformational Learning's Mining Leaders Program as well as the development of a new Massive Open Online Course (MOOC) called 'The Future of Mining?', the SMI's Master of Responsible Resource Development and the third-year undergraduate mining course, "Socio-Environmental Aspects of Mining".



Associate Professor Longbin Huang
Program Leader
 SMI-CMLR

Building on a solid foundation of research experience and expertise established over the last 8 years, the program of “Ecological Engineering of Soil-Plant Systems” in mined environment is firmly focussing on discovering new knowledge about key mechanisms and processes stimulating bioweathering of reactive minerals and soil-formation in metal mine tailings, which underpin the development of new technologies of engineered pedogenesis (or soil formation) of tailings. The new technology under development addresses critical challenges of topsoil deficiency and uncontrolled hydrogeochemistry in reactive tailings, such as sulfidic tailings and bauxite residues. By means of these technologies and methodologies, functional soil-plant systems can be engineered for desirable post-mining land use options with much improved confidence and success rate, thus contributing to the economic and environmental sustainability of the mining and minerals industry in Australia.

In 2016, Associate Professor Longbin Huang and his team were successful in winning a large ARC-Linkage project titled “Eco-engineering soil from mine tailings for native plant rehabilitation” (nearly \$1 M for three years), aiming to develop in situ tailing-soil formation in magnetite tailings by using organic matter inputs to stimulate microbial mediated iron formation. This project is co-funded by Karara Mining Ltd, a magnetite iron ore miner and Parks Authority of WA (Kings Park), and in partnership with the University of Western Australia (UWA) and Curtin University. In this large project, we are the first to have attempted to develop the tailing-soil engineering technology at industry scale, rather than laboratory scale. Two full-time postdoctoral fellows (one at UQ and one at UWA) and four PhDs are involved in this project. Through this collaboration, an excellent alliance has been established to generate many more collaborations in years to come, in the area of ecosystem rehabilitation for tailings landforms.

In 2016, the program also completed two projects on bionutralization of the alkalinity in red mud (bauxite residue) and coupled soil formation processes, with exciting findings on functional microbial groups tolerant of alkaline and saline conditions which catalyse the decomposition of labile organic matter and formation of large amounts of organic acids. Associate Professor Huang is closely involved in round-table discussions with Rio Tinto, looking for innovative and alternative technology to rehabilitate Alcan Gove red mud ponds, for substantially improving the cost-effectiveness and environmental performance of “would-be-rehabilitated” red mud domains. A large research project is expected to commence in 2017, to investigate field-based technology to engineer red mud into functional soil through microbial mediated bionutralization and organo-mineral coupled stimulation of physicochemical property development under field conditions.

In 2016, a PhD research project has revealed new findings about the role of extremophiles in the mineral weathering of sulphides and hardpan formation, with much improved understanding of mineralogy of hardpan and its microstructure. From these findings, it is expected in 2017, to develop a new project focussing on the in situ development of technology and methodology to stimulate the weathering of lead and zinc tailings under field conditions, in order to achieve a high degree of hydrogeochemical stability and a high degree of mineral cementation of the top layer of tailings. These would lead to much lowered requirements for covering depth and thus costs, to rehabilitate lead and zinc tailings domains on lead and zinc mines.

In 2017, we expect an upward swing in research collaborations with Chinese universities and research institutes, in PhD training, Masters coursework and collaborative research projects and increased numbers of high-quality publications. In particular, we will be co-Chief Investigator in a large national research project proposal led by College of Environmental Science and Engineering, Sun Yat-sen University, and Prof Wei Zhu, Hohai University.

In teaching, we aim to consolidate the current undergraduate/postgraduate courses (ENVM3520 and ENVM7301) and develop possible teaching programs in areas of environmental science and remediation. With increasing demand for environmental remediation and management professionals, we will campaign a promotion of the Masters program in environmental technology and management in China, in collaboration with the UQ’s School of Earth and Environmental Sciences.



Professor Neil McIntyre
Program Leader
 SMI-CWiMI

The Regional Water and Land Resources program is producing the knowledge, data sets and tools to support the sustainable management of water and land resources. This includes hydrology, water accounting, ecosystem service evaluation and water and land management from mine site to catchment scales.

Through 2016, the Regional Water and Land Resources program strengthened existing and developed new industry, government and academic relationships both within Australia and internationally.

The Program's strong partnership with Glencore continued through 2016 and will expand in 2017 with research and support being undertaken at a number of Glencore sites. Much of this work is undertaken in conjunction with other Environment Centres programs and encompasses the areas of tailings management, waste rock covers, evaporation, hydrogeology and final void water management.

The relationship with international consultants Kohn Crippen Berger Limited has been successful with a novel research program assessing the relationship between tailings hydrology, geochemistry and geotechnical properties with respect to tailings ageing, commencing in mid-2016. The initial outcomes of this research and a matching contribution from the Australian Government's Innovation Connections scheme, will lead to additional support from Kohn Crippen Berger through 2017.

The Program continues to work with UQ's Centre for Coal Seam Gas (CCSG) on estimating groundwater recharge in the Surat Basin; and extending a recently completed project that has been metering and modelling non-CSG groundwater extractions in the Surat.

Internationally, the Program's focus on South America continues with involvement in projects associated with SMI-ICE-Chile. A grant from the Australian Government's Council on Australia Latin America Relations (COALAR) is supporting the vision of establishing with the Universidad de los Andes, a Center for Sustainable Mining in Colombia. Three proof-of-concept projects involving five SMI Centres are underway. We are regularly encouraged to invest effort in Peru; however this has declined due to lack of staff resources, in the Program.

Relationships with other water-focussed groups within UQ and the Queensland Government continue to be strong, for example with the School of Civil Engineering, School of Earth and Environmental Sciences and the Queensland Department of Science Information Technology and Innovation we are developing a strategy for the future of Stradbroke Island hydrological research.

Following four staff departures in 2016, the Program has recently recruited two new staff, and aims to recruit at least one more in 2017. We have a dynamic program of visiting international researchers, which in 2017 will include visitors from Chile, Colombia, Canada, Germany and France. HDR recruitment continues to be healthy with 11 students associated with the Program.



PHOTO (left to right): SMI's Neil McIntyre, David Cliff and Saleem Ali at Los Andes University in Bogota to kick off three research collaborative projects



PHOTO (left): Headworks of a Colombian coal mine visited by Professor Neil McIntyre, Professor David Cliff and Professor Saleem Ali



PHOTO (right): Dr Greg Keir downloading groundwater abstraction data



PHOTOS (left to right): PhD Student, Nena Bulovic at one of the 47 groundwater abstraction monitoring stations established by CWIMI staff in the Surat Basin as part of the Centre for Coal Seam Gas Water Use project

In 2016, the SMI's People Centres continued to change and evolve. Several longstanding members of staff retired or reconfigured their roles, while new and emerging research leaders were appointed to carry the SMI's vision forward.

**PROFESSOR
DEANNA KEMP**

Director of People
Centres



After 15 years of service, Professor David Brereton retired from the SMI. Reflecting his significant contribution to the University, David was appointed an Emeritus Professor. This title is conferred to Professorial staff who have served the University in an outstanding manner. After a globally competitive process, Deanna Kemp was appointed Professor and Director of People Centres to oversee the strategic direction and management of both SMI-CSR and SMI-MISHC. Professor Kemp brings global experience and deep institutional and industry knowledge to this role.

Following Deanna's appointment to the Director's role, Associate Professor Nick Bainton was recruited from industry to lead the "Extractives and Communities" Program of research. With experience in both industry and academia, Associate Professor Bainton plans to grow the SMI-CSR's industry-facing work, with a particular focus on in-migration and social dimensions of mine closure. Nick has particular expertise in the Asia Pacific region.

Professor Saleem Ali was internationally sought for the new and prestigious position of "Blue and Gold Distinguished Professor of Energy and the Environment" at the University of Delaware. Professor Ali has moved to the United States of America, and retains a 20 per cent appointment with the SMI as the Chair of Sustainable Resource Development. In taking up this role, Saleem stepped aside from the "Governance and Development" Program Leader role. In his place, Dr Kathryn Sturman was appointed to lead the program. Dr Sturman will focus on regulation, voluntary certification schemes, and transparency, with a particular focus on emerging mineral economies.

Professor David Cliff also stepped aside from his position as Program Leader of the Communities, Workplace Health and Safety program within SMI-MISHC to focus on expert work and to take carriage of the SMI's collaborations with "UQ RISK", the university's hub for risk-related research. A new "Human Factors" Program has been established within SMI-MISHC, led by Professor Robin Burgess-Limerick. In 2017, Professor Burgess-Limerick plans to drive forward the Mine Automation Human Systems Integration (MAHSI) initiative on mine automation and human systems integration.

In terms of Centre-level initiatives, the "Mining, Resettlement and Livelihoods Research and Practice Consortium" has continued to grow. Founding Partners include Rio Tinto, Anglo American, Newmont and Newcrest Mining, with MMG and the Porgera Joint Venture (PJV) also supporting the initiative. The SMI successfully secured a matching grant from the Vice-Chancellor's Strategic Funding Scheme to support the appointment of two new members of staff: Dr Vlado Vivoda as Research Fellow, and Associate Professor John Owen as the Academic Lead on the Consortium's program of work. The Rio Tinto partnership was renewed after 10 years of research engagement with the CSR and continues to engage Centre staff in leading and industry-relevant research projects. The People Centre staff are also involved with new and strategic research partnerships with MMG and Newcrest mining.

People Centre staff across SMI-CSR and SMI-MISHC are currently designing a new project that focuses on "social incident investigation". SMI-MISHC has long been known for its work in accident and incident investigation, and SMI-CSR is known for its forensic treatment of some of the industry's most challenging social conflicts. This project will bring familiar models and methods for accident and incident investigation to social performance challenges. People Centre staff are also working on a number of projects with other Centres, including mine waste and new mining technologies – subjects that bring the SMI's multi-disciplinary teams together to engage challenges of the future.

The People Centre's diversity and depth of our research expertise is a testament to our determination to maintain our position as a high quality, competitive social and human sciences-orientated research centre that is willing to integrate and interface with other established disciplines in mining, into the future.



Dr Kathryn Sturman
Program Leader
SMI-CSR

A program of research and training for mining governance in Australia and developing countries of Asia Pacific, Africa and Latin America, was consolidated in 2016. Public sector funding sources were further extended from the Australian Department of Foreign Affairs and Trade (DFAT) to projects commissioned by the UK Department for International Development (DFID), the German Gesellschaft für Internationale Zusammenarbeit (GIZ), the United Nations Development Program (UNDP) and the World Bank (WB). Industry-funded projects were also renewed, for example, strategic social investment implementation and research for Vale Malaysia and bespoke research under the Rio Tinto Partnership.

Highlights of 2016 included research on 'The Impact of Extractive Industries on Political Settlements and Conflict with case studies of Ethiopia, Kenya and Rwanda', for the DFID East Africa Research Hub. Findings were incorporated into public policy of the UN Economic Commission for Africa and UK and Australian development assistance to resource governance in East Africa. Training materials were developed on mine licensing, contract negotiation and investment promotion for the Government of Lao PDR, delivered in a two week course for Ministries of Mining, Natural Resources and Environment, Planning and Finance. Research support to the Peruvian mining industry and government was provided for drafting the Peru Mining Vision 2030 funded by the UNDP. Field-based methods were developed to measure the contribution of mining to local economic development; and to assess livelihood opportunities for women artisanal miners in Madagascar.

The Program aims to promote mining for sustainable development and responsible resource governance in mineral-rich countries of Africa, Asia-Pacific and Latin America. The focus is on applying global norms and standards to improve local practice, avoid conflict and corruption, and share the economic benefit of extractive industries.

Notable outputs included: A 'Navigator' (tool) to support economic diversification in resource-rich countries; journal articles published in The Extractive Industries and Society, Corporate Governance, and Water International; a Facilitator's Guide to Implementing Free Prior and Informed Consent (FPIC) in the Philippines funded by the Pavetta Foundation; and a case study of regional mining infrastructure planning in Indonesia.

Plans for 2017 include a workshop in Bonn, Germany with metals and automobile industry bodies and mineral supply chain certification schemes to discuss findings of research on Leveraging Greater Impact of Mining Sustainability Initiatives: An Assessment of Interoperability. Case studies conducted in Zambia and Colombia in 2016 will be presented. An integrated socio-economic and environmental assessment of mining in Myanmar will be conducted for the UNDP. Delivery of two significant training programs will continue including the PNG Mineral Resources Authority (MRA) Community Relations Capacity-building Program (2014-2017) (World Bank), co-delivered with SMI-CSR's Extractives and Communities Program, and the Australia Awards for Africa Short Course on Mining and Community Development.

Research and engagement with the Extractive Industries Transparency Initiative (EITI) will be initiated in support of EITI implementation in Australia and the region. A knowledge hub on sustainable development of the coloured gemstones sector (GemHub) will be established in collaboration with the University of Delaware, funded by the Tiffany Foundation. Outputs will include completion of a book titled "Africa's Mineral Fortune", edited by Saleem Ali, Nina Collins and Kathryn Sturman under contract with the University of Chicago Press; and journal articles based on the DFID and GIZ project case studies.

There have been a number of significant achievements in the Extractives and Communities Program in 2016. Associate Professor Nick Bainton was recruited as the new Program Leader. He brings long-term industry and academic experience on the anthropology of resource development in Melanesia. In 2017, the Program will host a number of master classes on social performance and extractives and drive new research agendas on in-migration and mining, and the social considerations of mine closure.



Associate Professor Nick Bainton
Program Leader
SMI-CSR



PHOTO (left to right): Aerial view of the Papua LNG project base camp on the Purari River, Gulf Province, PNG.

Research and training partnerships

A three year Training and Research agreement was signed with Newcrest Mining Limited to design and deliver a tailored Social Performance Leadership Training Program. The first week intensive will be delivered at the SMI in February 2017 to participants from across Newcrest's global sites. The second week will be held on campus in July 2017.

Under a partnership agreement with MMG, SMI-CSR continued its long-standing involvement with the Century Mine, which had finished production in 2016. Dr Jo-Anne Everingham led a desktop review on the implementation of Century Mine's Gulf Communities Agreement.

Under the terms of a three partnership agreement with the Mineral Resources Authority (MRA) of Papua New Guinea, the program continued to deliver training and capacity support programs for the national regulator. Several MRA staff are enrolled in the SMI's Graduate Program in Responsible Resource Development.

Specialist expertise

In-migration: Under the recently renewed Rio Tinto Research Partnership agreement, SMI-CSR was commissioned to lead a study on in-migration and mining. Data was collected through 2016, and a consultation draft of a global scoping study on "Project-Induced In-Migration and Large-Scale Mining" is to be completed in early 2017. The final report will be publicly available.

Building on this project and the success of the Mining, Resettlement and Livelihoods: Research and Practice Consortium, the Program will bring into the frame the nexus between resettlement and in-migration. A symposium on the interface between resettlement and in-migration is proposed for mid-2017. This symposium will provide the basis for an edited volume, demonstrating SMI-CSR's ability to convene experts from across the region, and showcase its research on these two topics.

Human Rights: The Program continues to build on its longstanding engagement with the business and human rights agenda. Associate Professor Bainton collaborated with SMI-CSR Adjunct Fellow Nora Götzmann from the Danish Institute of Human Rights (DIHR) to undertake a human rights impact assessment (HRIA) for the Papua LNG project operated by Total in the remote reaches of Gulf Province in PNG. A public domain report will be available in 2017.

Professor Kemp will complete her participation in an expert panel convened by RESOLVE in the US to consider the issue of free prior and informed consent (FPIC) at the Merian mine in Suriname, majority owned and operated by Newmont Mining and located on the customary lands of the Maroon peoples. She also contributed as a writer on a public report for the Yanacocha Independent Fact Finding Mission, also convened by RESOLVE.



