

Facilities available for mineralogical/geochemical/isotopic research at South African universities and research institutes

compiled by A. Hofmann (ahofmann@uj.ac.za), University of Johannesburg (July 2024)

University departments/labs

NMU – Nelson Mandela University, Centre for HRTEM (<https://chrtem.mandela.ac.za/>)

RU - Rhodes University (www.ru.ac.za/geology)

SU - Stellenbosch University (www.sun.ac.za/english/faculty/science/earthsciences;
www.sun.ac.za/english/faculty/science/CAF)

UCT - University of Cape Town <https://science.uct.ac.za/department-geological-sciences/research-facilities>; <https://ebe.uct.ac.za/emu>; <https://science.uct.ac.za/pept-cape-town/facilities-10>)

UFS – University of the Free State (<https://www.ufs.ac.za/natagri/departments-and-divisions/geology-home/research-and-publications/analytical-facilities>)

UJ - University of Johannesburg (www.uj.ac.za/faculties/science/geology;
www.uj.ac.za/faculties/science/research/spectrum)

UKZN - University of KwaZulu-Natal (<https://saees.ukzn.ac.za/category/geology>)

UP - University of Pretoria (<http://www.up.ac.za/en/geology>)

Wits – University of the Witwatersrand (www.wits.ac.za/geosciences)

Research institutes

iThemba LABS - Sommerset West, Johannesburg (<https://tlabs.ac.za>)

MINTEK - Johannesburg (<https://www.mintek.co.za>)

NECSA – Pelindaba (<https://www.necsa.co.za>)

Facilities

1. Mineral separation (e.g. zircon)
2. XRD (crystallography, mineral identification)
3. XRF, ICP-MS, ICP-OES (major/trace element analysis)
4. Elemental analysis (CHNS)
5. Electron microprobe (in-situ major/trace element analysis)
6. LA-ICP-MS (in-situ trace element analysis, dating)
7. MC-LA-ICP-MS (radiogenic isotope geochemistry, dating)
8. Noble gas MS (Ar-Ar dating, (U,Th)-He dating)
9. Gas source IR-MS (stable isotope geochemistry, conventional C, O, H isotopes)
10. Ultra-clean lab (elemental separation for solution isotope analysis by mass spectrometry)
11. SEM-EDS, -WDS, -EBSD, -TKD, -CL (backscatter and secondary electron imaging, element mapping, mineral analysis, CL-imaging)
12. Automated quantitative mineral analysis
13. Micro-XRF (element and mineral imaging)
14. TEM
15. FIB-SEM
16. Raman spectroscopy (mineral identification, mapping, fluid inclusions)
17. X-ray tomography (3D scanning and image analysis)
18. Fluid inclusion lab
19. Palaeomag lab
20. Organic Petrology lab
21. Nuclear microprobe and PIXE (Particle Induced X-ray Emission)
22. Secondary Ion Mass Spectrometry via virtual SIMS facility
23. Thermal Ionisation Mass Spectrometry (TIMS)

Points to note

- Most of the above departments have sample preparation facilities that include the preparation of thin sections and epoxy mounts as well as rock crushing, milling, sawing etc.
- Most labs have different prices depending on internal vs external users. Some labs also offer collaborative rates. Analysis on a collaborative basis expects the submission of a proposal of the work to be undertaken and the publication of the results with the collaborator as a co-author.
- MINTEK has a host of equipment for mineralogical studies available to academia, at a cost and not for self-use. Equipment includes SEM, EPMA, XRD, XRF, micro-XRF, 3D tomography, LA-ICP-MS, FTIR, MLA, QEMSCAN (Deshentree Chetty, deshc@mintek.co.za).

