

## **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 (April 2022)

### **University departments/labs**

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

RU - Rhodes University ([www.ru.ac.za/geology](http://www.ru.ac.za/geology))

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

UCT - University of Cape Town ([www.geology.uct.ac.za](http://www.geology.uct.ac.za); <http://www.geology.uct.ac.za/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](http://www.uj.ac.za/faculties/science/geology);  
[www.uj.ac.za/faculties/science/research/spectrum](http://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](http://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 ([www.necsa.co.za](http://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. Micro-XRF (element and mineral imaging)
13. Mineral Liberation Analyser (automated quantitative mineral analysis)
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, deshch@mintek.co.za).

### 1. Mineral separation (e.g. zircon)

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

UCT (2 Frantz magnetic separators and heavy liquid separation; Philip Janney, phil.janney@uct.ac.za)

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

UP (SelFrag, Frantz magnetic separator; Jaco Delpont, delpontexploration@gmail.com)

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; Wiebke Grote, wiebke.grote@up.ac.za)



*Some facilities at Department of Geology, UP*

### 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 with NewWave UP213 and Applied Spectra RESolution 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, Christian Reinke, christianr@fastmail.com; 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; Allan Wilson, Grant Bybee, Allan.Wilson@wits.ac.za, 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; Deon van Niekerk, epma@ru.ac.za)

UCT (JEOL JXA 8100; Nicholas Laidler, nicholas.laidler@uct.ac.za)

UJ (Cameca SX-100; Christian Reinke, christianr@fastmail.com)

#### **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 with NewWave UP213 and Applied Spectra RESOLUTION excimer laser ablation system; Phil Janney, phil.janney@uct.ac.za)

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 (Two NuPlasma HR MS instruments, one 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; Jan Kramers, jkramers@uj.ac.za or 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)

iThemba LABS, Johannesburg (Thermo Delta V; Mike Butler, butler@tlabs.ac.za)

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 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, Mg) 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; Kimberley Beaton, kimberley.beaton@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)

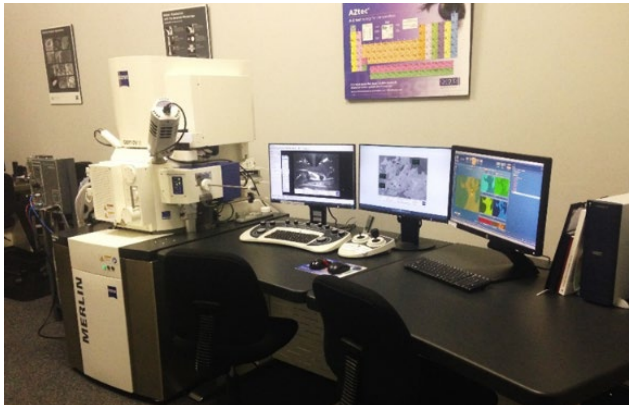
RU (Tescan VEGA SEM with Oxford INCA Penta-FET-X3 EDS; Deon van Niekerk, epma@ru.ac.za)

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. Mineral Liberation Analyser (automated quantitative mineral analysis)**

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

UJ (FEI XL40 ESEM; Fanus Viljoen, fanusv@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, desh@mintek.co.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)



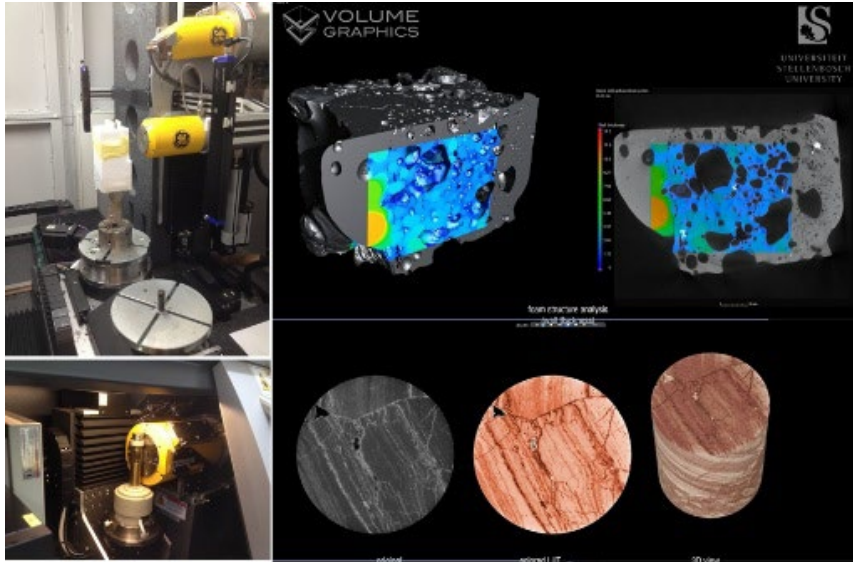
*WITec alpha300 R confocal Raman imaging system*

## 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](http://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](http://www.sun.ac.za/ctscanner))

Wits (micro-CT with high-energy capability, Jonah Choiniere, Jonah.choiniere@wits.ac.za)



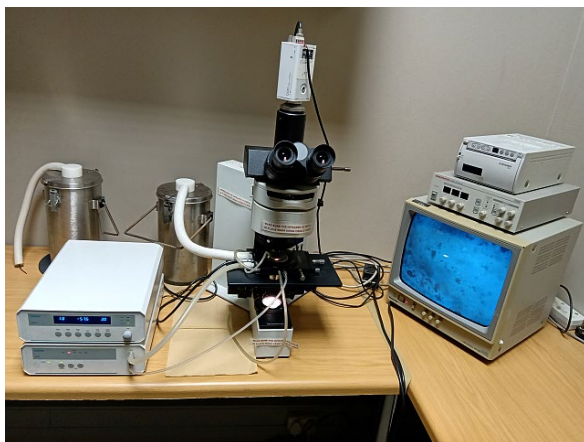
*Micro and nano CT facility at SU*

## 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; Tesfaye Kidane Birke, birket@ukzn.ac.za)

## 20. Organic Petrology lab

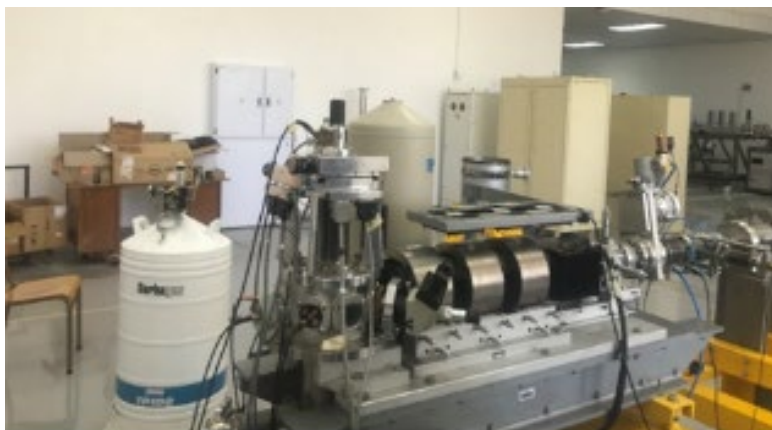
UJ (Zeiss Axiolmager M2M reflected light microscope, air and oil immersion lens for reflectance and organic matter; Olympus CX23, transmitted light, air and oil immersion lens) for palynology; Nikki Wagner, nwagner@uj.ac.za)



*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](mailto:robert.bolhar@wits.ac.za); Karen Smit, [karen.smit@wits.ac.za](mailto:karen.smit@wits.ac.za))