Annual Report 2024

Stellenbosch UNIVERSITY IYUNIVESITHI UNIVERSITEIT

Science
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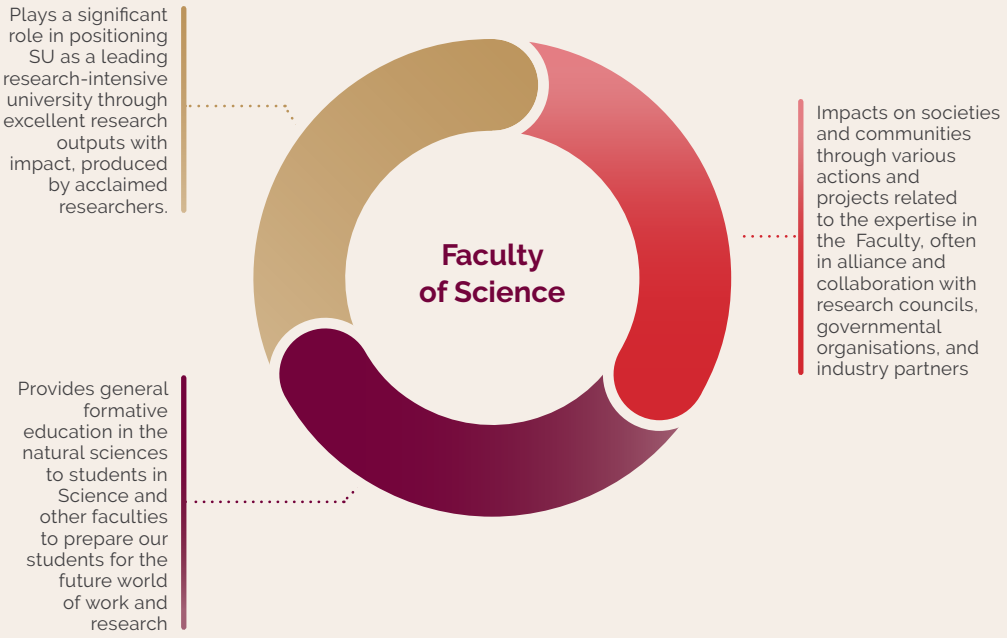
Natuurwetenskappe

VALUE STATEMENT



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From the Dean

In April 2024 I took over the reins of the Faculty of Science from Prof. Louise Warnich, who maintained a tight ship over the past decade. Much of the achievements showcased in this annual report, should still be attributed to her successful leadership of the Faculty.

Research and innovation

On the research front, we are happy to report on some major developments in 2024. Prof. Erick Strauss from the Department of Biochemistry is part of a network of world-class scientists across Africa who has entered the global drug discovery arena following a US$7.2 million joint investment by the medical research charity LifeArc and the Bill & Melinda Gates Foundation in the Grand Challenges Africa Drug Discovery Accelerator (GC ADDA) programme. Grand Challenges is a family of initiatives fostering innovation to solve key global health and development problems. Prof. Alakendra Roychoudhury received research funding of R15 million through Schmidt Sciences for a collaborative project on oxygen and biogeochemical dynamics along the West African margin.

Our researchers were involved in co-authoring papers in high impact journals – Prof. Roychoudhury co-authored a paper in *Science* on the important role of the Southern Ocean in global biological processes and the carbon cycle by providing the first field evidence of the underappreciated role of inorganic Zinc particles in these cycles. Prof. Thulani Makhalanyane was one of a group of leading African scientists who issued a compelling call for more equitable research partnerships in a paper published in *Nature Medicine*. The paper underscores the critical need for fair and collaborative research efforts to explore the unique and diverse microbiomes found in African populations and environments. Historically, these microbiomes have been underrepresented in global studies.

The Faculty of Science is also leading the charge when it comes to international collaboration and the awarding of joint PhD degrees. During 2024, four joint degrees were awarded between SU and the Friedrich-Schiller University in Jena, Germany, the University of Padova in Italy, Coventry University in the United Kingdom, and the *Muséum national d'Histoire naturelle* (MNHN) in France. Another highlight was when SU awarded an honorary doctorate to Dr Philemon Mphathi Mjwara, former director general of the Department of Science and Innovation. Dr Mjwara was honoured for his outstanding achievements as science policymaker and advocate, and his exceptional leadership contribution to the strengthening and advancement of science at the national and international level. We also welcomed the inaugural lectures of Prof. Yin-Zhe Ma from the Department of Physics, and Prof. Donita Africander from the Department of Biochemistry.

Awards to staff and students

Our staff were honoured for their contributions on several levels last year. Prof. Thulani Makhalanyane received the prestigious Silver Medal of the South African Society of Biochemistry and Molecular Biology (SASBMB) for his outstanding contribution to the field. Prof. Andries Engelbrecht received the South African Institute for Computer Scientists and Information Technologists (SAICSIT) Pioneer Award. Prof. Resia Pretorius and Prof. Johann Rohwer were welcomed as members of the Academy of Sciences of South Africa (ASSAf), while Dr Bjorn von der Heyden was elected as fellow to the Geological Society of South Africa. Prof. Delia Haynes, Prof. Bert Klumperman and Prof. Willem van Otterlo were inducted as Fellows of the SA Chemical Institute, while Prof. Van Otterlo was also elected as a Fellow of the Royal Society of SA. Prof. Kathy Myburgh was elected as vice-president of the Royal Society of South Africa for 2024-2026.

On the academic front, Dr Sanjeev Rambharose was selected for the Future Professors Programme, while the following lecturers were selected for the SU Research and Innovation Strategic Excellence (SUNRISE) programme – well done to Dr Prinessa Chellan, Dr Rueben Pfukwa, Dr Bali Sishi, Dr Naina Ralaivaosaona, and Dr Nasreen Peer.

From the Departmental reports, it is also evident that our postgraduate students did exceptionally well this year. To name but a few: Francisca Darkoh from the Department of Physiological Sciences was awarded a Mandela Rhodes Scholarship. Two postgraduate students in the Department of Earth Science made history with awards from the Geological Society of South Africa (GSSA) for the best MSc and the best BSc Honours thesis in Earth Sciences produced at a South African university in 2023. Dr Gestél Kuyler was awarded the South African Chemical Institute's Postgraduate medal and Lisa de Wet the James

Moir medal for best Honours student in Chemistry, while Dr Lauren Ball was awarded an Alexander von Humboldt postdoctoral fellowship. The S2A3 medal was awarded to MSc physics student Conrad Strydom, and siblings Danielle and Benjamin Kleyn came out tops in the Standard Bank South African Tertiary Mathematics Olympiad. Danielle also received the prestigious Chancellor's Award.

We are also proud to have our lecturers feature at the First-year achievement awards function. The following lecturers were nominated for contributing to students' success: Prof. Gareth Boxall, Prof. Karin-Therese Howell, Dr Lesley Wessels, Dr Dirk Basson, Prof. Francois Smit, Dr Hardus Diedericks, Dr Ebrahiem Botha, Prof. Gareth Arnott, Dr Christine Steenkamp, and Dr JJ van Zyl.

Social impact

Three of our staff members picked up the baton to raise funds for students in need. Prof. Ben Loos used the challenge posed by the Comrades Marathon to crowdfund for science students in need. Prof. Bert Klumperman participated in The Walk of the Word, walking 160km in four days, to raise funds for the Ron Sanderson Bursary Fund. Dr Marietjie Lutz raised R75 000 by cycling 600km in six days.

We are proud of Dr Ebrahiem Botha and Mr Jabu Lukhele who won a Social Impact award for the SU Chemistry Outreach Initiative (SUNCOI) that provide high school leaners and teachers access to practical chemistry laboratory work. During 2024, Prof. Shaun Wyngaardt from the Department of Physics worked with SU's Social Impact Office and alumni of Lückhoff High School in Stellenbosch to restore the legacy of the physicist and mathematics teacher, Walter Parry (1913-1966), with the establishment of the Walter Parry Memorial Lecture.

In conclusion

In conclusion, I want to express my deepest gratitude and appreciation for the unwavering commitment and hard work of our academic, administrative and technical staff, contributing to the overall success and reputation of our faculty. Through our numerous research activities and graduates, we continue to impact SA's science, technology, and innovation systems that in turn can impact the country's human and economic development and global competitiveness.

Prof. Bertie Fielding
Dean: Faculty of Science

From the Dean's Office

The Dean and Vice-Deans are supported by a cohort of ten staff members, supporting the various activities and responsibilities of their offices.

The Dean is directly supported by a personal assistant, **Ms Suzette Els**, and a director of faculty management in the person of **Mrs Mariétta van den Worm**, who has held this position for the past 25 years. Her primary responsibilities include management of all business processes in the faculty with regards to infrastructure and services, faculty budget allocations, faculty personnel planning, safety and risk oversight, and supporting the execution of faculty strategies. In 2024 two lifts to give access to physically disabled persons were installed in two buildings, four lecture rooms were refurbished with the latest teaching technology and new spaces were made available and refurbished to host the associated School for Data Science and Computational Thinking, the National Institute for Theoretical and Computational Sciences (NITheCS) and a new mechanical workshop in the Merensky building.

On the academic and student support side, **Ms Aatika Valentyn** is the coordinator for academic and student affairs. She supports undergraduate students from the prospective student stage till graduation. This includes administration of the undergraduate student selection process, advice on academic matters to current undergraduate students and administrative assistance to the Vice-Dean: Teaching and Learning, Prof. Ingrid Rewitzky, with regards to the academic project. Further support for teaching and learning in the faculty is provided by the blended learning coordinator, **Dr Ilse Rootman-le Grange**. She plays a key role in supporting the learning and teaching processes with regards to lecturers.

As postgraduate administrative officer, **Mrs Hayley du Plessis** supports the Vice-dean, Research and Postgraduate students, Prof Frikkie Scholtz, with all administrative matters associated with his portfolio. This includes the administration of the postgraduate examination process (Masters and doctoral), administration of the faculty postgraduate bursaries, welcoming of new Honours, Masters and Doctoral students and organising the annual Faculty of Science Postgraduate Research Conference.

Ms Ilse de Kock is the manager of the Computer User Areas (NARGA) in the Faculties of Science and AgriSciences. With a staff of three technicians and three system administrators she supports ICT services and needs in both faculties. In 2024 she established the Faculty IT Linux

community of practice which looks after all the Linux needs of postgraduate students and researchers. The NARGA staff also supports all undergraduate students' needs for Windows and Ubuntu operating systems in NARGA.

Mr Marius Swart is the human resources practitioner dedicated to dealing with all personnel matters in the Faculty of Science.

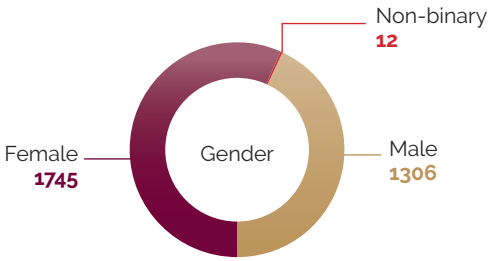
As media officer, **Mrs Wiida Basson** is responsible for all media, research communication, and marketing matters for the Faculty of Science. She is also involved in building science communication capacity in the SADC region as coordinator of the annual SADC Science Journalism Training Programme at Science Forum South Africa. Providing general administrative support to the Dean's office in various regards, **Mrs Comari Schoeman** is responsible for translation and language editing of all faculty documents, updating the yearbook and relevant institutional documents, and acting as liaison with our alumni and Advisory Board members.

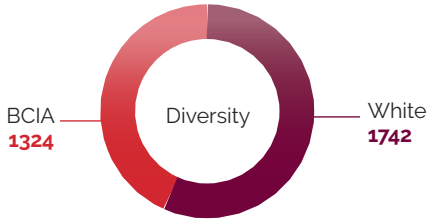
The Dean's office also cannot function without the invaluable support and hard work of **Ms Tesri Page** as office assistant.

2024
AT A GLANCE

Student Profile

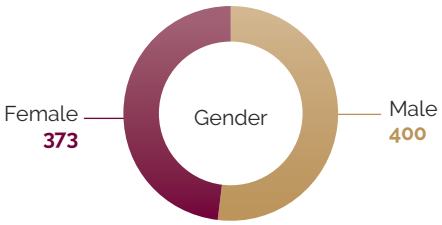
Undergraduate student profile

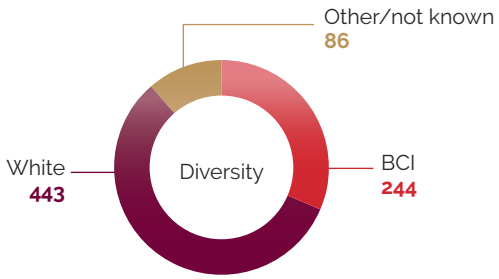


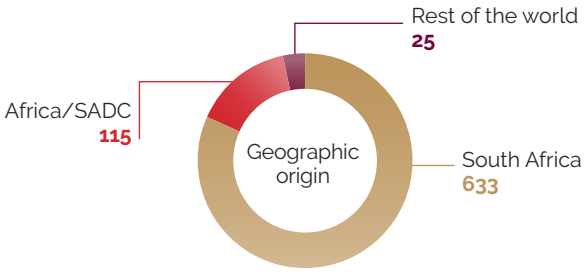


BCIA = Black African, Coloured, Indian and Asian

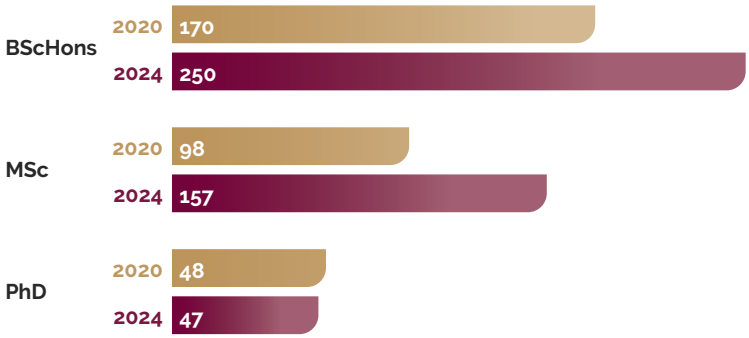
Postgraduate Student Demographics







Graduates 2020 vs 2024



Academic Profile

95,2%
% of academic staff with PhDs

27%
% of professional support staff with PhDs

10
Departments, Centres and Institutes

Research chairs

South African Research Chairs

SARChI chair in Mathematical and Theoretical Physical Biosciences — **Prof. Cang Hui**, Department of Mathematical Sciences

SARChI chair in Integrative Skeletal, Muscle Physiology, Biology and Biotechnology — **Prof. Kathy Myburgh**, Department of Physiological Sciences

SARChI chair in Mechanistic Modelling of Health and Epidemiology — **Prof. Jacky Snoep**, Department of Biochemistry

Endowed research chairs

Rand Water Care Company chair in Water Management — **Prof. Gideon Wolfaardt**, SU Water Institute

SU/University of Groningen joint research chair in Computational Astronomy — **Prof. Yin-Zhe Ma**, Department of Physics

African Rainbow Minerals Research Chair in Geometallurgy — **Prof. Bjorn von der Heyden**, Department of Earth Sciences

Global footprint

Top 100 institutions collaborating with Faculty of Science (co-authored publications) 2014-2023

Co-authored publications by Country/Region 2014-2023

Science

Departmental Reports

Department of Biochemistry

RESEARCH INTERESTS

- Steroid hormone and receptor function in health and disease
- Animal microbiome analysis
- Antimicrobial resistance, pathogen detection and control
- Antimicrobial peptides, materials, and drugs
- Drug discovery
- Mathematical, computational, and experimental systems biology
- Mechanistic enzymology
- Cell stress responses and protein folding.

RESEARCH HIGHLIGHTS

Tuberculosis research group meet at STIAS

The Grand Challenges African Drug Discovery Accelerator (GC ADDA) tuberculosis drug discovery flagship project funded by the Gates Foundation and LifeArc and led by Prof. Erick Strauss met for the first time in person at STIAS in November 2024. This meeting provided the team to look back on their first year of activities and achievements, and to plan how best to build on these successes in year two of the project. Such in person meetings are crucial to the success of the project. The team comprises members from Stellenbosch University (under leadership of Prof. Strauss from the department of Biochemistry), the South African Medical Research Council (SAMRC), Rhodes University, University of KwaZulu-Natal, the Kenya Medical Research Institute (KEMRI) and the H3D Foundation.

Prof. Lyn-Marié Birkholtz joined the Department of Biochemistry in 2024 to extend the expertise of the department in drug discovery. She co-leads the Malaria Flagship project for the GC ADDA, with the department now hosting both flagship projects of the GC ADDA network. The GC ADDA malaria drug discovery flagship project team comprising members from Stellenbosch University, the University of Pretoria, the University of the Witwatersrand, University of Limpopo, University of Ghana, the University of Science, Technique and Technologies of Bamako (Mali) and the H3D Foundation, with the Medicines for Malaria Venture, Gates Foundation and University of Dundee.

Systems Biology conference hosted at SU

Profs Johann Rohwer, Jacky Snoep, and Dr Dawie van Niekerk organised the 21st Conference of the International Study Group for Systems Biology, which was held in Stellenbosch during September 2024. The conference was chaired by Prof. Rohwer and featured contributions by 42 participants from 9 countries. Several postgraduate students and postdoctoral fellows from our department delivered oral or poster presentations.

▲ The GC ADDA tuberculosis drug discovery flagship project team at their first in-person meeting on 27 November 2024 at STIAS in Stellenbosch.

RESEARCH ACTIVITIES

Prof Donita Africander served as guest editor for *Frontiers in Immunology* and the *Journal of Steroid Biochemistry and Molecular Biology*, is senior editor for the *Journal of Endocrinology* and the *Journal of Molecular Endocrinology* and serves on the editorial board of the *Journal for Ethnopharmacology*. She has active collaborations with Profs Jacky Snoep and Karl Storbeck from this department, Prof. Anna-Mart Engelbrecht (SU's Department of Physiological Sciences), Dr Carmen Pheiffer (Medical Research Council), Prof. Janet Hapgood (UCT), Dr Pai Lin (Family Health International 360, Durham North Carolina, USA), and Dr Narender Kumar (Population Council, Rockefeller University, New York City, USA). Prof. Africander presented her professorial inaugural lecture, and delivered invited talks on the role of progestins in breast cancer at the 8th International PacRim Breast and Prostate Cancer "think tank" in Darwin, Australia and the Rise Up for Breast Cancer meeting in San Francisco, USA.

▲ Prof. Donita Africander.

Dr Mervyn Beukes has an active collaboration with Dr Daniella Altschuh (CNRS, University of Strasbourg, France) and the Group of Prof. HG Sahl (University of Bonn). He has links with several researchers in Africa, including at the University of Namibia and the University of Dar-Es-Salaam. He also collaborates with local researchers at the CSIR, the University of Pretoria and North-West University and Durban University of Technology. He received a certificate of recognition from the Department of Science and Technology through the National Intellectual Property Management Office, for the proof of concept, "Detection method of detecting ketone bodies in the breath of Type II diabetics, as diagnostic tool". He is a member of the American Society for Microbiology and served as a guest editor on their editorial board. In collaboration with the University of Pretoria, he holds a patent (No. 2012/09380) on a novel diagnostic tool for the detection of *Mycobacterium tuberculosis* infection "A method of the detecting surrogate markers for active tuberculosis in a serum sample".

Prof. Lyn-Marié Birkholtz joined the department in July 2024 as a full professor, and she is the incumbent of a DSI/NRF South African Research Chair (SARChI) in Sustainable Malaria Control. She is a scientific advisor for the South African Malaria Elimination Committee, director of a Medicines for Malaria Venture Global Test Centre, part of the Operational Leadership Team for the Grand Challenges

African Drug Discovery Accelerator (GC ADDA), scientific advisor to BioMalPar and on the editorial team for the *International Journal of Parasitology* and *Scientific Reports*. She co-leads the malaria flagship project in the GC ADDA, which aims to discover and deliver new antimalarial clinical candidates. This project is based on the $7.5 mil funding from the Gates Foundation and LifeArc for GC ADDA, with the Malaria Project receiving $2.54 mil of this funding. With this project, Prof. Birkholtz works with researchers in Ghana (Prof. Richard Amewu), Mali (Drs Laurent Dembele and Dinkorma Ouoluguem) and South Africa (Prof. Amanda Rousseau, WITS University, and Dr Winston Nxumalo, University of Limpopo and the H3D Drug Discovery Centre at UCT) to contribute new interventions for malaria elimination in Africa. Prof. Birkholtz is also a member of the Malaria Drug Accelerator, an international consortium of leading malaria researchers where she contributes expertise in blocking malaria parasite transmission. On this topic, she profiles frontrunner antimalarial candidates for the global community for their elimination potential, with Dr Didier Leroy at the Medicines for Malaria Venture (Switzerland). She further collaborates with Prof. Jacky Snoep and Prof. Albena Lederer (SU's Department of Chemistry and Polymer Science and the Leibniz Institute for Polymer Sciences) and Prof. Lizette Koekemoer (WITS) to design new delivery systems for antimalarial agents. She further collaborates with Eric Oldfield (University of Illinois, USA), Giovanna Poce (Sapienza University, Italy), Kenny Onajole (Roosveldt, USA), Susan Wyllie (University of Dundee and WCAIR). Prof. Birkholtz led the American Chemistry Society's Seminar on World Malaria Day, 2024, where she presented a keynote lecture on the discovery of antimalarial agents for malaria elimination. She also presented a keynote lecture on Transmission-blocking antimalarials for the Italian Malaria Network.

Dr Annelise Botes heads a research team focused on critical ostrich health challenges that impact production, specializing in pathogen detection, vaccine evaluation, microbiome analysis and antimicrobial resistance. Actively collaborating with Dr Adriaan Olivier, the industry veterinarian for the South African Ostrich Business Chamber, she also maintains research ties with experts in ostrich production from the Department of Agriculture, Western Cape Government.

Prof. Marina Rautenbach leads the BIOPEP Peptide Group that is currently focussing on creating peptide functionalised materials and nano-formulations with sterilising activity. Prof. Rautenbach serves on the editorial boards of *BBA Biomembranes* and *Journal of Microbiological Methods* and is on the Board of Advisors of the PhD Course in Biochemistry, Sapienza University, Rome, Italy. She has active collaborations with colleagues in SU's Department of Microbiology, Prof. Leon Dicks, Prof. Wesaal Khan, and Prof. Alf Botha, in the search for new antibiotics from environmental samples. She also collaborates with Dr Tawanda Zininga from the Department of Biochemistry on antimalarial peptides interacting with heat-shock proteins. She has a long-standing active collaboration with Prof. Marietjie Stander from the LC-MS CAF on mass spectrometry of biomolecules. On an international level she collaborates on the biophysical aspects of peptide self-assembly with Prof. B Bechinger (Strasbourg University, France), Prof. T Parker (Science and Technology Council, UK), Dr P Neethling (SU's Department of Physics), and Dr Vikas Kumar (Government College Khimlasa, Sagar, India). As a partner in the Triple-A-Coat consortium project funded by an EU Horizon Grant she collaborates with various members of an EU Horizon consortium on application of peptides in nanocellulose type materials, specifically to create broad spectrum sterilising cellulose-type materials for utilisation in high traffic areas. Prof. Rautenbach has licenced their patented innovations with Sanitouch SA for commercialisation of self-sterilising antimicrobial materials.

Prof. Johann Rohwer is a member of the international STRENDA (Standards for Reporting Enzymology Data) Commission. He currently serves as associate editor for *BMC Bioinformatics* and *Biochemical Society Transactions*. He serves on the editorial advisory board of *In silico Plants*, a relatively new online journal specialising in plant systems biology, and is statistics editor of the *Journal of Experimental Botany*. He also served as guest editor for a special issue of *Essays in Biochemistry*, focussing on computational biology, while co-editing a special issue of *Biosystems* on "50 Years of Metabolic Control Analysis". Prof. Rohwer has active collaborations with a number of groups, both nationally and internationally: with Dr Che Pillay (University of KwaZulu-Natal) on the modelling of cellular redoxin networks; with Prof Jonathan Gershenzon (Max Planck Institute for Chemical Ecology, Jena, Germany) on flux and control analysis of isoprene synthesis in plants; with Dr Brett Olivier (Free University, Amsterdam, Netherlands) on the Python Simulator for Cellular Systems software; and with Profs Jürgen Pleiss and Nicole Radde (University of Stuttgart, Germany), on developing workflows and computational tools for reproducible enzyme kinetics. Prof. Rohwer delivered an oral presentation at the 5th EnzymeML Workshop (held in Germany) on LabNexus, an open-source enzyme kinetics data automation web application. He co-authored a paper in *Nature Catalysis* on the STRENDA biocatalysis guidelines, which he helped develop as a STRENDA member.

Dr Naeem Sheik Abdul is a member of the Society of Toxicology. Dr Sheik Abdul actively collaborates with the group of Prof. Jeanine Marnewick (Applied Microbial and Health Biotechnology Institute, Cape Peninsula University of Technology) on microplastic toxicity and nutraceutical interventions. Other national collaborators include the group of Prof. Anil Chuturgoon (University of KwaZulu-Natal). On the international front, Dr Sheik Abdul collaborates with Prof. Melinda Kovacs (University of Kaposvar, Hungary) determining molecular mechanisms of mycotoxin toxicity.

Prof. Jacky Snoep serves on the editorial boards of *Molecular Systems Biology*, *IET Systems Biology*, *Frontiers in Systems Biology*, and *Metabolomics*. He is involved in the following collaborations: Prof. L-M Birkholtz (University of Pretoria); Prof. B Bakker (University of Groningen, Netherlands); Prof. C Goble (University of Manchester, UK); Prof. HV Westerhoff

and Dr Evelina Tutucci (Vrije Universiteit Amsterdam, Netherlands); Prof. Mattias Goksör and Dr Caroline Adiels (University of Gothenburg, Sweden); Prof. Dr Bettina Siebers (University of Duisburg-Essen, Germany); and Prof. Albena Lederer (Leibniz-Institut für Polymerforschung Dresden, Germany) who is the coordinator of the 3D4D2 project on drug administration dynamics for malaria treatment and blocking of transmission ("3D polymer matrix device for dual drug delivery and simultaneous treatment of acute malaria and malaria transmission"). Prof. Snoep gave oral presentations at the Nobel Symposium in Chemistry: Tuberculosis and Antibiotic Resistance – From Basic Drug Discovery to Clinic, STIAS, Stellenbosch; at the Institute for Community Medicine, University Medicine Greifswald, Germany; for the Pázmány Péter Catholic University, Budapest, Hungary; and at the Modelling the Context of African Health 2023 conference.

Prof. Marietjie Stander is a member of the Chromatography Society of South Africa and is a member of the Food Safety Forum of the Seafood Industry. She is a member of the South African Food Juice Association and OliveSA and was elected on the board of the South African Botanical Products Association. Prof. Stander has active collaborations within the Department of Biochemistry and is involved in the following collaborations: From Stellenbosch University, Profs NP Makunga, AJ de Villiers, and M Rautenbach; from the ARC, Profs D de Beer, and L Joubert; from the University of Johannesburg, Prof. BE van Wyk. A NEP grant was awarded to Profs Makunga and Stander for the first Cyclic Select IMS system in the Southern Hemisphere.

Prof. Karl Storbeck serves as an associate editor for the *Journal of Steroid Biochemistry and Molecular Biology* and on the editorial boards of *Steroids*, and *Molecular and Cellular Endocrinology*. Prof. Storbeck also serves as the treasurer of the Local Organising committee for the 27th meeting of the International Union of Biochemistry and Molecular Biology, which will be hosted in Cape Town in 2027. Prof. Storbeck has active collaborations with Prof. Donita Africander and Prof. Jacky Snoep within the Department of Biochemistry. Nationally Prof. Storbeck has collaborations with Prof. Julia Goedecke (South African Medical Research Council) on steroid hormones and diabetes risk in the South African population, and Dr Sven Parsons (University of Pretoria) on steroid hormone biosynthesis in South African Angora goats. His international collaborators on 11-oxygenated androgen research include Prof. Wiebke Arlt (UKRI MRC Laboratory of Medical Science), Prof. Michael O'Reilly (Royal College of Surgeons in Ireland), Prof. Tea Lanišnik Rižner (University of Ljubljana) and Prof. Wilbert Zwart (Netherlands Cancer Institute). Prof. Storbeck delivered invited talks on the role of 11-oxygenated androgens in health and disease at the XIXth International Adrenal Meeting in Boston, USA, the Translational Research on Endometriosis (TRENDO) online symposium and the Equalis (Swedish external quality assessment) endocrinology user meeting. He was also invited to attend the 8th International PacRim Breast and Prostate Cancer "think tank" in Darwin, Australia.

Prof. Erick Strauss currently leads the Grand Challenges African Drug Discovery Accelerator (GC ADDA) flagship project for the discovery on new, innovative antituberculosis treatments. This follows the joint award of US$7.2 million made by the Gates Foundation and the UK-based medical charity LifeArc in 2023 to support the GC ADDA network. Of this funding, US$2.2 million was earmarked to support a team that has as its specific focus the pursuit of new antituberculosis treatments. Until 2026, Prof Strauss will be leading this team of researchers from four institutions in South Africa and Kenya as they aim to apply the concept of targeted protein degradation (TPD) in the development of new agents that acts as growth inhibitors of the bacterium *Mycobacterium tuberculosis*. He has been serving on the editorial advisory board of the journal *ACS Infectious Diseases* since 2017, and the editorial advisory board of the ACS journal *Biochemistry* since 2022. He currently serves on the operational leadership team (OLT) of the GC ADDA network He has active collaborations with several groups both nationally and internationally. His interest in the use of structural biology for advancing drug discovery, and the establishment and expansion of the capacity to do such research in South Africa, has been supported through consortium grants from the UKRI (United Kingdom Research and Innovation).

Dr Dawie van Niekerk is involved in the following collaborations on malaria research: Prof. L-M Birkholtz (University of Pretoria/Stellenbosch), Prof. Jacky Snoep (SU) and collaborators, and Prof. Albena Lederer (Leibniz-Institut für Polymerforschung Dresden, Germany, and SU) as part of the 3D4D2 M-ERA.NET project. In addition, he collaborates on tools for computational modelling and FAIR research with Prof. C Goble (University of Manchester, UK); Priv.-Doz. Dr. Wolfgang Muller (HITS in Heidelberg, Germany), and Prof. Jacky Snoep (SU); and on glycolytic oscillations with Prof. Mattias Goksör and Dr Caroline Adiels (University of Gothenburg, Sweden), and Prof. Snoep (SU).

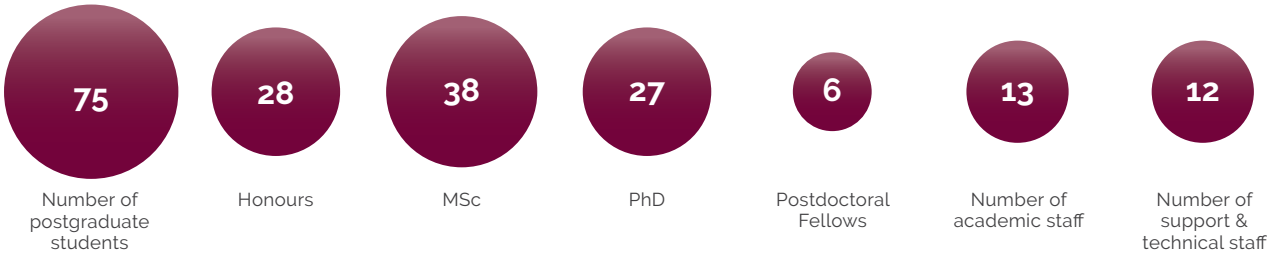
Dr Nicolette Verhoog works closely with Prof. Ann Louw, emeritus professor in the Department of Biochemistry, on the role of indigenous South African plants such as honeybush, rooibos and *Aloe ferox* on steroid receptor signalling, and with the Agricultural Research Centre (ARC) Infruitec-Nietvoorbij's Prof. E Joubert and Dr D de Beer. Other collaborations include Prof. Claude Libert (Ghent University, Belgium), Prof. Alexandra Kiemer (Saarland University, Germany), and Prof. Oliver Zierau (Technische Universität Dresden, Germany).

Dr Tawanda Zininga collaborates with Dr Prinesa Chellan (SU's Department of Chemistry and Polymer Science); Profs Marina Rautenbach and Erick Strauss (SU), and Prof. Karen Sliwa (Cape Heart Institute and Hatter Institute for Cardiovascular Research in Africa, University of Cape Town); with Prof. Addmore Shonhai (Department of Biochemistry, University of Venda); and with Prof. Don C Lamb (Ludwig Maximilian University of Munich, Germany), and Prof. Graham Chakafana (Hampton University, Virginia, USA). He has served as an editorial member of *BMC Molecular* and *Cell Biology* since 2021.

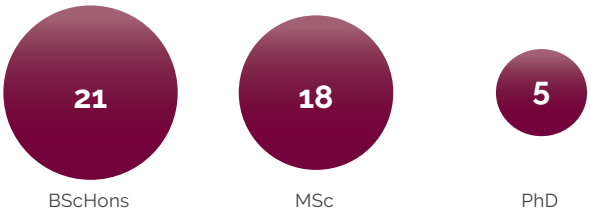
AWARDS TO STAFF AND STUDENTS

Sherwin Bezuidenhout, an MSc student from the group of Prof. Marina Rautenbach, received the best poster award at the 2024 SASBMB Conference in Polokwane. **Prof. Johann Rohwer** was elected as a member of the Academy of Science of South Africa. **Dr Tawanda Zininga** received the Early Career Researcher award.

ACADEMIC AFFAIRS



Number of graduates 2024



STAFF MATTERS

Mrs Welma Maart served at the department for 42 years, first as technical assistant, and later as administrative officer. She retired on 30 April 2024. **Prof. Lyn-Marié Birkholtz** was appointed as full professor on 1 July 2024. **Dr Tandeka Magcwebeba** was appointed as lab manager on 1 September 2024. **Ms Monica Yanta** was appointed as departmental secretary on 1 July 2024. With regard to promotions, **Prof. Karl Storbeck** was promoted to full professor and **Dr Tawanda Zininga** to senior lecturer from January 2025, while **Mrs Gertrude Gerstner** was promoted to departmental manager on 1 September 2024.