PHOTO: Associate Professor Nick Bainton visiting local community members from Ara'ava village, Gulf Province, Papua New Guinea, as part of a human rights impact assessment for the Papua LNG project.

PHOTO: Daily transport along the Purari River for community members and the company's community relations team.



Policy advice

The Program successfully developed the "Why Agreements Matter" guide for Rio Tinto in 2016, and will complete an on-line training component in 2017. Professor Marcia Langton and Adjunct Professor Bruce Harvey partnered with SMI-CSR as senior consulting authors.

Dr Everingham led a team that provided advice to the New South Wales Department of Planning and Environment and contributed to the development of a draft guideline on assessing the social impacts of mining, petroleum and extractive projects.

Competitive grants

The Program is engaged in a number of competitive grants. In March 2016, Dr Everingham commenced a two year project in collaboration with Central Queensland University on "Stakeholder involvement in planning post-mining land uses for the Bowen Basin" funded by the Australian Coal Association Research Program (ACARP).

Associate Professor Bainton will collaborate with researchers from UQ's School of Social Science to submit an Australian Research Council grant application for the 2017 round. The project is titled: "Anthropologies of resource extraction: agreements and uncertainty."

The Human Factors Program aims to improve health, safety and productivity of the resources industry through human-centred design of all aspects of project, plant and equipment. The program focuses on the integration of automated and human components within the total mining system.



Professor Robin Burgess-Limerick
Program Leader

SMI-MISHC

Risk & Health

Highlights of 2016 include collaborations with Associate Professor Maureen Hassall, UQ Faculty of Engineering, Information Technology and Architecture (EAIT), on critical control risk management projects funded by ACARP and Rio Tinto; RISKGATE updates and developments in strata, outbursts and vehicle interaction topics, as well as ongoing collaboration with Virginia Tech (USA); presentation of numerous critical control risk management, accident investigation, professional development courses; Fly-In-Fly-Out (FIFO) and mental health research projects; and provision of research methods and statistical advice to the Dow Centre of Sustainable Engineering Innovation for the NSW Department of Education (Science Technology, Engineering Mathematics (STEM) nuclear energy project. Further development of whole-body vibration measurement techniques was also undertaken in collaboration with Associate Professor Tammy Eger, Laurentian University, (Canada) and exploratory measurements of whole-body vibration at underground coal mines were undertaken with funding from the Coal Services Health and Safety Trust (NSW).

Notable publications included:

Harris, J., Bofinger, C. & Cliff, D. (2016). *The Leading Practice and Sustainable Development in Mining program - Community Health and Safety Handbook* (Department of Industry, Innovation and Science); and Burgess-Limerick, R. (2016). Measuring and managing workplace whole-body vibration exposures (*Acoustics Australia*, April 2016, Volume 44, Issue 1, pp 129–135.)

Human-centered design

Highlights of 2016 included the development of human-centred design case studies and training materials commissioned by the National Institute for Occupational Safety and Health (USA); and completion of an experiment using a haul truck simulator to assess proximity advisory control interfaces in collaboration with Associate Professor Guy Wallis, UQ Faculty of Health and Behavioural Sciences, funded by ACARP.

Notable publications included:

Horberry, T., Burgess-Limerick, R., Cooke, T. & Steiner, L. (2016). Can mining equipment safety be improved through the adoption of human-centered design? (*Ergonomics in Design*, 24(3) 29-34.)

Plans for 2017 include continuing professional development programs in critical control risk management and accident investigation; undertaking additional whole-body vibration measurement and management at underground mines in collaboration with Centennial Coal and funded by the Coal Services Health and Safety Trust; and developing new technology for continuous measurement of whole-body vibration and jolts and jars in collaboration with Dr Konstanty Bialkowski (EAIT) funded by ACARP.

Plans for 2017 include completion of a book titled *Human-Centered Design for Mining Equipment and New Technology* in collaboration with Professor Tim Horberry (Monash University) and Dr Lisa Steiner (NIOSH, USA) under contract with CRC Press; collaboration with Associate Professor Mark Horswill (UQ Faculty of Health and Behavioural Sciences) to develop a video based competency assessment tool for BHP Mitsubishi Alliance (BMA); and the development of a new program of work on Mining Automation Human Systems Integration in collaboration with Professor Joel Haight (University of Pittsburgh, USA).

In 2016 SMI took several steps towards recognising the importance of education and training activities as a key element in the dissemination of its research, and adopting a more integrated approach to this area. In a significant development, SMI and JKTech agreed to consolidate their resources focussed on Education and Professional Development, with a new Transformational Learning Program created towards the end of 2016 as a cross-cutting activity spanning the SMI Centres.

The consolidated postgraduate coursework program in Responsible Resource Development continued to attract a core of new students, including a number from the Papua New Guinea Mineral Resources Authority undertaking the Community Relations specialisation.

SMI has developed a good working relationship with the UQx group within UQ's Institute for Teaching and Learning Innovation (ITaLI), delivering two further iterations of the online Process Mineralogy course, designing a 'MININGx' Massive Open Online Course (MOOC) for finalisation in 2017, and using the edX platform to deliver a number of initiatives including a package of videos to support curriculum development at a Peruvian University, as well as several other professional development activities.

Successful initiatives include securing funding from the Australian Government through DFAT to maintain the alumni network and to provide governance support to the Government of Niger; funding from UNECA and UNDP to repeat the IM4DC Emerging Leaders in African Mining program at Mining Indaba; a project funded by GIZ focussed on building the capacity of Mongolian journalists reporting on the resources sector.

The Program also coordinated a number of Global Minerals Industry Risk Management (G-MIRM) and other OHS-related training programs for various industry organisations during the year, and worked with other programs within SMI to plan and deliver a number of workshops.

Following the finalisation of reporting for the International Mining for Development Centre (IM4DC) project at the end of 2015, SMI has continued to collaborate with The University of Western Australia in pursuing opportunities to build on the foundation of the IM4DC under the umbrella of the Minerals and Energy for Development Alliance (MEfDA).



PHOTO CAPTION: Robin Evans with the Indonesian Delegation Coal and Mineral Study Tour group visiting Australia as part of IM4DC.



Robin Evans
Program Manager
SMI **EDUCATION**

In 2017 the focus for the Transformational Learning Program will be on formalising and implementing a Transformational Learning Strategy which engages all SMI programs in developing learning activities built on their research, and implementing these with SMI stakeholders. The range of activities will include bespoke corporate executive-level programs, as well as skills-based graduate level courses and practitioner programs, tailored to corporate and regional contexts.

The Program will work closely with other UQ Faculties and Schools including the Business School and EAIT to maximise synergies, and develop shared capabilities in development and delivery of programs with a focus on experiential and blended learning approaches.



JKTech Pty Ltd is wholly owned by UQ and is the technology transfer company for SMI, commercialising research outcomes from the Centres of the SMI. Commercialisation is conducted via spin-off companies, sales of Intellectual Property (IP) and technology licensing, as well as through JKTech's suite of products and services that are delivered to the global resources industry. Often, SMI IP is incubated within JKTech's products and services, thereby enhancing its value prior to commercialisation by external parties. JKTech works closely with researchers to determine the optimum commercialisation pathway for research outcomes that have commercial potential.

JKTech's Chilean subsidiary (JKTech South America SpA) continued to play an integral role in the establishment and management of the SMI led International Centre of Excellence in Chile. The Centre was founded following the successful award of grant funding from InnovaChile Corfo ('CORFO').

The Centre's objective is to carry out research and development, technology transfer and commercialisation activities which will have a high national and international impact for Chile, and that strengthen Chile's research and development capabilities.

We understand the resources industry remains strategically important for the University's industry engagement program, so as one of UQ's two commercialisation companies, JKTech will continue to work with SMI researchers and industry alike, to identify the best commercialisation pathways for thought-leading, cutting edge breakthroughs as well as enhancements to processes, technologies and methodologies for the global resources industry.

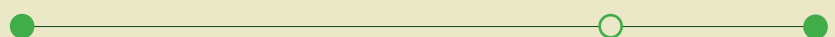
TECHNOLOGY TRANSFER AND COMMERCIALISATION

JKTech delivers economic and social value to the global minerals industry via innovative technology products and services. Our expertise in technology based consulting, laboratory services, software, specialist equipment and professional development, is implemented to improve the profitability, sustainability, and safety culture of resource operations across the globe.

In response to suppressed activity in the global resources industry, JKTech has continued to re-structure its business model in 2016. The cornerstone of its revised approach is to maintain a core group of people who are the real assets of our company, and who retain the knowledge, expertise and wide range of industry experience in minerals-related disciplines.

Despite the challenging market conditions, JKTech and SMI continued to collaborate strategically and operationally to deliver world-class capability that is aligned with The University of Queensland's core purposes of Learning, Discovery and Engagement.

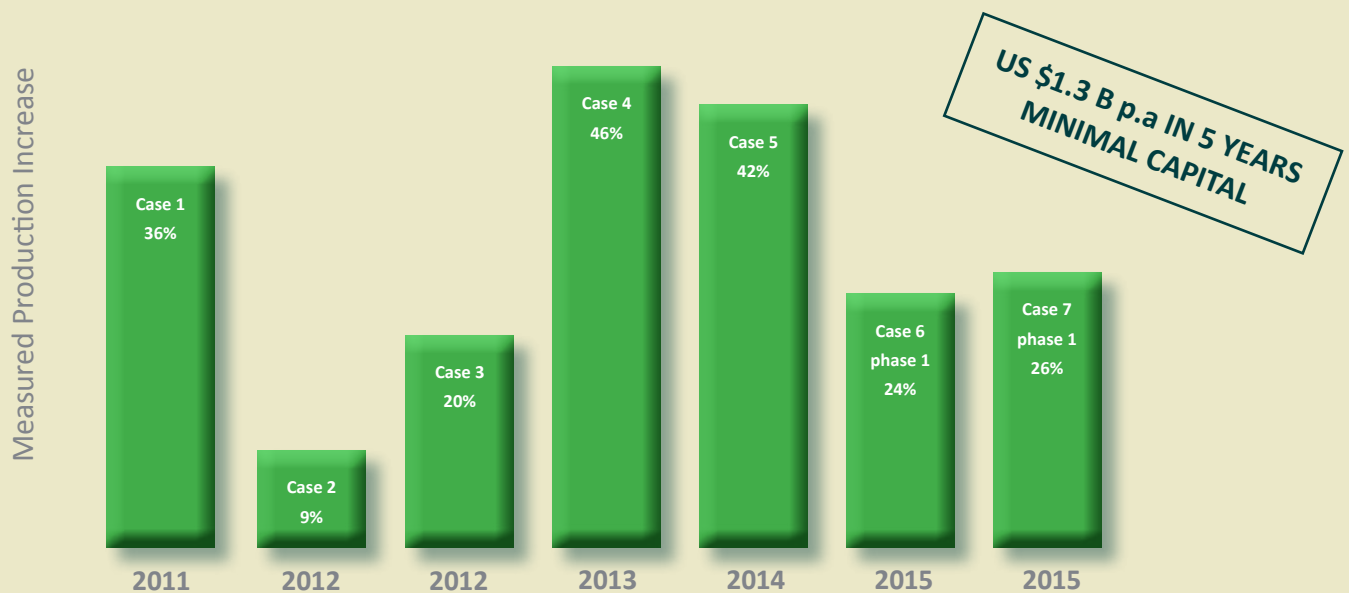
During 2016, JKTech's operations continued throughout the world, with activities undertaken in both North and South America, Africa, Europe, Asia, and of course Australia. In the first half of 2016, JKTech participated in a successful trade-mission to Russia, which led to software and product sales and follow on technical consulting opportunities.



JKTech's consulting arm, which encompasses mining and processing specialists in the areas of ore fragmentation, ore pre-concentration, comminution circuit optimization and design and minerals separation, continued to have a profound impact on the operations of our clients. The largest program of consulting work in 2016 was done for an Australian client which included an underground Mine-to-Mill™ project. This client will continue to work with JKTech in 2017 to broaden their understanding of the ore bodies from the mine to predict downstream performance and identify opportunities to enhance production from their facilities.

JKTech calculated the value they have delivered for their clients in the global minerals industry since 2011 using the Mine-to-Mill™ and JK Value Chain Optimisation philosophies.

JKTech Mine-toMill® Case Studies



The graph shows achievements from 2011 to 2015. None of these case studies has required significant capital expenditure to achieve the quoted production improvements. These case studies cover gold, copper/molybdenum, lead/silver/zinc and diamonds. The processing plants include carbon in leach (CIL), heap leach, dense medium and flotation operations.

JKTech continues to capitalise on our long history in software development, and has continued as a participant with the Australian federal government funded CRC ORE based in Brisbane. JKTech plans to play an integral role in the development and commercialisation of CRC ORE's Integrated Extraction Simulator (IES) product.

SMIICEChile

The University of Queensland, JKTech South America SpA and the Universidad de Concepción (UdeC) established the SMI International Centre of Excellence Chile (SMI-ICE-Chile) following a successful application through the Chilean Government's (CORFO) "Attraction of International R&D Centre for Competitiveness 2.0" Program. SMI-ICE-Chile was established to deliver demonstrable benefit to the Chilean people and its economy. The Centre will be at the forefront of innovative research and technology transfer to address several of the major challenges and competitive pressures faced by the Chilean minerals sector. It will make significant and auditable improvements for its industry in the areas of productivity and environmental management and will build local capacity in both research and technology transfer.

With the foundations strengthened in 2016, 2017 will see SMI-ICE-Chile progressively achieve its objectives of fundamentally improving the productivity and environmental signatures of Chilean mining operations. We will do this by creating a collaborative global mining knowledge force in Chile that builds human capital, provides innovative research outcomes and realises effective technology transfer to industry.

In March 2016, Professor Roberto Parra commenced as the Director of the Centre. He has more than 25 years of experience with research and development projects and consulting in Process Metallurgy, as well as teaching in the Department of Metallurgical Engineering at UdeC. Shortly after his appointment, Professor Parra led a delegation of UdeC researchers from the Department of Metallurgical Engineering and Applied Economic Geology Institute to meet with SMI and other UQ counterparts to present updates and discuss the findings from initial seed projects that had commenced in 2015.

Workshops on building industry engagement with and from these initiatives were held as were discussions on activities and opportunities to be developed and explored under the four research lines of the Centre. Two of these lines, "Next generation mine to concentrator" and "Next generation smelter", reflect research primarily focussed on the extractive processes for copper production. The other two lines, "Environment: water, energy and tailings" and "Intelligent systems and sensors" operate as both multi-disciplinary in their own right but also traverse research line boundaries and provide an effective platform for fully integrated project development and delivery.

The Director again travelled to UQ in August to discuss Centre projects and program updates and to participate in a workshop of a pyrometallurgy project led by Associate Professor Baojun Zhao from UQ's School of Chemical Engineering and sponsored by Codelco and Chinese company Dongying Fangyuan.

By the end of 2016, a lease was signed for new office space in Las Condes with occupancy and final completion and full functionality scheduled for early 2017. The SMI-ICE-Chile now has a permanent location in Santiago with sufficient room to conduct seminars and workshops and for visiting staff and students to make use of this facility. JKTech South America SpA and UQ International (Global Engagement) are now co-located in the same office and an official opening and associated event to mark the occasion will be held in 2017.

Industry research contracts executed through the Centre in 2016 have included Metso Minerals SA (Chile), Codelco and Fundación Chile, and proposals supported by Codelco in the field of pyrometallurgy that will flow through the Centre's "Next Generation Smelter" line of research were submitted. There are currently other collaborative projects underway, or in development, with Codelco and other companies. These include diagnosing issues and identifying potential points of intervention to improve tailings and water management practices, hydrogeological investigations to minimise risks of contamination pathways to groundwater, and building better predictive models from climate and hydrology datasets to allow climate-resilient water supply options for mines to be developed.

On 23 June, SMI researchers working with SMI-ICE-Chile presented 'Australia's response to the Chile Technological Roadmap in Mining: The University of Queensland experience' at an event in Santiago co-organized by the National Mining Program Alta Ley and UQ Global Engagement.



