

BIENNIAL REVIEW 2019-2020

School of Mining Engineering

We boast the largest mining school in Africa, and are recognised as being in the top 50 mining schools globally.



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Disclaimer:

Every effort was made to ensure the correctness of information presented in this biennial review report. However, should there be any information that may have been omitted or incorrectly captured, please notify the School of the errors.

Profile

As one of the world's leading mining engineering schools,

the School of Mining Engineering at the University of the Witwatersrand (Wits) has a comprehensive range of undergraduate and post-graduate academic programmes. Each year, we are able to educate about 750 students – around 550 undergraduates and 200 post-graduates. Our 20 full-time university-funded academic staff, supported by 12 technical and administration staff, place us among the world's largest mining engineering schools – as recognised by the international Society of Mining Professors (SOMP).

With our focus on the future of mining, we recently redesigned our undergraduate curriculum, aligning it to 'Mining 4.0' technologies. These technologies pave the way for hightech mines that are safer, productive and more economically viable, while also achieving better environmental and social sustainability. The post-graduate programme and research focus also make a valuable contribution to providing specialised technical skills to the minerals industry. This ensures that our graduates are internationally well-respected and well-equipped to address the industry's challenges.

The School's recently developed Strategic Plan 2020-2024 guides the Wits Mining Team to deliver quality mining engineering education and cuttingedge research – in support of the future sustainable development of the minerals industry, the country and the global economy.

The Wits School of Mining Engineering is recognised as one of the world's leading and largest mining engineering schools, with comprehensive undergraduate and post-graduate academic programmes.

This year – 2021 – marks the 125th anniversary of the Wits School of Mining Engineering. It began in Kimberley in 1896 as the South African School of Mines, transferring in 1904 to Johannesburg to become the original academic entity on which the University of the Witwatersrand was founded in 1922.

Our Strategic Plan 2020-2024

Vision

To be the recognised world-class mining engineering school in education and cutting-edge research.

Mission

To effectively equip mining engineering graduates with world-class skills, and to produce cutting-edge, innovative research to advance and lead the mining industry of the future.

Values

Collegial work environment – We create a collegial and collaborative work environment and maintain a healthy work-life balance.

Intellectual excellence and integrity – Our competence is seen in our excellent education; we are quality driven, and do our work ethically and with integrity.

International and national engagement – We engage with stakeholders, we pursue innovative developments, and we do relevant high impact research that adds value.

Social engagement - We fulfill our role as intellectual leaders through active participation in society.

Strategic Goals



Strategic Goal 3 State-of-the-art facilities



Strategic Goal 1 Quality education for sustainable future development



Strategic Goal 4 Cutting-edge research



Strategic Goal 2 World-class academic staff



Strategic Goal 5 Effective stakeholder relationships



Professor Cuthbert Musingwini

Message from the Head of School: Professor Cuthbert Musingwini

With our School's last review report done for 2018, this one is for 2019 and 2020 combined. We delayed the traditional annual review report due to time constraints and other challenges emanating from the global Covid-19 pandemic's impact on the academic project. The pandemic has taught us to adapt to new terminology such as 'social distancing', so we took a pragmatic decision to 'socially-distance' the frequency of the review reports - from an annual to a biennial basis. This will limit the amount of hard-copy printing, and allow sufficient time for more developments to report back on. As the Wits Mining Team, we have been sharing developments in the School annually through our annual review reports. On behalf of the team, it is my honour and privilege to say that once again, we can share developments in the School - this time in our maiden biennial review report for 2019 and 2020.

I took on the role of Head of School in 2015 and completed my first five-year term in January 2020. This is then my second and final term, and I am grateful to the university and fellow staff in the School for the opportunity to serve them again.

Despite the Covid-19 pandemic, I am happy to report that our School has remained steadfast in its core business of delivering high quality mining engineering education and research, remaining among the top league mining engineering schools in the world. The UK-based Quacquarelli Symonds Ltd (QS) World University Rankings ranked Wits in the 'Mineral and Mining Engineering' subject area among the top 15 mineral and mining engineering programmes in 2021. In these rankings, we were placed 13th in 2021, 12th in 2020, 13th in 2019, 15th in 2018, 22nd in 2017, 100th in 2016.

The international Society of Mining Professors (SOMP) also ranks our School among the largest mining engineering schools in the world in terms of student numbers. Some of our academic staff continue to be rated by the National Research Foundation (NRF) of South Africa for the quality of their research. Viewed together, these rankings are indeed a positive reflection on our School's global standing.



In 2015, our School adopted a five-point strategic plan to steer us through to 2019, and it has served us well in guiding the School's strategic direction. However, the plan reached its 'sell-by' date and it became imperative to develop a new strategic plan. To drive the School into the future, we mapped out a new five-year strategic plan for 2020-2024, over an intensive two days on 20 and 21 May 2019, which we share in this review report. The new plan was partly informed by the Faculty's roll-out of a Common First Year (CFY) programme from 2019, and the School's concomitant introduction in 2019 of a re-designed 'Mining 4.0' aligned undergraduate programme – in line with mining industry developments on adopting fourth industrial revolution (4IR) technologies. The re-designed curriculum ensures that our graduates are better prepared for the future world of work. These strategies ensure that our School remains agile even under the Covid-19 pandemic challenges, and we can confidently report on the following positive developments during 2019 and 2020:

- The School's mining engineering programme retained its high ranking on the QS World University Rankings by subject area, reflecting well on the quality of our graduates, staff, curriculum and research.
- We continued to produce at least two Doctorates per year, and a significant number of MSc graduates – attesting to solid post-graduate research productivity.
- Per capita research output also remained stable, confirming our staff's activeness in research.

