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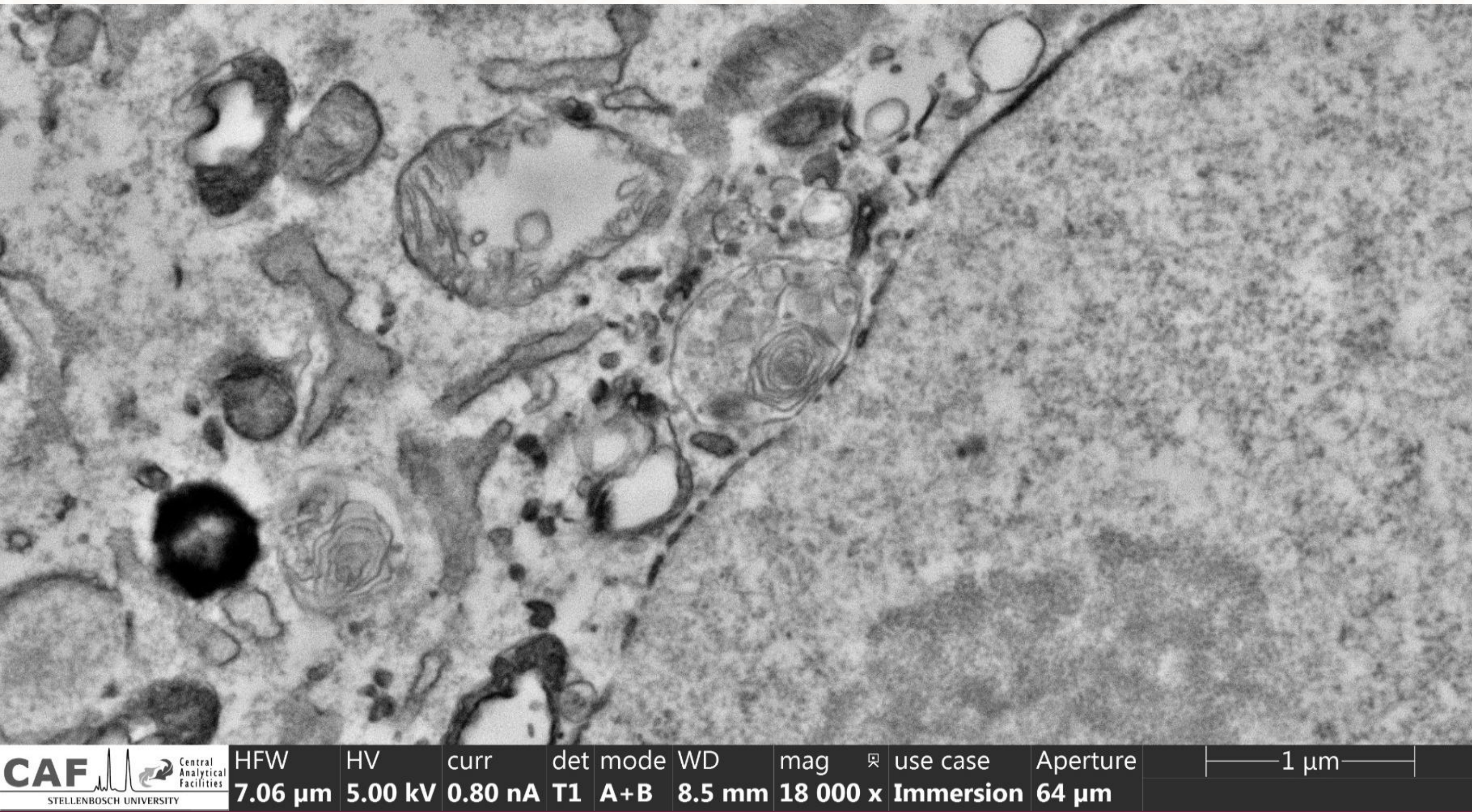
# 2024/2025 Annual Report *of the* Central Analytical Facilities




***Cover Image**: See caption on Page 1.*

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SAF • CAF
Central Analytical Facilities
IZiko eliPhambili kuHlalutyo
Sentrale Analitiese Fasiliteite

forward together
sonke siya phambili
saam vorentoe

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2025

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Dr Alex Doruyter
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# Contents

2024/2025 Annual Report



**Cover Image**: A 18000X magnification secondary electron micrograph showing a collection of cell organelles surrounding a nucleus. An autophagosome can be seen in closer proximity to the nucleus. We are also able to remarkably observe nuclear pores within the nuclear membrane. The image was acquired using an adapted version of the Megametal protocol for staining. The image was not processed post-acquisition. Within this project researchers aim to develop an algorithm that can identify autophagy pathway intermediates by using electron micrographs only. To develop this algorithm, the researchers performed Correlative Light and Electron Microscopy to train the algorithm with known ground truths and test the algorithms capabilities on similar images. The micrograph was captured by Ms Nicola Vahrmeijer, student of Prof Ben Loos, with assistance from Ms Janica Theron, CAF SEM analyst at the Tygerberg branch of the CAF Microscopy Unit.

# Overview

2025 represents a time of tremendous research opportunity for Stellenbosch University, with several important large equipment developments opening vast areas of new scientific investigation at the institution. One of these is the Thermo Scientific NEOMA Tandem Multicollector ICP MS. As detailed in the article below, the NEOMA will revolutionise SU research in the fields of biogeochemistry, petrology, environmental geochemistry, geochronology, etc. Other important equipment developments are two NRF National Equipment Programme awards for new large equipment in the Flow Cytometry Unit and the LC MS Unit, as well as the placement of a state-of the-art Olympus Laser Scanning Confocal Microscope in the Microscopy Unit, as part of a collaboration with Wirsam Scientific and Precision Equipment. Thus, in terms of expansion of the range of very advanced analytical equipment, 2025/26 will be a very good period for SU. However, the problems highlighted in the previous CAF report relating to the replacement of aging equipment and the development of adequate new laboratory space for CAF, remain.

2025 financial performance is projected to be strong, with most CAF units projected to either improve their position in terms of cost effectiveness or maintain a high level of cost effectiveness. As illustrated in Figure 1, below, this has been achieved by actively managing costs and becoming more efficient.

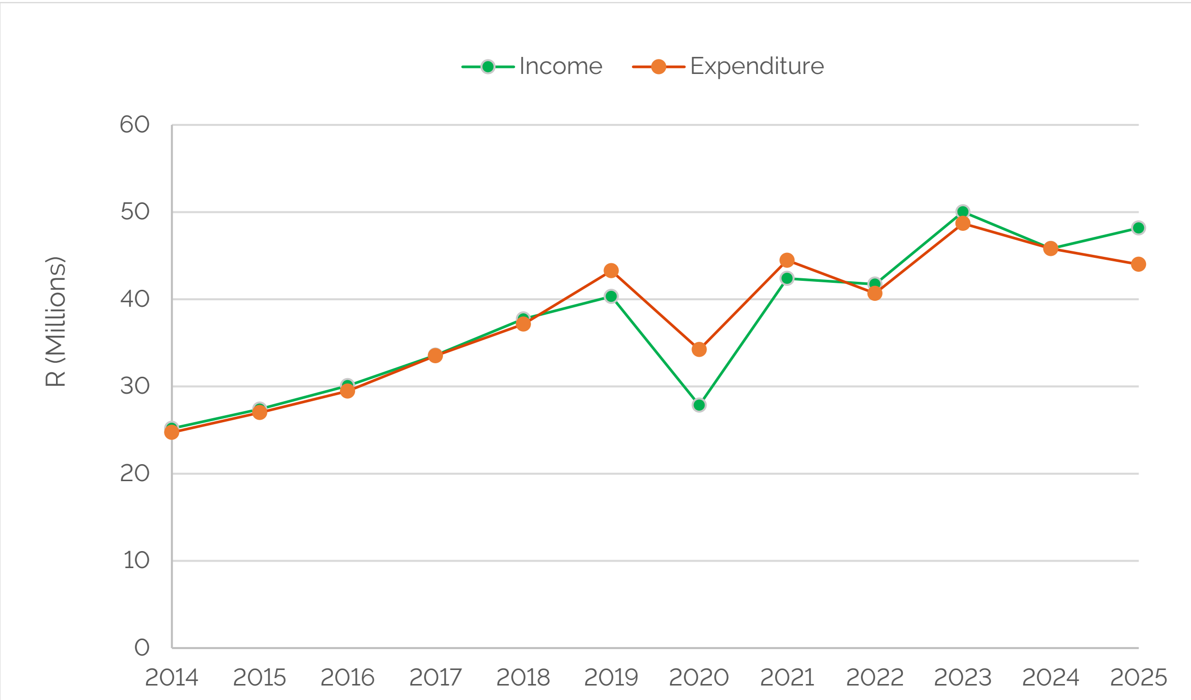


*Figure 1: CAF income and costs for the period 2014 to 2025, excluding income and costs from the DSI funded Nodes, which function as financially ringfenced entities. The 2025 projections were made on the same basis as for previous CAF reports.*

As the primary role of the Central Analytical Facility is to support research at Stellenbosch University through the sustainable management of our large, multi-user analytical facilities, it is very important to continuously reflect on CAF's contribution to research at the institution. The 2024 CAF annual report highlighted the fact that since 2019 there has been a gradual but consistent decline in the proportion of CAF income earned from Stellenbosch University clients. This report confirms that the trend has turned to become positive, but the year-on-year increase in spending on CAF analytical services within SU is still below inflation, as reflected in Figure 2 below. As CAF prices to internal clients generally increase at approximately the rate of inflation, this likely equates with less analytical services to SU clients each year. The influence of the COVID pandemic aside, the key change in the internal client income trend occurred in 2019, the year the NRF implemented changes that essentially did away with grant-holder-linked post-graduate bursaries. It appears that internal clients have less grant money available to spend on analytical services because of this change, possibly because they are spending more of their available resources on post-graduate student support. Consequently, SU is probably not getting maximum research advantage out of the tremendous range of analytical equipment and analytical expertise amassed within CAF. Indeed, CAF currently earns more from both services to private sector clients and to clients from other universities than it does from SU clients (Figure 3). As CAF is a largely self-funding entity within the university, this means that services to external parties are paying for SU to afford a comprehensive, well equipped and well-staffed core facility. There are myriad ways the institution could gain more advantage from these facilities. For example, faculties could create an analysis fund for their junior academics (or any other group), so that they could access free or low-cost analyses, thereby allowing their research careers to gain greater traction at an earlier stage. CAF admin has the capacity to easily manage such funds, with reporting back to the faculty. Alternatively, or additionally, the university could choose to provide a greater degree of subsidy to CAF, resulting in a decrease in prices to all internal clients.

A review of available analytical capacity within CAF demonstrates that all environments have between 5 and 50% free capacity, and that in laboratories with the lowest available extra capacity, the limiting factor is staff availability, which can easily be addressed. Thus, all CAF laboratories could handle more work from SU clients. The same review revealed that almost all CAF directors and managers regard internal demand for services as limited by the availability of research funds; and estimate that without this limitation internal demand would increase between 10 and 100%. The highest estimates come from the Node for Infection Imaging and the DNA Unit, both environments with very high consumable costs per analysis, as well as the NMR Unit.