CAPTION (Above Photo): Dr Mansour Edraki, presenting at joint UQ/ Alta Ley forum - Response to the Chile Technological Roadmap in Mining, June 2016



CAPTION (Above Photo, left to right): Roberto Parra – Director, SMI-ICE-Chile, Pascual Veiga, President of APRIMIN, Professor David Mulligan- Director of Environment Centres - Sustainable Minerals Institute, Ignacio Moreno – Vice-Minister for Mining, Shannon Powell - Senior Trade and Investment Commissioner, Andean Latin America, Australian Trade and Investment Commission (Austrade), Mauro Valdés – President, National Mining Program 'Alta Ley', Jonathan Castillo – Manager, National Mining Program 'Alta Ley'



CAPTION (Above Photo, left to right): Professor David Mulligan- SMI, Ignacio Moreno – Vice-Minister for Mining, Marcela Angulo - Manager of Technology Capabilities, Corfo, Roberto Parra – Director, SMI-ICE-Chile



CAPTION (Above Photo): Sampling along tailings transport channel, Rancagua Valley, Chile

In June, SMI researchers working with SMI-ICE-Chile presented 'Australia's response to the Chile Technological Roadmap in Mining: The University of Queensland experience' at an event in Santiago co-organized by the National Mining Program Alta Ley and UQ Global Engagement (through Carolina Rasse, UQ's Manager International Relations for Latin America) in collaboration with Austrade and the Centre for Copper and Mining Studies (CESCO). Other speakers included Chile's Vice-Minister for Mining and the Australian Ambassador to Chile. With an audience of over 220 people from government, industry, research and academe, this was an important showcasing and exposure of UQ's strengths and value as a contributor to Chile's progressive and future development of the sector. Following that event, the SMI joined a delegation of colleagues from UQ's School of Chemistry and Molecular Biosciences and presented at a joint symposium with UdeC in Concepción.

As a part of the business development and national ecosystem expansion strategy, and in addition to developing new project ideas by being responsive to industry-driven requests and initiatives for the Centre, the Director has engaged with other research centres and groups across the country, including several of the other International Centres of Excellence. During the year a joint research proposal with CSIRO Mineral Resources Chile, the Universidad Católica del Norte, the Universidad Santiago de Chile and the Chilean National Mining Corporation (ENAMI) on the recovery of valuable minerals from tailings was developed. Another large collaborative project with CORFO to install analytical, technical and piloting facilities in northern Chile was developed, complexities for the industry partners prevented the final submissions. However, industry continues to be supportive of these projects and funding pathways continue to be explored.

In collaboration with TAFE Queensland, SMI-ICE-Chile and Codelco developed a proposal for the establishment of a new training centre and the implementation of a Human Capital Training Model that would play a key role in the transition of the Chuquicamata open-pit copper mine to an underground development. A decision on this proposal is expected in 2017.

An early objective for 2017 is to review any improvements required to ensure there is a fit-for-purpose operating model embedded in the Centre. This will enhance and ensure the ability of the Centre to deliver projects and new initiatives which will accelerate SMI's efforts to build a self-sustaining and well-governed presence in Chile. Such ongoing strengthening of the Centre and its disciplinary diversity and integration in 2017 will assist the transition of SMI-ICE-Chile from the project's Implementation Stage into the Operation Stage in September 2018, and set it up for self-sustainability into the future.

Workplace Health, Safety & Facilities Manager Ryan Anderson

In 2016 the facilities function was added to the health and safety portfolio and is managed by SMI's Workplace, Health, Safety & Facilities Manager. The pairing of these functions has led to improved linkages between research space, facilities and safety issues.

Two key roles were created and filled to support the extended Workplace, Health, Safety & Facilities function. The Laboratory Facilities Manager and Site Facilities Coordinator ensure the Indooroopilly Experimental Mine Site's safety and facilities are efficiently and effectively managed. These two positions join the Workplace Senior Technician (Workshop) and Workplace, Health, Safety & Facilities Manager within this function.

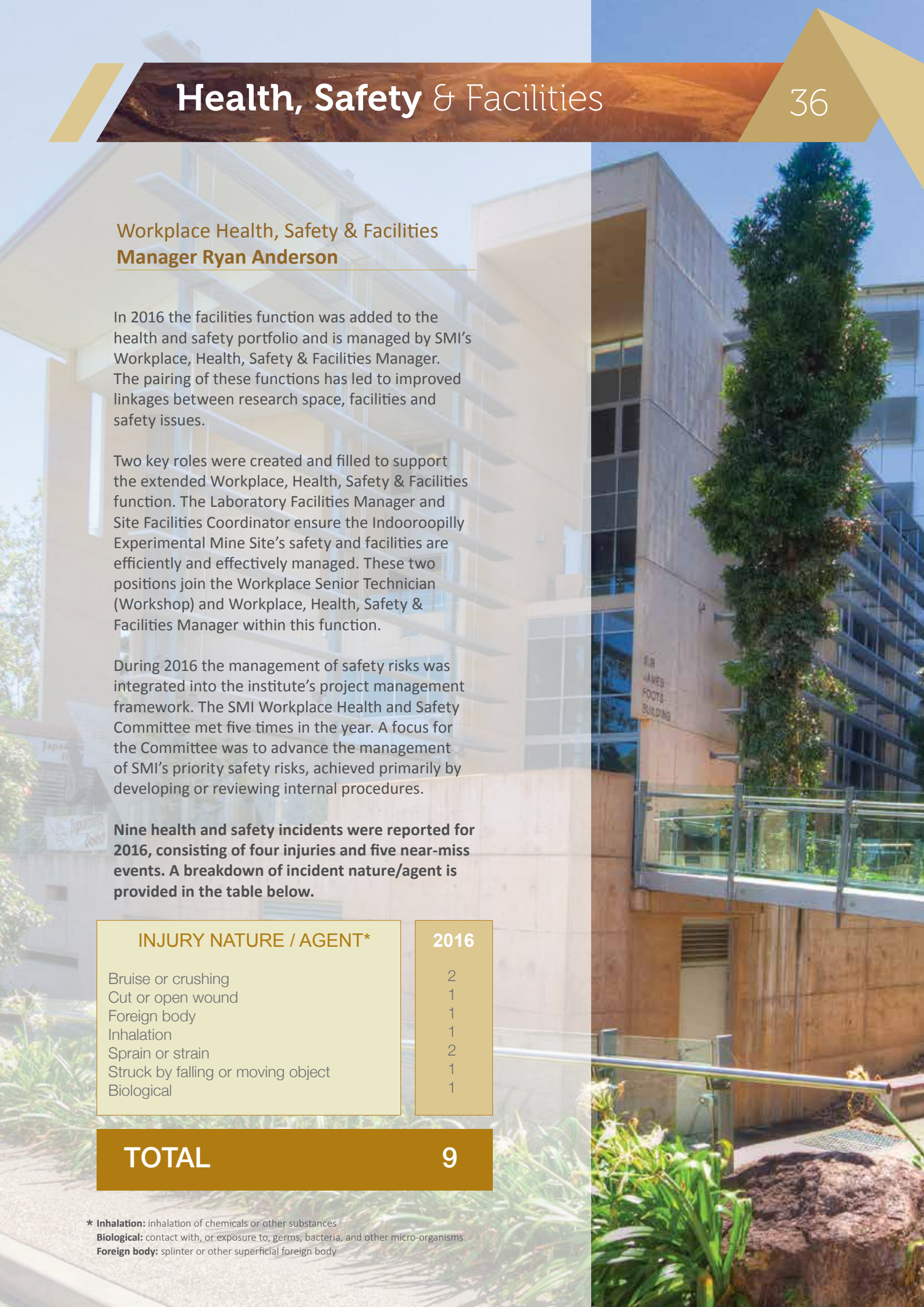
During 2016 the management of safety risks was integrated into the institute's project management framework. The SMI Workplace Health and Safety Committee met five times in the year. A focus for the Committee was to advance the management of SMI's priority safety risks, achieved primarily by developing or reviewing internal procedures.

Nine health and safety incidents were reported for 2016, consisting of four injuries and five near-miss events. A breakdown of incident nature/agent is provided in the table below.

INJURY NATURE / AGENT*	2016
Bruise or crushing	2
Cut or open wound	1
Foreign body	1
Inhalation	1
Sprain or strain	2
Struck by falling or moving object	1
Biological	1

TOTAL	9
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* **Inhalation:** inhalation of chemicals or other substances
Biological: contact with, or exposure to, germs, bacteria, and other micro-organisms
Foreign body: splinter or other superficial foreign body





SMI Students

SMI Higher Degree by Research Office Report

By the end of 2016, SMI had 88 enrolled students, with 74 in the Doctor of Philosophy and 14 in the Master of Philosophy. Our 41 international students come from 25 countries, reflecting the global reach of our research influence. Our total enrolments include 13 new students, nine of whom are domestic students, who we were pleased to welcome into our cohort in 2016.

As well as SMI welcoming new students, we were honoured to recommend conferral of 16 PhD degrees and four MPhil degrees: Ms Kathleen Cedenó, Dr Ashleigh Collins, Dr Nestor Cruz, Mr Pablo Gandara Moreno, Dr Christopher Gonzales, Dr Maruf Hasan, Dr Chao Li, Dr Eugene Louwrens, Dr Riza Mariano, Dr Frank Mendham, Dr Jun Meng, Ms Tamsyn Parker, Dr Jocelyn Quinteros Riquelme, Dr Mandana Shaygan, Dr Rajjeli Taga, Dr Kate Tungpalan, Mr Naren Vijayakumar, Dr Angela Werner, Dr Greg Wilkie, Dr Baris Yildirim. **Congratulations to you all!**

We applaud all our students who were awarded prizes and special funding during 2016, with special mention of these achievements:

Diego Silva Calquin (BRC), Amelia Hine (CMLR), Gernelyn Logrosa (MISHC), Anh Nguyen (JKMRC), and Sandy Worden (MISHC) each received a **Graduate School International Travel Award** (GSITA), which helped them participate in workshops with pre-eminent researchers in their fields, present at international conferences, and access the labs and facilities of leading institutions.

Philippa Dodshon (MISC) was awarded one of three inaugural **Mineral Council of Australia (MCA) Research Scholarships** in support of her PhD research into critical risk control management.

Diana Arbaelez-Ruiz was awarded an **Australia Government Endeavour Research Fellowship** which will allow her to spend four-months at the prestigious Peace Research Institute in Oslo, Norway.

Dr Riza Mariano won the prestigious **2016 Oz Minerals Prize** which is awarded to a graduate whose research and thesis in the field of mineral processing or extractive metallurgy was deemed "most worthy" by the Associate Dean (Academic) of the Faculty of Engineering, Architecture and Information Technology, in consultation with the Director of the Sustainable Minerals Institute.

Maedeh Tayebi Khorami received the **27th Ian Morley Prize**, which is awarded to a SMI-JKMRC research higher degree student who displays academic achievement, leadership and engagement in their research field.

SMI-JKMRC PhD and MPhil students participated in a six-week placement program in May and June at three mine sites in Mexico (Francisco I. Madero, Fresnillo and Saucito) owned by Peñoles and Fresnillo.

The placement came about through JKMR student initiatives and networks, which were developed into a successful placement program under the guidance of Professors Alban Lynch, Alice Clark and Tim Napier-Munn.

Our five student participants planned, executed and prepared samples, and analysed results of a series of comminution and flotation surveys. SMI was pleased and proud that Peñoles and Fresnillo welcomed and adopted our students' reports to optimise their operations. We are grateful for the encouragement and support that Peñoles and Fresnillo extended to SMI-JKMRC's students.



PHOTO: It wasn't all early mornings and dirty work for five SMI-JKMRC students on placement with the Francisco I. Madero, Fresnillo and Saucito mines in Mexico; they still found time for dinner with friends and supporters in the nearby city of Zacateca.

From L-R: Yogesh Reja, Kate Tungpalan, Prof. Alejandro Valdivieso (Universidad Autonoma de San Luis Potosi) and daughter to his left, Prof. Salvador Gomez (Fresnillo PLC Operations Manager and friend of Emeritus Professor Alban Lynch), Erica Avelar, Dr Mario Corona (Universidad de Guanajuato), Juan Frausto Gonzalez, German Figueroa Salguero.

SMI participated in the annual UQ Three Minute Thesis (3MT) Competition in 2016. The SMI 3MT Winner was Diego Silva Calquin, (SMI-BRC) and both the Runner-Up and People's Choice was Gernelyn Logrosa, (SMI-MISHC). Diego and Gernelyn progressed to compete in the UQ All Institute 3MT Final and represented SMI admirably in a tough competition.

The SMI Candidate Advisory Committee (CAC), comprised of student representatives from SMI's six centres of research, continued to provide professional development and networking opportunities for our students.

The CAC hosted two Industry Breakfasts in 2016 with Kirsty Liddicoat, BHP Billiton Coal Head of Geoscience and Exploration and past Chair of AusIMM Women in Mining, and Pamela Ruppin, who spent 30 years with Rio Tinto worldwide in corporate, consulting and operational roles within the environmental and community sectors.

The 2016 SMI RHD Industry Networking Evening in September was another successful event, thanks to engaged industry representatives from Ausenco, BHP Billiton, SolGold, Hydrobiology Consultants, Queensland Department of Natural Resources and Mines, CRC ORE, and BMT WBM Pty Ltd. Following the event, select students were invited to present their research to BHP Billiton in Brisbane. We thank Gordon Naidoo, BHP Billiton Resource Geologist, for extending this invitation and networking opportunity for our students.

The SMI-JKMRC student organisation, the JK Jackals, hosted their annual International Night at SMI-JKMRC in November. From the homemade international feast of food, to the guests displaying their cultural heritage in costume, to the singing, dancing, and children's activities, it was a fantastic night for families of SMI's students and staff.

SMI sincerely thanks all students who dedicated their precious time, effort and energy into making our research institute engaging and dynamic, to the benefit of all staff and students at SMI.



PHOTO: A few members of the dedicated 2016 SMI RHD Conference Committee take a break from proceedings to enjoy their hard work. From L-R: Gernelyn Logrosa, Erica Avelar, Constanza Paredes.

The CAC capped a great year with the SMI HDR Conference in November, themed 'Transforming research into sustainable practice in the resources industry.' With the financial support of JKTech Pty Ltd and the Centre for Coal Seam Gas, five keynote speakers and 12 students presented their research in the one-day conference, which closed with the lively panel discussion with Dr Ewan Sellers (JKTech), David Bainbrigge (Ausenco), Kirsty Liddicoat (BHP Billiton), Dr Luis Martinez (R&O Analytics), Daniel Mcleod (BMT WBM Pty Ltd), and Dr Mohsin Hafeez (Bureau of Meteorology). The prize for Best Presentation went to Dr Fiona Martin (SMI-CSR), runner-up to Erica Avelar, and People's Choice to Adam Babatu.



PHOTO: Erica Avelar enjoying her placement work at the Saucito mine in Mexico.

2016 SMI GRADUATES

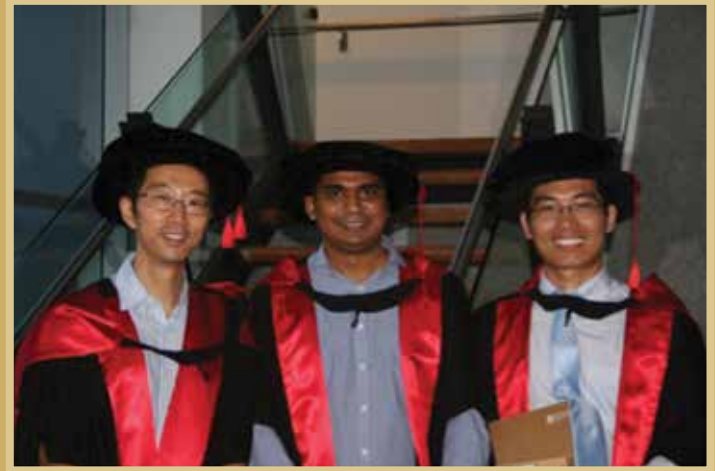


PHOTO: SMI was very pleased to host a reception for graduating RHD students and their families who attended the UQ Graduation Ceremony in July 2016. Here, Professor David Mulligan presides over our celebration of Dr Mandana Shaygan (SMI-CSR), Ms Tamsyn Parker (SMI-JKMRC), Dr Garry Marling (SMI-MISHC), Dr Frank Mendham (SMI-MISHC), Dr Eugene Louwrens (SMI-JKMRC), and Mr Naren Vijayakumar (SMI-JKMRC).