1. Mineral separation (e.g. zircon, monazite, garnet etc)

SU (Frantz magnetic and heavy liquid separation: Mareli Grobbelaar, mgrobbelaar@sun.ac.za)

UCT (Frantz magnetic and heavy liquid separation; Philip Janney, phil.janney@uct.ac.za)

UJ (Frantz magnetic and heavy liquid separation, mineral picking and mounting; Clarisa Vorster, clarisav@uj.ac.za)

UP (SelFrag, Frantz magnetic separator, pulsating jig, James table, wide range of mineral picking; Jaco Delpport, fossil@tuks.co.za)

Wits (Wilfley table, Frantz magnetic and heavy liquid separation: Louis Mudalahothe; louis.mudalahothe@wits.ac.za)

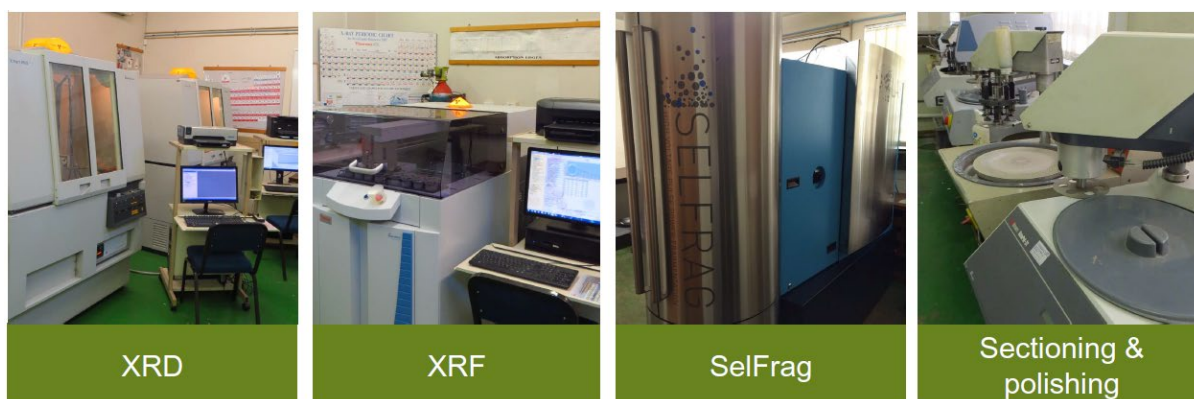
2. XRD (crystallography, mineral identification)

UFS (Panalytical Empyrean XRD; Megan Purchase, purchasemd@ufs.ac.za)

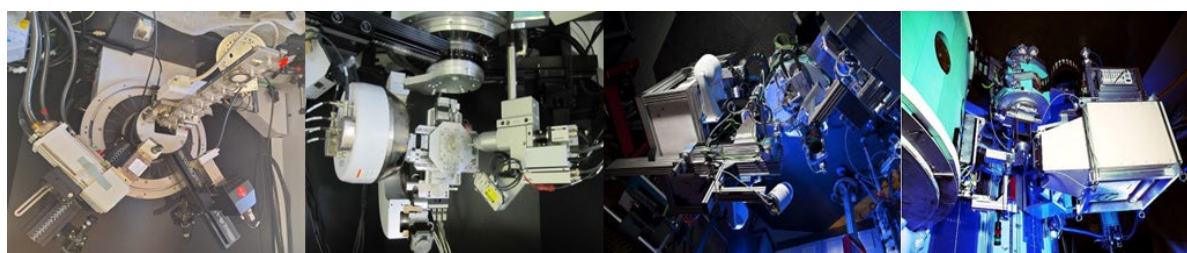
UJ (Panalytical XRD; Willie Oldewage, willieho@uj.ac.za)

UP (Panalytical XRD; no operator currently)

Necsa (XRD, various other x-ray and neutron-emitting instruments; useroffice@necsa.co.za)



Some facilities at Department of Geology, UP



ADVANCE Facility – X-Ray Powder Diffraction for Qualitative and Quantitative Analysis

D8 Discover – X-ray strain scanner

MPISI Facility – The Materials Probe for Internal Strain Investigations (using neutrons)

PITSI Facility – The Powder Instrument for Transition in Structure Investigations (using neutrons)

