



ANNUAL REPORT **2014**



SCHOOL OF MINING
ENGINEERING



UNIVERSITY OF THE WITWATERSRAND,
JOHANNESBURG

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 the bronze statue of the 'Unknown Miner' - commemorating all those who have contributed to this vital industry.



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Cover photo:

The life-size model mining stope panel in the basement of the School helps students visualise a real mine



**SCHOOL OF MINING
ENGINEERING**

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VISUALISING MINING'S FUTURE

This life-size mining stope panel in the basement of the Wits School of Mining Engineering's building on West Campus helps students learn about stoping activities through a better visualisation of how a real mine looks.

Handed over by sponsors New Concept Mining (NCM), the stope panel is part of a range of simulated facilities sponsored and developed in partnership with companies active in the mining sector such as Aveng, Gold Fields and Sibanye Gold.

Measuring some seven metres long, the model stope was constructed from a metal framework, mesh and concrete, and is the work of sculptor Russell Scott. He used various materials and techniques including hessian, hand-packed cement and layers of paint to achieve the realistic effect of a working stope face in an underground platinum mine.

The panel dips at 10 degrees, has a stoping width of one metre and extends some three metres on strike. It has been equipped with various items of support infrastructure to demonstrate to students the variety of technologies employed underground. These include timber props, timber packs, rockbolts and safety nets suspended near the working face.

Other simulated facilities include a mine tunnel, mine shaft steel work and a lamp room, all forming part of the 'digital mine' environment which is providing invaluable tools for learning and research, bringing a real mine experience to mining engineering students at Wits.



MINING: AT THE HISTORICAL HEART OF WITS UNIVERSITY

The School of Mining Engineering has a proud and unique position at 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 renamed the Transvaal Technical Institute. It became the Transvaal University College in 1906 and four years 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.

Prince Arthur of Connaught, Governor-General of the Union of South Africa, became the University's first Chancellor, and Professor Jan H Hofmeyr its first Principal. Building began on a site in Milner Park donated by the Johannesburg municipality.

Today, the School of Mining Engineering is recognised



Kimberley School of Mines 1901

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 students to its courses.

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 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, which 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 mineral economic principles.

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. Wits Mining graduates are up to these challenges and the School of Mining Engineering at the University of the Witwatersrand is known and respected internationally for the quality of its programmes and graduates.

Now one of the world's top schools, Wits Mining traces its distinguished history back to the diamond fields of Kimberley and was the original building block for Wits University itself



The contribution made by Professor of Mine Surveying Fred Cawood in his five-year term as Head of the School of Mining Engineering can only be described as outstanding.

ACKNOWLEDGMENT OF THE CONTRIBUTION MADE BY PROFESSOR FRED CAWOOD

Professor Cawood has lifted the role of the School and its functioning to new levels, focusing on the pursuit of 10 strategic goals including vital topics like student-staff ratios, student throughput, research output and NRF ratings.

The vision of a 'digital mine' is of particular interest to him, and it has found form in a number of projects that he has personally overseen from inception, aiming to bring underground control and monitoring of mining operations into the digital age of satellite communication.

His period of tenure saw a substantial increase in undergraduate and postgraduate student numbers, requiring him to manage a total student body of 800-900 students per annum. This was in addition to overseeing two research centres – the Centre for Mechanised Mining Systems (CMMS) and the Centre for Sustainability in Mining and Industry (CSMI).

Apart from his administrative duties, he continued his extensive involvement in teaching across a wide spectrum of students from those seeking certificate qualifications to postgraduate studies. His subject areas cover the roles of evaluators and surveyors in mineral resource management, as well as mine valuation and economics, mine surveying, mining graphics and design, and introduction to mining.

As a C1 NRF-rated scientist, he is actively engaged in contract research assisting African states with their mineral policy, fiscal and mining investment strategies. He is still actively engaged in assessing and supervising MSc and PhD candidates.

In his 17 years with the School, he supervised seven PhD students and 13 MSc students – this while producing 50 publications, 44 conference papers and 24 reports on his own research. This is a truly outstanding record of academic achievement. In the last five years alone, while managing the School, Professor Cawood has produced 44 academic articles published in accredited journals, conference proceedings, mining magazines, research reports, symposium addresses, seminars and lead editorials.

Professor Cawood began his association with Wits University in 1993, registering for the Graduate Diploma in Engineering in the field of Mineral Economics. He went on to complete a Master's degree in 1997, and then a PhD degree in 2000 on determining the optimal rent for South African mineral resources. The implications of this research are still being felt today, as aspects of his findings were used by the SA Treasury to establish mining royalty payments.

His career started at Gold Fields in 1981 as Mine Surveyor, moving to the Department of Minerals and Energy in 1989. He began teaching undergraduates in the areas of mine valuation and economics and mine surveying, and joined the School in 1999. He completed an LLM degree in Mineral Law and Policy from Dundee University in Scotland in 2009.

A remarkable aspect of Professor Cawood's academic achievements is not that he passed most of his qualifications with distinction, but that they were all through either distance learning or correspondence learning; not once in his career has he ever registered as a full-time student. Well done, Professor Cawood!

It is with a sense of achievement that I read this report as a reflection of the five years during which I led a special group of staff to influence the future of young talent.

Our Scorecard Achievements show progress; although some goals have not yet been achieved, it is vital to have goals and a sense of direction. This gives us the opportunity to change – and that is mostly what I tried to do during my term.

I want to thank the following persons, companies and organisations from the bottom of my heart – for their support, encouragement and criticism:

- My family, who stood with me during a particularly difficult time in our personal lives.
- Wits University, for the opportunity to head a School that is recognised internationally for its excellence – in particular, the two Deans to whom I reported: Professors Ian Jandrell and Beatrys Lacquet.

MESSAGE FROM OUTGOING HEAD OF SCHOOL: PROFESSOR FRED CAWOOD

- My predecessors – especially Professor Huw Phillips, with whom I share the same ideas on many things. Despite our occasional disagreements, there remained a deep respect and a genuine sense of doing what was right.
- The academic, support, laboratory and centre staff of the School, who are often described as ‘difficult’. To be honest, I like what is perceived as ‘difficult’; such individuals are usually special and competent, and they keep you in check.
- The students, who are my real ‘employers’, and in particular the Wits University Mining Engineers Association (WUMEA).
- The sponsors of the School, whose support is profound; the mining industry has tough leaders, but their hearts melt when it comes to education and student development. The Minerals Education Trust Fund (METF) and Mining Qualifications Authority (MQA) promote staff stability and development at mining schools. Five years ago, Gold Fields announced a substantial donation to the University, and its CEO Mr Nick Holland specified certain amounts to go directly to the School of Mining Engineering. Two other mining executives took a personal interest in what I

was doing at Wits: Mr Martin Hobbs, during his time as MD at Aveng Mining, and Mr Neal Froneman, the CEO of Sibanye Gold.

I must congratulate the University on appointing Professor Cuthbert Musingwini as the new Head of Mining at Wits; he will ably take the School to the next level. Significant changes to mining will require different skill sets for executives, managers and workers, and relevance of programmes will become the measure of success for mining schools.

The School should identify national and international opportunities to support the larger technology endeavor to change the future of mining. Meaningful mining R&D is more than a dream; through a partnership approach, it can become real.



As the School continues its proud history as a leading mining school internationally, I am humbled by the vote of confidence to lead the School for a quinquennial term.

MESSAGE FROM INCOMING HEAD OF SCHOOL: PROFESSOR CUTHBERT MUSINGWINI

With the support of a committed team, delivering on our new five-point Strategic Plan, we can secure a good future for the School by building on its solid past.

As the eighth Head of School in its 119 years of existence, I sincerely acknowledge the contribution of my predecessors in building the School's strong reputation for excellence. 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".

It is my hope that the structural re-alignment of the School will enable it to better serve the needs of our faculty, the university and the mining industry at large.