PHOTO: Nine SMI RHD students were eligible to attend the UQ Graduation Ceremony in December 2016, however work and family commitments for most meant many could not attend; we were nonetheless proud to honour Dr Jun Meng (SMI-JKMRC), Dr Maruf Hasan (SMI-JKMRC), and Dr Chao Li (SMI-JKMRC) and their families at a reception before the ceremony.

2016 SMI STUDENTS NATIONALITIES



Student	Program	Centre	Thesis title	Principal Advisor
MS Kathleen CEDENO	Mphil	CMLR	Understanding the potential effects of mining on water quality in the Altayan and Taplan Catchments, Philippines	Dr Mansour Edraki
DR Ashleigh COLLINS	PhD	JKMRC	Classification of multi-component feeds in a hydrocyclone	Dr Peter Holtham
DR Nestor CRUZ	PhD	JKMRC	Interactions of clay minerals and their effects on copper-gold flotation	Dr Yongjun Peng
MR Pablo GANDARA MORENO	Mphil	BRC	Cave establishment under high stress conditions using a conventional panel caving at Esmeralda South mine	Professor Gideon Chitombo
Dr Christopher GONZALES	PhD	CMLR	The potential use of mine wastes as cover materials in a water-shedding cover configuration as applied in a seasonally wet but arid environment setting	Dr Thomas Baumgartl
Dr Maruf HASAN	PhD	JKMRC	Process modelling of gravity induced stirred mills	Dr Sam Palaniandy
Dr Chao LI	PhD	JKMRC	An investigation of flotation froth rheology	Dr Kym Runge
Dr Eugene LOUWRENS	PhD	JKMRC	A novel geometallurgical approach to tailings storage facility characterisation and evaluation	Professor Tim Napier-Munn
Dr Riza MARIANO	PhD	JKMRC	Measurement and modelling of the liberation and distribution of minerals in comminuted ores	Dr Cathy Evans
Dr Frank MENDHAM	PhD	MISHC	Improving fire safety and asset loss control in mining: evaluation and development of a video based fire detection system	Professor David Cliff

Surname	Program	Centre	Thesis title	Principal Advisor
Dr Jun MENG	PhD	JKMRC	Measurement and prediction of turbulence in flotation cells	Dr Weiguo Xie
Ms Tamsyn PARKER	MPhil	JKMRC	The effects of high voltage pulse treatment on ore characteristics and separation performances of a porphyry copper ore	Dr Frank Shi
Dr Jocelyn QUINTEROS RIQUELME	PhD	JKMRC	Improved process development for complex silver ores through systematic, advanced mineral characterisation	Dr Elaine Wightman
Dr Mandana SHAYGAN	PhD	CMLR	Evaluating the leaching of salt affected soils for the purpose of reclamation and revegetation	Dr Thomas Baumgartl
Dr Raijeli TAGA	PhD	CMLR	Development of in-vitro methods to predict bioavailability of arsenic, cadmium, copper, lead and zinc in mine wastes for human health risk assessment	Dr Barry Noller
Dr Kate TUNGPALAN	PhD	JKMRC	Investigating textural drivers for separation performance in a variable and complex ore body Awarded the 25th Ian Morley prize in 2014	Professor Emmy Manlapig
Mr Naren VIJAYAKUMAR	MPhil	JKMRC	Application of the grindcurve methodology to AG/SAG mill control	Dr Marko Hilden
Dr Angela WERNER	PhD	MISHC	Environmentally-related health impacts of coal seam gas development: an impact assessment approach in Queensland, Australia	Dr Sue Vink
Dr Greg WILKIE	PhD	JKMRC	Rapid assessment of the sorting potential of copper porphyry ores through modelling of textures and grade distributions	Professor Ben Adair
Dr Baris YILDIRIM	PhD	JKMRC	Development of a correlation between mineralogy, rock strength measures, and breakage of copper porphyries	Professor Malcolm Powell

Professor Tadimety Chakrapani Rao (T. C.)



PHOTO: UQ Experimental Mine at Indooroopilly (JKTECH, SMI-JKMRC & SMI-BRC)

Professor T. C. Rao was the first international PhD student of mining engineering at The University of Queensland, just the third SMI-JKMRC graduate. The technical modelling work he developed as part of his PhD is still used globally in academia and industry today. In 2015, he was honoured with the Award for Outstanding Achievement in Science & Technology at the Australian Alumni Excellence Awards – India.

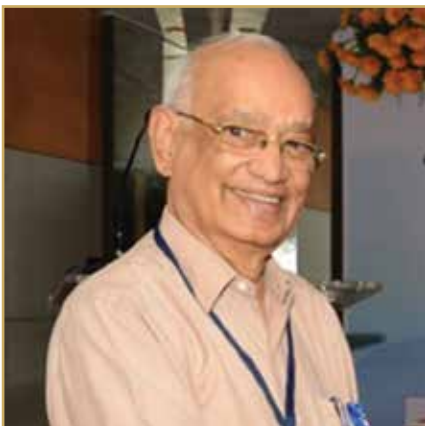


PHOTO: Professor T. C. Rao

Professor Tadimety Chakrapani Rao (T. C.) was awarded the **2016 UQ International Alumnus of the Year**

T. C. Rao is a prominent figure in the field of mineral engineering, recognised for his technical expertise, innovation and contributions to education, research and development.

He has been instrumental in developing innovations in mineral processing over several decades benefitting the mining industry and he has also played a leading advisory role with the Indian government and mining companies.

Described as ‘the Father of Indian Mineral Processing’, T. C. Rao has published over 225 research papers in international and national journals and is seen as a key figure in nurturing young talent, including establishing a four-year graduate programme (B.Tech.) in Mineral Engineering at the Indian School of Mines, Dhanbad - the only one of its kind in India.

In addition to mineral and materials engineering, T.C. Rao has also nurtured the research and development activities in the areas of rural development, environment, energy and agriculture. He has worked to improve lives through the application of these advances in technology to rural development, employment generation and uplift of economically weaker sections of society, such as tribal and rural communities and women.

Dr Baris Gazanfer Yildirim

PhD student, 2012-2016



PHOTO: Honorary Research Fellow at SMI-JKMRC Mining Engineer and Geologist, Dr Yildirim (Photo, far right)

I joined SMI in 2012 as part of my professional development. I moved from Canada to Australia, which was a big step. I started a research project which focusses on the fundamental link between geology and mineral processing.

Like every PhD student, I had the tough times both in my social and technical life. The team was always supportive. We are dealing with the unknowns in research, therefore the team and working environment is very important and SMI provides the right platform to complete the journey.

In 2017, I am moving to Turkey and focussing on continuing my research. I am also working with the Ministry of Energy and National Resource (MENR) to develop the country's resource and reserve coding system called UMREK which will be linked with Joint Ore Reserves Committee (The JORC Code), the Australian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves, developed in Australia.

SMI gave me a platform to integrate with distinguished researchers at different jurisdictions. It was amazing to observe the different perspectives on the same research question.

Working at SMI gave me the opportunity to do testing in different laboratories located in Brazil, Chile, Australia and Turkey. This also provided a platform to integrate with distinguished researchers at different jurisdictions. It was amazing to observe the different perspectives on the same research question.

I was recently appointed an honorary research fellow at SMI and I am pleased to maintain contact with my university. The time I spent at UQ has been an important part in my life. The advisory team, students and research fellows became my family and supporters during my journey.

My time at SMI has been pivotal to my career. I first started at SMI as a research assistant during my undergraduate degree, and over the years I have consistently been drawn back!

I first heard of the Centre for Water in the Minerals Industry during a Rio Tinto lunch meeting with then-Director Don McKee. After explaining my passion for advancing sustainable water management in the mining sector, he suggested that I contact Professor Chris Moran who was looking for new talent to join his team.

I worked as a research assistant for Professor Moran for the following two years and contributed to a number of exciting research projects including scoping papers for the Centre for Sustainable Resources Processing (CSR) and the International Council on Mining and Metals (ICMM). I also helped to advance the WaterMiner program for simulating mine site water risks and improving water accounting across sites.

After graduating from my undergraduate degree in Chemical Engineering and Business Management, I worked for Rio Tinto as a graduate process control engineer at the Yarwun Alumina Refinery in Gladstone. However I missed being at SMI, where I had seen the power of applied research for triggering real change towards sustainable development in mining.

I subsequently returned to complete a PhD with Professor Moran and Associate Professor Tim Kastle from the UQ Business School. Under their mentorship, I performed one of the first applications of social network analysis in the mining sector. The work was also innovative because it demonstrated the importance of addressing the dual socio-technical challenges faced in mine water management.

Dr Nadja Kunz

2006-2013



PHOTO: Dr Nadja Kunz

Following my PhD, I completed a two-year postdoctoral position in an environmental policy group at Eawag, The Swiss Federal Institute of Aquatic Science and Technology in Switzerland. This experience allowed me to broaden my knowledge beyond the mining sector through working on urban water issues. It was also an opportune time to expand my network, particularly among international institutions.

The networks that I made in Switzerland led me to be hired as a consultant and water specialist for the International Finance Corporation (IFC). In this role, I have applied knowledge gained over many years of research to influence water management in practice. This has included promoting a consistent approach to water reporting among eight mining companies in the South Gobi of Mongolia by drawing upon the Water Accounting Framework developed by SMI and the Minerals Council of Australia.

Recently, I co-led the preparation of a joint publication by IFC and ICMM on *Shared Water, Shared Responsibility, Shared Approach: Water in the Mining Sector*. This work showcased collective action on water among mining companies in the South Gobi, along with other global case studies. I continue to

support IFC on water projects.

Since January 2017, I have also joined the University of British Columbia (UBC) as an Assistant Professor across two applied research institutes, NBK Mining Engineering and the Liu Institute for Global Issues. Under my research program, I will develop new engineering models to improve quantification of water risk in mining, and to simulate trade-offs of changing company practices such as the water-energy nexus. Beyond the company fence, my team will explore new decision making models to help the mining sector contribute towards the UN's Sustainable Development Goals with a focus on three geographical regions: Mongolia, Peru and South Africa. My teaching responsibilities involve developing new educational courses on water, mining and policy for undergraduate and masters' students at UBC. Through the Canadian International Resources and Development Institute (CIRDI) I am also helping to develop and deliver a Certificate in Integrated Water Resources Management in partnership with Pontificia Universidad Catolica del Peru (PUCP) in Lima.

I am privileged to have found a career that allows me to improve water and sustainability practices within the mining sector, and to inspire the next generation of professionals.

At the end of each year SMI celebrates our achievements and recognise staff and students who have made considerable contribution to the success of the Institute. In 2016 a review of the awards was conducted which resulted in new categories and a revised process. Thirty-seven nominations were received for the awards. The below table details the winners.

Category	Description	Placing
Discovery & Innovation	Recognises those involved in a significant new research discovery or the implementation of innovative, effective practices or initiatives. Can be awarded to an individual or team.	<p>WINNER: Frank Shi, Principal Research Fellow, SMI-JKMRC</p> <p>SPECIAL MENTION: Grant Ballantyne, Research Fellow, SMI-JKMRC</p>
Leadership	Recognises exemplary leadership which helps to create a positive fun culture and contributes to the achievements of SMI.	<p>WINNER: Jo-Anne Everingham, Senior Research Fellow, SMI-CSRSM</p> <p>SPECIAL MENTION: Melissa Glendenning, Deputy Director Operations</p>
Engagement	Recognises an individual who has displayed a significant effort to engage and influence members of the minerals industry, Government, education partners and/or external bodies to SMI.	<p>WINNER: Mohsen Yahyaei, Research Fellow, SMI-JKMRC</p> <p>SPECIAL MENTION: Will Rifkin, Principal Research Fellow, SMI-CSRSM</p>
Collaboration	Recognises someone who is committed to working with others and fostering a collaborative approach to their research with others, either within SMI, UQ or other Institutions.	<p>WINNER: Peter Erskine, Senior Research Fellow, SMI-CMLR</p> <p>SPECIAL MENTION: Jo-Anne Everingham, Senior Research Fellow, SMI-CSRSM</p>
Service and Support	Recognises someone who demonstrates a high level of commitment and excellence in their work within SMI. It is for someone who regularly goes above and beyond what is expected of them to provide assistance and those who promote a strong sense of community to make the SMI a more pleasurable and inclusive work environment.	<p>WINNER: Melissa Miller, Senior Management Accountant, SMI</p> <p>SPECIAL MENTION: Michelle Rowland, Admin Officer, SMI-CSRSM & SMI-MISCH</p>
Outstanding Student Contributor	Awarded to a student who is diligent and enthusiastic about their field of study. They engage well with their peers and encompass the culture of SMI.	<p>WINNER (SHARED): Gernelyn Logrosa Juan Jose Frausto Gonzales</p> <p>SPECIAL MENTION: German Figueroa Salguero</p>
Honorary Contributor	Recognises someone who has made a significant contribution and commitment to SMI over the year.	<p>WINNER: Charlie Sartain, SMI Advisory Board Chair</p> <p>SPECIAL MENTION: Christine Charles, Adjunct SMI-CSRSM</p>
Fun Awards	These awards embrace a fun culture within SMI.	<p>WINNERS: Anita Whybrow (SMI), Will Rifkin (SMI-CSRSM), Michelle Rowland (People Centres), Jenny Ebbott (SMI), Sarma Kanchibotla (SMI-JKMRC), Kylie Pettitt (SMI)</p>



SMI Staff

Institute Directors

Professor Chris Moran (until June 2016)

Professor David Mulligan (June 2016 – October 2016)

Professor Neville Plint (commenced October 2016)

SMI STAFF AND AFFILIATES

SMI Academic Staff

SMI Production Centres

SMI JKMRC

Julius Kruttschnitt Mineral
Research Centre

SMI BRC

WH Bryan Mining &
Geology Research Centre

Director of Production Centres

Professor Alice Clark, Director of Julius Kruttschnitt Mineral Research Centre (JKMRC) & WH Bryan Mining and Geology Research Centre (BRC)

Production Centres Program Leaders

Professor Gideon Chitombo - BRC

Professor Sarma Kanchibotla - JKMRC

Professor Malcolm Powell - JKMRC

Dr Kym Runge - JKMRC

Dr Rick Valenta - BRC

Dr Mohsen Yahyari - JKMRC

Production Centres Researchers

Dr Christian Antonio - *Senior Research Fellow* - JKMRC

Dr Grant Ballantyne - *Research Fellow* - JKMRC

Dr Benjamin Bonfils - *Research Fellow* - JKMRC

Ryan Bracey - *Research Officer* - JKMRC

John Donohue - *Senior Research Fellow* - BRC

Dr Cathy Evans - *Senior Research Fellow* - JKMRC

Jessica Gray - *Research Technician* - JKMRC

Mr Marko Hilden - *Senior Research Fellow* - JKMRC

Dr Mark Hinman - *Senior Research Fellow* - BRC

Dr Vladimir Jokovic - *Senior Research Fellow* - JKMRC

Mark Jones - *Senior Software Developer* - JKMRC

Dr Robert Morrison - *Chief Technologist* - JKMRC

Dr Travis Murphy - *Senior Research Fellow* - BRC

Dr Mark Pirlo - *Senior Research Fellow* - BRC

Dr Frank Shi - *Principal Research Fellow* - JKMRC

Kellie Teale - *Technical Officer* - JKMRC

Dr Francois Vos - *Research Fellow* - JKMRC

Dr Dion Weatherley - *Senior Research Fellow* - JKMRC

Dr Elaine Wightman - *Senior Research Fellow /
Postgraduate Coordinator* - JKMRC

Dr Deming Wang - *Principal Research Fellow* - JKMRC

Dr Nirmal Weerasingh - *Senior Research Fellow* - JKMRC

Dr Weiguo Xie - *Senior Research Fellow* - JKMRC

Professor Rodney Wolff - *Chair in Geostatistics* - BRC

SMI Environment Centres

SMI CMLR

Centre for Mined Land Rehabilitation

SMI CWiMI

Centre for Water in the Minerals Industry

Director of Environment Centres

Professor David Mulligan, Director of Centre for Mined Land Rehabilitation (CMLR) & Centre for Water in the Minerals Industry (CWIMI)