Some facilities at Beam Line Centre, Necsa

3. XRF, ICP-MS, ICP-OES (major/trace element analysis)

SU (PANalytical Axios XRF; Mareli Grobbelaar, mgrobbelaar@sun.ac.za; Thermo iCAP 6200 ICP-OES; Agilent 7900 ICP-MS: Charney Anderson, charney@sun.ac.za; Agilent 8800 QQQ ICP-MS: Riana Rossouw, rrossouw@sun.ac.za)

UCT (PANalytical Axios XRF; Thermo iCAP-RQ ICP-MS with Applied Spectra RESOLUTION 193 nm excimer laser ablation system; Phil Janney, phil.janney@uct.ac.za)

UFS (Rigaku Primus IV WD XRF; Megan Purchase, purchasemd@ufs.ac.za)

UJ (PANalytical XRF; Perkin Elmer NexION 300; Spectro ARCOS; Willie Oldewage, willieho@uj.ac.za)

UP (Thermo Fisher XRF; Jeanette Dykstra, jeanette.dykstra@up.ac.za)

Wits (PANalytical XRF; Perkin Elmer Elan DRC-e, Thermo iCapQ; Grant Bybee, grant.bybee@wits.ac.za)



Perkin Elmer Elan DRC-e ICP-MS (left) and Thermo Element XR (right) at the Earth Lab, Wits University

4. Elemental analysis (CHNS)

SU (Elementar Vario EL Cube Elemental Analyzer: Charney Anderson, charney@sun.ac.za)

5. Electron microprobe (in-situ major/trace element analysis)

RU (JEOL JXA-8230; Electron Microscopy Unit, Deon van Niekerk, epma@ru.ac.za)

UCT (JEOL JXA-iSP100; Nicholas Laidler, nicholas.laidler@uct.ac.za)

UJ (Cameca SX-100; Willie Oldewage, willieho@uj.ac.za)

UFS (JEOL JXA-iSP100; Freddie Roelofse, roelofsef@ufs.ac.za)

6. LA-ICP-MS (in-situ trace element analysis, dating)

SU (RESOLUTION LR-M50 and SE-S155 excimer lasers; Agilent 7700 ICP-MS, Agilent 8800 QQQ ICP-MS; Thermo Element 2 SF SC ICP-MS Scientific E2 SF; Resonetics SE excimer laser; trace element analysis: Riana Rossouw, rrossouw@sun.ac.za; U-(Th)-Pb dating: Riana Rossouw, rrossouw@sun.ac.za)

UCT (Thermo iCAP-RQ ICP-MS and NuPlasma Attom HR-ICP-MS (single collector magnetic sector) both of which can be used with Applied Spectra RESolution 193 excimer laser ablation system; Phil Janney, phil.janney@uct.ac.za (Q-ICP-MS), Tara Edwards, tara.edwards@uct.ac.za (HR-ICP-MS))

UJ (Thermo-Fischer iCap ICP-MS; ASI RESOLUTION laser; New Wave UP213 laser; Clarisa Vorster, clarisav@uj.ac.za or Marlina Elburg, marlinae@uj.ac.za)

Wits (Thermo Scientific Element XR single collector ICPMS coupled with ASI Resolution SE-155 excimer laser; Robert Bolhar, robert.bolhar@wits.ac.za)



LA-ICP-MS lab at SU

7. MC-LA-ICP-MS (radiogenic isotope geochemistry, dating)

UJ (NuPlasma HR MS with ASI RESolution excimer laser with S155 sample cell; Marlina Elburg, marlinae@uj.ac.za)

UCT (Nu Instruments Plasma3 and upgraded NuPlasma HR MS instruments both solution mode, and Plasma3 with ASI RESolution excimer laser with S155 sample cell; Petrus le Roux, petrus.leroux@uct.ac.za)

Wits (NuSapphire with ASI RESolution SE-155 excimer laser or solution mode; Robert Bolhar, robert.bolhar@wits.ac.za; Karen Smit, karen.smit@wits.ac.za)



MC-LA-ICP-MS facility at UJ (left) and UCT (right)

8. Noble gas MS

UJ (MAP 215-50 with Nd:YAG lasers for Ar-Ar dating; Georgy Belyanin, gabelyanin@uj.ac.za; also MKS E-VISION2 quadrupole gas MS with extraction furnace for (U,Th)-He dating; Tebogo Makhubela, tvmakhubela@uj.ac.za).