- The School's NRF-rated academic staff grew from three in 2018 to five in 2020 (one academic being rated in 2019 and the other one in 2020), indicating the quality of research generated by our academics.
- Our student population remained fairly stable, so we prevail among the world's largest mining engineering schools. This is indicative of the future sustainability of the programme, in a world where some mining engineering schools are struggling to attract sufficient student numbers.

I am quite humbled by the agility with which both our staff and students rose to the challenges of the Covid-19 pandemic. We were able to successfully complete our 2020 academic year, and started 2021 on a steady footing. Kudos to all of them – and to the Faculty and University for their support of our School's efforts. Lastly, our sincere gratitude goes to the South African mining industry, especially their financial support provided through the Minerals Education Trust Fund (METF). I trust you will enjoy reading this maiden biennial review report, as it exudes hope for mining engineering education and research for our School and beyond.

Profile of Thabile Makgala

Executive: Marula and Two Rivers Operations

Thabile Makgala is an astute mining executive with nearly 20 years of experience in the sector, specifically in gold and platinum group metals. Thabile joined Implats in 2018 as Executive: Mining and her proven leadership has recently seen her become Executive: Marula and Two Rivers operation.

It was her hands-on experience as a production mining engineer that gave her the grounding for a career that has included leadership roles at Gold Fields, AngloGold Ashanti and Anglo American Platinum. She dedicated an effective decade of service to Gold Fields – from her earliest vocational role to her later return in a senior management capacity. Thabile also successfully served AngloGold Ashanti for four years, Anglo American for two years and Sasol for a year.

With her early experience as a Production Manager, Mine Overseer, Production Supervisor and Underground Miner, she gained a 360-degree, practical view of operational challenges and opportunities. She has applied this asset in later years, to the bottom line and operational benefit of her employers.

Her notable achievements include being one of 16 South African women featured in the 2018 list of Top 100 Global Inspirational Women in Mining, compiled by the Londonbased non-profit Women in Mining (WiM). It showcases the achievements of female highflyers in global mining and supporting industries, allowing these role models to encourage more women to follow mining careers. She has addressed the African Mining Indaba, Joburg Indaba and Junior Indaba on women's empowerment.



Thabile Makgala

Thabile was instrumental in developing the CAR Business Improvement Programme and Business Planning Process at AngloGold Ashanti, and the new colliery shift system for Anglo American Thermal Coal. Other proud accomplishments include securing major supply contracts with two mining houses in Witbank, and consistently meeting monthly production targets at Gold Fields while working in the production sections.

She is passionate about empowering women to prosper in the mining industry and chairs the local advocacy group Women in Mining South Africa (WiMSA). This platform encourages women in the industry to network and to benefit from mentorship and guidance. Recognising the many barriers to entry that women must overcome to reach leadership positions in mining, she believes mining companies should prioritise and advocate for diversity, inclusion, parity and greater recognition of female leadership within their organisations.

Thabile takes inspiration from a quote by Ellen Johnson Sirleaf, the first elected female head of state in Africa, who said: "The size of your dreams must always exceed your current capacity to achieve them. If your dreams do not scare you, they are not big enough." She encountered numerous obstacles while navigating her mining career path.

"As the first female mining engineering graduate at Gold Fields Kloof and Driefontein division (now Sibanye Gold), I soon realised that the industry had not prepared itself to accept women in mining," she said. "The response to women's needs – in infrastructure, personal protective clothing and policies – was slow and very little was in place to address women's issues. Regardless of impeccable qualifications, solid work ethic and the achievement of production targets, my abilities would be questioned and tested."

She commented that, when she started out in this maledominated industry, there were no support networks.

"My first time underground was in 2001, and WiMSA was only established in 2010," she said. "Since then, the situation for female mining professionals has improved, but not nearly enough. If the environment is not conducive for growth, females leave the mining industry and join other industries."

Student Mine Site Visits

We are always grateful to our partners who host our students for technical visits at their mines and company facilities. This is a vital part of our School's education, giving students practical insights into mine operations, as well as the equipment and services upon which mines rely.



For those who choose to stay, though, being offered the leadership opportunity is a challenge in itself, said Thabile.

"Women are questioned about their abilities, and most are told they have leadership gaps they need to attend to before being offered leadership positions," she said. Thabile believes our leaders of the future need the requisite skills and qualities to lead organisations in a world disrupted by technology.

"They need to inspire, develop talent and drive innovation in their organisations," she said. "Future leaders need to be able to lead and motivate diverse teams, with generation gaps resulting in complexities in the workplace."

Thabile is a member of the Southern African Institute of Mining and Metallurgy and a director of Women in Mining South Africa. She holds an MBA from the University of Stellenbosch Business School and a BSc in Mining Engineering from the University of the Witwatersrand.



Hydraulic cylinders of tunnel boring machines at Master Drilling



Biennial Review 2019-2020



Prominent Wits Mining Alumni

in senior executive roles in mining

Dr Gys Landman CEO: Detnet

Phillip Tobias COO - New Business Development: Harmony Gold

Thando Mkatshana CEO Platinum Division: African Rainbow Minerals (ARM)

Mzila Mthenjane Executive Head Stakeholder Affairs: Exxaro

Thabile Makgala Executive - Eastern Limb: Impala Platinum & Chairperson: Women in Mining South Africa (WiMSA)

John Wallington CEO: Benga Mining, Canada

Bheki Khumalo CEO: Mwelase Opencast Mining Services

Thabo Dube CEO: Mine Health and Safety Council (MHSC)

David Msiza Chief Inspector of Mines: Department of Mineral Resources and Energy (DMRE)