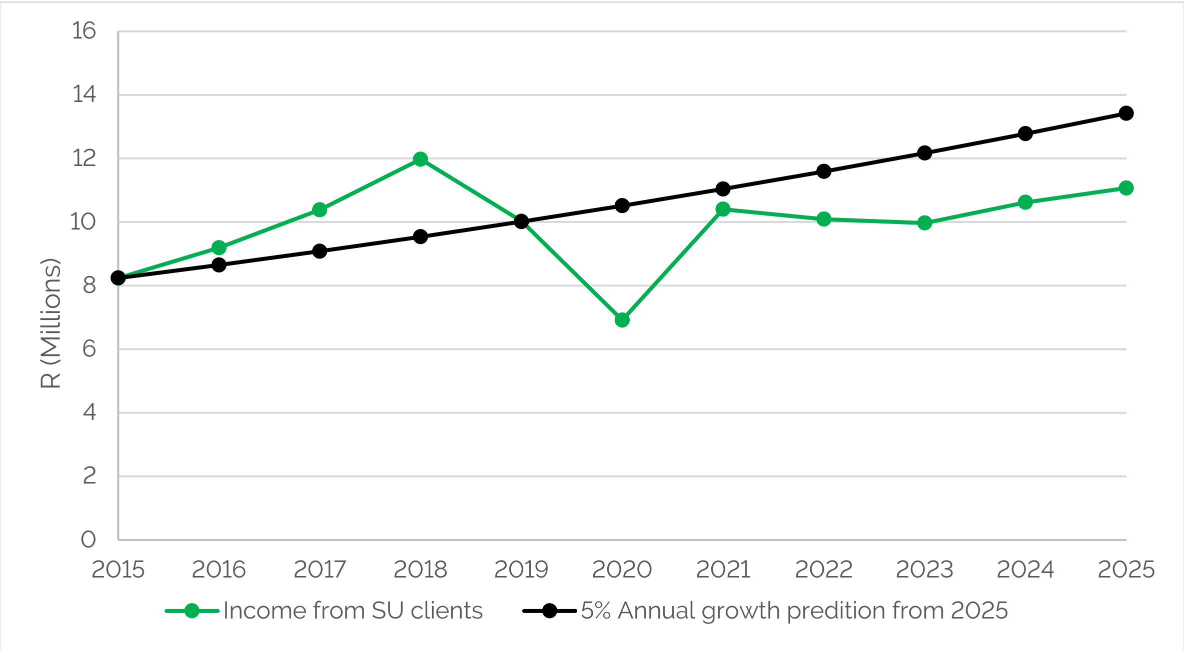


*Figure 2: CAF income from SU clients for the period 2015 to 2025 (2025 values projected), Note the clearly different trajectories relative to average inflation, pre 2019 where income (a proxy for number of analyses) increased at a rate greater than 5%, and post 2019 where there has been no growth.*

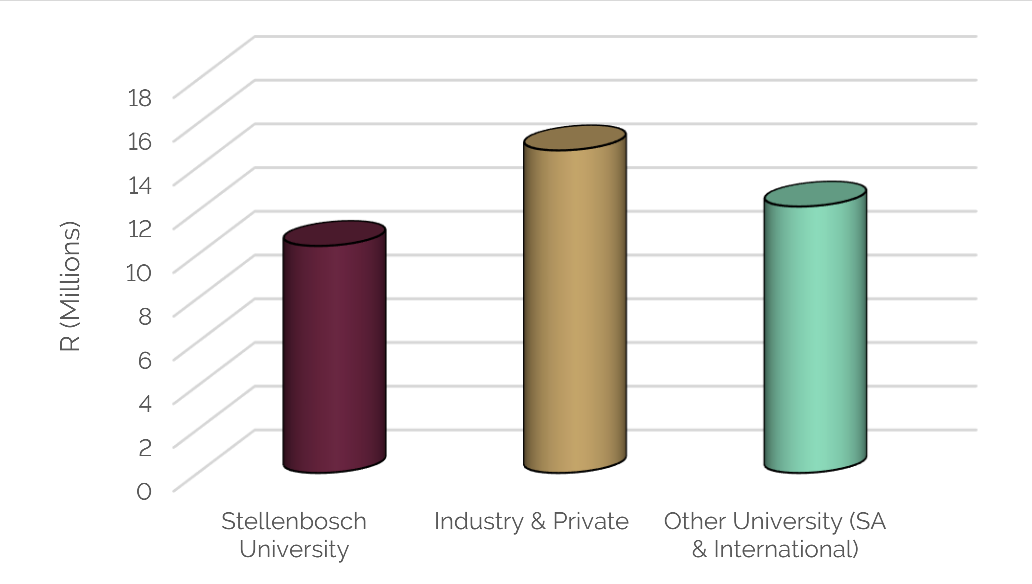


*Figure 3: CAF income from different categories of client in 2024,*

To close off this overview, I'd like to relate a small but very positive and significant change that has occurred in CAF during the last year. For the first time, CAF has a regular client from a non-SET faculty with the long-term rental of a high-density EEG system from the Neuromechanics Unit to the Department of Linguistics. Recent discussions with Prof Madiba, the Dean of Education and Prof Bayaga from the Department of Curriculum Studies, have highlighted the potential of EEG systems to contribute to research in the Humanities. Hopefully this will lead to future equipment grant applications and an expansion of CAF support to these environments.

**Professor Gary Stevens**
**CAF Director**

# Profile of the CAF Client Base

Since 2017, CAF has collected comprehensive information on the user base. This enables us to provide our principal equipment funders, the NRF and DSI, with a comprehensive summary of who uses CAF NEP and DSI-funded equipment; whether they are researchers or post graduate students; if the latter, their level of study; institution of origin, etc. Figures 2 - 5 below provide some information on the CAF client base in 2024 as well as on possible changes to the profile of CAF clients over time:

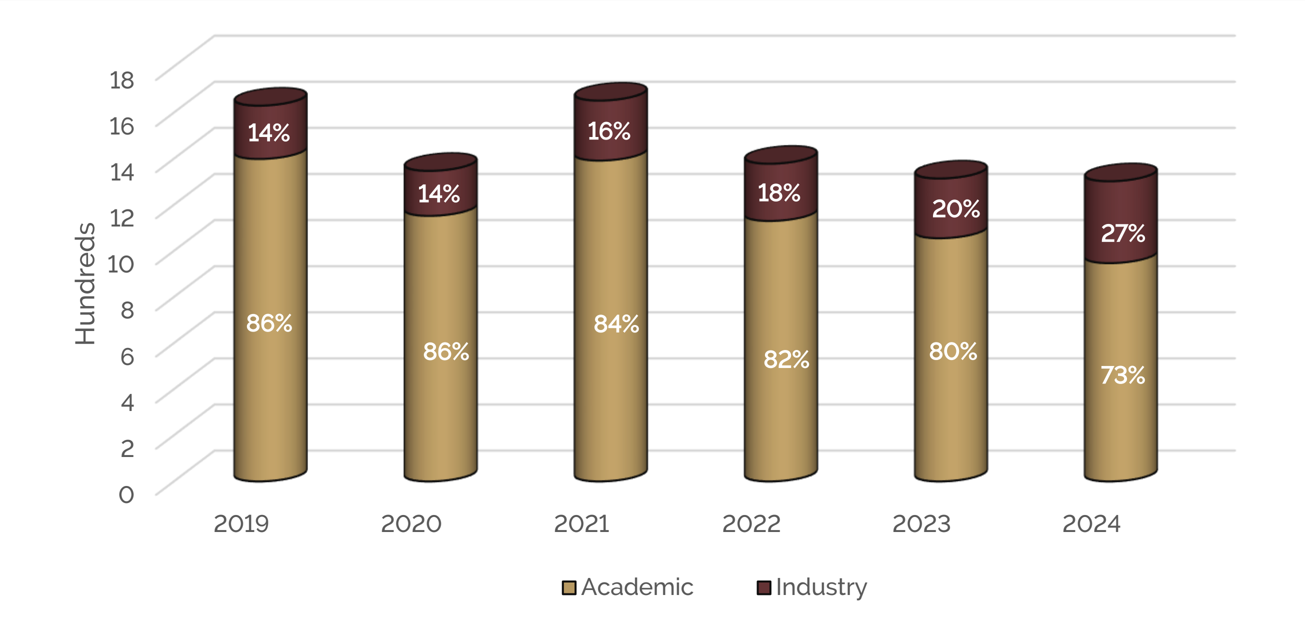


*Figure 4: The number of active CAF clients from 2019 to 2024, including the percentage of industry and academic clients. Apart from the clear trend of a growing proportion of industry clients, the academic client numbers are complicated by the fact that samples for many postgraduate students may be submitted under their supervisor's identity, and they are therefore not counted.*

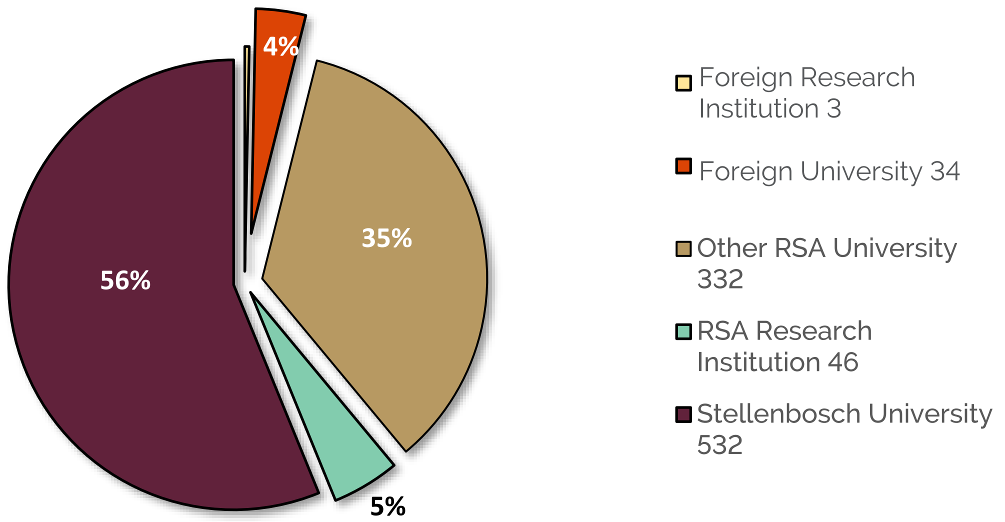


*Figure 5: The subdivision of CAF academic clients according to type of institution for 2024.*

