SCHOOL OF MINING ENGINEERING

ANNUAL REVIEW 2015

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

1922

Founded in 1922, the University of the Witwatersrand has its roots in the South African School of Mines, which became the Wits School of Mining Engineering. Today, the School's building on West Campus hosts at its entrance Herman Wald's bronze statue of the 'Unknown Miner' - commemorating all those who have contributed to this vital industry, as well as Wits University's educational role.

CONTENTS

Testing rock strength in Wits School of Mining Engineering's Genmin Laboratory - mines face unprecedented pressure as operations reach new depths.

The Wits School of Mining Engineering

PROFILE

The Wits School of Mining Engineering is today recognised as one of the world's top mining engineering schools, with among the most expansive programmes. It also has one of the highest growth rates of any of the engineering schools or departments, having seen a consistent increase in the number of students to its courses.

The challenges facing mining today are substantial. However, best-practice innovations and technology offer the opportunity for the design and management of high-tech mines that are not only safer, but also more productive and environmentally and socially responsible, while still being economically successful.

To promote such innovation, the School has two Centres of Excellence:

- The Centre for Mechanised Mining Systems (CMMS) focused on efficiency and safety improvements, developing new capabilities in technology and in people; and
- The Centre for Sustainability in Mining and Industry (CSMI) acts as a bridge between academia and practitioners to integrate disciplines in solving complex health and safety, and sustainability-related problems.

The School's new Strategic Plan ensures that the Wits Mining team can deliver excellence in teaching, research and service in line with the Wits Vision 2022 of being a leading research-intensive university firmly embedded in the top 100 world universities by 2022.

As mining requires the skills and technology of several branches of engineering, most of the curriculum for years one and two is common to all branches of engineering. The third and fourth years focus on mining engineering and include technical valuation, ventilation and environmental engineering, mine transport and rock mechanics.

The Wits School of Mining Engineering is respected globally for the quality of its programmes and graduates – it is also among the fastest-growing of the engineering departments at Wits

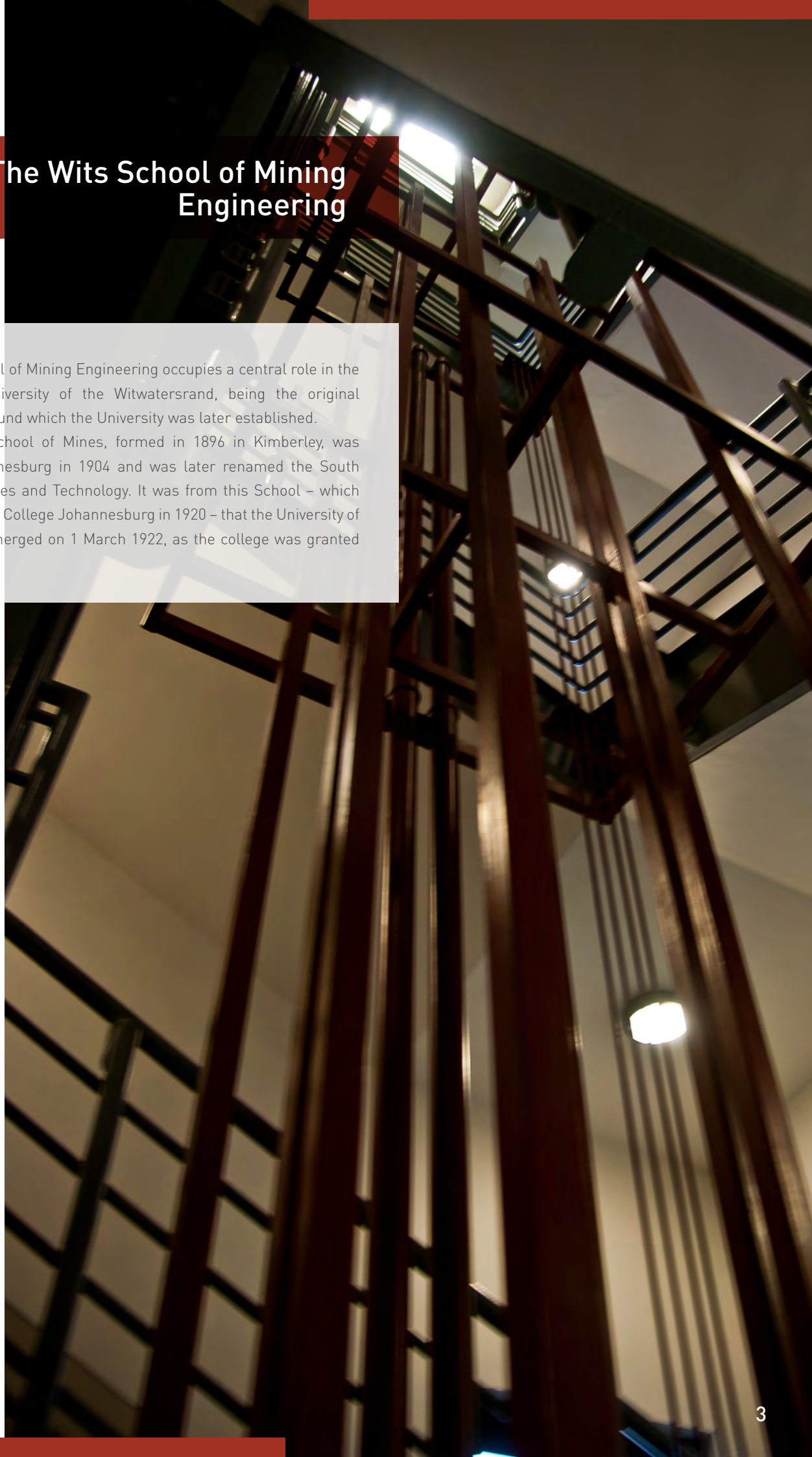
The School's undergraduate programme is designed to provide graduates with the engineering expertise they require as mining engineers. The School has, in conjunction with the South African mining industry, developed a programme of postgraduate courses designed to cater for the needs of graduates. These include technical subjects for specialist skills in mining, mineral resource management and evaluation, and rock engineering, as well as management skills in evaluation techniques and fundamental principles in mineral economics.

Wits Mining graduates are ready for these challenges and the School of Mining Engineering is known and respected internationally for the quality of its programmes and graduates.

The Wits School of Mining Engineering

Historically, the School of Mining Engineering occupies a central role in the formation of the University of the Witwatersrand, being the original educational entity around which the University was later established.

The South African School of Mines, formed in 1896 in Kimberley, was transferred to Johannesburg in 1904 and was later renamed the South African School of Mines and Technology. It was from this School – which became the University College Johannesburg in 1920 – that the University of the Witwatersrand emerged on 1 March 1922, as the college was granted full university status.



Professor Cuthbert Musingwini

It is with a deep sense of encouragement and hope that I reflect on the School's achievements in 2015, which was also my first year as Head of School. In 2016, the School is turning 120 years old – a significant milestone in its history.

As the School continues to build on its reputation as a leading mining school internationally, I am excited to report that – despite some challenges faced – the School was able to start delivering on the five Strategic Initiatives adopted for my five-year term from 2015-2019. These initiatives will ensure that the Wits Mining team can deliver excellence in teaching, research and service in line with the Wits Vision 2022 of being "a leading research-intensive university firmly embedded in the top 100 world universities by 2022".