Environment Centres Program Leaders

Dr Glen Corder - CMLR
Associate Professor Peter Erskine - CMLR
Associate Professor Longbin Huang - CMLR
Professor Neil McIntyre - CWIMI

Environment Centres Researchers

Dr Thomas Baumgartl - *Principal Research Fellow* - CMLR
Ian Callow - *Research Manager* - CWIMI
Professor Frank Carrick - *Professorial Research Fellow* - CMLR
Dr Mansour Edraki - *Senior Research Fellow* - CMLR
Vanessa Glenn - *Research Officer* - CMLR
Dr Artem Golev - *Postdoctoral Research Fellow* - CMLR
Professor Emmanuel Manlapig - *Professorial Research Fellow* - CMLR
Phillip McKenna - *Research Officer* - CMLR
Vinod Nath - *Research Assistant* - CMLR
Dr Barry Noller - *Principal Research Fellow* - CMLR
Corinne Unger - *Senior Research Officer* - CMLR
Dr Antony Van Der Ent - *ARC Postdoctoral Research Fellow* - CMLR
Dr Sue Vink - *Principal Research Fellow* - CWIMI
Kasper Johansen - *Senior Research Fellow* - CMLR
Dr Talitha Santini - *Lecturer* - CMLR
Dr Alex Lechner - *Research Fellow* - CWIMI
Nena Bulovic - *Research Assistant* - CWIMI
Dr Sebla Kabas - *Postdoctoral Research Fellow* - CMLR
Dr Sven Arnold - *Research Fellow* - CWIMI
Dr Caitlin Johns - *Postdoctoral Research Fellow* - CMLR

SMI People Centres

SMI CSRSM

Centre for Social Responsibility in Mining

SMI MISHC

Minerals Industry Safety & Health Centre

Director of People Centres

Professor David Brereton (until July 2016)
Professor Deanna Kemp (commenced July 2016), Director of Centre for Social Responsibility in Mining (CSRSM) & Minerals Industry Safety and Health Centre (MISHC)

People Centres Program Leaders

Associate Professor Nick Bainton - CSRSM
Professor Robin Burgess-Limerick - MISHC
Dr Kathryn Sturman - CSRSM

Researchers

Professor Saleem Ali - *Professorial Research Fellow* - CSRSM
Carmel Bofinger - *Associate Professor* - MISHC
Pam Bourke - *Senior Lecturer* - CSRSM
Professor David Cliff - *Professor OH&S in Mining* - MISHC
Dr Jo-Anne Everingham - *Senior Research Fellow* - CSRSM
Dr Jill Harris - *Research Fellow* - MISHC
Lynda Lawson - *Training Manager* - CSRSM
Danellie Lynas - *Research Fellow* - MISHC
Dr Renzo Mori Junior - *Postdoctoral Research Fellow* - CSRSM
Dr John Owen - *Associate Professor* - CSRSM
Dr Paul Rogers - *Research Fellow* - CSRSM
Dr Vlado Vivoda - *Research Fellow* - CSRSM
Dr Katherine Witt - *Research Fellow* - CSRSM
Dr Philip Kirsch - *Associate Professor* - MISHC
Nina Collins - *Research Analyst* - CSRSM
Dr Will Rifkin - *Principal Research Fellow* - CSRSM
Dr Fitsum Weldegiorgis - *Research Officer* - CSRSM

- David Brereton - *Emeritus Professor* - SMI
 Don McKee - *Emeritus Professor* - SMI
 Tim Napier-Munn - *Emeritus Professor* - JKMRCC
 Professor Benjamin Adair - *Adjunct Professor* - SMI
 Dan Alexandern - *Adjunct Professor* - SMI
 Dr Chris Anderson - *Adjunct Professor* - SMI
 Dr Nick Bainton - *Honorary Senior Research Fellow* - CSRMM
 Hendry Baiquni - *Honorary Fellow* - CMLRR
 Alan Baker - *Honorary Professor* - CMLRR
 Philip Bangerter - *Industry Fellow* - CMLRR
 Professor Damian Barrett - *Adjunct Professor* - SMI
 Professor Dee Bradshaw - *Honorary Professor* - SMI
 Ron Brew - *Industry Fellow* - CSRMM
 Dr Marcos Bueno - *Honorary Fellow* - JKMRCC
 Dr Isabel Cane - *Honorary Fellow* - CSRMM
 Dr Louise Cartwright - *Adjunct Senior Fellow* - CMLRR
 Christine Charles - *Adjunct Professor* - CSRMM
 Glynn Cochrane - *Adjunct Professor* - CSRMM
 Alan Cocker - *Industry Fellow* - BRC
 Nina Collins - *Industry Fellow* - CSRMM
 Brett Cunningham - *Industry Fellow* - SMI
 Dr Byambajav Dalaibuyan - *Honorary Fellow* - CSRMM
 Anand Datar - *Honorary Fellow* - CMLRR
 Dr David Doley - *Honorary Associate Professor* - CMLRR
 Zulaa Dorjsuren - *Honorary Fellow* - CMLRR
 Dr Heather Douglas - *Industry Fellow* - CSRMM
 Dr Jason Dunlop - *Adjunct Fellow* - CWiMI
 Robert Dunne - *Adjunct Professor* - JKMRCC
 Courtney Fidler - *Honorary Fellow* - CSRMM
 Sharon Flynn - *Industry Fellow* - CSRMM
 Dr Chris Fountain - *Industry Fellow* - JKMRCC
 Dr Michele Fulcher - *Honorary Research Fellow* - CSRMM
 Professor Peter Fullagar - *Adjunct Professor* - BRC
 Dr Emma Gilberthorpe - *Honorary Senior Research Fellow* - CSRMM
 Dr Kirsty Gillespie - *Honorary Fellow* - CSRMM
 Dr Peter Glazebrook - *Adjunct Professor* - CMLRR
 Nora Gotzmann - *Adjunct Fellow* - CSRMM
 Dr Tim Grice - *Honorary Senior Fellow* - CSRMM
 Dr Ying Gu - *Honorary Associate Professor* - JKMRCC
 Alan Guest - *Adjunct Professor* - BRC
 Dr Hua Guo - *Adjunct Professor* - BRC
 Dr Tami Haase - *Adjunct Fellow* - CMLRR
 Marty - Haase - *Adjunct Professor* - SMI
 Bruce Harvey - *Adjunct Professor* - CSRMM
 Dr Roger Higgins - *Adjunct Professor* - SMI
 Dr Peter Holtham - *Honorary Associate Professor* - JKMRCC
 Dr Tim Horberry - *Honorary Associate Professor* - MISHC
 Dr Richard Jackson - *Industry Fellow* - CSRMM
 Dr Caitlin Johns - *Honorary Fellow* - CMLRR
 Professor Bill Johnson - *Adjunct Professor* - JKMRCC
 Professor Jim Joy - *Honorary Professor* - SMI
 Dr Geoffrey Just - *Honorary Associate Professor* - BRC
 Dr Sebla Kabas - *Honorary Fellow* - CMLRR
 Dr Luke Keeney - *Honorary Research Fellow* - JKMRCC
 Philip Kirsch - *Honorary Associate Professor* - MISHC
 Professor Erhan Kozan - *Honorary Professor* - BRC
 Ramanie Kunanayagam - *Industry Fellow* - CSRMM
 Dr Nadja Kunz - *Adjunct Fellow* - SMI
 Dr David Lamb - *Honorary Associate Professor* - CMLRR
 Professor Marcia Langton - *Honorary Professor* - CSRMM
 Dr Alex Lechner - *Adjunct Fellow* - CWiMI
 Dr Xiaofang Li - *Honorary Fellow* - CMLRR
 Ruth Link - *Industry Fellow* - CSRMM
 Dr Eugene Louwrens - *Honorary Fellow* - JKMRCC
 Dr Ping Lu - *Adjunct Senior Fellow* - CMLRR
 Martha Macintyre - *Honorary Professor* - CSRMM
 Dr Reinier Mann - *Adjunct Associate Professor* - CWiMI
 Dr Garry Marling - *Honorary Fellow* - MISHC
 Henriett Marrie - *Adjunct Associate Professor* - CSRMM
 Nic McCaffrey - *Honorary Fellow* - CMLRR
 John McGagh - *Adjunct Professor* - SMI
 Benjamin McLellan - *Honorary Senior Fellow* - CSRMM
 Robert Milbourne - *Industry Fellow* - CSRMM
 Janice Moriarty - *Industry Fellow* - CSRMM
 Professor David Parry - *Honorary Professor* - CMLRR
 Dr Catherine Pattenden - *Honorary Senior Fellow* - CSRMM
 Dr Usha Pillai-McGarry - *Honorary Senior Fellow* - CMLRR
 Dr Ruslan Puscasu - *Honorary Senior Fellow* - BRC
 Dr Andrew Richmond - *Adjunct Professor* - BRC
 Rauno Sairinen - *Honorary Professor* - CSRMM
 Ian Satchwell - *Adjunct Professor* - SMI
 Robert Schouwstra - *Adjunct Professor* - JKMRCC
 Dr Vigya Sharma - *Affiliate Research Fellow* - CSRMM
 Mr Glenn Sharrock - *Adjunct Associate Professor* - BRC
 Dr Donald Singer - *Honorary Professor* - BRC
 Dr David Tierney - *Honorary Fellow* - CMLRR
 Duncan Tyler - *Adjunct Associate Professor* - JKMRCC
 John Vann - *Adjunct Professor* - BRC
 Dr Tony Webster - *Honorary Senior Fellow* - BRC
 Dr Nirmal Weerasekara - *Adjunct Associate Professor* - JKMRCC
 Fitsum Weldegiorgis - *Industry Fellow* - CSRMM
 Dan Wood , AO - *Adjunct Professor* - BRC
 Dr Weiguo Xie - *Honorary Senior Fellow* - JKMRCC
 Dr David Yates - *Honorary Associate Professor* - CMLRR
 Baris Yildirim - *Honorary Fellow* - JKMRCC

Operations

Deputy Director (Operations)

Melissa Glendenning

Strategy and Project Coordinator

Amelia Stuckey (until March 2016)
Karen Hendrickson (from March 2016)

Executive Assistant to the Institute Director

Anita Whybrow

Executive Assistant / Admin Officer

Khushbu Srivastava
Tamara Dare

Administration Officer

Elisabeth Hansen (until August 2016)
Michelle Rowland

Institute Travel Coordinator

Laurelle Elliott

Receptionist

Jenny Ebbott

Transformational Learning

Program Manager

Robin Evans

Knowledge Transfer Coordinator

Kylie Pettitt

HDR Student Administration

Manager, Postgraduate Student Admin

Jacqueline Ross-Hagebaum

Administrative Officer

Tess Dobinson

Human Resources

Human Resource Consultant

Cathy Baynham

Human Resources Advisor

Lizanne Holt
Serena Leeke

Information Technology

Senior IT Support Officer

Al Sweeney (until June 2016)

IT Support Officer

Mali Moazen (until June 2016)
Ton Nguyen (until June 2016)

OHS & Facilities

Workplace Health, Safety & Facilities Manager

Ryan Anderson

Facilities Coordinator

Sherrin Brundle

Lab Facilities Manager

David Garcia Tabares

Senior Technical Officer

Michael Kilmartin

Finance

Finance Manager

Taryn Donnelly (until June 2016)

Senior Management Accountant

Melissa Miller

Management Accountant

Nathan Weir

Gail Kenny (until August 2016)
Sifelani Mafico (until July 2016)

Finance Officer

Anton Chandrasekara
Charlie Shao

Finance Assistant

Michelle Ranson

Legal

Head of Legal

Elise Neilson (Maternity leave from June 2016)

Senior Research Council

Jocelyn Aboud

Legal Support Officer

Sherrie Palmer (until August 2016)
Elisabeth Hansen (from August 2016)

Portfolio Support Office

Research Partnerships Manager

Lisa Kennedy

Business Manager

Christian Antonio
Dr Bronwyn Battersby
Irene Dullaway
Elizabeth Alcantarino

Portfolio Officer

Emma Quinlan (until May 2016)

Portfolio Support Officer

Jordan O'Sullivan

Professor Neville Plint

- University Senior Management Group (USMG), **Committee Member**
- UQ Academic Board, **Committee Member**
- SMI Advisory Board, **Committee Member**
- JKTech Board, **Committee Member**
- UQ School of Chemistry & Molecular Biosciences Industry Advisory Board, **Committee Member**
- UQ SAGE Self-Assessment Team (SAGE Athena SWAN pilot program (Science in Australia Gender Equity program)), **Committee Member**
- SMI Production Centres Advisory Board, **Committee Member**

Melissa Glendenning

- SMI Intellectual Property Committee (SMI), **Chair**
- Enhancing Systems and Services Human Resources Design Team (UQ), **Institute Representative**
- SMI Workplace Health and Safety Committee, **Chair**

Professor Deanna Kemp

- Expert Panel for the International Council of Mining and Metals New Member Review Process, **Member**
- Advisory Board, Institute of Human Rights and Business (IHRB), **Member**
- Journal of Impact Assessment and Project Appraisal, **Editorial Board Member**
- Journal of Corporate Social Responsibility and Environmental Management, **Editorial Board Member**
- Journal of Development Studies Research, **Editorial Board Member**
- Journal of Extractive Industries and Society, **Editorial Board Member**
- Impact Assessment and Project Appraisal, **Editorial Board Member**
- Yanacocha Independent Fact Finding Mission in Peru, convened by RESOLVE, **Member**
- Expert Review Panel, Mining and Free Prior and Informed Consent in Suriname, convened by RESOLVE, **Member**
- Organising Committee, International Association for Impact Assessment (IAIA), Special Symposium on Resettlement and Livelihoods, Manila, Philippines, **Member**

Professor David Mulligan

- Alligator Rivers Region Technical Committee, **Independent Member**
- Bathurst Resources Escarpment Mine, New Zealand, Peer Review Panel, **Independent Member**
- International Affiliation of Land Reclamationists, **Australian Representative**
- Life-of-Mine (LOM 2016) 3rd International Conference, Brisbane, Australia, **Chair**
- Planning for Closure of Mining Operations (P4C 2016) 1st International Congress, Santiago, Chile, **Co-chair**
- Greening Australia, **Advisory Councillor**
- Editorial Advisory Board for Elsevier's (Academic Press) 2nd Edition of the Encyclopedia of Applied Plant Sciences, **Member**
- American Society for Mining and Reclamation, **Life Member**
- Australasian Institute of Mining and Metallurgy, **Fellow**
- Australian Soil Science Society Inc., **Member**
- Canadian Land Reclamation Association, **Member**
- Ecological Society of Australia, **Member**
- International Mine Water Association, **Member**
- Society for Ecological Restoration, **Member**

Professor Alice Clark

- New South Wales State Government Gateway Panel, **Member**
- Earth Sciences Transactions Journal, **Editorial Board Member**

Dr Grant Ballantyne

- International Mineral Processing Congress Emerging Leaders Working Group – **Committee Member**
- International Mineral Processing Congress Education Commission Sub-Committee – **Committee Member**