This annual report closes out the 10-goal strategic plan under the leadership of Professor Cawood, while introducing five strategic initiatives for 2015-2019:

- **Strategic Initiative 1: Increase normalised research productivity.** This will be executed through an integrated approach to research, with staff undertaking research within three identified themes. Structurally, a new School Research Committee has now been established under the leadership of the School's postgraduate coordinator to proactively engage with this initiative.
- **Strategic Initiative 2: Improve teaching and learning effectiveness.** The primary aim of this initiative is to help increase throughput by addressing student attrition. Structurally, a new School Teaching and Learning Committee has now been established

to drive this initiative under the leadership of the undergraduate coordinator.

- **Strategic Initiative 3: Enhance the academic project support system.** This initiative will focus mainly on: student support systems, such as mentoring; and staff support systems, such as full understanding of policies and procedures that ensure a smooth functioning School. Ultimately, this initiative speaks to a transformed environment in which both staff and students will feel welcome, develop a sense of belonging and can see that the School sets them up for success.
- **Strategic Initiative 4: Increase the visibility of the School and its staff.** Primarily, this initiative will ensure an increased staff footprint in professional bodies, and will raise the profile of the School within the mining industry. Structurally, a new Public Relations Committee has now been established to drive this initiative.
- **Strategic Initiative 5: Review and establish internal and external collaborations.** One such collaboration is a formal Heads of Mining Schools Forum for the country's mining schools.

I am confident that we can continue to make significant strides as we nurture and seek 'win-win' partnerships within the industry we serve – locally and internationally.

HIGHLIGHTS FOR 2014

The highlights for 2014 can be summarised as follows:

1. There was continued progress of the Digital Mine (DigiMine) project, with the addition of a mock-up narrow reef stope facility on the School's premises.
2. There was one resignation and a retirement on the academic staff, and one resignation from support staff; immediate replacements maintained the full staff complement.
3. Full-time PhDs and Professors in the School remained at eight and five respectively.
4. Female student numbers in the undergraduate programme stabilised at the mid-30% level (it was 37% at the beginning of 2015).
5. After a curriculum review of the undergraduate programme in January 2014, the School's Industry Advisory Council endorsed the review outcome.
6. At a certificate level, the School continued to run two highly successful programmes: Mineral Resource Management and Mine Planning.
7. Our partnerships with Gold Fields Limited, Aveng Mining and Sibanye Gold continued well, supporting mock-up facilities to aid experiential learning.
8. Through their subventions and lecturer support schemes, the Minerals Education Trust Fund (METF) and the Mining Qualifications Authority (MQA) have become our mechanism, firstly, to prevent high academic staff turnover and, secondly, to develop the future professorial staff. This support is arguably the most significant and strategic investment in mining education internationally.
9. We hosted Council/Committee meetings of the South African Institute of Mining and Metallurgy (SAIMM), the Association of Mine Managers (AMMSA), the South African Colliery Managers' Association (SACMA), the South African National Institute of Rock Engineering (SANIRE), the Institute of Mine Surveyors of South Africa (IMSSA) and the Mine Ventilation Society of South Africa (MVSSA) - demonstrating our close links to the industry we serve.
10. Our contribution to mining skills was strong, with numbers graduating from the undergraduate programme increasing from 53 in 2013 to 72 in 2014; the School's output of research degrees (at MSc and PhD level) has steadily improved since 2009.
11. With improved research output, a number of staff attended international conferences to present papers.
12. Professor Nielen van der Merwe and Mr Markus Mathey (PhD student) were awarded the Salamon Prize by the SANIRE, for the best paper published in 2013/14. Mr Mathey also won the Institute's Ortlepp Prize for the best paper in 2013/14 by a researcher younger than 35 years.
13. Professor Dick Minnitt was joint winner, with Dr Hugh Bartlett and Mr Lukas Korff, of the SAIMM Silver Medal in 2014 for the paper, 'The allocation of gold production from multiple shafts feeding a common treatment plant using run-of-mine sampling of ore deliveries' - published in the Journal of the SAIMM, Vol. 114, No. 1, January 2014, pp. 109-120.
14. Mr Bekir Genc was a joint winner, with Mr Alan Cook, of SACMA's best paper award for their paper entitled 'Spontaneous combustion liability of South African coals' - published in the December 2013 edition of the MVSSA journal.
15. Professor Fred Cawood received a C1 rating from the National Research Foundation (NRF).

Solid partnerships with industry stakeholders are helping the School to constantly raise the bar in both teaching and research

SCORECARD ACHIEVEMENTS IN 2014

This scorecard marks the final year of the strategic 10-goal plan set out for the five-year term of Professor Fred Cawood; once again, the School scored well against

its objectives and made good progress in applying corrective action where necessary.

1 - Not meeting target 2 - Meeting target

GOAL	DESCRIPTION	2014 SCORE	CORRECTIVE ACTION
GOAL 01	Reduce student-to-staff ratios	02	Faculty added lecturer post to the School.
GOAL 02	Retain one final-year student as a grant-funded associate lecturer	02	
GOAL 03	Increase the percentage of fully-sponsored students in the School	02	
GOAL 04	Manage student and staff populations towards acceptable demographic ratios	01	Market mining programme to under-represented groups.
GOAL 05	Review undergraduate, postgraduate and certificate programmes for relevance on a five-yearly basis	02	
GOAL 06	Build strong partnerships (internal and external)	02	
GOAL 07	Retain ECSA accreditation of the undergraduate programme	02	
GOAL 08	Improve student throughput in all programmes	01	Better selection of first-year students resulted in a reduced class size for 2015
GOAL 09	Improve research output through research degrees and publications	02	
GOAL 10	Increase the number of NRF-rated staff	02	

GOAL 01

REDUCE STUDENT-TO-STAFF RATIOS

Since 2011, the School has enjoyed a full staff complement while experiencing a low staff turnover. Timeous replacements have been made for the few retirements and resignations. The Mining Qualifications Authority (MQA) and the Minerals Education Trust Fund (METF) deserve credit in assisting the School to stabilise its staff complement through the historically disadvantaged South Africans (HDSA) Staff Development Programme and the salary subvention scheme, respectively.

Through their support, it is possible for the School to continue to attract highly qualified and experienced professionals while developing the next generation of academics.

Staff who left the School during 2014 were:

- Mr J Maans: Senior Laboratory Technician (resigned effective end-September 2014)
- Ms S Naidoo: Lecturer (resigned effective end-December 2014)
- Dr H Mtegha: Senior Lecturer (retired effective end-December 2014)

The School is fortunate that Professor RCA Minnitt (JCI Chair of Mineral Resources and Reserves), who reached retirement age in early 2014, agreed to defer his retirement by a further three years. Professor Emeritus HR Phillips (Chair of Mining Engineering) and Professor N van der Merwe (Centennial Chair of Rock Engineering) continued to serve the School on post-retirement appointments. Professor Emeritus TR Stacey, a previous Centennial Chair of Rock Engineering, continues to actively supervise research and teach in the School at postgraduate level.

Mr T Tholana joined the School in September 2014 to fill an additional position awarded to the School by the Dean. In January 2015, Mr H Thomas joined the School from Anglo American to replace Ms S Naidoo. Mr B Cebekhulu replaced Mr J Maans in January 2015. Mr P Leeuw was appointed Senior Lecturer from January

2015 and transferred from the MQA Staff Development Programme to replace Dr Mtegha. The School was able to engage Dr Mtegha as a Visiting Adjunct Professor after his retirement.

The future of the School is secured through maintaining a pipeline of young staff developing as academics. It is commendable that in 2014 the number of full-time PhDs and Professors on staff stood at eight and five respectively. The following academic staff members are congratulated for their notable achievements in 2014:

- Ms P Neingo, for obtaining an MSc degree
- Professor C Musingwini, for promotion from Associate to Full Professor, effective July 2014
- Professor RCA Minnitt, for jointly receiving – together with Dr H Bartlett and Mr L Korff – the SAIMM Silver Medal in 2014 for their paper published in the Journal of the Southern African Institute of Mining and Metallurgy
- Professor FT Cawood, for receiving a C1 rating from the NRF

The School continues to closely monitor and manage its student enrolments in order to match existing staff capacity. Enrolments in the postgraduate programme increased slightly from 175 in 2014 to 185 at the start of the 2015 academic year. This number has since increased to 201 for 2015.

