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DSTI-NRF Centre of Excellence for Integrated Mineral and Energy Resource Analysis

science, technology & innovation
Department:
Science, Technology and Innovation
REPUBLIC OF SOUTH AFRICA

NRF National Research Foundation | RISA Research and Innovation Support and Advancement

20 YEARS 2005-2025

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UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

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NEWSLETTER

MARCH 2025 Nº 5

2025 Welcome message by Prof. Sue Webb

DSTI-NRF CIMERA Exciting Opportunities

It is with great excitement and a deep sense of responsibility that I step into the role of Co-Director of CIMERA at Wits University. First and foremost, I want to pay tribute to Prof. Judith Kinnaird, whose dedication, leadership, and unwavering commitment have played a pivotal role in shaping CIMERA into what it is today. Her tireless efforts in fostering research, supporting students, and building strong industry collaborations have left an indelible mark on CIMERA, and I am honoured to build upon the solid foundation she has laid. I have witnessed firsthand the dedication of our researchers and students, and I am eager to continue fostering an environment of growth, collaboration, and excellence. CIMERA has always been about opportunities—opportunities for students, researchers, and the geoscience community as a whole—and I am committed to ensuring that this legacy continues to thrive.

2025 Starts Off with a Bang

The year kicked off with a major milestone—CIMERA's presence at the Mining Indaba in Cape Town in February. For the first time, young geoscientists were represented on stage in panel discussions, a space traditionally reserved for senior industry professionals. Seeing students take the stage and contribute to key conversations about the future of mining and exploration is a testament to CIMERA's dedication to creating opportunities. This development reflects our belief that the next generation of geologists must be engaged in shaping the industry from the outset. We are immensely proud of the students stepping up to this challenge and suggest you read some of their LinkedIn posts for inspiration and the value of early career voices (search on #DSTI-NSF-CIMERA).

Personal Highlights from Last Year

Reflecting on 2024, there were many memorable moments, but two highlights stand out for me. Our road show visits to the University of Limpopo and University of Venda were incredibly rewarding, as we had the chance to engage with students and faculty, discuss research initiatives, and explore ways to strengthen collaborations. Seeing firsthand the enthusiasm and potential in these institutions reaffirmed CIMERA's commitment to providing meaningful opportunities across the country.

Another standout was the 'Translate Your Research' competition, which encouraged students to explain their research not only in accessible language, but in their home language. This initiative proved to be a great success. I would love to hear ideas on how we can expand its reach—perhaps by connecting with appropriate radio stations to broadcast winning entries or by starting with videos of winners explaining their research in their home language. If anyone has relevant contacts or suggestions, please reach out!

Student and Researcher Opportunities

The greatest strength of CIMERA lies in the funding opportunities it offers for students and researchers alike. Through funding provided by DSTI-NRF, postdoctoral fellows, postgraduate students and researchers across multiple institutions are supported. This funding enables them to pursue their research goals and advance their careers in geosciences. With our continued engagement in various projects, including those affiliated with the Helmholtz Institute Freiberg for Resource Technology (HIF), the Anglo-American Angolan Kunene project, as well as participation in the International Continental Scientific Drilling Program's Bushveld Drilling Project

(ICDP BVDP), we are ensuring that our researchers gain international exposure and access to cutting-edge developments in geoscience. Calls for 2026 research proposals will be opening soon, so start working on your ideas. If your company seeks academic research projects, be sure to reach out to us for collaboration.

ICDP executive visit

South Africa was selected to host the annual meeting of the ICDP Assembly of Governors and Executive Committee. This high-profile meeting in May will be organized by CIMERA and will provide a rare opportunity for CIMERA students to interact with key decision-makers in international geoscience and gain insights into the latest developments in continental scientific drilling. Engaged students will be able to learn from top experts, exchange ideas, and explore future research possibilities within this prestigious global program.

GeoCongress 2025 & CIMERA Colloquium

GeoCongress 2025 will not only be an exciting platform for students and researchers to present their work and engage with leading experts, but there is also a dedicated workshop for discussing CIMERA's development. We encourage students, researchers and industry to take full advantage of GeoCongress to build connections, gain insights, and showcase their research. We hope to strategize several new projects during the dedicated workshop. We encourage as many of you as possible to participate.