Dr Thomas Baumgartl

- European Journal of Soil Science, **Associate Editor**
- Environmental Geochemistry and Health, **Associate Editor**
- Applied Clay Science, **Editorial Board Member**
- International Soil and Water Conservation Research, **Editorial Board Member**
- Soil and Tillage Research, Editorial Advisory Board Soil Processes, **Editorial Board Member**
- EGU2016: Restoration and rehabilitation of degraded lands in arid, semi-arid and Mediterranean environments short course, **Session Convenor**
- EGU2016: Restoration of degraded lands: optimising methods for monitoring and assessment, **Session Convenor**

Professor Robin Burgess-Limerick

- UQ Research Committee, **Member**
- Applied Ergonomics, **Editorial Board Committee Member**
- Ergonomics Open Journal, **Editorial Advisory Board Member**
- International Ergonomics Association, **Mining Technical Committee Chair**
- Human Factors and Ergonomics Society of Australia, 2016 Annual Conference, **Scientific Convenor**
- SafeMining 2016 Seminar, Santiago, **International Co-Chair**

Dr Glen Corder

- IChemE in Australia Board, **Technical Policy Director**
- IChemE Mining and Minerals Special Interest Group, **Committee Member**
- IChemE Professional Review Interview panel, **Member**
- AusIMM Community and Environment Society – JORC / VALMIN Review for Community and Environment Aspects Working Group, **Member**
- "Minerals in Mine Wastes: Contributions to the Circular Economy" Special Issue in 'Minerals', Mine Wastes, **Guest Editor**
- Open access journal 'Recycling', **Editorial Board Member**
- Life-of-Mine 2016 Conference, **Organising Committee Member**

Professor David Cliff

- Level One organising Committee Queensland Underground Coal Mine Emergency Evacuation Simulation, **Member**
- UQ OHS degree advisory board, **Member**
- OHSS2001 Occupational Health and Safety Management Systems, **Guest Lecturer**
- Level one organising committee Queensland underground metal mine Emergency Evacuation Simulation, **Member**
- OHS Accreditation Board, **Academic Representative**
- Organising committee for International Fibre Optic and Photonics Conference 2017, **Member**
- Organising committee for Minesafe 2017, **Member**
- AusIMM OHS Society, **Committee Member**
- Safety in Mines Testing and Research Station Advisory Board, **External Board Member**
- Technical Steering Committee for the Coal Mining Abatement Technology Support Program, **Alternate Member**
- Advisory Group for Coal Workers Health Scheme, **Independent Chair**
- *Minerals*, **Guest Journal Editor**
- 2016 - Australia India Education Council Eminent Researcher Lecture Program, **Eminent Lecturer**
- MINE 7650, **Guest Lecturer**
- MINE 2105, **Guest Lecturer**
- Journal of Sustainable Mining, **Reviewer**
- Journal of Risk Analysis, **Reviewer**
- International Journal of Risk Assessment and Management, **Reviewer**
- Fire Safety Journal, **Reviewer**
- International Journal of Coal Geology, **Reviewer**
- Applied Mathematical Modelling, **Reviewer**
- Safety Science, **Reviewer**
- Combustion Science and Technology, **Reviewer**
- Journal of Environmental Monitoring and Assessment, **Reviewer**
- School of Mechanical and Mining Engineering Teaching and Learning Committee, **Member**

Professor Gideon Chitombo

- Innovative Technologies and Concepts for the Intelligent Deep Mine of the Future, **Advisory Board Member**
- Networks of Centres of Excellence on Ultra Deep Mining Network, **Expert Panel Member**

Dr Mansour Edraki

- Chemie Der Erde, Geochemistry, (Journal), **Associate Editor**
- Australian Acid and Metalliferous Drainage Workshops, **Organising Committee Chair**
- International Network for Acid Prevention (INAP), **UQ Representative**
- Technical committee of Enviormine, International Seminar on Environmental Issues in Mining, **Committee Member**

Dr Jo-Anne Everingham

- Rural Society Journal, **Reviewer**
- Rural Studies Journal, **Reviewer**
- Resources Policy Journal, **Reviewer**
- Rural and Community Development Journal, **Reviewer**
- The Australian Sociology Association, **Member**
- Australian Evaluation Society, **Member**
- International Association of Impact Assessment, **Member**
- International Rural Sociology Association, **Member**

Dr Jill Harris

- QLD Department of Natural Resources and Mines, Eliza Gill, Statistics for Measurement of Dust Exposure Assessment (Oct 2016 to present), **Committee Member**
- SMI Student Ethics Committee, **Member**
- Resources journal, **Reviewer**
- CSR Masterclass: Community Research Methods for the Resources Sector, August 2016; Teach two statistics/methodology classes, **Guest Lecturer**

Associate Professor Longbin Huang

- Frontiers in Plant Science, section Plant Nutrition, **Section Editor**
- Environmental Geochemistry and Health, **Coordinating Editor**
- Academic Committee, Key Laboratory of Land Consolidation and Rehabilitation, Ministry of Land and Resources of China, **Member**
- Asia Pacific Biochar Conference 2016, Gangwon Province, Korea, **Co-Chair**
- EAIT/SMI/AIBN Local Confirmation & Promotion Committee (LCPC), **SMI Representative**
- SMI Postgraduate committee, **Member**

Danellie Lynas

- Human Factors and Ergonomics Society of Australia (HFESA), **Member**
- HFESA, **Mentoring Co-ordinator**
- HFESA (Qld) Professional Development, **Committee Member**
- Certified Practicing Ergonomist (CPE) with HFESA
- Australian Institute of Management, **Member**
- Australian Physiotherapy Association, **Member**
- Registered Physiotherapist with AHAPRA
- SMI, **Floor Fire Warden & First Aid Officer**

Professor Neil McIntyre

- International Scientific Council of the Centre for Water Resources in Mining and Agriculture, University of Concepcion, **Member**
- Water in Mining conference, Santiago, (May 2016), **Co-Chair and Proceedings Co-Editor**
- Leading Practice Sustainable Development Program, Steering Committee, Department of Industry, **Member**

Dr Barry Noller

- National Association of Testing Authorities, (Environmental Testing) of the Chemical Accreditation Advisory Committee, **Technical Expert**

Dr John Owen

- Corporate Social Responsibility and Environmental Management, **Editorial Board Member**
- American Journal of Industrial Management, **Editorial Board Member**
- Porgera Joint Venture Pilot Resettlement Independent Observer Panel, **Expert Panel Member**
- Department of Foreign Affairs and Trade, Pacific Women in Mining, **Industry Advisor**

Professor Malcolm Powell

- Australasian Institute of Mining and Metallurgy, **Fellow**
- South African Institute of Mining and Metallurgy, **Fellow**
- International Journal of Mineral Processing, **Editorial Board Member**
- Minerals Engineering International, **Reviewer**
- Powder Technology, **Reviewer**
- Advanced Powder Technology, **Reviewer**
- Chemical Engineering Science, **Reviewer**
- Advances in Mechanical Engineering, **Reviewer**
- South African National Research Foundation and Canadian NSERC, **Reviewer**

Associate Professor Will Rifkin

- Commonwealth Office of Learning and Teaching, **National Assessor for Teaching Awards**
- Science and Mathematics Network of Australian University Educators, **Steering Committee Member**
- University of Sydney, School of Physics, **Honorary Associate Professor**
- Rural Sociology Journal, **Editorial Board Member**

Dr Sue Vink

- Fitzroy Basin Association Partnership for River Health Science Panel, **Member**

Corrine Unger

- AusIMM Community and Environment Society, **Immediate Past Chair**
- AusIMM Board of Chartered Professionals, **Board Member**
- AusIMM/CMLR Life of Mine 2016 Conference Organising, **Committee Member**
- AusIMM/CMLR Life of Mine 2016 Conference, **Extended Abstract Reviewer**
- AusIMM Spectrum Series Publication Committee, **Member**

Dr Tony Webster

- Geological Society of Australia - Queensland Division, **Chair**
- Australian Journal of Earth Sciences, **Associate Editor**
- Committee of the Geoscience Society of the AusIMM, **Member**
- AusIMM Heritage Committee, **Correspondent**
- UQ activities for the World Science Festival (March 2016), **SMI representative**
- AusIMM, **Fellow, Chartered Professional**
- Geological Society of London, **Fellow**
- Society of Economic Geologists, **Fellow**
- Geological Society of Australia, **Member**
- Australian Institute of Geoscientists, **Corporate Member**
- Australasian Society for Historical Archaeology, **Member**

Dr Elaine Wightman

- UQ Research Higher Degree Committee, **Member**
- UQ International Scholarship Selection Committee (AIBN, EAIT & SMI), **Member**
- Minerals Engineering, **Reviewer**
- GEOMET 2016, **Technical Review Committee**
- SMI Research Committee, **Member**
- Candidate Advisory Committee, **Member**
- SMI RHD Committee, **Chair**
- Process Mineralogy, monograph, **Editor**

SMI Advisory Board Members

Name	Title and Organisation
Mr Charlie Sartain	Chair SMI Advisory Board, Member of UQ Senate
Prof. Neville Plint	Director, Sustainable Minerals Institute
Mr James Purtill	Director-General, Department of Natural Resources and Mines
Prof. Robyn Ward	Deputy Vice-Chancellor (Research), The University of Queensland
Dr David Way	CEO, JK Tech
Mr Michael Wright	Managing Director, Thiess Pty Ltd
No representative	Rio Tinto
Mr Frans Knox	Head of Production, BMA
Mr Troy Hey	Executive General Manager – Stakeholder Relations, MMG Limited
Mr Blair Sands	Head of Health and Environment, Newcrest Mining Limited
Mr Kenneth Ramsey	Regional Group Executive, Environment and Social Responsibility, Newmont Asia Pacific
Mr Donovan Waller	Group Head of Technology Development, Anglo American plc
Mr Paul Dowd	Independent Member
Dr Roger Higgins	Independent Member
Adjunct Prof. Christine Charles	Adjunct Professor, SMI-Centre for Social Responsibility in Mining
Mr Peter Roe	Chairman, SMI-Centre for Mined Land Rehabilitation Advisory Board
Mr Peter Forrestal	Chair, SMI-Production Centres Board

SMI- Centre for Social Responsibility in Mining and SMI-Minerals Industry Safety and Health Centre

Name	Title and Organisation
Adjunct Prof. Christine Charles	People Centres Joint CSR/MISHC Advisory Board Chair
Prof. Deanna Kemp	Director, People Centres, Sustainable Minerals Institute, UQ
Prof. Neville Plint	Director, Sustainable Minerals Institute, UQ
Mr Ramanie Kunanaygam	Industry Fellow, Group Head of Social Performance and Human Rights, BG Group
Ms Sharon Flynn	Visiting Industry Fellow
Adjunct Prof. Chris Anderson	Principal, Yirri LLC

SMI-Julius Kruttschnitt Mineral Research Centre (JKMRC) and SMI-W.H. Bryan Mining and Geology Research Centre

Name	Title and Organisation
Mr Peter Forrestal	Production Centres Joint BRC/JKMRC Advisory Board Chair
Prof. Alice Clark	Director Production Centres, Sustainable Minerals Institute, UQ
Prof. Neville Plint	Director, Sustainable Minerals Institute, UQ
Mr Ian Sheppard	Chief Operating Officer, Aeris Resources
Mr Colin Moorhead	Chief Executive Officer, Merdeka Gold
Mr Myles Johnston	Chief Operating Officer, Lighthouse Minerals
Ms Natascha Viljoen	Group Head – Processing, Anglo American
Dr Barun Gorain	Senior Manager - Mineral Processing, Strategic Technology Solutions, Barrick Gold Corporation

SMI-Centre for Mined Land Rehabilitation (CMLR)

Name	Title and Organisation
Mr Peter Roe	CMLR Advisory Board Chair
Prof. David Mulligan	Director, Environment Centres, Sustainable Minerals Institute, UQ
Prof. Neville Plint	Director, Sustainable Minerals Institute, UQ
Mr Ross Browning	Group General Manager - Sustainable Development and ReGen, Downer EDI Mining
Ms Mary-Anne Crawford	Manager Planning and Environmental Services, Singleton Council
Ms Suzanne Davis-Hall	(Formerly Klohn Crippen Berger)
Dr Peter Eaglen	General Manager – Group Internal Audit, Rio Tinto
Mr Mike Slight	Director, Mike Slight & Associates
Mr Peter Smith	Director, Environment Action Pty Ltd
Mr Paul Smith	Director, Pandanus Solutions
Mr Pieter Swart	Queensland Environment and Community Manager, Coal Assets Australia, Glencore

SMI-Centre for Water in the Minerals Industry (CWIMI)

Name	Title and Organisation
Ms Kristina Ringwood	CWiMI Advisory Board Chair
Prof. David Mulligan	Director, Environment Centres, Sustainable Minerals Institute, UQ
Prof. Neville Plint	Director, Sustainable Minerals Institute, UQ
Mr Chris McCombe	Assistant Director, Environmental Policy, Minerals Council of Australia
Prof. Jurg Keller	Director, Advanced Water Management Centre, UQ
Ms Erika Korosi	Senior Manager Environment, BHP Billiton
Dr Claire Cote	Environmental Specialist, Anglo American Met Coal AU
Mr Scott Diggles	Principal Advisor – Water, Rio Tinto Coal Australia
Mr Darren Moor	Executive Director of Central Region, Department of Natural Resources and Mines



Book Chapters

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Journal Articles

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Li, H., He, Y., Shi, F., Zuo, W., Zhou, N., Wei, H. et al. (2016) Performance of the static air classifier in a Verticle Spindle Mill. *Fuel*, 177: 8-14.

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McLellan, B., Yamasue, E., Tezuka, T., Corder, G., Golev, A. & Giurco, D. (2016) Critical minerals and energy—impacts and limitations of moving to unconventional resources. *Resources*, 5(2).

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SMI JKMRC

Julius Kruttschnitt Mineral Research Centre

Book Chapters

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Wightman, E., Evans, C., Becker, M. & Gu, Y. (2016) Automated scanning electron microscopy with energy dispersive spectrometry. In Megan Becker, Elaine Wightman, Cathy Evans (Eds.), *Process mineralogy* (pp. 97-107). Brisbane, Australia: Julius Kruttschnitt Mineral Research Centre.

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Conference Papers

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- Carrasco, C., Keeney, L., Napier-Munn, T. & Francois-Bongarcon, D. (2016) Managing uncertainty in a Grade Engineering® industrial pilot trial. *Minerals Engineering*, 99: 1-7.
- Carrasco, C., Keeney, L., Scott, M. & Napier-Munn, T. (2016) Value driven methodology to assess risk and operating robustness for grade engineering strategies by means of stochastic optimisation. *Minerals Engineering*, 99: 76-88.
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- Li, C., Runge, K. Shi, F. & Farrokhpay, S. (2016) Effect of flotation froth properties on froth rheology. *Powder Technology*, 294: 55-65.
- Liu, L. & Powell, M. (2016) New approach on confined particle bed breakage as applied to multicomponent ore. *Minerals Engineering*, 85: 80-91.
- Meng, J., Xie, W., Tabosa, E., Runge, K. & Bradshaw, D. (2016) Turbulence model development for flotation cells based on piezoelectric sensor measurements. *International Journal of Mineral Processing*, 156: 116-126.
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- Shi, F. (2016) A review of the applications of the JK size-dependent breakage model Part 2: assessment of material strength and energy requirement in size reduction. *International Journal of Mineral Processing*, 157: 36-45.
- Shi, F. (2016) A review of the applications of the JK size-dependent breakage model Part 3: comminution equipment modelling. *International Journal of Mineral Processing*, 157: 60-72.
- Shi, F. (2016) Determination of ferrosilicon medium rheology and stability. *Minerals Engineering*, 98: 60-70.
- Shi, F. & Xie, W. (2016) A specific energy-based ball mill model: from batch grinding to continuous operation. *Minerals Engineering*, 86: 66-74.
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Creative Work

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Conference Papers

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SMI CMLR

Centre for Mined Land Rehabilitation

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SMI CWiMI

Centre for Water in the Minerals Industry

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SMI CSR M

Centre for Social Responsibility in Mining

Book Chapter

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In May of 2016, the Centre for Social Responsibility in Mining (SMI-CSR) hosted the launch of Rio Tinto's "Why agreements matter" guide.