The new first-year enrolments (excluding repeats) were up from 151 in 2014 to 197 in 2015. In total, undergraduate numbers increased from 587 in 2014 to 648 at the start of the 2015 academic year. Due to five subsequent de-registrations (mainly for financial reasons), the total undergraduate numbers dropped slightly to 643.

At a total student head count of 844, the School remains the largest mining school in the English-speaking world. The overall student to (full-time) academic staff ratio stabilised at around 33 students per full-time lecturer in the past five years.

(Continued on page 12)

UNIVERSITY OF THE WITWATERSAND

School of Mining Engineering

Staff 2015



From left to right:

FIRST ROW: Mzila Mthenjane, Anzolette Saville, Richard Minnitt, John Cruise, Cuthbert Musingwini, Ian Jandrell, Caroline Digby, Huw Phillips, Mamokete Madonsela, Lileen Lee

SECOND ROW: Tinashe Tholana, Paseka Leeuw, Sihe Nhleko, Halil Yilmaz, Lindy Dabrowski, Phila Gamedza, Irene Mansour

THIRD ROW: Mona Shah, Ingrid Watson, Jacob Mabeba, Idris Ally, Clinton Birch, Nancy Coulson, Sonja Douman

FOURTH ROW: Mpho Tlala, Dave Borman, Carl Beaumont, Erhan Uludag

ABSENT: Frederick Cawood, Kelello Chabedi, Bekir Genc, Daisy Matlou, Mothusi Mochubele, Mbali Mpanza, Paskalia Neingo, Tomi Oshokoya, Barry Prout, Thomas Stacey, Huw Thomas, Tawanda Zvarivadza, Andrew Carpede, Musa Cebekhulu, Joseph Negondeni, Dirk Bakker, Siva Rungan, Paulos Sibeko

The GDE and MEng enrolments have been managed down so that, by the end of 2015, no students are registered in these programmes – in order to comply with the

requirements of the Higher Education Qualification Sub-Framework (HEQSF) by 2016. This process concomitantly triggered growth in the MSc numbers.

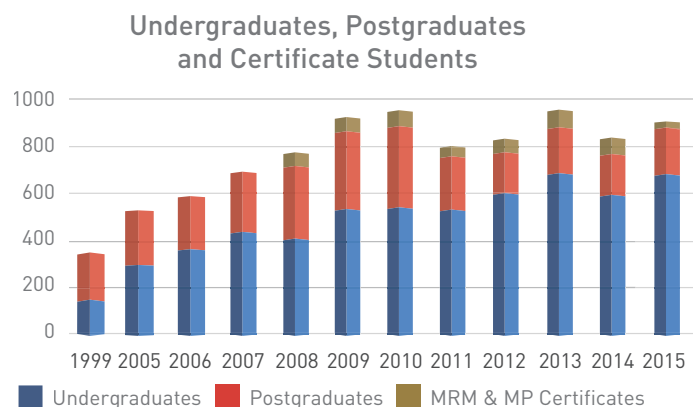
Table 1a: Wits School of Mining Engineering student head count, 2005 to 2015

Year	1st Yr	2nd Yr	3rd Yr	4th Yr	Grads	Under Grads	GDE	MEng	MSc	PhD	Post Grads	Total UG & PG	MRM & MP Cert
1999	43	25	33	26	27	146	123	66	8	197	343		
2005	103	90	46	29	33	268	144	59	17	10	230	498	
2006	137	91	75	33	25	336	149	48	18	16	231	567	
2007	158	67	90	66	57	381	174	49	17	16	256	637	
2008	153	68	94	52	47	367	206	62	23	14	305	672	54
2009	223	89	79	82	62	473	199	85	31	14	329	802	61
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		643	3	2	176	20	201	844	25

Note: The first-year class size is influenced by the new intake target (150 students), as well as the many returning first-year students from the year before (to repeat subjects) who join the new first-year intake

Table 1b: Student-to-academic-staff ratios

Year	Full-time academic staff	Total students	Student-to-staff ratio
2009	14	802	57
2010	19	808	42
2011	21	695	33
2012	20	704	35
2013	22	825	37
2014	24	762	32
2015	25	844	33



Key: Excludes the certificate students, part-time staff, honorary staff, visiting staff, and staff from the Centre for Sustainability in Mining and Industry (CSMI) and the Centre for Mechanised Mining Systems (CMMS).

The student-to-staff ratio has successfully been kept steady at 33:1 for the 2015 academic year

The School continued to successfully run the two NQF Level 6 Certificate programmes in Mineral Resource Management (MRM) and Mine Planning, although numbers have somewhat declined in 2015 due to the difficult economic conditions being experienced globally by the mining industry. These qualifications play a pivotal role in the upskilling of practitioners in the mining

industry. Plans are still in place to gradually extend this service offering to include Mine Ventilation and Climate Control, Rock Engineering and Mine Surveying. The certificate programmes are offered through Wits Enterprise and coordinated by Mr Clinton Birch from within the School.



RETAIN ONE FINAL-YEAR STUDENT AS A GRANT-FUNDED ASSOCIATE LECTURER

As part of developing young academics, the School initiated a programme in 2010 to target and retain one of the top final-year students as a grant-funded associate lecturer to pursue an MSc degree. This was in addition to the associate lecturer positions on the MQA Staff Development Programme. An associate lecturer position is for a period of three years to allow the incumbent sufficient time to complete the MSc degree.

have been hosted through this initiative. Due to staff development and movements, changes have inevitably occurred from year to year. An associate lecturer may transfer to an MQA associate lecturer position or leave for a position in industry. Initial funding for this initiative was made available by the Dean; subsequently, the Gold Fields donation allowed the School to offer a development position for three consecutive years.

Between 2010 and 2014, a total of five associate lecturers

Table 2: New development positions at Wits Mining

Year	Full-time staff*	Name
2009	0	-
2010	1	Ms Charlotte Nangolo – Funded by the Dean
2011	2	Ms P Neingo – Funded by Gold Fields
2012	2	Ms P Neingo – Funded by Gold Fields Ms C Nangolo was replaced by Ms M Zulu
2013	1	Mr H Mukuwiri – postgraduate scholarship funded by Gold Fields
2014	1	Mr S Nhleko appointed after securing a DoHET grant to December 2014, and transferred to MQA at the start of 2015.
2015	0	-

* Excluding MQA-funded positions



One of the top students in the school, Ms Paskalia Neingo, was retained as a grant-funded associate lecturer

A School programme to retain a top final-year student as a grant-funded associate lecturer has allowed the hosting of five incumbents during the period 2010 to 2014

In 2012, Ms Paskalia Neingo and Mrs Mbali Mpanza (nee Zulu) were attracted to this position, but soon transferred to the MQA programme. Sibanye Gold accommodated Ms Neingo to work towards a rock breaking certificate, and she completed the MSc degree in 2014. The remainder of the Gold Fields donation earmarked for Ms Neingo was used in 2013 to offer Mr Hilton Mukuwiri a one-year scholarship to continue with his MSc studies. He left the programme at the end of 2013 to join industry.

The DoHET made funding available in 2013 for the recruitment of an associate lecturer and Mr Sihe Nhleko was appointed to the position. Since then, the Dean made available Council funding to extend this one-year grant to December 2014. Mr Nhleko transferred to an MQA associate lecturer position at the start of 2015 as Mr Paseka Leeuw transferred from the MQA programme to take up a Council-funded position in January 2015.



INCREASE THE PERCENTAGE OF FULLY-SPONSORED STUDENTS IN THE SCHOOL

Mining companies, the National Student Financial Aid Scheme (NSFAS) and the Mining Qualifications Authority (MQA) remained the three largest sponsors of the School's undergraduate students in 2014.

The School continued to receive support through generous donations to assist needy and deserving students without bursaries but requiring some form of financial assistance. The following companies and organisations were helpful in this regard: Sibanye Gold,

MQA, BME (Omnia Group), SAIMM, and the Wits University Mining Engineers Association (WUMEA).