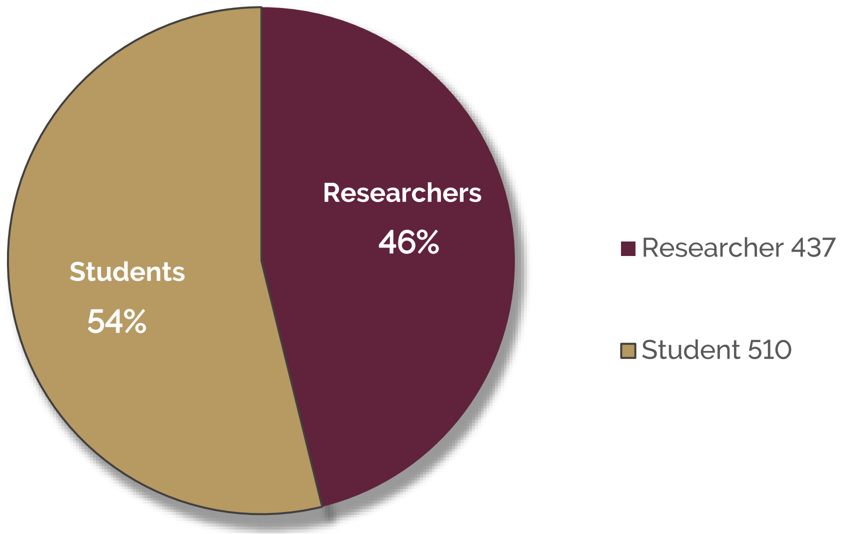


*Figure 6: The proportion of academic clients for 2024.*

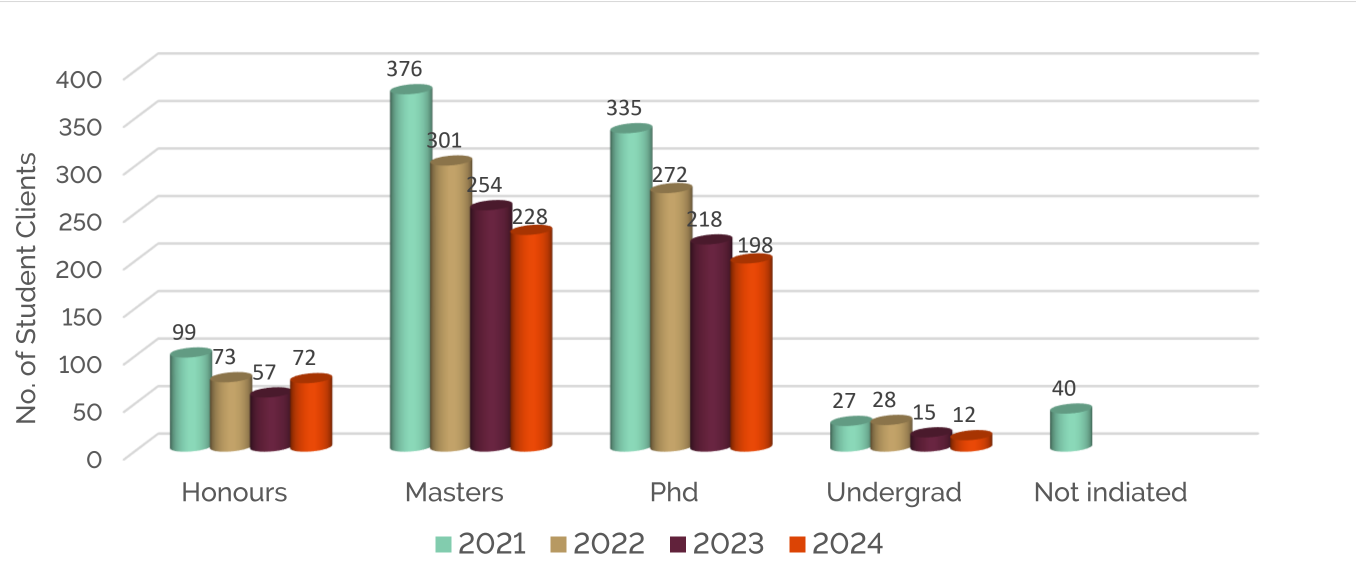


*Figure 7: The subdivision of 510 student clients in 2024 according to their level of study compared with the same data for each year since 2021. There has been a notable gradual decline in the number of student clients in each category since 2021, mirroring the decrease in CAF internal client income for the same period.*

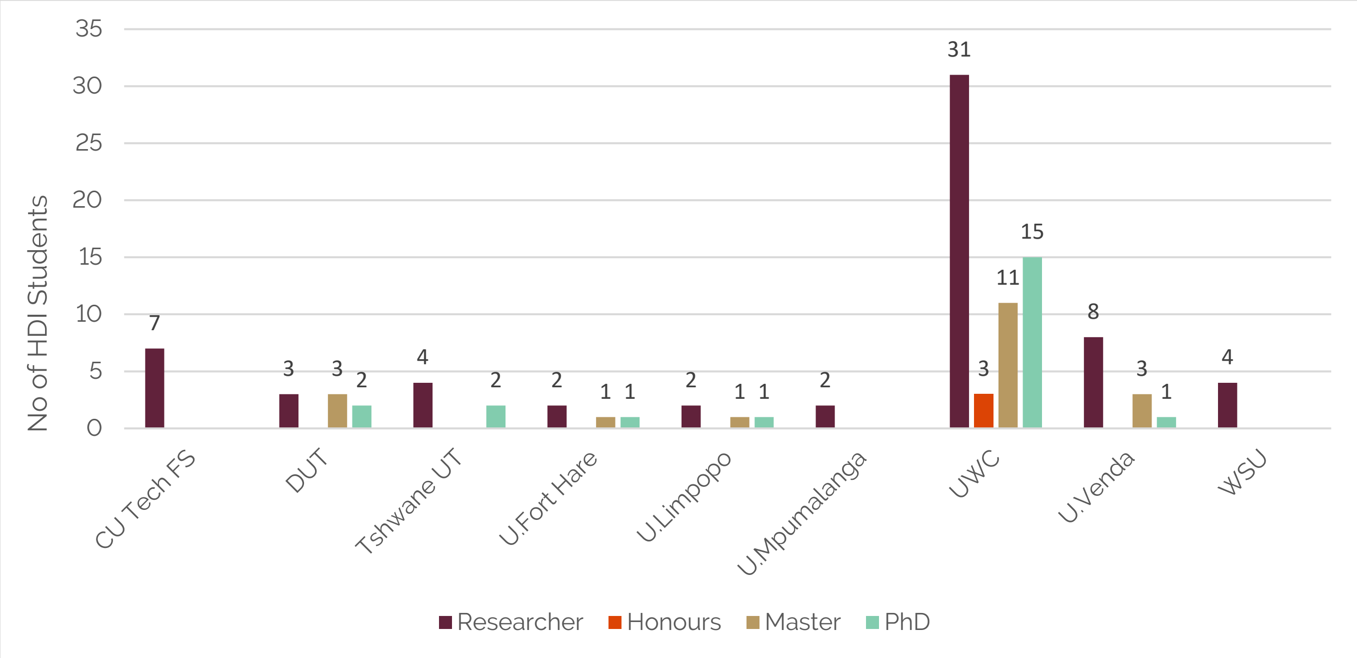


*Figure 8: Analysis of the number of users for 2024 from Historically Disadvantaged Institutions (HDI) in South Africa. Note that this is a minimum estimate of the students from these institutions who benefit from CAF services and expertise because students are commonly accommodated under the identity of their supervisor.*

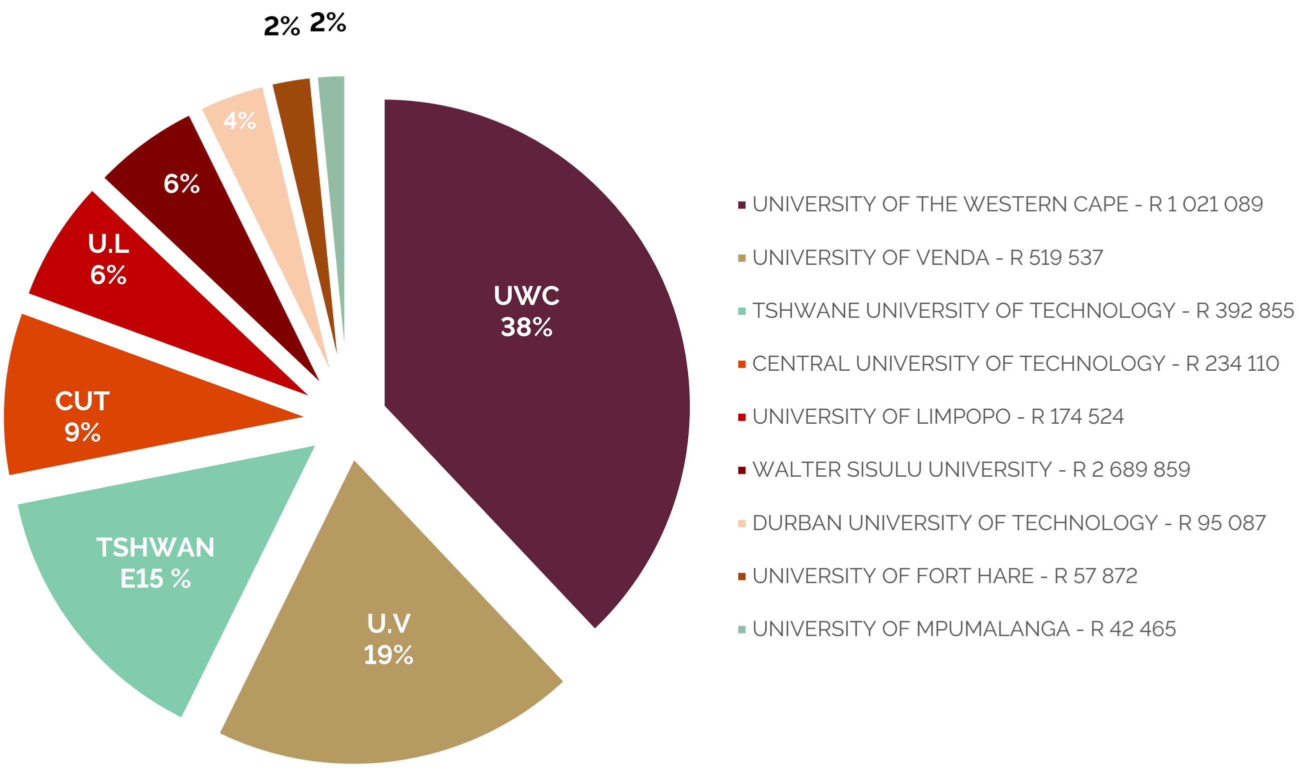


*Figure 9: Analysis of the income derived from the different Historically Disadvantaged Institutions (HDI) in South Africa for 2024. The total value of services rendered to these institutions for 2024 was R 3 117 867. The pie graph illustrates the percentage of this income relevant to each institution.*

# 2024/25 Equipment News: Tandem Multicollector ICP-MS Instrument for Biogeochemical Research

***Advancing Isotope Geochemistry: Next-Generation Analytical Capabilities at CAF***
*The Central Analytical Facilities has transformed its research infrastructure with the installation of cutting-edge mass spectrometry equipment, establishing new frontiers in high-precision isotope analysis and spatially resolved microanalysis for diverse biogeochemical, geological and environmental applications.*

**By Riana Rossouw and Prof Cristiano Lana**

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The Central Analytical Facilities (CAF) at Stellenbosch University significantly expanded its analytical capabilities with the installation of a Thermo Scientific Neoma MS/MS MC-ICP-MS in May 2025, enabling a new generation of high-precision isotope ratio measurements for a wide range of research applications. The instrument is part of the DSI-funded BIOGRIP Node for Soil and Water Analysis but is hosted within the Elemental and Isotope Analysis Unit, where it interfaces with existing equipment such as laser ablation systems, thereby expanding applications to in-situ isotope measurements.

**State-of-the-Art Infrastructure and Leadership**
The existing laboratory space was redesigned, and after building works were completed, the Neoma instrument was installed and commissioned in mid-May, standing alongside the Thermo Element 2 SF ICP-MS and Resolution 193nm Excimer laser ablation system. The new MC ICP-MS instrument is being managed by Prof Cristiano Lana, who joined CAF and the Department of Earth Sciences in August 2024. Soon after installation, he initiated method development on numerous isotope systems, initially focusing on in-situ mineral applications.