Additionally, our **Annual Research Colloquium**, scheduled for November 2025, will be another highlight of the year. This event provides a platform for postgraduate students to showcase their research, whether through poster presentations in the early stages or oral presentations in the final year. The Colloquium is open to everyone to attend and includes high profile scientists and industry keynote speakers. CIMERA students can look forward to additional workshops for softskills. We look forward to celebrating the incredible work being done and fostering discussions that drive our field forward.

Networking is one activity that consistently creates opportunities. Whether through conferences, workshops, or LinkedIn, we encourage everyone to seize opportunities to connect, collaborate, and grow within the CIMERA community.

Let's keep creating CIMERA opportunities and make 2025 another year of success, growth, and research!

Best regards,
Prof. Susan Webb
Co-Director, DSTI-NRF CIMERA

2024 RECAP

Annual Research Colloquium 2024 & Soft Skills Workshop

We successfully hosted the DSTI-NRF CIMERA 2024 Annual Research Colloquium at the Johannesburg Business School on November 25th and 26th, featuring informative research presentations and networking opportunities. Dr Hielke Jelsma, from Anglo-American, delivered a keynote address on global mineral systems and CIMERA students presented their research highlights. Twenty-two CIMERA funded students presented their diverse research findings and 11 poster presentation were provided. The event welcomed 73 delegates in person and 11 online.

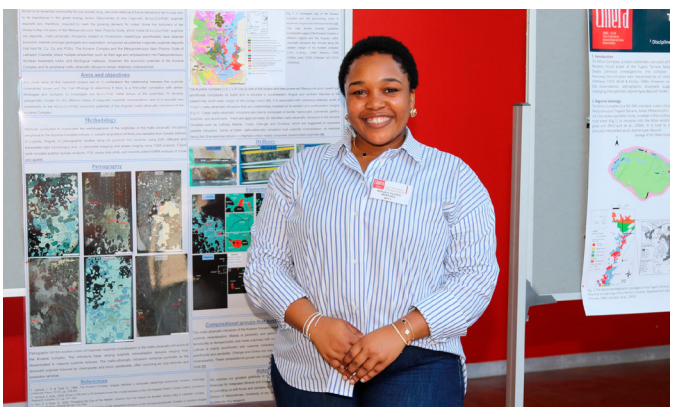
The closing, the colloquium concluded with a keynote by Dr. Leonidas Vonopartis (Wits). Awards were presented for exceptional presentations, with Jena Moldenhauer and Danielle Visagie, MSc candidates from the University of Cape Town, receiving the Best Oral Presentation awards (tie), and Merrily Tau, a PhD candidate from the University of Cape Town, recognized for the Best Poster Presentation. The colloquium showcased collaborative efforts between academia and industry to advance geoscientific knowledge. The networking event provided an opportunity for collaborations in a more social environment.

Soft Skills Workshop

A Soft Skills workshop was held with guest facilitators Ms. Chane de Jager and Ms. Raksha Naidoo from Wimsa, highlighting the importance of soft skills such as communication, effective teamwork, problem-solving, and adaptability for early-career professionals. These skills complement technical expertise, enhance employability, and support career growth.

X4P/Freiberg Short Course

19th Freiberg Short Course in Economic Geology, **'Critical Raw Materials: A Global Perspective,'** took place from December 9th to 13th at the Helmholtz Institute Freiberg for Resource Technology (HIF) at HZDR. **Prof. Judith Kinnaird, our retired CoE Co-director,** along with Prof. Paul Nex from the University of the Witwatersrand, presented the course. Eighty participants from nine countries attended, the majority of whom were students. Each day featured a series of lectures, concluding with interactive activities on recent Critical Raw Material topics and engaging contributions from the audience. This course was part of the X4P CIMERA-HIF Collaboration.



IMPORTANT ANNOUNCEMENTS

DSI-NRF CIMERA to DSTI-NRF CIMERA abbreviation name change

The Department of Science and Innovation (DSI) has been officially renamed to the Department of Science, Technology, and Innovation (DSTI). As a result, our organization will now be known as DSTI-NRF CIMERA, reflecting the updated departmental name. Please note this change in all future references, documentation and social media.