Traditionally, the percentage of students without bursaries decreases with higher years of study. In the past five years, there has also been a gradual increase in the number of students receiving bursaries from non-mining companies and provincial governments. The table below shows the percentage of students sponsored by mining companies at the start of the academic year,

Table 3: Analysis of bursaries for first-year students upon arrival at the School, and those benefitting from the project for needy and deserving students

Year	Sponsored by mining companies (%)	Additional sponsorships facilitated by the School
2010	7% + 6%	13 students funded by the LME
2011	21% + 21%	14 students funded by the LME, 14 by DMR and 22 by Eskom
2012	15% + 17%	12 students funded by the LME, 6 by BME (Omnia Group) and 22 by SRK
2013	10% + 20%	5 students funded by BME (Omnia Group), 4 by SAIMM, 7 by WUMEA, and the balance by MQA and mining companies
2014	13% + 10%	MQA, BME Omnia Group, SAIMM and WUMEA
2015 (start)	6% + *	

* Final number will only be available at the end of 2015

plus the percentage that received bursaries from mining companies during the remainder of the year.

At the start of 2015, according to registration and School questionnaire information, the percentage of students that did not have bursaries or had bursaries from non-mining companies were as follows: 66% of first-year students; 64% of second-years; 59% of third-years; and 55% of fourth-years.

A non-financial challenge that the School faces among students without bursaries (or with bursaries from non-mining companies) is that they often struggle to find the compulsory vacation work that is required in order to graduate. The School has been fortunate to have partnerships that helped in the placement of unbonded students for vacation work. These partnerships have been mainly with Sibanye Gold and Anglo American Platinum's School of Mines.



Indicative of the challenging economic conditions facing the mining sector, the percentage of students sponsored by mining companies fell again in 2014 – for the third consecutive year. However, there was an increase in the number of students receiving bursaries from non-mining companies and provincial governments.

City of Gold: The Wits School of Mining Engineering is situated in the Chamber of Mines Building at the University of the Witwatersrand in Johannesburg, South Africa



GOAL 04

MANAGE STUDENT AND STAFF POPULATIONS TOWARDS ACCEPTABLE DEMOGRAPHIC RATIOS

The total undergraduate student body numbered 648 at the start of the 2015 academic year but has since reduced to 643 due to five de-registrations (mainly for financial reasons). The proportion of female students in the undergraduate programme rose slightly but remained in the mid-30% band (37% in 2015). The proportion of white students (at just 0,5%) remains a challenge for the School going forward, as demographics should ideally mirror those of the workplace and country. Despite minor year-on-year fluctuations, international students constitute about 10% of the student body while postgraduate students account for about 20%.

The School Employment Equity (EE) Plan developed in 2010 has been applied during interviews over the past five years to fill vacancies with staff from designated groups. The major barrier for professionals from the designated groups to join academia has been remuneration, as there are large differences in salaries and benefits between

the university and elsewhere. Remuneration remains a challenge for the university as it is always difficult to compete, especially with the private sector.

However, the School is very fortunate in that most academic staff receive a salary subvention from the METF, which helps to reduce the gap between university and industry salaries. In addition, the MQA has fully sponsored seven full-time academics from designated groups at equally competitive salaries, and continues to do so in 2015. The MQA grant-funding makes it possible for staff from designated groups to fill vacancies that arise in the School from time to time.

The School plans to gradually grow the percentage of staff with PhDs to the Wits target of 75%. The School's workload is therefore allocated in a way that assists academics to complete their MSc and PhD qualifications. In addition, interventions such as mentoring ensure that higher degrees are obtained and publications are undertaken.

Table 4: Transformation at Wits Mining School

	Full-time academic staff*									Undergraduate students								
	WHITE			BLACK**			TOTAL			WHITE			BLACK**			TOTAL		
	M	F	Tot	M	F	Tot	M	F	Tot	M	F	Tot	M	F	Tot	M	F	Tot
2009	10	0	10	6	1	7	16	1	17	2	0	2	304	167	471	306	167	473
2010	10	0	10	6	1	7	16	1	17	7	1	8	305	151	456	315	153	468
2011	10	0	10	7	3	10	17	3	20	5	0	5	300	168	468	305	168	473
2012	10	0	10	7	3	10	17	3	20	3	0	3	335	193	528	336	193	531
2013	10	0	10	7	5	12	17	5	22	4	1	5	400	229	629	404	230	634
2014	11	0	11	10	5	15	21	5	26	2	0	2	379	204	583	383	203	587
2015***	11	0	11	9	4	13	20	4	24	3	0	3	404	241	645	407	241	648

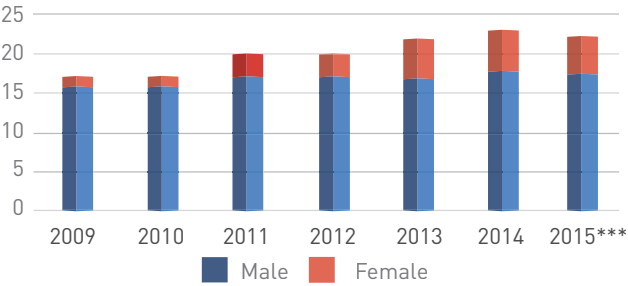
* Source: School EE Plan (as at March 2015)

** Black includes African, Indian and Coloured

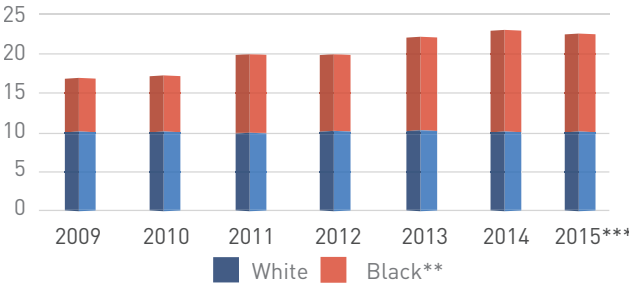
*** At start of 2015

The proportion of female students in the undergraduate programme remained in the mid-30% band, while salary subventions are helping maintain the number of HDSA staff

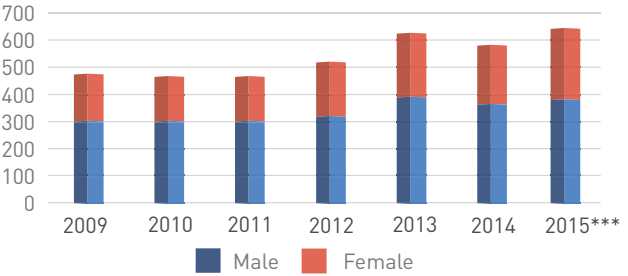
Full-time Academic Staff*



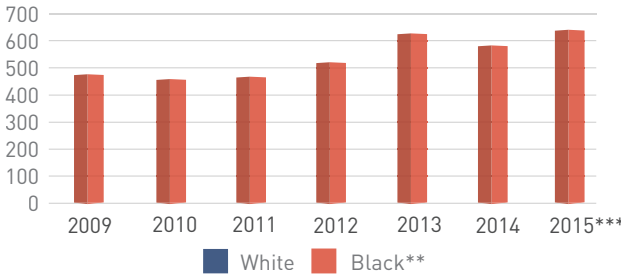
Full-time Academic Staff*



Undergraduate Students



Undergraduate Students



GOAL 05

REVIEW UNDERGRADUATE, POSTGRADUATE AND CERTIFICATE PROGRAMMES ON A FIVE-YEARLY BASIS

In the 2012 accreditation visit by the Engineering Council of South Africa (ECSA), the undergraduate programme was accredited for the regular five-year cycle from 2012-2017. The School's Industry Advisory Council (IAC) was consulted in 2013 on curriculum relevance of the undergraduate programme and gave guidance in this respect.

The School then ran a two-day workshop in January 2014 to review the undergraduate curriculum with respect to subject content flow, ECSA outcomes and input from the IAC. The outcome of that workshop was that the curriculum was still relevant and no major changes were required. Discussions around having a common first year (CFY) remains an agenda item for the Faculty.