NRF-RATED RESEARCHERS	
Internationally acclaimed researchers	
Prof Jacky Snoep	Computational Systems Biology
Prof Lyn-Marié Birkholtz	Pharmaceutical biochemistry, functional genomics and infectious disease drug discovery
Established researchers	
Dr Marietjie Stander	Mass Spectrometry and Analytical Chemistry
Dr Karl Storbeck	Steroid Biosynthesis and Metabolism
Dr Dawie van Niekerk	Computational Systems Biology
Dr Tawanda Zininga	Cell stress biology, malarial and cardiovascular biomarker discovery

SOCIAL IMPACT

Prof. Karl Storbeck served as a convenor and judge at the Eskom Expo for young scientists.

FUNDING

Global
- Gates Foundation
- M-ERA.NET project: 3D4D2
- International Centre for Genetic Engineering and Biotechnology (ICGEB)

South Africa
- BIOPEP™ Peptide Fund
- Cancer Association of South Africa (CANSA)
- InnovUS Postdoctoral funding
- Medical Research Council (MRC)
- NRF Competitive Support for Unrated Researchers (CSUR)
- NRF Competitive Programme for Rated Researchers (CPRR)
- NRF Community of Practice in in Evaluating Malaria Control Interventions
- NRF SACEMA/SARCHI research chair in mechanistic modelling of health and epidemiology
- NRF Thuthuka
- South African Centre for Epidemiological Modelling and Analysis (SACEMA)
- South African Rooibos Council (SARC)
- South African Technology Innovation Agency (TIA)
- Stellenbosch University Subcommittee B
- Stellenbosch University Faculty of Science

Germany
- Beilstein Institut
- Alexander von Humboldt Foundation

United Kingdom
- LifeArc

United States of America
- National Institutes of Health (NIH)

European Union
- EU COST Action COZYME
- EU Horizon 2020

STAFF LIST

Academic staff
Professor
- Prof D Africander
- Prof L-M Birkholz
- Prof M Rautenbach
- Prof J Rohwer
- Prof J Snoep (SARChI)
- Prof K Storbeck
- Prof E Strauss (HoD)

Senior lecturer
- Dr M Beukes
- Dr D van Niekerk
- Dr N Verhoog
- Dr T Zininga

Lecturer
- Dr A Botes
- Dr M Sheik Abdul

Extraordinary appointments, research fellows and academic rank
Extraordinary professor
- Prof O Zierau

Extraordinary associate professor
- Prof M Stander

Extraordinary senior lecturer
- Dr M De Villiers

Research fellows
- Dr A Banda
- Dr A van Heerden
- Dr D Lind
- Dr L van der Westhuizen

Professional and support staff
Administrative
- G Gerstner
- M Yanta

Technical
- A Arends
- T Fischer
- Y Engelbrecht
- R Louw-du Toit
- R Louw
- T Magcwebeba
- S Sungay

Service
- K Botha
- R Brandt
- C Jansen

Postdoctoral fellows
- Dr A Banda
- Dr A van Heerden
- Dr D Lind
- Dr L van der Westhuizen

CONTACT DETAILS
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Fax: 021 808 5863
Email: yanta@sun.ac.za (secretary)

Department of Botany and Zoology

RESEARCH INTERESTS

- Biotic diversity and ecology of the Cape Region and its coastline
- Systematics and molecular ecology
- Evolutionary ecology
- Physiological ecology
- Marine biology
- Medicinal plant biology
- Global change biology
- Invasion biology
- Plant-microbe interactions

▲ The common padloper tortoise. Photo: Raqual Garcia

RESEARCH HIGHLIGHTS

Tortoises in invaded habitats: do thermal changes affect their performance?

With a changing climate it becomes crucial to understand how organisms experience temperature in their habitats. For terrestrial animals, air temperatures translate into a wide array of microclimates on the ground, depending on habitat features such as topography and vegetation. Ectothermic species take advantage of this thermal diversity to regulate their body temperature by moving around or taking shelter. But what happens to the thermal heterogeneity of habitats when non-native plants alter the vegetation structure of habitats or when the macroclimate becomes warmer, or when both threats act simultaneously? And how might animals respond?

At the CLIME Lab, Dr Raquel A. Garcia and Prof. Susana Clusella-Trullas have been investigating these questions for a small tortoise endemic to South Africa, the common padloper (*Homopus areolatus*). They tracked tortoises in their renosterveld habitats in the Western Cape to measure their activity patterns and temperature selection, studied how the species' locomotory performance changed with temperature in the laboratory, and characterised the thermal landscapes available to them in native areas both with and without non-native trees.

In the first outcome of this project, published in *Conservation Physiology*, they found mixed effects of non-native trees on the thermal suitability of habitats to tortoises, contingent on the season and the life-cycle stage of the tortoise. Invaded areas became cooler and less exposed to temperatures above the species' preferred temperature in summer, providing stronger buffering from climate warming. However, thermal heterogeneity decreased, hampering behavioural thermoregulation in sub-optimal conditions. At the same time, unsuitably low ground temperatures became more prevalent and underground incubation conditions became cooler. These results show the complexity in assessing the impacts of non-native plants and underscore the importance of using a suite of thermal change metrics. Our work illustrates the value of integrating thermal physiological and detailed microclimatic information for a more mechanistic understanding of conservation problems. – *Susana Clusella-Trullas*

Resolving the evolutionary history of two genera of lice, *Polyplax* and *Hoplopleura*

Prof. Conrad Matthee pursued his evolutionary genetic research on mammal parasites and spent two months of his sabbatical in the USA collaborating with world-class parasitologists, including Lance Durden and Dmitry Apanaskevich at Southern Georgia University and Jessica Light at Texas A&M University. The primary focus of this collaboration was to use multi-gene data to help resolve the evolutionary history and taxonomy of two genera of lice, *Polyplax* and *Hoplopleura*. These permanent, species-specific lice share a close evolutionary relationship with rodent hosts and have a nearly global distribution. The study not only identified at least four new, yet-to-be-described species but also revealed that the currently accepted taxonomic framework—based on morphological descriptions—is in need of revision. The genus names are likely not valid for all species within each genus. The evolutionary history of these lice was shaped by the evolution of their hosts, coupled with biogeographic factors. Additionally, ancestral hybridization likely occurred among some members of these genera in the distant past, particularly among lice species found on Southern African gerbils. A large-scale genomic study is currently underway to further investigate these findings.

▲ Profs Conrad Matthee and Sonja Matthee at the Smithsonian National Tick Collection in the USA. Photo: Dmitry Apanaskevich

As a result of this research, a manuscript titled "Host associations, host switching, geographic location, and potential reticulate evolution shape the systematics of sucking lice (Psocodea: Anoplura) belonging to the genera *Hoplopleura* and *Polyplax*" is currently under review in the *Zoological Journal of the Linnean Society*.

During his sabbatical, Conrad and his team also completed research on the microbiome diversity of two tick species, *Amblyomma hebraeum* and *Dermacentor rhinocerinus*, sampled from white rhinos in Kruger National Park, South Africa. This study was performed in close collaboration with staff at SANPARKS and executed by an MSc student, Jemma Mitchell. It is currently under review in *Microbial Ecology*. Additionally, papers were submitted on the ectoparasites and gastrointestinal helminths associated with Smith's bush squirrel (*Paraxerus cepapi*) in South Africa. This research also led to the submission of a paper titled "Phylogeography of a species-specific sucking louse, *Johnsonpthirus heliosciuri*, provides new insights on population connectivity among Smith's bush squirrels." This study was conducted by MSc student Inge Raubenheimer and is one of the few examples where parasite genetic structure has been used to infer non-detectable host dispersal patterns. Finally, a long-standing collaboration with Antonio Zurita from the University of Seville, Spain, resulted in a paper titled "A molecular phylogeny of Ceratophyllomorpha (Insecta: Siphonaptera): Geographical distribution, origins, and host associations" which has been provisionally accepted in the *Zoological Journal of the Linnean Society*. This study provides the most comprehensive molecular phylogeny of this flea assemblage to date, analysing 148 species. The evolution of these fleas was influenced by biogeographic history and a highly complex pattern of co-evolution with their hosts – *Conrad Matthee*.

First generation sequence data remain a cheap and effective method for evolutionary studies

Prof. Savel Daniels published 13 peer reviewed papers in 2024 that focused on the evolutionary biology of selected Arthropod groups. One of these manuscripts, co-authored with two postgraduate students, used both first and next generation DNA sequencing on the South African velvet worm *Peripatopsis sedgwicki* species complex, resulting in a peer-reviewed article published in *Molecular Phylogenetics and Evolution*. Phylogenetic analyses using the COI datasets retrieved four distinct, well-supported clades within the species complex. Divergence time estimates coupled with the geographic exclusivity of species and phylogeographic results suggest recent cladogenesis during the Plio/Pleistocene. The RADseq data results corroborate the four main clades observed using the COI data, however, applying additional filtering revealed additional diversity. The high overall congruence observed between the RADseq data and COI data suggest that first

generation sequence data remain a cheap and effective method for evolutionary studies, although RADseq does provide a far greater resolution of contemporary temporo-spatial patterns. These four genetically defined clades were morphologically investigated, with three novel species described – *Savel Daniels*

▲ Live velvet worms of a single specimen representative from each of the four clades in the *Peripatopsis sedgwicki* species complex. *Peripatopsis sedgwicki.* (A) dorsal and (B) ventral view of live specimen; *P. margaritarius*, (C) dorsal and (D) ventral view of live specimen; *P. collarium*, (E) dorsal and (F) ventral image of live specimen; finally, *P. orientalis* is represented by (G) dorsal and (F) ventral images. Scale bar = 10 mm. Photo: A. Barnes

The legacy of Dr Augusta Vera Duthie

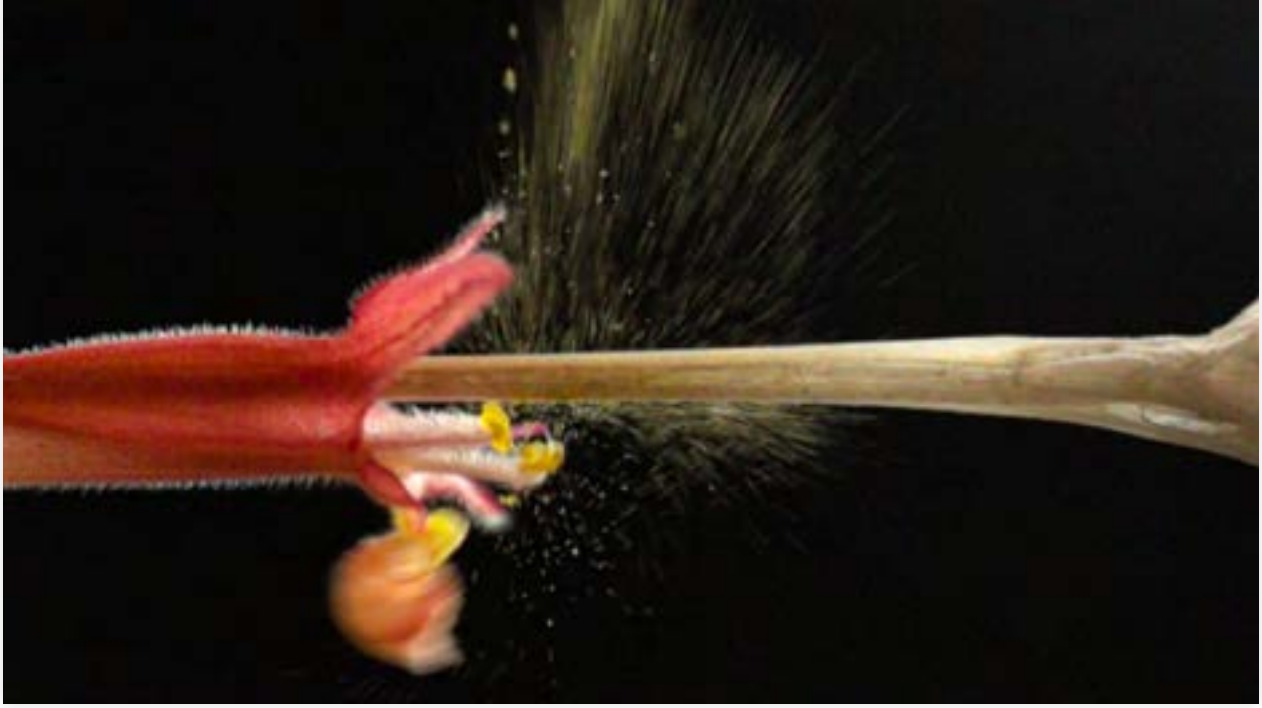
To commemorate the 50th Annual Conference of the South African Association of Botanists, the *South African Journal of Botany* will be publishing a special edition entitled "The status of botanical science in South Africa – a series of review and research papers" in 2025. Prof. Léanne Dreyer was invited to write a review paper for this special issue to review the life and legacy of Dr Augusta Vera Duthie, founder of the Department of Botany at Stellenbosch University. She teamed up with Mrs. Wiida Fourie-Basson (first author), science writer and media officer for SU's Faculty of Science, and Dr Paul Hills from SU's Institute for Plant Biotechnology, and together they embarked on a major exploration to accumulate all possible published, archived and documented traces of the life of this remarkable scientist. The review paper briefly sketches her early life, and then moves on to relive her tenacious, focussed and often challenging creation and gradual expansion of the Botany Department at Stellenbosch University. After humble beginnings, she secured a space for the Botany department in the (then) new Natural Science Building, initiated a botanical library, herbarium and botanical garden. Her considerable contributions to science are briefly summarized, particularly to our knowledge of the lowland flora of Stellenbosch. The paper concludes with a review of her extensive legacy, which today lives on in the form of the Stellenbosch University Herbarium, the Stellenbosch University Botanical Gardens, and the botanically invaluable Duthie Reserve in Stellenbosch – *Léanne Dreyer.*

▲ A selection of herbarium specimens collected by Dr A.V. Duthie in the Stellenbosch district. These, and many other specimens she collected, are still lodged in the Stellenbosch University Herbarium. Photo credit: Cayla Basson

Floral evolution from the "male perspective"

Unlike most animals, the majority of plants are hermaphrodites, meaning that they often have male and female sex organs within the same flower. This complicates the calculation of fitness in plants, the currency through which natural selection and evolution takes place. Fitness in plants is not just calculated by the numbers of seeds produced by the female sex organs but also includes the addition of the number of seeds sired on other plants – the male contribution to fitness. The male contribution to plant fitness has been notoriously difficult to calculate and consequently most of what we know about floral evolution has been gained through the lens of female fitness (seed production).

Using fluorescent nanocrystals called quantum dots, Prof. Bruce Anderson's lab has developed a technique to mark and follow the fates of pollen grains, allowing his team to quantify aspects of male fitness in plants and gain insights into floral evolution from a male perspective. Their most recent work, published in *American Naturalist* (2024) and *Functional Ecology* (2025), has involved collaborations with

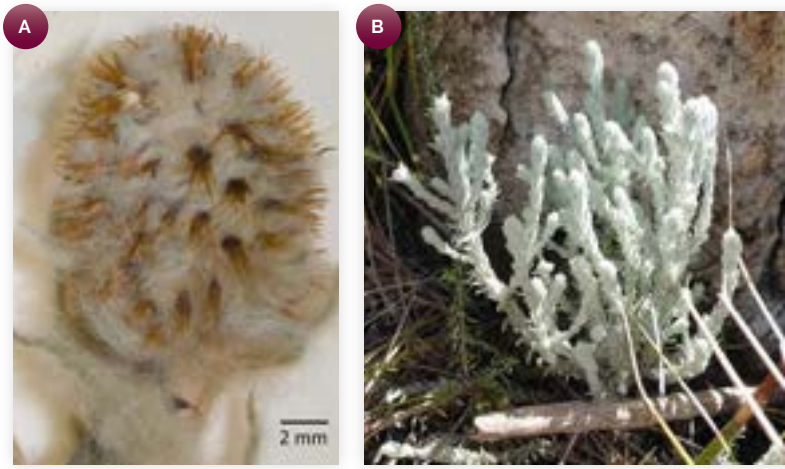


▲ Pollen is fired at the bills of hummingbirds and displaces the pollen from other *Hypenia* flowers. Photo: Bruce Anderson and Vini Brito

researchers from several Brazilian institutions (e.g., the University of Uberlandia) and demonstrates that plants have evolved complex sexual strategies to monopolize the limited space available to place their pollen on pollinators. For example, their work in *American Naturalist*, which was featured by multiple popular news agencies, demonstrates that some flowers use their pollen as projectiles, catapulting them at high speeds to knock off and displace the pollen of other flowers from the bodies of their pollinators. This allows them a "clean space" to deposit their own pollen and a higher probability that their own pollen will successfully fertilise the ovules of the next flower visited. The research changes the way we think about flowers – making them active participants in their own "mating games," and finally explains the evolutionary advantage of several floral structures – *Bruce Anderson*

Describing a new species within the daisy family

Dr Zaynab Shaik and her collaborators formally described a new species, *Stoebe kogelbergensis*, from within the Asteraceae lineage, from the Kogelberg Nature Reserve. This is a range-restricted endemic found at elevations between 800 and 1100m. *S. kogelbergensis* is morphologically distinct from its close relative, *S. incana*, with shorter flower clusters and longer, flat leaves densely covered in hairs. This new species description was published in the *South African Journal of Botany* – *Zaynab Shaik.*



▲ *Stoebe kogelbergensis*, a new species from the Kogelberg Nature Reserve. A - single-flowered head nestled in a thick, white, wool-like covering. B – non-flowering plant. Photo: Z. Shaik

RESEARCH ACTIVITIES

The **Department of Botany and Zoology** hosted Profs Neville Pillay (Wits), Armada Bastos (UP) & Brad Ripley (Rhodes), the reviewing panel for the departmental self-evaluation.

Prof. Susana Clusella-Trullas was invited to join a collaborative project examining the thermal sensitivity and colour variation of an insect model (the moth *Manduca sexta*) in the Chiricahua mountains. She attended the Gordon Research Conference with the theme "Unifying a predictive ecology of the Anthropocene" and presented the results of a recent study entitled "A novel approach to quantify thermoregulatory filtering across species and habitats".

Prof. Allan Ellis visited Melbourne, Australia to work with research collaborators there, and presented public talks at both Royal Melbourne Institute of Technology (RMIT) and Monash Universities. He also presented a talk at the 20th

International Botanical Congress in Madrid, Spain.

Prof. Nox Makunga attended the eminent International Botany Conference (IBC) in Madrid in 2024. She gave a public plenary lecture, upon invitation, titled "Delving into South African medicinal plant treasures". **Prof. Makunga** and **Dr Itumeleng Moroenyane** were also engaged with Black Botanist Week events

Prof. Conrad Matthee visited the Smithsonian National Tick Collection at Georgia Southern University and presented an invited seminar at Texas A&M University. He serves on the editorial boards of *Molecular Phylogenetics and Evolution*, *Koedoe*, and the *African Journal of Marine Science*.

Dr Itumeleng Moroenyane organised the inaugural Plant Day at SU. He served on the editorial boards of the *ISME Communications Journal* and *Phytobiomes Journal* and delivered a keynote address at the African Microbiome Conference.

Dr Nasreen Peer hosted the Africa-Japan CORE eDNA Bioinformatics workshop at SU. This four-day workshop brought together collaborators and postgraduate students from South Africa, Japan, Malaysia, Kenya and Senegal to offer students bioinformatics training from global experts. Nasreen attended the two-week Confusing Crustaceans Peracarid Taxonomy workshop hosted by the Smithsonian Tropical Research Institute on Bocas Del Toro, Panama, as well as the International Marine Conservation Congress held in Cape Town.

Prof. Carol Simon was invited to join a collaborative project titled "MARine molecular tools LINking education and research in a trans-Atlantic partnership" (MARLIN), spear-headed by Dr Natalya Budeava from the Department of Natural History, University of Bergen, Norway. She is on the editorial boards of *African Zoology* and *ZooTaxa*, and special editor for the *Proceedings for the International Polychaete Conference* (IPC14).

Prof. Sophie von der Heyden was selected to represent SU at the South African-Sweden University Forum (SASUF) and was a keynote speaker at the Fisheries Society of the British Isles (FSBI) annual conference held in Bilbao, Spain. She serves on the editorial boards of *Conservation Biology*, *npjBiodiversity*, and is Associate Editor for Special Issues for *Aquatic Conservation and Molecular Ecology Resources*.

Prof. Theresa Wossler is the Editor-in-Chief of *African Zoology*.

Prof. Léanne Dreyer was invited to co-author a review on the life and legacy of Dr Augusta Vera Duthie, founder of the Department of Botany at Stellenbosch University, in a paper for the *South African Journal of Botany*.

AWARDS TO STAFF AND STUDENTS

Prof. Savel Daniels received the Stellenbosch University's Established Researcher Award

Tallulah Rose Glasby reached the South African finals of FameLab 2024. She was also recognised as the Best overall presenter at the SANBI Student Research Day. She was awarded the "Best Poster Presentation" at the Fynbos Forum and received the Zoological Society of South Africa (ZSSA) best Honours student at Stellenbosch University in her discipline.

Izabella le Roux received the Zoological Society of South Africa (ZSSA) best third-year student at Stellenbosch University in her discipline.

Kristina Loosen was awarded the Best Flash Talk at the Two Oceans Aquarium Foundation Student Presentation Day.

Tebogo Masetlana won best poster at the African Microbiome Symposium

Dr Itumeleng Moroenyane received the Rehana Malgas-Enus Award at Stellenbosch University.

Andrew Ndhlovu and **Rew Searle** received the best poster prize (from ~1000 judged) at the International Society for Microbial Ecology.

Ria Olivier and her team received the SU Social Impact Award for the work of the Antarctic Legacy South Africa (ALSA) project

Dr Nasreen Peer was selected for the first intake of the SUNRISE (SU Research & Innovation Strategic Excellence) programme.

Perryn Richardson and **Tania Pogue** received first and second place PhD awards for best presentations at the School for Climate Studies Annual Research Meeting. **Bridget O'Connor** received third place for the MSc award for best presentations at the same meeting.

Prof. Dave Richardson was listed in the first position by Research.com in their list of "Top Ecology and Evolution Scientists in South Africa" (and in the top 20-30 globally) based on publications and citations.

Erin Ross-Marsh received the Runners-up (1000+ presenters) award for best student presentation from Africa at the 25th Biennial Conference on the Biology of Marine Mammals.

Best student research talks at the 2024 Annual Research meeting of the Department of Botany and Zoology were awarded to **Perryn Richardson** (PhD), **Aidan Bossert** (MSc), and **Anna Roux** (Honours).

ACADEMIC AFFAIRS

The BSc Biodiversity and Ecology has programme has undergone a renewal process with the final restructured BSc Biodiversity and Ecology programme implemented in 2024. The programme renewal included broadening the student offering. The restructured programme consists of three focal areas all leading to postgraduate degrees in Botany or Zoology:

- Climate Change Ecology
- Plant and Animal Biodiversity
- Plants and Microbes

We are home to the School for Climate Studies, and the Centre of Invasion Biology. These entities respond to existing and emerging issues in the management of invasive species, climate change impacts, adaptation and mitigation responses, thus supporting social resilience of the impacts of global change. The Department of Botany and Zoology continues to support the School for Climate Studies, which aims to create a transdisciplinary capacity in Research and Teaching & Learning.

Dr Itumeleng Moroenyane contributed to international education through membership of the International Working Group on Plant Biology Education and by participating in the drafting of a manifesto on plant biology teaching and assessment.

SOCIAL IMPACT

LeaTHOPS – Learning, Teaching and Opening Science

LeaTHOPS works in collaboration with the other social impact initiatives of the Department, such as Iimbovane, but is centered on curriculum material and practical class demonstrations, so that teaching of a subject does not fall to the teacher alone. This is especially important in schools that are understaffed, and teachers are overworked. Indirectly, this initiative also acts as a marketing strategy for the Department aiding in the recruitment of talented youth from diverse socioeconomic groups to consider our environment for their tertiary education.

Prof. Nox Makunga and PhD student **Mr Frikkie Becker** visited high schools in the townships surrounding Stellenbosch to assess the educational needs and teaching challenges that educators face in the teaching of Life Sciences. They hope to bridge these gaps by leveraging SU's expertise and resources to create a scalable model for STEM outreach that empowers both learners and educators while addressing systemic inequities. Teachers reported challenges in integrating practical science activities into the curriculum due to resource constraints and lack of training. Biology teachers at Kayamandi and Lückhoff High Schools indicated a need for equipped laboratory facilities. To address some of these needs, portable microscopes were assembled by learners during Plant Day celebrations, organised by Dr Itumeleng Moroenyane. Partnerships for school talks were given by several postgraduate students from the Department of Botany and Zoology and several visits to the SU Botanical Gardens that also included different postgraduate students as tour guides were undertaken by learners from these schools. The LeaTHOPS programme continues to promote the appreciation of Natural Sciences as a means to bridge gaps in the teaching of biology at school level and to inspire learners to consider botanical and zoological sciences as an option of choice when they enter into tertiary education – *Nox Makunga*.

Plant Day

The fascinating world of plants was under the global spotlight when plant lovers from all over the world celebrated the seventh International Fascination of Plants Day on Saturday 18 May 2024. The Fascination of Plants Day is hosted annually under the umbrella of the European Plant Science Organisation (EPSO) and the Global Plant Council. **Dr Itumeleng Moroenyane** (national coordinator for events in South Africa), organised the first participation of South Africa in this global event. This event acknowledged the significant contributions that South African plants have made to our cultural identity and traditional knowledge systems. At SU's Department of Botany and Zoology, Dr Moroenyane organised a programme for learners from local schools.

▲ Active learning for Lückhoff Grade 11 learners enrolled in Life Sciences.

▲ Plant Day activities in the Stellenbosch Botanical Garden

The Plant Day Celebration at Stellenbosch University represented a significant milestone in advancing plant science education and fostering community engagement. The practical, hands-on learning experiences imparted invaluable insights and practical skills to the participants. The event highlighted our core commitment to fostering diversity in STEM, with a strong emphasis on inclusivity and gender equity in scientific education – *Itumeleng Moroenyane*.

STAFF MATTERS

Prof. Mike Cherry retired, having been in the Department of Botany and Zoology for approximately 30 years.
Prof. Anton Pauw resigned to take up a position at the University of Cape Town.

COLLABORATION

Australia
- Macquarie University
- Monash University
- RMIT University

Austria
- University of Vienna

Belgium
- Royal Museum Central Africa
- Research Institute for Nature and Forest (INBO)

Brazil
- Federal University of Rio de Janeiro
- University of Uberlandia

Canada
- University of British Columbia
- University of Toronto

Chile
- Universidad de Concepción

China
- The University of Hong Kong

Czechia
- The Czech Academy of Sciences

France
- CNRS
- Sorbonne University

Italy
- University of Sassari

Japan
- University of the Ryukus
- Natural History Museum

Kenya
- Kenya Marine and Fisheries Research Institute

Norway
- University of Bergen

South Africa
- Agricultural Research Council
- Kwazulu-Natal Museum
- Nelson Mandela University
- South African National Biodiversity Institute (SANBI)
- SANPARKS
- University of Cape Town
- University of the Free State
- University of KwaZulu-Natal
- University of Pretoria
- University of Venda

Spain
- University of Seville

Sweden
- University of Gothenburg

Switzerland
- University of Fribourg

The Netherlands
- Waginingen University

United States of America
- Arizona State University
- Ohio Wesleyan University
- Purdue University
- South Georgia University
- Texas A&M University

United Kingdom/Ireland
- Cambridge University
- Global Species Programme, Cambridge
- Oxford University

FUNDING

- Africa-Japan Core NRF grant
- Australian Research Council
- Belgium Directorate-general Development Cooperation
- Council for Scientific and Industrial Research (CSIR)
- CropLife South Africa for outreach activities
- Department of Science and Innovation
- Marine and Coastal Research
- National Research Foundation
- New Phytologist Foundation for outreach activities
- Nilsson-Ehle Endowments
- South African National Biodiversity Institute (SANBI)
- Syngenta SA
- University of Pretoria
- University of the Western Cape
- University of Toronto

NRF-RATED RESEARCHERS	
Leading international researchers	
Prof GF Midgley	Ecology and ecophysiology
Prof DM Richardson	Biological invasions and conservation biogeography
Internationally acclaimed researchers	
Prof BA Anderson	Plant-animal interactions
Prof S Clusella-Trullas	Thermal adaptation of ectotherms and implications for climate change
Prof S Daniels	Molecular systematics, phylogeography and conservation of invertebrates
Prof AG Ellis	Evolutionary ecology of plants and insects
Prof CA Matthee	Molecular systematics and phylogeography
Prof CA Pauw	Evolutionary ecology of plants and their pollinators
Emeritus Prof D Baird	Marine ecology
Emeritus Prof B van Wilgen	Biological invasions and conservation
Extraordinary Prof J Wilson	Biological invasions and conservation

NRF-RATED RESEARCHERS	
Established researchers	
Prof LL Dreyer	Evolution of Cape Flora
Prof NP Makunga	Medicinal plant biotechnology
Prof TB Robinson-Smythe	Drivers, patterns and impacts of marine invasions
Prof CA Simon	Marine invertebrate; reproduction and worm taxonomy
Dr S Kumschick (SCS)	Invasion biology
Prof J Measey (SCS)	Conservation and ecology of invasive species
Extraordinary Prof L Foxcroft	Invasion ecology

STAFF LIST

Academic staff

Professor
- Prof B Anderson
- Prof M Cherry
- Prof S Clusella-Trullas
- Prof S Daniels
- Prof L Dreyer
- Prof A Ellis
- Prof N Makunga
- Prof C Matthee
- Prof G Midgley
- Prof A Pauw
- Prof D Richardson
- Prof S von der Heyden

Associate professor
- Prof C Simon
- Prof T Wossler (HoD)

Senior lecturer
- Dr M Mouton
- Dr I Maroenyana
- Dr N Peer
- Dr V Rambau

Lecturer
- Dr Z Shaik

Extraordinary appointments, research fellows and academic rank

Extraordinary professor
- Prof A Goossens
- Prof M Jennions
- Prof J Measey

Extraordinary associate professor
- Prof L Foxcroft
- Prof JJ le Roux

Extraordinary senior lecturer
- Dr T Gridley
- Dr I Maroenyana
- Dr N Peer

Extraordinary lecturer
- Dr S Andreotti
- Dr S Mynhardt
- Dr M Moir (academic rank)

Research fellow
- Dr S Elwin
- Dr J Landschoff
- Dr J Leaver
- Dr N Miranda
- Dr C Tilbury
- Dr CP von Maltitz
- Dr K Wimberger

Professional and support staff

Administrative
- J Basson
- C Engelbrecht
- C Nel
- M Sauerman

Technical
- F Gordon
- J Hutton
- S Johnson
- M Mathese
- N Solomons
- J Williams

Service
- R Robertson
- B van der Reede
- D Willemse
- H Witbooi

Postdoctoral fellows
- Dr H Beckett
- Dr L Djeutchouang
- Dr R Mofokeng
- Dr J Muller
- Dr A Ndhlovu
- Dr L Potgieter
- Dr A Watson

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Department of Chemistry and Polymer Science

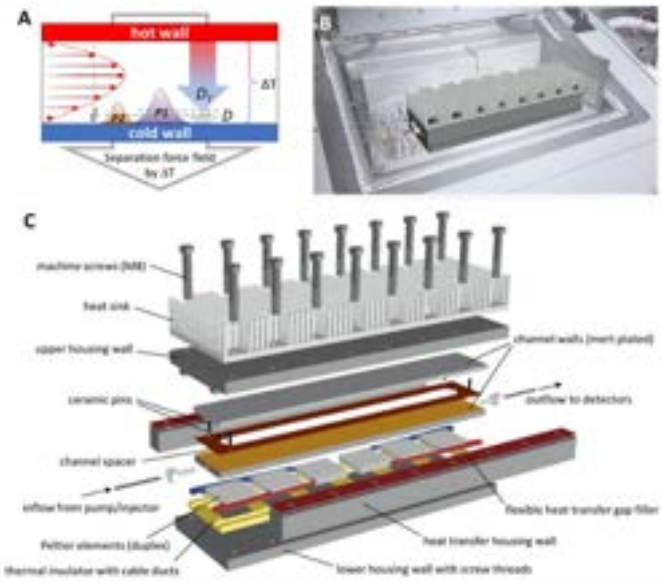
RESEARCH INTERESTS

- Organic and medicinal chemistry
- Inorganic and organometallic chemistry
- Analytical chemistry
- Polymer science
- Materials technology
- Physical and computational chemistry
- Supramolecular and materials chemistry
- Chemistry education
- Nanotechnology

RESEARCH HIGHLIGHTS

Novel method for polyolefin analysis

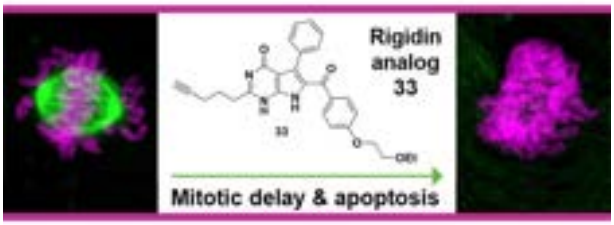
A key collaboration between IPF Dresden and Stellenbosch University, funded by DPI and led by Prof. Albena Lederer, has led to a novel method for polyolefin analysis. The HT-ThFFF prototype represents a breakthrough, enabling precise characterization of complex polyolefin (PO) materials, addressing longstanding industrial challenges. This innovation enhances polyolefin recyclability strategies, supporting a circular plastics economy. The research highlights SU's unique expertise and advanced equipment for PO analysis, backed by Sasol. Further recognition comes from a recent publication in *Analytical Chemistry* and a German patent (2024053014311500DE).



Principle of High Temperature Thermal Field Flow Fractionation (HT-ThFFF). A) The ThFFF separation principle. B) Simulation of a ThFFF-channel in a HT oven. C) Composition of the HT-ThFFF in exploded view. *Graphic: Martin Geisler*

Paving the way for rigidin-inspired anti-cancer therapies

A collaboration between the Prof. Willem van Otterlo's research group and multiple local and international partners resulted in a paper being published in the American Chemical Society's Journal of Medicinal Chemistry. This paper, based on the PhD research of Aletta van der Westhuizen, describes how synthetic modifications on the natural product rigidin-inspired 7-deazahypoxanthine gave antiproliferative molecules with improved properties, potentially paving the way for further development of these molecules into anti-cancer therapies.