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UNIVERSITY OF JOHANNESBURG

Call for 2026 funding to be announced in April.

Be on the lookout on our social media platforms and website for updates.

DSTI-NRF CIMERA Annual Research Colloquium 2025

We are delighted to announce that the DSTI-NRF CIMERA Annual Research Colloquium will take place in the Limpopo Province in 2025 co-hosted with the University of Limpopo and University of Venda. We look forward to your participation and informative contributions to the 2025 colloquium.

More details regarding the event schedule and venue will be shared in due course.

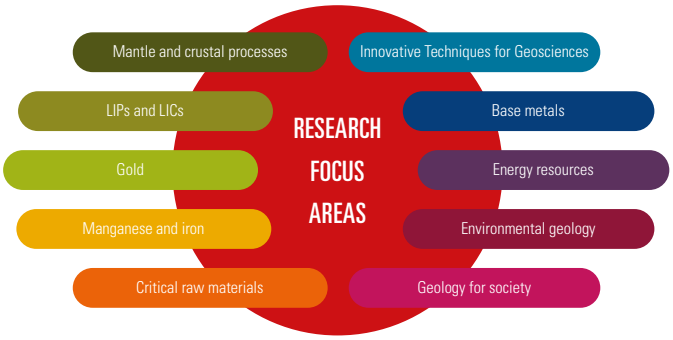
PUBLICATIONS

Focus Area 1

Oxygen isotope constraints on proto-kimberlite melt modification through assimilation of low $\delta^{18}O$ recycled crust in the deep lithosphere. Link: https://doi.org/10.1016/j.gca.2024.12.028Get rights and content

Focus Area 3

Mineralisation controls for the diverse Cape manganese occurrences, South Africa. Link: https://doi.org/10.25131/sajg.127.0028



Focus Area 4

The behaviour of scandium during crustal anatexis: Implications for the petrogenesis of Sc-enriched granitic magma. Link: https://doi.org/10.1016/j.lithos.2024.107874

Focus Area 9

An assessment of Rare Earth Elements in borehole cores from the Ermelo, Witbank and Waterberg Coalfields, South Africa: Focus on mode of occurrence. Link: http://dx.doi.org/10.17159/2411- 9717/692/2024

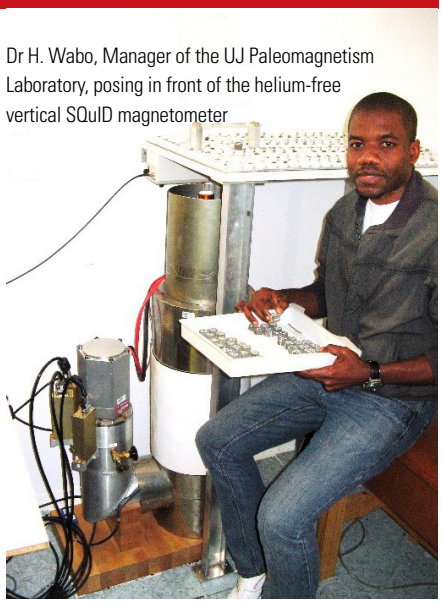
CIMERA ACADEMIA RESEARCH NEWS

The UJ Paleomagnetism Laboratory: An Analytical Tool for Economic Geology

The UJ Paleomagnetism Laboratory was established in 2004 and is the sole facility of its kind on the African continent housing a liquid helium-free Superconducting Quantum Interference Devise (the so-called SQuID magnetometer). The Laboratory is part of the Rock and Paleomagnetism Instrument Development (RAPID) Consortium managed by Caltech in the US.

The particularity of Paleomagnetism is its capability to provide a temporal information and a spatial component. This binary information can be used for magnetic dating of ore deposit genesis while allowing paleogeographic reconstructions with correlation of geological units hosting significant mineral deposits, hydrocarbon and/or water resources. Paleomagnetism has multi-disciplinary applications and can be incorporated into any CIMERA research focus areas.