A new development is that the Faculty is exploring '3 + 2' models with a few universities in the country to allow their three-year BSc graduates to enter our engineering programmes and study for a further two years to complete the BSc Engineering degree. It is still too early to say when these arrangements are likely to apply to the mining engineering degree programme; once

more information is available, the School will report on progress.

The School restructured its postgraduate programme in 2010 for better throughput and research output. The most important change was the grouping of subjects to clearly define specialisations, so that the subjects lead naturally to focused MSc (50:50) research degrees. Besides being in the focused areas of specialisation, the individual MSc subjects are available as either Certificates of Attendance or Competence at NQF Level 9 – to cater (for professional development purposes) to participants that register as occasional students. The 12 areas of specialisation available in the School are:

- Mineral Economics
- Rock Engineering
- Mining Geology (in partnership with the School of Geosciences)
- Mineral Resources Management
- Mineral Resource Evaluation (in partnership with the Geostatistical Association of South Africa)

Table 5: Programme reviews

Year	Programme	Remark
2011/2	Certificate	Approval and implementation of Mine Planning Certificate
2011/2	Postgraduate	Workshops in 2010, implementation 2011/2
2011/2	Undergraduate	CFY discussions in 2011; ECSA accreditation visit in 2012
2012/3	Undergraduate	CFY discussions; workshop curriculum for relevance
2012/3	Postgraduate	Continue with implementation of new specialisations
2013/4	Postgraduate	Continue with implementation of new specialisations. Mineral Asset Valuation and Mine Planning and Optimisation introduced as two new specialisations at MSc level
2013/4	Undergraduate	Relevance check on subject matter and content analysis at two Industry Advisory Council meetings
2014/5	Undergraduate	Workshop on relevance check on subject matter and content analysis
2014/5	Postgraduate	Phasing out GDE and MEng by end of 2015

- Coal Engineering and Management (in abeyance in 2015 to regularise the partnership with the Fossil Fuel Foundation)
- Occupational Health and Safety (in partnership with the CSMI)
- Environment and Sustainable Development (in partnership with the CSMI)
- Mechanised Mining Systems (in partnership with the CMMS)
- Mine Ventilation Engineering (in partnership with the CMMS)
- Mineral Asset Valuation
- Mine Planning and Optimisation

In addition, a decision was taken to phase out the Graduate Diploma in Engineering (GDE) and the coursework-only MEng qualifications by the end of 2015 in order to align with HEQSF requirements that will be implemented in the country's universities from as early

as 2016. Consequently, as of 2015, there are only three students still registered for the GDE and two others still registered for the MEng. This change has meant that – through identifying appropriately qualified and experienced professionals in industry – the School had to increase its visiting and honorary staff appointments to assist with higher degree supervision. In 2015, a total of 28 visiting and/or honorary appointments are in place, including 16 Professor / Associate Professor / Adjunct Professor and 12 Senior Lecturer / Lecturer appointments.

Through Wits Enterprise, the School currently offers two highly successful certificate programmes: one in Mineral Resources Management and another in Mine Planning. These certificates are offered at NQF Level 6 as a formal qualification for practitioners in the mining industry. The individual certificate subjects are also available as either Certificates of Attendance or Competence at NQF Level 6, to cater for development purposes for practitioners in industry.

A 2014 review of the undergraduate curriculum – with respect to subject content flow, ECSA outcomes and input from the IAC – concluded that the curriculum was still relevant and no major changes were required



GOAL 06

BUILD STRONG PARTNERSHIPS (INTERNAL AND EXTERNAL)

The School actively collaborates with other schools at Wits University, with the South African mining industry and with institutions internationally. These partnerships are important because the Wits mining engineering programme is recognised as a leader both locally and globally.

Some of the collaborations we have within Wits include:

- Hosting the CSMI – headed by Adjunct Professor Caroline Digby – which informs the understanding and implementation of sustainable development in mining and industry;
- Hosting the CMMS – headed by Dr Declan Vogt – which enhances the mining industry's mechanisation and automation initiatives. The CMMS in turn has a strong formal relationship with TUNRA, the research and consulting company of The University of Newcastle, Australia, regarding the technology of handling and transporting bulk materials, including rock material;
- Our jointly hosted annual event with the Mandela Institute at the Wits Law School, which provides a platform for technical and law professionals to mix, discuss and learn how technical and legal matters interact;

- Partnering with Wits Enterprise, which coordinates our Certificate programmes under a commercial arrangement managed by Mr Clinton Birch from the School; and
- The re-launching of the Wits Mining Research Institute (WMRI) under the leadership of Professor Cawood as Interim Institute Professor, to address the university's 21st Century Institutes strategy.

The School's academic partnerships with the mining industry include the following:

- Our partnership with Gold Fields Limited has resulted in us having world-class facilities such as the Gold Fields Library, Rock Engineering Laboratory and mock-up facilities;
- Sibanye Gold hosts our students for practical workshop training, and also hosts students who must complete vacation work immediately after their final year – to be able to graduate in the April of the following year. In addition, Sibanye Gold assisted with the development of Ms Neingo to do her shifts and rock breaking certificate at their operations;



Adjunct Professor Caroline Digby, director at the CSMI



Dr Declan Vogt, director at the CMMS

- The Anglo American Platinum School of Mines also hosts some students who need to do vacation work, and provides exposure programmes to students who have never been to a mine;
- There are many other companies hosting our students for mine visits, vacation work and other contributions to Students Mining Engineering Society (SMES) events – these companies are recognized at the end of this report;
- Through their subventions and lecturer support schemes, the METF and the MQA have become our mechanism to, firstly, prevent high academic staff turnover and, secondly, develop future professorial staff. This support is arguably the most significant and strategic investment in mining education internationally;
- Honorary Professor Zvi Borowitsh embarked on a programme to link the School (and CMMS in 2013) in offering, along with several international mining schools, the Master of International Mining Engineering degree at the Mining University of Leoben, Austria. This programme is sponsored by Sandvik;
- The Centennial Chair of Rock Engineering, Professor Nielen van der Merwe, has a long-standing arrangement with SRK to host masters and doctoral students for the research requirement of their studies. The advantage for both the School and students is that their research progress is accelerated and is an important source of funding for the Chair;
- The JCI Chair of Mineral Resources and Reserves, Professor Dick Minnitt, hosts the Cosmo Scholarship in Mine Planning;
- Wits Mining hosts the SAIMM's Mine Planning School on a two-year cycle, organised by Mr Mike Woodhall (MineRP Solutions) and Professor Cuthbert



with the mining engineering community through the creation of a club that meets once or twice a year to discuss topical and mining innovation matters. The topic of the club's 2014 event was 'Mining Into The Future' – for which it partnered with Sandvik. In 2015, the topic is 'Mining Into The Future 2015' where the club is partnering with Barloworld Equipment and CAT;

- Emeritus Professor Huw Phillips, is instrumental

Musingwini. The School is also a beneficiary of the SAIMM Scholarship Trust Fund, which annually allocates an amount to assist with financially needy and deserving students;

- The School has strong links with the GASA, in which we have an arrangement for Professor Christina Dohm at Anglo American PLC to lecture and promote the highly specialised postgraduate subjects in geostatistics;

- We hosted council and committee meetings of the SAIMM, AMSSA, SACMA, SANIRE, IMSSA and the MVS. The hosting of these prestigious professional institutes and learned societies strengthens our link to the industry we serve with pride;
- Mr Mike Teke, President of the Chamber of Mines, addressed the final year students at the annual WUMEA Chairman's Cocktail event in a grand send-off for the class of 2014. The event was very well attended and Mr Teke's message to students was very well received. WUMEA's AGM was also well attended, with Emeritus Professor Huw Phillips delivering the keynote speech for the evening.