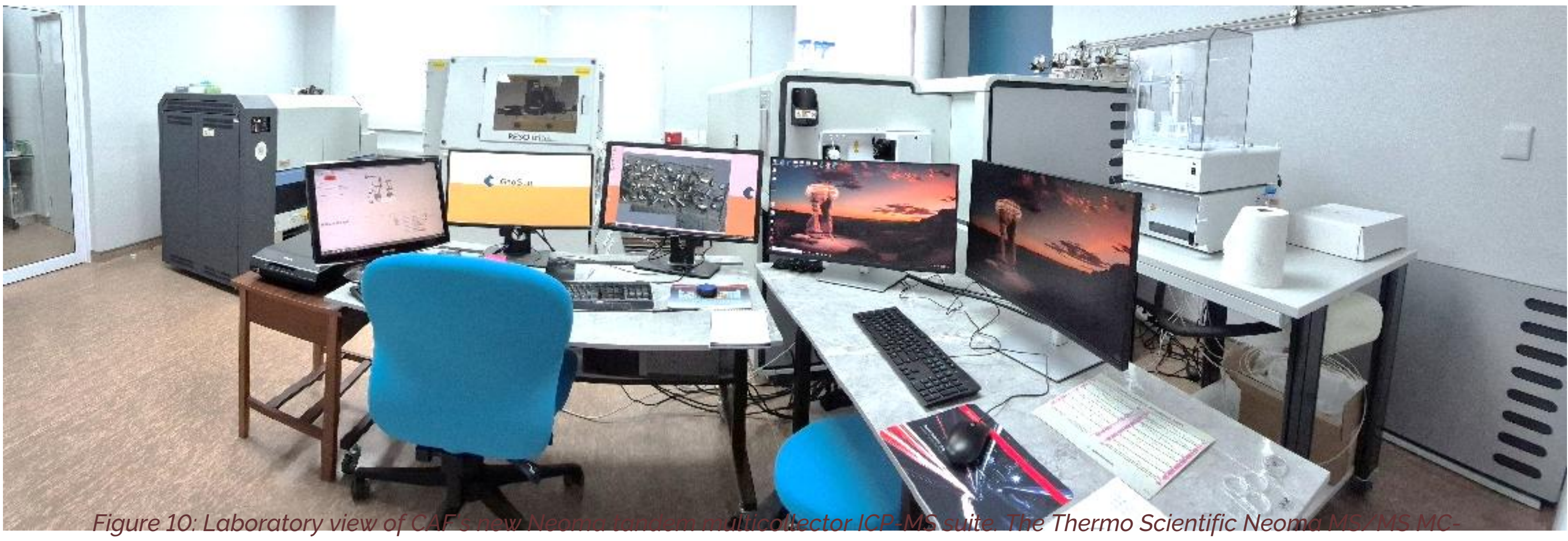

*Figure 10: Laboratory view of CAF's new Neoma tandem multicollector ICP-MS suite. The Thermo Scientific Neoma MS/MS MC-ICPMS (background, centre) is shown integrated into the redesigned Elemental and Isotope Analysis Unit at Stellenbosch University's Central Analytical Facilities. Paired with its 193 nm excimer-laser ablation system and dedicated workstation cluster (foreground), the instrument establishes next-generation capability for high-precision isotope-ratio measurements in biogeochemical, geological and environmental research.*

**Revolutionary U-Pb Dating Capabilities**

This cutting-edge multi-collector instrument now supports in situ U–Pb dating across a wide range of minerals, with protocols customised to their physical and isotopic characteristics:

- Zircon and monazite: ultra-high resolution dating at 7 to 13 µm spot size
- Coltan, cassiterite, apatite, and titanite: robust dating at 15 to 25 µm spot size
- Garnet and calcite: large-spot analysis at ≥50 µm spot size

All analyses deliver 1–2% precision, with a dedicated high-precision setup for igneous zircon achieving better than 0.3% precision using conventional 30 µm spot sizes. This setup is optimised for high-quality, low-common Pb zircon populations, making it ideal for igneous geochronology where maximum resolution is required. Calcite U–Pb analyses, including those on fossil shells and vein carbonates, routinely achieve ~1% uncertainty, allowing precise dating of diagenetic, hydrothermal, and paleoenvironmental events in both marine and terrestrial carbonate systems.

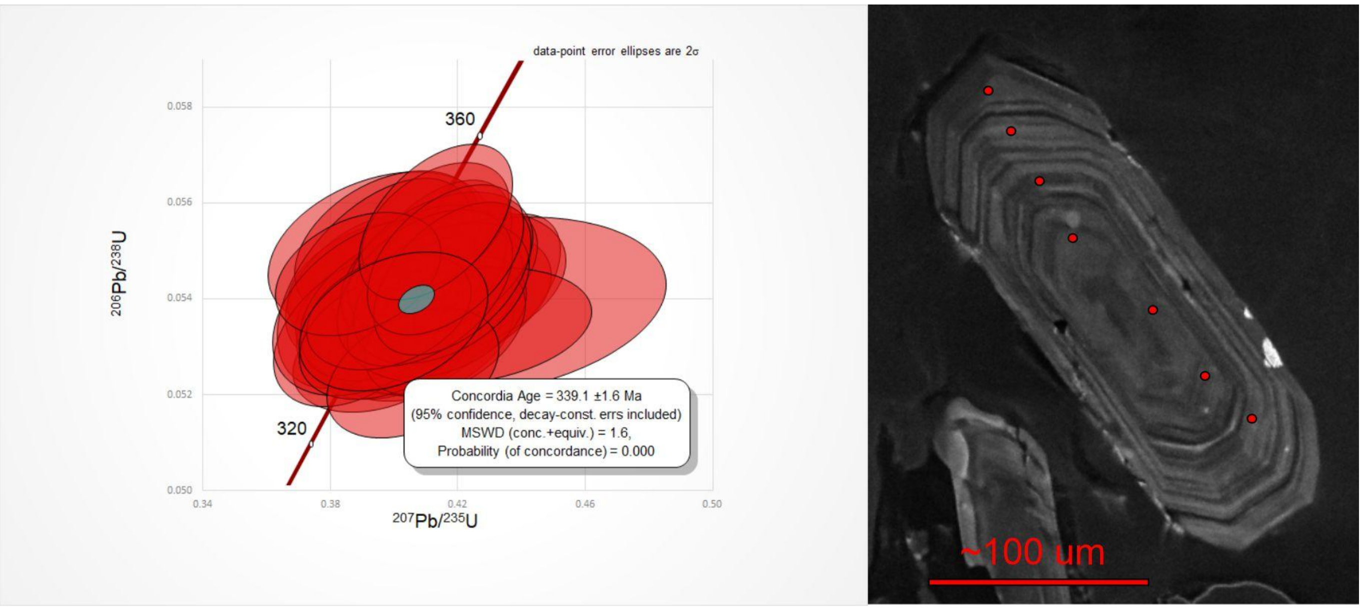


*Figure 11: In situ LA-ICP-MS U–Pb dating of zircon with 7 um spots. Concordia diagram showing a concordant age of 339.1 ± 1.6 Ma (2σ) with an MSWD of 1.6. CL image of zoned zircon grain with laser ablation spots (~100 µm), illustrating intra-crystal growth bands targeted for U–Pb analysis.*

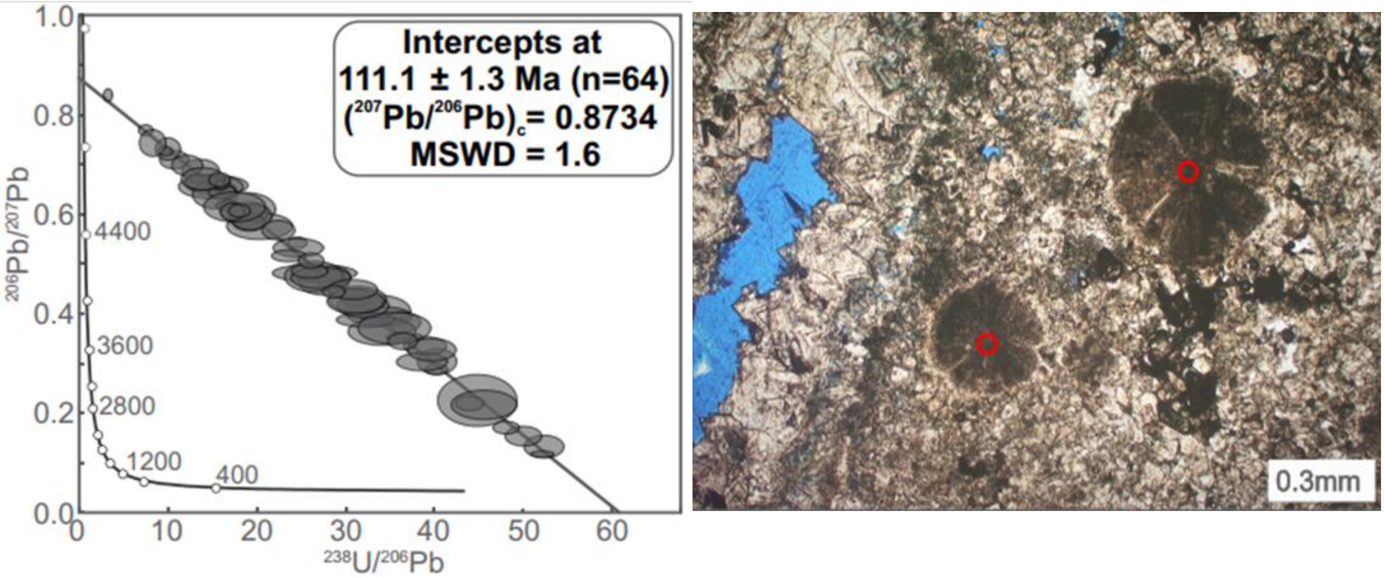


*Figure 12: In situ U–Pb dating of carbonate vein using LA-ICP-MS. Top left: Tera-Wasserburg concordia plot showing a lower intercept age of 111.1 ± 1.3 Ma (n = 84, MSWD = 1.6), with initial $^{207}Pb/^{206}Pb$ = 0.8734. Bottom: Reflected light image of carbonate sample with laser ablation pits (red circles) targeting coarse-grained vein calcite; scale bar = 0.3 mm.*

## Advanced Strontium Isotope Analysis

Prof Lana has implemented dedicated in situ $^{87}Sr/^{86}Sr$ workflows using the Neoma MC-ICP-MS, enabling precise strontium isotope measurements in carbonates, phosphates, and silicates, with full internal correction of isobaric interferences and mass bias. This analytical setup supports high-resolution investigations of paleoenvironmental change, fluid-rock interaction, and tectonic provenance.