9. Gas source IR-MS (stable isotope geochemistry, conventional C, O, H isotopes)

UCT (O-isotopes in silicates by laser and conventional fluorination; H and O by Picarro and IRMS, C and O in carbonates, H in silicates; Access to DeltaXP and Delta V dual-inlet mass spectrometers; Chris Harris, chris.harris@uct.ac.za)

10. Ultra-clean lab (elemental separation for solution isotope analysis by mass spectrometry)

UCT (Radiogenic Isotope Facility, routine chemical separation of Rb-Sr, Sm-Nd, Lu-Hf, U-Th-Pb, some non-traditional isotope systems (Li, B) in development; Petrus le Roux, petrus.leroux@uct.ac.za)

Wits (Wits Isotope Geoscience Lab; capabilities include isotope dilution and chemical separation of Rb-Sr, Sm-Nd, Lu-Hf, U-Pb, Fe-Cu-Zn, Ca-Sr, Al-Be; Grant Bybee, grant.bybee@wits.ac.za)

11. SEM-EDS, -WDS, -EBSD, -TKD, -CL (backscatter and secondary electron imaging, element mapping, mineral analysis, CL-imaging)

NMU (JEOL 7001F SEM + Oxford (Aztec) EDS and WDS + Oxford HKL EBSD and TKD; Arno Janse van Vuuren, arno.jansevanvuuren@mandela.ac.za)

RU (Tescan CLARA FEG-SEM with both windowed & windowless Oxford EDS detectors; Deon van Niekerk, Electron Microscopy Unit, epma@ru.ac.za)

SU (Zeiss MERLIN FESEM, Zeiss EVO SEM, Zeiss LEO VP-SEM; Madelaine Frazenburg mrfsem@sun.ac.za)

UCT (FEI NovaNano SEM with Oxford INCA EDS (UCT Electron Microscope Unit); Miranda Waldron, miranda.waldron@uct.ac.za)

UFS (JEOL JSM-6610 SEM + EDS/WDS; Megan Purchase, purchasemd@ufs.ac.za)

UJ (Tescan SEM; Willie Oldewage, willieho@uj.ac.za)



MERLIN nano-FEG SEM with EDS at SU

12. Automated quantitative mineral analysis (liberation analyses, modal analyses, bright phase search)

UCT (FEI QEMSCAN 650F (UCT Centre for Image Analysis, Chemical Engineering Dept), Megan Becker, megan.becker@uct.ac.za)

UJ (FEI XL40 ESEM; Gabrielle Ficq, gabriellef@uj.ac.za)

Wits (Automated Mineralogy Lab; TESCAN TIMA; Nonkusela Madlakana, nonkuselo.madlakana@wits.ac.za)

13. Micro-XRF (element and mineral imaging)

MINTEK (Bruker M4 Tornado, Deshenthree Chetty, deshc@mintek.co.za)

UJ (Bruker M4 Tornado+; Axel Hofmann, ahofmann@uj.ac.za)

14. TEM

NMU (JEOL JEM 2100 + Gatan EELS + Oxford EDS and JEOL ARM200F + Gatan EELS + Oxford EDS; Arno Janse van Vuuren, arno.jansevanvuuren@mandela.ac.za)

UCT (FEI F20 Cryo TEM and FEI T20 TEM with EELS (Electron Microscope Unit) Mohamed Jaffer, mohamed.jaffer@uct.ac.za)

UJ (JEM-2100; Willie Oldewage, willieho@uj.ac.za)