We also collaborate with other university programmes and research institutions, both nationally and internationally:

- The School assists the Zambian School of Mines, the National University of Sciences and Technology (NUST) in Pakistan, and the Instituto Superior Politécnico de Tete (ISPT) in Mozambique to build capacity to offer quality undergraduate programmes at these institutions;

- Having membership of the Society of Mining Professors (SOMP) in order to share ideas and pursue collaboration opportunities with other mining schools internationally;
- Receiving academics and students from the University of Namibia for laboratory work training;
- Our relationship with the China University of Mining and Technology (CUMT) is assisting with our digital mine initiative;
- Akita University in Japan established a Partners Forum to Advance Resource Education in Japan. The Schools of Mining Engineering and Geoscience at Wits were identified as preferred partners in South Africa. This partnership resulted in Akita hosting Professor Fred Cawood during 2015; and
- Emeritus Professor Phillips is serving a three-year term as a member of the Advisory Board of the Department of Mining and Metallurgy at the Polytechnic of Namibia – soon to become a University of Technology.

Table 6: Academic partnerships

Year	Programme	Remark
2008	Sandvik	Established by Emeritus Professor Huw Phillips
2010	Maastricht	EU-Funding approved, implementation 2011
2011/2	BRICS	Process of identifying Schools started 2010 – CUMT and ISM approached
2011/2	Dundee and NUST	MOUs finalised and first projects initiated
2012/3	NMU (Ukraine), CUMT (China), CSM (USA) and Curtin (Australia)	MOUs finalised and first projects initiated
2013/4	ISPT (Mozambique), Nottingham (UK), Akita (Japan) and UWA (Australia)	Projects initiated
2014/5	ISPT (Mozambique), NUST (Pakistan)	Three ISPT academic staff hosted for MSc/Phd and six NUST staff hosted for MSc/PhD

The Wits Mining Engineering programme's status as a global leader underpins a range of collaborations with academic and research institutions worldwide, with other schools at Wits University, and with the SA mining industry

GOAL 07

RETAIN ECSA ACCREDITATION OF THE UNDERGRADUATE PROGRAMME

The Engineering Council of South Africa (ECSA) visits the School on a five-year accreditation cycle to conduct a comprehensive review of the undergraduate programme's compliance with the rigorous, internationally-agreed Washington Accord guidelines. ECSA accreditation is important as it provides our graduates with international recognition and mobility.

In 2012, the School received full accreditation for the maximum period of five years and no deficiencies were

detected in the programme. The next visit will be in 2017, so the School held a workshop in early 2014 to review alignment of the programme with ECSA's accreditation criteria and industry relevance. The School's Industry Advisory Council (IAC) assigned Professor John Cruise and Mr Rick Mohring to participate in the workshop as IAC representatives. The findings of the curriculum review, which indicated that there was no need for any major curriculum changes, were approved by the IAC in March 2014.

Industry Advisory Council Members 2015



From left to right:

FIRST ROW: Mzila Mthenjane, John Cruise, Cuthbert Musingwini, Jim Porter

SECOND ROW: Rick Mohring, Ian Jandrell, Wilco Uys

ABSENT: Gordon Smith, Gys Landman, Kevin Robinson, Mike Rogers, Ken Matthysen, Vusi Maseko, Mike O'Hare, Peter Turner, Billy Mawasha, Thibedi Ramontja

Having received ECSA's full five-year accreditation in 2012, the School has prepared the way for their next visit by completing an alignment review of the undergraduate programme

GOAL 08

IMPROVE THE NUMBER OF STUDENTS GRADUATING FROM ALL PROGRAMMES

The School continues to make a significant contribution in the development of mining skills. Table 1a (under heading Goal 1) gives the number of enrolled students, while graduation numbers are given in Table 8a. A total of 72 out of 88 students (82%) from the final year undergraduate class of 2014 graduated in December 2014 and April 2015.

Overall throughput rates are complex to calculate but

can be crudely estimated by dividing the number of graduates into the total student body for the programme for that academic year; this approach is followed in Table 8b. Ideally, the highest throughput rate for the full-time, four-year undergraduate programme is 25% (assuming that there are equal numbers of students in each year of study), while the target score for both certificate and postgraduate (two-year courses) programmes is 50%.

Table 8a: Postgraduate and Certificate programme outputs

QUALIFICATIONS ISSUED AT WITS SCHOOL OF MINING ENGINEERING								
Year	BSc	GDE	MEng	MSc	PhD	Total Degrees	MRM/ Mine Planning Certificates	Total qualifications
1999	27	50	17		4	98		98
2005	33	53	19	4	1	110		110
2006	25	26	22	10	2	85		85
2007	57	36	15	5	1	114		114
2008	47	43	14	4	2	110	5	115
2009	62	49	14	5	0	130	11	141
2010	79	55	24	16	2	176	10	186
2011	62	63	24	8	3	160	14	174
2012	70	92	22	16	3	203	18	221
2013	53	87	15	11	2	168	20	188
2014	72	26	0	14	2	114	18	132

*Excluding Certificates of Competence / Attendance as these are for individual courses, not a complete qualification

The throughput rate among undergraduate students was 12% in 2014 – up from 8% in 2013 – and 82% of the 2014 fourth-year class graduated

Throughput among postgraduates rose from 59% in 2013 to 65% in 2014, while the trend in the certificate courses was slightly negative

Table 8b: Student throughput rates

Year	Undergraduate	Certificate	Postgraduate
2009	11%	29%	21%
2010	17%	52%	29%
2011	11%	30%	44%
2012	13%	31%	77%
2013	8%	26%	59%
2014	12%	24%	65%

It is expected that the last batch of GDE and MEng students will graduate in 2015, as these qualifications will be phased out by 2016. The number of MSc graduates will, however, be expected to increase in future as this will be the minimum postgraduate degree offered by the School. The restructured postgraduate programme, firstly, deepens our areas of specialisation (AoS) and, secondly, seeks opportunities for multi-disciplinary research. Some of the new qualifications, such as the MSc with a specialisation in Mine Planning and Optimization, are our response to industry requests and were implemented from 2014.

The School's long-standing mentoring system for first-year and second-year students – as well as WUMEA's assistance to students who have lost bursary support in their higher years of study – have assisted in improving our throughput rate. The WUMEA support is provided as an interest-free loan, to be repaid when a beneficiary starts working after graduation. The mentoring system is done through compulsory monthly, scheduled meetings as a group (5-10 students) with a member of staff (mentor). Academic and other problems, along with advice, are discussed at mentor meetings. Minutes are generated and the Head of School follows up and liaises with other parties within Wits for the necessary interventions.

The quality of the students exiting our undergraduate programme is enhanced by inducing competition through prizes for top-performing students. A motivating factor for students to outperform their peers is their recognition at the faculty's annual prize-giving ceremony. The sponsors of prizes in 2014, along with recipients, were:

- AEL Mining Services prize in Excavation Engineering – Thabang Gabriel Maepa
- AMMSA Mine Managers prize for best second-year student – Thabang Gabriel Maepa
- Danie Krige prize in Mine Evaluation – Tafadzwa Chindedza
- Herbert Simon Memorial prize for best fourth-year student – Stella Tinotenda Nyamwanza
- IMSSA prize in Mine Surveying – Stella Tinotenda Nyamwanza
- MVSSA prize in Mine Ventilation – Stella Tinotenda Nyamwanza
- Sasol Medal for Excellence in Coal Mining – Stella Tinotenda Nyamwanza
- WUMEA Prize for best fourth-year student in mining engineering subjects – Stella Tinotenda Nyamwanza
- Rand Pioneers (Inc) & Rand Women Pioneers Prize for most determined student – Siyabulela Arthur Masoka
- SAIMM Prestige prize for third-year or fourth-year student with high order interactions and contributions to student affairs – Prianka Padayachee
- SANIRE prize for the best student in Rock Mechanics courses – Lughile Ngobeni

The number of BSc degrees awarded for 2014 increased to 72, bringing the total number of degrees from the School to 114 for the year

GOAL 09

IMPROVE RESEARCH OUTPUT THROUGH RESEARCH DEGREES AND PUBLICATIONS

The School's annual output in terms of MSc and PhD research degrees since 2010 has numbered about 15 and two respectively. As part of the Wits 2022 Vision, the University aims to be one of the top 100 universities in the world by 2022. Although the School regards itself as being among the top ten mining schools internationally, Wits Mining needed to improve on its

research output. The School is correcting this situation with its plans to assist all staff to obtain higher degrees, its restructuring of the postgraduate programme to promote the output of research degrees, and its support of its research centres. Table 9 shows the School's research output patterns over the past five years.