Indeed, we are already well placed: in its 2016 World University Rankings, the UK-based Quacquarelli Symonds (QS) Ltd ranked Wits Mining in the top 100 of 403 mining schools worldwide, and number one among mining schools in South Africa.

It is indeed with great pleasure that I am able to share the following key achievements in 2015:

- The School successfully graduated six PhDs and one DEng to give a total of seven doctorates, the highest in any year in the School's history. Some of the doctoral research topics provided important insights into the prediction of mining conditions under increasing temperature and rock stresses; as our mines continue to mine deeper-seated mineral reserves, these are conditions that they can expect to encounter.

- The School produced higher research output units and edged its way up into the top three schools within the Faculty in terms of research output. Some of the research papers were presented and well-received at the 23rd International Symposium on Mine Planning and Equipment Selection (MPES 2015) hosted by the Southern African Institute of Mining and Metallurgy (SAIMM) from 9-11 November 2015. This was the first time that South Africa hosted the MPES conference, which has been held regularly for 25 years.

- For the first time in the School's history, the final year undergraduate class size breached the 100-mark in 2015, indicative of its status as one of the largest mining schools worldwide.

Generally, the School managed to maintain its postgraduate and undergraduate student populations, and staffing levels remained fairly constant. The maintenance of staffing levels ensured that the quality of teaching and learning was not compromised.

- The School was instrumental in working with the other three mining schools in the country in setting up a Mining Heads of School Forum, which subsequently rebranded itself as Mining Engineering Education South Africa (MEESA). I am happy to report that MEESA was able to meet quarterly and that there is now an even greater sense of collaboration among the country's four mining schools.
- The School was commended by industry assessors during their 2015 Quinquennial Review (QQR) visit, which was followed by the university's QQR Internal Review Committee visit in 2016; this also provided positive feedback on the way it is conducting its business. The QQR is an indicator of the quality of the School's teaching, research and service.

"Wits Mining is in the top 100 of 403 mining schools worldwide, and number one among mining schools in South Africa"

Reflecting on 2015, we successfully completed our academic programme during the remainder of the year and have had a good start to 2016 – despite the country-wide 'Fees Must Fall' campaign and its attendant challenges, which ran for two weeks from 14 October 2015 and resumed sporadically on a smaller scale in early 2016. I have no hesitation in expressing my confidence in the Wits Mining team and their continued commitment to serve our students, industry and the University with distinction.

Professor John Cruise

Professor John Cruise's links with the School of Mining Engineering at Wits (then known as the University's Mining Department) date back to 1962, when he was awarded a Union Corporation scholarship to study for a Bachelor's degree in mining engineering. In 1967, he was awarded a Chamber of Mines scholarship to study for a Master's degree in Rock Mechanics on a dissertation entitled, "The Determination of the Strength Characteristics of Wide Pillars". Much later, in 2006, he was admitted to the degree of Doctor of Philosophy for his thesis on "The Development of a Directional Primer Charge for Blasting in Mines".

Professor Cruise's early career in mining was as a production mining engineer on the gold mines of Union Corporation, rising up the ranks from assistant ventilation officer, through miner, shift boss and mine captain to underground manager. He was then posted to Richards Bay Minerals as Mine Superintendent, to start up a large heavy mineral sands mining operation.

In 1978, he became an academic mining engineer when he joined the Mining Department at Wits as a Senior Lecturer responsible for Exploitation Systems and Explosives Engineering. In 1979, he represented Wits Mining Department as a visiting "professor" (the Chileans refer to all university lecturers as professors), presenting a post-graduate course in explosives engineering to the Codelco copper company in Chile. During his two years on the Wits staff, Professor Cruise also developed blasting courses for the South African mining industry.

In 1980, he became a consulting mining engineer when he joined a consulting engineering firm as a Partner and Head of the Mining Department. During the two and a half years with the firm, he put his explosives engineering knowledge – which he had honed while lecturing at Wits – to good use. He undertook many consulting contracts related to blasting; his role as consulting engineer for the first implosion of a tall, city-centre building in Johannesburg was followed by another seven such city-centre implosions.

Professor Cruise formed a blasting contracting company in 1982. His first contract was to stabilise the undermined ground of a site on which a ten-storey building was to be built across an outcrop. He then became a contracting mining engineer and over the following 25 years, he carved a niche for himself in the field of stabilisation and rehabilitation of undermined ground.

Since 1982, Professor Cruise managed his own group of explosives, mining and civil engineering contracting and consulting companies and kept a close connection to Wits University by operating out of the Science Park at Franckenwald – where he rented offices from 1990 until he retired to Cape Town in 2009.

His close relationship with Wits includes his role as a committee member of the Wits University Mining Engineers' Association (WUMEA) for forty years from 1967, and as Chairman of WUMEA from 1992 to 1994.

In 1992, Professor Cruise was approached by Wits to help them to assess the safety of excavations at the Sterkfontein Caves. While he was there, he was also asked to assist in blasting out rock layers containing fossils. For the next two decades, he provided blasting services for Sterkfontien and Swartkrans. He became a founder trustee of the Palaeo-Anthropological Scientific Trust (PAST) in 1994; PAST was instrumental in the declaration of the Cradle of Humankind as a World Heritage Site. He is currently the sole remaining founder trustee of PAST.

With links to Wits dating back to 1962, Professor Cruise has been a leading figure in the South African mining and civil engineering sectors

Recently, he was asked by the Deputy Vice Chancellor to sit on a Wits committee to oversee the removal of the Little Foot fossil from the Sterkfontein Caves and was present when it was finally brought to surface after some three million years underground and 14 years of excavation.