▲ Synthetic modifications on the natural product rigidin-inspired 7-deazahypoxanthine gave antiproliferative molecules with improved properties. *Credit:Alette van der Westhuizen*

Working at the interface of chemistry and biology

Dr Katherine de Villiers joined the research laboratory of Prof. Iqbal Hamza at the Center for Blood Oxygen Transport and Haemostasis at the University of Maryland School of Medicine in July 2024 for a year. This is as part of the Simons Foundation›s coveted Pivot Fellowship awarded to De Villiers early in 2024. Prof. Hamza's group specialises in molecular genetics, cell biology and biochemistry to better understand heme transport and trafficking in eukaryotes, with implications for human health and disease. In 2019, the Hamza lab published a seminal paper in Elife, where they provided unequivocal evidence that knockout mice devoid of a key heme transporter (HRG1) are heme tolerant as a consequence of hemozoin formation. Previously, this crystalline material was only thought to occur in blood-feeding organisms such as *Plasmodium falciparum*, which do not have heme oxygenase machinery that mammals do. During the fellowship year, De Villiers hopes to master the necessary lab skills and expertise in cellular biology and genetics to enable her to work at the interface of chemistry and biology

Founded in 1994, the mission of the Simons Foundation is to advance the frontiers of research in mathematics and the basic sciences. The Pivot Fellowships were established in 2022 to support researchers who have a strong track record of success and achievement in their current field, and a deep interest, curiosity and drive to make contributions to a new discipline.

Nanosene raking in the awards

Dr Gestél Kuyler proudly represented Nanosene at the AIT Swiss-Africa Spring Conference in Lagos, Nigeria as one of the top 20 African Startups selected to attend the pitching event). They were announced the overall winner of the AIT Swiss-Africa event, along with receiving the Public Vote award. This outcome meant that Nanosene (Pty) Ltd was one of the 12 finalists to attend the Swiss Residency Week in Switzerland this May.

Following a highly competitive pitching competition, Nanosene was selected as one of eight SA startups to join the French Embassy to South Africa's delegation at VivaTech in Paris. In June 2024 Nanosene was selected as one of only two South African start-ups across all categories as finalists in the Science Startups (#FallingWallsVenture) category of the #GlobalCall24, standing out amongst a highly competitive pool of over 1,100 nominations from 300+ institutions. Other achievements are:

- In November 2024, Nanosene was selected as one of only 100 prototypes from 27 000+ international submissions and 100 countries to attend and exhibit at Dubai Future Solution – Prototypes for Humanity. Dr Gestél Kuyler, Elaine Barnard and Prof. Bert Klumperman attended the exhibition.
- Nanosene was a winner of the University Spin-Off of the Year Award, presented by the Cape Chamber of Commerce and Industry and the Cape Higher Education Consortium (CHEC), hosted by MTN.
- At the YOPE funding opportunity on 4 November 2024, Nanosene was successful in securing a €25,000 grant.

▲ Nanosene's Dr Elaine Barnard and Dr Gestél Kuyler (second and third from the left) and Prof. Bert Klumperman (second from the right) with the University Spin-Off of the Year Award.

SACI Fellowships

The South African Chemical Institute (SACI) honoured Profs Delia Haynes, Bert Klumperman and Willem van Otterlo by awarding them the prestigious SACI Fellowships. SACI recognizes the contribution of its members to the field of chemistry by way of the prestigious appointment of selected members to the Fellows membership category. The nominee must be a current full SACI member in good standing with the Institute and have been a member of the Institute for at least ten years. In addition, candidates must have demonstrated excellence and leadership in the areas of both: (a) the profession, education and/or management of chemistry, and (b) volunteer service to the chemical community.

Record number of PhD degrees in chemistry

Contributing significantly to the Faculty of Science's 47 PhD 2024 graduates, the Department of Chemistry proudly awarded 14 doctoral degrees, with two conferred in December 2024 and 12 in March 2025.

▲ PhD graduates in Chemistry and their supervisors at the March 2025 graduation ceremony. *Image: Stefan Els*

RESEARCH ACTIVITIES

Prof. Gareth Arnott undertook a sabbatical visit with Tom Lectka at Johns Hopkins (Baltimore, USA), partly funded by an Oppenheimer Memorial Trust fellowship.

Prof. Len Barbour published several papers, as first author in *Nature Materials*, and as co-author in the *Journal of the American Chemical Society*. He presented at the following conferences: the 17th International Seminar on Inclusion Compounds and Porous Materials, Adam Mickiewicz University, Poland; and at the third International Conference on Noncovalent Interactions (ICNI-III) in Belgrade, Serbia, 17-21 June 2024. He served as associate editor of *Crystal Growth and Design*, published by the American Chemical Society (ACS). He furthermore serves on the editorial advisory boards of *CrystEngComm* (an RSC journal) and *ACS Sustainable Chemistry and Engineering,* as well as *Chemistry of Materials* (an ACS journal).

Dr Ebrahiem Botha published a paper in *Results Chem*. He is a member of the South African Chemical Institute (SACI) and coordinates the SU Chemistry Outreach Initiative (SUNCOI) with **Jabu Lukhele**.

Dr Prinessa Chellan published papers in the *Journal of Inorganic Biochemistry* and the *New Journal of Chemistry*. She did a "Flash presentation" with Leandre van der Merwe, Dr Catherine Kaschula and Dr Prinessa Chellan titled "Targeting breast cancer with novel organometallic complexes" at the 2024 Inorganic and Carman Conference in the Central Drakensberg, KwaZulu-Natal, South Africa, June 2024. She collaborates with Dr Tawanda Zininga (Department of Biochemistry) on the screening of novel compounds as inhibitors of heat shock proteins in malaria; with Dr Catherine Kaschula (Department of Chemistry and Polymer Science) on the ROS abilities of novel gold complexes on different cancers; with Dr Siyabonga Ngubane (UCT) on the redox profiles of compounds in biological media; and with Dr Vuyo Mavumengwana (South African Medical Research Council) on transcriptomics of novel gold complexes. She serves on the editorial and advisory board of *ChemBioChem's* Early Career Editorial Advisory Board (2021-current). She is reviewing editor for *Frontiers in Inorganic Chemistry*

(2020-current) and is a full member of the Royal Society of Chemistry (MSRC) and the South African Chemical Institute.

Prof. André de Villiers published papers in *Journal of Chromatography Open*, *Analytical Chemistry*, and *Food Research International*. He delivered an invited keynote lecture titled "Detailed investigation of cannabis phenolics using 1- and 2-dimensional liquid chromatography hyphenated to ion mobility spectrometry and high resolution MS" at the 18th International Symposium on Hyphenated Techniques in Chromatography (HTC-18), 28-31 May 2024, Leven, Belgium. He gave an invited lecture titled "Fundamental aspects, strategies for method development and improved sample characterization" at the third Nordic Symposium on Multidimensional Chromatography, 13 November 2024, Copenhagen, Denmark; and another one titled "Automated method development tools to explore the limits of online comprehensive 2D-LC combining HILIC and RP-LC" as part of the PhD course on multidimensional chromatography, 14-15 November 2024, Copenhagen, Denmark. During 2024 Prof. De Villiers hosted Prof. Stefan Louw (University of Namibia), Prof. Dwight Stoll (Gustavus Adolphus College, US), Prof. Chiara Cordero (University of Turin, Italy) and Prof. Frederic Lynen (University of Gent, Belgium). He serves on several editorial and advisory boards: as chair of the Western Cape division of the Chromatographic Society of South Africa (ChromSA); as member of the organising committee of Analitika 2024, held 10-14 March at the Champagne sports resort, Central Drakensberg; as member of the editorial advisory boards of Analytical Chemistry, Trends in Analytical Chemistry, Chromatographia and LCGC.

Dr Katherine de Villiers attended the Gordon Research Conference's Chemistry and Biology of Tetrapyrroles at Salve Regina University, Newport, Rhode Island, USA, 14-19 July 2024. She began a year-long sabbatical in July 2024 at the University of Maryland Baltimore, School of Medicine. As a Simons Foundation Pivot Fellowship, she is working alongside renowned heme biochemist Prof. Iqbal Hamza to investigate the formation of mammalian hemozoin and its implication as a mechanism of heme tolerance. She serves on several editorial and advisory boards: as member of the Organisation for Women in Science for the Developing World as well as the Women in Malaria network.

Prof. Catharine Esterhuysen published in several journals, including the *Zeitschrift* für *Naturforschung, Journal of Crystal Growth, Macromolecular Chemistry and Physics*. She was an invited speaker at the sixth International Symposium on Halogen Bonding (ISXB-6), Dubrovnik, Croatia, 20-25 October 2024, with a talk titled "Probing the continuum of covalent contributions to halogen vs hydrogen bonds", as well as at the third International Conference on Noncovalent Interactions (ICNI-III), Belgrade, Serbia, 17-21 June 2024, with a talk titled "The role of noncovalent interactions in the behaviour of framework materials". She gave a keynote address titled "Probing the continuum of covalent contributions to noncovalent interactions" at the fourth European Symposium on Chemical Bonding (CBOND2024), Amsterdam, Netherlands, 24-27 September 2024; and another keynote titled "The role of noncovalent interactions in the properties of porous compounds" at the 19th Inorganic and Carman Conference, Drakensberg, 2-6 November 2024. She was also the plenary speaker at the 30th Croatian-Slovenian Crystallographic Meeting, Veli Losinj, Croatia, 12-16 June 2024, with a talk titled "The role of intermolecular interactions in chemical processes". During 2024 Prof. Esterhuysen visited Prof. Dr. Jan Weigand at the Technical University Dresden, Germany, and she continued her collaboration with Prof. Chuanyi Wang from Shaanxi University of Science and Technology, China. She serves on editorial and advisory boards: as associate editor of the *New Journal of Chemistry*; she is a member of the International Union of Crystallography's Commission on Crystallographic Teaching, of the International Advisory Boards of the *Canadian Journal of Chemistry* and the International Symposium on Halogen Bonding. She is a Fellow of the Royal Society of Chemistry, the Royal Society of South Africa, and the South African Chemical Institute.

Dr Adine Gericke published an article titled "Thermal and Moisture Management in the Microclimate of Socks for Diabetic Foot Care: The Role of Mohair-Wool Content" in the journal *Fibers*. She collaborates with researchers in the Department of Textile Engineering at the Technical University of Liberec in the Czech-Republic as well as the local SA wool industry in finding sustainable solutions for the future, focusing on the development of sustainable wool and mohair products with enhanced functional properties.

Prof. Delia Haynes published papers in several journals, including *Inorganic Chemistry, Crystal Growth & Design*, *CrystEngComm*, and co-authored the editorial foreword for the African Crystallographic Association (AfCA) collection in the journal *Acta Cryst.*, celebrating work published by African researchers in International Union of Crystallography (IUCr) journals. She was a member of the Program Committee for the fourth Pan-African Conference on Crystallography (PCCr4), Algeria, October 2025; and co-chair of microsymposium for the 34th European Crystallographic Meeting (ECM34), Italy, August 2024. She delivered the keynote address at Crystal35, Fremantle Australia, October 2024, titled "Crystal engineering with multicomponent crystals", and invited talks at the Gordon Research Conference, Crystal Engineering, USA, June 2024, titled "Salt vs. Co-crystal: experimental conditions, selectivity and crystal quality"; at the third International Conference on Noncovalent Interactions (ICNI-3), Belgrade, Serbia, June 2024, with a talk titled "Pancake bonding in dithiadiazolyl radicals"; and at the first workshop on benchmarking solid state properties "From Molecules to Materials", in Warsaw, Poland, September 2024, with a talk titled "Multicomponent crystals: mechanochemistry and sublimation". She presented a talk titled "Multi-component crystals from the gas phase" at the 34th European Crystallographic Meeting (ECM34), Padova, Italy, August 2024, and co-chaired a micro symposium on noncovalent interactions in structure design. Prof. Haynes visited Poznan University in Poland in January 2024, and the University of Adelaide, Australia, in October 2024. She collaborated with Drs Maxime Deutsch and Nicolas

Claiser at the University of Lorraine, Nancy, France, and visited Nancy in September 2024. She serves on several editorial and advisory boards: as first president of the African Crystallographic Association; as member of the SACI Western Cape Committee (2014-present); as member of the IUCr Meeting Support Committee; as member of the Advisory Board of the RSC journals *CrystEngComm* and *New Journal of Chemistry*; as guest editor for a special issue of *CrystEngComm* on Crystal Engineering in Africa, an IUCr journals special collection (AfCA collection), and special issue of *Crystal Growth & Design* (Legacy and Future Impact of the Cambridge Structural Database: A Tribute to Dr. Olga Kennard). Prof. Haynes is a Fellow of the Royal Society of Chemistry, the Royal Society of South Africa, and the South African Chemical Institute.

Dr Catherine Kaschula published several papers in the journals *ChemMedChem*, the *Journal of Medicinal Chemistry*, and the *New Journal of Chemistry*. She gave an oral presentation at the 30th International Symposium on the Organic Chemistry of Sulfur (ISOCS -30), Florence, Italy, 28 July – 2 August 2024. During 22 November 2024 she visited the Department of Chemistry, Canterbury University, New Zealand, and was invited to deliver a lecture. She is a member of SACE Western Cape committee, and on World Cancer Day she did a 15-minute interview on Channel 405, Newzroom SABC3 television.

Prof. Bert Klumperman published several papers in the journals *Macromolecular Materials and Engineering*, the *European Polymer Journal*, *Macromolecules*, *Polymer Chemistry*, *Archives of Biochemistry and Biophysics*, and in *Macromolecular Chemistry and Physics*. He gave an invited lecture at the ACS National Meeting in Denver, USA, and attended the *Macromolecules* Associate Editors meeting. During 2024 Prof. Klumperman visit the University of Birmingham and pharma companies in connection to the Wellcome Trust project in collaboration with Prof. TR Dafforn (University of Birmingham); and Coventry University in relation to a dual PhD program with Prof. M Wheatley. He also visited NEXT Life Sciences, Flagstaff, AZ, USA, for the testing of hydrogels as part of the MSc work of Ms KM Raoult. He serves on several editorial and advisory boards: as associate editor of *Macromolecules* (ACS); as member of the Editorial Board of the *Journal of Macromolecular Science, Part A: Pure and Applied Chemistry*; as member of the International Scientific Advisory Group of the Aston Institute for Membrane Excellence (AIME) at Aston University (UK). He was also the main organiser of the 11th ACS Symposium/Workshop on "Reversible Deactivation Radical Polymerization" (CRP2025).

Prof. Albena Lederer published seven papers in the journals *Applied Science*, Analytical Chemistry, *Macromolecular Chemistry and Physics*, *International Journal of Molecular Science*, and *Macromolecules*. She gave invited lectures at the IUPAC MACRO 2024 Educational Workshop (Warwick, UK), in July 2024, titled "Advanced Field Flow Fractionation for the Analysis of Supramolecular and Complex Polymer Materials"; and at the Biennial Meeting of the Macromolecular Division of the GDCh Makro 2024, Polymers for a Sustainable Future, (Dresden, Germany), in September 2024, titled "FFF for precision structure analysis - from single chain to hybrid architectures". She also gave an invited lecture titled "Scattering and Separation – From Dendritic Polymers to Polymersomes" in October 2024 at the Polymer Networks Group Honorary Symposium for the life achievement of Prof. em. Dr. Walther Burchard from Universität Freiburg. During 2024 she collaborated with Prof. Lars Lilsson at Lund University on the coupling AF4-SANS; as part of M-Era.Net she collaborated with Prof. Lyn-Marie Birkholtz (SU/UP), Prof. Lizette Koekemoer (WITS), Prof. Christo Tzachev (Sofia University), Dr Uwe Freudenberg (IPF Dresden), and Prof. Sandra Franz (University Hospital Leipzig). She continues to collaborate with Prof. Jan Merna (UCT Prague) as part of the DFG GACR Collaboration, and with Prof. Harald Roehm (TU Dresden) as part of the DFG Collaboration. She serves on various editorial and advisory boards: as member of the editorial board of the *International Journal of Polymer Analysis and Characterization* (Taylor and Francis); as chair of the scientific committee for the International Symposia on Field and Flow Fractionation; as member of the scientific committee for the SC of the 22nd European Symposium on Polymer Spectroscopy (ESOPS) 2024; as member of the Scientific Advisory Board of the International Symposium on Separation and Characterization of Natural and Synthetic Macromolecules; and as an elected member of the Scientific Board of the International Symposium on Polymer Analysis and Characterisation (ISPAC).

Dr Marietjie Lutz presented a paper at the Scholarship of Teaching and Learning (SOTL) conference, Stellenbosch University, Stellenbosch. During 2024 she continued co-supervision of a PhD student together with Prof P. Mamza and Prof C.E. Gimba from Ahmado Bello University, Zaria, Nigeria.

Prof. Peter Mallon presented a paper at the MACRO 2024 Conference hosted in Warwick (UK) in June 2024 and gave a keynote lecture at the POLY_CHAR 2024 Madrid conference in May 2024. He served on various editorial and advisory boards: as Vice-President and President elect of the International Union of Pure and Applied Chemistry (IUPAC) Division IV: Polymer; and is a permanent member of the Subcommittee on Polymer Terminology and the Subcommittee on Polymer Education; as a founding executive board member of Commonwealth Chemistry (the Federation of Commonwealth Chemistry Societies) and serves as the Chair of Finance. In 2024 Prof. Mallon was elected as a Fellow of the South African Chemical Institute and serves on the Executive Committee and Council of SACI. He is also a Fellow of the UK-based Royal Society of Chemistry.

Prof. Selwyn Mapolie published four papers in the *Journal of Molecular Structure*, *Waste and Biomass Valorization*, the *Journal of Inorganic BioChemistry*, and *Results in Chemistry*. He gave oral presentations at the Gauteng Catalysis Forum, Johannesburg, April 2024, titled "Metal-Decorated Triazine Polymer Matrices as Catalysts in Oxidative Transformations of Alcohols"; at the 10th International IUPAC Conference on Green Chemistry, Beijing, October 2024, titled "Organic transformations of bio-renewable substrates using recyclable catalysts", and at the Catalysis Society of South

Africa (CATSA) 34th Annual Conference, Drakensberg, November 2024, titled "Metal-porphyrins embedded in polymeric matrices as catalysts in tandem oxidative coupling reactions". Prof. Mapolie collaborates with Prof. Jan Weigand (University of Dresden), Prof. Angelo Frei (University of York, UK), Prof. Liezel van der Merwe (University of Pretoria), Prof. Andrew Swarts (WITS), Prof. Sharon Prince (UCT). He is a member of the management committee of the Catalysis Society, and continues to serve as committee member of the Catalysis Society of South Africa (CATSA).

Dr Cassiem Joseph published a book chapter titled "Development of Mn(i)-based catalysts for CO2 hydrogenation/dehydrogenation in the context of hydrogen storage/release systems" in the *RSC Organometallic Chemistry Book Series*. He also published two papers in *Results in Chemistry* and the *European Journal of Inorganic* Chemistry. He presented a poster titled "Hydrogen Production from Formic Acid Mediated By Pyridine-Pyrazolyl Ru(II) Complexes: Catalytic Performance and Mechanistic Insights" at the 34th Catalysis Society of South Africa (CATSA) conference, Drakensberg, South Africa, 3-6 November. He has research collaborations with Prof. Swarts (WITS), working on reaction kinetics and mechanisms; and with Dr Kotze (WITS), working on advanced NMR techniques to study ion-pairs. He served on the NRF Virtual Peer Review Panel (VPRP) and the Physical Peer Review Panel (PPRP) committee for the evaluation of grant applications submitted by Next Generation and Emerging Researchers, effective from August 2024 to June 2026. Dr Joseph is an associate member of the Royal Society of Chemistry (ARSC) and a member of the South African Chemical Institute (SACI).

Dr Rueben Pfukwa published three papers in *Macromolecular Materials and Engineering*. His PhD-student, W. le Roux, presented a paper at Electrochemistry 2024 (Braunschweig, Germany) titled "Unlocking Efficiency: Alternative Hydrophilic Binders in the Alkaline Hydrogen Evolution Reaction"; and another paper titled "Exploring Hydrophilic Binders for Enhanced Performance in the Alkaline Hydrogen Evolution Reaction" at CATSA 2024 (Drakensburg, South Africa). Dr Pfukwa hosted Prof. Geoff Geiser (University of Virginia, USA) in November 2024; and collaborates further with Prof. Rob Rioux (Pennsylvania State University, USA), Prof. Marina Rautenbach (SU) and Prof Anton du Plessis (SU); Dr Anzel Falch (WITS) and Dr Julia Meitz-Hopkins (SU). He serves on the council of the Royal Society of South Africa; and as guest editor of *Macromolecular Materials and Engineering*'s special issue on *Polymers in South Africa*.

Dr Helen Pfukwa published a paper in *Analytical and Bioanalytical Chemistry.* She collaborates with Prof. Andreas Fery and Dr Christian Rossner (Leibniz Institute for Polymer Research) and visited Germany on a Alexander von Humboldt fellowship. She also works with Prof. Annie Chimphango (SU) and co-supervised an M.Eng student; and also co-supervised students with Prof. Luvuyo Tyhoda (Department of Forest and Wood Science, SU), and with Dr Zinash Belay (Department of Food Science, SU) and Dr Oluwafemi Caleb (Agricultural Research Council).

Prof. Willem van Otterlo published seven papers in journals such as the *European Journal of Organic Chemistry*, *Journal of Medicinal Chemistry*, *RSC Medicinal Chemistry*, *ChemMedChem*, *Scientific Reports*, *ChemCatChem*, and in *ARKIVOC* (*Archives of Organic Chemistry*): Commemorative Issue in Honor of Prof. Alan R. Katritzky and Prof. Charles Rees. He gave invited lectures at the FloHet Conference (Florida, USA) in March 2024, titled "Atroposelective synthesis of naturally occurring 5,8'-naphthylisoquinolines with nickel catalysis; and at the CATSA Conference (Drakensberg, SA) in November 2024 titled "Atroposelective synthesis of naturally occurring 5,8'-naphthylisoquinolines with nickel catalysis". In June 2024 he was invited to a seminar on "Convergent (synthetic) approaches to novel, bio-inspired active compounds" hosted by the Department of Chemistry, University of Porto, and the University of Aveiro (Portugal). During the same month he also visited the Department of Chemistry at Groningen University in The Netherlands to discuss future inter-departmental interactions. Prof. Van Otterlo serves on the editorial control board of the Platinum open-access journal, Archives of Organic Chemistry – Arkivoc, and is the immediate past-president of the South African Chemical Institute (SACI).

Dr Megan Matthews published two papers in *Macromolecular Materials and Engineering*. She collaborates with Dr T. Emmler and Dr K. Luetzow at the Helmholtz-Zentrum Hereon, Teltow, Germany), and is a member of the SACI Western Cape Committee.

AWARDS TO STAFF AND STUDENTS

The **SUNCOI** (SU Chemistry Outreach Initiative) was honoured with a Social Impact Award from Stellenbosch University, recognizing its significant contribution to education and community engagement. Led by **Dr Ebrahiem Botha**, **Mr Jabu Lukhele**, and **Dr Cassiem Joseph**, the initiative provides high school learners and teachers with hands-on laboratory experience, bridging the gap for under-resourced schools. Originally founded in 2013 by Dr. Rehana Malgas-Enus, SUNCOI has expanded from assisting Grade 12 learners to supporting students from Grade 4 through Grade 12. Beyond training learners, the initiative equips teachers with the necessary skills and resources to conduct chemistry experiments, ensuring long-term impact. The recognition highlights SUNCOI's growing influence, including collaborations with universities such as UP, NMU, and CPUT, as well as international interest from the American Chemical Society (ACS).

Dr Marietjie Lutz received the Stellenbosch University (SU) Teaching-Learning-Assessment Award in the Scholarly Teacher division. **Dr Gestél Kuyler** was awarded the SACI post-graduate medal (2024), while **Lisa de Wet** (SU) and **Reece Tuck** (former NMU student) were awarded the James Moir (Honours) medals. **Dr Lauren Ball** was awarded an Alexander von Humboldt postdoctoral research fellowship at the Leibniz Institute for Polymer Research, Dresden, Germany.

The SUNCOI team Mr Jabu Lukhele and Dr Ebrahiem Botha with Prof. Nico Koopman (far left) and Dr Leslie van Rooi from SU's Social Impact and Transformation Division.

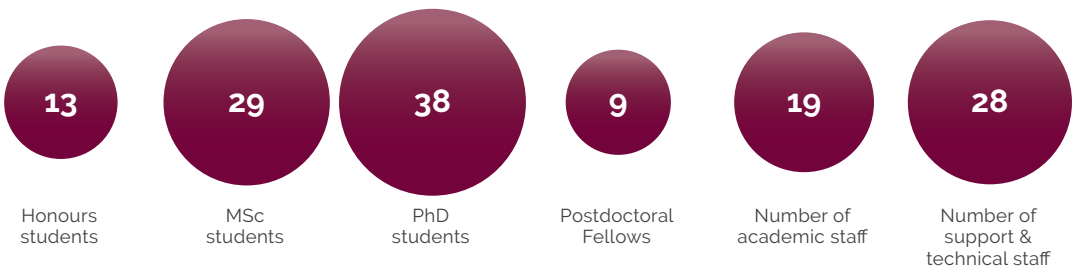
ACADEMIC AFFAIRS

A new Applied Chemistry module on the "Principles of Medicinal Chemistry" was introduced within the Interdisciplinary BSc focal area Applied Medicinal Chemistry. The module was carefully designed to show the application of biology and chemistry to the design of new therapeutic agents for treating diseases. This module covers principles of drug discovery including selection of targets, identification of bioassays, discovery of lead compounds (including natural products, drug repurposing), computer-aided drug design, introductory pharmacokinetics (DMPK), manufacture and drug delivery systems.

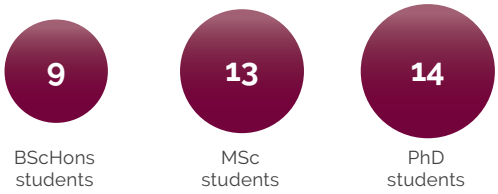
Within the BSc (Chemistry) programme a new focal area titled "Applied and Sustainable Chemistry" was developed to meet the needs of the current awareness of challenges around sustainability. A new Applied Chemistry module with this focus was developed for introduction in 2025. It will introduce students to the application of sustainable approaches to chemical processes and products, such as the utilisation of green solvents and solvent-free synthesis, alternative feedstocks, recycling and upcycling. In addition, there have been on-going discussions within the department regarding the renewal of our undergraduate and Honours-level teaching curriculum and approach.

The commitment of academics within the Department of Chemistry and Polymer Science to teaching and learning is evidenced by their visible presence at the annual Scholarship of Teaching and Learning conference, held from 5-6 November 2024. The following members of the department presented contributions at the conference: **Dr Marietjie Lutz** presented a paper titled "Bridging the gap: high school lab experience and first-year chemistry", while **Dr Megan Matthews** presented a poster titled "Game-based learning for nuclear magnetic resonance spectroscopy".

Student profile



Number of graduates 2024



STAFF MATTERS

Three long-serving staff members retired at the end of 2024: **Prof. Selwyn Mapolie** (2008 –2024), **Mr Malcolm Mclean** (2013-2024), and **Mrs Erinda Cooper** (1990-2024). **Mr Rudzani Manafe** resigned to take up the position of Chief-Technical Officer at SU's Tygerberg Campus, while **Mr Ayanda Nxopo** and **Mr Hugh Gordon** also resigned during 2024. Several new appointments were made: **Dr Cassiem Joseph** to lecturer, **Dr Leigh Loots** as manager of the Crystal Characterisation Laboratory, **Waajidah Arnold** as technical officer and **Shannon Walbrugh** as principal technical assistant.

NRF-RATED RESEARCHERS	
Leading international researchers	
Prof L Barbour	Nanostructured functional materials
Prof B Klumperman	Living radical polymerization and advanced macromolecular architectures
Internationally acclaimed researchers	
Prof A de Villiers	Separation science fundamentals and applications
Prof D Haynes	Crystal engineering of non-metal containing materials
Prof A Lederer	Analytical Polymer Science
Prof WAL van Otterlo	Organic synthesis and medicinal chemistry
Prof A de Villiers	Separation science fundamentals
Established researchers	
Prof G Arnott	Inherently chiral calixarenes; asymmetric methodology
Dr P Chellan	Bio-inorganic chemistry, organometallic chemistry, catalysis
Prof C Esterhuysen	Intermolecular interactions
Dr C Kaschula	Medicinal chemistry
Prof R Luckay	Ligand design for metal ion coordination in industrial and medical applications
Prof S Mapolie	Catalytic transformations using late transition metal complexes
Dr R Pfukwa	Functional polymer materials
Prof A van Reenen	Polyolefins
Promising young researchers	
Dr H Pfukwa	Biomass valorisation and polymer characterisation

SOCIAL IMPACT

SUNCOI outreach activities

SUNCOI extended an invitation to 129 SciMathUS students to participate in conducting the Grade 12 Esters and Acid-Base Titration experiments on 19 July 2024.

▲ SUNCOI event with 129 SciMathUS students.

On 20 July 2024, 29 learners from Cloetesville, Lückhoff, and Kylemore High Schools also conducted the Grade 12 Esters and Acid-Base Titration experiments. Also on 20 July 2024, AlchemUS and SUNCOI collaborated to host an interactive science day, offering learners from Kutlwanong School the opportunity to observe and experience chemistry demonstrations. Learners were particularly captivated by the Elephant Toothpaste and Water-to-Wine-to-Milk-to-Beer experiments.

On 9 November 2023, SUNCOI visited Botha Halte Primary School in Worcester, accompanied by teachers from four neighbouring schools, to conduct a teachers' workshop. During the session, participants engaged in eight hands-on experiments designed for Grade 4–7 learners. At the conclusion of the workshop, each school received a SUNCOI Chemistry Box, equipped with household materials, enabling them to replicate the experiments up to four times with their learners.

Soapbox Science

Prof. Catharine Esterhuysen presented a general introduction to intermolecular interactions and why these are important in materials science to members of the public during the Soapbox Science event at Cape Town's Waterfront on 6 October 2024.

▲ The SUNCOI team at Botha Halte Primary School in Worcester.

▲ Prof. Catharine Esterhuysen in action at the Soapbox Science event.

ACS on Campus and Outreach Summit

The American Chemical Society (ACS) and the Department of Chemistry and Polymer Science hosted a joint ACS on Campus event and Outreach Summit from 30 September to 3 October 2024. The ACS on Campus event is an initiative aimed at advancing the careers of undergraduate and postgraduate students in the science and engineering disciplines. The half-day programme featured insights into the future of drug discovery, opportunities in green chemistry presented by Prof. Anwar Jardine as well as an expert panel of local ACS journal editors including Prof. Kelly Chibale, Prof. Cara Schwarz and Prof. Dean Brady providing their experiences into what it takes to publish research. Students were also given the opportunity to network with these experts and the ACS representatives to find out how to kick-start their careers in STEM.

The Outreach Summit followed the On Campus event and was aimed at staff members from various universities, universities of technology and science centers across South Africa. The Outreach Summit provided training to 43 scientists to encourage the youth of South Africa to develop an interest in science and engineering. Topics such as event logistics, marketing and how to measure the success of outreach activities were facilitated by Dr Lily Raines from the ACS. The ACS also provided the delegates with helpful resources for future outreach activities. The Summit participants demonstrated a lively, supportive spirit that led to the establishment of a national chemistry outreach working group – with the aim of sharing experience in outreach initiatives across provinces. It was clear that this ACS Outreach Summit event had not only sparked curiosity but also fostered a sense of community among outreach volunteers. The collaborative spirit and innovative ideas showcased throughout the day underscored the importance of collaboration in promoting educational initiatives.

▲ Participants in the American Chemical Society (ACS) and the Department of Chemistry and Polymer Science's joint ACS on Campus event and Outreach Summit.

Wheels of Opportunity (WOOP) fundraiser

In 2024, the Wheels of Opportunity (WOOP) initiative was launched as a first-time fundraising effort to support financially disadvantaged undergraduate Science students. This campaign saw a faculty member, Dr Marietjie Lutz, joined by her family, cycle 600 km over six days from George to Stellenbosch to raise awareness and funds for students in need. The inaugural WOOP ride successfully raised over R76 000, directly contributing to bright, hardworking students facing financial barriers to higher education. Beyond financial support, the initiative also served as a platform to highlight the Faculty of Science's commitment to student success and social impact. With strong media exposure and community engagement, WOOP has laid the foundation for future efforts to expand its reach and impact.

▲ Dr Marietjie Lutz in front of her first-year chemistry class. Photo: Stefan Els

▲ Dr Marietjie Lutz riding 600km from George to Stellenbosch with the support of her family.

Walking 160 km to raise funds

Prof. Bert Klumperman used his participation in The Walk of the World – walking 160 kilometers in four days – to raise over R40 000 for the Ron Sanderson Bursary Fund.

The fund was established in 2015 in recognition of the late Prof. Ron Sanderson's contribution to the development of polymer education in South Africa.