Wayne Robinson Executive VP - US PGM Operations: Sibanye-Stillwater

*Please advise us of our other prominent alumni in the mining industry who you are aware of and who may have been unintentionally omitted from the list above. Also, please advise the School of any updates or corrections that need to be made to the list above, in cases where changes have occurred. Robert van Niekerk Chief Technical Officer: Sibanye-Stillwater

Richard Cox Executive VP SA Gold Operations: Sibanye-Stillwater

Dennis Tucker Founder & Owner: Qinisele Resources

Peter Freyberg Head of Industrial Assets: Glencore

James Morotoba Senior VP Mining Operations: Foskor Limited

Harold Motaung CEO: Atlatsa Resources

Percy Ntuthuko Khoza MD: Zikhona Investments & Non-Executive Director: Grinding Media SA William Joughin Chairman: SRK Consulting & Vice-President (Africa): International Society for Rock Mechanics (ISRM)

Jacob Mothomogolo Projects Executive: Wesizwe Platinum

Lemogang Pitsoe CEO: Alexkor

Dalikhaya Rain Zihlangu CEO: Eyabantu Capital Consortium

Tim Rowland Vice President - Geology and Group Planning: Gold Fields Limited

Bonginkosi Ngqulunga COO: Village Main Reef

Robert Hull CEO: UMS United Mining Services Group

Dr Rudy Phillis Head - VSA Lead, Business Excellence: Barloworld Equipment



School Self-Evaluation on Strategic Goals 2020

To assist the School in re-prioritising its actions, we track and report on our progress in achieving each goal, according to the framework below. Having defined our new strategic goals for the period 2020-2024, we report here on our progress with the 2020 goals. In the next sections of this biennial review report, we highlight the main developments for each of our five strategic goals.



Some progress made but, not satisfactory



Progress is satisfactory, but there is room for improvement



Progress is more than expected

Strategic Goal No	Description	2020 Progress	Priority Actions
1	Quality education for sustainable future development	Roll-out of re-designed undergraduate curriculum – aligned with 'Mining 4.0' – successfully progressed. Successful transition made to blended teaching and learning under Covid-19 national lockdown restrictions in 2020.	Continue with successful roll-out of re-designed curriculum until final roll-out in 2022. Prepare for Quinquennial Review (QQR) in 2021 and ECSA accreditation visit in 2022.
2	World-class academic staff	Two additional visiting professorial appointments made in 2020. One staff member submitted their PhD thesis for examination. An additional staff member received an NRF-rating and another one received a higher NRF-rating.	Seek more professionals eligible for visiting/honorary professorial appointments and support academic staff to complete the PhDs. Encourage more academic staff eligible to apply for NRF rating to do so.
3	State-of-the-art facilities	Audio visual (AV) system upgrade in the Mine Design Lab was undertaken.	Continue with upgrading of facilities to match 'Mining 4.0' expectations.
4	Cutting-edge research	NRF rated researchers increased from three in 2018 to five in 2020. Per capita research output units remained relatively stable. PhDs awarded remained at more than two per year. Motivation submitted to the Faculty Research Committee (FRC) for the formal recognition of the Mineral Resources Governance Research Group (MRGRG), which was approved by the University Research Committee (URC) in 2021.	Continue to encourage staff to take on more postgraduate supervision and maintain the school's publication rate. Encourage more academic staff eligible to apply for NRF rating to do so.
5	Effective stakeholder relationships	The research partnership with Gold Fields was extended to 2022 to continue outstanding postgraduate research projects. In conjunction with the Wits Mining Institute (WMI), the Sibanye- Stillwater sponsorship was renewed for another three years 2021-2023. The Minerals Education Trust Fund (METF) continued its financial support to the school.	Continue to carefully manage existing partnerships and seek new ones

Strategic Goal 1:

Quality education for sustainable future development



Our first strategic goal is to deliver high-quality, internationally competitive mining engineering education – taking into account the landscape of higher education institutions, the university's institutional constraints and developments in the minerals industry. We rely on regular independent evaluations to assess the quality of what we deliver, such as:

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- The university's internal Quinquennial Review (QQR) process, undertaken within the guidelines of the Council of Higher Education (CHE) of South Africa. The CHE mandates universities to undertake their own institutional internal quality assurance reviews;
- Accreditation by the Engineering Council of South Africa (ECSA), undertaken in line with the Washington Accord guidelines; and
- World university rankings by subject area such as the Quacquarelli Symonds Limited (QS) World University Rankings.

The last QQR was done in 2015, so the School was due for the five-year regular QQR evaluation in 2020. This had to be postponed to 2021, however, due to Covid-19 national lockdown restrictions.

The School's undergraduate mining engineering programme was awarded full ECSA accreditation in 2017 and is due for the next five-year regular accreditation visit in 2022.

The QS World University Rankings by subject area ranks mining engineering programmes annually under its category of 'Mineral and Mining Engineering'. These independent evaluations continue to endorse the high quality of the School's education delivery.

The mining industry has embraced the technologies of the fourth industrial revolution (4IR or Industry 4.0). In response, we re-designed our undergraduate curriculum in 2018 (for rollout from 2019) to align with 'Mining 4.0' developments. The re-design and roll-out also aligns with the Faculty's Common First Year (CFY) programme that began in 2019. In 2021, the re-designed curriculum is successfully in its third year, and we expect to fully roll it out across all years of study by the end of 2022.

In line with Strategic Goal 1, the School also annually reviews its enrolment numbers so that the teaching and learning resources closely align with student numbers. Since 2015, we have gradually lowered our annual first-year enrolment target from 150 to a new cap of 100 first-year students – from 2021 onwards. At the same time, the school has allowed an organic growth of postgraduate research student numbers – to align with the university's 2020-2024 enrolment plan. This plan aims to achieve a split of 55% undergraduate students and 45% postgraduate students by 2024. With a lower undergraduate student population, the School can continue to deliver quality undergraduate mining engineering education, while concurrently growing postgraduate research output.