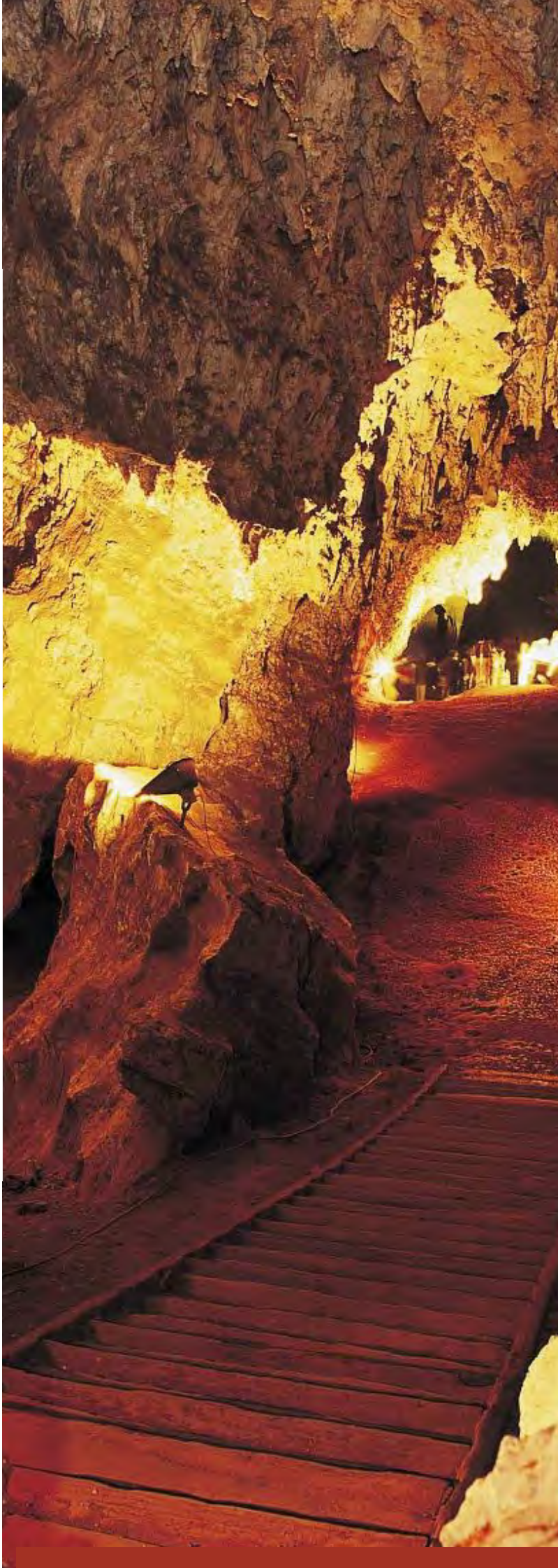
Some of Professor Cruise's more interesting and esoteric contracts concerned explosives and blasting. This included blasting an excavation under the maternity ward of a hospital, blasting two three-tonne propellers off a sunken ship off East London, blasting down the side of the mountain above the Fiko Patso Dam, blasting tunnels under Simmonds Street, blasting an inspection tunnel to within ten metres of the concrete face of the Mohale Dam wall, and the driving of a tunnel through soft ground for the Umgeni Water Scheme. For many years, he was a member of the South African National Committee on Tunnelling (SANCOT) and is a past Chairman of SANCOT, as well as being a past representative for South Africa on the International Tunnelling Association. He is also a past Chairman of the Association of Mining Contracting Companies.

In collaboration with Naschem, Professor Cruise modified an anti-tank weapon and developed it for commercial use in underground mines, namely the Slugshot Hang-up Clearance Device. He marketed and sold the Slugshot to the mining industry for ten years. For this development – "making ploughshares out of swords" – he received the Naschem Chairman's Award.

For 50 years, Professor Cruise has been a member of the Southern African Institute of Mining and Metallurgy (SAIMM), serving as a Council Member for 35 of those years; he was President from 1994 to 1995 and also served as Honorary Treasurer from 1995 to 2010. He is an Honorary Life Fellow of the SAIMM and is a Fellow of the South African Academy of Engineering.

He has also been a Council Member of the Engineering Council of South Africa (ECSA), and the Chairman of ECSA's Professional Advisory Committee for Mining Engineering. Professor Cruise served for many years on the ECSA accreditation teams to the two mining universities of Pretoria and Wits.

He is currently the Chairman of the Centennial Trust Fund Trustees' Committee for the Wits Chair of Rock Engineering, and Chairman of the Industry Advisory Council for the Wits School of Mining Engineering. Wits Mining prides itself on having in its fold a mining engineer with such an illustrious track record.



School Self-Evaluation: Progress against Strategic Initiatives in 2015

The following framework for progress ratings has been applied to each of the five Strategic Initiatives, to help the School prioritise where to place more emphasis. Details of progress during 2015 within each initiative are contained in subsequent sections of this report.

Rating	Description
☹	Some progress made, but not satisfactory
😐	Progress is satisfactory and there is room for improvement
☺	Progress is more than expected

Strategic Initiative Number	Description	Rating	2015 progress	Action required
1	Increase normalised research output	😐	Senior Lecturer Research Equivalent (SLRE) units increased by 71% on 2014 outputs, which is still below the expected target of 2.0 per SLRE. The School Research Committee was established. Four postgraduate students were awarded Julian Baring Scholarships.	Establish more platforms for staff to publish and facilitate completion of degrees by staff doing PhDs.
2	Improve teaching and learning effectiveness	😐	The School's Teaching and Learning Committee was established. The Quinquennial Review (QQR) endorsed the School's teaching and learning. A workshop on preparations for the ECSA accreditation visit in 2017 was successful and will be repeated in early 2017.	Focus on high attrition courses to reduce failure rate.
3	Enhance the academic project support system	😐	A 'Policies & Procedures' workshop for staff was conducted. Student mentoring continued.	More engagement to explain how the School functions, especially with new staff members.
4	Increase the visibility of the School and its staff	☺	The School's Public Relations Committee was established and started working on the School's historic 120-year celebrations in 2016. One staff member applied for registration as a professional engineer (Pr. Eng.) in 2015 and was successfully registered in 2016, bringing to five the number of staff professionally registered. Another staff member was accepted to serve on the Councils of the SAIMM and SACMA. A third staff member was President-Elect and Honorary Treasurer for the SAIMM.	Embark on information sessions in the university's feeder high schools. More staff eligible to apply for Pr. Eng. registration with ECSA need to apply.
5	Review and establish internal and external collaborations	☺	The Mining Heads of School's Forum established and re-branded as Mining Engineering Education South Africa (MEESA). Significant progress was made through MEESA on enhancing the relationship between the Mining Qualifications Authority and the four mining schools.	Continue seeking win-win partnerships.

The Chamber of Mines building at Wits University

Strategic Initiative 1: Increase normalised research output

01

As part of the Wits 2022 Vision, the University aims to be one of the top 100 universities in the world by 2022 and the School recognises the positive role it must play in this regard. Research output – in terms of quantity and quality – is one of the important criteria used in the world rankings. In this context, Wits Mining Engineering should actively work on improving its research output and proxies for quality, such as the number of NRF-rated academic staff, staff with PhDs, and research awards accorded to staff and students. Under this initiative, the School recognises that in order to increase its normalised research output, it must undertake several actions that are intricately interlinked.

The School's research output is measured in terms of MSc and PhD research degrees that are awarded, and articles published in refereed, subsidy-earning research publications accredited by the Department of Higher Education and Training (DoHET).

"There is a general increase in normalised research publications units between 2010 and 2015, though this is still below the expected 2.0 units per SLRE"

In order to meaningfully measure research progress, it is necessary to normalise the research publications units. An acceptable measure for parity across years and schools in the University is the number of research publications output units per academic staff or per senior lecturer research equivalent (SLRE).

The SLRE is a notional measurement scale that is produced by applying the following factors to the staff categories:

- Full Professor = 1.3;
- Associate Professor (or Adjunct Professor) = 1.1;
- Senior Lecturer = 1.0;
- Lecturer (or Senior Tutor) = 0.8;
- Associate Lecturer (or Tutor) = 0.6.

The University's target for normalised research output for publications is a minimum of 2.0 research output units per SLRE per year. Table 1 shows the School's normalised research output for the period 2010-2015. The cohorts of MSc and PhD students graduating are reported for the July and December graduations for each calendar year and the April graduation of the consecutive calendar year, while the credited publications are for papers published between January and December of a calendar year.