15. FIB-SEM

NMU (FEI Helios Nanolab 650 FIBSEM, site specific sampling applications for TEM nanoanalysis; Arno Janse van Vuuren, arno.jansevanvuuren@mandela.ac.za)

16. Raman spectroscopy (mineral identification, mapping, fluid inclusions)

NMU (Bruker FTIR/Raman; Ettienne Minnaar, ettienne.minnaar@mandela.ac.za)

UCT (WiTec Alpha 300 confocal Raman spectrometer, 532 and 785nm lasers available (UCT Electron Microscope Unit) Miranda Waldron, miranda.waldron@uct.ac.za)

UJ (WITec alpha300 R; Axel Hofmann, ahofmann@uj.ac.za)



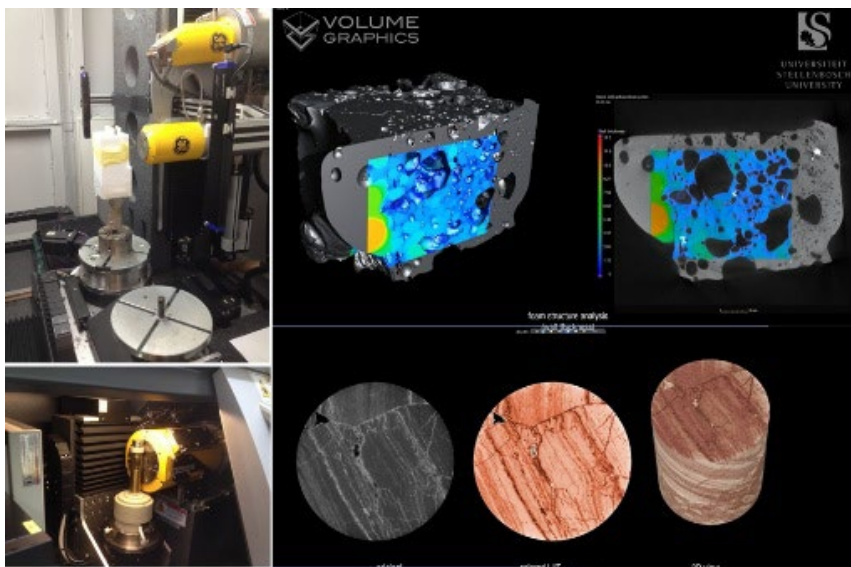
WITec alpha300 R confocal Raman imaging system

17. X-ray tomography (3D scanning and image analysis, reconstruction, modelling & image-based simulation)

NECSA (micro-CT, Nikon XTH 225 ST, Lunga Bam, Lunga.Bam@necsa.co.za; www.necsa.co.za/radiography-and-tomography-radtom-group)

SU (micro- and nano-CT, Muofhe Tshibalanganda, muofhe@sun.ac.za; www.sun.ac.za/ctscanner)

Wits (micro-CT, Nikon Metrology XTH 225/320 LC, faculty contact: Jonah Choiniere, Jonah.choiniere@wits.ac.za; scanner manager: Gideon Chinamatria, Gideon.chinamatira1@wits.ac.za)



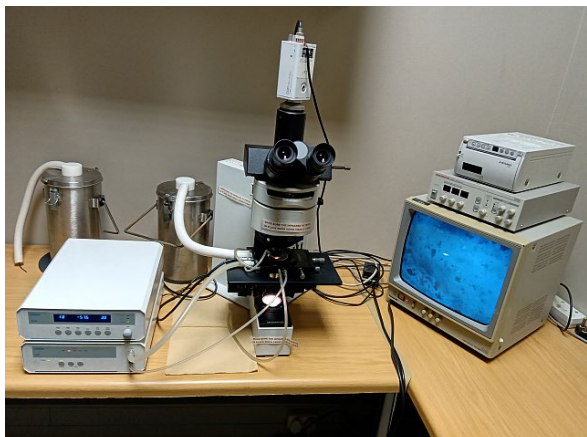
Micro- and nano-CT facility at SU

18. Fluid inclusion lab

UCT (Linkam THMSG600; Geoff Howarth, geoffrey.howarth@uct.ac.za)