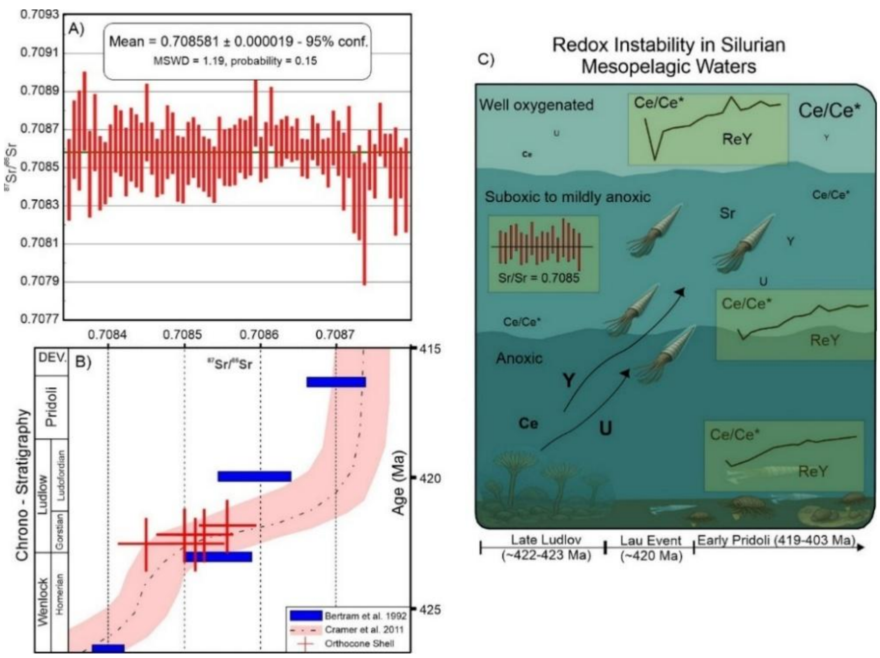


*Figure 13: (A) In situ $^{87}Sr/^{86}Sr$ analyses from orthocone shells yield a mean of 0.708581 ± 0.000019 (2σ), consistent with Late Ludlow seawater. (B) Stratigraphic placement of the orthocone $^{87}Sr/^{86}Sr$ values relative to global Silurian seawater curves (Bertram et al., 1992; Cramer et al., 2011). (C) Paleoceanographic model illustrating redox stratification during the Late Ludlow–Pridoli, with Sr isotope composition, Ce anomalies, and REY patterns varying with depth from oxic to anoxic conditions. Together, the three panels demonstrate that: 1) Orthocone shells faithfully archive contemporaneous seawater $^{87}Sr/^{86}Sr$; 2) Their isotopic composition constrains deposition to the Late Ludlow–earliest Pridoli; 3) Coupled Ce/Ce* and REY signals reveal a dynamically stratified Silurian water column, with oxic surface waters overlying redox-unstable mesopelagic layers that periodically tipped into anoxia. This redox instability likely influenced marine trace-metal budgets and biotic turnovers at the dawn of the Pridoli.*

A key example of this capability is it's application to Silurian orthoconic nautiloid shells from Morocco, where in situ $^{87}Sr/^{86}Sr$ analyses produced a tightly clustered mean value of 0.708581 ± 0.000019, consistent with Late Ludlow seawater composition (~425 Ma). When integrated with Ce anomalies and REY patterns, these strontium data helped reconstruct a dynamic redox structure in Silurian mesopelagic waters, ranging from well-oxygenated to fully anoxic conditions. The ability to resolve such subtle isotopic gradients in fossil carbonate material highlights the power of LA-MC-ICP-MS strontium isotope analysis in paleoceanographic and geobiological research.

**High-Throughput Analytical Workflows**

In parallel, the laboratory maintains a fully automated U–Pb workflow for detrital zircon using an Element 2 sector field and Agilent triple quadrupole ICP-MS coupled with high-resolution 193 nm excimer laser ablation systems. These platforms enable high-throughput dating of hundreds of grains per session, utilising 20 μm spot sizes and achieving 1–2% precision, making them ideal for sedimentary provenance studies. Beyond geochronology, the Element 2 and Agilent systems are extensively used for precise trace element determinations and high-resolution trace element mapping on thin sections and polished slabs, supporting applications in petrogenesis, metasomatism, and fluid–rock interaction studies.

**Innovative Software Development**

The analytical capabilities described above are enhanced by a suite of in-house developed software platforms, designed to provide flexibility, transparency, and analytical precision across a wide range of applications:

- **U–Pb Saturn** provides a comprehensive geochronology suite for LA-ICP-MS that automates all stages of data processing, including signal smoothing, background subtraction, drift correction, downhole fractionation correction, common Pb filtering, and age calculation. The platform supports both carbonate and silicate matrices, making it suitable for dating zircon, monazite, titanite, apatite, calcite, and other U-bearing minerals.
- **TE Mapping** offers a dynamic platform for quantitative trace element imaging, providing high-resolution heatmaps, RGB compositional visualisations, elemental ratio maps, and fully exportable region-of-interest statistics. It supports batch-mode processing, certified reference material calibration, and internal standardisation, enabling robust quantification in thin sections, grain mounts, and polished slabs.
- **TE Saturn** serves as a specialised module for quantitative trace element analysis, designed to integrate seamlessly with LA-ICP-MS data workflows. The system applies certified values and internal standard-based normalisation to produce accurate elemental concentrations in unknown samples, compatible with both spot analysis and line scan formats.
- **Sr Saturn** provides a focused application for in situ strontium isotope analysis for LA-MC-ICP-MS data, enabling real-time correction of isobaric interferences, baseline subtraction, mass bias correction, and drift tracking, with full integration of standard bracketing and matrix-matched reference materials.


*Figure 13: Screenshot of the Saturn U–Th–Pb software interface during LA-ICP-MS data reduction. The dataset shown was acquired using a 7 µm laser spot size, highlighting Saturn's capability for ultra-high spatial resolution in U–Pb geochronology. The interface integrates data tables, standard/sample selection, signal processing, fractionation correction, time-resolved spectra, and real-time age plots. The $^{207}Pb/^{235}U$ ratio is displayed with mean and error bars, with clear definition of background and signal regions. Saturn provides full control over filtering, error propagation, and visualisation for precise and transparent age determinations.*

## Future Developments and Strategic Vision

Future developments at CAF will further expand the capabilities of the Neoma MC-ICP-MS, with planned workflows for:

- Ca and Sr isotopes in river and seawater,
- Fe isotopes in seawater
- Rb–Sr dating in thin sections and mounted mineral grains
- Hf and Nd isotope analyses in zircon and related minerals
- B isotopes in tourmaline and hydrous minerals, and
- S isotopes in sulphides using laser ablation with full correction of mass interferences.

Together, these developments position CAF at the forefront of isotope geochemistry and spatially resolved microanalysis, supporting innovative projects in geochronology, paleoclimate reconstruction, ore deposit studies, and environmental geochemistry. The facility's combination of cutting-edge instrumentation, innovative software development, and expert leadership establishes a new benchmark for analytical excellence in the regional research landscape.

Learn more at: [air.app.br](air.app.br)

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# The Neuromechanics Unit's Clinical Collaborations: Bridging the gap between laboratory research and clinical

*The Neuromechanics Unit has developed cutting-edge biomechanical solutions that enhance surgical precision, rehabilitation effectiveness, and accessibility to advanced healthcare technologies.*

**By Mr Oloff Bergh**

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**Collaboration with the Medical and Surgical Sector**

The Neuromechanics Unit has substantially expanded its interdisciplinary partnerships with clinical collaborators, particularly within the fields of orthopaedics and biomedical engineering. These strategic alliances enabled the application of advanced biomechanical expertise to clinical challenges while fostered research development across multiple academic departments.

**Orthopaedic Research Initiatives**

A major research programme examined the biomechanical effects of external fixator frames on patient locomotion. This collaborative effort involved orthopaedic surgeons Dr Rudolph Venter and Prof Nando Ferreira, alongside biomedical engineers including Prof Kristiaan Schreve and colleagues at Stellenbosch University. Multiple MSc and PhD candidates utilised our VICON motion capture system to investigate interfragmentary movements of bone fragments during healing processes and evaluated various frame configurations against walking performance metrics. This research programme generated significant collaborative outputs while directly informed the design and optimisation of medical devices that impact patient mobility, comfort, and recovery outcomes.

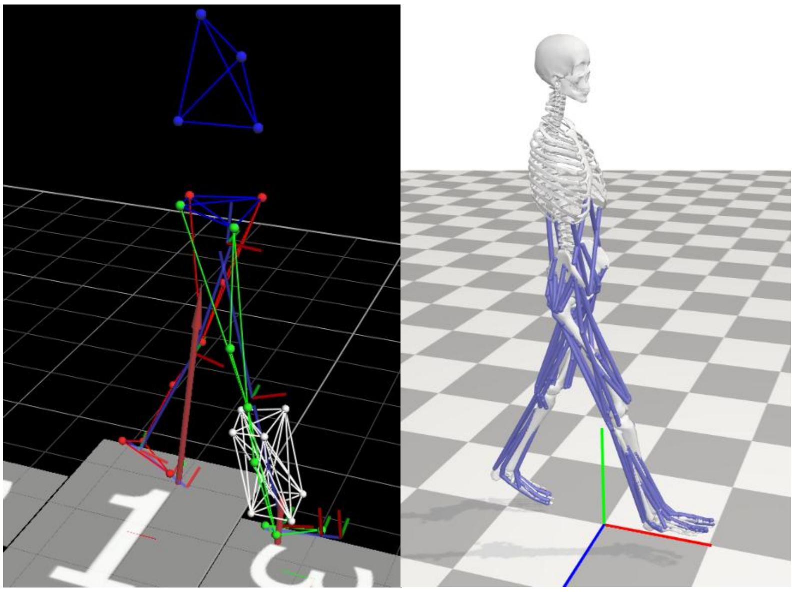

*Figure 14: a) Gait analysis using VICON Nexus of a lower limb stabilized with an Illizarov frame following a tibial fracture. Ground reaction forces are recorded via numbered force plates (1, 2, 3), and color-coded marker trajectories are used for inverse kinematics analysis during dynamic activities. b) OpenSim musculoskeletal model showing skeletal anatomy and muscle–tendon units (blue). Motion capture data from VICON Nexus can be used to drive the model for inverse dynamics analysis, enabling biomechanical evaluation for surgical planning and post-operative assessment.*

Concurrently, the unit evaluated three-dimensional ankle joint motion in patients who received minimally invasive ankle surgery. This investigation, conducted in partnership with private orthopaedic surgeons Dr Mark Maritz and Dr Hein Herbst at Busamed Somerset West, focused on understanding patient outcomes associated with specific surgical techniques and orthopaedic equipment. The study assessed how minimally invasive approaches influence post-operative gait patterns and joint mechanics. Future funding for this research is currently being pursued through a strategic partnership with the orthopaedic equipment manufacturer involved in the procedures.

**Paediatric Neuromuscular Research**

The unit continued its specialised work with children diagnosed with cerebral palsy, conducting comprehensive assessments of movement patterns before and after spinal cord surgery. As part of an extensive collaboration with Prof Yumna Albertus at the University of Cape Town, the research integrated high-density electromyography (HD-EMG) with three-dimensional motion analysis to enhance understanding of neuromuscular control in children undergoing selective dorsal rhizotomy. The project supported both surgical decision-making processes and long-term rehabilitation planning while it

*Figure 15: Pilot testing of a markerless, camera-based motion-capture system for wheelchair fitting and postural assessment in Western Cape public hospitals. The low-cost setup, developed through a Stellenbosch University–Western Cape Government partnership, supports remote evaluation and telerehabilitation to improve functional outcomes for wheelchair users in under-resourced settings.*

contributed to the development of shared datasets and joint publications across institutions.