Table 1: Research Output

Year	SLRE	MSc	PhD	Total Publication Units Credited	Total Publication per SLRE
2010	18.71	16	2	1.71	0.09
2011	20.49	6	3	12.25	0.60
2012	22.72	16	3	5.50	0.24
2013	22.94	11	2	14.29	0.64
2014	25.94	14	2	12.39	0.48
2015	26.99	13	5	22.89	0.85

Note: the total publication units for 2015 are provisional estimates

There is a general increase in normalised research publications units between 2010 and 2015, though this is still below the expected 2.0 units per SLRE. The School also moved from the bottom three Schools out of the seven in the Faculty (in terms of research output) into the top three. The research highlights for 2015 are:

- The School's normalised research output was up 71% on 2014 levels.
- The School's academics showcased their research through 18 conference papers that were presented and published as part of the proceedings of the 23rd International Symposium on Mine Planning and Equipment Selection (MPES 2015). MPES, which has been run for the past 25 years internationally, was hosted for the first time in South Africa by the Southern African Institute of Mining and Metallurgy (SAIMM).
- Between January and December 2015, a total of six PhD students graduated from the School; with a DEng student also graduating, this brought to seven the total doctorates awarded in the 2015 calendar year.
- One of the School's academics, Bekir Genc, was awarded a PhD, bringing to five the number of staff with doctorates – equating to about 20% of staff; this is a slight improvement towards the target of at least 75% of staff with PhDs envisaged in the Wits 2022 vision.
- The following postgraduate students were awarded the Julian Baring Scholarships: Takudzwa Maposa, Monica Tetteh, Thembani Chirinda and Tatenda Munjeri.
- Final-year student Tonderai Chikande was selected among the top three students at the SAIMM Student Colloquium and qualified to publish his research project in the April 2016 edition of the SAIMM journal.
- The School's four NRF-rated academics maintained their ratings. These academic staff are Prof Stacey, Prof Minnitt, Prof Cawood and Prof Musingwini.

The School's four **NRF-Rated Academics**

Professor Dick Stacey
Professor Emeritus

Professor Dick Minnitt
JCI Professor of Mineral Resouces and Reserves

Professor Cuthbert Musingwini
Head of School

Professor Fred Cawood
Director of the Wits Mining Institute

Strategic Initiative 2: Improve teaching and learning effectiveness

02

One of the ways of ensuring teaching and learning effectiveness is by inducing a competitive learning environment in which good effort is rewarded. To assist students in excelling in their studies, the School has historically partnered with mining companies and related organisations to offer prizes for best performance and attitude to promote the proper functioning of the School.

Table 2 shows the 12 prizes that have historically been awarded, plus three additional new prizes awarded from 2015. This list can be grown and the School invites other mining companies and organisations not on the list in Table 2 to consider participating in this worthwhile initiative that enables us to regularly deliver quality graduates to our mining industry.

Table 2: Mining Engineering Prizes

	Prize	Criteria	2015 Recipient
1	**AEL Mining** Services Prize	The student with the highest mark in the second year Excavation Engineering course	**Kgabo Mokoena**
2	**Danie Krige** Prize in Mine Evaluation	The student with the highest average mark in the courses on Technical Valuation and Financial Valuation	**Tonderai Chikande**
3	**Herbert Simon Memorial** Prize	The student with the highest aggregate mark in final year examinations	**Tonderai Chikande**
4	**Institute of Mine Surveyors** of South Africa Prize	The best student in Mine Surveying	**Jack Lesetsa Segoale**
5	**Mine Managers** Prize	The Mining Engineering student with the best second year results	**Tabotabo Talane**
6	**Mine Ventilation** Prize	The best final year student in Mine Ventilation	**Tonderai Chikande**
7	**Prof S Budavari Memorial** Prize	The third year Mining Engineering student with the highest mark in the subject of Rock Mechanics	**Kudzanai Knight**
8	**S A Institute of Mining and Metallurgy** Prestige Prize (Mining)	The student in the third or fourth year of study whose academic achievement, contributions to the student affairs, and interactions with the School are of a high order	**Given Sithole**
9	**Sasol Medal** for Excellence	The best final year student in Coal Mining	**Jack Lesetsa Segoale**
10	South African **National Institute of Rock Engineering**	The student with the best aggregate mark for third and fourth year Rock Mechanics courses	**Jack Lesetsa Segoale**
11	Witwatersrand University **Mining Engineers' Association Prize**	The final year student obtaining the highest marks in Mining Engineering subjects	**Tonderai Chikande**
12	**Worley Parsons** Prize for Mining Engineering	For the fourth year student with the highest aggregate mark for all the Mining Method subjects (Mining A,B,C,D,E) and Mine Design Project	**Tonderai Chikande**
13	**Worley Parsons** Prize for Mining Engineering	For the third year student with the highest mark in the subject Health, Safety and the Mining Environment	**Peter Rungani**

In order to improve effectiveness in teaching and learning, one of the actions required is to keep the student:staff ratios at acceptable levels. In the context of the School, this requires capping the new student intake and ensuring staffing is kept at full complement through timeous replacements for retirements and resignations.

Tables 3 and 4 show the staff and student populations for the period 2010-2015. It is notable that the student body grew disproportionately with the fairly constant staffing levels, resulting in increasing student:staff ratios. In 2015, the School implemented a strategy to cap new first year students going forward.

Table 3: Wits Mining student head count

Year	1st	2nd	3rd	4th	Graduates	Total Undergrads	GDE	MEng	MSc	PhD	Total Postgrads	Total UG&PG	MRM & MP Cert
2010	228	85	79	76	79	468	196	68	60	16	340	808	69
2011	233	96	82	62	62	473	137	32	34	19	222	695	46
2012	234	143	80	74	70	631	102	15	42	14	173	704	59
2013	302	124	142	66	53	634	90	15	70	16	191	825	77
2014	212	139	148	88	72	587	38	3	112	22	175	762	76
2015	231	144	162	106	83	643	3	2	176	20	201	844	25
2016*	250	118	177	118		663	3	1	138	20	162	825	

*** At start of 2016**

Table 4: Student to academic staff ratios

Year	Full-time academic staff	Total Students	Student: Staff Ratio
2010	19	808	42
2011	21	695	33
2012	20	704	35
2013	22	825	37
2014	24	762	32
2015	25	844	33
2016*	24	825	34

Key: Excludes the certificate students, part-time staff, honorary staff, visiting staff, CSMI and CMMS staff.

*** At start of 2016**

Some of the highlights in Teaching and Learning activities for 2015 were:

1. The School entered into and concluded discussions with Worley Parsons to offer two new prizes. From 2015, Worley Parsons introduced prizes for Mining Engineering in the third and fourth year of study.
2. In 2015, the School successfully raised its minimum automatic Academic Point Score (APS) for new first years from 40+ to 42+ (with Mathematics, English and Physical Science set at Level 6 or 70% or more). This decision ensures that we can continue to maintain the quality of intake given the increasing annual demand for places.
3. The School jealously guards the accreditation of its programme by the Engineering Council of South Africa (ECSA) which ensures the education and training remains of the highest international quality standards. ECSA awards accreditation on a five-year cycle using the internationally recognised Washington Accord guidelines. The School received full accreditation in 2012 and is due for the ECSA accreditation visit in 2017. Preparations are already underway, including an internal ECSA accreditation workshop held on 24 November 2015.
4. As part of quality assurance and quality control (QA/QC), the University undertakes – on a five-year cycle – a Quinquennial Review (QQR) of its units. The School had its Industry Assessors visit the School on 8 October 2015 and provided positive feedback. This was followed by the University's internal Review Committee visit on 9 March 2016, which also provided positive feedback on the way the School conducts its activities.
5. The School established a new Teaching and Learning Committee to assist the School in alleviating teaching and learning challenges.