The UJ Paleomagnetism Laboratory has been involved in many projects in economic geology over the last two decades, and by doing so, has greatly contributed to the mineral industry. Paleomagnetic projects in the Bushveld Complex have contributed to better constrain the chronology of Platinum Group Elements (PGE) within the Rustenburg Layered Suite and Ni-Cu-PGE mineralization in the Uitkomst Complex, as well as the timing of polymetallic mineralization (Cu-Pb-Zn-Ag-U-F) in the Lebowa Granite Suite. Paleomagnetic dating was also successfully used to test previous ore-



Dr H. Wabo, Manager of the UJ Paleomagnetism Laboratory, posing in front of the helium-free vertical SQuID magnetometer

forming models in the Kalahari Manganese Field in the Northern Cape with confirmation of the multistage evolution of manganese ores. Projects in India have contributed to place the Purana basins that host important manganese deposits and conglomeratic diamonds in proper chronological context, which helped industrials formulate appropriate exploration strategies. The successful achievement of the above-mentioned projects has resulted in several scientific publications in top 10 and 1% journals (e.g., Nature portfolios, Geology, Precambrian Research).

The UJ Paleomagnetism Laboratory is currently involved in many other economic projects in collaboration with research institutions and companies in Africa, Asia, Europe and North America. One example is the Kunene Project in Angola and Namibia funded by Anglo-American that is looking at prospective mafics and ultramafics for Ni-Cu-Co-PGE mineralization. Another project is in the Francevillian basin in Gabon that is host to important Manganese and Uranium deposits – and is connected to the newly funded ICDP-GEO-DEEP International Drilling Project.

There is also a collaboration with the Khalifa University in UAE on a project looking at ore forming-models of critical raw minerals deposits (e.g., Li, Ni-Cu) in the Abu Dhabi foreland basin and Semail Ophiolite. The increased incorporation of paleomagnetism in research portfolios at CIMERA will certainly add a greater value to scientific development of the COE and will contribute to shape the future of Economic Geology at UJ Geology, with a view to assist global efforts to achieving energy transition.If you are interested in collaborative project, please contact Dr H. Wabo (hwabo@uj.ac.za).

CIMERA STUDENT NEWS

Senamile Dumisa utilizing the recently installed SXES spectrometer on the electron microprobe at UNIGE, a piece of equipment not available in South Africa.

Senamile Dumisa (2nd from left) with Prof. Luca Caricchi (1st from left) and the UNIGE team.

Senamile Dumisa's Visit to the University of Geneva

I'm Senamile Dumisa, a postdoctoral researcher at the University of Johannesburg. I had the privilege of travelling to the University of Geneva (UNIGE) in Switzerland for a two-month research visit from November 2nd, 2024, to January 1st, 2025. This visit was part of my involvement in the project **'A Machine-Learning Approach to Constrain the Pressures and Temperatures (P-T) of Crystallisation of the Kunene Anorthosite Complex and its Mafic-Ultramafic Satellite Intrusions.'**

This project is part of a larger multi-disciplinary research initiative that seeks to explore the petrogenesis of the Kunene massif-type anorthosite complex. Located in the Angola–Namibia region, this complex is the most significant known massif-type anorthosite intrusion on Earth (Bybee et al., 2019). It holds significant geological interest, particularly due to its potential as a source of Ni-Cu-Platinum Group Elements (Bybee et al., 2029; Maier et al., 2013).

However, there are limited constraints on the pressures and temperatures (P-T) at which the Kunene magmas crystallized. This gap in knowledge exists because the mineral assemblage in the anorthosite lacks the necessary phases for conventional thermobarometry. To tackle this challenge, our project aimed to apply a machine learning (ML) approach developed by Prof. Caricchi and colleagues at UNIGE. This innovative approach derives P-T conditions and melt chemistry in equilibrium with the minerals by correlating mineral chemistry data with a range of existing experimental datasets.

One of the most valuable aspects of this visit was the hands-on training I received in the ML techniques developed by Prof. Caricchi and his team. I also had the opportunity to process the Kunene dataset using their expertise and to perform electron microprobe analyses on a subset of samples. This analysis, which focused on the Fe2+/Fe3+ ratio, was crucial for supplementing the existing Kunene dataset. Additionally, the University of Geneva had recently installed an SXES spectrometer on their electron microprobe, a piece of equipment not available in South Africa, allowing us to gather detailed and accurate data that enhanced the dataset.

