

AFRIROCK

PIONEERING PROGRESS : THE FUTURE OF ROCK ENGINEERING

VENUE: Sun City, Rustenburg, South Africa

19 JULY 2025 – Pillar Workshop

TIME: 08:00-16:00



Pillar Workshop

Saturday, 19 July 2025

The South African mining industry faces several engineering challenges. This workshop was arranged to discuss a key challenge, namely to obtain accurate estimates of pillar strength and to develop appropriate pillar design methodologies for South African mines. The coal mining industry adopted empirical strength formulae in the early 1960s. Extensive research into coal pillar strength was conducted in the aftermath of the Coalbrook disaster. The famous Salamon and Munro power-law strength formula was the result of this research effort. Although this formula has been used successfully for decades, significant advances were made in recent years in terms of coal pillar strength and this will be discussed at the workshop.

The shallow chrome, platinum and manganese mines in South Africa typically also use mechanised bord and pillar mining layouts. These mines need to estimate the strength of their pillars for optimum layout design. As nothing better was available, the Hedley and Grant pillar strength formula, which was originally developed for Canadian uranium mines in the early 1970s, was used for many decades. The older hard rock operations are gradually increasing in depth and this adversely affects the extraction ratios. The available design methodologies and pillar strength formulae dictate an increase in pillar size and a decrease in extraction ratio with depth. As these mining operations are vital to the South African economy, it is critical to maximise the extraction ratios and to ensure that the orebodies are optimally exploited. It is therefore somewhat surprising that only a limited amount of research has been conducted to develop reef-type specific pillar strength formulae for the hard rock mines in South Africa. This workshop will be used as a forum to discuss possible alternative methods of pillar design, hopefully serving as a motivation for future research programmes. It will also be valuable to rock engineering practitioners as the strengths and pitfalls of the existing methods will be rigorously debated.

Agenda of the workshop

7:30	Registration and Early Morning Refreshments	
8:00	Welcome	
8:15	The need for this Workshop and recent advancements	F. Malan
8:45	Underground measurements and visual observations	B. Watson
9:15	Geotechnical Uncertainty in pillar designs	W. Joughin
9:45	Panel Discussion	
10:00	Mid-Morning Refreshments	
10:15	The application of an alternative failure criterion for pillar design with applications to underground examples	R. Kersten
11:00	An alternative pillar design methodology.	R. Kersten
11:45	Panel Discussion	
12:15	Lunch	
13:00	Coal Pillars & design advancement	J.N. van der Merwe
15:00	Panel Discussion	
15:15	What are we to do now?	F. Malan
15:30	Closing remarks	F. Malan
15:30	Afternoon Refreshments	

FOR FURTHER INFORMATION, CONTACT:

Gugu Charlie,
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Coordinator

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Workshop Presenters:



Prof Francois Malan

Prof Malan started his geotechnical career in 1993 at the Chamber of Mines Research Organisation. This later became the CSIR Division of Mining Technology. There he mostly conducted research on the rock mass behaviour in deep tabular mines. His particular interest during this period was the time-dependent behaviour of hard rock and he used this as topic for his PhD thesis. In 2011 he joined Groundwork Consulting and worked on pillar designs and layout problems in the South African platinum industry, geotechnical problems in the deep gold mines and instrumentation development for geotechnical applications. In 2011, he joined the gold mining industry and was appointed as Senior Consultant Rock Engineering of Gold Fields South Africa. These mines were taken over by Sibanye Stillwater in 2013 and he remained with Sibanye Stillwater. In 2018, he joined the University of Pretoria as Associate Professor. In 2021, he was promoted to full Professor and is currently the Head of Department and the Director of the Mining Resilience Research Centre. He currently has an NRF rating of B2 and has more than 1800 citations on Google Scholar.

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His key research interest is numerical modelling and pillar and layout design for hard rock tabular mines. During the last 7 years, he was fortunate to be part of a vibrant research group in rock engineering in the Mining Department, focussing mostly on pillar design and numerical modelling aspects. This group has produced a significant number of papers on these topics.

Over the years, he has received various awards for his contributions to rock engineering. These include six gold and silver medals from the South African Institute of Mining and Metallurgy and three Salomon awards from the South African National Institute of Rock Engineering for best publications. The ISRM awarded him the Rocha medal in 2011 for the best PhD in the world and in 2017 he presented the ISRM Franklin Lecture at the AfriRock Symposium in Cape Town. He also presented the 29th ISRM online lecture during March 2020. He has been appointed as an ISRM Fellow and was inducted in Saltzburg in October 2023. The position of ISRM Fellow was introduced in 2011 to recognise select individuals who have achieved outstanding accomplishments in rock mechanics and rock engineering and have contributed significantly to the work of the ISRM.