Strategic Initiative 3: Enhance the academic project support system

03

When the School operates smoothly, it creates an environment in which both staff and students feel welcome, develop a sense of belonging and are able see that the School sets them up for success. In this way, the School is better positioned to serve the faculty, university and industry. It was necessary for the School to initiate a structural re-alignment to ensure that it is better aligned with these stakeholders, by setting up additional support structures to respond to their needs. The School continues with its enviable tradition of student mentoring, which ensures that student needs are addressed timeously and efficiently.

A structural re-alignment and additional support structures are underway to enhance the environment in which staff and students feel welcome

The developments in 2015 that enhanced the School's support system were:

1. The School Research Committee (SRC), Teaching and Learning (T&L) Committee and Public Relations (PR) Committee were set up.
2. The School held a Policies and Procedures Workshop on 11 June 2015 for academic staff to get a better understanding of how the School functions and to ensure familiarity with policies and procedures governing the School's functions. Positive feedback was received on the possibility of repeating the workshop in future.
3. Timeous replacements were made for Ms Mona Shah, who retired from the School Administration Manager position, by Mrs Zeenath Adam; Mr Bongumusa Cebekhulu replaced Mr Jonathans Maans as the School's laboratory technician, and Mrs Mbalenhle Mpanza was replaced by Ms Lisa Chanderman at the expiry of her contract. In January 2015, Mr Paseka Leeuw was appointed into a Senior Lecturer position to replace Dr Hudson Mtegha, who retired at the end of 2014, and Mr Huw Thomas was appointed as a Senior Lecturer to replace Ms Sanisha Naidoo, who resigned effective 31 December 2014.

Strategic Initiative 4: Increase the visibility of the School and its staff

04

The proper functioning of the School is intricately linked to its industry networks. Staff are encouraged to actively participate in the industry's professional bodies, and the School maintains its presence in professional bodies and at their events. The highlights in 2015 in support of initiatives to increase the visibility of the School and its staff were:

1. In 2015, Dr Bekir Genc applied for registration as a professional engineer with ECSA; his application was successful and he was formally registered in 2016. The six staff members who are registered as professional engineers with ECSA are Professor Dick Stacey, Dr Halil Yilmaz, Mr Barry Prout, Professor Cuthbert Musingwini, Mr Mpho Tlala and Dr Genc.
2. Professor Musingwini was given a second term as SAIMM Honorary Treasurer for the 2015/2016 financial year and also became SAIMM's President-Elect.
3. Mr Mpho Tlala was elected to the Council of SAIMM in August 2015 and co-opted to the Council of the South African Colliery Managers Association (SACMA) in February 2016.
4. The School hosted a meeting of the Association of Mine Managers of South Africa (AMMSA) on 14 August 2015. As indicated in the section on Strategic Initiative 2, AMMSA annually awards the Mine Managers Prize in the School.
5. The School hosted a visit by Sibanye Gold executives on 23 July 2015; after the visit, Sibanye Gold pledged its continued support of the School's Digital Mine project.
6. The School hosted a visit by the Chief Executive Officer (CEO) of Gold Fields, Mr Nick Holland, on 8 December 2015; this resulted in agreements between the School and Gold Fields on a number of research projects at Gold Fields' South Deep mine.
7. The School hosted a visit by the CEO of Anglo American Platinum, Mr Chris Griffiths, which resulted in the company offering access to one of its mechanised mining facilities.

"Staff actively participate in the industry's professional bodies"

From left to right: Professor Fred Cawood, Professor GL Smith (Anglo American Platinum Executive), Mr Chris Griffiths (Anglo American Platinum CEO) and Professor Cuthbert Musingwini.

Strategic Initiative 5:
Review and establish internal and external collaborations

05

The School is always actively exploring collaborative partnerships with other schools within Wits University, with the South African mining industry and with other institutions internationally. These partnerships are important because the Wits Mining Engineering programme is recognised as a leader both locally and globally.

It is a primary objective in seeking collaboration that the partnerships are of a 'win-win' nature in order to be relevant to both parties in the relationship. While the School has collaborated significantly with other universities globally, it has had limited collaborations with the other three mining schools in the country. It is therefore one of the key activities over the five-year period from 2015 to 2019 to strengthen collaboration with the three schools; this was initiated in 2015 with the formation of the Mining Heads of Schools Forum - which was later rebranded as the Minerals Engineering Education South Africa (MEESA).

MEESA will provide a platform for a unified approach to shared problems and solutions relevant to the four mining schools in the country. The body has already engaged with the Mining Qualifications Authority for a streamlined payment process, and this was approved. MEESA also collectively approached mining companies with Vacation Work needs and successfully secured 15 places per school for Vacation Work at Murray & Roberts and AngloGold Ashanti.

The School continues to maintain its partnerships and the growing list of partners is shown in this report. Some of the highlights of the collaborative activities for 2015 were:

1. The School was instrumental in setting up MEESA, which was able to meet quarterly and create a greater sense of collaboration among the country's four mining schools.
2. An academic member of staff from the National University of Sciences and Technology (NUST) in Pakistan, Sarfraz Ali, completed his PhD and graduated in April 2016. Another two NUST staff members, Moshini Ali and Zeeshan Asghar, completed their MSc degrees and graduated in December 2015 from Wits.
3. Sibanye Gold once again hosted three groups of the School's second year students for the one-week Workshop Practice required as part of the curriculum.

"It is one of the key activities of the School to strengthen collaboration with the other three mining schools in South Africa"

4. Our alumni body, the Witwatersrand University Mining Engineers Association (WUMEA), the Southern African Institute of Mining and Metallurgy (SAIMM) Scholarship Trust Fund, Sibanye Gold and BME (Omnia Group) continued with their financial support for needy but deserving students in the School.
5. The School's two centres continued their vital work: the Centre for Sustainability in Mining and Industry, under the leadership of Adjunct Professor Caroline Digby, assists the mining industry with Health and Safety training and implementation of sustainable development, while the Centre for Mechanised Mining Systems, under the leadership of Dr Declan Vogt, assists the mining industry with training on mechanisation and automation.

Adjunct Professor Caroline Digby
(Centre for Sustainability in Mining and Industry)

Dr Declan Vogt
(Centre for Mechanised Mining Systems)

The School also collaborates with the Wits Mining Institute (WMI) hosted in the Faculty of Engineering and the Built Environment. The WMI is headed by Professor Frederick Cawood.