This is the fourth guide Rio Tinto has developed in partnership with the Centre for Social Responsibility in Mining. Other guides include "Why gender matters", "Why cultural heritage matters" and "Why human rights matter".

Professor Marcia Langton partnered with SMI-CSR as a senior consulting author and collaborator to assist in the development of the the publication.

Joanne Farrell, Global Head of Rio Tinto's Health, Safety, Environment and Communities section together with Bruce Harvey (SMI-CSR) and Professor David Brereton (SMI), offically launched the guide at Brisbane's Customs House.

Other notable guests in attendance included Rio Tinto's Janina Gawler, Global Practice Leader, Communities & Social Performance and UQ's Pro-Vice-Chancellor Professor Cindy Shannon.



PICTURED: (Left to right): Joanne Farrell of Rio Tinto, Adjunct Professor Bruce Harvey (SMI-CSR) and Professor David Brereton (SMI).

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Kemp, D., Worden, S. & Owen, J. (2016) Differentiated social risk: rebound dynamics and sustainability performance in mining. *Resources Policy*, 50: 19-26.

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Guidebook

Everingham, J., Kemp, D., Ali, S., Cornish, G., Brereton, D., Parmenter, J. and Harvey, B. (2016) Why agreements matter.

SMI MISHC

Minerals Industry Safety & Health Centre

Book Chapter

Burgess-Limerick, R. (2016) Workplace vibration effects on health and productivity. In Alan Hedge (Eds.), *Ergonomic workplace design for health, wellness, and productivity* (pp. 103-114). Boca Raton, FL, United States: CRC Press.

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Cliff, D. (2016). OHS in the Mining Industry in the 21st Century. In Naj Aziz, Bob Kininmonth, Jan Nemcik, Ali Mirza, Ismet Canbulat, John Hoelle (Eds.), *COAL 2016, Coal Operators Conference*. COAL 2016, Coal Operators Conference, Wollongong, (418-424). 10-12 February 2016.

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Logrosa, G., Hassall, M., Cliff, D. & Bofinger, C. (2016). Identifying risks that matter: a case study on introducing technology into Artisanal and Small-Scale Mining (ASM). In *Risk and Resilience Mining Solutions*. Risk and Resilience Mining Solutions, Vancouver, Canada. 14-16 November 2016.

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Journal Articles

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Liu, Q., Meng, X., Hassall, M. & Li, X. (2016) Accident-causing mechanism in coal mines based on hazards and polarised management. *Safety Science*, 85: 276-281.

Smith, N., Ali, S., Bofinger, C. & Collins, N. (2016) Human health and safety in artisanal and small scale mining: an integrated approach to risk mitigation. *Journal of Cleaner Production*, 129(129): 43-52.

“Corporate Peacemaking, Mining and Alternative Energy Supply Chains”

Presented by: Dr Natalie Ralph - Thursday 3rd November 2016

In recent years, interest has turned to how mining corporations can reduce their negative impacts on conflict-affected and high-risk areas, and more recently, how they can contribute proactively to building peace. Yet little is understood of Corporate Peacemaking (CPM). CPM is the political/diplomatic role of companies when they assist peace talks/multi-stakeholder dialogues at the local or national levels, helping to bring together conflict parties such as communities, government and/or armed groups, for talks. The book, *Peacemaking and the Extractive Industries*, therefore takes an interdisciplinary approach to explore and develop theory, frameworks, tools and best-practice in CPM.

‘Between a rock and a hard place? A description and analysis of the NW Province mining boom, Zambia, 2002-2015’.

Presented by: Margaret O’Callaghan – Friday 5th August 2016

Taking a multi-sectoral approach, Margaret O’Callaghan provided a description of the major events which occurred during the first decade and then focussed on the issues arising and the lessons learnt. The main focus was on the impact on local people and the role that the government played (or did not play) and that of the major mining companies (First Quantum (Kansashi and Kalumbila mines) and Barrick Gold (Lumwana mine).

“Innovation Connections” Presented by: David Martin – Friday 9th September 2016

Innovation Connections is a facilitation first service delivered by a national network of Innovation Facilitators to encourage and assist Universities to engage with small and medium businesses who seek to access knowledge, engage with researchers and foster innovation.

SMI 2016 SEMINARS

A win-win strategy for fossil-fuel producers and environmentalists”

Presented by Dr Graeme Taylor (Adjunct Research Fellow at Griffith University’s Environmental Futures Research Institute) – Thursday 28th July 2016

Humanity now faces a dangerous dilemma: on one hand leading scientists predict that if we continue to burn coal, gas and oil the environmental consequences are likely to be catastrophic; on the other hand many economists argue that if we stop using fossil fuels our industrial civilisation will run out of energy and collapse. This dilemma underlies the failure of international negotiations to agree to sharp reductions in greenhouse gas emissions. While most decision-makers accept that climate change poses growing threats, they are unwilling to enact policies likely to cripple their businesses and national economies.

“Estimation of dissipation of nickel and chromium in steel scrap recycling using IO-based dynamic material flow analysis”.

Presented by: Kentaro Takeyama (Visiting Scholar) Department of Metallurgy, Graduate School of Engineering Tohoku University Thursday 18th August 2016

Strategic metals including nickel (Ni) and chromium (Cr) are mainly used for production of alloy steels. Stable supply of alloy elements is essential for sustainable steel production, and strategic management of alloy elements is important not only for the steel industry but every manufacturing industry that uses steel materials. To ensure the continued availability of Ni and Cr, recycling of steel scrap has a very important role. However, current steel scrap recycling system regards steel scrap mainly as source of iron with almost no consideration of alloy elements beyond tramp elements (copper, and tin). As a result, this recycling system could cause losses of Ni and Cr. To avoid this, a more sustainable and responsible system for recycling alloy elements in steel scrap must be adopted. Material flow analysis (MFAs) are useful tools for elucidating the material cycle and providing insight into the structural problems of a recycling system. Dynamic MFA quantify the dynamic flow and stock of materials over time. In this study, dynamic material flow of alloy elements associated with steel material was measured using the IO-based dynamic MFA model. The aim of the study was to evaluate the dissipation of Ni and Cr in Japan and assess the potential to reduce it.

"Defining and Understanding Indigenous - State Partnerships"

Presented by: Dr Alan Tidwell
(Director of the Centre for Australian, New Zealand and Pacific Studies at the Edmund A. Walsh School of Foreign Service at Georgetown University) -
Tuesday 5th July 2016

Both the United Nations and World Bank promote indigenous – state partnerships as vital elements in poverty alleviation. Yet, neither institution defines partnership. This leaves indigenous peoples, the state, not to mention bureaucrats at both the UN and World Bank scrambling to give meaning to partnership. Not only are people being asked to create something ill defined, but once formed how will these ad hoc partnerships be evaluated and judged? This discussion explored the nature and character of indigenous – state partnership in the mining and mineral sector.

SMI & The School of Social Sciences presents

"Fieldwork in Mining and Virtual Reality: Ethics, Politics and the Unexpected Dimension of Two Very Different Field Sites"

Presented by: Dr. Alex Golub
(Associate Professor of Anthropology, University of Hawai'i at Mānoa) - **Friday 22nd July 2016**

Dr. Golub discussed the ethics and politics of conducting fieldwork in two very different locations: The Porgera gold mine in Enga Province, Papua New Guinea, and the massively multiplayer video game World of Warcraft.

"Visualisation of supply chain risk from the resource logistics perspective".

Presented by: Dr Kazuyo Matsubae
(Associate Professor in the Graduate School of Engineering, Tohoku University, Japan) -
Thursday 23rd June 2016

Dr Kazuyo Matsubae demonstrated the risk weighted flow analysis by combining the resource logistics database and Global Link Input Output model. The discussion shed light on how resource logistics prepares policy makers and R&D engineers to confront the risks behind resource usage and how the information should be shared among the stakeholders.

"Governance of Eco-labels: Expert Opinion and Media Coverage"

Presented by: Dr Pavel Castka
(Assoc. Prof. in Operations Management College of Business & Law, University of Canterbury) -
Monday 18th April 2016

The seminar presented findings from a published paper. In this paper authors contribute to eco-labels being perceived as better governed, in the eyes of experts as well as the media. Unlike previous studies, which are mostly conceptual, qualitative, or focused on one or few eco-labels, then studied a large set of eco-labels, combining data from three different sources. The findings suggest that experts and media are primarily concerned about "reassurance" practices, looking for one or preferably multiple layers of "re-assurance" that independent parties are overseeing the eco-label and the firms certified under it.

"Challenging assumptions about mining's contribution to the United Nations sustainable development goals."

Presented by: Ms Beris Gwynne,
Incitäre Geneva, Switzerland -
Thursday 28th July

Beris Gwynne spoke about charting recent developments in the industry – from image laundering and philanthropy, from Corporate Social Responsibility to 'responsibility' full-stop. Challenging assumptions about the current contribution to sustainable development goals and suggesting some pathways towards successfully-managed transitions were also discussed.

"Chinese Mining in Africa & its Global Controversy"

Presented by: Professor Barry Sautman (Hong Kong University of Science and Technology) -
Wednesday 30th March 2016

Based on documentary research, field visits to a dozen African countries, and fieldwork in Zambia's Copperbelt from 2007-2015, the background to Chinese investment in the world and in Africa, especially in mining, were introduced, followed by a critical analysis of the centerpiece of the discourse of Chinese mining in Africa, the 2011 report on Chinese copper mining in Zambia, by prominent US-based NGO Human Rights Watch (HRW). That study received huge international media coverage and continues to be cited as a reliable source for appraising how "the Chinese" invest. Our analysis shows that almost every aspect of the HRW study is empirically inaccurate and conceptually flawed. Reasons for this result will be adduced and placed in the context of the highly-politicized and racialized discourse of "China in Africa."

JKMRC Friday morning seminars showcase the latest developments in sustainable mining

The Julius Kruttschnitt Mineral Research Centre (SMI-JKMRC) Friday Seminars are an institution to SMI-JKMRC staff, students, friends and alumni. Every Friday before 9am during the University semester the car park fills and visitor badges are donned as friends past and present make their weekly pilgrimage to the SMI-JKMRC lecture theatre at the Indooroopilly Experimental Mine Site. The Friday seminars have a long, proud history of approximately 1,500 seminars, starting in 1971 on the lawn by the Uni Mine head frame as the seminar room was being built. Bill Whiten was acting director at that time, while Director Prof Alban Lynch was on a year's sabbatical leave.

Initially the seminars were primarily given by SMI-JKMRC research students reporting on their work. Prof Lynch recalls fondly that the early seminars were lively and there was much animated discussion, and not much has changed in this regard. One of the fiercest inquisitors was the late Ian Morley, former Queensland Government Mining Engineer who endowed the annual Ian Morley Prize for students at the SMI-JKMRC. However, what has changed in more recent times is the number of external people attending and presenting which has benefited the depth of discussion afterwards. The seminars give the students an opportunity to hear leading practitioners talk about their work, and provide an incentive for some lateral thinking on the issues of the day.

With the JKMRC being part of the Sustainable Minerals Institute, the mineral processing topics are interspersed with geology, mining and some more wide reaching presentations.

The list of presenters and the titles of their presentations is included below:

DATE:	PRESENTER:	SEMINAR TITLE:
11-Mar-16	Dr Frank Shi, SMI-JKMRC	Ore pre-concentration by high voltage pulse selective breakage and size based separation
18-Mar-16	Kate Tungpalan, SMI-JKMRC	Investigating textural drivers for liberation in a complex ore
08-Apr-16	Ewan Sellers, JKTech	Blasting for improved productivity
15-Apr-16	Dr Weiguo Xie, SMI-JKMRC	Quantifications of Turbulence: From Single Phase to Multiphase Flows
22-Apr-16	Dr Tony Webster, SMI-BRC	Challenges of Accurately Characterizing the Ore and Host Rocks of Deep Mineral Discoveries
29-Apr-16	Dr Grant Ballantyne, SMI-JKMRC	Energy Efficiency of HPGRs: Trudging through the murky waters of Bond Work index, Microcracking, Conveying power and Ore hardness
06-May-16	Dr Thu Nguyen and Vas Matei, JKTech	Cannington Open Pit Pre-feasibility Study
13-May-16	Riza Mariano, SMI-JKMRC	Mineral liberation in Comminution
20-May-16	Dr Andrew Chryss, CSIRO	Mineral Resources Tailings deposition and the science of small channels
27-May-16	Farhad Faramarzi, SMI-JKMRC	Towards Modification of the Gamma-Based Blast Fragmentation Model
03-June-16	Professor Jean-Paul Franzidis, University of Cape Town	Remembrance of things past—and a pique into the future

DATE:	PRESENTER:	SEMINAR TITLE:
29-July-16	Prof. Peter Knights, School of Mechanical and Mining Engineering	Why don't more mines use In-Pit Crushing and Conveying Systems?
05-Aug-16	Greg Lane, Ausenco	Engineering and design implications in comminution circuit selection
12-Aug-16	Bill Whiten, SMI-JKMRC	Aristarchus Mathematician and Astronomer
19-Aug-16	Luke Keeney, CRC ORE	Grade Engineering at Los Bronces: An example of CRC ORE's Innovation Pathway
26-Aug-16	Steve Morrell, SMC Testing	Evaluation of the Energy Efficiency of Comminution Circuits
02-Sept-16	Kym Runge, SMI-JKMRC	Integrated grinding and flotation simulation
09-Sept-16	Ben Bonfils, SMI-JKMRC	Meaningful measurement of rock impact strength: Linking rock composition, alteration, and damage to processability
16-Sept-16	Juanjo, German, Yogesh and Erica, SMI-JKMRC	Results from student surveys of Saucito, Fresnillo and Medero
23-Sept-16	Joe Pease, Mineralis	Crossing the Innovation Valley of Death
30-Sept-16	John Jackson, JKTech	What is an oretype?
07-Oct-16	Travis Murphy, SMI-BRC	Beyond (and Before) Rock Mass Characterisation – The Impact of Geology on Block Cave Mining
14-Oct-16	Mal Lees, Bougainville	Bougainville Crushing Plant Performance Improvement -- The "Why? and How"
21-Oct-16	Prof. T.C. Rao	"The father of Indian mineral processing" (introduction by Prof. Lynch) Mineral (Processing) Industries: A Holistic View - T.C. Rao's Perceptions
28-Oct-16	Prof. Malcolm Powell, SMI-JKMRC	Integrated Process Prediction

A summary of the activities of CRC ORE was presented by **Dr Luke Keeney**, concentrating on the results that were obtained from the recent site study at Los Bronces, Chile. His team found that they achieved great results by embedding researchers and site personnel into project teams where 80% of their job is delivery on the project.

Dr Kym Runge discussed the effect which changes in the mineral size distribution have on flotation recovery. The presentation made clear that the overall mass size distributions (that comminutors consistently use) are not a good measure of mineral size distributions, which are integral to flotation performance. Her rule of thumb was that a 10 µm increase in P80 typically reduces recovery by 1%, but that this was only seen on site, not in the laboratory. She observed that coarse particle recovery regularly dropped off with the addition of ultra-fines, possibly due to the robbing of reagents by the increased surface area of the fines.

Dr Steve Morrell ventured back to the SMI-JKMRC to give a fantastic summary of his approach to the evaluation of energy efficiency of comminution circuits. He went back through the history such as his 1991 AusIMM Mill Operators paper that found that a semi-autogenous grinding (SAG) mill circuit could be as energy efficient as a crushing/ball mill circuit. He also told of his finding that open circuit milling had a much higher Bond Operating Work index (OWI) than closed circuit milling, not because of differences in energy efficiency but due to fundamental problems with Bond's equation. He explained that within the accuracy of the results, his method found no significant difference between the energy efficiency of different tumbling mill circuits when they were well run.