COLLABORATION

South Africa
- Cape Peninsula University of Technology
- Drug Discovery and Development Centre (H3D), University of Cape Town
- Nelson Mandela University
- North-West University
- Rhodes University
- University of Cape Town
- University of Johannesburg
- University of KwaZulu-Natal
- University of Pretoria
- University of Venda
- University of the Witwatersrand

Australia
- Griffith University
- Queensland University of Technology

Austria
- Medical University of Vienna
- University of Natural Resources and Life Sciences

Belgium
- Free University Brussels
- Ghent University

Canada
- McGill University
- University of Alberta
- University of Waterloo

Czech Republic
- Technical University of Liberec
- University of Chemical Technology Prague

Denmark
- University of Copenhagen

France
- Université de Lorraine
- University of Strasbourg

Germany
- Albert Ludwig University of Freiburg
- Dortmund Technical University
- Heinrich-Heine-Universität Düsseldorf
- Leibniz-Institut für Polymerforschung Dresden
- Johannes Gutenberg University of Mainz
- Ludwig Maximilian University of Munich

India
- Jawaharlal Nehru University
- Tezpur University

Ireland
- University of Limerick

Italy
- Turin University

Japan
- Nagoya University

Netherlands
- University of Amsterdam
- Vrije University Amsterdam

Poland
- Adam Mickiewicz University
- University of Warsaw

Portugal
- NOVA University Lisbon
- Gulbenkian Institute of Science
- University of Porto

United Arab Emirates
- New York University Abu Dhabi

United Kingdom
- Coventry University
- Lancaster University
- National History Museum
- University of Birmingham
- University of Glasgow
- University of Nottingham
- University of Warwick

United States of America
- Carnegie Mellon
- Emory University
- Georgetown University
- Georgia Institute of Technology
- Gustavus Adolphus College
- Pennsylvania State University
- Texas State University (TSU)
- University of Texas Southwestern Medical Centre
- University of Virginia
- Virginia Polytechnic Institute

FUNDING

- African Academy of Sciences
- DFG German Research Foundation
- DST/NRF SARChI Programme
- Dutch Polymer Institute
- European Union (M-ERA-NET Initiative)
- Medical Research Council (MRC)
- National Institutes of Health (NIH)
- NRF Competitive Programme for Rated Researchers
- NRF International SA / France (Protea) programme
- NRF National Equipment Programme
- NRF Research Development Grants for Y-Rated Researchers
- NRF Thuthuka Programme
- Restek
- Royal Society
- Safripol
- SASOL
- Stellenbosch University
- Technology Innovation Agency (TIA)
- Wellcome Trust
- Wilhelm Frank Trust

STAFF LIST

Academic staff

Professor

- Prof L Barbour
- Prof A de Villiers
- Prof D Haynes
- Prof C Esterhuysen
- Prof B Klumperman
- Prof A Lederer
- Prof P Mallon
- Prof S Mapolie
- Prof W van Otterlo (HoD)

Associate professor

- Prof G Arnott
- Prof R Luckay

Senior lecturer

- Dr P Chellan
- Dr K de Villiers
- Dr C Joseph
- Dr C Kaschula
- Dr R Pfukwa

Lecturer

- Dr E Botha
- Dr A Gericke
- Dr M Lutz
- Dr M Matthews

Extraordinary appointments, research fellows and academic rank

Extraordinary Professor

- Prof J Wiegand

Research fellow

- Prof I Green

Professional and support staff

Administrative

- E Cooper
- M Dludlu
- J Goldie
- B Ntadane

Technical

- W Arnold
- T Hunt
- L Loots
- J Lukhele
- M McLean
- G Marapula
- J Motshweni
- Dr H Pfukwa
- G Willemse

Service

- T Abels
- D Isaacs
- T Finca
- M Jones
- C Maart
- P Page
- C van Reenen
- S Walbrugh

Postdoctoral fellows

- Dr L Ball
- Dr M Geisler
- Dr M Liprini
- Dr ED Maggot
- Dr TB Matemb Ma Ntep
- Dr B Motloung
- Dr SD Olapido
- Dr AI Vicatos
- Dr M Scheepers

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Department of Earth Sciences

RESEARCH INTERESTS

- Applied Geology
- Archean geology
- Economic geology
- Experimental petrology
- Geometallurgy
- Igneous petrogenesis
- Metamorphic petrology
- Ore geology
- Sedimentology and palaeontology
- Tectonics and orogenic processes
- Environmental Geochemistry
- Air Quality
- Climate and Global Change
- Environmental geochemistry
- Groundwater Modelling
- Isotope Hydrogeochemistry and Hydrogeology
- Marine geochemistry
- Trace-element and isotope geochemistry

RESEARCH HIGHLIGHTS

▲ *A core from the Bushveld Drilling Project.*

Deep scientific drilling in the Bushveld Complex, South Africa

Dr Amy Allwright is co-Principal Investigator on the ICDP-funded Bushveld Drilling Project, led by Prof. Susan Webb (University of the Witwatersrand), which investigates the deep subsurface of the Bushveld Igneous Complex. The hydrogeological component, led by Dr Amy Allwright, investigates deep groundwater systems for potential water resource identification. Drilling to 950 m revealed fracture-

▲ *Drill rig at the Bushveld Drilling Project site.*

controlled aquifers with distinct hydrochemical profiles and minimal modern recharge. Elevated temperatures, gas anomalies, and structural features suggest geothermal potential and complex fluid migration. Collaborating geologists from several South African institutions contributed to the structural and stratigraphic framework. Novel methods were developed to reduce drilling fluid contamination during hydrochemical sampling. Prof. Yohey Suzuki (University of Tokyo) leads microbiological studies, identifying persistent microbial life in deep clay-filled fractures. Together, these efforts provide a multidisciplinary understanding of the Bushveld's deep crust, with implications for water resource management, geochemical processes, and energy exploration.

▲ Team members of the Bushveld Drilling Project, from left to right, Yohey Suzuke (University of Tokyo); Mpho Mpho Molautsi (University of Limpopo); Amy Allwright (Stellenbosch University); Jared van Rooyen (Eawag); and from the University of the Free State, Fanie de Lange, Rolene Lubbe, and Leor Bester.

From air quality in informal settlements to the Southern Oceans

Prof. Susanne Fietz' team investigated air quality and health risks of potentially toxic metals in dust around an industrial hub as well as in informal settlements. Her research group also continued working on marine aerosol research and dynamics of phytoplankton and micronutrients in the Southern Ocean.

▲ Earth Sciences Postdocs Dr Heleen Vos (right) and Dr Ole Valk (left) changing filters on the high-volume dust sampler over the Southern Ocean during the 2024/2025 Antarctic Relief voyage on board RV SA Agulhas II. Photo: Heleen Vos

US$ 10 million-project investigates resilience of the South Atlantic ecosystem

Prof. Alakendra Roychoudhury is one of the Principal Investigators in an international initiative at the prestigious Ocean Biogeochemistry Virtual Institute (OBVI). With US$ 10 million in funding from Schmidt Sciences and one of the five projects, this initiative will investigate the resilience of the South Atlantic ecosystem and the cause of frequently occurring hypoxic events along the west African margin. Multi-year sampling efforts in the Southern Ocean by the TracEX research group headed by Prof. Roychoudhury culminated in the first *in situ* data published in *Science* that confirmed model predictions to explain the Zinc-Silica paradox. The findings are also a prime example of how processes at molecular level can influence global scale events such as warming of our oceans.

RESEARCH ACTIVITIES

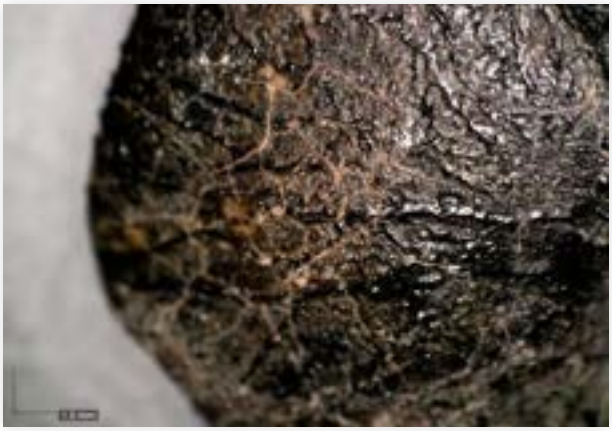
Dr Amy Allwright serves on the executive committee for the International Associated for Hydrogeologists – South African Chapter as well as the Groundwater Division. She is Principal Investigator on a related Water Research Commission project covering the water-related research on the BVDP. This project also facilitates collaboration with numerous institutions including the University of the Witwatersrand, University of the Free State, Swiss Federal Institute of Aquatic Science and Technology (Eawag), GFZ Helmholtz Centre for Geosciences in Potsdam and the Council for Geoscience (CGS).

Prof. Alexander Kisters was speaker and presenter as part of a five-day course (11-15 March 2024) of lectures, practicals and field trips during the 30th Geology of Gold course hosted by the University of Melbourne in Australia. The course presents the latest on every aspect of gold mineralisation to industry geologists, academics and senior students. He was also invited speaker of the Australian Institute of Geoscientists (13 March 2024) and presented a talk on the controls of gold mineralisation in South Africa's Barberton district in the historic mining town of Bendigo in Victoria. The remainder of the trip was

spent with Prof. Neil Phillips (University of Melbourne/SU), undertaking field work in the Strathbogie batholith in Victoria, studying the emplacement mechanisms of the very large granite pluton.

In September (21-26. Sept. 2024), Prof. Kisters led a six-day field trip through the Damara Belt of Namibia as part of the annual international conference of the Society of Economic Geologists (SEG) held in Windhoek, Namibia. The 22 participants hailed from 16 nations and were exposed to a wide range of styles and controls of gold mineralisation in the Damara Belt on the 1800km long trip.

Dr Matthew Mayne is a Metamorphic Petrologist focused on thermodynamic modelling and research of the continental crust both on Earth and on rocky moons (*photo below*). His research is funded by international collaborations with the Jet Propulsion Laboratory, the BuCoMO project (Building Continents from Mantle to Ore) and locally by the National Research Foundation.



▲ (Left) Flow lines and contraction cracks on a stony meteorite surface and (right) iron-nickel alloys forming the classic Wodmanstatten-patterning on an iron meteorite. Photo credit: Llelani Coetzer

Dr Ryan T. Tucker is an Explorer in Residence within the National Geographic Society, with funding for 2023 and 2024. Dr Tucker, in-partnership with multidisciplinary earth and life scientists from North America, Japan and Mongolia (MADEx) are currently addressing fundamental questions about patterns and drivers of terrestrial biotic change during the Cretaceous Thermal Maximum (KTM), in order to produce results directly relevant to climate policy now. MADEx will derive geoscientific and palaeoscientific data from Mongolia's Gobi Basin and North America's Western Interior Basin, which together, preserve the world's richest records of Cretaceous terrestrial life. This data will include biodiversity metrics, geochronologic/spatiotemporal records, functional traits (e.g., diet and range derived from geochemical proxies), temperature and precipitation estimates, and environmental data. By integrating across Earth-life systems, MADEx aims to tackle a series of hierarchical objectives, including establishing a refined chronology of ecosystem change, assessing climate trends and drivers of habitat evolution, and exploring the impact of extreme warming on ecosystem integrity, functional biodiversity, and species threat.

Dr Bjorn von der Heyden is a committee member of the Mineralogical Society of South Africa (MINSA), external moderator for the undergraduate programme at the University of Cape Town, a representative for the Earth Sciences in the African Strategy for Fundamental and Applied Physics (ASFAP), and a member of the national panel for the International Continental Scientific Drilling Program (ICDP).

Prof. Susanne Fietz, Head of the Department, is Associate Editor for *Global Biogeochemical Cycles*, a Q1 international scientific journal, external moderator for undergraduate and postgraduate courses at the University of the Witwatersrand, Cape Peninsula University of Technology, panel reviewer for international science programmes (e.g., the German Research Foundation or DFG), member of the national BIOGRIP Steering Committee, member of RUSTED (Reducing Uncertainty in Soluble aerosol Trace Element Deposition) an international SCOR Working Group. In this context, Prof. Fietz also works with researchers from the South African Weather Service's atmospheric chemistry team on sinks and sources of mercury in the atmosphere. As such, the team's postdoc Dr Heleen Vos participated in the 2024/2025 Antarctic Relief Voyage to collect aerosol samples, supervise the atmospheric mercury monitoring and retrieve sea ice cores. Prof. Fietz' team furthermore worked in collaborative projects on Late Cenozoic palaeoenvironmental reconstructions on the southwestern shelf of Africa. Related to these projects, she gave talks at international and national conferences and workshops in 2024. Examples of international conferences are: International Conference on Mercury as a Global Pollutant (ICMGP 2024), Cape Town, and the Surface Ocean–Lower Atmosphere Study (SOLAS) Open Science Conference, Goa, India. Examples of national conferences and workshops are the National Association for Clean Air (NACA), Randburg.

▲ Earth Sciences MSc candidate Miranda Sitofile, postdocs Dr Heleen Vos, and Dr Ole Valk having lunch on the ice during a sea ice coring session during the 2024/2025 Antarctic Relief Voyage. Photo credit: Heleen Vos

Prof. Alakendra Roychoudhury established and heads the TracEx research group and the only trace metal clean laboratory in Africa capable of analysing trace elements in ocean waters. His research fulfils the mandate of the International GEOTRACES program and is funded by multiple philanthropic donors. His research on Zinc in the Southern Ocean was published in the journal *Science* and was instrumental in deciphering the Zinc-Silica paradox. He also acts as the co-Director of the International Whales and Climate Change Program that brings together scientists from various fields to understand the role of whales in maintaining an ecological balance.

Prof. Gary Stevens currently serves as associate editor of the *Canadian Journal of Mineralogy and Petrology* and the steering committees of the DSI-NRF Centre of Excellence for Integrated Mineral and Energy Resource Analysis (CIMERA) and the Biogeochemistry Research Infrastructure Platform (BIOGRIP). He has built and runs the only experimental petrology laboratory in Africa, which is equipped with a range of autoclaves that allow direct investigation of metamorphic, magmatic, and ore-forming systems in Earth's crust and upper mantle. His research is currently focussed on understanding mantle melting events that produced massive chromitite deposits; understanding the primary felsic magma compositions and the assembly of granite plutons; understanding incompatible element enrichment during low degrees of partial melting of metasediments; as well as the formation of Earth's Hadean and Archean crust.

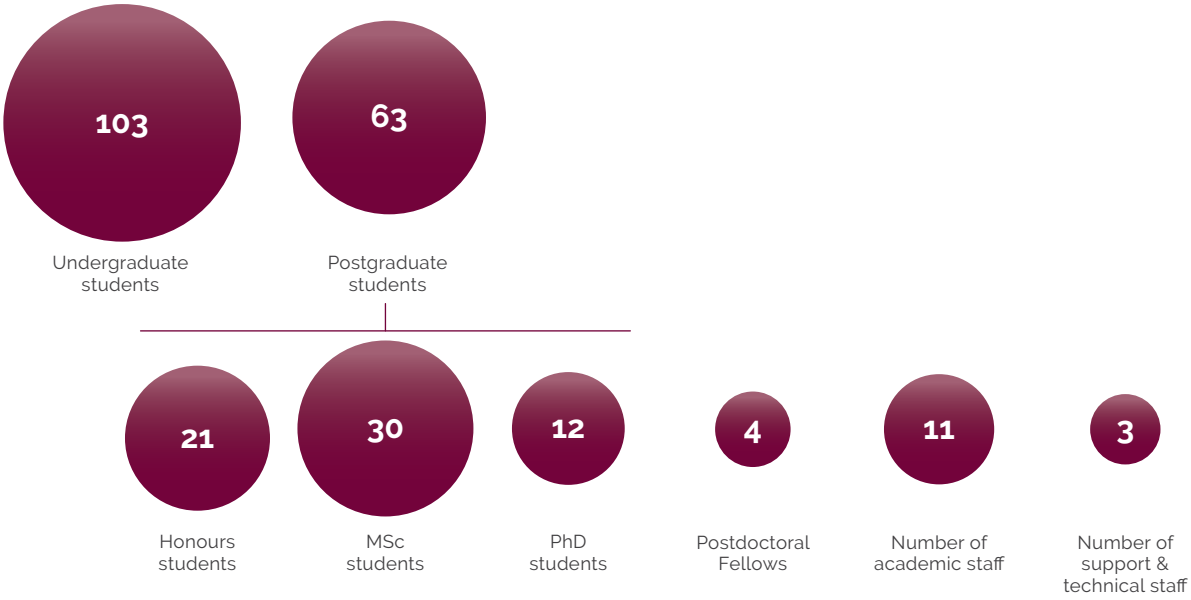
AWARDS TO STAFF AND STUDENTS

Two of our postgraduate students were recognised by the Geological Society of South Africa (GSSA) for the best MSc and the best Honours thesis in earth sciences produced at a South African university.. **Rutger La Cock** received the Johan Handley award for the best MSc thesis in earth sciences for his work on the gold-carbon coupled geochemical cycle, with a particular emphasis on how these cycles intersected in gold-bearing samples from the more than three-billion-year-old Barberton Greenstone Belt. **Llelani Coetzer** received the Haughton award for the best Honours project in earth sciences for her work on metamorphic conditions in the plumbing systems of the Darling Batholith within the Saldania Belt. She was supervised by Prof. Gary Stevens, and is currently continuing with an MSc looking at the minerals and internal structures of meteorites.

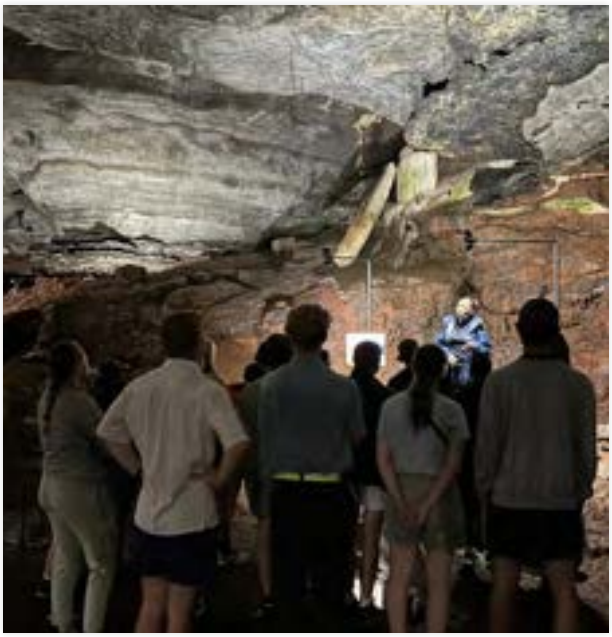
Other achievements are:

- 2024 Igneous and Metamorphic Studies Group (IMSG) award for best BScHons Presentation to **Llelani Coetzer.**
- **Rutger La Cock** (MSc), best oral presentation, CIMERA Colloquium, SA, awarded in 2024.
- **Heleen Vos** (Post-Doc), Best Early Career Oral presentation, International Conference on Aeolian Research (ICAR), 2023, USA.
- **Bjorn von der Heyden** was a finalist in the 2024 South32- National Science and Technology Forum (NSTF) awards.
- MSc student **Mapasholi Mokethi** was awarded the best research presenter at the sixth SADC Groundwater Conference 2024.
- BSc Earth Science postgraduate students competed in the final round of the Frank Arnott Next Generation Explorers geological challenge during the Prospectors & Developers Association of Canada (PDAC)'s 2024 conference, where they won the Innovation Award for their project that link machine learning algorithms and geometallurgy.

ACADEMIC AFFAIRS



One of the highlights of our programme is the annual Honours Tour. The students travel across South or Southern Africa and visit important geological features as well as some mines. This tour represents an excellent opportunity to see in person some of the processes and features discussed over years in class.



▲ During the Honours Tour 2024, the students visited well-known geological features and mines. Photo: Tahnee Otto

STAFF MATTERS

Dr Amy Allwright was appointed as lecturer in Hydrogeology at the Department of Earth Science. **Dr Bjorn von der Heyden** was promoted to Associate Professor and **Dr Matthew Mayne** to Senior Lecturer. Matthew also received a Y1-rating from the National Research Foundation. Our extraordinary researcher **Glenn Brown** was promoted to Honorary Professor. **Prof. Cris Lana** joined the department in November 2024. **George Olivier**, senior technical officer, completed his doctoral degree and graduated in March 2024. It is **Dr** George Olivier now! 2024 was **Prof. Susanne Fietz**' first year as Head of the Department.

CURRENT NRF-RATED RESEARCHERS	
Established researchers	
Prof S Fietz	Environmental geochemistry, biogeochemistry
Dr B von der Heyden	Economic geology
Dr R Tucker	Sedimentology and palaeontology
Dr Matthew Mayne	Igneous and Metamorphic Studies

SOCIAL IMPACT

Departmental social events

Every year the department hosts several social events where undergraduates, postgraduates, staff and alumni can mingle. That includes our traditional Start of the Year event, our quiz nights, a Dance Formal, a Year End Function, and many events in between.

▲ Earth Sciences undergraduates, postgraduates and alumni at our Start of the Year Function held annually at the Van der Stel Sports Field, where all ages play sports and games together and end the day with a braai. Photos: Luc de Villiers

Citizen Science Project: Fossil Shark Tooth Forensics

Dr Ryan T Tucker, in partnership with North Carolina State University, continued with an ongoing collaboration with the Western Cape Education Department (WCED) and other Western Cape primary and secondary schools to partake in the Citizen Science Project: Fossil Shark Tooth Forensics in 2024. He is also partnering with the North Carolina Museum of Natural Science, North Carolina State University, the Bank of America, and WECD to bring down to South Africa the Citizen Science Project: Cretaceous Critters. The first teacher workshop was held in January of 2025, with amazing success and the request for an additional larger workshop in 2026.

Science, robotics and the Antarctic

Prof. Susanne Fietz hosted a group of primary school children from The Strand in the department to discuss "Science and Robotics on an Antarctic Voyage" in September 2024. She also visited Ukhanyo Primary School in Cape Town to present concepts and research on the importance of "tiny organisms and their needs in the Antarctic ecosystem" in collaboration with 'Guardians of the Deep' and the South African Polar Research

Infrastructure (SAPRI). The seminar highlighted the role of algae, plankton, and other microorganisms in the food web and the equipment used to collect and analyse samples in the field. The learners also experienced being scientists by dressing up in lab coveralls and learning about lab work and safety.

Other outreach events

Dr Matt Mayne collaborated with the Faculty of Science to produce a marketing video showcasing the department's social impact initiatives. He also hosted the Igneous and Metamorphic Studies Group meeting which provides postgraduate students from across South Africa an opportunity to present on their work. He also secured funding for this meeting to sponsor student accommodation and reimbursing of partial travel fees to encourage inclusivity.

In January 2024, **Prof. Alexander Kisters** presented a five-day, field-based course for industry geologists and senior students at the University of Namibia on the principles of hydrothermal fluid flow, controls of mineralisation and applications. The course was held at field locations in and around Karibib in Namibia and attended by some 16 geologists and geology students.

Dr Amy Allwright worked with learners from Rhenish High School and a local hydrogeology consultancy to provide real-work experience during the school holiday.

▲ Two learners from Ukhanyo Primary School were dressed up as "next generation researchers" during a workshop presented by Prof. Susanne Fietz. She was invited by 'Guardians of the Deep' and the South African Polar Research Infrastructure (SAPRI). Photo credit: Susanne Fietz

FUNDING

- Anglo American
- Barrick Gold Corporation
- CNRS/NRF funding to BUCOMO France/RSA
- Donor funding: Whales and Climate Change Program
- DSI-NRF Centre of Excellence (CoE) for Integrated Mineral and Energy Resource Analysis (CIMERA)
- National Research Foundation (NRF) CPRR program
- National Research Foundation (NRF) SANAP program
- National Research Foundation (NRF) Thuthuka program
- National Research Foundation (NRF): African Origins Platform (AOP)
- National Science Foundation (NSF): Frontier Research in Earth Sciences (FRES)
- NRF SARChI funding
- OKR Corporation Ltd
- Orange River Pegmatite Company
- Osino Resources
- Pan-African Resources
- Stellenbosch University: Early Career Advancement Grant 2020
- Stellenbosch University: Sub Committee B

◀ Two learners from Rhenish High School visited a campus borehole along with GEOSS for a real-work experience during the school holiday. Here the students are taking in-field water quality results from groundwater samples. Photo: Amy Allwright

STAFF LIST

Academic staff

Professor
- Prof A Kisters
- Prof C Lana
- Prof A Roychoudhury
- Prof G Stevens

Associate professor
- Prof S Fietz (HoD)

Senior lecturer
- Dr M Klausen
- Dr R Tucker
- Dr B von dr Heyden

Lecturer
- Dr A Allwright
- Dr r Heyn
- Dr M Mayne

Extraordinary appointments, research fellows and academic rank

Extraordinary professor
- Prof I Basson
- Prof D Cornell
- Prof N Phillips

Extraordinary lecturer
- Dr R Chow

Research fellow
- Dr N Backeberg
- Dr G Brown
- Dr C Koegelenberg
- Dr J Miller
- Dr R Scheepers
- Dr B Thomas
- Dr H Tsikos
- Dr J Vearncombe

Professional and support staff

Administrative
- G Strydom

Technical
- G Olivier

Service
- F Timmey

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Department of Mathematical Sciences

RESEARCH INTERESTS

Applied Mathematics Division

- Applied discrete mathematics
- Computational fluid dynamics
- Differential equations with applications
- Dynamical systems
- Flow through porous media
- Fluid dynamics and modelling
- Machine learning and computer vision
- Mathematical applications in industry
- Numerical analysis and scientific computing
- Probability theory and simulation methods applied to physics and machine learning
- Solid Mechanics
- Stochastic processes

Computer Science Division

- Assistive technology and human computer interactions
- Automata and grammars: theory and applications
- Computer networks
- Computing and society
- Data Science
- Machine learning, computational intelligence, and artificial intelligence
- Software engineering: program testing and verification

Mathematics Division

- Algebra
- Algebraic geometry
- Algebraic number theory
- Analytic number theory
- Biomathematics
- Category theory
- Discrete mathematics and algorithms
- Functional analysis
- Mathematical Physics
- Model theory

RESEARCH HIGHLIGHTS

Biomathematics

Prof. Cang Hui contributed to work of the Global Forest Biodiversity Initiative (GFBI) consortium, which identified positive feedback and alternative stable states in global forest leaf types. This work was published in *Nature Communications*. Prof. Hui's SARChI team designed an adaptive rock paper scissors game to capture the dynamics of strategy densities with trait-mediated payoffs. This work was published in *Applied Mathematics and Computation*.

Category theory and point-free topology

During 2024, the category theory research group at SU showed significant growth with the appointment of Dr. Graham Manuell and Dr. Peter Faul. In collaboration with NITheCS, a regular departmental hybrid category theory research seminar ran in 2024. Visitors of the research group in 2024 included Dr. Ülo Reimaa (Tartu University, Estonia), Dr. Amartya Goswami (University of Johannesburg) and Dr. Luca Mesiti (University of KwaZulu-Natal). A master student in the research group, Mr Bernardus Wessels, was awarded the prestigious Skye Foundation bursary to pursue his MSc studies at the University of Cambridge, where he was successfully accepted.

In joint work with Dr Ülo Reimaa (Tartu University, Estonia), **Prof. Zurab Janelidze** showed that the construction of the Serre quotient of an abelian category, well known in algebraic geometry, uncovers 2-dimensional categorical-algebraic aspects of the category of abelian and more widely, Puppe-exact categories. Dr Graham Manuell proved that completions of uniform locales can be constructed using Cauchy sequences, unlike the situation for uniform spaces where filters must be used.

Number theory and geometry

Prof. Florian Luca, an A1 rated scientist working in number theory, joined the department in August 2024. Together with two co-PI's, Prof Luca was awarded the ERC Synergy Grant 101167561 – DynAMiCs in November 2024. This is a 7.5 million Euro grant, over six years, for work combining mathematics, specifically techniques associated with number theory, and theoretical computer science. Among the open problems forming the focus of the research is the Skolem problem: deciding whether a linear recurrence sequence will contain the number zero.

Prof. Florian Luca. Photo: Stefan Els

RESEARCH ACTIVITIES

Dr Liam Baker submitted a substantial paper to the prestigious journal *Transactions of the American Mathematical Society*, and a further paper to *Afrika Mathematika*. Dr Baker has been developing a variety of lines of research, including an abstract approach to the summation of infinite series. He continued to co-supervise the PhD of Joseph Atalaye, together with Dr Sophie Marques.

Prof. Bruce Bartlett saw his paper "The quintic, the icosahedron, and elliptic curves" appear in the widely read journal *Notices of the American Mathematical Society*. He gave an invited talk to the Mensa Society of the Western Cape, related to this work. He also gave an invited course on Geometric Quantization in the Thematic Program on Field Theory and Topology at the University of Notre Dame in the United States of America in June. A paper on Bayesian forecasting, co-authored with his PhD student, Nelson Kyakutwika, appeared online in the *Investment Analysts Journal*. Prof Bartlett continued to supervise several postgraduate students and he played a leading role in the running of the Riemann Academy, which provided inspiring talks for undergraduates, leading them in the direction of mathematics research.

Dr Dirk Basson saw his very substantial paper, "Drinfeld modular forms of arbitrary rank", coauthored with Florian Breuer and Richard Pink, appear in the *Memoirs of the American Mathematical Society*.

Dr Ronalda Benjamin gave a talk on the order Lozanovsky spectrum of a positive operator at the Conference on Ordered Structures with Applications (COSA) that took place in Kenitra, Morocco from 5-9 February 2024. This was followed by an invitation to be a plenary speaker at COSA 2025. She also attended the Banach Algebra and Functional Analysis connecting Lancaster and South Africa (BAFALASA) workshop at the University of Lancaster from 3-6 July 2024 and presented a talk on Positivity in Fredholm theory (with open questions). Her joint paper "The spectral rank and Drazin inverse in J-semisimple and torsion-free rings" with Dr Miles Askes was accepted for publication in *Filomat*. In this paper results involving the spectral rank and Drazin inverse in Banach algebras are generalized to the setting of rings. Dr Benjamin was a member of the local organizing committee of the Functional Analysis and Operator Theory South Africa 2024 (FAOTSA24) workshop, which took place at AIMS South Africa as part of their Siyakhula festival. She also served as a reviewer for the *Journal of Mathematical Analysis and Applications* (JMAA), *FILOMAT* and *Positivity*.

Prof. Gareth Boxall continued his collaboration with Charlotte Kestner and Tsinjo Rakotonarivo on the local definable (p,q)-conjecture, and his own project which applies ideas from model theory to unlikely intersections problems in Diophantine geometry. His paper "Superrosiness and dense pairs of geometric structures" appeared in *Archive for Mathematical Logic*.

Prof. Willie Brink extended the Google DeepMind scholarship programme at SU for 2025, and secured PhD fellowships from InstaDeep. With this support students can participate in the structured MSc (Machine Learning and Artificial Intelligence) programme as well as pursue doctoral studies thereafter. In 2024 Prof. Brink supervised one of his PhD students and two of his MSc students to completion, published one conference paper, and submitted a further two journal papers and three conference papers for peer review. Prof. Brink was also a regular guest lecturer in the AI for Science Masters programme at AIMS-SA.

Dr Maret Cloete has taken a path focussing on lecturing and she is involved with undergraduate and postgraduate lecturing to both engineering and science students. She is also involved with developing and implementing alternative teaching methods.

Dr Hanno Coetzer co-authored a 30-page paper in the *International Journal of Biometrics* in 2024 and has sustained his collaboration with KU Leuven and Medical Care NV (Belgium). He supervised one PhD student to completion while another PhD student is expected to graduate in December 2025. In addition to this, one MSc student graduated in March 2024, while another MSc student graduated in December 2024. He also successfully supervised two MLAI master's projects and two honours projects during 2024.

Dr Hardus Diedericks published one conference paper that he presented at the 13th South African Conference on Computational and Applied Mechanics (SACAM 2024) and he published in the journal *Chemical Engineering Science* with colleagues at the division. He was also a co-author of a contract report based on an industry project with Anchor Environmental Consultants. He has research collaboration with Anchor Environmental Consultants and the research institute Fiskaaling on the Faroe Islands. As part of his collaboration with Fiskaaling his MSc student visited the Faroe Islands and successfully completed his MSc studies. In addition, Dr Diedericks hosted interns from France for a three-month period. Dr Diedericks was also nominated by two students for recognition at the First-year Achievement Awards.

▲ Dr Hardus Diederichs with the two students who nominated him for the First-Year Achievement Awards function.

Dr Andie de Villiers continued with her work on modelling transvers isotropy peridynamics with Paul Steinmann (University of Erlangen-Nuremberg, FAU), Ali Javili (Bilkent University), Andrew McBride (Glasgow University) and Georges Limbert (University of Southampton). A publication entitled Continuum-kinematics-inspired peridynamics for transverse isotropy has been accepted for publication in the journal *Computer Methods in Applied Mechanics and Engineering*. One of her MSc students graduated in March 2024 and is now registered for a PhD at the University of Erlangen-Nuremberg. Another MSc student successfully upgraded to a PhD in September 2024.

Dr Marcel Dunaiski served on the programme committee for the South African Institute of Computer Scientists and Information Technologists (SAICSIT) 2024 conference. Dr Dunaiski and his MSc student, Daniel van Zyl, in collaboration with CERI and Dr Joicy Xavier (Instituto Tecnológico de Aeronáutica, São Paulo) developed a new machine-learning classification pipeline for viral genomic sequences for SARS-CoV-19, HIV, and Dengue. The classification methodology is based on a bit-wise chaos game representation as an alignment-free method for feature extraction from viral genomic sequences and uses random forest as a classifier. It is fast, scalable, and provides state-of-the-art classification accuracy. Marcel Dunaiski hired Wian Laing, who graduated in 2024 with BSc (Hons) in Computer Science, over the 2024 Christmas holiday period to develop a website for this project to make this classification pipeline publicly available. It is available at: https://fast.pathotrack.health/

Prof. Andries Engelbrecht was involved in editorial activities as Deputy-Editor-in-Chief: *Engineering Applications of Artificial Intelligence*; Series Editor for *Artificial Intelligence*, *IntechOpen*, Guest-Editor for *Applied Sciences*; Associate-Editor for *Swarm Intelligence Journal*, *Evolutionary Computation Journal*, *Complex & Intelligent Systems*, *Journal of Cognitive Computing in Engineering*, *International Transactions in Operational Research*; Advisory Board Member: *KIET Journal of Computing and Information Sciences*, *Machine Learning for Modeling and Simulation in Engineering & The Sciences*, *Studies in Computational Intelligence*; Editorial Board member for *MethodsX*, *Machine Learning for Computational Science and Engineering*. He presented invited keynote on "Multi-guide Particle Swarm Optimization: An Efficient Approach to Multi- and Many-Objective Optimization" at the 8th International Conference on Intelligent Systems, Metaheuristics and Swarm Intelligence and an invited keynote on "Recent Advances in Particle Swarm Optimization for Multi-Objective and Many-Objective Optimization" at the IEEE Computational Intelligence Society Summer School on Contemporary Advancement in Multi-Objective Optimization, Silchar, Delhi 2024. He presented an invited seminar on "Particle Swarm Optimization: A Multi-Purpose Optimization Approach" at the South Asian University, Delhi, India, 2024. Prof. Engelbrecht has active collaboration with Prof. Beatrice Ombuki-Berman (Department of Computer Science, Brock University, Canada) and Prof. Mohammed Omran (Department of Computer Science, Gulf University of Science and Technology, Kuwait). He also visited Prof. Jagdish Bansal (Department of Computer Science, South Asian University, Delhi, India).