Professor Fred Cawood
(Wits Mining Institute)

Partnering can involve Vacation Work for third and fourth year students, awarding bursaries or prizes, offering financial support or engaging the School in research

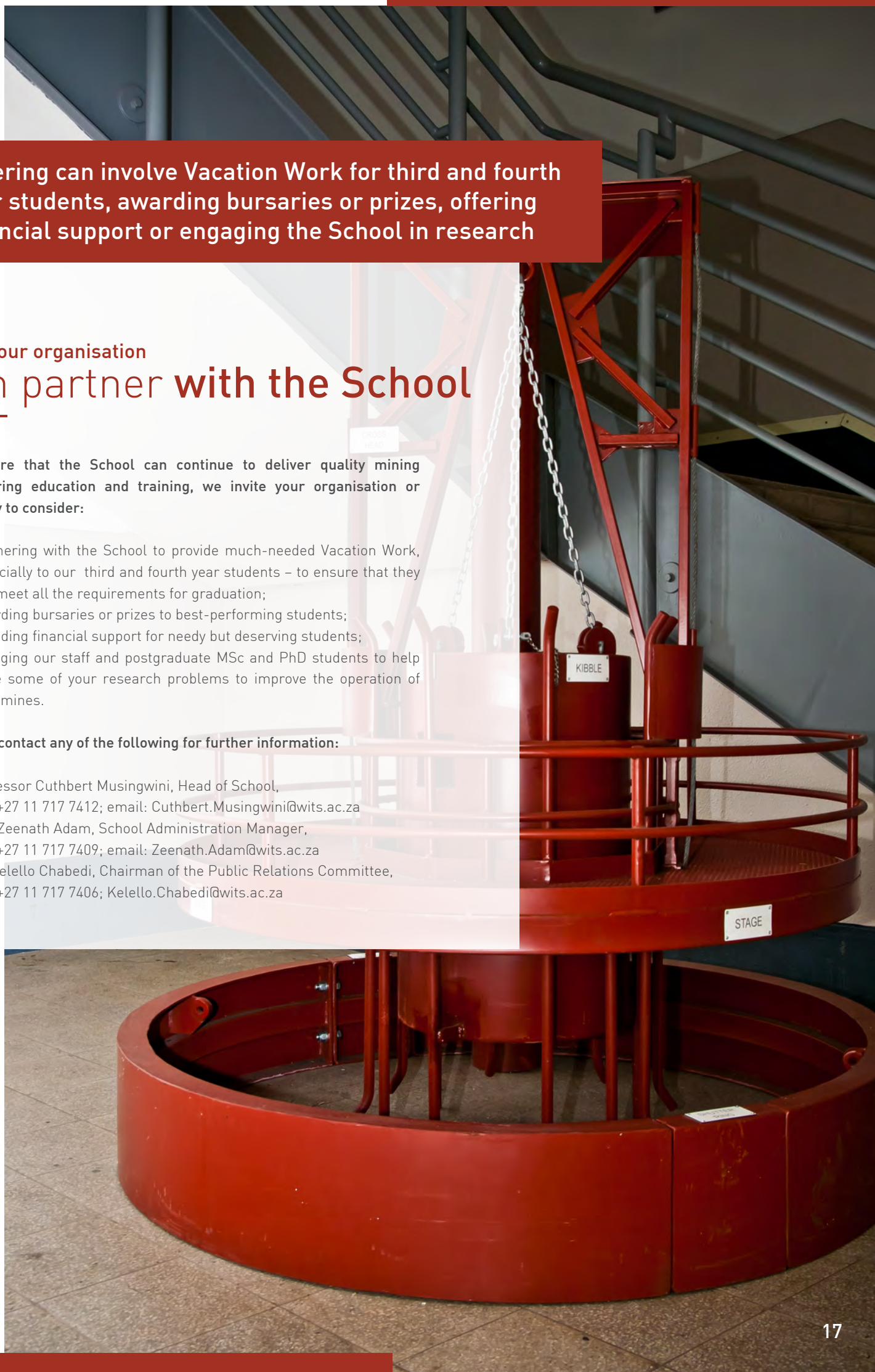
How your organisation
can partner **with the School**

To ensure that the School can continue to deliver quality mining engineering education and training, we invite your organisation or company to consider:

- Partnering with the School to provide much-needed Vacation Work, especially to our third and fourth year students – to ensure that they can meet all the requirements for graduation;
- Awarding bursaries or prizes to best-performing students;
- Providing financial support for needy but deserving students;
- Engaging our staff and postgraduate MSc and PhD students to help solve some of your research problems to improve the operation of your mines.

You can contact any of the following for further information:

- Professor Cuthbert Musingwini, Head of School,
  Tel: +27 11 717 7412; email: Cuthbert.Musingwini@wits.ac.za
- Mrs Zeenath Adam, School Administration Manager,
  Tel: +27 11 717 7409; email: Zeenath.Adam@wits.ac.za
- Mr Kelello Chabedi, Chairman of the Public Relations Committee,
  Tel: +27 11 717 7406; Kelello.Chabedi@wits.ac.za



Staff 2016

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

SCHOOL OF MINING ENGINEERING

From left to right:

First Row: Lileen Lee, Mamokete Madonsela, Caroline Digby, Cuthbert Musingwini, Paseka Leeuw, Bekir Genc, Tinashe Tholana

Second Row: Jacob Mabeba, Lindy Dabrowski, Declan Vogt, Barry Prout, Richard Minnitt, Phila Gamedza

Third Row: Paskalia Neingo, Noleen Dube, Ingrid Watson, Daisy Matlou, Andrew Carpede, Clinton Birch, Huw Thomas

Fourth Row: Paulos Sibeko, Siva Rungan, Mpho Tlala, Kelello Chabedi, Thomas Stacey, Sonja Douman

Fifth Row: Musa Cebekhulu, Dave Borman, Frederick Cawood, Joseph Negondeni

Absent: Idris Ally, Carl Beaumont, Lisa Chanderman, Mothusi Mochubele, Sihe Nhleko, Tomi Oshokoya, Erhan Uludag, Halil Yilmaz, Tawanda Zvarivadza, Zeenath Adam, Anzolette Saville.

Industry Advisory Council Members

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

SCHOOL OF MINING ENGINEERING

From left to right:

First Row: John Cruise, Tim Rowland, Cuthbert Musingwini, Thibedi Ramontja, Mzila Mthenjane.

Absent: Gordon Smith, Gys Landman, Mike Rogers, Vusi Maseko, Mike O'Hare, Peter Turner, Billy Mawasha, Wilco Uys, Ian Jandrell, Jim Porter.