The two months spent at the University of Geneva were invaluable to my personal and professional development. I gained new skills in applying machine learning techniques to geoscientific problems, and the collaboration with experts at UNIGE further strengthened the research foundations of the Kunene Complex project. I am deeply grateful to CIMERA's funding that made this opportunity possible, and I look forward to continuing this exciting and innovative work.

CARBON ORE RESEARCH GROUP
UNIVERSITY OF JOHANNESBURG

Ms Matlala, Prof Nikki Wagner, Dr Biswas (PDRF) and Ms Chitlango with their certificates

Four members of the Carbon Ore Research Group, Department of Geology, UJ have received international accreditation from the International Committee for Coal and Organic Petrology (ICCP) Single Coal Accreditation program. Ms Matlala (DSTI-NRF CIMERA PhD candidate) and Prof Wagner received re-accreditation, and Dr Biswas (PDRF) and Ms Chitlango (DSTI-NRF CIMERA PhD candidate) received first time accreditation. There are 6 accredited petrographers on the African continent, 4 now based at UJ, and less than 90 accredited petrographers globally.

Attending the Igneous and Metamorphic Studies Group (IMSG) Conference at Stellenbosch University

Attending the Igneous and Metamorphic Studies Group (IMSG) conference at Stellenbosch University in January 2025 was an enriching experience. The conference kicked off with a field trip to Yzerfontein and Trekoskraal, where valuable information about the Cape Granite Suite was shared. The official conference began with presentations from fellow colleagues, coupled with discussions that enriched my understanding of various geological aspects.

I had the privilege of presenting the preliminary structural results of my MSc project titled "Structural and Economic Geology of the Mafic-Ultramafic Ombuku South and Otjijanjasemo Intrusions at the Periphery of the Kunene Complex in Northern Namibia." The main goal was to present my study area to a broader geological community, as it remains relatively understudied due to its remoteness and past social unrest in Namibia and Angola. Seeing the interest and enthusiasm of other geologists was both motivating and encouraging.

On a personal note, this trip marked several firsts, my first time on an airplane and visiting Cape Town. These experiences added excitement and personal growth to the professional development I gained. Overall, attending the IMSG conference was both academically rewarding and personally memorable.

Thabiso Sibanyoni (left) is a MSc student from the University of Johannesburg.

INDUSTRY EVENTS

Prof Nikki Wagner, Phumudzo Munyai, Tom Khetani, Merrily Tau, Peace Zowa, Nthabeleng Romotolo, Thabo Kgarabjang and Ronaldo Malapane, #MI25

Investing in African Mining Indaba 2025

This year's Investing in African Mining Indaba conference was a noteworthy event, filled with energy and a forward-looking spirit. Hyve Group, the organizers, did an excellent job of including the perspectives of both industry leaders and young researchers in the discussions.

Five of our students participated as speakers on different panels at this year's Mining Indaba. Additionally, our CoE director, Prof. Nikki Wagner, contributed to a discussion on the disruptive stage titled "Coal and Uranium: And Renewables! What is the 'Sweet Spot' Energy Mix?"

Thabo Kgarabjang, a PhD candidate from the University of Limpopo, took part in the discussion titled "What Does a Future Explorer Look Like? New Approaches and New Investment Opportunities." His contributions were insightful, focusing on innovative exploration strategies.

Phumudzo Munyai, from the University of Venda, contributed to the discussion on "Tailings: Launch of the Global Tailings Management Institute." He emphasized the importance of sustainable tailings management.

Khethani Tom Ramphabana, also from the University of Venda, discussed "The Big Question - How Africa Can Develop a Globally Competitive Infrastructure Platform." He highlighted the need for substantial infrastructure to enhance Africa's competitiveness in mining.

Peace Zowa, from the University of the Witwatersrand, spoke about "A New Talent Pool – Preparing Tomorrow's Next Generation of Miners in an Evolving Technological Landscape." Her insights focused on training skilled professionals in mining, considering the rapid technological advancements.

Ronaldo Malapana, from the University of Limpopo, discussed "Rare Earth Elements: Still Rare in the Just Energy Transition?" He examined the availability and importance of rare earth elements in the energy transition and Africa's role in this critical area.