Dr Peter Faul joined the department in April. He wrote three papers in 2024. These were on the reverse representation problem, the case for inverse semirings and F-inverse monoids as weakly Schreier extensions. Two of these were in collaboration with his MSc student, Gideo Joubert, and other authors. One was single authored. Together with Dr Graham Manuell, Dr Faul supervised three first-year undergraduate students on a research project which they then presented at the annual congress of the South African Mathematical Society in Pretoria in December.

Prof. Sonia Fidder attended the 2024 EQUiiP (Educational Quality at Universities for inclusive international Programmes) summer school at the University of Groningen, Groningen, The Netherlands. She submitted a portfolio and received an EduBadge added to her email signature. While abroad, she visited her collaborator Prof Jeff de Hosson at the University of Groningen. She also presented the results of the EQUiiP portfolio at the SoTL 2024 conference. Her PhD student Yannick Harrison Nkocko Awountsa (with co-supervisor Dr Hardus Diedericks) successfully completed his dissertation within three years and graduated in December 2024. Mr Nkocko was a recipient of the DAAD-AIMS Scholarship. Her MSc student, Rocco van Velden, received the prestigious Wilhelm Frank scholarship. Prof Fidder also participated in the REEP programme, led by Prof. Karin Wolff from the Faculty of Engineering, which involves knowledge

practices in relation to improving foundational knowledge and the transition to Engineering sciences.

Prof. Bernd Fischer is a member of the editorial board for *ACM Transactions on Software Engineering Methodology* (TOSEM, associate editor), *Proceedings of the ACM on Software Engineering* (PACMSE), *Science of Computer Programming* – Software Section. He is a member of the steering committee for Automated Software Engineering (ASE, chair) and Software Language Engineering (SLE). He is a Program Committee member for the International Conference on Software Engineering (ICSE), International Symposium on Software Testing and Analysis (ISSTA), Conference on Fundamental Approaches to Software Engineering (FASE) and International Conference on Software Language Engineering (SLE). Prof. Fischer was awarded the Best Paper Award at the 12th International Conference on Networked Systems (2024). Together with the University of Molise, Italy, he received the Erasmus+ exchange grant of €56 165.00 from 2025-2027. He is a member, of the IFIP TC-2 Working Group 2.11, "Program Generation". He has active collaborations with G. Parlato (University of Molise, Italy) and S. La Torre (University of Salerno, Italy) on *Sequentialization-based techniques for the verification of concurrent software*. He visited Parlato at the University of Molise for four weeks, June-July 2024. He also has active collaboration with M. Raselimo and L. Grunske (Humboldt-University of Berlin, Germany), on "Grammar learning for complex software systems". As part of this, Raselimo visited Fischer at Stellenbosch University for two weeks, September 2024.

Prof. James Gray submitted two single author papers in 2024. The first was devoted to showing that weak action representability is not equivalent to action accessibility, and also that it does not enjoy the same stability properties. The second was on showing that the centre of the split extension classifier of a perfect object is necessarily trivial. Prof. Gray and Dr Michael Hoefnagel continued collaborating with X. García-Martínez (Universidade de Vigo, Spain), T. van der Linden (Université catholique de Louvain, Belgium), and C. Vienne (Université catholique de Louvain, Belgium). They are nearing completion of their first joint paper, which explores the categorical algebraic properties of the category of Heyting semi-lattices.

Dr Trienko Grobler is currently collaborating with Prof. George Azzopardi at the Bernoulli Institute (Groningen University). He is also collaborating with Prof. Waldo Kleynhans at the University of Pretoria.

Prof. Nick Hale has established new international research projects with Dr Ashleigh Hutchinson at the University of Manchester and Prof. Jan Nordström at Linköping University in Sweden. He organised and presented at the 45th South African Numerical and Applied Mathematics symposium (SANUM2024) in Stellenbosch and submitted a paper on this work with colleague Prof. JAC Weideman. He published a single author paper in the *IMA Journal of Numerical Analysis* on the topic of spectral methods for differential equations of delay-type. He is the Assistant Focus Area Coordinator for Numerical and Applied Mathematics for the DSI-NRF Centre of Excellence in Mathematical and Statistical Sciences and served on the NRF ratings panel for Applied Mathematics.

Dr Retha Heymann continued her work on Lyapunov algebras. Her PhD student, David Olabiyi, had the opportunity for a six-month exchange to Germany where she interacted with mathematicians in his area. Dr Heyman also played a leading role in the Riemann Academy, which provided inspiring talks for undergraduates at Stellenbosch, leading them in the direction of mathematics research. Together with Dr Christian Budde (University of the Free State), Dr Heymann has begun to organise an international conference on Evolution Equations to take place at Stellenbosch in October 2025.

Dr Michael Hoefnagel had four papers appear in 2024, three in strong category theory journals and one in the general mathematics journal, *Quaestiones Mathematicae*. He works with a range of collaborators, including internationally leading category theorist Dominic Bourn. Dr Hoefnagel has been developing a direction of research that has to do with unique-factorisation and refinement and seeks to understand these topics from an algebraic and categorical point of view. He supervises two PhD students in this area. In 2024, Dr Hoefnagel examined a PhD thesis for UCT and refereed for strong international journals in algebra, universal algebra and category theory.

Prof. Cang Hui leads the SARChI Biomathematics team. In 2024, he published 23 articles and delivered two keynote talks at international symposia (Purdue University, USA; Hefei University of Technology, China). His postdoctoral team gave four talks at international conferences and several at local events. He collaborated with STIAS fellow Ralf Seppelt from the Helmholtz Centre for Environmental Research (UFZ) in Germany on biodiversity and agriculture from a theoretical and biomathematical perspective. He organised a two-day workshop on modelling social wasp invasions, bringing together experts from Genetics, Conservation Ecology, SANBI, and visiting researcher Derek Daly (University of Liverpool). With Prof. Karin-Therese Howell from AIMS, he co-hosted an algebraic biology workshop at AIMS Muizenberg, fostering dialogue between local and international scientists (Andronikos Paliathanasis, David Holgate, Jeff Sanders, Matthew Macauley).

With Andrew Bell (Cornell University), he led a week-long NITheCS workshop on human-environment interactions, using agent-based modelling in NetLogo. He also organised workshops on biodiversity informatics, ecological modelling, and biodiversity data cube for policy, involving a broad range of stakeholders. In 2024, Prof. Hui's key international collaborators included Nick Isaac (United Kingdom Centre for Ecology and Hydrology), Quentin Groom (Meise, Belgium), Ulf Dieckmann (Okinawa Institute of Science and Technology Graduate University, Japan), Melodie McGeoch (Monash University, Australia), Min Su (Hunan University of Technology, China), Adrian Serohijos (University of Montreal, Canada), and Jessica Gurevitch (Purdue University, USA). He leads Stellenbosch

▲ Algebraic biology workshop at AIMS in Muizenberg.

University's team in the UK NERC-funded Global Insect Threat-Response Synthesis (GLiTRS) project and the EU Horizon Europe-funded Biodiversity Building Block for Policy (B3) project. He collaborates regularly through the Centre for Invasion Biology (as a core team member), AIMS (as a researcher), NITheCS (as an associate), and the International Initiative for Theoretical Ecology (IITE, London; as a trustee). He also serves on the editorial boards of nine international journals, including *Bulletin of Mathematical Biology*, *Ecological Complexity*, *Mathematics in Medical and Life Sciences*, *Journal of Dynamics and Games*, *Advances in Complex Systems*, *Global Ecology and Biogeography*, *Biological Invasions*, *BMC Ecology and Evolution*, and *Frontiers in Ecology and Evolution*.

Prof. Zurab Janelidze was on research leave in 2024, which led to seven papers submitted for publication, of which one is among the two papers co-authored by him that were published in 2024. In addition to this, several promising research projects were initiated. In particular, based on his earlier collaborative work with students taking the Foundations of Abstract Mathematics modules, Prof. Janelidze developed an open-source Python module, [ADA] (beta release published on github), for the assembly of deductive arguments (mathematical proofs) that is based on an original intuitive higher order logical framework. In 2024, Prof. Janelidze was on research visits to Portugal, Belgium, Italy and Estonia, which led to new collaborative research projects. He attracted two young Italian category theorists to take up post-doctoral positions in South Africa, one of which (Dr. Elena Caviglia) was appointed as a NITheCS postdoctoral fellow at Stellenbosch in 2024. Prof. Janelidze gave several invited talks at seminars and workshops in 2024: Category Theory Seminar, University of Louvain-la-Neuve (Belgium), September (invited by Prof. Marino Gran); Structures for the Foundations of Mathematics, University of Padova (Italy), September (invited by Prof. Milly Maietti); Algebra Seminar, University of Tartu (Estonia), September (invited by Dr. Ülo Reema); CT & CatAlg, Workshop on the occasion of Enrico Vitale, 60th birthday, University of Milan (Italy), September (invited by Prof. Beppe Metere on behalf of the organising committee); Informal Logic and Semantics Retreat, Tallinn (Estonia), September 2024 (invited by Prof. Tarmo Uustalu), Recent trends in gravitation, 32nd Chris Engelbrecht Summer School, NITheCS & UKZN Drakensberg, April (invited by Prof. Sunil Maharaj). Prof. Janelidze serves on the editorial boards of *Applied Categorical Structures*, *Cahiers de topologie et géométrie différentielle catégoriques*, and *Africa Matematika*.

Dr Shane Josias successfully completed his PhD in Applied Mathematics and graduated in December 2024. As part of his doctoral research, he presented his work at the British Machine Vision Conference (BMVC) in Glasgow, Scotland, in November 2024, where he was also recognised as an outstanding reviewer. Additionally, he secured research funding through the UCDP-UCDS programme, administered by the University of Pretoria and the Department of Higher Education and Training.

Prof. Steve Kroon continues his external collaboration with Dr Michael Burke (Monash University, Melbourne, Australia)**;** Prof. Stephan Chalup (University of Newcastle, Newcastle, Australia)**;** Prof. Luc de Raedt (Katholieke Universiteit Leuven, Belgium) and Dr. McElory Hoffmann (Praelexis).

Dr Pietro Landi was the co-author of five papers published in peer-reviewed international journals. A student under his supervision completed his PhD successfully and will graduate in March 2025

◀ Dr Shane Josias (far right) with colleague and supervisor Prof. Willie Brink and a graduate from the Machine Learning and Artificial Intelligence programme, Jean Randrianantenaina.

Prof. Florian Luca joined the department in August 2024. He had 21 papers published in 2024. Prof. Luca is a highly productive researcher, working in number theory and some related areas, with relevance to computer science. In November 2024, he and two other researchers were awarded the ERC Synergy Grant 101167561 – DynAMiCs. This multi-million Euro grant will have a substantial effect on Prof. Luca's research projects and contribution to Stellenbosch University. Prof. Luca gave an invited talk at the conference *Symbolic dynamics and arithmetic expansions* in Roscoff, France in September. He is on the editorial board for 10 mathematics journals, focussing on number theory or general mathematics.

Dr Graham Manuell joined the department in February 2024. He works in the general area of category theory, with a particular interest in point-free topology. Dr Manuell gave talks at the Topology, Algebra and Categories in Logic (TACL) conference in Spain, the Summer Conference in Topology in Portugal, and the South African Mathematical Society (SAMS) Annual Congress. He also visited the University of Coimbra in Portugal and was visited by Amartya Goswami (University of Johannesburg) and Ülo Reimaa (University of Tartu). He had two papers accepted for publication, "Uniform locales and their constructive aspects" and "The representing localic groupoid for a geometric theory", and also a chapter of a book on "Pointfree topology and constructive mathematics". He submitted two further papers for publication. He has ongoing collaborations with Lurdes Sousa, Joshua Wrigley, Ülo Reimaa and Nelson Martins-Ferreira from various universities overseas and with Peter Faul, James Gray and Michael Hoefnagel within the department.

Dr Sophie Marques saw her paper "A characterization of ramification groups via jet algebras", co-authored with Luigi Pagano, appear in the *European Journal of Mathematics*. A further paper, joint with her PhD student Daniella Moore, and Liendro Boonzaaier, appeared online in a leading algebra journal, with several more papers expected to appear in 2025. Dr Marques visited the Simons Laufer Mathematical Sciences Institute (SLMath) in Berkeley in July, with a grant from Berkeley, and XLim, a joint research unity of the University of Limoges, in November, with a grant from Limoges. While in France in November, she gave seminar talks at XLim, at Université Toulouse 3, Paul Sabatier, and at the Institut Montpelliérain Alexander Grothendieck. Dr Marques was a co-organiser of the international number theory conference held in Stellenbosch early in 2025, and of a workshop on Algebraic Stacks and Derived Categories at XLim in 2024.

Prof. Sonja Mouton had two papers published in 2024, one with her PhD student, Dimby Ravearivony, in *Quaestiones Mathematicae* and the other, with coauthor Robin Harte, in the *Bulletin of the Australian Mathematical Society*. Dimby Ravearivony successfully completed his PhD in 2024. Prof. Mouton continued to supervise her MSc student, Nicholas Sander. She also examined a PhD thesis for UJ, refereed for *Positivity* and *Filomat* and reviewed for *Mathematical Reviews*. Prof. Mouton made substantial progress with her research project "Irreducibility and its applications and OBAs" and she presented a talk at the Functional Analysis and Operator Theory South Africa 2024 Workshop (FAOTSA 2024) at AIMS SA, Muizenberg.

Dr Prince Nchupang successfully completed his PhD and will graduate in April 2025. He was appointed as lecturer in the division. He explored and implemented different teaching methodologies.

Dr Mkhuseli Ngxande is currently collaborating with Shoprite on fourth year Data Science projects. Additionally, he is working with Dr. Ndivhuwo Makondo from IBM on an honours project on creating a Natural Language Interface to Data Visualisation.

Dr Naina Ralaivaosaona saw his substantial paper "The birth of the strong components" appear in *Random Structures Algorithms*. He also supervised two PhD students, Brice Razakarinoro, who completed in time to graduate in December 2024, and Masreshaw Kassaye, who will graduate in March 2025, among other research students. Dr Ralaivaosaona was also heavily involved with the African Institute for Mathematical Sciences (AIMS), teaching there and taking part, with other colleagues from Mathematics, in the Imperial College-AIMS Connect Partnership Seed Workshop in June. Dr Ralaivaosaona played an important role in the organisation of an international number theory conference and a CIMPA graduate school that were both held in Stellenbosch in January 2025.

Dr Riana Roux has completed her collaborative research project on subdivision criticality with Prof. Michael Henning (University of Johannesburg), Dr Magdalena Lemanska and Dr Magda Dettlaff (Gdansk University, Poland) with two papers that is currently under review. She also continued her research projects with local collaborators at the University of Cape Town, University of Johannesburg, University of Pretoria, Rhodes University and the University of KwaZulu-Natal. Dr Roux presented her work on zero-forcing irredundance at the Gdansk Conference on Graph Theory in June in Poland. Her PhD student Opeyemi Oyewumi (co-supervisor Prof. Stephan Wagner) graduated in December 2024. Dr Roux, together with Dr Eric Adriantiana (Rhodes University) and Dr Valisoa Rakotonariva (University of Pretoria), have organised, as part of the CoE MaSS Graph Theory node, several collaborative research activities, including the Graph Theory Research Retreat in Pretoria in November.

Prof. Ingrid Rewitzky is a member of the International Mathematical Union Committee on Electronic Information and Communication (CEIC) and of the SU-UIC Standardisation Sub-committee for the International Senior Certificate introduced in 2022. Prof. Rewitzky was invited to participate in the MPS Workshop on Perspectives on Electronic Information and Communication in Mathematical Sciences at the Simons Foundation, New York, 12-13 September. She serves as an associate editor for *Quaestiones Mathematicae* and as Vice-Dean (Learning and Teaching) in the Faculty of Science.

Prof. Francois Smit was nominated by two first year Engineering students for recognition at the First-year Achievement Awards. Jana de Jongh, a BSc (Hons)

student that did her honour's project with Prof. Smit (with co-advisor Dr Marèt Cloete) presented a paper at Studentesimposium in die Natuurwetenskappe 2024, on her project. She came second in her group for her presentation, and her project won the overall prize for the most relevant in everyday life. Two papers of his post-graduate students were presented at the 13th South African Conference on Computational and Applied Mechanics (SACAM 2024). Prof. Smit was also involved with hosting interns from ENSEIRB-MATMECA in France.

Prof. Hugo Touchette spent much of 2024 on a research sabbatical visiting various universities and institutes in France, the UK, Canada, Spain, and India to develop his research collaborations on stochastic modelling and simulations. As part of these visits, he lectured at a summer school near Chamonix in France and gave invited talks at Cambridge University, the University of Paris, the University of Granada, and the International Centre for Theoretical Sciences in Bangalore, India. With a long-term collaborator in France, he was also busy writing a book titled *Transformations and Symmetries of Markov Processes* that will be published in 2026 by Cambridge University Press.

Prof. Bill Tucker presented the opening keynote entitled "Community-based Co-design" for the 31st Southern African Association for Institutional Research (SAAIR) conference, 5-8 November 2024, in Pretoria. He was invited by the conference chair, Michael Gordon, a former Honours student (2002) who is now Institutional Planner at TUT. He was a panellist for the cross-faculty roundtable discussion on generative AI and the University in the Department of Philosophy, Stellenbosch University, 19 September 2024. He was a session chair at FIP WG9.4 ICTD conference, Cape Town. He has been involved in editorial activities as Associate Editor, *ACM Journal of Personal and Ubiquitous Computing* to champion a human-centred design theme for responsible computing in the context of social development; reviewer for the *ACM Communications of the ACM (CACM), the South African Computer Journal (SACJ).* He has active collaboration with Dr Chris Low (Pitt River Museum, Oxford University) and !Khwa ttu San Cultural Heritage Centre, on a San education renarration project; Abalimi and Harvest of Hope NGOs for a community-farming project in Khayelitsha; Prof. Jean-Louis Fendji (University of Ngaoundéré) on community data in relation to CASI's Deaf and San renarration projects, e.g. to leverage community-sourced data for GAI/LLMs in low-resourced languages. In 2024 he secured R1.8 million in funding from the MICT SETA for 20 MSc and PhD bursaries and research expenses across the Computer Science Division, including students in Applied Mathematica and in the Machine Learning and Artificial Intelligence Masters' programme. Prof. Tucker also received a significant portion of the R16 million phase one funding from the Gates Foundation and SA Medical Research Council-funded project MzansiMed. R398 000 will be allocated for four bursaries.

Prof. Brink van der Merwe served on the programme committees for the 14th International Workshop on Non-Classical Models of Automata and Applications (NCMA 2024) in Göttingen, Germany; the 28th International Conference on Implementation and Application of Automata (CIAA 2024) and the South African Institute of Computer Scientists and Information Technologists (SAICSIT) 2024 conference. He was invited to participate in a Dagstuhl Seminar in Wadern (Germany) on "Regular Expressions: Matching and Indexing". Prof. Van der Merwe has on-going collaboration with Prof Yo-Sub Han (Theory of Computation Lab at Yonsei University, Seoul, South Korea). His PhD student, Sicheol Sung, visited Stellenbosch University's Computer Science Division for a six-month period during 2024-2025.

▲ Prof. Francois Smit with the two engineering students who nominated him for the First-Year Achievements Awards function.

Prof. Leon van Wyk had four papers published in 2024. Two of these were in *Linear Algebra and its Applications*, one was in the *Journal of Algebra* and one was in *Communications in Contemporary Mathematics*, a strong international general mathematics journal. He continued his collaboration with researchers in Warsaw, Bucharest and Miskolc, adding to his very substantial body of work on matrix algebras and polynomial identities. Prof. Van Wyk serves on the editorial boards of *Afrika Matematika*, *Miskolc Mathematical Notes* and *Quaestiones Mathematicae*.

Prof. Lynette van Zijl served on the editorial board for the *Journal of Universal Computer Science*.

Prof. J.A.C. Weideman was elected as Fellow of the Royal Society of South Africa in September 2024. He presented a talk at the conference Journées Approximation held in Lille, France, in May 2024. Local talks were presented at SANUM2024 in Stellenbosch, in the colloquium series of NITheCS, and at a colloquium held at the University of the Witwatersrand in honour of David Mason's 80th birthday. A paper with UK collaborators John King and Marco Fasondini was published in 2024 and another was submitted with colleague Nick Hale and sabbatical visitor Enrique Thomann. He served as associate editor for *Numerical Algorithms* and *Electronic Transactions of Numerical Analysis*.

Dr L. K. Wessels published the first article from her thesis, titled "On direct sums and quotient spaces of Near-vector spaces", in *Afrika Matematika*. The paper was co-authored by her PhD supervisor, Karin-Therese Howell, and P. Cara (Department of Mathematics, Vrije Universiteit Brussel, Belgium). She also began work on a further project with Karin-Therese Howell and Nancy Neudauer (Pacific University, Oregon).

AWARDS TO STAFF AND STUDENTS

Danielle Kleyn was awarded Stellenbosch University's prestigious Chancellor's Medal for 2024. Kleyn received the medal during her graduation ceremony where she was awarded a BSc Honours in Mathematics (*cum laude*). Only one student receives the award, which was first instituted in 1961. It is given annually to a final-year or postgraduate student who has not only excelled academically but has also contributed to campus life in numerous ways and helped develop co-curricular attributes. Over the past four years, Kleyn has excelled in national and international mathematics competitions. Between 2021 and 2024, she was placed in the top ten at the South African Tertiary Mathematics Olympiad. This year, she clinched first place in the competition. In 2023 and 2024 she represented the University and South Africa at the International Mathematics Competition. Kleyn has also been involved in mathematics research outside of her BSc Honours programme and separate from her honours project. As a maths coach for the South African Maths Foundation, she has been able to help develop a strong culture of Olympiad mathematics.

▲ Danielle Kleyn receiving the Chancellor's Medal for 2024. *Photo: Stefan Els*

▲ Rocco van Velden with Prof. Burtram Fielding, Dean of Science, at the Faculty of Science Postgraduate Research Conference. Photo: Ignus Dreyer

The following students received prizes for their performances in applied mathematics modules in 2023: **Daniel Ristow** (first-year applied mathematics), **Charles de Kock** (second-year applied mathematics), **Tyla Peens** (third-year applied mathematics) as well as **Adele Lourens** and **Rocco van Velden** (Honours in Applied Mathematics).

Daniël Cloete, MSc student, received a Travel Bursary from NITheCS to attend a summer school in France. July 2024. **Rocco van Velden** received a prize for the best presentation at the post-graduate conference presented by the Faculty of Science for which he received R10 000.

The following students received prizes for their performances in computer science modules in 2023: **Joseph Chemaly** and **Darren Dube** (first-year computer science), **Ryan Christie** and **Joshua Bloom** (second-year computer science), **Iain le Roux** and **Jean Weight** (third-year computer science), **Emile Ferreira** (Honours in Computer Science and Honours project) and **Abel Kotze** (Honours in Machine Learning).

Prof. A.P. Engelbrecht received the South African Institute for Computer Scientists and Information Technologies Pioneer Award for work in Computer Science, Information Systems and Information and Computation Technologies. He was also awarded Fellow of the Soft Computing Research Society of India.

Ms Tessa Malan (Honours, CS) was awarded a Rhodes Scholarship and began studying for a master's at Oxford University in October after being paid by the CDI (Child Development Index) team in SU's Linguistics Department to continue working on her 2023 Honours project from January to August.

Jacobie Mouton, a 2023 Computer Science MSc graduate, was the 2024 runner-up for the Deep Learning Indaba's Alele-Williams Masters Dissertation Award for excellence in research and writing by master's candidates at African universities, in any area of computational and statistical sciences.

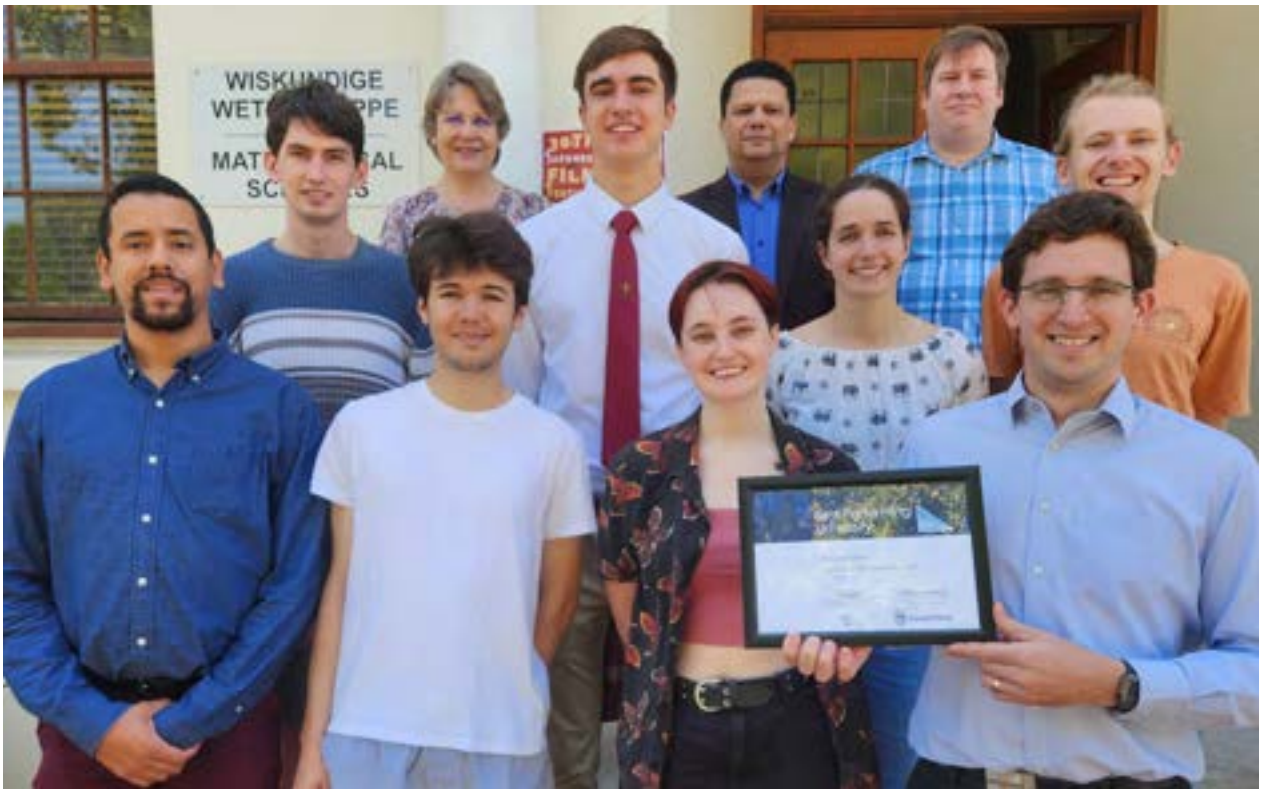
Profs Gareth Boxall, **Karin-Therese Howell** and **Francois Smit** and **Drs Lesley Wessels**, **Dirk Basson** and **Hardus Diedericks** were nominated by top performing 2023 first-year students to attend the First-year Achievement Awards dinner in March 2024.

▲ In front, Dr Lesley Wessels (2nd from the left) and Dr Dirk Basson (far right), and at the back Dr Gareth Boxall (3rd from the left) with the students who nominated them.

The following students received Rubbi book prizes for their performances in mathematics modules in 2023: **Luka Joubert** and **Samuel Lloyd Johnson** (first-year mathematics), **Christian Kotze** and **Kian Claassen** (first-year engineering mathematics), **Rachel Pereira** and **Kerry Porrill** (second-year mathematics), **Danielle Kleyn** and **William Carlyle Stewart** (third-year mathematics), **Bernardus Wessels** and **Nicholas Sander** (Honours in Mathematics).

Stellenbosch was the top performing university in the 2024 South African Tertiary Mathematics Olympiad. The following 8 students were all placed in the top 21: **Danielle Kleyn** (tied 1st), **Benjamin Kleyn** (tied 1st), **Hugo Bruwer** (3rd), **Kerry Porrill, Jared Slater**, **Karlo Grobbelaar**, **Jean Weight, Joseph Curunely**. The Stellenbosch involvement was led by **Dr Dirk Basson**.

The following students received prizes for a best talk at the South African Mathematical Society (SAMS) Annual Congress held at the University of Pretoria from 4 to 6 December 2024: **Kerry Porrill** (best undergraduate student talk prize), **William Stewart** (best Honours student talk prize), **Daniella Moore** (best PhD student talk prize).



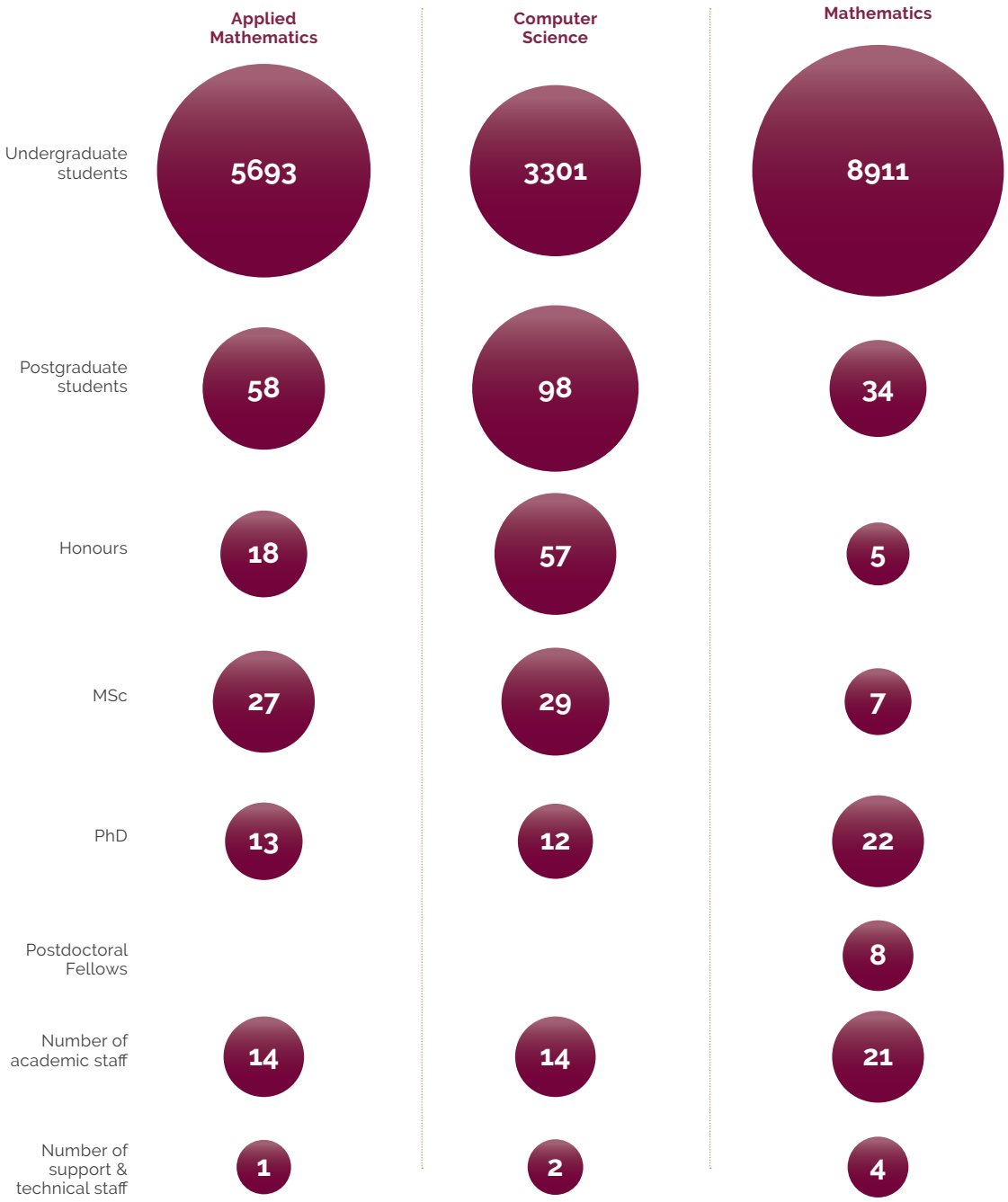
▲ Stellenbosch was the top performing university in the 2024 South African Tertiary Mathematics Olympiad, with eight students in the top 21. Photo: Wiida Fourie-Basson

ACADEMIC AFFAIRS

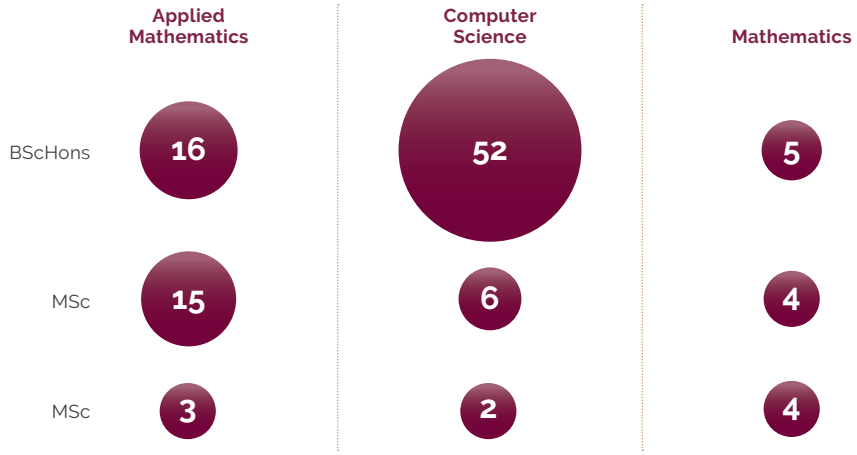
A change was made to the definition of Major in Mathematics. This change gives a more restricted list of modules that should be taken at Stellenbosch in the third year to qualify for a Major in Mathematics.

Changes were made to the Foundations of Abstract Mathematics modules (Mathematics 278 and Mathematics 378). They were changed from 32 credit year-long modules to 16 credit modules, with this change to be phased in over the next few years.