## Technology Innovation and Accessibility

To broaden access to biomechanical assessment tools within clinical environments, the unit explored markerless motion capture technologies powered by machine learning algorithms. Through a partnership with the Western Cape Government and Prof Quinette Louw at Stellenbosch University, a pilot initiative was launched focusing on wheelchair fitting and postural assessment in public hospital settings. This project investigated low-cost, camera-based systems supported by custom-built software for remote assessment and telerehabilitation applications. The initiative provided access to advanced evaluation tools while improving functional outcomes for wheelchair users in under-resourced healthcare contexts.

*Figure 16: Pilot testing of a markerless, camera-based motion-capture system for wheelchair fitting and postural assessment in Western Cape public hospitals. The low-cost setup, developed through a Stellenbosch University–Western Cape Government partnership, supports remote evaluation and telerehabilitation to improve functional outcomes for wheelchair users in under-resourced settings.*

## Research Outputs and Future Directions

Collaborative research papers have been published this year from these various initiatives (https://doi.org/10.1016/j.dib.2025.111579; https://doi.org/10.7910/dvn/grrrom), with several additional publications in progress. The unit's expanding network of clinical and academic partnerships reflects both its contribution to research output at the university and its commitment to translating biomechanical insights into tangible improvements for patient care.

These initiatives demonstrate how biomechanics serves as a crucial bridge between fundamental research, technological innovation, and healthcare delivery. Moving forward, the unit's focus remains on supporting evidence-informed advances in surgical decision-making, rehabilitation practices, and assistive technology development—all directed toward improving quality of life for the populations we serve.

# CAF Winter Schools 2025: Building Research Excellence and Postgraduate Pathways

*Second year of this recruitment-focused program attracted 37 postgraduate students from across Southern Africa.*

***By Dr Angelique Coetzer***

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The Central Analytical Facilities (CAF) concluded its 2025 Winter Schools program during the 2nd week of July, having hosted 37 postgraduate students from universities across South Africa in five specialized training schools. This marked the second year CAF ran the program as a combined capacity building and direct recruitment opportunity, connecting students with Stellenbosch University researchers actively seeking new team members.

**Tailored Training Meets Strategic Recruitment**

Winter Schools offered in Medical Biomechanics, LC-MS, DNA Analysis, SEM, and Biomedical Microscopy, were specifically tailored by CAF scientists to meet the needs of participating academics who were actively recruiting for their research teams.

Each school integrated recruitment activities throughout the program, with students participating in tea-time networking sessions and supervisor presentations outlining existing research opportunities. The program concluded with a networking event in the Stellenbosch University Botanical Gardens (Image above). Strong participation from historically disadvantaged institutions reflected CAF's commitment to broadening access to advanced analytical training.

**Impact and Future Goals**

With 185 applications received, we selected the participants based on their academic credentials, the strength of their motivational letters and their commitment to pursue future postgraduate research degrees at Stellenbosch University.

CAF aims to attract at least ten new postgraduate students from this group to register at SU in 2026 or 2027, building on the past success of this recruitment-focused approach.
This program positions CAF's Winter Schools as an innovative model for addressing South Africa's research capacity building challenges while achieving transformation in Stellenbosch University's postgraduate cohort.

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*The Central Analytical Facilities Winter Schools program in 2025 was funded by CAF and represents part of Stellenbosch University's commitment to research excellence and transformation in South African higher education.*

**Key Outcomes:**

- 185 applications received for 37 available positions
- Strong participation from historically disadvantaged institutions
- Target: 10+ new postgraduate registrations for 2026/2027 from the group trained






*Figure 19: Marketing material which promoted the application of Southern African post graduate students to attend one of the five winter schools which were offered by CAF this July.*

# Modernising CAF: Strategic Expansion into Multi-Laboratory Private Sector Services

*To better serve several key South African industries, CAF has initiated a new, integrated, multi-lab service.*

*By Dr Angelique Coetzer*

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The Central Analytical Facilities (CAF) is currently refining a new service for private sector clients, where samples are analysed using a variety of methods in different CAF laboratories, and the results integrated into a single report against a single purchase order. This shift enables CAF to serve large private sector clients requiring coordinated analytical services across multiple specialized facilities while strengthening the multidisciplinary approach that defines modern scientific excellence.

**Multi-Lab Integration: The Wine Industry Model**

DALRRD (Department of Agriculture, Land Reform and Rural Development) currently use CAF services to verify that South African agricultural products for export meet the import requirements of the destination market, which are becoming increasingly stringent in most countries. To provide the required report for products such as wine whilst meeting stringent reporting deadlines (72 hours), requires seamless coordination between the LC-MS Unit, the GC-MS Unit, the Biogrip Node for Soil and Water Analysis, and the Elemental and Isotope Analyses Unit (previously the ICP-MS & XRF Unit). The requirement that individual samples be split and analysed simultaneously within different laboratories has demanded the development of comprehensive inter-lab protocols for sample handling, task assignment, result delivery, and billing across four distinct analytical environments.

The success of this integrated model demonstrates how multi-lab collaboration creates analytical capabilities impossible for individual laboratories operating in isolation. Custom software solutions coordinate workflows between facilities, enabling automated sample tracking and streamlined reporting across the multi-lab network while maintaining cost-effective service delivery.

**Scaling Multi-Lab Collaboration**

With the wine industry multi-lab model fully operational, CAF is extending this collaborative approach to a honey industry initiative with DALRRD, SABIO, and researchers from DUT, Wits, and UCT. This expansion will leverage multiple laboratory specializations to address critical gaps in providing the information required to support the export of honey and to authenticate honey.

*Figure 20: Field sampling for the CAF–DALRRD Honey Provenance Initiative. A beekeeper harvests frames at a Western Cape apiary, providing reference samples for the new multi-lab collaboration between CAF, DALRRD, SABIO and partner universities (DUT, Wits, UCT). The project applies advanced chemical and isotopic profiling—adapted from the wine industry model—to authenticate South African honey and support export certification.*

The proven multi-lab integration framework provides a scalable template for coordinating diverse analytical capabilities across specialized facilities, demonstrating how collaborative laboratory networks create unique competitive advantages for serving complex industry requirements.

**Technology and Impact**

The modernization includes a dual-purpose website, automated quotation processes, and real-time project tracking. These developments will ensure substantial private sector income without disrupting academic priorities, with partnerships strategically selected to complement research activities. Private sector contributions have shown significant growth, reduced the grant dependence of CAF while provided revenue.

This integrated multi-lab approach creates comprehensive analytical solutions that individual laboratories cannot provide, establishing a new paradigm for how university research facilities can leverage multi-disciplinary collaboration to serve complex industry needs.

***Key Outcomes:***

- Inter-lab protocols enabling coordinated workflows and sample tracking
- Transformation from isolated operations to integrated laboratory networks
- Multi-disciplinary approach creating comprehensive analytical solutions
- Scalable framework for coordinating diverse laboratory specializations

# Cyclotron Project Update

By Prof. Gary Stevens

With a view to performing early human research with a candidate radiopharmaceutical (developed by NIAID) targeting *Mycobacterium tuberculosis (Mtb)*, in 2022 the NII was awarded a **USD1.3 million** infrastructure grant by the Gates Foundation to establish a cyclotron unit in collaboration with a commercial partner at SU's Tygerberg Campus. SU's principal aim with this project was to establish an **independently registered, GMP-compliant research radiopharmacy** equipped to perform sophisticated syntheses and drive design of novel radiopharmaceuticals. These plans were featured in the 2023/24 CAF Report. However, the cyclotron project fell through after the commercial partner unexpectedly withdrew in late 2024. The Gates Foundation agreed that the primary aim could still be achieved by **upgrading the existing NII radiopharmacy**, provided this could be achieved by the project deadline of **31-Dec-2026,** <u>failing which SU would be required to refund the award</u>.

The NII radiopharmacy upgrade project has been registered with SU Facilities Management and was approved by CPRC on 23-Jun-2025 (Project Nr. 3479 950 TP). Permission to proceed with the upgrade has been granted by Western Cape Provincial Treasury. We are currently in the process of drafting an addendum to the existing MOA between SU and the PGWC while continuing with the design of the upgraded radiopharmacy (first project meeting with SU FM held 15-Jul2025). Use of the remaining Gates Foundation grant money (~**R25m**) is restricted to building works and fixtures and matches the high-level costing of the building project by SU Facilities Management. Additional funding (~**R12m**) will be required to equip the facility. In July 2025, we will apply to the SU Strategic Fund for money to purchase a **R6m automated synthesis module** (incl. 3 yrs warranty/SLA), with the balance of equipment funding (~**R6m**) to be guaranteed by NII/CAF. The NII will continue to pursue additional funding from other sources so that this guarantee can be reduced.

# Financial Reports

Financial reports compiled by Ms Selina Budhram.

| | | 2022 | 2023 | 2024 | Projected 2025 |
|---|---|---|---|---|---|
| **MS Unit (From 2025 Lc-MS & GC-MS Units)** | Internal Invoicing | 1 731 444 | 1 487 985 | 1 924 451 | 2 020 673 |
| | External Invoicing | 7 803 460 | 8 500 394 | 8 262 992 | 8 676 141 |
| | Total Logbook Income | **9 534 904** | **9 988 379** | **10 187 442** | **10 696 815** |
| | Salaries | 4 548 745 | 4 758 594 | 4 519 751 | 4 622 105 |
| | ICR | 1 542 253 | 1 700 079 | 1 652 598 | 1 735 228 |
| | Running Costs | 1 133 629 | 756 131 | 1 608 672 | 1 670 529 |
| | Maintenance | 1 064 626 | 489 265 | 141 874 | 157 780 |
| | Travel Costs | | | | 165 |
| | Small Equipment & KKW | 92 020 | 32 380 | 74 146 | 78 055 |
| | Deferred Costs | 439 992 | 827 723 | 833 749 | 852 641 |
| | Total Expenses | **8 821 265** | **8 564 172** | **8 830 791** | **9 116 504** |
| **Flow Cytometry Unit** | Internal Invoicing | 576 163 | 807 630 | 968002 | 1016402 |
| | External Invoicing | 27 708 | 20 247 | 137349 | 144217 |
| | Total logbook income | **603 871** | **827 877** | **1122351** | **1178469** |
| | Salaries | 765 987 | 792 048 | 834835 | 856 597 |
| | ICR | 5 542 | 2 904 | 27470 | 28 843 |
| | Running Costs | 112 328 | 115 368 | -318973 | -306 077 |
| | Maintenance | 469 496 | -3 180 | 283441 | 28 3441 |
| | Deferred Costs | 165 000 | 61 800 | 61800 | 63 315 |
| | Total Expenses | **1 518 353** | **968 939** | **888 573** | **926 119** |
| **Microscopy Unit** | Internal Invoicing | 1 588 073 | 1 579 225 | 1 810 488 | 1 901 012 |
| | External Invoicing | 1 120 729 | 1 039 425 | 1 304 148 | 1 369 356 |
| | Total Logbook Income | **2 708 802** | **2 618 650** | **3 148 636** | **3 306 068** |
| | Salaries | 2 453 032 | 2 237 563 | 2 250 486 | 2 305 102 |
| | ICR | 224 146 | 207 885 | 260 830 | 273 871 |
| | Running Costs | 275 843 | 179 803 | 540 994 | 533 082 |
| | Maintenance | 189 828 | 243 349 | 43 482 | 50 383 |
| | Travel Costs | 21 179 | | 46 096 | 59 061 |
| | Small Equipment & KKW | 24 058 | 32 841 | 137 600 | 164 160 |
| | Deferred Costs | 132 000 | 221 280 | 450 000 | 461 029 |
| | Total Expenses | **3 320 086** | **3 122 722** | **3 729 489** | **3 846 687** |