The panel included:

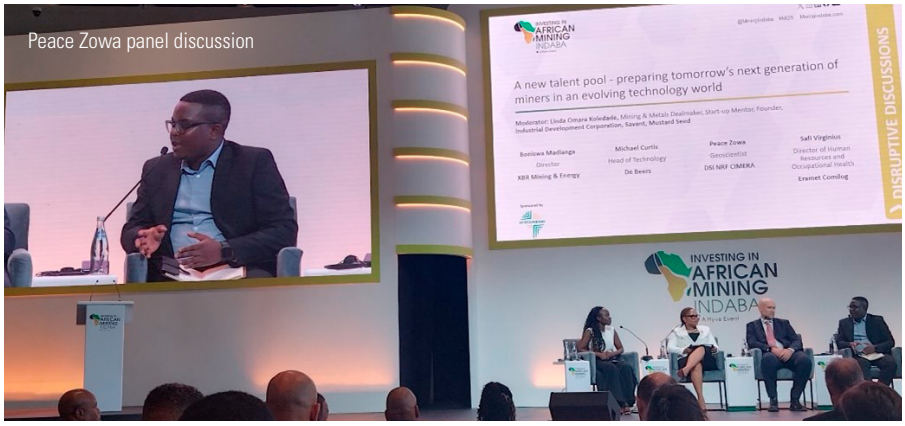
- Hon. Phiona Nyamutoro, *Minister of State for Mineral Development, Republic of Uganda*
- Dr Elmar Muller, *Executive Manager of Hydrometallurgy at Mintek*
- Alwyn Vorster, *CEO of Lindian Resources*
- George Bennett, *CEO of Rainbow Rare Earths*

Together, they explored Africa's leadership in rare earth production and the role of clean energy suppliers and miners in the transition towards renewable resources. The discussions highlighted the need for collaboration and innovation in the African mining sector.

The event focused on new approaches, investment opportunities, and the development of a skilled workforce, setting the stage for a more sustainable and competitive mining industry. The involvement of young researchers and industry leaders indicates a promising future for the sector.

The information shared underscored Africa's potential to harness its abundant resources while developing local expertise and infrastructure. This conversation is crucial for positioning Africa as a key player in the global rare earth market, contributing to a sustainable energy transition.

Visit our website for student feedback on the Mining Indaba 2025 conference experience and check out the gallery page for the Mining Indaba images.



Peace Zowa panel discussion

Prof Nikki Wagner panel discussion


Thabo Kgarabjang, Peace Zowa, Tom Khetani, Ronaldo Malapane

Ronaldo Malapane panel discussion

MI25 gallery link: https://cimera.co.za/2025-gallery/investing-in-the-mining-indaba-conference-2025/

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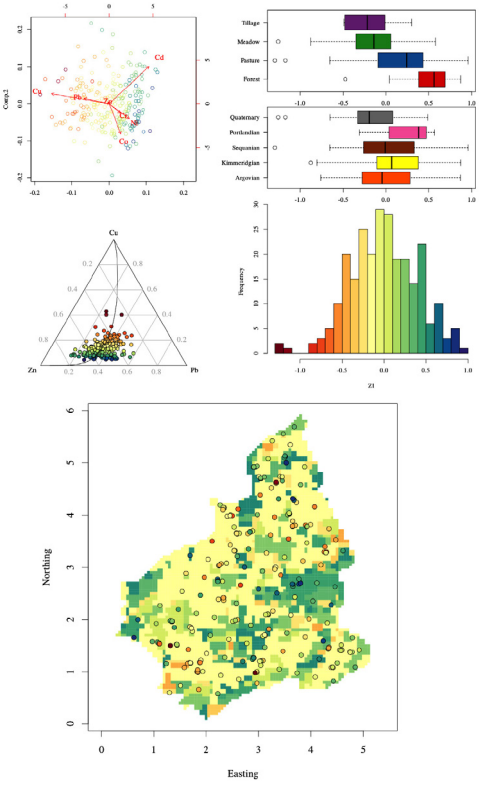

HIF HELMHOLTZ INSTITUTE FREIBERG FOR RESOURCE TECHNOLOGY
HZDR HELMHOLTZ ZENTRUM DRESDEN ROSSENDORF
X4P

19-23 May 2025

DSTI-NRF CIMERA Workshop

DSTI-NRF CIMERA in collaboration with Helmholtz Institute Freiberg for Resource Technology invite you to attend a workshop:

Introduction to data analysis with R for geoscientists.