The onset of the Covid-19 global pandemic meant that lecturing had to be done online. Lecturers stepped up to the challenge and successfully ran pre-recorded lectures in PowerPoint with voice-over, as well as interactive online lectures. Students also quickly adapted to this new way of teaching and learning. Despite all the challenges, we successfully conducted sit-down examinations and also invigilated online exams under controlled conditions. We applaud both staff and students for rising to the occasion and successfully completing the 2020 academic year.

The School's awarding of prizes supports our aim of producing quality graduates who are sought after by industry. We are fortunate to have industry partners to sponsor prizes for our best performing undergraduate students, as this helps create a competitive learning space for students to give of their best. We therefore invite our industry stakeholders not listed in Table 1 to consider contributing prizes – to help ensure the quality of the mining engineering education we provide.

Table 1. Acknowledgementof prizes awarded to miningengineering students



	Prize	Criteria	2019 Recipient	2020 Recipient
1	AEL Mining Services Prize	The student with the highest mark in the 2nd year 'Excavation Engineering' course	Sicelo Khaba	No award due to change in curriculum
2	Institute of Mine Surveyors of South Africa Prize (IMSSA)	The best student in Mine Surveying	Margaret Banda	Mphahlele Nape
3	Mine Managers Prize (AMMSA)	The Mining Engineering student with the best 2nd year results	Puisano Mahloko	Marinda Tapiwa
4	Mine Ventilation Prize (MVSSA)	The best final year student in Mine Ventilation	Sifiso Bina	Puisano Mahloko
5	Prof S Budavari Memorial Prize	The third year Mining Engineering Student with the highest mark in Rock Mechanics	Adam Kuhl	Mthethwa Sibusiso
6	Southern African Institute of Mining and Metallurgy Prestige Prize: Mining (SAIMM)	The student in the 3rd or 4th year of study, whose academic achievement, contributions to the student affairs, and interactions with the School are of the highest order	Mgombagomba Zulu	Minenhle Khumalo
7	South African Colliery Managers' Association (SACMA)	The best final year student in Coal Mining	Loeto Sekwati	Adam Khul
	South African National Institute of Rock Engineering (SANIRE)	The student with the best aggregate mark in the 3rd and 4th year Rock Mechanics courses	Thabang Morakile	Adam Kuhl
9	Witwatersrand University Mining Engineers' Association Prize (WUMEA)	The final year student obtaining the highest marks in mining engineering subjects	Thabang Morakile	Adam Kuhl
10	Worley Parsons (now Worley) 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	Temosho Monnye	Adam Kuhl
11	Worley Parsons (now Worley) Prize for Mining Engineering	For the third-year student with the highest mark in the subject Health, Safety, and the Mining Environment.	Lindokuhle Ntombifuthi Mbiza	Sipho Sakhile Mncwango

Tables 2 and 3 profile our staff and student populations for 2010-2021.

The tables show that student and staff populations have been generally stable, at a student to staff ratio of about 35:1. The School currently has capacity for about 550 undergraduates and about 200 postgraduates (25 PhD and 175 MSc), for a total student population of about 750. These student numbers vary throughout the year because:

BSc Eng undergraduate students register once a year (at the start of the academic year) including those who register late. With permission from the Faculty, however, they can also de-register from the programme during the first few months of the year. MSc 50/50 (by coursework and research) students register twice a year – at the start of the first semester and at the start of the second semester. They can also de-register (with permission from the Faculty) or put their studies into abeyance during the academic year. MSc (research only) and PhD students register once every quarter. They can also (with permission from the Faculty) de-register or put their studies into abeyance during the academic year.

Our high student population in fact led to the School being invited to participate in a 2021 webinar on 'Student Recruitment and Retention in Mining Engineering Schools'. We have one of the largest mining engineering student populations in the world, while some mining engineering schools are struggling to attract sufficient students to remain viable and sustainable. The webinar was organised by the international Society of Mining Professors (SOMP) in April.

Table 2. Wits Miningstudent headcount

Note: The 2021 numbers are best estimates at the start of 2021 and exclude (1) subsequent late registrations, (2) mid-year registrations for MSc 50/50 and (3) subsequent quarterly registrations for MSc (research only) and PhD. The GDE and M Eng (coursework only) programmes were phased out at the end of 2016 to align with HEQSF requirements. (N/A = not available.)

Year	1st Year BSc Eng	2nd Year BSc Eng	3rd Year BSc Eng	4th Year BSc Eng	2020 BSc Eng Graduates	Total Under- graduates	GDE	MEng	MSc	PhD	Total Post- graduates	Total UG&PG
2010	228	85	79	76	79	468	196	68	60	16	340	808
2011	233	96	82	62	62	473	137	32	34	19	222	695
2012	234	143	80	74	70	631	102	15	42	14	173	704
2013	302	124	142	66	53	634	90	15	70	16	191	825
2014	212	139	148	88	72	587	38	3	112	22	175	762
2015	231	144	162	106	83	643	3	2	176	20	201	844
2016	250	118	177	118	99	663	3	1	138	20	162	825
2017	250	125	147	110	90	632	0	0	199	20	219	851
2018	213	156	112	140	106	621	0	0	194	19	213	834
2019	184	127	143	95	62	549	0	0	167	22	189	738
2020	211	88	151	105	91	555	0	0	183	21	204	759
2021*	166*	132*	98*	111*	N/A	507*	0	0	106*	16*	122*	629*

Table 3. Student to academicstaff headcount ratios

*At start of 2021, excluding academic staff appointed as sessional part-time, visiting or honorary.