| | | 2022 | 2023 | 2024 | Projection 2025 |
|---|---|---|---|---|---|
| **Elemental & Isotope Analysis Unit (Previously ICP & XRF Unit)** | Internal Invoicing | 1 258 680 | 1 120 588 | 1 623 943 | 1 705 140 |
| | External Invoicing | 3 733 736 | 3 828 503 | 5 390 506 | 5 660 032 |
| | Total Logbook Income | **4 992 416** | **4 949 091** | **7 014 449** | **7 365 172** |
| | Salaries | 2 273 082 | 2 386 284 | 2 503 795 | 2 573 371 |
| | ICR | 746 747 | 765 701 | 1 078 101 | 1 132 006 |
| | Running Costs | 726 212 | 1 033 650 | 1 193 336 | 1 200 981 |
| | Maintenance | 825 264 | 64 551 | 56 032 | 61 144 |
| | Travel Costs | 52 933 | | 64 121 | 64 121 |
| | Small Equipment & KKW | 4 791 | 16 004 | 380 679 | 432 509 |
| | Deferred Costs | 439 992 | 600 000 | 600 000 | 614 706 |
| | Total Expenses | **5 069 021** | **4 866 191** | **5 876 065** | **6 078 838** |
| **DNA Unit** | Internal Invoicing | 3 525 681 | 4 068 018 | 3 083 127 | 3 237 284 |
| | External Invoicing | 6 885 051 | 9 136 958 | 9 952 483 | 10 450 107 |
| | Total Logbook Income | **10 410 732** | **13 204 977** | **13 035 610** | **13 687 391** |
| | Salaries | 3 485 899 | 3 647 163 | 3 687 077 | 3 785 062 |
| | ICR | 1 377 010 | 1 827 392 | 1 990 497 | 2 090 021 |
| | Running costs | 5 804 969 | 6 441 528 | 6 132 345 | 6 277 962 |
| | Maintenance | 66 303 | 76 885 | 5 243 | 7 554 |
| | Travel Costs | 962 | | | |
| | Small Equipment & KKW | 298 123 | -10 419 | 106 610 | 106 610 |
| | Deferred Costs | 313 500 | 291 843 | 132 000 | 135 235 |
| | Total Expenses | **11 346 767** | **12 274 392** | **12 053 772** | **1 2402 445** |
| **NMR Unit** | Internal Invoicing | 546 554 | 520 052 | 601 621 | 631 702 |
| | External Invoicing | 388 191 | 550 020 | 1 236 977 | 1 298 826 |
| | Total Logbook Income | **934 745** | **1 070 072** | **1 838 598** | **1 930 528** |
| | Salaries | 1 600 780 | 1 681 988 | 1 809 477 | 1 209 867 |
| | ICR | 77 638 | 110 004 | 247 395 | 259 765 |
| | Running costs | 598 477 | 314 545 | 478 640 | 507 908 |
| | Maintenance | 5 753 | 1 376 | | |
| | Small Equipment & KKW | | | | 379 |
| | Deferred Costs | | | 60 000 | 61 471 |
| | Total Expenses | **2 282 648** | **2 107 914** | **2 595 512** | **2 039 389** |

| | | 2022 | 2023 | 2024 | Projection 2025 |
|---|---|---|---|---|---|
| **CT Unit** | Internal Invoicing | 563 014 | 290 500 | 363 810 | 382 001 |
| | External Invoicing | 1 592 203 | 509 983 | 353 515 | 371 191 |
| | Total Logbook Income | **2 155 216** | **800 483** | **717 325** | **753 191** |
| | Salaries | 663 043 | 590 688 | 618 688 | 634 854 |
| | ICR | 319 254 | 101 997 | 70 703 | 74 238 |
| | Running costs | 176 635 | 190 583 | 395 930 | 406 492 |
| | Maintenance | 338 789 | 20 156 | | |
| | Travel Costs | | | | |
| | Small Equipment & KKW | | | | 22 |
| | Deferred Costs | 385 007 | 411 600 | 258 420 | 264 754 |
| | Total Expenses | **1 882 728** | **1 315 024** | **1 343 741** | **1 380 360** |
| **Neuromechanics Unit** | Internal Invoicing | 174 250 | 88 380 | 165 060 | 173 313 |
| | External Invoicing | 827 884 | 40 535 | 44 196 | 46 406 |
| | Total Logbook Income | **1 002 134** | **128 915** | **234 256** | **245 969** |
| | Salaries | 763 075 | 418 141 | 478 762 | 492 207 |
| | ICR | 165 577 | 8 107 | 8 839 | 9 281 |
| | Running costs | 156 445 | 80 462 | 23 191 | 23 691 |
| | Maintenance | 4 550 | | | 797 |
| | Travel Costs | | | | |
| | Small Equipment & KKW | | 20 550 | | |
| | Deferred Costs | 99 996 | 106 800 | 106 800 | 109 418 |
| | Total Expenses | **1 189 643** | **634 059** | **617 593** | **635 394** |
| **Vibration Spectroscopy Unit** | Internal Invoicing | 124 325 | 5 280 | | |
| | External Invoicing | 18 897 | | | |
| | Total Logbook Income | **143 222** | **5 280** | | |
| | Salaries | | | | |
| | ICR | 3 779 | | | |
| | Running costs | 2 187 | 555 | | |
| | Maintenance | | | | |
| | Travel Costs | | | | |
| | Small Equipment & KKW | | | | |
| | Deferred Costs | 109 992 | | | |
| | Total Expenses | **115 959** | **555** | | |

| | | 2022 | 2023 | 2024 | Projection 2025 |
|---|---|---|---|---|---|
| TOTAL UNITS' INCOME | Total Internal Income | 10 088 184 | 9 967 659 | 10 616 503 | 11 067 528 |
| | Total External Income | 22 397 858 | 23 626 065 | 26 682 167 | 28 016 275 |
| | **Total Income: All Units** | **32 486 042** | **33 593 723** | **37 222 670** | **39 163 603** |
| ADDITIONAL INCOME | Interest Received | 1 386 828 | 2 116 938 | 1 880 864 | 1 958 180 |
| | Funds Received VR(R) | 1 000 000 | 1 000 000 | 1 000 000 | 1 000 000 |
| | Salary Contribution VR(R) | 5 213 114 | 5 092 607 | 5 711 202 | 605 3874 |
| | ALT Contribution | | 4 086 667 | | |
| | Equipment Replacement Fund | | 3 000 000 | | |
| | NII LEVY | 180 000 | | | |
| | BIOGRIP LEVY | 200 000 | 97 398 | | |
| | VAT Refund on Equipment | 1 259 968 | 1 035 372 | | |
| TOTAL ADDITIONAL INCOME | | **10 776 890** | **16 428 984** | **8 592 067** | **9 012 054** |
| TOTAL INCOME | | **42 388 341** | **50 022 707** | **45 814 736** | **48 175 657** |
| TOTAL UNIT'S EXPENDITURE | Salaries: Admin | 2 514 161 | 2 726 830 | 3 773 397 | 4 247 811 |
| | Salaries: Units | 16 553 643 | 16 512 470 | 16 702 871 | 16 479 164 |
| | 17% 20% ICRR (Indirect Cost Recovery) | 4 461 946 | 4 724 068 | 5 336 433 | 5 603 255 |
| | Running Costs (sum of units) | 8 986 726 | 9 112 625 | 10 061 371 | 10 314 568 |
| | Maintenance (sum of units) | 2 964 608 | 892 403 | 530 072 | 561 098 |
| | Travel Costs (sum of units) | 75 074 | | 110 217 | 123 347 |
| | Small equipment & KKW (sum of units) | 418 992 | 91 356 | 699 036 | 781 735 |
| | Deferred Costs | 2 085 480 | 2 521 046 | 2 502 769 | 2 562 569 |
| | CAF General Running Costs | 506 170 | 638 805 | 270 636 | 286 874 |
| | Travel Costs-Courier | 112 637 | 78 678 | 83 391 | 88 394 |
| | Infrastructure | 9 995 | | | |
| | Equipment | 27 111 | 11 395 | 288 882 | 306 215 |
| | NMR Purchase | 126 369 | | | |
| | Maintenance | | | 28 462 | 28 605 |
| | Equipment Repair Fund | 500 000 | 500 000 | 500 000 | 2 500 000 |
| | CAF Vehicle Fund | 45 000 | 45 000 | 45 000 | 45 000 |
| | Equipment Replacement Fund | 1 250 000 | 1 000 000 | 2 880 000 | 3 700 000 |
| | Infrastructure | | 3 059 807 | 2 000 000 | 500 000 |
| TOTAL UNIT EXPENDITURE | | **40 672 455** | **48 694 499** | **43 999 679** | **48 128 634** |
| **SURPLUS/SHORTFALL** | | **1 053 498** | **1 328 209** | **21 618** | **47 024** |

| | | 2022 | 2023 | 2024 | Projection 2025 |
|---|---|---|---|---|---|
| **EQUIPMENT EXPENDITURE** | | | **19 654 570** | **1 539 664** | **25 287 694** |
| | NRF-NEP Total grants | | 10 000 000 | | 14 991 519 |
| | ALT/US Funds | | 5 164 141 | | 6 118 157 |
| | Contributions: Faculty of Medicine | | | | 983 891 |
| | Contributions: Faculty of Science | | 1 000 000 | | 2 500 000 |
| | CAF Contribution | | 126 678 | | |
| | Insurance Claim | | 3 363 750 | 1 539 664 | 694 127 |
| **FUNDS** | | **22 874 130** | **25 553 691** | **35 459 813** | **42 066 135** |
| | Emergency Equipment Repair Fund | 2 172 494 | 2 672 494 | 3 220 187 | 5 720 187 |
| | Vehicle Replacement | 360 092 | 405 092 | 461078 | 529170 |
| | Reserve, Food Security Project | 1 240 437 | 1 248 540 | 1 258 320 | 1 278 877 |
| | Maintenance Fund Equipment: BD FACS Jazz sorter (2013) | 1 463 516 | 1 512 840 | 1 373 359 | 1 117 155 |
| | Provision for Leave Payment | 901 297 | 1 082 924 | 1 018 621 | 1 018 621 |
| | Equipment Replacement | 5 250 000 | 3 250 000 | 12 830 000 | 16 530 000 |
| | Deferred Costs | 5 122 543 | 6 681 802 | 8 198 248 | 8 772 126 |
| | Alt Funds 2022-2025 (CAF Running Costs) | 3 000 000 | 2 000 000 | 7 100 000 | 7 100 000 |
| | Cyclotron Project 2023 | | 6 700 000 | | |

| CAF UNITS: Financially ring-fenced DSI funded research infrastructure platform nodes | | 2021 | 2022 | 2023 | 2024 | Projection 2025 |
|---|---|---|---|---|---|---|
| **NODE FOR INFECTION IMAGING (NII)** | | | | | | |
| | NODE Funding | 3 000 000 | 3000 000 | | | |
| | Bridging Funding | | | | | |
| | VAT Refund on Equipment | | 3 084 593 | | | |
| | Interest Received | 199 879 | 330 702 | 558 727 | 747489 | 784 863 |
| | Income | 1 211 787 | 3 085 219 | 656 293 | 1 139 734 | 1 196 721 |
| | Private Patients | 4 112 235 | 6 454 310 | 9 505 372 | 16 940 757 | 17 787 795 |
| TOTAL INCOME | | **8 523 900** | **12 954 823** | **10 720 391** | **18 080 492** | **18 984 516** |
| | Salaries & Running Costs | 8 800 612 | 10 349 779 | 10 951 214 | 14 239 647 | 14 951 629 |
| | Building & Equipment | 366 473 | 50 635 | 36 900 | 178 292 | 187 207 |
| | Bursaries | | | | | |
| TOTAL EXPENDITURE | | **9 167 085** | **10 400 414** | **10 988 114** | **14 417 939** | **15 138 836** |
| YEAR END BALANCE | | **5 657 499** | **8 211 908** | **7 944 185** | **3 662 552** | **3 845 680** |
| **BIOGRIP NODE FOR SOIL AND WATER ANALYSIS** | | | | | | |
| | Internal | 388 477 | 183 353 | 532 405 | 329 169 | 345 627 |
| | External | 239 745 | 477 219 | 859 002 | 1 546 105 | 1 623 410 |
| TOTAL INCOME | | **628 222** | **660 573** | **1 391 407** | **1 875 274** | **1 969 037** |
| | ICRR | 47 949 | 95 444 | 171 800 | 309 221 | 1 704 581 |
| | Running Costs | 354 962 | 687 176 | 570 623 | 2 101 059 | 1 335 841 |
| | Maintenance Costs | 5 941 | 784 409 | 317 389 | 283 437 | 30 0413 |
| | Salaries | 1 235 621 | 1 515 095 | 1 379 256 | 1 911 183 | 2 025 854 |
| TOTAL EXPENDITURE | | **1 644 473** | **3 082 124** | **2 439 069** | **4 604 900** | **5 366 689** |