Between 2007-2011, Prof Malan served as ISRM Vice-President for Africa. Prior to this, he was also the President of the South African National Institute of Rock Engineering for the period from 2003 -2005. Prof Malan is a Fellow of the South African Institute of Mining and Metallurgy, a Fellow of the South African National Institute of Rock Engineering and a member of the Society of Mining Professors. He acts as a reviewer for several rock engineering journals and is a member of the Publications Committee of the Journal of the South African Institute of Mining and Metallurgy and a member of the Editorial Board of the International Journal of Rock Mechanics and Mining Sciences.

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Prof Bryan Watson

40 years in the mining industry: Platinum, gold and coal. A strong focus on hard rock pillar design and behaviour. Rock engineering design of shallow and deep-level stopes. Underground instrumentation and laboratory testing.

Awards

CSIR Innovators Award (1994).

2nd best PhD thesis in the world (Rocha runner-up certificate) (2011).

SAIMM silver medal award for an outstanding publication (2011).

SAIMM gold medal award for an outstanding publication (2022).

SANIRE Salomon Award for best rock engineering paper in RSA (2011).

AMMSA (Association of Mine Managers of South Africa) paper award (2022).

Achievements

19 Journal publications.

20 Conference papers.

20 major research reports.

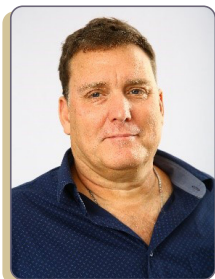
Chartered Engineer

ISRM commission on rock mass strength and deformation

Community service

Graduated ~480 undergrad students.

Graduated 17 MSc students.



William Joughin

William Joughin has over 30 years of experience in the field of underground rock engineering, which includes 10 years on South African deep level gold mines and the remainder in consulting. He specializes in underground rock engineering investigation and design and has provided consultancy services for mining projects on six continents, with various orebody geometries and rock mass characteristics, exploited with a wide range of mining methods. His work encompasses geotechnical investigations, numerical modelling, mining method selection, design of mining excavations, and geotechnical risk.

William has published over 50 articles on rock engineering and is the recipient of an SAIMM (Southern African Institute of Mining and Metallurgy) gold medal and the Alec Wilson Award from SANCOT (South Africa National Committee on Tunnelling) for outstanding papers.

William served as Director and Chair of the board at SRK Consulting (South Africa) and Director of SRK Consulting (Global). William is a Past President of the SAIMM and the South African National Institute of Rock Engineering (SANIRE); and a Past Vice President for Africa of the International Society for Rock Mechanics (ISRM).

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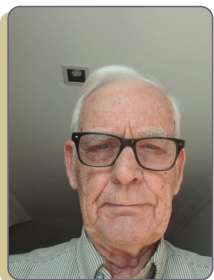
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Rudi Kersten

Rudi Kersten, rock mechanics consultant, has more than 60 years experience in the mining industry. As consultant to Anglovaal he has been involved in the design and maintenance of both open pit and underground mines. Consultancy work was also done as an independent consultant with South African and overseas clients since 1994 and has been involved in a number of due diligence and resource evaluations. He gained his MSc degree in geology in 1970 at the University of Pretoria and a PhD (Mining Engineering) at Wits University in 2016. Throughout his career, he has been involved in the guidance and evaluation of the research activities of the Chamber of Mines Research Organisation.



Nielen van der Merwe

Professor Nielen van der Merwe has been in the mining industry for over 50 years, with 27 years directly in practice and 25 years in a combination of research, teaching and practice as a consultant. He is the author of two books and 90 other publications. He has been awarded the SAIMM Gold and Silver Medals as well as the Salamon Award on more than ten occasions. He was Head of the Mining Engineering Department of the University of Pretoria and incumbent of the Centennial Chair for Rock Engineering at the University of the Witwatersrand.

His leadership qualities are demonstrated by the fact that he was the last President of the South African National Group on Rock Mechanics (SANGORM) and following reconstruction, the first of the South African National Institute of Rock Engineering (SANIRE). In this capacity, he served as the Vice President for Africa of the International Society of Rock Mechanics. He was also president of the SAIMM.

He continued promoting South Africa on the international rock engineering landscape by becoming President of the ISRM and President of the Federation of International Geo-Engineering Societies (FeDIGS).

Registration Fee: R3 000

Online: R1 000

Students: Free (Proof full time student status required)

REGISTER HERE

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