Changes were decided for the BSc Honours in Mathematics, to make it more focused and to better reflect research interests in the Mathematics Division.



Number of graduates 2024



STAFF MATTERS

Dr Dirk Basson and **Dr Elna Ungerer** resigned from the Mathematics Division with effect from 1 February 2025. During 2024 several new appointments were made in the Mathematics Division: **Dr Miles Askes**, **Dr Karin Bothma**, **Dr Peter Faul**, **Prof. Florian Luca** and **Dr Graham Manuell**. **Dr Chevarra Hansjeev** was appointed in the Applied Mathematics Division, starting in 2025..

Dr Sophie Marques was promoted to associate professor, while **Dr Dirk Basson** and **Dr Marcel Dunaiski** were promoted to senior lecturers. **Dr Shane Josias** and **Prince Nchupang** were promoted to lecturers.

CURRENT NRF-RATED RESEARCHERS	
Leading international researchers	
Prof A Engelbrecht	Artificial Intelligence
Prof F Luca	Number theory
Prof JAC Weideman	Numerical analysis and scientific computing
Prof W Visser	Software failure, software engineering and software development
Internationally acclaimed researchers	
Prof B Fischer	Software engineering
Prof N Hale	Numerical analysis and scientific computing
Prof C Hui	Biomathematics and ecological modelling
Prof Z Janelidze	Category theory
Prof H Prodinger	Analysis of algorithms, number theory and combinatorics
Prof H Touchette	Theory of large deviations
Prof L van Wyk	Matrix algebras and polynomial identities
Established researchers	
Prof G Boxall	Model theory and some aspects of number theory
Prof J Gray	Category theory

SOCIAL IMPACT

Soapbox Science Cape Town was held at the V&A Waterfront in October. At this event women and non-binary scientists interact with the public and tell them more about their research in an interactive way in an open public space (last year at the Pierhead at the Waterfront). **Dr Riana Roux** presented the following topic: Colour the world: How graphs and colours solve scheduling problems.

▲ Dr Riana Roux presenting at the Soapbox Science Cape Town in the V&A Waterfront. Waiting for high res version

Drs Dirk Basson and **Liam Baker** were significantly involved with mathematics competitions in 2024. Dr Baker was co-chair of the Pan African Mathematics Olympiad and was also on the problem committee for that and for the Simon Marais Mathematics Competition, an international competition for university students. Dr Basson led the Stellenbosch University involvement in the South African Tertiary Mathematics Olympiad.

Prof. Bruce Bartlett was interviewed on the John Maytham show on Cape Talk about the 2024 South African election voter turnout and gave a talk, titled "From Kepler to Ramanujan: solving math problems using symmetry" for the Mensa Society of the Western Cape.

The online magazine *Wisaarkhu*, founded and managed by **Dr Sophie Marques**, continued to supply readers with thought-provoking columns on topics related to the teaching and learning of mathematics.

Dr Ronalda Benjamin, through the Rising Above project she started in Worcester, provided learners from disadvantaged backgrounds with help and encouragement to get better at math.

Together with Dr Elena Caviglia and Dr Luca Mesiti and in collaboration with NITheCS and SAMF, **Prof. Zurab Janelidze** organised a Future Mathematicians session at the South African Mathematical Society (SAMS) Congress in December 2024, where school learners and junior undergraduate students were invited to explore mathematics together with mathematicians and more senior students in mathematics.

Prof. Bill Tucker, leading the Computing and Society Impact (CASI) research group, is coordinating and involved in the following six projects:

- **Co-designing agricultural technology for small-scale peri-urban and/or rural farming:** With PhD student, Bhekisisa Dube, co-supervised with Prof. Thinus Booysen in Electrical Engineering. The work is to support humans-in-the-loop for peri-urban/rural farming with low-cost Internet of Things (IoT) devices running "tiny ML" software. We are in collaboration and discussions with Prof. Melissa Densmore and Ms Sarina Till at the University of Cape Town's Computer Science Department and the FairFood NGO.

- **Community-based co-design of renarration software for San educators:** With MSc student Courtnay Dalton, the work is to support renarration of primary school education content in local San languages together with teachers and students at a remote village school in northeast Namibia, Tsumkwe, with a software platform running on a solar powered WiFi hotspot. Our collaborators are Dr Chris Low (Oxford University) and the !Khwa ttu San Cultural Heritage Centre.

- **Deaf Education Annotation Framework (DEAF):** Honours student Zander Vermeulen co-supervised with Prof. Frenette Southwood at SU's Linguistics Department. Essentially a browser, plug-in-based approach to renarrate school content in South African Sign Language. Our main collaborators are the Dominican School for Deaf Children and HandLab.

- **Empowering Peri-Urban Farmers: a user-centred approach to developing a market application:** With a new Honours student Dirk Bester. Essentially, a supply chain management system using the WhatsApp API to help community farmers in Khayelitsha get their produce to restaurants. Our collaborators are Abalimi and Harvest of Hope NGOs.

- **Childhood Development Index (CDI) data collection**: with a former Honours student, Tessa Malan, and the CDI Team in Linguistics, including Profs Heather Brookes and Frenette Southwood. The CDI Team paid Tessa to continue working on her 2023 Honours project on a mobile app to collect data from mothers in several official South African languages. The data is then supplied to the CDI team for analytics.

- **MzansiMed - Advancing Healthcare equity through language access:** This is a mobile app that helps users

interact with pharmacists who do not speak a local South African language. The app uses AI and LLMs to help bridge the gap. Our collaborators are pharmacists and linguists at the University of the Western Cape.

COLLABORATION

Australia
- Griffith University
  International Institute for Applied Systems Analysis
- La Trobe University
  Monash University
  University of Newcastle
  University of New South Wales
- University of Tasmania

Belgium
- KU-Leuven
  Ghent University
  Vrije University
  Université catholique de Louvain
- University of Louvain-la-Neuve
- University of Antwerp

Brazil
- Universidade Federal de Itajuba

Canada
- Brock University
- Lakehead University
- Ontario Tech University
- University of Quebec

Chile
- Universidad de Concepción

China
- China Agricultural University
- Chinese Academy of Sciences
- Hefei University of Technology
- Nanjing Forestry University

Cyprus
- Research Centre on Interactive Media, Smart Systems and Emerging Technologies
  University of Cyprus

Estonia
- University of Tartu

France
- Ecole Polytechnic
- IMT Atlantique in Nantes
- Université de Toulouse
- Université du Littoral
- Université Paris Cité
- Université Paris-Saclay
- University of Bordeaux
  University of Cote d'Azur
- Xlim

Germany
- Braunschweig University of Technology
  Friedrich-Wilhelms University, Bonn
- Justus-Liebig-University Giessen
  Max-Planck Institute for Mathematics, Bonn
- Max-Planck Institute for Mathematics, Bonn
  Technical University of Kaiserslautern
  Friedriech-Alexander University, University of Erlangen
- University of Hamburg

Hungary
- Alfréd Rényi Institute of Mathematics
- University of Debrecen
  University of Miskolc

India
- Indian Institute of Technology Roorkee

Ireland
- Trinity College, Dublin

Italy
- Université de Rome
- University of Molise, Isernia
- University of Padova

Japan
- Institute for Global Environmental Strategies
- Okinawa Institute of Science and Technology

Madagascar
- University of Antananarivo

Poland
- Gdańsk University of Technology
- Warsaw University of Technology

Portugal
- Polytechnic Institute of Leiria
- Polytechnic University of Viseu
- University of Coimbra
- University of the Algarve

Romania
- University of Bucharest

South Africa
- Council for Scientific and Industrial Research (CSIR)
- North-West University
- Rhodes University
- University of Cape Town
- University of Johannesburg
- University of Pretoria

- University of South Africa
- University of the Western Cape
- University of the Witwatersrand

Spain
- Institute of Agriculture and Food Research and Technology, Barcelona
- University Fuenlabrada
- Universidade de Vigo
- University of Lleida

Sweden
- Nordic Institute for Theoretical Physics (Nordita), Stockholm
- Umeå University

Switzerland
- ETH Zurich
- University of Fribourg

Tanzania
- Mkwawa University College of Education
- University of Dar es Salaam

The Netherlands
- IHE Delft Institute for Water Education
- University of Groningen
- Utrecht University
- Vrije Universiteit Amsterdam

Turkey
- Bilkent University
- Mammara University

United Kingdom
- Aberystwyth University
- Imperial College London
- InstaDeep (South African Office) DeepMind
- King's College London
- Lancaster University
- University of Cambridge
- University College London
- University of Glasgow
- University of Leicester
- University of Manchester
- University of Oxford
- University of Strathclyde

United States of America
- Chapman University
- John Hopkins University
- Machine Intelligence Research Labs, Auburn, Washington
- Massachusetts Institute of Technology
- Oregon State University
- Purdue University
- Pacific University
- Stanford University
- University of California, San Diego
- University of Houston
- University of Kentucky
- University of Louisiana at Lafayette
- University of Notre Dame
- University of Rhode Island

Zambia
- University of Zambia

FUNDING

South Africa
- Centre of Excellence for Mathematical and Statistical Sciences (CoE-MaSS)
  DHET University Capacity Development Programme
- DST/NRF SARChI Programme
  EU Marie Skłodowska-Curie Actions (MSCA) Staff Exchange
- Gates Foundation
- International SA / France (NRF-PROTEA)
  Media, Information, and Communication Technologies (MICT) Sector Education and Training Authority
- National (SETA)
- Graduate Academy for Mathematical and Statistical Sciences (NGA-MASS)
  National Institute for Theoretical and Computational Sciences (NITheCS)
  NRF Thuthuka Programme and Rated Researchers Programme
- South Africa Medica Research Council (SAMRC)
- Stellenbosch University – Subcommittee B

STAFF LIST

Applied Mathematics Division

Academic staff

Professor
- Prof H Touchette
- Prof A Weideman

Associate professor
- Prof W Brink
- Prof S Fidder-Woudberg
- Prof N Hale

- Prof F Smit

Senior lecturer
- Dr H Coetzer
- Dr H Diedericks (Div head)
- Dr R Roux

Lecturer
- Dr M Cloete
- Dr A de Villiers
- Dr P Landi

Extraordinary appointments, research fellows and academic rank
Extraordinary professor
- Prof J Pulliam
- Prof U Paquet (academic rank)

Extraordinary associate professor
- Prof S Moyo (academic rank)

Extraordinary senior lecturer
- Dr E Dufourq (academic rank)
- Dr M Hoffman
- Dr A Pretorius
- Dr R Sweke (academic rank)
- Dr C van Schalkwyk (academic rank)

Extraordinary lecturer
- Dr L Bolton (academic rank)
- Dr J Wilms

Professional and support staff
Administrative
- S Fortuin

Service
- M Sebastiaan

Computer Science Division

Academic staff
Professor
- Prof AP Engelbrecht
- Prof B Fischer
- Prof B Tucker
- Prof L van Zijl
- Prof AB van der Merwe (Div head)
- Prof W Visser

Associate professor
- Prof S Kroon

Senior lecturer
- Dr T Grobler
- Dr C Inggs

Lecturer
- Dr M Dunaiski
- Mr I Govender
- Ms H Haroldt
- Dr M Ngxande
- Dr G Rens

Junior lecturer
- Mr W Bester

Extraordinary appointments, research fellows and academic rank
Extraordinary professor
- Prof L Pretorius

Extraordinary associate professor
- Dr F Yamaguchi
- Dr L Cleophas

Extraordinary lecturer
- Dr M Raselimo

Professional and support staff
Administrative
- G Fortuin

Service
- W Isaacks

Mathematics Division

Academic staff
Professor
- Prof C Hui
- Prof F Luca
- Prof Z Janelidze
- Prof S Mouton
- Prof I Rewitzky (HoD)
- Prof L van Wyk

Associate professor
- Prof B Bartlett
- Prof G Boxall (Div head)
- Prof J Gray

Senior lecturer
- Dr R Benjamin
- Dr M Hoefnagel
- Dr S Marques
- Dr N Ralaivaosoana

Lecturer
- Dr Askes
- Dr L Baker
- Dr D Basson
- Dr K Bothma
- Dr P Faul
- Dr R Heyman
- Dr D Manuell
- Dr E Ungerer
- Dr L Wessels

Extraordinary appointments, research fellows and academic rank
Extraordinary associate professor
- Prof KT Howell (academic rank)
- Prof NA Neudauer

Lecturer (extraordinary lecturer)
- Dr M Marias
- Dr A Ouhinou

Professional and support staff
Administrative
- D Louw
- L Muller

Service
- D Stephanus

Postdoctoral fellows

- Dr E Caviglia
- Dr D Gergonne
- Dr J Jansma
- Dr GJ Kietzka
- Dr MS Kubyana
- Dr J Rodger
- Dr S MacFadyen
- Dr VH Ranaivomanana

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Mathematics Division
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Email: maths@sun.ac.za
Web: https://math.sun.ac.za/

Department of Microbiology

RESEARCH INTERESTS

- Bioprocessing
- Synthetic and systems biology
- Lactic acid bacteria: Antimicrobial peptides, Probiotics, Nano-biosensors
- Microbial ecology and mycology
- Environmental and host associated microbiomes
- Biological treatment of water sources
- Secondary metabolite production and antifouling potential
- Yeast and fungal biotechnology for bioenergy and the bioeconomy
- Waste valorisation
- Bioplastic hydrolysis
- Functional microbial bioinformatics
- Biotechnologies for water treatment
- Interactions of opportunistic pathogens
- Biofilm ecology
- Wastewater-based epidemiology
- Environmental analytical chemistry
- Environmental microbiology
- Eco-toxicology
- Real-time microbial activity and water quality monitoring.

RESEARCH HIGHLIGHTS

▲ The Urobo Biotech team, from left to right, Prof. Lorenzo Favaro (Padova University), and from SU Dominique Rocher, Prof. Marinda Viljoen-Bloom and Dr Wessel Myburgh.

New spin-out company Urobo Biotech established

Dr Wessel Myburgh, PhD student **Dominique Rocher** and **Prof. Marinda Viljoen-Bloom** were appointed as directors of Urobo Biotech, a new Stellenbosch University spin-out company. The company, focusing on microbial hydrolysis of bioplastics, also received a Research Innovation and Excellence Awards: Technology Transfer/Innovation Award in 2024. Urobo Biotech was born from a long-term research collaboration with Prof. Lorenzo Favaro of the University of Padova (Italy) that included several researchers and postgraduate students at both universities. Together with Dr Rosemary Cripwell, Prof. Favaro also established Agri-E, a startup supported by Padova University, focusing on bioenergy from agricultural waste.

Two novel *Psilocybe* species described from Southern Africa

M.Eng student **Breyten van der Merwe** and **Prof. Karin Jacobs** published a paper in the journal *Mycologia*, describing two novel *Psilocybe* species, *P. ingeli* and *P. maluti*, from Southern Africa. With their co-workers they reported on the medicinal use of this mushroom in traditional medicine. Late in 2024 the paper was the most read paper of the journal with more than 12 500 reads.

▲ *Psilocybe maluti* was found growing in pastureland on cow manure in the Free State, KwaZulu-Natal and the highlands of the Kingdom of Lesotho. *Credit: Cullen Taylor Clark*

▲ A single collection of *Psilocybe ingeli* was found in KwaZulu-Natal, growing in pasture land. *Credit: Talan Moult*

The Stellenbosch Biofoundry

The Department of Microbiology at SU has established the Stellenbosch Biofoundry, a cutting-edge facility designed to accelerate biotechnology research and development in South Africa. The Biofoundry integrates synthetic biology, automation, and high-throughput analytics to optimise microbial production systems and biomanufacturing processes. The facility will provide a range of specialised services, including high-throughput strain development, small-scale bioprocess optimisation, and bioassay workflows. By offering researchers, startups, and industry partners access to state-of-the-art biomanufacturing tools and expertise, the Stellenbosch Biofoundry is poised to drive bio-based innovation and strengthen South Africa's bioeconomy.

Searching for microbes in the Antarctic

PhD student **Nosipho Hlalukana** from **Prof. Thulani Makhalanyane**'s microbiome group went on an Antarctic expedition on board the SA Agulhas II from 13 December 2024 to 11 February 2025 to collect marine samples for use in marine studies. Another postgraduate student, **Mayibongwe Buthelezi**, also went on an Antarctic research expedition – the PS146 aboard Polarstern from 12 December 2024 to 12 March 2025. He collected samples to be used for culture-dependent and -independent methods, in studying the effects of spatial changes on microbial communities' microbial breakdown of organic sulfur compounds to circumvent Antarctic environmental changes.

▲ Mayibongwe Buthelezi during his three-month-long Antarctic research expedition.

▲ Nosipho Hlalukana on board the SA Agulhas II.

Presenting on clinically relevant fungi at international conferences

During 2024 members of **Prof. Alf Botha**'s research team presented their findings on the interactions of clinically relevant fungi at two international conferences. Posters were presented at the AIDS Mycoses International Workshop that was held in Cape Town between 10 and 12 July 2024 by Heidi Steffen, Elizaveta Koroleva and Corné van Deventer. The titles of their presentations were respectively: "Up the river without a paddle: Challenges facing quantitative microbial risk assessment of waterborne fungal infections", "Polyamine metabolism in the biology of the emergent fungal pathogen *Emergomyces africanus*" and "Investigating phenotypic virulence expression among clinically relevant ascomycetous yeasts". A few months later Heidi presented a talk at the 16th International Congress on Yeasts that was held in Cape Town from 30 September until 4 October 2024. The title of her presentation was "Diversity of phenotypic virulence in *Candida* spp."

▲ A micrograph of the endemic opportunistic fungus *Emergomyces africanus*, which causes severe morbidity and mortality among immunocompromised patients in South Africa.

RESEARCH ACTIVITIES

Prof. Alf Botha is a member of the editorial board of *FEMS Yeast Research* (2008 – present); editor of the *Canadian Journal of Microbiology* (associate editor since 2011).

Prof. Leon Dicks serves on the editorial boards of the journals *Probiotics and Antimicrobial Proteins* (associate editor from 2008 to the present), *Beneficial Microbes* (associate editor, from 2008 to the present), *Annals of Microbiology* (2013 to the present) as well as *Bioscience of Microbiota, Food and Health* (2011 to the present). The latter is the joint scientific journal of the Japan Bifidus Foundation, the Japanese Association for Food Immunology, and the Japan Society for Lactic Acid Bacteria. Prof. Dicks serves as chief editor of the *South African Journal of Enology and Viticulture* (editor since 2005).

Prof. Karin Jacobs is a member of the editorial boards of *Mycology: An International Journal of Fungal Biology* (Taylor and Francis), *African Biodiversity and Conservation Journal* (*Bothalia*) (AOSIS) and *ISME Communications* (Nature journal). Prof. Jacobs also served on the organising committee of the 19th International Symposium on Microbial Ecology (ISME19), 18-23 August 2024, held at the Cape Town International Convention Centre (CTICC). She was also invited as co-lecturer for the PhD course in "Frontiers in Microbial Ecology" at the University of Groningen, 17-22 November 2024.

Prof. Wesaal Khan forms part of the South African Higher Education Community Engagement Forum and is a member of the editorial board of the *Journal of Environmental Chemical Engineering* (Elsevier). She currently serves as a member of the NRF Rating Specialist Committee for Basic and Applied Microbiology.

Prof. Marinda Viljoen-Bloom is co-founder and director of Urobo Biotech, a Stellenbosch University spinout company that received the Innovus Technology Transfer / Innovation Award in 2024. She serves on the PhD Teaching Board in Crop Science at the Padova University (Italy) and was nominated for a Research Innovation and Excellence Award in the category: Women in Research, in 2024.

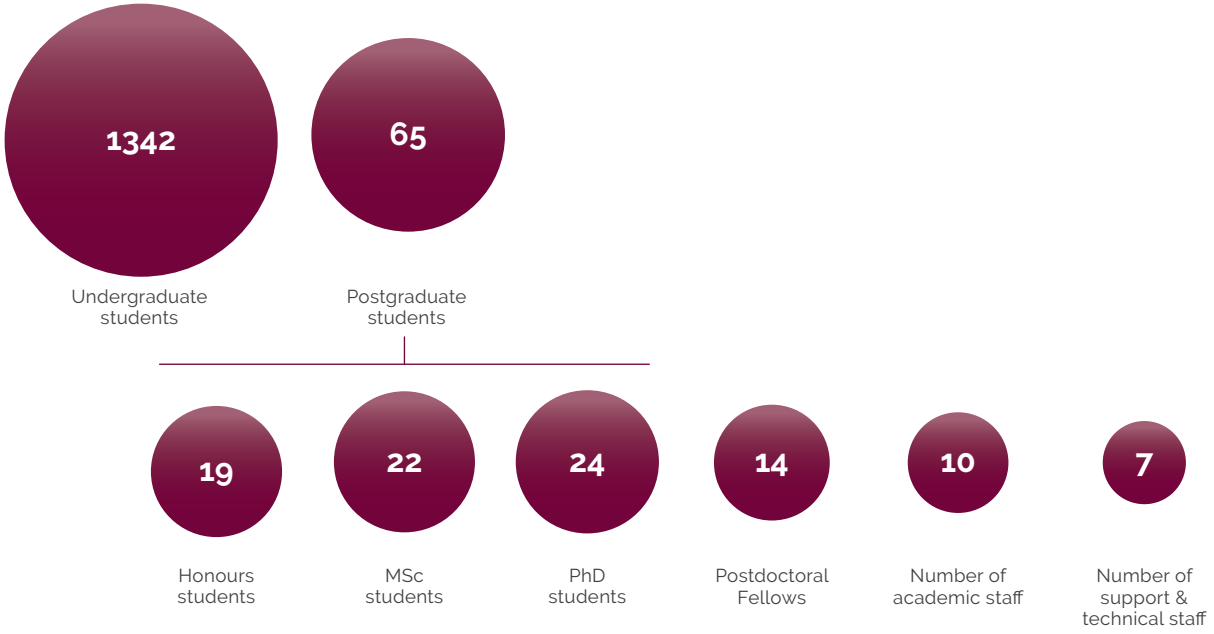
Prof. Heinrich Volschenk's research group is a member of the South African mRNA vaccine consortium (SAMVAC) which was established to address the challenges associated with creating a self-sufficient, sustainable, and pandemic-responsive African mRNA vaccine manufacturing hub. African-based production of mRNA vaccines currently relies heavily on international supplies of essential reagents which inflate manufacturing costs.

Prof. Gideon Wolfaardt is an inventor and co-founder of BioTrac Systems, for which he and his team received the Innovus Technology Transfer / Innovation Award in 2024. He also received the 2024 Faculty of Science's Postgraduate Supervision Award. His research is funded by amongst others two Horizon EU projects, an EU-JPI project, the Rand Water Chair in Public Health, as well as two German-funded projects (BMBF and the German Federal Ministry of Education and Research).

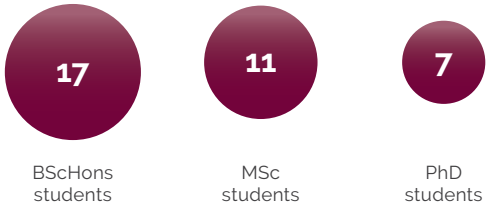
Prof. Thulani Makhalanyane serves as Editor in Chief of the *ISME Journal* and Senior Editor at *mSystems* and the *Journal of Sustainable Agriculture and Environment*. He serves on the editorial boards of *FEMS Microbial Ecology and FEMS Environmental Microbiology*. Prof. Makhalanyane serves on the Executive Advisory Board for the International Society for Microbial Ecology. He is a member of the prestigious Soil Stars. He is convener of the Rating Specialist Committee for Basic and Applied Microbiology, and a council member of the South African Society for Microbiology.

Dr Trudy Jansen serves as secretary of the South African Society of Microbiology (SASM).

ACADEMIC AFFAIRS



Number of graduates 2024



NRF-RATED RESEARCHERS	
Internationally acclaimed researchers	
Prof GM Wolfaardt	Applied and environmental microbiology
Prof A Botha	Yeast ecology
Prof TP Makhalanyane	Microbiome research
Established researchers	
Prof H Volschenk	Discovery, engineering, and recombinant production of novel enzymes/proteins of industrial relevance using synthetic biology and functional bioinformatics approaches in yeast
Prof K Jacobs	Microbial ecology and taxonomy
Prof W Khan	Innovation in rainwater treatment and monitoring; biosurfactants as alternative antimicrobials and antifouling agents
Prof M Viljoen-Bloom	Expression of recombinant proteins in yeasts
Y- Rated researchers	
Dr Peter Montso	Microbiome research
Dr C Truter	Molecular Biology, ecotoxicology, endocrine disruptors and biosensors

STAFF MATTERS

Prof. Gideon Wolfaardt retired at the end of 2024. **Dr Heinrich Volschenk** was promoted to associate professor from January 2024.

AWARDS TO STAFF AND STUDENTS

The spinout company Urobo Biotech received a Research Innovation and Excellence Award: Technology Transfer/ Innovation Award from SU.

Prof. Marinda Viljoen-Bloom was nominated for a Research Innovation and Excellence Award: Women in Research.

Dr Wessel Myburgh received a Research Innovation and Excellence Award: Doctoral Students from SU.

Prof. Thulani Makhalanyane received the South African Society for Biochemistry and Molecular Biology (SASBMB) Silver Award in June 2024.

Mr. Mayibongwe Buthelezi won the Early Career Researcher ISME Best poster award. Mayi was also awarded the best poster presentation at the CERI-SACEMA 2024 symposium.

Dr. Nonsikelelo Hlongwa, received the L'Oréal-UNESCO For Women in Science Young Talents South Africa Award.

Prof. Gideon Wolfaardt received the Innovus Technology Transfer / Innovation Award, and the Faculty of Science's Postgraduate Supervision Award. **Dr Cleo Conacher** received the Deputy Vice-Chancellor's Top 5 Postdoctoral Research Fellows Award.

▲ Ms Elizaveta Koroleva receiving her prize from Prof. Burtram Fielding. Photo: Ignus Dreyer

▲ Dr. Nonsikelelo Hlongwa

Ms Elizaveta Koroleva received Best Poster Award at the Postgraduate Research Conference of SU's Faculty of Science.

SOCIAL IMPACT

Prof Gideon Wolfaardt is a co-principal investigator of the EU funded project "Diversifying revenue in rural Africa through bio-based solutions", which is focussed on contributing to sustainable livelihoods in rural areas of Africa, through domestic agri-food systems which can sustain growing populations in an inclusive and environmentally friendly way in the long term.

Prof. Thulani Makhalanyane is the outgoing Director of the International Society for Microbial Ecology's Ambassador Program. This program promotes microbial ecology through coordinating Ambassadors in over 100 countries. The support includes training workshops for learners and other programs for Early Career Researchers.

COLLABORATION

South Africa and Africa
- University of Botswana
- University of Cape Town
- University of Johannesburg
- University of the Western Cape

International
- Johns Hopkins University (USA)
- Polytechnic University of Madrid (Spain)
- Sustainable Livelihoods Foundation
- Ulster University
- University of Groningen
- University of Oxford (UK)
- University of Padova (Italy)
- Wake Forest University (USA)

FUNDING

South Africa
- Central Analytical Facilities (CAF), Stellenbosch University
- Cipla MedPro
- Claude Leon Foundation
- De Novo Food Labs
- Department of Science and Innovation, South Africa
- Energy and Water Sector Education and Training Authority (EWSETA)
- First Rand
- FirstRand Foundation
- National Research Foundation
- Rand Water
- South African Biosystematics Initiative
- South African Medical Research Council
- South African National Energy Research Institute
- Stellenbosch University
- Water Research Commission
- Western Cape Government, Environmental Affairs and Development Planning

International
- Bill & Melinda Gates Foundation
- BMBF (German Federal Ministry of Education and Research; water security in Africa Programme)
- Danisco
- EPSRC/GCRF Global Challenges Research Fund
- European Commission Horizon 2020
- Global Challenges Research Fund
- Grand Challenges Africa
- UKRI GCRF/Newton Fund Agile Response call to address COVID-19

STAFF LIST

Academic staff

Professor
- Prof A Botha (HoD)
- Prof L Dicks
- Prof K Jacobs
- Prof W Khan
- Prof T Makhalanyane

Associate professor
- Prof H Volschenk
- Prof M Viljoen-Bloom

Lecturer
- Dr T Jansen
- Dr R Ngobeni

Extraordinary appointments, research fellows and academic rank

Extraordinary professor
- Prof B Fielding (academic rank)
- Prof S Liss
- Prof LR Lynd

Extraordinary associate professor
- Dr L Favaro
- Dr S Giannakis
- Prof C Gilchrist
- Prof L Joubert

Professional and support staff

Administrative
- T van der Merwe
- W Wentzel

Technical
- T Daniels
- J de Kock
- M Gey von Pittius

Service
- L Daniels
- M Stuurman

Postdoctoral fellows

Contract researchers and project managers
- Dr E Bester
- Dr K Bester
- Dr M Botes (SUWI)
- Dr R Cripwell
- Dr S Rose
- Dr C Truter
- Mr O Jacob
- Mr D Rowland

CONTACT DETAILS

Tel: 021-808-5847 **Fax:** 021-808-5846
Email: wendyw@sun.ac.za **Web:** http://www.sun.ac.za/english/faculty/science/microbiology

Department of Physics

RESEARCH INTERESTS

Astrophysics | Cosmology

- Black hole accretion
- Large-scale structure of the Universe
- Radio astronomy
- Relativistic astrophysics
- Theoretical cosmology

Theoretical Physics

- Condensed matter
- General relativity, cosmology, and the physics of black holes
- Non-commutative quantum mechanics and field theory
- Quantum phase transitions and exceptional points
- Soft condensed matter and biophysics
- Solitons in field theory and particle physics

Nuclear Physics | Health and Radiation Physics

- Applications of artificial intelligence
- Co-linear cluster tripartition mode in ternary fission
- Computational nuclear physics
- Fundamentals of single particle properties on nucleons inside a nucleus
- New radiation detector technologies
- Nuclear clustering phenomenon in light and heavy nuclei
- Nuclear radiation in the medical and health sector
- Nuclear structure and interactions
- Nuclear techniques and technologies to study nuclear radiation in the environment
- Pygmy resonance within nuclei
- Structural properties on the atomic nuclear and fundamental interactions within the nucleus

Laser Physics

- Biophotonics
- Closed loop quantum control and quantum simulation using trapped ions
- Laser pulse shaping for microscopy
- Laser-based additive manufacturing and X-ray tomography.
- Nonlinear spectroscopic and imaging techniques
- Optical Tweezers
- Quantum Communication
- Quantum information processing with light
- Quantum light-matter interactions
- Quantum sensing
- Resonant ionization spectroscopy and ion beam production
- Super resolution microscopy
- Transient absorption spectroscopy

RESEARCH HIGHLIGHTS

Muon detector from IP2I to support cosmic-ray research at SU and UWC

Cutting edge technology in the form of a muon detector on loan from the Institute of Physics of the Two Infinities (IP2I) in Lyon, France, will kick-start cosmic-ray research at Stellenbosch University (SU) and the University of the Western Cape (UWC). The exchange forms part of a series of scientific studies to determine the merits of constructing a deep underground laboratory north to the Huguenot tunnel in the Du Toitskloof Mountain pass between Worcester and Paarl. South Africa's Department of Science and Innovation (DSI) recently allocated seed funding of R5 million for scientific and engineering studies to determine the feasibility of the proposed Paarl Africa Underground Laboratory (PAUL). If it goes ahead, it will be a first for Africa and only the second such laboratory in the southern hemisphere. The muon detector was developed

by Dr Jacques Marteau, a particle physicist at IP2I, a joint research unit of France's National Centre for Scientific Research (CNRS) and Claude Bernard University Lyon 1. Martineau will be working closely with Dr JJ van Zyl, an experimental physicist at SU's Department of Physics, and Prof. Robbie Lindsay from UWC's Department of Physics and Astronomy and their postgraduate students.

▲ In front of the plastic scintillator type of muon detector are, from the left, Dr J.J. van Zyl, MSc student Stephan Jonker and Prof. Richard Newman – all from SU. Next to them are Prof. Robbie Lindsay and Dr Lumkile Msebi from the University of the Western Cape, followed by Prof. Faïriouz Malek and Dr Jacques Marteau, both affiliated with the National Centre for Scientific Research (CNRS) in France. *Photo: Ignus Dreyer*

Stellenbosch laser physicist develops protocol for production of high-tech radiopharmaceuticals

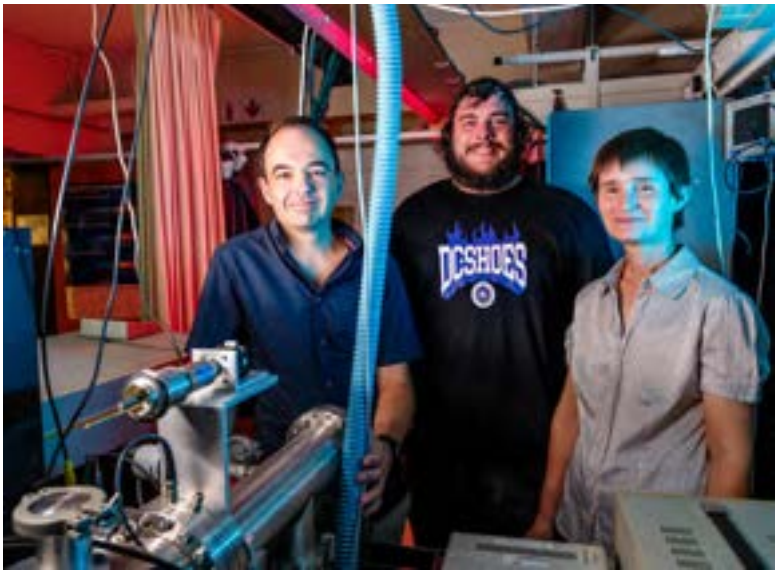
Dr Christine Steenkamp and high-tech company Enlightened Isotopes, a subsidiary of ASP Isotopes, have entered into a research partnership worth R8.5 million to develop a protocol for the separation of the ytterbium-176 isotope to be used as a radiopharmaceutical in cancer therapy. Worldwide, isotope producing companies are looking for alternative technologies as traditional sources, mostly nuclear reactors, are coming to the end of their life cycles. At present, Russia and China are the world's largest suppliers of isotopes.