Year	Full-time academic	Total student headcount	Headcount 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
2017	24	851	35
2018	24	834	35
2019	23	738	32
2020	21	759	36
2021*	20*	629*	31*

Strategic Goal 2:

World-class academic staff

To maintain intellectual excellence and high academic standards, it is imperative for the School to attract and retain high profile experts in their respective knowledge areas. A proxy for any high calibre academic team is the proportion of staff with PhDs, so the School often scouts for and appoints industry professionals or retired academics as visiting or honorary professorial staff. There is, however, only a limited pool of academics with PhDs in some niche areas of mining engineering – not only in South Africa but also internationally. The School therefore also launched an initiative to 'grow its own timber'. This initiative has been successful, as we find that staff who have been trained within the School tend to stay on the staff. By comparison, staff hired externally tend to be more mobile.

As part of this strategy, we secured a Phase 6 New Generation of Academics Programme (nGAP) position, which we successfully filled from January 2021. Another nGAP Phase 7 position will be filled from January 2022. The nGAP programme targets the recruitment of staff with PhDs as post-doctoral appointments; it also allows those with excellent MSc qualifications to be appointed, as long as they can embark on and complete their PhDs within six years of their appointment.



Our success in achieving Goal 2 also hinges on staff contributing actively beyond the precincts of the university. In this way, staff develop valuable networks and industry recognition – which are critical factors in building the School's role within the minerals industry and academia. We therefore encourage our staff to participate in the activities of professional bodies relevant to their areas of expertise, and to take an active role by serving on committees within these bodies. In 2020, our staff's participation included the following:

- Five staff members maintained their professional engineer (Pr Eng) registration with the Engineering Council of South Africa (ECSA): Professor Emeritus Dick Stacey, Professor Cuthbert Musingwini, Professor Bekir Genc, Mr Kelello Chabedi and Mr Paseka Leeuw.
- Four other staff members maintained their registrations with their respective professional bodies: Mr Clinton Birch as a professional natural scientist (Pr Sci Nat) with the South African Council for Natural Scientific Professions (SACNASP); Professor Frederick Cawood and Mr Huw Thomas as professional surveyors with the South African Geomatics Council (SAGC); and Mr Ohveshlan Pillay as a chartered engineer (C Eng) with the Engineering Council United Kingdom (ECUK).
- Professor Cuthbert Musingwini continued to serve ex-officio as a Past President on the Council of the Southern African Institute of Mining and Metallurgy (SAIMM) and Professor Bekir Genc has also served on the SAIMM Council since 2020.

We also experienced some turnover of staff:

- Full-time technical staff positions that became vacant due to retirement: at the end of December 2020, Mr Joseph Negondeni retired and Mr Paulos Sibeko took early retirement.
- Full-time grant-funded academic staff positions with contracts that expired: Mrs Duduzile Modiba (contract expired in October 2019); Mr Zwelinzima Thebethe (December 2019); Ms Matsobane Nong (March 2020); and Mr Isaac Mahlomola Mabala (March 2021).
- Full-time academic staff position resignations: Professor Antonio Nieto resigned at the end of May 2019; Professor Rudrajit Mitra resigned at the end of February 2020.

- Full-time academic staff position retirement: Professor Frederick Cawood took early retirement at the end of May 2021.
- Full-time administration staff resignation: Mrs Anzolette Saville resigned at the end of February 2019.
- Full-time administration staff engagement: Mrs Thobile Sedumedi joined the staff in May 2019.
- Full-time academic staff engagements: Professor Antonio Nieto joined in March 2019; Mr Zwelinzima Thebethe re-joined staff in July 2020; and Dr Oluwatomisin (Tomi) Akinseye (nee Oshokoya) re-joined staff in September 2020.

It is with heavy hearts and great sadness that we share the sad news on the passing on of some of our colleagues. We lost Mr Jacob Mabeba, our general clerk, who passed on in March 2020, and Mrs Phila Gamedza, our receptionist, who passed on in April 2021.

Strategic Goal 3:

State-of-the-art facilities

The School prides itself on having state-of-the-art facilities for teaching and learning, as well as for research purposes. We upgrade these facilities continually, mostly with the financial support we gratefully receive from the mining industry.

In 2018 and 2019, the School was able to secure discretionary capex funding from the Minerals Education Trust Fund (METF); this supported our equipment and facilities upgrade to the tune of about R1,58 million in 2018 and a further R2,09 million in 2019. The pictures below illustrate the new equipment and upgraded facilities which were commissioned in 2019.

Our partner, Sibanye-Stillwater contributes both to our facilities and our students, as part of a joint agreement with the School and the Wits Mining Institute (WMI). Sibanye-Stillwater provides an annual donation that funds facilities upgrades and students who are financially academically deserving.

Significantly, the Sibanye-Stillwater donation allowed us to replace some of the out-of-warranty and intermittently malfunctioning audio-visual (AV) equipment in the School's Mine Design Laboratory (MDL). The MDL is a critical facility for our teaching activities, but was not fully operational in 2019 due to the occasional malfunctioning of the AV equipment. This made the delivery of quality lectures a challenge, but this was resolved with new and more durable, higher-spec components.



Strategic Goal 4:

Cutting-edge research

A key metric used in the QS World University Rankings is research productivity and the associated impact of the research generated. Citation rates and research awards are used as proxies for academic impact. Research impact is also recognised in other ways, including patents granted and the rating of researchers.

As a School, we strive to produce cutting-edge research that is impactful, working actively to improve our research output and quality. We therefore monitor proxies such as our research output units, the number of our academic staff rated by the National Research Foundation (NRF) and academic staff with PhDs.