Partners

A
AEL Mining Services
African Exploration and Mining Finance
Afrisam
Akita University, Japan
Andalusite Resources
Anglo American Chairman's Fund
Anglo American – New Vaal Colliery
Anglo American plc
Anglo American Thermal Coal
AngloGold Ashanti – Tau Tona Gold Mine
Anglo Operations
Anglo Platinum
Anglo Platinum – Bathopele and Thembelani mines
Anton du Kom University, Suriname
Association of Mine Managers of South Africa
Anglo Platinum – Unki Mine, Zimbabwe
Atlas Copco, Zimbabwe
AusAid
Aveng Mining (Grinaker LTA)

B
Barbrook Gold mine
Barloworld Equipment
Basil Read
BBE Consulting
Billiton Energy Coal South Africa (BECSA)
BHP Billiton
BME (Omnia Group)
Burnstone Development Trust

C
CAT
Career Wise
Centre for Energy, Petroleum and Mineral Law and Policy (CEPMLP), Dundee University
Centre for Mechanised Mining Systems
Centre for Sustainability in Mining and Industry
Chamber of Mines
China University of Mining and Technology (CUMT)
Coaltech 2020
COSMO Scholarship Fund
Cons-Murch Gravelotte Mine
Colorado School of Mines, US

D
Dean: Faculty of Engineering and the Built Environment, Wits University
De Beers Consolidated Mines
Department of Mineral Resources
Dessault Systemes

E
Engineering Council of South Africa (ECSA)
Eskom
Exxaro – Matla Coal Mine
Eyesiswe
ESRI-SA

F
Fossil Fuel Foundation

G
Gemcom GEMS
Gemcom Whittle
Geostatistical Association of Southern Africa
Gold Fields
Great Basin Gold

H
Harmony

I
IBM
Impala Platinum
International Mining for Development Centre
Institute of Mine Surveyors of South Africa
Instituto Superior Politécnico de Tete (ISPT), Mozambique
iProp

J
Japan International Cooperation Agency (JICA)
Joburg Mining Indaba
Joy Mining Global

K
Kearney Education Trust
Kumba Iron Ore – Thabazimbi Mine

L
Latona Consulting
Lesotho Government
London Metal Exchange
Lonmin Platinum
Lily Gold Mine

M
Mandela Institute
Matla Colliery
McGill University
Maastricht University, Netherlands

M

Mine Health and Safety Council
MinRED – Anglo American
Minerals and Education Trust Fund
MineRP Solutions
Mine Ventilation Society of South Africa
Mining Qualifications Authority
Murdoch University

N

Namdeb
National Student Financial Aid Scheme
New Concept Mining
Northam Platinum
National University of Sciences and Technology, Pakistan
National Mining University, Ukraine
Nottingham University, UK

P

Palabora Copper Ltd

R

R.E.D. Graniti SA
Resources4Africa
Royal Bafokeng Holdings

S

Samancor
Sandvik
Shaft Sinkers Shauenburg
Sasol
Sibanye Gold
Simang Mining
Sound Mining Solutions
Southgold Exploration
South African Colliery Managers' Association
Southern African Institute of Mining and Metallurgy
South African National Institute for Rock Engineering
SRK Consulting Canada
SRK Consulting South Africa
Student Mining Engineers Society
Swaziland Government
Society of Mining Professors
Sanlam

T

Tendele Coal Mining – Somkhele Mine
Two Rivers Platinum
TWP Consulting

U

United Nations Economic Commission for Africa
University of Johannesburg
University of Namibia
University of Western Australia
University of Newcastle (Australia)

V

Ventsim
Village Main Reef
Vibra-Tech
VUMA Software ADCO (Pty) Ltd
Vantage Goldfields Pty Limited

W

Western Australian School of Mines (WASM), Curtin University
Western Chrome Mines
Wits University Mining Engineers Association
World Bank
WorleyParsons Resources and Energy / TWP
WSE Stone Consulting
Wesizwe Bakubung Platinum Mine
Wits Enterprise
Wits Mining Institute

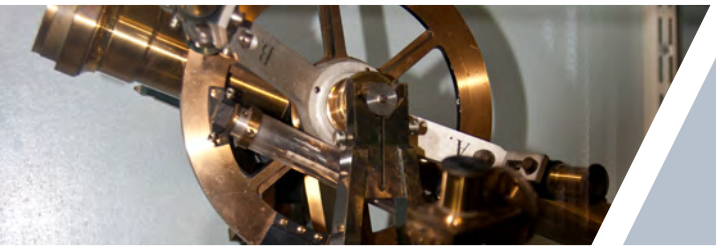
X

Xstrata Coal
Xstrata South Africa

Z

Zambian School of Mines
Zimasco
Zimbabwe Scholarship Fund
Zimplats

Partners Continued



External Examiners

A
Afeni, B
Andersen, D
B
Baartjes, N
Bals, A
Bartlett, H
Biffi, M
Bisnath, A
Borowitsh, Z
C
Camisani-Calzolari, F
Campbell, GA
Canbulat, I
Chamberlain, V
Chirimumimba, HP
Clark, I
Cohen, A
Cruise, J
D
De Jager, K
Deutsch, C
Docrat Y
Dohm, C
E
Esterhuizen, G
Falcon, R
Fleming, DR
G
Gardner, L
Goode, R
Grobler, H
H
Hebblewhite, BK
Hermanus, M
Herselman, S
Hull, D
J
Jarosz, A
Johnson, R A
Jooste, R
Jooste, M
Joughin, W
K
Karmis, M
Kasatuka, C
Katakwa, PT
Khumalo, BE
L
Limpitlaw, D
Lydall, M
M-N
Macfarlane, A
Madolo, N
Malan, DF
Mahomed, F
Maponga, O
Matunhire, I
McGill, J
Mitra, R
Mohanlal, K
Morgan, CJ
Moseki D
Mugodi, T
Mutemeri, N
Napier, J
Ndlovu, X
Nel, W
Nilsen, B
Njowa, G
Nong, S
O
Otto, J
Ozbay, M
P-R
Pheto, Z
Potvin, Y
Prins, C
Rangasamy, T
Rawlins, A
Roberts, D
Rocha, J
Rupprecht, S
Ruther, H
S-T
Saungweme, WZ
Sears, M
Schouwstra, R
Scott, B
Sellers, E
Sheer, TJ
Shires, SD
Skivington, P
Smit, J
Stacey, T
Steffen, O
Steyn, M
Stiefenhofer, J
Terbrugge, P
Tudor, D
V-Z
Vafai, F
Van Zyl, J
Vieira, F
Visser, J
Von Deutsch, C
Wagner, N
Walraven V
Watson, B
Wikinson, A
Woodhall, M
Zindi, L

Acronyms

ADU	Academic Development Unit
AMMSA	Association of Mine Managers of South Africa
CMMS	Centre for Mechanised Mining Systems
CSMI	Centre for Sustainability in Mining and Industry
CUMT	China University of Mining and Technology
DMR	Department of Mineral Resources
ECSA	Engineering Council of South Africa
DHET	Department of Higher Education and Training
FEBE	Faculty of Engineering and the Built Environment, Wits University
FFF	Fossil Fuel Foundation
GASA	Geostatistical Association of South Africa
HDSA	Historically Disadvantaged South African
IMSSA	Institute of Mine Surveyors of South Africa
ISPT	Instituto Superior Politécnico de Tete, Mozambique
LME	London Metals Exchange
METF	Minerals and Education Trust Fund
MHSC	Mine Health and Safety Council
MQA	Mining Qualifications Authority
MVSSA	Mine Ventilation Society of South Africa
NRF	National Research Foundation
NSFAS	National Student Financial Aid Scheme
NUST	National University of Sciences and Technology, Pakistan
SACMA	South African Colliery Managers' Association
SAIMM	South African Institute of Mining and Metallurgy
SANIRE	South African National Institute of Rock Engineering
SLRE	Senior Lecturer Research Equivalent
SMES	Students Mining Engineering Society
WASM	Western Australian School of Mines
WMI	Wits Mining Institute
WUMEA	Witwatersrand University Mining Engineers Association

SCHOOL OF MINING ENGINEERING

Class of 2015

From left to right:

First Row: Mr B Prout, Mr H Thomas, Mr M R Tlala, Mr P J Leeuw, Mr E Uludag, Mr T Tholana, Dr B Genc, Prof R C A Minnitt, Prof C Musingwini (Head of School), Prof H R Phillips, Dr H Yilmaz, Mr C K Chabedi, Mr C R Beaumont, Ms P N Neingo, Ms M Mpanza, Mr I D Ally, H K Khoali.