Greg Lane presented a very interesting account of the design of capital sensitive comminution circuits that leverage natural contours, have low footprint, low height and use less concrete, steel and piping. This style of design is an iterative process that involves the challenge of listening and aligning to customer's specifications, developing trust and delivering. He explained that one of the failings of engineering companies is that they all have their own paradigms and formulas and can only achieve as much optimisation as the budget will allow.

In addition to the Friday seminars, **Professor Tim Napier-Munn** delivered the Brisbane version of his extremely interesting AusIMM Delprat lecture at the SMI-JKMRC. In this he discussed the hypothesis that innovation is not optional, it is critical to our business, and in the past the mineral industry has innovated rather well. However forces are gathering which will make innovating in the industry more difficult in the future, and he laid out a strategy for dealing with these problems. *This talk is also available through the SMI YouTube account at: www.youtube.com/user/smiuq*

A paradigm shift in the methods of characterisation of rocks for comminution was presented by **Dr Benjamin Bonfils**. He presented the history and use of the Short-Impact Load Cell (SILC). Using this device he found that there was no significant difference in the strength of rock prepared by either cut or blast and that the High Pressure Grinding Roll (HPGR) product had the same strength below 1 mm. He asserted that fines particle breakage is controlled by crack initiation, whereas fracture of coarse particles is dominated by crack propagation. Finally, he presented a methodology for breaking mini-core samples that reduced variance in the results by 1/10th and allowed the real difference between populations of rocks to be measured accurately.

The presentation given by **Dr Mal Lees** was a retrospective analysis of the Bougainville crushing circuit. The Bougainville story is one that has fascinated many within the mining industry and this was another chapter that is not often presented. Over a number of years, the team responsible for the crushing plant was able to achieve 92% utilisation. This was a breath of fresh air in a world where crushing operations expect utilisation rates of around 75%. His simple mindset of maximising power utilisation and then deciding on the specific energy to achieve a grind size and recovery was very elegant and successful.

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Juan Jose Frausto Gonzalez (a SMI-JKMRC student) presented a summary of the recent study trip that a team of SMI-JKMRC students took to Mexico. Juan was inspired by Prof Lynch to use his contacts at Peñoles and Fresnillo to accept six students to conduct surveys at three of their mines. This was a great example of technology transfer and training between PhD students and site operators, and is a format that will be followed into the future. Juan described the measurements that were taken at Minera Saucito mine. He showed that when high-frequency (Derrick) screens are installed in place of hydrocyclones, an increase in throughput and lead recovery was measured, but silver recovery dropped significantly. This was found to be due to differences in the size-by-recovery in flotation and differences in the mineral and bulk size distributions due to the density bias that occurs in a cyclone.

SMI-JKMRC 2016 SEMINARS

Finally, the last presentation for the year was given by **Prof Malcolm Powell** who presented his vision for integrated process prediction. His presentation distilled the thinking about uniting our understanding down the whole value chain. His hypothesis is that the information we need to break down the current silos is all present in the rock. He suggests that our current use of proxy characterisation methods are clouding our perceptions and limiting our ability to integrate. And he finished by presenting the tools and capabilities that are currently being developed in the SMI-JKMRC to achieve this goal.

In his typically engaging way, **Joe Pease** presented his experiences in 'crossing the innovation valley of death'. His experiences were drawn from the many innovations that were progressed while he worked at Xstrata Technology. Of those he discussed details behind the IsaMill, Jameson cell, and IsaSmelt technologies. He stressed that if the minerals industry appears conservative it is because it is highly interconnected, complex and risky. Innovators need to find way to reduce risk rather than increase it. He highlighted that even simple changes can be highly disruptive – even a simple screen to remove low grade coarse waste (i.e. Grade Engineering™) has disruptive effects on materials handling and ore flow unless carefully designed with operators. We were reminded that maintenance, operability and KPIs always win. And he left us with seven key conditions for innovation: driving need, designed for your ore, passionate champions, bite-sized implementation, simple Intellectual Property (IP), high quality ongoing support and enabling organisation systems.

The best-attended event of the year was when **Prof T.C. Rao** came to present his holistic view of mineral processing industries. Prof Rao was the second student to graduate with a PhD from the SMI-JKMRC in 1966 and subsequently has gone on to do great things back in India where he is affectionately known as "the father of Indian mineral processing". He was in Australia to receive the University of Queensland's International Alumni of the Year award and we took advantage of this and asked him to present a Friday seminar. The presentation turned into a great event; I don't think there was a spare seat as many of the SMI-JKMRC alumni came out to celebrate (see photo below). His presentation was very insightful bringing together community needs and expectations together with the industry requirements. His holistic approach combined the needs of all the stakeholders: Mining, Environment, Community and Biodiversity.

How to improve the effectiveness of sustainability certification standards

Date: Thursday 7 July 2016

This webinar, part of the Research Webinar Series, presented research on how sustainability certification schemes can help to deliver positive outcomes in the mining and minerals sector.

Sustainability certification schemes and standards are one key means for civil society actors to hold mineral companies and governments to account and for companies and governments to demonstrate that they are operating responsibly. This research report explored the potential role these initiatives can play to effectively deliver positive outcomes and foster local development.

Renzo Mori Junior is a Postdoctoral Research Fellow at the Centre for SMI-CSR. At SMI-CSR he is undertaking applied research to investigate the potential role sustainability certification schemes can play to improve standards for responsible mining. This applied research will review the design characteristics of proposed and existing certification schemes to develop practical resources and recommendations for how certification can better work to improve environmental and social outcomes.

Extractive Industries and the Great Barrier Reef - The UNESCO World Heritage Controversy

Date: Friday 8 April 2016

Environmental Conflicts are a major concern around extractive industry projects worldwide. The challenge in meeting many of the Sustainable Development Goals (SDG's) and targets is to find a way by which ecological conservation goals can be reconciled with key infrastructure and development goals effectively. The threat by UNESCO to list the Great Barrier Reef as "in-danger" on the World Heritage list is a case of how such a conflict was reconciled between environmentalists, the government of Australia and a multilateral body.

The Webinar was open to people from around the world to hear one of the world's leading experts on the Great Barrier Reef discuss this case and how insights can be gleaned for other environmental conflicts worldwide.

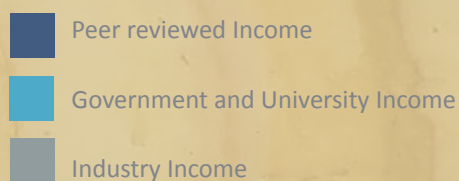
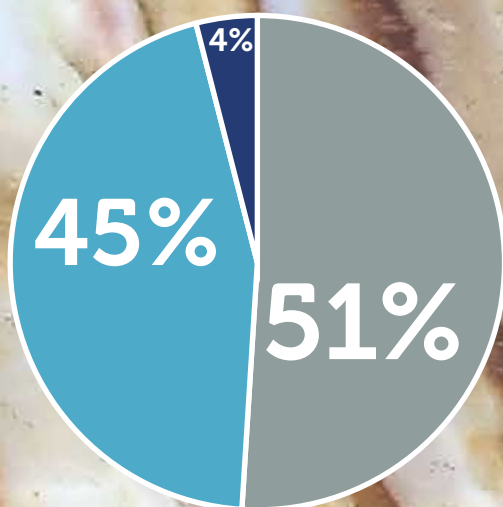
- **Convenor and moderator:** Professor Saleem H. Ali, Chair in Sustainable Resource Development and Programme Leader in Development and Governance at the Sustainable Minerals Institute, University of Queensland
- **Keynote speaker:** Professor Ove Hoegh-Guldberg, Director of the Global Institute at the University of Queensland, Australian Laureate Fellow Brought to you by the University of Queensland and SDSN Australia/Pacific. The Great Barrier Reef is the largest structure by volume built by living organisms on the planet. Bordering the coast of Queensland, Australia, it is a remarkable ecosystem with immense ecological and economic value.

In 1981, the reef was listed as a UNESCO World Heritage Site after considerable controversy in Australia because there was a concern that this may limit extractive industries development along the coast. During the past two decades, Queensland has developed enormous extractive resources including a major coal-seam gas infrastructure project near the town of Gladstone and plans to also develop one of the world's largest coal mines led by Indian corporation Adani. Concerns about the impact the extractives sector would have on the reef in terms of pollution and increased traffic volume of cargo ships led to UNESCO deliberating a delisting of the reef as a World Heritage site in 2012. There were a series of scientific studies which were presented to support and erode this proposition. Ultimately, in 2015, the reef was granted a reprieve from UNESCO from the "in-danger" listing threat – at least for now.

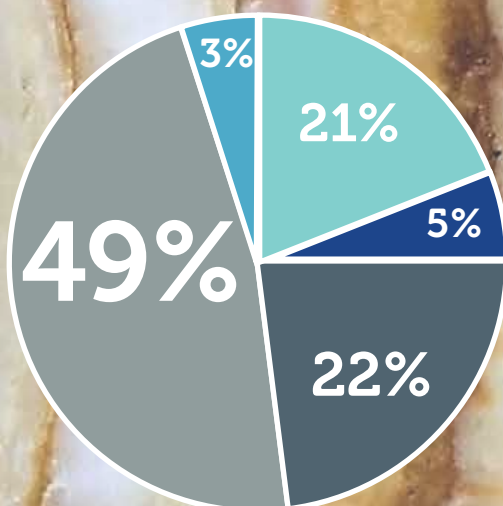
This case presents an important and instructive example of how extractive industries development, even in an advanced industrialized country with strict regulations, can create an environmental conflict. The webinar included presentations by experts on the ecology and economics of extractive industries development versus alternative livelihoods such as tourism and fishing.

The Webinar considered the role of international organizations and "soft law" in fostering constructive change to ensure extractive industries development can occur with minimal negative impacts and more efficiently meeting the targets of the new UN Sustainable Development Goals.

Total Income



Distribution of Expenditure







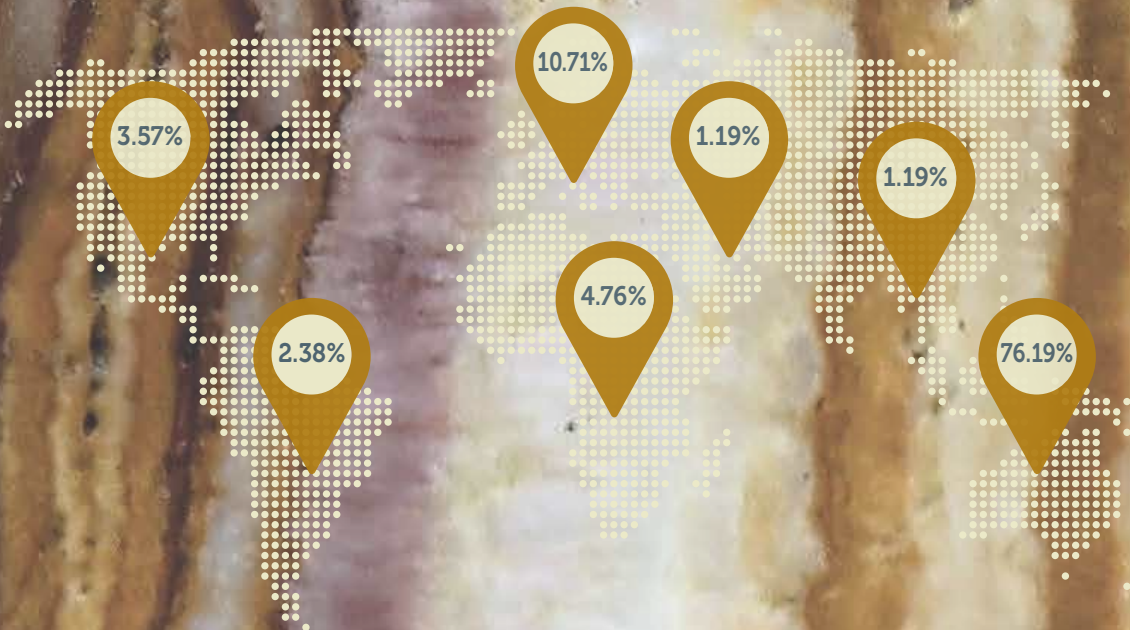
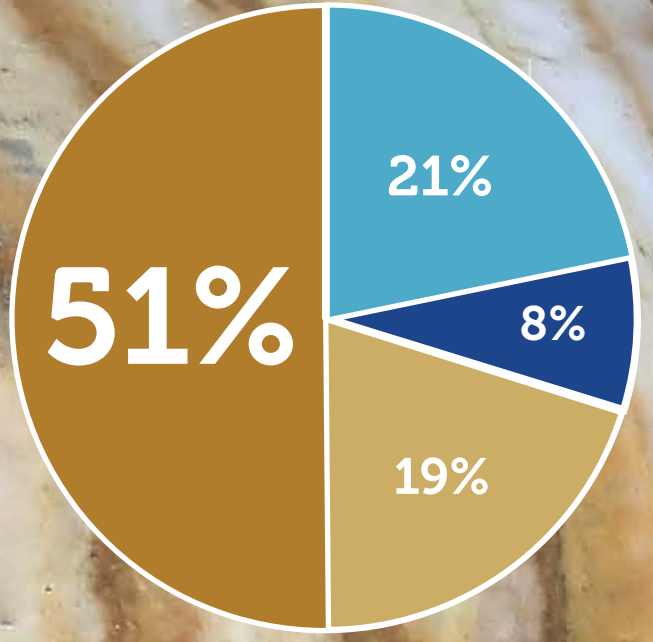
Income	2012	2013	2014	2015	2016
	\$000	\$000	\$000	\$000	\$000
Peer reviewed income					
ARC Grants	364	133	257	228	471
AUS Gov funding	738	950	419	0	215
CRC Programme	2,905	2,209	857	5,110	0
					686
Government and University Income					
UQ Operating funding	1,161	-156	99	284	774
Government Operating Grants	3,299	3,398	38	57	32
Tuition Fees	846	911	1,088	995	771
AUS University Collab	878	2,517	1,144	469	200
QLD State funding	530	367	590	761	528
Research Block Grants	0	0	4,558	5,489	5,757
					8062
Industry income					
Donations	599	653	433	315	228
Commercial Contracts	7,272	3,850	3,939	2,184	2,558
AUS Industry	14,371	15,759	12,871	10,004	3,922
AUS foundations and Individuals	30	234	415	238	111
International Industry	1,405	2,179	4,234	4,778	2,177
					8996
TOTAL INCOME	34,398	33,004	30,942	30,912	17,744

Expenditure	2012	2013	2014	2015	2016
	\$000	\$000	\$000	\$000	\$000
Remuneration Expenditure					
Researchers	16,049	16,405	15,503	13,442	10,418
Administrative	8,829	8,833	8,526	7,096	4,768
Research and Operating Expenditure					
Equipment	2,632	1,183	476	393	346
Consultant Professional Services	4,551	5,813	4,773	5,047	2,877
Scholarships	1,219	1,383	1,408	1,135	807
Administration and support	4,442	1,685	1,181	884	622
Travel	2,540	2,206	2,176	1,686	947
Collaborative projects	374	434	91	24	473
TOTAL EXPENDITURE	41,317	39,307	35,973	31,773	21,258

SMI Staff Demographics

GENDER	Professional	Academic	TOTAL
Male	8.33%	51.19%	59.52%
Female	21.43%	19.05%	40.48%
TOTAL	29.76%	70.24%	

	MALE	FEMALE		MALE	FEMALE
PROFESSIONAL			ACADEMIC		



NATIONALITY	
Africa	4.76%
Asia	1.19%
Australasia	76.19%
Europe	10.71%
Middle East	1.19%
North America	3.57%
South America	2.38%



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