Some academic staff in the School are nearing the completion of their PhDs, so our research output can be expected to continue growing into the future. We also concentrate on setting up focused research groups, which promote intra-school research collaboration and enable more research output to be generated.

A measure of the School's research productivity is reflected in Table 4, which shows key research outputs such as:

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The number of MSc and PhD research students that graduated.

The peer-reviewed subsidy-earning publications accredited by the Department of Higher Education and Training (DHET).

In 2020, our research productivity was impacted negatively by the Covid-19 pandemic, as staff re-directed some of their research time to manage the unprecedented transition to online teaching and learning. On a per capita basis, however, our School still ranks relatively well against other schools in the Faculty. The research publication units are converted to a per capita basis by the Faculty Research Committee (FRC), as this is an equitable way to evaluate productivity across years within a school and across schools within the Faculty. This approach caters for staff turnover and different staff complements as this varies from school to school.

It is also worth noting that research output can sometimes be cyclical, as indicated in Table 4, although there is a slight improvement in publication output units since 2010.

Table 4. Research output

Year	MSc graduated	PhD graduated	Total publication units accredited by DHET	Per capita research output units
2010	16	2	1.71	N/A
2011	6	3	12.25	N/A
2012	16	3	5.50	N/A
2013	11	2	14.29	N/A
2014	14	2	12.39	N/A
2015	13	7	22.89	N/A
2016	10	5	40.15	1.49
2017	35	3	36.50	1.52
2018	44	2	36.27	1.51
2019	37	4	21.75	1.36
2020*	15	3	N/A	N/A

Note: The 2020 publications are still being collated and will be available later in 2021. The per capita research output units are drawn from the annual Faculty of Engineering and the Built Environment Research Reports. (N/A = not available.)



(Senior Editor, IJMST, Professor Zhenfu Luo (Editor-in-Chief, IJMST), Professor Bekir Genc (Wits), Professor Cuthbart Musingwini (Wits) and Professor Budraiit Mitra (Wits)

The per capita research productivity indicates that the School's academic staff are generally a research-active team. At a three-year rolling average of 1,46 per capita research output units, the School is placed among the top three of the seven schools in the Faculty. Research-related highlights for the School during the period from 2019 to 2021 include the following:

- In 2019, the SAIMM honoured Professor Emeritus Richard (Dick) Minnitt for his illustrious research record in mining by awarding him the March 2019 edition of the SAIMM journal as a Dick Minnitt Special Edition.
- The NRF awarded Professor Rudrajit Mitra a C2 rating (established researcher) in 2019, and Professor Bekir Genc a C2 rating in 2020. Professor Cuthbert Musingwini was re-rated by the NRF in 2020 at a B2 rating (considerable international recognition), up from his previous six-year C3 rating as an established researcher. Two other staff members retained their NRF ratings in 2019 and 2020: Professor Emeritus Thomas (Dick) Stacey at B1 (considerable international recognition) and Professor Frederick Cawood at C1 (established researcher).
- A total of four PhDs and one Senior Doctorate (DEng) were awarded in 2019, and three PhDs in 2020.
- In 2019, the School signed a Memorandum of Understanding (MoU) with the International Journal of Mining Science and Technology IJMST to foster research collaboration. The IJMST is a high impact journal in the mining space and is published by Elsevier.

- In 2019, Professor Bekir Genc and his then PhD student Mr Moshood Onifade registered a patent for determining the spontaneous combustion propensity of carbonaceous materials. Moshood subsequently graduated and is now Dr Onifade.
- In 2020 and 2021, Professor Bekir Genc was recognised by the IJMST for co-authoring highly cited papers. He was also recognised in 2020 by the International Journal of Coal Science and Technology for co-authoring papers in the category of best papers.
- In line with our Strategic Goal 4 to establish focused research groups, the School submitted a motivation in 2020 from Mrs Pontsho Twala for the formal recognition of the Mineral Resources Governance Research Group (MRGRG) by the Faculty Research Committee (FRC) and University Research Committee (URC). The motivation was approved in May 2021 and the MRGRG is now formally recognised in the university.



Strategic Goal 5:

Effective stakeholder relationships

Locally, we partner with other mining engineering schools under the Mining Engineering Education South Africa (MEESA) initiative, where the heads of South Africa's four mining schools meet regularly to share common challenges and develop feasible solutions. Internationally, some of the School's academic staff participate in the activities of the international Society of Mining Professors (SOMP), which organises annual meetings and regional meetings. These meetings are valuable forums to share and advise each other on international developments related to mining engineering education and research. School of Mining Engineering

As we strive to deliver quality mining engineering education and cutting-edge research, our School knows that we cannot do it alone. We need partners to help us realise our goal, so we are always exploring avenues for mutually beneficial collaboration with other schools within Wits, and with other universities around the country and internationally.

We also look for 'win-win' partnerships with companies and organisations within the South African minerals industry. These partnerships enhance our international standing as a leading school for mining engineering education and research.

As indicated elsewhere in this review report, we invite your organisation or company to partner with us. Table 5 lists some of the key direct sponsors or donors to the School in 2020.

Table 5. Key direct sponsorsor donors to the School in 2020

Sponsor/Donor name	Nature of sponsorship/donation
Minerals Education Trust Fund	Providing financial support to the School for academic staff salary supplementations and ad hoc discretionary capex for equipment and upgrading of facilities
Sibanye-Stillwater	Annual donation for (1) assisting students in financial need, who have potential for success in their studies, and (2) upgrading of teaching and learning facilities.
Gold Fields	Providing the School with research projects for postgraduate students, along with funding for those projects.
Witwatersrand University Mining Engineers Association (WUMEA)	Providing funding to the School to assist students in financial need, who have academic potential.
Southern African Institute of Mining and Metallurgy (SAIMM) Scholarship Trust Fund	Providing funding to the School to assist students in financial needs, who have academic potential.
BBE Consulting	Providing free educational software licences for the VUMA mine ventilation software.
Dassault Systèmes	Providing free educational software licences.
GEOVIA	For the Surpac (mine design software), Whittle (for open pit optimisation) and Minesched (for mine scheduling).