The workshop is designed for Honours, MSc and PhD students, Postdocs and Industry representatives with basics of data analysis and a background in geosciences / engineering of the mineral value chain sector.

Workshop	Introduction to data analysis with R for geoscientists
Duration	32 UE (1UE = 45min)
Date	**Lunchtime 19 May, end lunch-time 23 May 2025**
When	from 19.05.2025 to 23.05.2025 – Monday from 12:45 to 16:00 – Tuesday, Wednesday and Thursday from 09:00 to 16:00 – Friday from 09:00 to 12:15
Where	Wits Geosciences Building
Lecturer	**Raimon Tolosana-Delgado**
Content	– basics of programming with R and tidy R – structuring data, exploratory data analysis (EDA), scale assessment and constrained data: categorical data, compositions and orientations – multivariate analysis: principal component analysis, regression, tests – working with groups: supervised and unsupervised classification
Price	R1000
Language	English
Contact	Zintle Daraza – zintle.daraza@wits.ac.za
Participants	Maximum 25
CPD Points	To be confirmed (4 full day contact teaching)
Requisites	Own laptop with R and R-studio installed (Mo 10:30-12:00: voluntary preparation session offered to help installing the system by pre-registration only!)

X4P International Research Collaboration Workshop

Upcoming Workshop on Data Analysis for Geoscientists

We are excited to announce the upcoming Introduction to Data Analysis with R for Geoscientists collaborative HIF course," scheduled to take place from 19 May to 23 May 2025, at the Wits Geosciences Building.

DATES AND TIMES
Monday 19 May: 12:45 to 16:00
Tuesday, Wednesday, Thursday: 09:00 to 16:00
Friday 23 May: 09:00 to 12:15

LECTURER: Dr Raimon Tolosana-Delgado (HZDR-HIF)

COURSE CONTENT
- Basics of programming with R and tidy R
- Structuring data, exploratory data analysis (EDA), scale assessment, and constrained data: categorical data, compositions, and orientations
- Multivariate analysis: principal component analysis, regression, tests
- Working with groups: supervised and unsupervised classification

PRICE: R1000

LANGUAGE: English

CONTACT: Zintle Daraza (zintle.daraza@wits.ac.za)

NUMBER OF PARTICIPANTS: Maximum 25

CPD Points: To be confirmed (4 full day contact teaching)

AUDIENCE: This Course is designed for Honours, MSc, and PhD students, Postdocs, and Industry representatives with basic data analysis knowledge and a background in geosciences or engineering of the mineral value chain sector.

REQUISITES: Participants must bring their laptops with R and R-studio installed. A voluntary preparation session will be offered on Monday from 10:30 to 12:00 to help with the installation, available by pre-registration only.

We look forward to your participation in this informative and practical course.

Please reach out to Zintle Daraza for any inquiries or to secure your spot.