Second Row: C M Malatji, R N Mashele, A K Mabule, K K Mbhele, N R Molele, A G Ndou, S S Binta, D J Moagi, A M Mphaphuli, J K Ramabu, M A Moganedi, K L Motshepe, Y L Ikaneng, T Matjila, N B Vuma, V C Netshilaphala.

Third Row: K K Mahapa, S S Tema, L J Maimela, J L Segoale, N E Mahlangu, M P Nobela, R P Tlhoaele, L Majola, L Mbuqa, V N Ngubane, C H Kubayi, M P Mametja, Z E Lekoto, T S Sepuru, N Q Ngwenya.

Fourth Row: A A Gqada, N S Mlotshwa, T D Mametja, N Mutshinya, N L Ntangeni, K Mashoene, B Motsaathebe, K L Moepi, C Chauke, M T C Masilo, T Ngubane, K P Knight, M E Malebe, N Q Ngwenya

Fifth Row: M H Mpe, N Jiyane, K G Mathebula, T Chikande, M C Hlongo, P J Selepe, I H Mbodi, C K A Khumalo, D R Ramaridili, S A Madanda, P Mopai.

Sixth Row: E Munzhedzi, H D Mabunda, M C Moswatse, M Tshukudu, S M Valoi, T C Lesupi, L J Ramashia, B Khosa, T C Mathonsi, P C Musehane

Seventh Row: G G Sithole, H S Magampa, S Bilitane, R K Chitsiku, S Mbonani, T J Maphosa, T Poffu, K T Lebopo, H K Mdluli.

Absent: T Oshokoya, C Birch, D Borman, Prof F Cawood, D Matlou, M Mochubele, S Nhleko, T Zvarivadza.

Gordon Harris Photographic cc. Tel: 012 430 3725

Organogram – April 2016

SCHOOL OF MINING ENGINEERING

HEAD OF SCHOOL
Professor Cuthbert Musingwini

SECRETARY TO HOS
Mrs Sonja Douman

VISITING / HONORARY STAFF

HONORARY / VISITING PROFESSORS

Prof Emeritus TR Stacey
Prof Emeritus HR Phillips
Prof N van der Merwe
Prof C (Ina) Dohm
Adj. Prof J Cruise
Adj. Prof B van der Steen
Adj. Prof C Prins
Adj. Prof H Mtegha
Adj. Prof J Kuijpers
Ass. Prof D Malan
Ass. Prof GL Smith
Ass. Prof EJ Sellers

HONORARY SENIOR LECTURERS

Adv J Rocha
Dr S Ramparsad

VISITING SENIOR LECTURERS / LECTURERS

Mr A Macfarlane
Mr M Woodhall
Mr A Bals
Dr J McGill
Mr D Munro
Mr L Zindi
Mr JG Taylor

PROFESSORS

Prof Frederick Cawood
Prof Richard (Dick) Minnitt
Ass. Prof Bekir Genc

SENIOR LECTURERS

Dr Halil Yilmaz
Mr Barry Prout
Mr Dave Borman
Mr Carl Beaumont
Mr Clinton Birch
Mr Erhan Uludag
Mr Huw Thomas
Mr Paseka Leeuw
Mr Kelello Chabedi

LECTURERS

Dr Siva Rungan
Mr Idris Ally
Mr Mothusi Mochubele
Ms Tomi Oshokoya
Mr Mpho Tlala
Mr Tinashe Tholana
Mr Tawanda Zvarivadza
Ms Daisy Matlou
Ms Paskalia Neingo
Mr Sihesenkosi Nhleko
Ms Lisa Chanderman

SUPPORT STAFF

Zeenath Adam	– Admin. Manager
Andrew Carpede	– Principal Technician
Lindy Dabrowski	– Bookkeeper
Phila Gamedza	– Secretary
Anzolette Saville	– Postgrad Adm. Officer
Musa Cebekhulu	– Senior Technician
Joseph Negondeni	– Workshop Assistant
Paulos Sibeko	– Workshop Assistant
Jacob Mabeba	– Messenger
Alvinah Madonsela	– Clerical Assistant

DIRECTOR CSMI
Adj. Prof Caroline Digby

HONORARY STAFF

Ass. Prof D Limpitlaw
Adj. Prof K de Jager
Adj. Prof May Hermanus
Ass. Prof Nellie Mutemeri

SENIOR LECTURERS

Mrs N Coulson
Mr D Bakker

LECTURERS

Mrs I Watson
Ms Pontsho Ledwaba

SUPPORT STAFF

Ms Lileen Lee – Course co-ordinator

VISITING ASSOCIATES

Ms E Hoadley
Ms Lois Hooge
Mr Paul Kapelus
Mr Jean Didier L Nzinga
Ms July Stacey
Mr Andre Stockhusen
Dr Sizwe Phakati
Mr Dion Marais
Mr Eugene Dabner
Mr Gys Rautenbach
Mrs Janeen Ferguson
Mr Johann Beukes
Mr Terrence Parker
Mr Reg de la Hunt
Mr Ed O' Keefe
Ms Alison McCallum
Mr Hilton Johnson
Ms Noleen Dube

VISITNG LECTURERS

Mr Neal Westgate (Gr. EN.08

Director CMMS
Dr Declan Vogt

VISITING PROFESSOR
Prof John Sheer

OFFICE-BASED STAFF

Ms Debra Gallagher
Ms Ana-lucia Cheon
Mr August Lamos
Mr Stanley Marokane
Mr Mark Silverwood

VISITING PROFESSORS/ ASSOCIATES

Adj. Prof Zvi Borowitsh
Adj. Prof Jim Porter
Adj. Prof Alex du Plessis
Prof Gabriel Lodewijks
Prof Craig Wheeler
Prof Kenneth Williams
Dr David Mills
Mr Edward Birch
Dr Tobias Krull
Mr Rod Pickering
Mr Mark Holton

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Looking skyward – from its base in the Chamber of Mines building on Wits University's West Campus, the School of Mining Engineering is creating a digital mining environment to help chart the industry's future into the 21st century.

UNIVERSITY OF THE
WITWATERSRAND,
JOHANNESBURG

SCHOOL OF MINING
ENGINEERING

Physical address:
Wits School of Mining Engineering, Second Floor,
Chamber of Mines Building, West Campus,
Wits University, Enoch Sontonga Road, Braamfontein, 2017

Postal address:
Private Bag 3, Wits, 2050

Contact details:
Website: www.wits.ac.za
Tel: +27 11 717-7403 | Fax: +27 11 339-8295