Dr Steenkamp has been investigating the use of laser-based resonance ionisation as a technique to purify atomic isotopes for medical use since 2015. She is doing research in the field of resonance ionisation spectroscopy – an extremely sensitive and highly selective analytical measurement method to detect individual atoms and molecules. Steenkamp and her team have already successfully applied the technique to zinc isotopes, as the production of pure zinc-68 is important for the production of gallium-68 (used in medical PET diagnostic scans). The project will consist of two phases: During phase 1 existing equipment and experimental setup will be used to study and understand the specific isotope of ytterbium. This will give them a better understanding of the experimental setup required to control and separate the isotope on commercial scale from the material in which it occurs naturally. Ytterbium is a rare earth chemical element (Yb) that occurs naturally in ores. One of its seven isotopes, ytterbium-176, can easily be transmuted into radioactive lutetium-177, used primarily in the treatment of prostate cancer. In nuclear medicine, isotopes that release low levels of radiation are used to target cancer cells. Because body tissues affected by cancer have increased cell activity, the cancer cells will absorb more of the radioactive isotope. In this way, the cancer cells are targeted.

Therapeutic isotopes are, however, very expensive and can cost tens of thousands of dollars per gram. And because these isotopes remain radioactive for only a short period of time, they need to be produced close to hospitals. And even though the work is currently focused on Yb-176, there exists a pipeline of medical isotopes that are waiting for development.

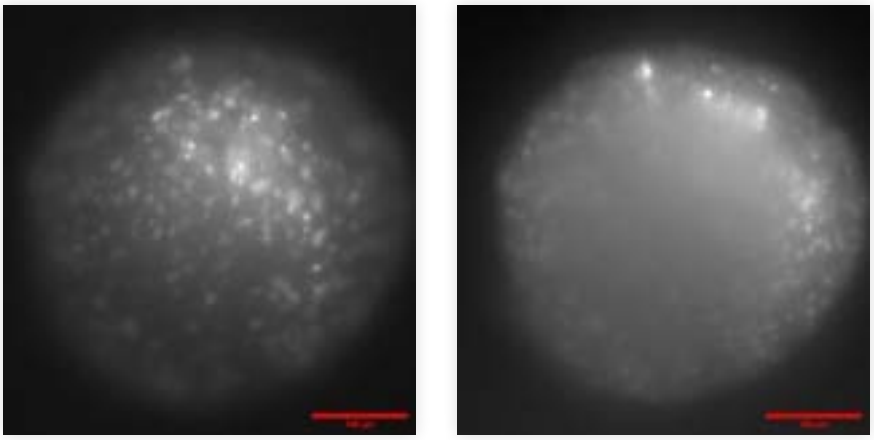
Fluorescence Microscopy

Dr Gurthwin Bosman's research focuses on developing and modelling imaging systems to locate and track fluorescent objects far below the optical diffraction limit. During 2024 they constructed high-resolution fluorescence-based microscopes (wide-field imaging of single molecules and light sheet modalities) and accurately modelled the light propagation through their imaging systems to improve various imaging parameters (resolution, field of view). The research enjoys support from the CSIR/NLC rental pool program, with the primary aim being to develop a microscope for rapid imaging of a large collections of cells. To date we have developed to separate light sheet microscope systems. The first (seen below) in collaboration with Prof Ben Loos is housed at the Department of Physiological Sciences and features four separate excitation wavelengths (405 nm, 488 nm, 561 nm and 637 nm) as well as numerical aperture control to adjust the light sheet thickness which improves sectioning capability. This system provides an overall lateral resolution of approximately 1.1 um (measured) and an axial resolution of 1.5 um (after deconvolution), with an impressive field of view of 500 um.



▲ Prof. Pieter Neethling, PhD candidate Frikkie Waso and Dr Christine Steenkamp in the high-resolution laser spectroscopy laboratory in SU's Department of Physics. *Photo: Stefan Els*

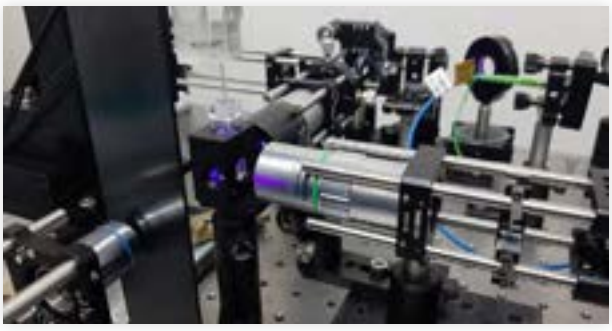
The second system, housed at the Physics Department, demonstrates the first application of a powerful ptychoghraphic iterative pulse compression algorithm for supercontiuum laser pulses as applied to two-photon light sheet microscopy. Although the system provides similar resolutions and fields of view as the former, its uniqueness lies in the use of a near-infrared excitation source, which ultimately results in decreased light scattering and improved penetration depths. Additionally, due to the efficient pulse compression, we were able to perform measurements (typical pulse energy of 500 pJ) on cardiomyoblast spheroids far below typical saturation energies.



◀ Unprocesssed 3D-images of cardiomyoblast spheroids – from the front (left) and middle (right) section. Every little ball is the nucleus of a given cell. There are thousands of cells in one such spheroid. *Images: Marguerite Blignaut*

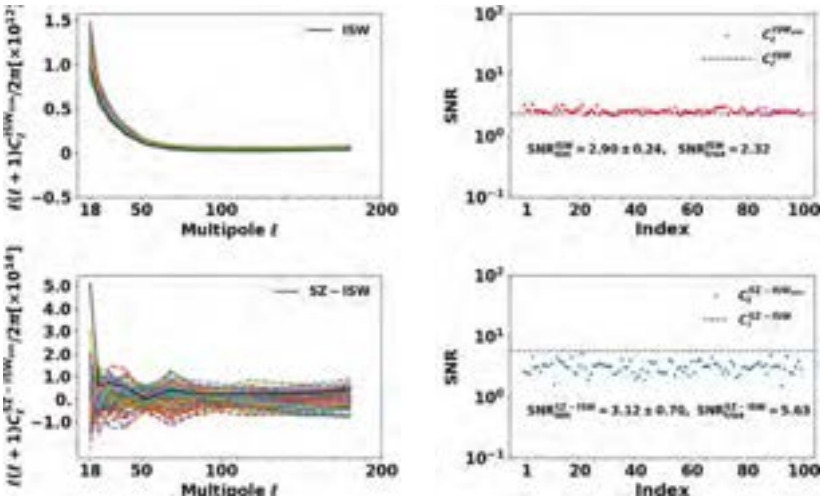
Highlights in Astrophysics

The first research highlight from Prof. Yin-Zhe Ma's astrophysics research group is the cross-correlation of the Integrated Sachs-Wolfe effect and Planck Sunyaev-Zeldovich effect map. In the paper of Ibitoye *et al.* (2024), we present a joint cosmological analysis of the power spectra measurement of the Planck Compton parameter and the integrated Sachs–Wolfe (ISW) maps. We detect the statistical correlation between the Planck thermal Sunyaev–Zeldovich (tSZ) map and ISW data with a significance of a 3.6-sigma confidence level (CL), with the autocorrelation of the Planck tSZ data being measured at a 25-sigma CL. The joint auto- and



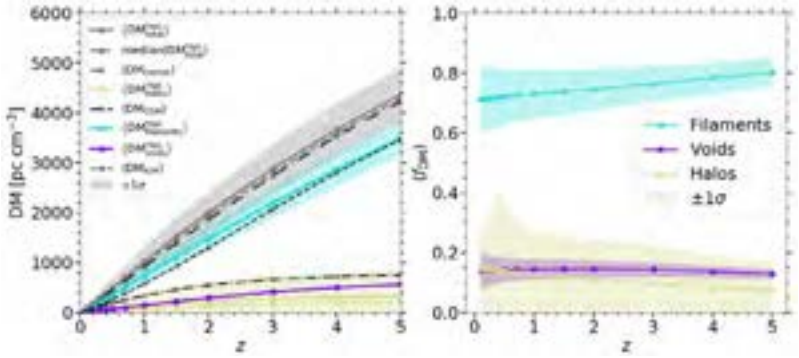
▲ A custom-built light-sheet microscope system for rapid imaging of a large collection of cells at SU's Department of Physiological Sciences. *Image: Gurthwin Bosman*

cross-power spectra constrain the matter density to be Omega_m=0.317^{+0.040}_{-0.031}, the Hubble constant to be H_0=66.5^{+2.0}_{-1.9} km/s/Mpc, and the rms matter density fluctuations to be sigma_8=0.730^{+0.040}_{-0.037} the 68% CL. The derived large-scale structure S_8 parameter is S_8=sigma_8*(Omega_m/0.3)^0.5=0.755 \ pm 0.060. If using only the diagonal blocks of covariance matrices, the Hubble constant becomes H_0=69.7^{+2.0}_{-1.5} km/s/Mpc. In addition, we obtain the constraint of the product of the gas bias, gas temperature and the density as b_gas*(Te/0.1 keV)*(ne/1 m^(-3))=3.09^{+0.32}_{-0.38}. We find that this constraint leads to an estimate on the electron temperature today as T=(2.4^{+0.25}_{-0.30}) X10^6 Kelvin, consistent with the expected temperature of the warm–hot intergalactic medium. Our studies show that the ISW–tSZ cross correlation is capable of probing the properties of the large-scale diffuse gas.



▲ The left panel illustrates the real SZ-ISW correlated power spectrum alongside 100 simulations represented by colored curves, while the right panel displays the signal-to-noise ratio of the genuine SZ-ISW correlation compared to the 100 simulations, which gives 3.12-sigma level of detection. Figure is taken from Ibitoye et al (2024).

A second major research highlight from the group is achieving the 3.6-sigma C.L. detection of the cross-correlation and giving a novel constraint on the cosmological parameters. Another highpoint is to use the Illustris simulation to investigate the contribution of DM from cosmic structures. The large-scale distribution of baryons, commonly referred to as the cosmic web, is sensitive to gravitational collapse, mergers, and galactic feedback processes, and its large-scale structure (LSS) can be classified as halos, filaments, and voids. Fast radio bursts (FRBs) are extragalactic transient radio sources that undergo dispersion along their propagation paths. These systems provide insight into ionised matter along their sightlines by virtue of their dispersion measures (DMs) and have been investigated as probes of the LSS baryon fraction, the diffuse baryon distribution, and of cosmological parameters. Such efforts are highly complementary to the study of intergalactic medium (IGM) through X-ray observations, the Sunyaev-Zeldovich effect, and galaxy populations. We use the cosmological simulation IllustrisTNG to study FRB DMs accumulated while traversing different types of LSS. We combined methods for deriving electron density, classifying LSS, and tracing FRB sightlines through TNG300-1. We identified halos, filaments, voids, and collapsed structures along randomly selected sightlines, and calculated their DM contributions. We present a comprehensive analysis of the redshift-evolving cosmological DM components of the cosmic web. We find that the filamentary contribution to DM dominates, increasing from 71% to 80% on average for FRBs originating at z= 0.1 versus z=5, while the halo contribution falls, and the void contribution remains consistent to within 1%. The majority of DM variance between sightlines originates from halo and filamentary environments, potentially making void-only sightlines more precise probes of cosmological parameters. We find that, on average, an FRB originating at z = 1 will intersect 1.8 foreground collapsed structures of any mass, with this value increasing to 12.4 structures for an FRB originating at z = 5. The measured impact parameters between our sightlines and TNG structures of any mass appear consistent with those reported for likely galaxy-intersecting FRBs. However, we measure lower average accumulated DMs from these structures than the 90 pc cm^(-3) DM excesses reported for these literature FRBs, indicating that some of this DM may arise from beyond the structures themselves.



▲ *Our analysis revealed that filamentary structures predominantly contribute to DM, increasing from approximately 71% to about 80% on average for FRBs for redshift range [0.1, 5]. Conversely, the contribution from halos decreases, while the contribution from voids remains relatively constant, fluctuating within approximately 1%. The primary source of DM variability among sightlines stems from halo and filamentary environments, suggesting that sightlines traversing voids exclusively could serve as more accurate probes for cosmological parameters. Figure is taken from Walker et al (2024).* – Sufficient quality?

RESEARCH ACTIVITIES

Dr Gurthwin Bosman's research group focused on fundamental investigations of photo-induced reactions on ultrashort timescales, with four projects exploring various light-matter interaction schemes. The first is work done on memristive devices with Prof. Petra Rudolf (Zernike Institute for Advanced Materials, University of Groningen, Netherlands). The PhD student on this project, Miss Charmaine Sibanda, is enrolled in a joint PhD degree between SU and UG for this work. She has completed all of her femtosecond spectroscopy measurements and data analysis and has submitted her dissertation for draft editing. Additionally, she has completed two draft manuscripts detailing key findings on the nanoclustered gold films that exhibit memristive behaviour. The second project focuses on UV-absorbing compounds, aiming to understand the energy dissipation channels in UV-excited molecules. This work benefits from local collaboration with Prof. Bice Martincigh (School of Chemistry and Physics, UKZN). In 2024, PhD student Jane Dai used the resources at the Centre for High-Performance Computing to perform a series of computational chemistry calculations. The goal of this work was to determine whether the photoprotection mechanism in our chosen molecules can be explained through excited-state energy transfer methods. Additionally, Miss Kelsey Everts (second-year MSc) and Miss Dai conducted further fs-TAS measurements of these compounds in solution, which have been incorporated into a draft version of Miss Dai's thesis. Furthermore, we successfully secured travel grant funding through the DRD, along with additional support from the UK African Wild Scholar Fund, to conduct transient spectroscopy work in the MIR. Initial results from the MIR spectra indicate that a key dissipation pathway occurs through vibrational redistribution on the picosecond to nanosecond timescale. In the third project, second-year MSc student Miss Kelsey Everts continued her work on the transient spectroscopy of donor-acceptor polymer films. She studied the influence of high pump fluence and found that, although it increased the initial number of excitons, these excitons underwent annihilation, which did not directly lead to improved cell efficiency. She also introduced silver nanoparticles into the donor-acceptor thin film system and observed a clear increase in light scattering. However, this did not result in measurable differences in the femtosecond to picosecond timescale results. She completed her work and submitted her MSc thesis for evaluation. This research was conducted in collaboration with Dr. Neway Tegegne from Addis Ababa University. The fourth project is a new initiative aimed at establishing and fostering collaborations with Prof. Neil Hunt at the University of York, UK. Through the DRD travel grant, they conducted UV-pump MIR-probe measurements with sub-picosecond resolution on a class of osmium and ruthenium phenanthroline and polypyridyl complexes. As expected, the initial results indicate rapid metal-to-ligand charge transfer. In the field of fluorescent microscopy, they successfully published three manuscripts—two theoretical articles in *Optics Express* on point spread functions and the third in *Scientific Reports* on a new light-sheet microscopy method using compressed pulses. A key factor in the success of these publications was the contribution of two former PhD students, Miss Dina Ratsimandresy (currently a postdoctoral researcher at the Medical Research Council, Cambridge, UK) and Mr. Imraan Badrodien (now a postdoctoral researcher at Yale University, USA).

Dr Anslyn John delivered a presentation titled "Structure formation with viscous dark matter" at the Bangkok Workshop on Gravity and Cosmology, Chulalongkorn University, Bangkok, Thailand, 22-26 January 2024; as well as a paper titled "Relativistic electrodynamics in a medium" at the International Symposium on Science at PAUL (Paarl Africa Underground Laboratory, 14-18 January 2024. He also delivered an invited talk on "The ins and outs of science outreach" at the fifth Advanced Nuclear Science and Technology Techniques (ANSTT5) workshop at NRF-iThemba LABS in Cape Town, 15-19 April 2024; and a NITheCS colloquium titled "Cosmology with viscous dark matter" at SU on 29 April 2024. Dr John was Chair of the Scientific and Local Organising Committees of the the South African Gravity Society (SAGS) conference, hosted at SU in August 2024. He continues to collaborate with Prof. William Kinney (State University of New York, USA) and with Prof. Yen-Kheng Lim (Xiamen University, Malaysia). From 2025-2035, he will be involved with co-authoring the South African Multiwavelength Astronomy Strategy.

Dr Hannes Kriel published a paper in *Quantum 8* and participated in the International Workshop: "Geometry and non-adiabatic responses in non-equilibrium systems" which took place in Dresden, Germany. During this time, he visited the group of Prof. Dr. Giovanna Morigi at Saarland University.

Prof. Yin-Zhe Ma published several papers during 2024, including the *Monthly Notices of the Royal Astronomical Society,* the *Astrophysical Journal Letters*, *Physics of the Dark Universe*, *The Astrophysical Journal*, *Publications of the Astronomical Society of the Pacific*, the *Astrophysical Journal Supplement Series* (ApJS), *Astronomy and Astrophysics*. Prof. Ma is a member of the editorial board of *Research in Astronomy and Astrophysics* and refereed papers from a range of journals during 2024. He made presentations at the following conferences: the PAUL Symposium at Western Cape, January 2024; the MeerKAT@5 and Modelling MeerKAT conferences, South Africa; Theoretical Modelling of the Large-Scale Structure of the Universe, June 2024 in Edinburgh; and Fast Radio Bursts conference in Thailand, November 2024. During 2024 several of his visitors presented colloquiums in the physics department. These visitors were from the University of Manchester, Tongji University, Hangzhou Dianzi University, Nanjing Institute for Astronomical Optics and Technology, University of Malaya, Xiamen University Malaysia, and the National University of Singapore, November 2024. He served on the science committee of the African Astronomical Society and participated in the International Astronomical Union's (IAU) General Assembly 2024.

Prof. Kristian Müller-Nedebock's research is focused on the cellular and subcellular length scales, both on equilibrium properties but also including the role of molecular machines in cells (so-called active matter). The statistical physics of soft condensed matter and biological systems, presents tools to investigate the role of structures and physical processes in living matter. Of particular interest in biology is that the phenomena occur out of equilibrium. A project to understand the structural and viscoelastic properties of asters coupled by cross-linking active motors is ongoing with collaborators Prof. Buddhapriya Chakrabarti (Kansas State University), Prof. Karsten Kruse (University of Geneva), and Prof. Natsuhiko Yoshinaga (Future University Hakodate). PhD student Nadine du Toit has developed a model for dynamical networking, as found in reversible synthetic networks, but also in cytoskeleton. Discussions with prospective PhD student, Fameno Rakotoniaina, co-supervised with Dr Rhoda Hawkins (AIMS Ghana), are leading to studying the dynamics of ingression of the malaria parasite in red blood cells. Further mechanical properties and coupling of the cytoskeleton, membranes, organelles, and active machinery in cells can be investigated through analytical and computer simulation work, that occurs in collaboration with expert microscopy and other experimental techniques, with the groups of Prof. Benjamin Loos (SU), Prof. Stanley Botchway (Rutherford Appleton Laboratory), and Dr Verena Kriechbaumer (Oxford Brookes University). During 2024, Prof. Müller-Nedebock presented two public lectures, one at the Physics Open Day in August 2025, with a presentation ``Can you untie your tangled biomolecules? Are they knotted or not? – Knotty situations in biophysics (and other fields too)'', the other at the Faculty of Science annual lectures on the science behind the year's Nobel Prizes, on some aspects of the Physics Prize.

Dr Pieter Neethling hosted the African Laser Centre workshop and another workshop for the ALC on Modern Aspects of Photonics. During 2024 he spent a month at York University in the United Kingdom, conducting experiments in the labs of Prof. Neil Hunt; as well as hosting Dr Jan Rothardt from Leibniz Institute, Jena, Germany, for a research visit. Together with Dr Christine Steenkamp, they established an industry funded research project to develop protocols for the laser-based enrichment of medically relevant isotopes. He attended the following conferences: the Coherent Multidimensional Spectroscopy conference, York, UK; International Commission of Optics (ICO) conference, Somerset West, South Africa; South African Institute of Physics Annual Conference, Makhanda, South Africa, and published a paper in *Scientific Reports*.

Prof. Richard Newman organised the first Symposium on the Science at PAUL at the DuKloof Lodge resort in Paarl. As Scientific Program manager, he visited numerous research facilities in Europe, including Modane Underground Laboratory (LSM), Liquid Propulsion Systems Centre (LPSC), Irène Joliot-Curie Laboratoire de Physique des 2 Infinis (IJC-Lab), Institut de Physique des 2 Inifinis (IP2I), Laboratoire de Physique de Clermont-Ferrand (LPC) in France and the Canfrance Underground Laboratory (LSC) in Spain. Prof. Newman resigned to join iThemba LABS on 1 July to take up management of the South African Institute for Nuclear Technology and Science (SAINTS).

Dr Christine Steenkamp and her team made two breakthroughs in 2024. In their project on laser-based techniques to produce medical isotopes they demonstrated selective extraction of the zinc-67 isotope from a natural zinc sample, for the first time in the presence of a magnetic field and using broadband lasers. Removing zinc-67 from zinc-68 samples is important for the production of gallium-68 that is used in medical PET (positron emission tomography) diagnostic scans. The paper was published by *Journal of Applied Optics*. In their quantum control project using ytterbium ions, ion clouds and single ions have been trapped and visualised for the first time. Numerical modelling of the trapped ion system is in progress to investigate under which conditions the quantum state of an ion can be followed by so-called unsharp quantum measurements. Dr Steenkamp is leading experimental and numerical investigations of the industry-funded research project aimed at laser-based enrichment of medically relevant isotopes. Dr Steenkamp engages in collaborations at the ISOLDE facility at CERN and participated in an experiment testing a new technique to produce ultracold molecules by laser-photodetachment during December 2024.

Prof. Mark Tame's group focused on several key aspects of quantum nanophotonics, quantum communication, and quantum sensing. They explored methods to verify single-photon path entanglement using nitrogen-vacancy centres, important for scalable quantum networks and secure communication, with findings published in *Applied Optics*. Additionally, they developed quantum plasmonic techniques for refractive index sensing, employing photon correlations to enhance measurement precision significantly beyond classical capabilities; this work appeared in *Physical Review A*. The group's experiments on quantum teleportation

demonstrated the feasibility of quantum information transmission across networks, highlighting practical aspects for distributed quantum computing, also published in *Physical Review A*. Furthermore, the group investigated quantum sensing using Hong–Ou–Mandel interferometry combined with plasmonic nanostructures, which demonstrated improved sensitivity suitable for advanced biosensing applications; these results were published in *Metrologia*. Throughout the year, Prof. Tame and his students presented these findings internationally, including at the International Congress of Optics in Cape Town and during a visit to Saint Louis University, USA, reinforcing collaborative relationships. Additionally, he continued serving on the editorial board of the *Journal of Optics*, a role he has held for the past five years, contributing to the international scientific community in optics and photonics.

Dr JJ van Zyl was appointed to the Steering Committee of the Paarl Africa Underground Laboratory (PAUL) consortium and chaired the group involved with muon measurements in the Huguenot tunnel. Throughout 2024 the group conducted a series of muon flux measurements with a muon detector on loan from Institut de Physique des 2 Inifinis (IP2I) in Lyon, France, at different positions along the length of the tunnel. The recorded muon flux data are used to characterize the density of the rock overburden above the tunnel and provide information about the most suitable position for the proposed underground laboratory. A number of postgraduate student projects, related to the muon measurements and simulations, were presented as part of this research.

▲ The muon detector on its way to be installed in a service tunnel of the Huguenot Tunnel in the Du Toitskloof Mountains. On the trailer is Dr JJ van Zyl (SU) and Prof. Robbie Lindsay (UWC) with PhD student Lumkhile Mesebi (UWC) and Prof. Richard Newman (SU) in the front. *Photo: Wiida Fourie-Basson*

During July of 2024 Dr van Zyl visited Prof Ivan Stekl of the Institute of Experimental and Applied Physics (IEAP) at the Czech Technical University in Prague, who is one of the international advisors to the PAUL project. The purpose of the research visit was to gather advice and expertise about modern particle detectors, their design and applications, with the aim of developing a local modern muon detector. Dr van Zyl also visited Prof. Paweł Moskal, Head of the Department of Experimental Particle Physics and Applications, Jagiellonian University in Kraków, to present the interests of the PAUL project and investigate possible collaboration with Prof Moskal's research group related to their J-PET detector design. Dr van Zyl was invited to present at a regular seminar "Between Physics and Biology and Medicine" at the Institute of Physics, Jagiellonian University on 18 July 2024, with the title "Opportunities at the Paarl Africa Underground Laboratory (PAUL)". These research visits form an integral part of building the partnership between the Stellenbosch Nuclear research group, the Paarl Africa Underground Laboratory (PAUL), and key international partners in Europe. Dr van Zyl's visit to the above-mentioned institutions is important for the growth and development the nuclear science research and training programs at Stellenbosch University and its consortium partners within the PAUL project. Dr Van Zyl presented a memorial talk at the 41st International

Workshop on Nuclear Theory (IWNT-41) in Bulgaria between 30 June and 6 July 2024, dedicated to the late Prof. Anthony Cowley about his contributions to the field of Nuclear Physics over many years. As professor in Nuclear Physics at Stellenbosch University, he was not only a member of the International Advisory Committee of this IWNT conference for a decade, but also a regular contributor to the conference and an active research collaborator with several of the scientists in Sofia, Bulgaria, up to his passing in 2022. The in-person visit was a fitting opportunity to engage with members of our long-standing collaboration and encourage continued research partnership where Prof. Cowley has made such a valuable impact. Dr van Zyl also presented two radio interviews on the program DrieSestig on RSG on 22 February and 14 March about the proposed Paarl Africa Underground Laboratory (PAUL) initiative, entitled "Die Paarl kry 'n ondergrondse laboratorium" (https://omny.fm/shows/driesestig-1/die-paarl-kry-n-ondergrondse-laboratorium), as well as on dark matter and muon detectors, entitled "Wat is donker materie" (https://omny.fm/shows/driesestig-1/wat-is-donker-materie)

Prof. Herbert Weigel continued his successful research on solitons in quantum field theory. During 2024 he (co)-authored five research publications and presented results from his research activities at three international conferences or workshops.

Prof. Shaun Wyngaardt took over the leadership of the Paarl Africa Underground Laboratory (PAUL) as Scientific Project Manager. In November he visited numerous research facilities in France, such as LSM, LPSC, LSP, as part of his duties as Scientific project manager of PAUL. During his visit to France, he met with the directorate of the French National Institute of Nuclear and Particle Physics (IN2P3) to establish collaborative relationships between South Africa and France on the PAUL project and other potential collaborative initiatives in science and engineering. Prof. Wyngaardt also visited the ATLAS experimental facility at the European Organization for Nuclear Research (CERN), as an opportunity to include Stellenbosch University into the ATLAS experimental program.

AWARDS TO STAFF AND STUDENTS

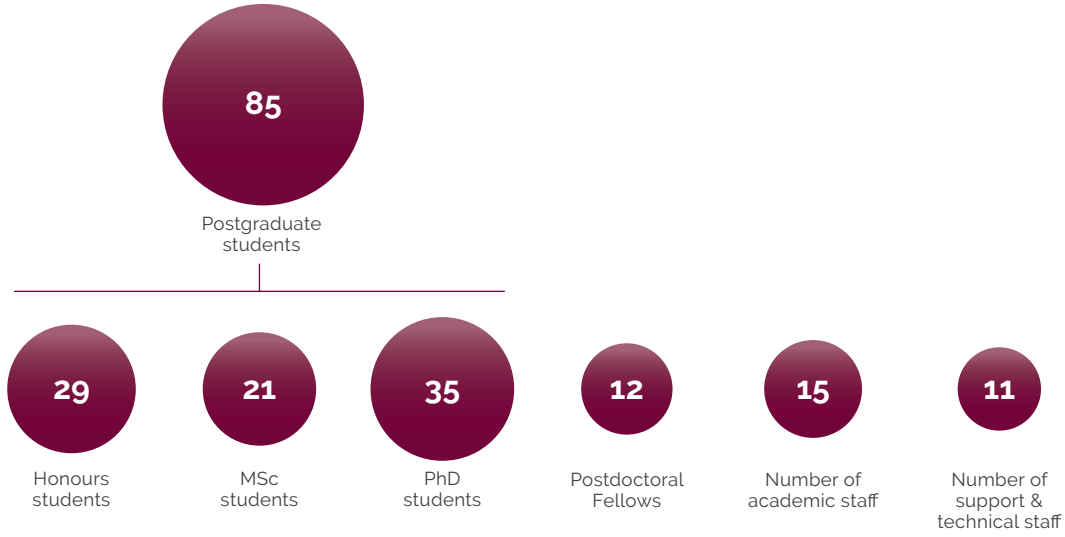
MSc student **Kelsey Everts** received the South African Institute of Physics (SAIP) Photonics Prize as best MSc student at the SAIP 2024 conference.

MSc student **Le Roi du Plessis** won a MSc best poster prize at the Stellenbosch University Faculty of Science Postgraduate Research Conference, as well as a poster prize at the African Laser Centre (ALC) Modern Aspects of Photonics workshop.

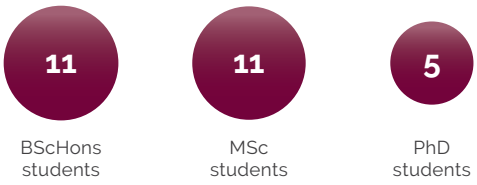
PhD student **Eugene Fouche** won the best poster price at the International Commission of Optics conference, as well as at the ALC Modern Aspects of Photonics workshop.

▸ Le Roi du Plessis receiving his prize from Prof. Burtram Fielding. *Photo: Ignus Dreyer*

ACADEMIC AFFAIRS



Number of graduates 2024



NRF-RATED RESEARCHERS	
Leading international researcher	
Prof Dieter Heiss	Physical effects and significance of spectral singularities
Internationally acclaimed researchers	
Prof A du Plessis	Additive manufacturing, X-ray tomography and biomimicry
Prof Herbert Weigel	Quantum field theories emphasizing on many different scenarios in which standard perturbative treatments cannot be applied. This comprises field configurations with localized energy densities, known as solitons or solitary waves. They have innumerable applications in physics, ranging from properties of subatomic particles via condensed matter phenomena to cosmological defects.
Prof Mark Tame	Quantum nanophotonics which involves the study of light-matter interactions at the quantum level with applications in quantum computing, quantum communication, and quantum sensing
Prof Yin-Zhe Ma	Radio Astronomy, theoretical astrophysics, cosmology
Prof WA Richter	Theoretical nuclear physics
Established researchers	
Prof Erich Rohwer	Laser development, laser techniques and applications, laser spectroscopy and microscopy
Prof Pieter Neethling	Laser spectroscopy and microscopy, bio-photonics, laser pulse shaping, optical tweezers
Prof Richard Newman	Radionuclide metrology, environmental radioactivity, dosimetry, radiation transport modelling, radiation safety, elemental analysis, physics education

STAFF MATTERS

Prof. Richard Newman resigned to take up a position at iThemba LABS. **Dr Yaseera Ismail** joined us as Senior Lecturer, while **Prof. PH Neethling** was promoted to Associate Professor. **Mr Stanley February** was appointed as the Department Manager in Physics.

SOCIAL IMPACT

The Walter Parry memorial lecture

Members of the department have been working with the Lückhoff School Alumni Association as part of an ongoing social justice initiative to establish the first Walter Parry Memorial lecture on 22 May 2024. The lectures were delivered by Mr Brian Pool, former principal of Lückhoff and a former colleague of Walter Parry, and Prof. Shaun Wyngaardt.

An art installation memorializing the event is being prepared for display in both the Merensky building and the Old Lückhoff building.

▲ Lückhoff High School alumni and the community who attended the inaugural Walter Parry lecture in the Department of Physics. *Image: Henk Oets*

Physics Open Day

Another successful department open day was staged on 29 August 2024. Prof. Kristian Müller-Nedebock entertained a captive audience with his presentation titled "Can you untie your tangled biomolecules? – Are they knotted or not?". Following the lecture, members of the public, including undergrads, school learners and their parents got to meet the speaker, engage in discussions, and tour our lab facilities.

Nobel Prize lectures

The annual Nobel Prize lectures were held on 7 November. Colleagues from across the faculty delivered popular-level lectures explaining the science behind this year's science Nobel prizes (Physics, Chemistry and Physiology/Medicine). Prof Müller-Nedebock spoke on the physics prize awarded to Hopfield and Hinton for work leading to machine learning with artificial neural networks.

Women in Physics

The annual Women in Physics event continued with a discussion over cake and tea on 23 August at Taste Restaurant. A total of two female staff and 16 postgraduate students from the Department of Physics attended. The event took the form of a round table discussion on the experiences of women in physics and ideas for the future. The aim of this annual event is to celebrate and support the women in the department, providing them with an opportunity to connect, share experiences, and build professional relationships. By encouraging mentorship and exchange of ideas, we strive to create a supportive and inclusive environment that promotes the advancement of women in physics throughout all stages of their careers. The event was sponsored by Women in Physics in SA (WiPiSA) and the Department of Physics.

▲ The Women in Physics event was attended by 16 postgraduate students and two female lecturers from the Department of Physics.

Other outreach events

The department was involved in the Stellenbosch University Open Day on 20 April 2024. The departmental brochures were updated.

We hosted some exceptional public talks this year.

The 2018 Nobel Physics laureate, Prof. Donna Strickland (Waterloo University) delivered a public talk titled "Generating high-intensity ultrashort optical pulses" at the Endler Hall on 22 October. This event was part of the 2024 International Optics Conference organized by Dr Yaseera Ismail.

Prof. Roger Deane (University of the Witwatersrand) delivered a public talk titled "Tuning into cosmic symphonies with giant radio telescopes" at the Merensky building on 19 August. This event was part of the 2024 South African Gravity Society conference organized by Dr Anslyn John.

Physics road trip

The Physics outreach road trip is an annual social impact initiative led by the postgraduate students of the Physics Department which has been successfully running since 2009 with the generous support of Optica, SPIE, NITheCS, the Stellenbosch University Physics Department and the Faculty of Science. The 2024 road trip took place from 9 to 13 September over the recess period. A group of postgraduate students from the Physics Department travelled around the Western Cape region, visiting nine schools and engaging with 286 learners about interesting concepts in physics through demonstrations and inspiring them to pursue a career in science. This year's trip added an element of chemistry and one of the demonstrators was a PhD student from the Department of Chemistry and Polymer Science. This collaboration with SUNCOI emerged after Dr Ebrahim Botha from the Department of Chemistry and Polymer Science attended the presentation on the 2023 road trip.