Sponsor/Donor name	Nature of sponsorship/donation
Rocscience Inc	Providing free educational software licences for the Examine 2D, Examine 3D, RS2 and RS3 software for rock engineering modelling.
Datamine	Providing free educational software licences for Mineable Stope Optimizer (MSO) software (used for mine planning), Studio RM (used for resource modelling), Studio UG (used for underground mine planning) and Studio OP (used for open pit mine planning).
Impala Platinum Holdings Limited	Sponsor 4th year Mine Tour for students' golf shirts, backpacks and travel water bottles
Imperial Logistics Holdings Ltd	Golf shirts
Epiroc – South Africa	Jackets
Sandvik Mining & Rock Technology	T-shirts
Overlooked Colliery	Golf shirts
aQuelle Natural Spring Water Company	Flavoured and still bottled water
Worley Energy Chemicals Resources	Mugs, pens and screen cleaners



Partner with our School

The School needs your involvement to continue delivering high-quality, internationally competitive mining engineering education, and generating cutting-edge research. We are reaching out to your organisation to join us on this vital journey – to ensure the sustainability of our minerals industry, as well as our national and global economy. Please consider partnering with us; there are many opportunities for collaboration, especially under the current Covid-19 challenges. Among our immediate needs are these:

- Providing vacation work, especially to our 3rd and 4th year students – to whom this experience is a requirement for graduation. It is also valuable exposure to the industry that helps them find jobs after graduation.
- Providing bursaries or prizes to top-achieving students, so that we can encourage our students in a competitive learning environment – helping them become the best they can be.

Please talk to us

further information:

about these partnership opportunities - or any

others - by contacting one of the following for

Making donations to assist academically strong students who are in financial need. The School will work with you to identify suitable students who meet these criteria.

Making research projects available which can provide opportunities to our staff and postgraduate (MSc and PhD) research students to assist in solving some of your operational or strategic challenges. Their research could improve the economic success and operational sustainability of your mines.

Head of School Professor Cuthbert Musingwini, Tel: +27 11 717 7412; email: Cuthbert.Musingwini@wits.ac.za

School Administration Manager Mrs Zeenath Adam Tel: +27 11 717 7409; email: Zeenath.Adam@wits.ac.za.

Chairperson of Public Relations Committee Mr Kelello Chabedi,Tel: +27 11 717 7406; email: Kelello.Chabedi@wits.ac.za. Secretary to the Head of School Mrs Sonja Douman, Tel: +27 11 717 7403; email: Sonja.Douman@wits.ac.za.

Industry Advisory Council members 2021

Professor John Cruise Chairperson & Retired Mining Engineer

Professor Fred Cawood Wits Mining Institute Director

Kelello Chabedi Public Relations Officer, Wits School of Mining Engineering

Ranganai Chinamatira Seriti

Professor Ian Jandrell Dean of the Faculty of Engineering and the Built Environment (FEBE), Wits University

Dr Gys Landman Detnet Vusi Maseko Kumba Iron Ore

Billy Mawasha Kolobe Mala Investments

Tebogo Mmotla Mining Qualifications Authority

Mzila Mthenjane Exxaro

Professor Cuthbert Musingwini Head of School, Wits School of Mining Engineering

Mr Jim Porter Independent Hawk Rakale Sehwai

Professor Thibedi Ramontja Independent

Tim Rowland Gold Fields

Kevin Seyfried Hatch

Professor Gordon Smith Anglo American

Wits Mining Team 2021

Full-time staff

Zeenath Adam Admin Manager

Dr Tomi Akinseye Senior Lecturer

Professor Fred Cawood Professor (100% secondment to WMI/Early Retirement end of May 2021)

Carl Beaumont Senior Lecturer

Clinton Birch Senior Lecturer

Andrew Carpede Principal Technician

Kelello Chabedi Senior Lecturer

Professor Bekir Genc Professor

Lindy Dabrowski Senior Bookkeeper

Sonja Douman HOS Secretary Phila Gamedza Frontline Reception/Secretary

Pontsho Ledwaba Lecturer

Paseka Leeuw Senior Lecturer

Alvinah Madonsela Messenger

Isaac Mabala Associate Lecturer

Daisy Matlou Lecturer

Siyabonga Mbatha IT Consultant

Mothusi Mochubele Lecturer

Andrew Morgan Senior Technician

Professor Cuthbert Musingwini Professor and Head of School Paskalia Neingo Lecturer

Sihesenkosi Nhleko Lecturer

Ohveshlan Pillay Lecturer

Thobile Sedumedi PG Admin Officer

Zweli Thebethe Lecturer

Huw Thomas Senior Lecturer

Tinashe Tholana Lecturer

Erhan Uludag Senior Lecturer

Professor Bryan Watson Associate Professor

Emeritus, Visiting and Honorary professorial staff

Professor John Cruise Honorary Adjunct Professor

Professor Christina (Ina) Dohm Visiting Professor

Professor Daniel Limpitlaw Visiting Associate Professor

Professor Tania Marshall Visiting Adjunct Professor

Professor Isadore Matunhire Visiting Adjunct Professor Professor Richard (Dick) Minnitt Professor Emeritus & Visiting Professor

Professor Rudrajit Mitra Visiting Associate Professor

Professor Hudson Mtegha Visiting Adjunct Professor

Professor Nellie Mutemeri Visiting Associate Professor

Professor Huw Phillips Professor Emeritus Professor Thibedi Ramontja Honorary Adjunct Professor