UJ (Linkam THMSG600; A. Hofmann, ahofmann@uj.ac.za)

Wits (Linkham THMSG600; Nonkuselo Madlakana, nonkuselo.madlakana@wits.ac.za)



Fluid inclusion measurement setup at UJ

19. Palaeomag lab

UJ (SQUID; Michiel de Kock, mdekock@uj.ac.za)

UKZN (JR6A – spinner magnetometer and LDA-5 AF demagnetizer; no operator currently)

20. Organic Petrology lab

UJ: Zeiss Axiolmager M2M reflected light microscope with Hilgers Diskus Fossil components and software, air (x10) for observation, and oil immersion lens (x50, X100) for thermal maturity assessments by reflectance analysis, and organic matter determination (macerals, microlithotype) by point counting. Fluorescence capability. Nikki Wagner, nwagner@uj.ac.za

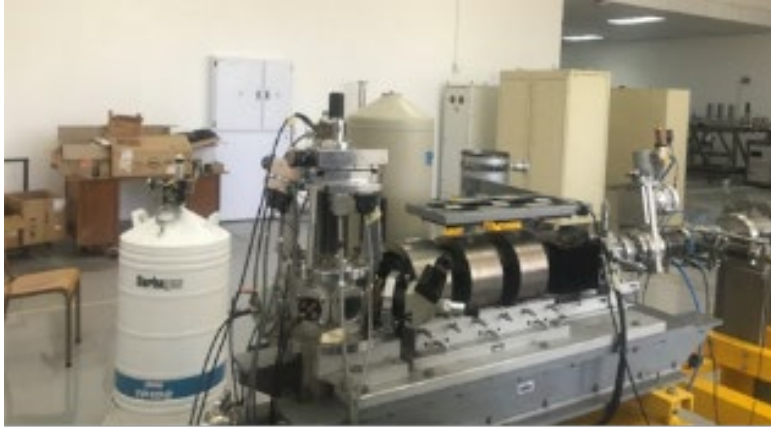
UJ: Olympus CX23 transmitted light, air and oil immersion lens for palynology; Nikki Wagner, nwagner@uj.ac.za



Organic petrology microscopes at UJ

21. Nuclear microprobe and PIXE (Particle Induced X-ray Emission)

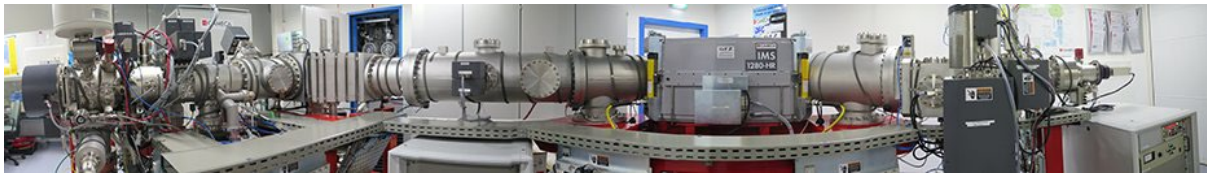
iThemba LABS (Somerset West; Mlungisi Nkosi, mlungisin@tlabs.ac.za)



Multi-elemental microanalysis and mapping of elements from Na to U using PIXE at iThemba LABS, Somerset West

22. Secondary Ion Mass Spectrometry (isotope geochemistry, dating, trace element analysis, depth profiling, element distribution maps) via virtual SIMS facility

Wits (virtual usage of Potsdam CAMECA 1280-HR; Sarah Glynn, Sarah.Glynn@wits.ac.za)



SIMS at GFZ Potsdam

23. Thermal Ionisation Mass Spectrometry (isotope geochemistry, dating)

Wits (NuTIMS; Robert Bolhar, robert.bolhar@wits.ac.za; Karen Smit, karen.smit@wits.ac.za)