Table 9: Research output

Year	MSc	PhD	Research Productivity	Books & Chapters	Subsidy Articles	Other Articles	Subsidy Conference Papers
2009	5	0	1,18	0	1	2	5
2010	16	2	1,36	0	10	2	6
2011	6	3	2,03	4	11	8	14
2012	16	3	1,56	4	7	6	11
2013	11	2	4,42	3	21	0	19
2014	14	2	tbc	3	13	8	10

The following research achievements for 2014 are worth highlighting:

- Professor Fred Cawood was awarded a C1 rating by the NRF;
- Professor Nielen van der Merwe and Mr Markus Mathey (PhD student) were awarded the Salamon Prize by the South African National Institute of Rock Engineering, for the best paper published in 2013/14. Mr Mathey also won their Ortlepp Prize, for the best paper in 2013/14 by a researcher younger than 35 years;
- Professor Dick Minnitt was joint winner – with Dr H

Bartlett and Mr L Korff – of the SAIMM Silver Medal in 2014, for the paper 'The allocation of gold production from multiple shafts feeding a common treatment plant using run-of-mine sampling of ore deliveries' – published in the Journal of the South African Institute of Mining and Metallurgy, Vol. 114, No. 1, January 2014, pp. 109-120.

- Mr Bekir Genc was a joint winner with Alan Cook, of the South African Colliery Managers Association's best paper award for their paper entitled 'Spontaneous combustion liability of South African coals' – published in the December 2013 edition of the Mine Ventilation Society of South Africa journal.

Wits Mining's strategy to improve research productivity is also in line with the university's Wits Vision 2022, which aims to place Wits in the top 100 universities globally

GOAL 10

INCREASE IN NUMBER OF NRF-RATED STAFF

The School had three NRF-rated researchers on the full-time staff in 2012: Professor Emeritus Dick Stacey, Professor Nielen van der Merwe and Professor Dick Minnitt. This number has now risen to four.

Professor Cuthbert Musingwini submitted his application at the start of 2013 and received a C3 rating from the NRF for the period 2014-2019. Professor Fred Cawood

submitted his application in 2014 and received a C1 rating for the period 2015-2020.

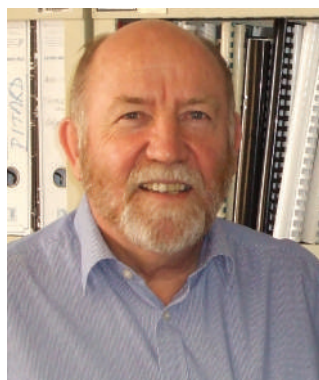
Dr Halil Yilmaz and Dr Bekir Genc have been encouraged to apply for rating in 2015. These ratings are important as they put the School in good academic standing, attesting to the quality of the School's senior academics.

Table 10: NRF-rated researchers in the School

Year	Addition	Total	Remark
2010	0	2	Professors Stacey (Professor Emeritus) and van der Merwe (Centennial Chair of Rock Engineering).
2011	1	3	Professor Minnitt (JCI Chair of Mineral Resources and Reserves).
2013/4	1	3	Professor Musingwini added but Professor van der Merwe's rating lapsed and did not apply for a re-rating.
2014/5	1	4	Professor Cawood rated for 2015-2020.



Professor Emeritus Dick
Stacey



Professor Dick Minnitt



Professor Cuthbert
Musingwini



Professor Fred Cawood

There are now four NRF-rated researchers in the School, attesting to the quality of its senior academics

LIST OF PARTNERS (in alphabetical order)

Aveng Mining (Grinaker LTA)	Engineering Council of South Africa	RSV Consulting
Anglo American Chairman's Fund	Fossil Fuel Foundation	Samancor
AEL Mining Services	Gemcom GEMS	Sandvik
African Exploration and Mining Finance	Gemcom Whittle	Schauenburg Systems
Afrisam	Geostatistical Association of Southern Africa	Shaft Sinkers
Akita University, Japan	Gold Fields	Sasol
Andalusite Resources	Gold One	Sibanye Gold
Anglo American – New Vaal Colliery	Glencore	Simang Mining
Anglo American plc	Great Basin Gold	Sound Mining Solutions
Anglo Platinum	Harmony	Southgold Exploration
Anglo Platinum – Bathopele and Thembelani mines	Impala Platinum	South African Colliery Managers' Association
Anglo Platinum – Unki Mine, Zimbabwe	International Mining for Development Centre	Southern African Institute of Mining and Metallurgy
AngloGold Ashanti – Tau Tona Gold Mine	Institute of Mine Surveyors of SA	South African National Institute for Rock Engineering
Association of Mine Managers of South Africa	iProp	SRK Consulting Canada
AusAid, Australia	Instituto Superior Politécnico de Tete, Mozambique	SRK Consulting South Africa
Anton du Kom University, Suriname	Joburg Mining Indaba	Student Mining Engineers Society
Anglo Operations	Joy Mining Global	Swaziland Government
Anglo American Thermal Coal	Kearney Education Trust	Society of Mining Professors
Atlas Copco, Zimbabwe	Kumba Iron Ore – Thabazimbi mine	Sanlam
Barloworld Equipment (CAT)	Lesotho Government	Tendele Coal Mining – Somkhele Mine
Basil Read	Lonmin Platinum	Terramin (CIO Chasm Consulting)
BBE Consulting	Lily Gold Mine	To The Point Growth Specialists
Billiton Energy Coal South Africa	Mandela Institute	Two Rivers Platinum
BHP Billiton	Matla Colliery	TWP Consulting
BME (Omnia Group)	McGill University	United Nations Economic Commission for Africa
Burnstone Development Trust	Mining Lekgotla	University of Johannesburg
Barbrook Gold Mine	MinRED – Anglo American	University of Namibia
Career Wise	Minerals and Education Trust Fund	University of Western Australia
Centre for Mechanised Mining Systems	MineRP Solutions	University of Pretoria
Centre for Sustainability in Mining and Industry	Mine Ventilation Society of South Africa	University of Newcastle, Australia
Chamber of Mines	Mining Qualifications Authority	Ventsim
Coaltech 2020	Murdoch University	Village Main Reef
Cosmo Scholarship Fund	Modikwa Mine – student day arranged by Association of Mine Managers of South Africa (AMMSA)	VUMA Software ADCO Vantage Goldfields
Consolidated Murchison – Gravelotte Mine	Maastricht University, Netherlands	Western Chrome Mines
Curtin University – Western Australian School of Mines	Namdeb Diamond Corporation, Namibia	Wits University Mining Engineers Association
China University of Mining and Technology	New Concept Mining	World Bank
Colorado School of Mines, US	Northam Platinum	WorleyParsons Resources and Energy/TWP
De Beers Consolidated Mines	National Student Financial Aid Scheme	WSE Stone Consulting
Department of Mineral Resources	National University of Science and Technology, Pakistan	Wesizwe Bakubung Platinum Mine
Dessault Systemes	National Mining University, Ukraine	Wits Enterprise
Centre for Energy, Petroleum and Mineral Law and Policy, University of Dundee	Nottingham University, UK	Wits Mining Research Institute
Dean: Faculty of Engineering and the Built Environment, Wits University	Palabora Copper	Xstrata Coal
Eskom	Palisade Corporation	Xstrata South Africa
Exxaro – Matla Coal Mine	Petra Diamonds	Zambian School of Mines
Eyesiswe	RED Graniti SA	Zimasco
	Resources4Africa	Zimbabwe Scholarship Fund
	Rockwell Diamonds	Zimplats
	Royal Bafokeng Holdings	

LIST OF EXTERNAL EXAMINERS

(in alphabetical order)