Professor Gordon Smith Visiting Associate Professor

Professor Thomas (Dick) Stacey Professor Emeritus & Visiting Professor

Professor Nielen van der Merwe Visiting Professor

Final Year Class of 2019

Ndivho Tevin Bale; BinaSfiso; Fred Brown Andrade Chambal; Nhlakanipho Musawenkosi Dlamini; Louis Ntsako Hlungwani; Khangisa Luyanda Jafta; Dennis Jimu; Thabisile Tsatsa Khoza; Siyabonga Syprian Khumalo; Madimetja William Ledwaba; Masingita Matete Lekwadu; Lefu Joel Lephosa; Diapo Juda Letsoalo; Gill Lunga; Thembuluwo Mabodi; Sbusiso Emmuel Madonsela; Vumasande Makasi; Tshegofatjo George Makhafola; Glad Maluleke; Kamogelo Manyelo; Mokhine Phillistus Masemula; Rupert Mashele; Matsobane Eric Mashiane; Sinethemba Luvuyo Mdala; Tinyiko Gift Mhlanga; Kopano Job Minaar; Bonani Hazel Mkhari; Nkosinathi Rian Mndawe; Potso Jill Mokonyama; Temosho Pheteswana Monnye; Thabang Emmanuel Morakile; Boitumelo Gasenewe Mosiapoa; Lebogang Diaz Mothutsi; Tshegofatso Ghento Motsepe; Ida Tsakane Motshegoa; Motlokoe Emanuel Mphahlele; Kgothatso Msibi; Anelisa Ndongeni; Khumbudzo Archibald Netshipale; Tshilidzi Netshituka; Samkelisiwe Promise Ngidi; Mahlori Dacia Ngobeni; Thandanani Ngangezwe Johannes Nhlabathi; Herbert Mutshidzi Mathivha; Phindulo Matidza; Sedibu Mackenzie Matlebjane; Katlego Matloha; Mable Ngwetsana Matsieng; Talifhani Terrence Matumba; Mark Mauai; Sindiso Newton Mayisa; Thato Maropeng Satekge; Loeto Levious Sekwati; Pule Innocent Sello; Siphelele Lawrence Shabangu; Thandeka Shabangu; Nelisiwe Sibeko; Kgotlelelo Patience Teffo; Xolani Nkabinde; Sifiso Nkosi; Dignity Thabang Nkuna; Sityhilelo Nongendzi; Lebogang Phalane; Katlego Sherron Phanyane; Vusumuzi Pungula; Ndikandafhi Ramano; Tumelo Romane Tshoma; Mahlomola Tsoaledi; Nhlanhla Johanne Tsungo; Jabulani Titos Vilani; Anelisa Zimema; Andile Radnuph Zulu; Mgombagomba Lucas Zulu; Dumisile Precious Zwane; Lucky Vusi Zwane.

Final Year Class of 2020

Sabatha Aphane; Palesa Rozzette Babile; Margaret Tiwonge Banda; Ntsako Gershom Chauke; Reward Chauke; Zinomtha Phinda Gqweta; Vuyo Nkosenhle Gule; Sikhonzi Hadebe; Msizi Majahandile Hlatshwayo; Marcelle Johnson; Nyange Kekana; Vhahangwele Khuluvhe; Adam Kuhl; Sanah Kgothatso Lelagane; Ndivhuwo Kevin Lirubu; Thandeka Magareth Mabena; Nicholus Collen Mabona; Vutomi Life Mabunda; Nomfundo Madlala; Tshepho Mahlaela; Princess Dineo Mako; Thapelo Pollen Makofane; Tshenolo Magoshi Makola; Thabo Clinton Malapane; Collins Matime Mampuru; Mabilanyana Mandlazi; Tina Manina; Tshegofatso Manyathela; Mahudu Keletso Maredi; Matome Rufus Masenya; Mohweledi Dimpho Mashego; Lesesa Ronald Masunya; Khanyisa Matebese; Mulweli Matini; Tshepo Wilfred Matshoge; Ndivhuwo Darryl Justine Matsile; Lindokuhle Ntombifuthi Mbiza; Sinethemba Luvuyo Mdala; Kopano Job Minaar; Bongumenzi Sibusiso Mlotsa; Keba Rinolda Moalusi; Godfrey Monama; Koena Bennedict Monene; Teboho Jonas Mosia; Sizwe Moswathupa; Regina Mologadi Mothapo; Phumelelo Mphahlele; Nandipha Mthetho; Shandukani Mudau; Thabang Rivaldo Mudzunga; Unotjari Hannalore Mungunda; Khonani Munyai; Orifha Suzan Munyangane; Vonhlakanipho Nkosi; Ntsakiso Claudette Pearl Nkuna; Lwanele Misokuhle Ntuli; Njabulo Nyembe; Yamkela Pango; Makofane Macdonald Phetla; Michael Lephakela Phokungoane; Solomon Jack Pusoe; Sandisiwe Qitsi; Zelda Fhumulani Radzuma; Thabang Maepe Godfrey Raganya; Gift Hanyane Ramaphala; Tshegofatso Rathipa Mabitse Rampedi; Molatelo vy Ratlabyana; Atang Seboka; Mogobo Ronny Semenya; Pabalelo Mmakgomane Shayi; Innocent Sithole; Tshegofatso Khumo Thathane; Mashudu Tlhatlhetji; Keletso Mitchell Tolo; Stephens Phomolo Tsebe; Vhulungani Tshikhudo; Mahlomola Tsoaledi; Nhlanhla Johanne Tsungo; Mzwandile Phelelani Xulu.





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