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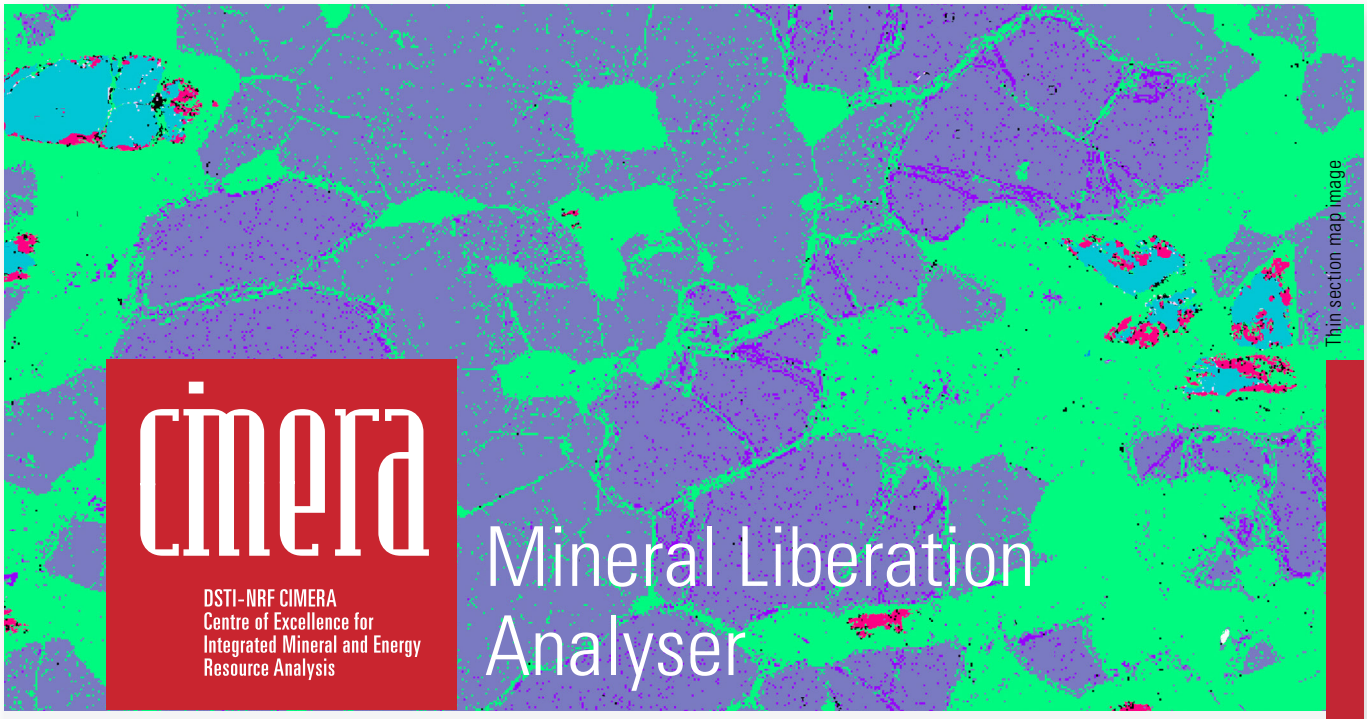
Calling all CIMERA Alumni

Please ensure that we have your updated details as we would like to invite you to our events.
Please email the CoE Manager at cimera@uj.ac.za and share your news with us.



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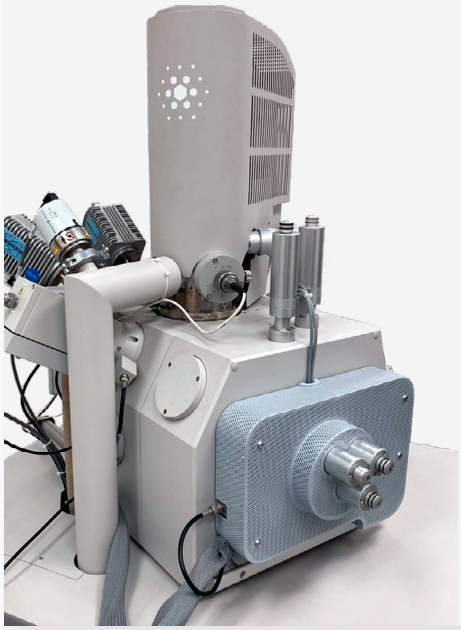

The **MLA (QUANTA 650 FEG SEM)** is an Automated Scanning Electron Microscope equipped with Energy Dispersive X-ray Spectrometry designed for high-resolution imaging, rapid automated data collection, and mineral phase identification. The data is derived from two-dimensional measurements from the exposed surface of either a standard thin section or a 25/30mm diameter polished section. The ability of unattended analysis on multiple sections leads to a larger throughput of data.

LOCATION: SPECTRA
University of Johannesburg,
Auckland Park Kingsway Campus, C1 Lab 348

SERVICES:

Manual SEM analysis
High resolution imaging
Elemental Mapping
Line mapping
Single EDS analysis

Automated SEM analysis
Detailed mapping of geological material (milled or in-situ)
Determine mineralogical composition
Particle detail:
- Liberation
- Grain Size Distribution
- Mineral Association

SAMPLE TYPES:
Standard thin section
Milled material set in resin blocks (25/30mm diameter)

ORE TYPES:
Fly ash
Precious metals
Base metals
And other commodities

SEVICES AVAILABLE TO: Academia and Industry

ENQUIRIES: Contact gabriellef@uj.ac.za or cimera@uj.ac.za