Afeni, B	Hull, D	Mutemeri, N	Smit, J
Andersen, D	Jarosz, A	Ndlovu, X	Steffen, O
Bakker, D	Johnson, RA	Nel, W	Stacey, T
Biffi, M	Jooste, R	Nilsen, B	Terbrugge, P
Camisani- Calzolari, F	Jooste, M	Njowa, G	Thomas, H
Cohen, A	Joughin, W	Otto, J	Vafai, F
Cruise, J	Kasatuka, C	Potvin, Y	Van der Steen, B
De Jager, K	Khumalo, BE	Roberts, D	Visser, J
Docrat, Y	Mahomed, F	Rocha, J	Walraven, V
Fleming, DR	Maponga, O	Rupperecht, S	Watson, B
Goode, R	Marsden, H	Ruther, H	Wikinson, A
Gardner, L	Mpunzi, P	Sears, M	
Hermanus, M	Moseki, D	Scott, B	
Herselman, S	Mugodi, T	Shires, SD	

ACRONYMS

ADU	Academic Development Unit	NRF	National Research Foundation
AMMSA	Association of Mine Managers	NSFAS	National Student Financial Aid Scheme
CMMS	Centre for Mechanised Mining Systems	NUST	National University of Sciences and Technology, Pakistan
CSMI	Centre for Sustainability in Mining and Industry	SACMA	South African Colliery Managers' Association
CUMT	China University of Mining and Technology	SAIMM	South African Institute of Mining and Metallurgy
DMR	Department of Mineral Resources	SANIRE	South African National Institute of Rock Engineering
ECSA	Engineering Council of South Africa	SMES	Students Mining Engineering Society
DHET	Department of Higher Education and Training	WASM	Western Australian School of Mines
FEBE	Faculty of Engineering and the Built Environment, Wits University	WMRI	Wits Mining Research Institute
FFF	Fossil Fuel Foundation	WUMEA	Witwatersrand University Mining Engineers Association
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 Education Trust Fund		
MQA	Mining Qualifications Authority		
MVSSA	Mine Ventilation Society of South Africa		



SCHOOL OF MINING
ENGINEERING



UNIVERSITY OF THE WITWATERSRAND,
JOHANNESBURG

School of Mining Engineering Class of 2014



From left to right:

FIRST ROW: M N Jabane, S Ncube, Mr T Zvarivadza, Mr M R Tlala, Mrs M Mpanza, Ms P N Neingo, Ms P O Oshokoya, Mr B Genc, Prof C Musingwini, Prof F T Cawood (Head of School), Prof R C A Minnitt, Mr C R Beaumont, Ms M D Matlou, Mr E M Mochubele, Mr C K Chabedi, Mr C Birch, Mr E Uludag, E Jeque

SECOND ROW: Mr P J K Leeuw, F A Maimela, B M I Malomane, P C Thobejane, T C Makua, K M Mmuledi, T Nesengani, T Munjeri, M Mhlongo, R C Meletse, N S Sekgobela, M L Sebone, B S Maruma, R N Mashele, RM Makwela, M C Gaula, X P Mphakati, H L Maringo, Mr A S Nhleko

THIRD ROW: N Chauke, N W Mbhalati, N Mbewe, L Ngwane, A Mapuranga, D Tshike, T L Maposa, D A Stevens, TFP Mangwiro, D G Mokoena, K S Munatsi, M L Ramunongo, T H M Montoedi, V A Mtuti, M N Sebpela, F M Modau

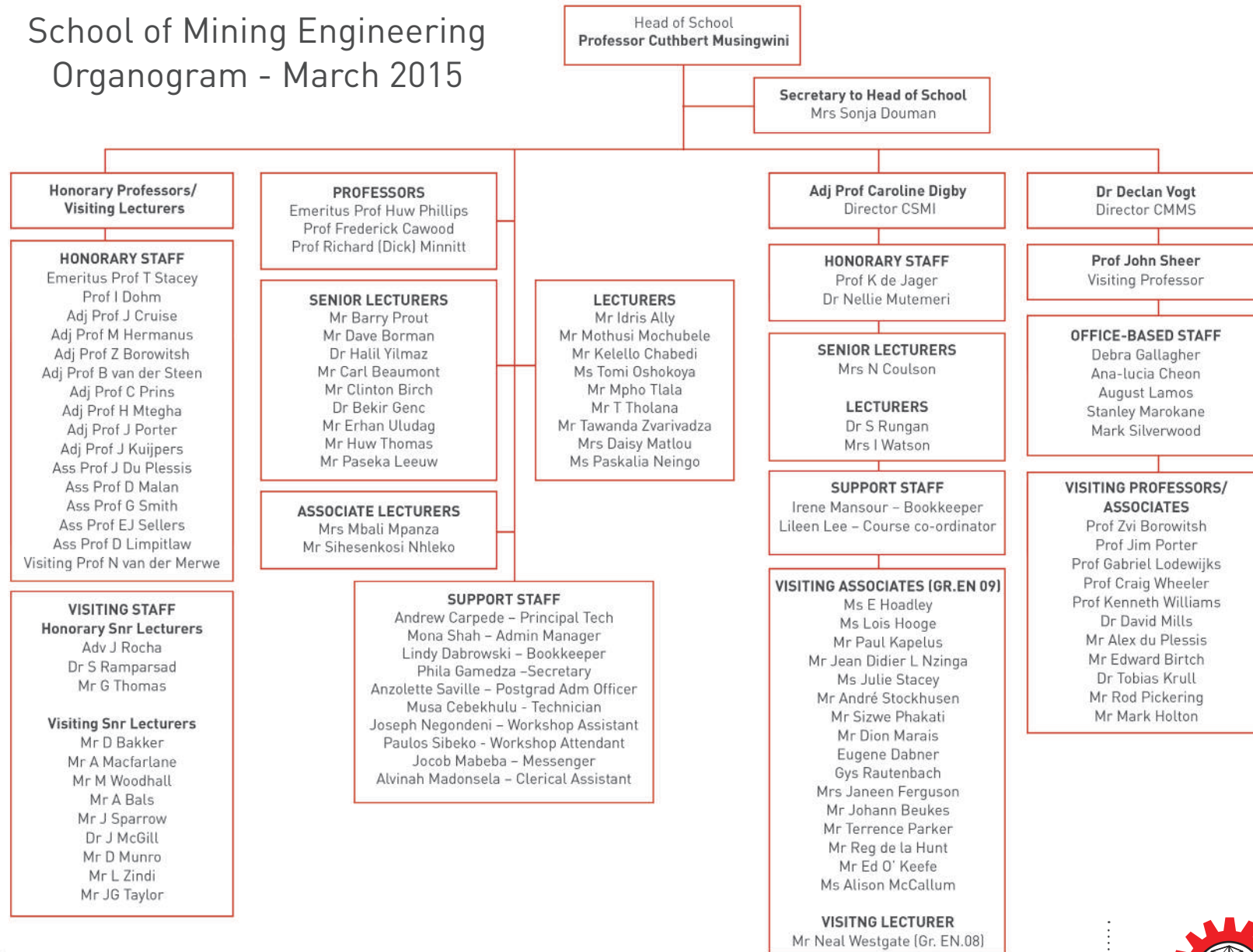
FOURTH ROW: A Nosilela, T S Sakoane, T A Makhadimele, T M Malatji, S A Masoko, W E N Nzuza, M P Thutse, L B Sekhokoane, C K Maseka, R M Molepo, R B Motswadi, J P Labuschagne, T T C Mahlebebe, K N Serepong, T Chindedza

FIFTH ROW: T D Hlangwane, T K Moshokoa, M J Molomo, L Ngobeni, W C Chinyowa, P R Segopolo, B S Lukhele, K Mampuru, GL Kabangu, B Sihlangu, P W Nhlapho, L H Matlala, S Mahamba, M T Minyuku

SIXTH ROW: S T Nyamwanza, T M Ralebala, T S Mlondobozi, C M Malatji, P Padayachee, F Kaniki, T S Makacha, B G Mkize, L C Mbatha, T Chirinda, H Mathebula, F M Mohale

ABSENT: Mr I Ally, Mr D Borman, Mr B Prout

School of Mining Engineering Organogram - March 2015



UNIVERSITY OF THE WITWATERSRAND,
JOHANNESBURG



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