Notes: DSI financial year runs from 1 April – 31 March.

# Graphs Detailing Aspects of CAF Income During 2024

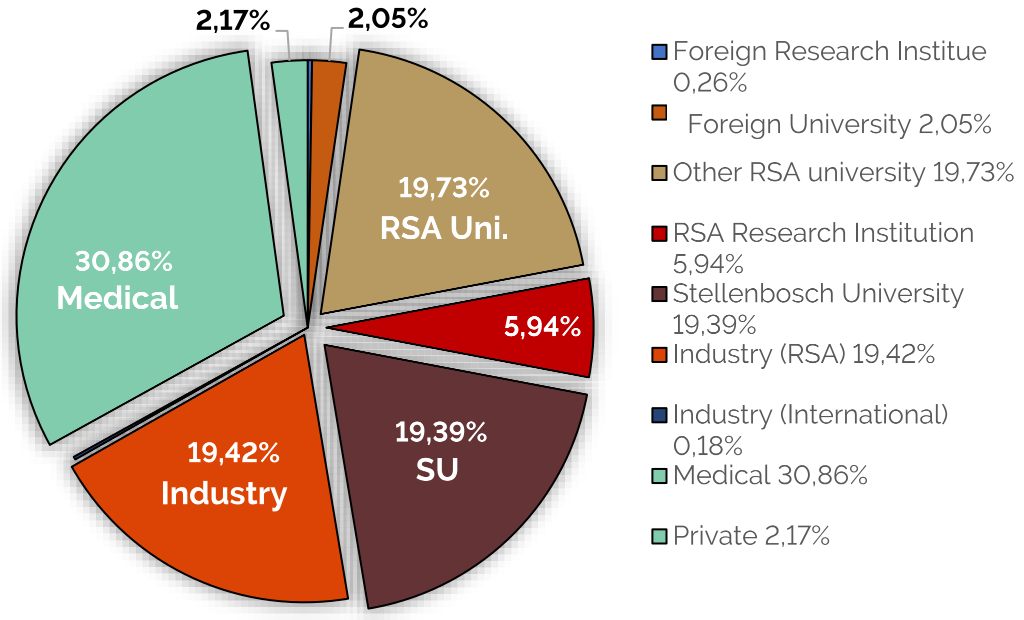


*Figure 21: Percentage of income derived from the distinct categories of clients for 2024.*

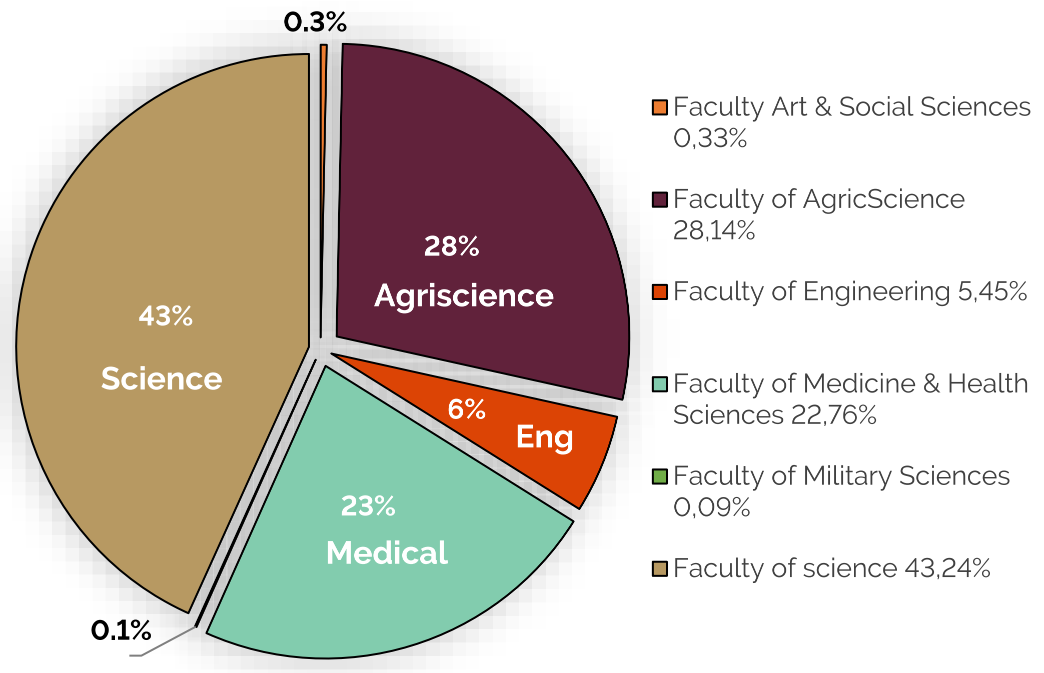


*Figure 22: Percentage of income derived from the distinct faculties for 2024.*

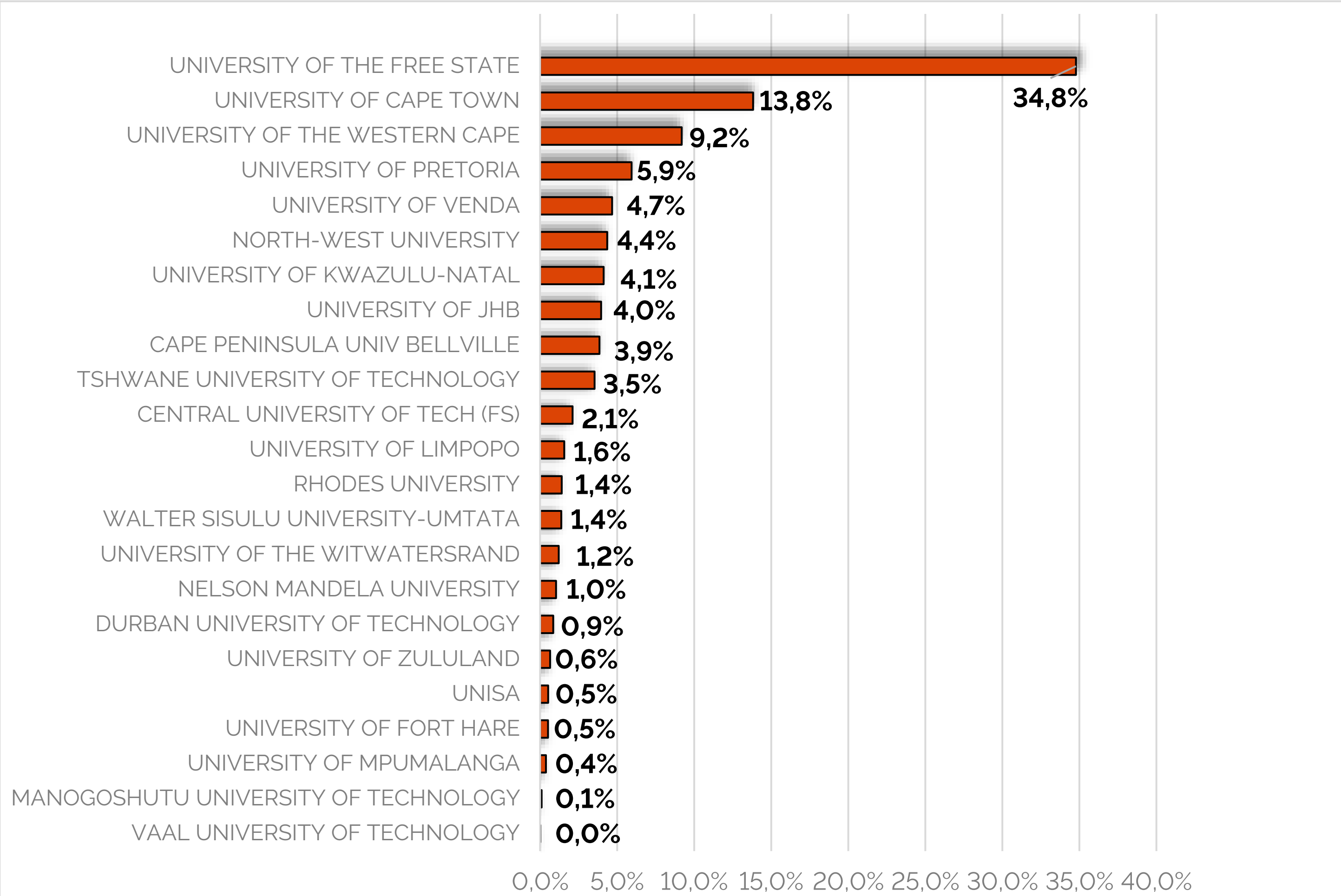


*Figure 23: Analysis of the percentage of CAF income for 2024 from external clients by institutions.*

# CAF Structure 2025

## MANAGEMENT

**DIRECTOR:** PROF GARY STEVENS

**FINANCE**: MS SELINA BUDHRAM

**DNA SEQUENCING UNIT**
DR CAREL VAN HEERDEN

**MICROSCOPY UNIT**
MS LIZE ENGELBRECHT

**NMR UNIT**
DR JACO BRAND

**FLOW CYTOMETRY UNIT**
DR DALENE DE SWARDT

**BIOGRIP NODE FOR SOIL & WATER ANALYSIS**
DR JANINE COLLING

**NUMERI NODE FOR INFECTION IMAGING (NII)**
PROF ALEX DORUYTER

**LC-MS UNIT**
MR ERICK VAN SCHALKWYK

**GC-MS UNIT**
MR LUCKY MOKWENA

**ELEMENTAL & ISOTOPE ANALYSIS UNIT**
MS RIANA ROSSOUW

**NEUROMECHANICS UNIT**
MR OLOFF BERGH

**CT SCANNER UNIT**
MS CARLYN WELLS

*Figure 24: CAF structure for 2025 showing management units and nodes.*

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