The Stellenbosch Laser Student Chapter conducted numerous further outreach activities to local schools and hosted a number of professional development sessions for our post-graduate students.

COLLABORATION

South Africa

- Cape Peninsula University of Technology
- Council for Scientific and Industrial Research (CSIR)
- Executive Engineering
- iThemba LABS
- Klydon
- LRS implants
- Nanodyn
- Nelson Mandela University (NMU)
- Rapid3D
- University of Cape Town
- University of KwaZulu-Natal (UKZN)
- University of Pretoria
- University of South Africa (UNISA)
- University of Western Cape (UWC)

Belgium

- Katholieke Universiteit Leuven
- University of Antwerp
- Université Catholique de Louvain

Ethiopia

- Addis Adaba University

France
- LPSC, Grenoble (CNRS)
- LP2I, Lyon (CNRS)

Germany
- Fraunhofer
- Johannes Gutenberg University
- Karlsruhe Institute of Technology
- Leibniz Institute of Photonic Technology (IPHT)
- Max Planck School of Photonics, Jena

India
- SN Bose Center for Basic Science, Kolkata
- Indian Institute of Science (IIS) in Bangalore

Italy
- University Trento
- Netherlands
- University of Groningen

Korea
- Quantum Universe Center, Korea Institute for Advanced Study
- Hanyang University

Lesotho
- National University of Lesotho

Norway
- Norsk Medisinsk Syklotronsenter AS
- Norwegian University of Science and Technology (NTNU)

Switzerland
- University of Bern

United Kingdom
- Rutherford Appleton Laboratories, Oxford
- Sheffield University
- University of York

United States of America
- ASP Isotopes
- Oak Ridge National Laboratory
- Pennsylvania State University
- University Texas El Paso

FUNDING

South Africa
- African Laser Centre
- Centre for Nuclear Safety and Security
- Council for Scientific and Industrial Research (CSIR)
- CSIR National Laser Centre's Rental Pool programme
- CSIR Rental Pool Program
- CSIR/SU Research Chair in Quantum, Optical and Atomic Physics
- CSIR-DST Inter-Programme Postgraduate Bursary Support
- Department of Science and Innovation (PAUL project seed funding)
- Institute for Maritime Technology (IMT)
- National Research Foundation (NRF)
- Nkosi Innovations
- NRF unrated researchers funding
- NRF/DST SARChi Chair in Quantum Information Processing
- SA-CERN Consortium
- SA-JINR grant for development of a virtual laboratory for Nuclear Physics
- SA-JINR travel grant
- SAQuTI
- South African Institute for Physics (SAIP), Women in Physics in SA (WiPiSA)
- South African Quantum Technology Initiative (SAQuTI)

Africa
- African Laser Centre
- DSI Collaborative Program in Additive Manufacturing (CPAM)
- DSI M-era.net project on NiWRe alloys for new X-ray gratings for NDT applications
- Ghana and USA (Middlebury College).

Europe
- DAAD scholarships in Germany
- European Physical Society
- Federal Ministry of Education and Research (BMBF), Germany
- Newton Fund, Rutherford Appleton Laboratory
- NT-MDT Spectrum Instruments
- PicoQuant
- Wirsam Scientific International Centre for Theoretical Physics

United States of America
- Optical Society of America (OSA)
- International Society of Optics and Photonics (SPIE) for the Laser Student Chapter
- ASP Isotopes

STAFF LIST

Academic staff

Professor
- Prof Y Ma
- Prof K Müller-Nedebock
- Prof FG Scholtz
- Prof M Tame
- Prof H Weigel

Associate professor
- Prof P Neethling
- Prof R Newman
- Prof B van der Ventel
- Prof S Wyngaardt

Senior lecturer
- Dr G Bosman
- Dr Y Ismael
- Dr H Kriel
- Dr C Steenkamp
- Dr JJ van Zyl

Lecturer
- Dr A John
- Dr P Southey

Extraordinary appointments, research fellows and academic rank

Extraordinary professor
- Prof R Adam (honorary)
- Prof M Bucher (academic rank)
- Prof WD Heiss
- Prof J Indekeu
- Prof M Kastner
- Prof FH Malek
- Prof F Petruccione (academic rank)

Extraordinary associate professor
- Prof R Newman

Extraordinary senior lecturer
- Dr N Erasmus
- Dr N Mkaza

Extraordinary lecturer
- Dr CM Takalana

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- Prof M Bucher (academic rank)
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- Prof J Indekeu
- Prof M Kastner
- Prof FH Malek
- Prof F Petruccione (academic rank)

Extraordinary associate professor
- Prof R Newman

Extraordinary senior lecturer
- Dr N Erasmus
- Dr N Mkaza

Extraordinary lecturer
- Dr CM Takalana

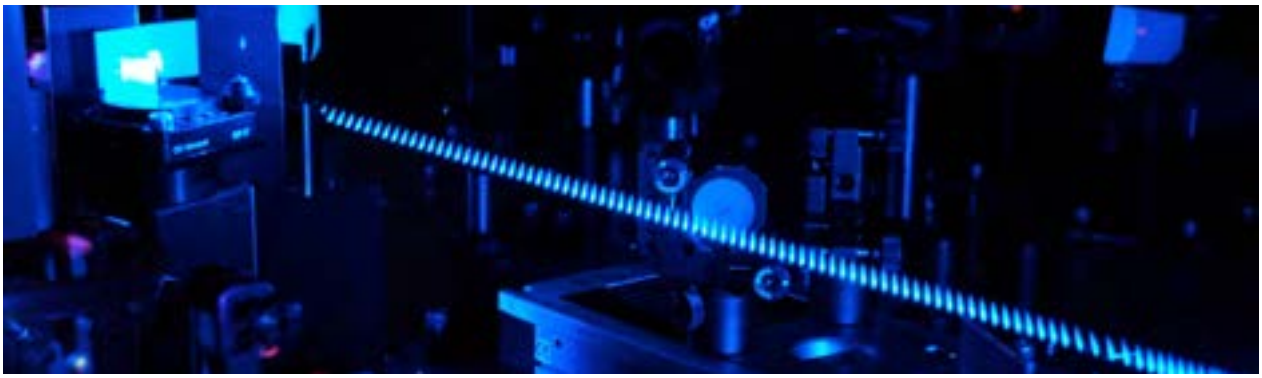
Professional and support staff

Administrative
- S February
- U Isaacs
- S Josias

Technical
- M Botha
- R Benting
- P Cornelissen
- J Germishuisen
- J Gertze

Service
- C Pool

Postdoctoral fellows
- Dr BL Adams
- Dr B Alexander
- Dr C Buckton
- Dr KK Dayaram
- Dr WJ Guo
- Dr S Jolicoeur
- Dr P Nandi
- Dr G Pleasance
- Dr MD Sarkis
- Dr LC Ugwuoke
- Dr G Wang
- Dr FJ Waso



CONTACT DETAILS

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Web: www.sun.ac.za/physics

Department of Physiological Sciences

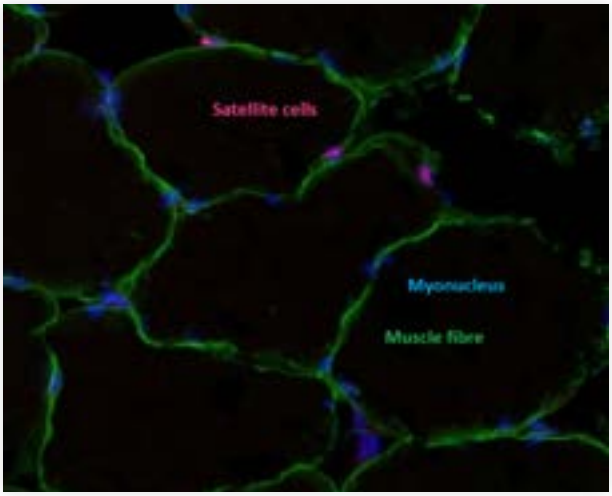
RESEARCH INTERESTS

- Cancer research
- Cardio-metabolic research
- Cardio-oncology research
- Chemotherapeutic resistance in breast cancer
- Clinical haemorheology and coagulation research
- Integrated Metabolic Physiology Research
- Bio-inspired drug delivery research
- Muscle physiology and cell biology research
- Neuro and Autophagy Research
- Neurovascular research and the blood-brain barrier

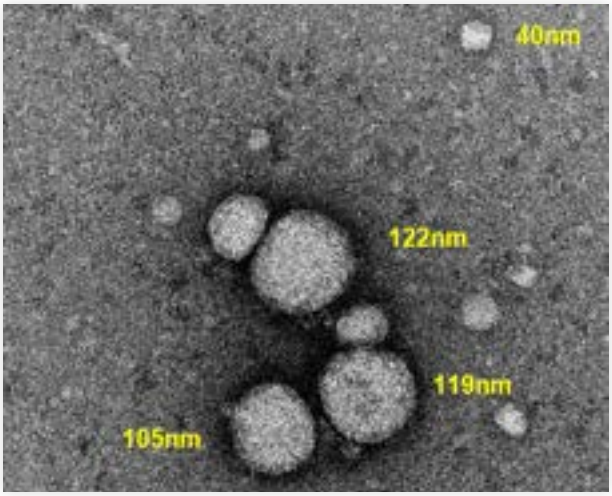
RESEARCH HIGHLIGHTS

Prof K Myburgh (Muscle Physiology)

Skeletal muscle satellite cells are the adult stem cells resident just outside of muscle fibres. These cells are activated to participate in muscle adaptation and regeneration from injury. In 2024 our research group was the first to establish that unilateral exercise resulting in moderate muscle damage and delayed onset muscle soreness activated, not only the satellite cells of the exercised quadriceps, but also the contralateral unexercised leg. This finding has implications for how rehabilitation can be implemented.



▲ Cross-sectional view of muscle fibres in a biopsy sample collected from human participants, with clearly visible muscle specific stem cells called satellite cells. *Image: Michael Cowley*



▲ Nano-sized extracellular vesicles: carriers of molecular cargo that have functional effects during intercellular communication. *Image: John Hingle*

We used electrical pulse stimulation of muscle myotubes in culture to bring about contractions. MicroRNA is a short-stranded RNA that inhibits translation of mRNA to protein. MicroRNA can be secreted by skeletal muscle in small vesicles. We found that microRNA-206 was secreted in vesicles at levels 6 times higher than the next most prominent miR. Next, we collected these vesicles from the culture media and applied them to myoblasts. This resulted in longer and larger myotubes and provided the evidence that the cargo of the vesicles had positive functional effects on recipient cells.

Prof. E Pretorius

In 2024, significant research advancements were made in understanding the role of microclots and neutrophil extracellular traps (NETs) in Long COVID. A groundbreaking study revealed that microclots are structurally associated with NETs, providing new insights into Long COVID pathology. This study, currently under review, was conducted in collaboration with INSERM at the University of Montpellier, and a patent related to this discovery has been filed by E. Pretorius, C. Venter, and A. Thierry (INSERM). Additionally, research into clot composition found that clots retrieved from stroke patients contain amyloid fibrin regions, a finding with important implications for thrombotic diseases. The impact of this research has been widely recognized, with invitations to contribute to international policy and research initiatives. In 2024, Prof. Pretorius was invited as a World Health Organisation (WHO) panel member for Long COVID treatment guidelines and was elected as a member of the Academy of Science of South Africa (ASSAf).

She also co-authored a global expert consensus on Long COVID, which was submitted to *The Lancet (Infectious Diseases)*. These research efforts were supported by key funding, including a *Standing Up To POTS* grant of US$72 400 for studying coagulation in POTS and Long COVID, as well as postdoctoral salary support from the *Kanro Research Foundation* to the value of US$99 565 for 2025–2027. The research findings were presented at several high-profile conferences. At the **NIAID-sponsored Workshop at the National Institutes of Health in Bethesda, USA, September 2024** (online), Prof. Pretorius discussed endothelial injury, thrombosis, and complement activation in Long COVID. She was also an invited speaker at the Women in Physics in SA (WiPiSA), where she presented on *"Thrombotic endothelialitis in Long COVID and ME/CFS".* Further, she delivered a plenary lecture on *"Thrombotic endothelialitis in Long COVID"* at the **Mexican Congress of Clinical Pathology (Oct–Nov 2024)** and gave a plenary talk titled *"Microcirculation, microclots in PASC and ME/CFS"* at the **IiME-R Colloquium in Stockholm in October 2024.** These contributions highlight the ongoing global impact of her research in the field of thrombotic inflammatory diseases.

Prof. A-M Engelbrecht

Our research group continued to make significant strides in personalized medicine, cancer biology, and biomedical engineering, with a strong emphasis on functional genomics, tumour microenvironment interactions, and innovative therapeutic strategies. PhD student Claudia Christowitz completed a groundbreaking study integrating functional genomics into the pathology-supported genetic testing framework, advancing precision oncology for breast cancer patients.

Madré Meyer's research on senolytic therapy in cervical cancer demonstrated the potential of targeting therapy-resistant cells to improve treatment efficacy. Postdoctoral researcher Dr. Carla Eksteen expanded investigations into tumour immunogenicity and chemotherapy resistance, while Ngwedha Ndjene started an environmental carcinogenesis study with Dr Christoff Truter from the SU Water Institute and Prof. Rialet Pieters (North-West University) as co-supervisors, assessing the impact of waterborne contaminants on cancer risk in South Africa.

Biomedical engineering collaborations with Prof. Willie Perold from SU's Faculty of Engineering flourished, with students developing biosensors for cancer diagnostics, including circulating tumour DNA (ctDNA) detection and dielectrophoresis-based cell sorting. The integration of phytotherapy and nanotechnology also gained momentum, with projects exploring green-gold nanoparticles and plant-derived compounds in combination cancer therapies. These advancements reflect our commitment to translational research, interdisciplinary collaboration, and innovative solutions for resource-constrained healthcare settings.

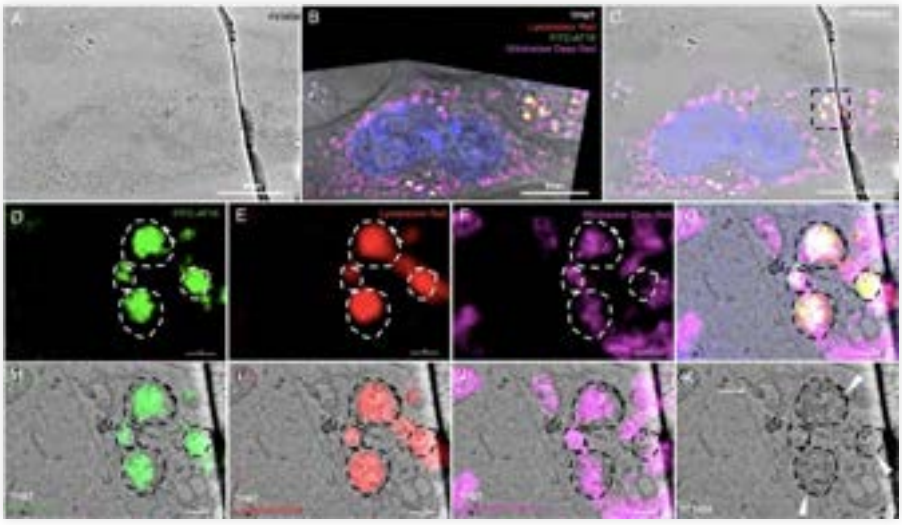
▲ Dr Claudia Christowitz with her two supervisors, Prof. Anna-Mart Engelbrecht (left) and Prof. M. Meyer. *Photo: Wiida Fourie-Basson*

RESEARCH ACTIVITIES

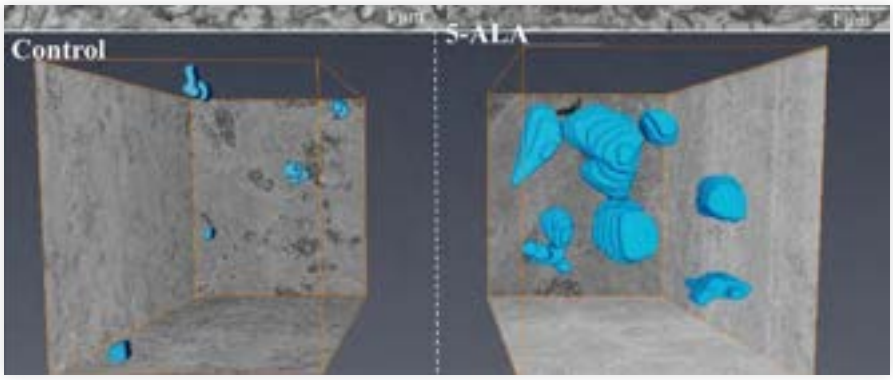
Prof. Anna-Mart Engelbrecht and her research group continued to make significant contributions to cancer research, focusing on treatment resistance, tumour microenvironment interactions, and precision medicine approaches. Several publications emerged from the group, covering senolytic therapies, inflammation, tumour biology, and functional genomics, published in peer-reviewed journals such as *Advances in Medical Sciences*, *Cytokine*, *Biology*, *Acta Histochemica*, *Cancer Control*, *Immunologic Research*, *Mutation Research – Reviews in Mutation*. Prof. Engelbrecht served as Guest Editor for *MDPI Biology*'s Special Issue on Breast Cancer.

Dr Danzil Joseph leads the Cardiometabolic Research Group (CMRG), with specific focus on the interplay between hyperglycaemia (in the diabetes setting) and exposure to variants of SARS-CoV-2 spike proteins. The project investigates the resultant metabolic and molecular changes to understand the underlying mechanisms that link diabetes, specifically hyperglycaemia, as important contributory factor to severe outcomes associated with COVID-19. PhD student Tara Michaels completed her MSc and graduated cum laude in April 2024. Tara uncovered novel data linking specific variants of the spike protein to metabolic alterations and changes in spike-interacting proteins in a pancreatic beta-cell line. This work was presented at the American Physiology Society Summit in Long Beach, CA, USA in April 2024, and at the SAMRC Biomedical Research Platform (BRIP) conference in October. A review article outlining the molecular interactions between hyperglycaemia and novel host cell receptors for SARS-CoV-2 was published in the journal *Viruses*. MSc student Mzolisi Dotwana focussed on oxidative stress in the beta-cell model. MSc students Fatimah Lakay, Jana Strydom and Gabrielle Dunn are studying the effects of chemotherapeutic intervention on cardiac- and hepatic metabolic function. This project is in collaboration with Dr Bali Sishi's group. Jana presented her findings at the Faculty of Science Postgraduate Conference in November. Maria Lichtenberg, Ané Louw, Anastacia Wakens, Ivana Stevens and Rehana Noah completed their BSc Hons degrees under Dr Joseph's supervision in 2024. Dr Joseph was further co-supervisor to PhD student Nyasha Mukonowenzou and MSc student Handré Muller. His long-standing collaboration with Prof. Faadiel Essop (Division of Medical Physiology) continued to focus on the interplay between psychological stress and cardiometabolic diseases. The work by PhD student, Megan Cairns (Division of Medical Physiology), resulted in a publication in the *American Journal of Physiology Heart and Circulatory Physiology*, and presentations at several national conferences, including winning first prize in the Wyndham Oral Competition at the Physiology Society of Southern Africa (PSSA) conference. New collaborations were formed with Dr Sanjeev Rambharose, Prof. Ben Loos and Prof. Burtram Fielding in 2024, focussing on novel nanoparticle-based therapeutic interventions for diabetes, mitochondrial dynamics in response to hyperglycaemia and further effects on SARS-CoV-2 spike protein, respectively.

Prof. Ben Loos's research group seeks to better understand the role of autophagy activity, i.e. autophagic flux, in cell death onset in neurodegenerative disease and gliomas, with a view to better quantify and control autophagy function, so as to govern cell death decision making. In 2024, several key applications in the field of autophagy in neurodegeneration and glioma's have been achieved. First, our first implementation of volume electron microscopy (volume EM) was successfully implemented, conducted and published, revealing 3D architecture of glioma spheroids, with particular focus on mitochondrial morphology. This is exciting, as globally the field of volume EM is rapidly growing.



▲ Visualisation and localisation of FITC-AF16 (green) in neurons using Correlative Light and Electron Microscopy (CLEM). Representative electron, fluorescence and overlay micrographs revealing the mitochondrial (red) and lysosomal (magenta) compartment. Micrograph: Nicola Vahrmeijer, Jurgen Kriel



▲ Human glioma spheroids, acquired using seral blockface scanning electron microscopy. Exposure to 5-ALA leads to structural and morphological changes, such larger regions low in electron density, revealed through volumetric rendering. Micrograph: Kim Fredericks, Jurgen Kriel.

With the focus of understanding neuronal injury, the antisecretory peptide, which is thought to serve a major role for future treatment of traumatic brain injury, has been characterized at the molecular level. To this end, its localisation in specific intracellular compartments was dissected, by labelling the peptide fluorescently, and performing correlative light and electron microscopy (CLEM). This work, which has been performed in collaboration with the Department of Neurosurgery, has been published in 2024 and provides important mechanistic insights.

In addition to these publications, Prof. Loos was invited to an opinion article in the journal *Nature Cell Biology*, to highlight the current trends, promises and obstacles in the autophagy research field. PhD students Nicola Vahrmeijer and Meenal Bhaga attended advanced microscopy courses in Yale, USA, and London, UK, on expansion microscopy and correlative light and electron microscopy, respectively. In November 2024, the Loos lab received the VP-CLEM-kit, part of a Chan Zuckerburg Initiative (CZI) and funded collaborative effort with the Francis Crick Institute, to advance the democratisation of CLEM.

Dr Theo Nell leads the Integrated Metabolic Physiology Research Group, focused on understanding the relationship between the metabolic system, inflammation, and dietary fatty acids in the development of chronic lifestyle diseases. Their work aims to identify strategies to mitigate disease risk in individuals predisposed to these conditions. As part of an international collaboration with Prof. Derek Renshaw (Coventry University, United Kingdom), the group co-authored published findings on the role of ANXA1 in regulating inflammation, insulin secretion, and metabolic function. This research is particularly relevant in the context of fatty acids and sepsis, where systemic inflammation and metabolic disturbances are closely linked. ANXA1's ability to modulate inflammation and improve metabolic function suggests its potential as a therapeutic target for reducing sepsis severity, particularly in individuals with altered fatty acid metabolism and diabetes. Expanding on this work, MSc student Francisca Darkoh is conducting research on sepsis, with a focus on the interplay between metabolic and inflammatory responses in disease progression and potential therapeutic interventions. Prof. Maretha Opperman (CPUT) is contributing to the fatty acid analysis aspect of the study, while Prof. Resia Pretorius co-supervises the project. Francisca is set to complete data collection this year and will present her findings at the Society for Endocrinology, Metabolism and Diabetes of South Africa (SEMDSA) Conference in September 2025. Members of the research group also participated in the conference of the Microscopy Society Southern Africa, December 2024; the Welcome Leap Delta Tissue Symposium in Dundee, UK, in September 2024; and the Global Bioimaging Conference, Okazaki, Japan, October 2024.

Dr Shireen Mentor gave an oral presentation with Sanelisiwe Matubatuba titled "Investigating the exacerbating effects of HIV-proteins on Immortalized Mouse Brain Endothelial Cells (b.End5): An *in vitro* blood-brain barrier model" at the Physiology Society of Southern Africa 50th Congress held in Limpopo, 25-28 August 2024.

Prof. Kathy Myburgh participated in the Conference of the American College of Sports Medicine, Boston, USA, where she was selected as a Travel and Research Awards Committee Member. She also participated in the European Muscle Conference, Ljubiljana, Slovenia. She served on the Programme Committee and gave a plenary lecture at the Physiology Society of Southern Africa 50th Congress, Limpopo, 25-28 August 2024. Prof. Myburgh serves on the editorial boards of *Medicine and Science in Sports and Exercise* and *Journal of Muscle Research and Cell Motility*. She was elected as Vice-President of the Royal Society, South Africa. She is also Chair of the New Fellows and Annual Awards committee meeting and a member of the Scholar Essay Competition Committee. For the Academy of the International Union of Physiology Societies (IUPS), she is part of the Task Force for Mentorship of Early Career Physiology Lecturers in Africa.

Dr Sanjeev Rambharose published several papers in high-impact international journals in 2024. He also reviewed grants for the National Research Foundation (NRF) and served as a reviewer in several pharmaceutics and

drug delivery journals. Dr Rambharose maintains active collaboration with several researchers at the University of Cape Town, the University of KwaZulu Natal, the University of the Witwatersrand, the University of the Western Cape, the University of Texas at El Paso, the United States Naval Medical Research Unit San Antonio, the United States Department of Defence, and the United States International University-Africa, Nairobi, Kenya.

Dr Bali Sishi participated in the 50th Annual Congress of the Physiology Society of Southern Africa, hosted by the University of Limpopo in Polokwane, 25-28 August 2024..

ACADEMIC AFFAIRS

Dr Sanjeev Rambharose was selected to participate in the Department of Higher Education and Training (DHET) National Future Professor Programme (FPP) which is conducted over 2024 -2025. He was also selected to participate in the Scholarship of Educational Leadership (SoEL) programme at SU and completed this in 2024.

Dr Shireen Mentor lectured first and second year classes in Cardiovascular Physiology, Respiratory Physiology, Renal Physiology, and Immunology.

Dr Theo Nell serves as the Chair of the Departmental Undergraduate Academic Affairs and the Human Life Sciences Programme Committee. He is the module coordinator for F 334 and F 364 and has lectured for modules 114 (phased out), 334, and 344. Additionally, he oversees select undergraduate practicals as a practical convenor. Dr Nell also contributes as an external moderator in Physiology for the University of the Free State, Limpopo University, and the University of the Western Cape.

As part of our department's commitment to innovative Teaching, Learning and Assessment, **Dr Nell** and the module coordinators of the Department of Physiological Sciences has developed an AI-driven learning tool (with **Drs Bali Sishi**, **Danzil Joseph**, **Sanjeev Rambharose**, and **Shireen Mentor**) *PhysioBot*®, designed to support undergraduate students in mastering complex physiological concepts. Although not rolled out yet, *PhysioBot*® will be integrated into the BSc Human Life Sciences programme providing interactive tutoring, real-time assessments, and lab report feedback through the STEMLearn platform. The primary aim is to enhance undergraduate student learning engagement by offering adaptive quizzes, AI-driven case-based learning, and automated grading for key physiological systems (e.g. neurophysiology, endocrinology, metabolism, and clinical applied physiology etc). By leveraging the prescribed textbook and evidence-based open-access resources, *PhysioBot*® will ensure high academic rigor while fostering critical thinking and problem-solving skills. This initiative reflects our commitment to blended learning, equipping students with cutting-edge tools for academic success and future careers in basic and health sciences.

Dr Danzil Joseph was programme coordinator for the BSc Hons programme. His teaching, learning and assessment activities included lecture blocks and practicals for the Physiology 114, 144, 314, 334 and 364 undergraduate modules, and for the 774 (Hons) and 874 (MEngSc Biomedical Engineering) postgraduate modules.

STAFF MATTERS

Dr Carin de Villiers resigned in June 2024. **Dr Shireen Mentor** was appointed as lecturer in August 2024.

AWARDS TO STAFF AND STUDENTS

Michael Cowley received the first prize for his oral presentation in the Life Sciences at the annual Microscopy Society of South Africa conference.

John Hingle received the third prize for his oral presentation in the Biological Sciences at the annual Faculty of Science Postgraduate Student Research Conference.

Dr Bali Sishi received a Merit Award in "Recognition and Appreciation" for long service as secretary/treasurer of the society at the 50th anniversary of the Physiology Society of Southern Africa annual congress.

Dr Bali Sishi and **Dr Shireen Mentor** were selected as one of 20 mentees in Africa to form part of the first cohort of the International Union of Physiological Sciences

▲ John Hingle receiving his award from the Dean of Science, Prof. Burtram Fielding. *Photo: Ignus Dreyer*

▲ Msc student Francisca Darkoh. *Photo: Wiida Fourie-Basson*

(IUPS) mentoring Programme for the next generation of physiology lecturers in Africa. The programme on the African continent is a flagship with the IUPS to phase in similar programmes on all continents.

Ms Francisca Darkoh of the Integrated Metabolic Physiology Research Group received the Mandela Rhodes Scholarship, which is administered by the Mandela Rhodes Foundation, and one of Nelson Mandela's three official legacy projects.

Dr Carla Eksteen of the Cancer Research Group was the division winner of Bio Centrifuge Africa where she was invited to attend the 10th BioHealth Capital Region Forum from 17-19 September in Rockville, Maryland, USA.

PhD student **Michelle van der Merwe** received the Mitacs Globalink Research Award to complete an internship at the BC Cancer Research Centre in Vancouver, Canada, under the supervision of Prof. Cathie Garnis from January to May 2024.

SOCIAL IMPACT

SU Life Science Outreach Initiative

The SU Life Science Outreach initiative is continuing in its sixth year in 2025. It involves the presentation of Life Science practical sessions for Grade 10-12 learners at Lückhoff Secondary School in Idas Valley, Stellenbosch. Drs Danzil Joseph, Balindiwe Sishi, Theo Nell, Sanjeev Rambharose and Miss Veronique Human from the Department of Physiological Sciences manage the initiative in partnership with the school's Life Science teachers, Mrs Elizna Philander and Mr Avril Abrahams. Practical sessions involve experiments where learners make use of household items to explore various concepts in their Life Science curriculum. Postgraduate students in the

▲ MSc student Lé-chandré Asja at an outreach event at Lückhoff High School in Idas Valley, Stellenbosch. *Photo: Stefan Els*

department assist in preparing materials and facilitating sessions on a voluntary basis. A real success story of the initiative is that two former Lückhoff learners, Handré Muller and Lé-chandré Asja, who were involved with the first practicals in 2019, subsequently completed their BSc degrees in the Faculty of Science, as well as their BSc Hons degrees in the Department of Physiological Sciences. The two students are now enrolled for MSc degrees in the department. Both students play significant leadership roles among the postgraduate cohort, being President and management committee member of the Physiology Postgraduate Student Society (PPSS), respectively.

COLLABORATION

Africa
- United States International University-Africa, Nairobi, Kenya
- University of Botswana, Botswana

Austria
Vienna University

France
- Genethon
- French National Institute of Health and Medical Research (INSERM)

Germany
- Max-Planck-Zentrum für Physik und Medizin

Israel
- EDS/Chiari Center at Mount Sinai South Nassau Hospital
- Mount Sinai Health System
- Icahn School of Medicine at Mount Sinai

New Zealand
- University of Auckland

South Africa
- Cape Peninsula University of Technology
- Stellenbosch University, Faculty of Medicine and Health Sciences
- University of Cape Town
- University of KwaZulu Natal

Thailand
- Faculty of Medicine, King Chulalongkorn Memorial Hospital, Chulalongkorn University, Bangkok

United Kingdom
- Coventry University, UK
- Francis Crick Institute, London, UK
- Sheffield Hallam University, UK
- Stirling University, Scotland
- University College London (UCL)
- University College London Hospitals (UCLH)
- University of Derby, UK
- University of Liverpool
- University of Manchester

United States of America
- New York University (NYU) Grossman School of Medicine
- PolyBio Research Foundation
- University of California (San Francisco)
- University of Kansas Medical Center
- University of Nebraska
- University of Washington
- The University of Texas at El Paso
- United States Naval Medical Research Unit San Antonio
- United Sates Department of Defense

FUNDING

Denmark
- Steno Institute

South Africa
- Cancer Association of South Africa (CANSA)
- Department of Science and Innovation (DSI)
- Knowledge Collaboration and interchange
- Medical Research Council (SAMRC)
- National Research Foundation
- SA Rooibos Council
- Stellenbosch University Subcommittee B
- Stellenbosch University Faculty of Science
- Technology Innovation Agency (TIA)
- University Technology Fund (UTF) grant
- Water Research Commission

United Kingdom
- Royal Society
- Welcome Leap
- United States of America
- Carnegie Fellowship

Prof. Resia Pretorius maintains a large network of collaborators in blood laboratories all over the world since 2007. They are, in alphabetical order:

- Arizona University, USA
- Atherosclerosis/ Lipid Apheresis Center, Kansas, USA
- Emek Medical Center, Afula, Israel
- Ghent University, Belgium
- Indiana University School of Medicine, USA
- Institut Régional du Cancer Montpellier, University of Montpellier, France
- King Chulalongkorn Memorial Hospital, Chulalongkorn University, Bangkok, Thailand
- Max Planck Institute for the Science of Light, Germany
- Max-Planck-Zentrum für Physik und Medizin, Germany
- Medical University of Vienna, Austria
- Mount Sinai South Nassau Hospital, New York, USA
- National Institute of Technology, Calicut, India
- New York University Grossman School of Medicine, USA
- PolyBio Research Foundation, USA
- *Shanghai Jiao Tong University,* China
- Sheffield University, England
- University College London, England
- University of Auckland, New Zealand
- University of Birmingham, England
- University of California, San Francisco, USA
- University of Kansas Medical Center, USA
- University of Manchester, England
- University of Manchester/Liverpool, England
- University of Toledo, Ohio, USA
- University of Warwick, England
- University of Washington, USA
- Vanderbilt University, USA
- Vrije Universiteit Amsterdam, The Netherlands
- Yale University, USA

STAFF LIST

Academic staff

Professor
- Prof AM Engelbrecht
- Prof B Loos
- Prof K Myburgh
- Prof E Pretorius

Senior lecturer
- Dr T Nell
- Dr S Rambharose
- Dr B Sishi

Lecturer
- Dr D Joseph
- Dr S Mentor

Extraordinary appointments, research fellows and academic rank

Extraordinary professor
- Prof A Henriksson
- Prof A Kell
- Prof L Saso

Extraordinary lecturer
- Dr G Ellis

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cyclodecapeptide combinations
Faisa A. Hassan and Marina Rautenbach, Department of Biochemistry, Stellenbosch University
peptides (AMPs) such as tyrocidines,
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Centres and Institutes

Centre for Bioinformatics and Computational Biology

RESEARCH INTERESTS

- **Prof HG Patterton** – Epigenomics, synthetic biology and bioinformatics
- **Prof GC Tromp** – Infectious diseases, biostatistics and bioinformatics
- **Prof JT Burger** – Viral genetics and bioinformatics
- **Prof T de Oliveira** – Pathogen Genomics and bioinformatics
- **Prof JM Rohwer** – Systems biology and bioinformatics
- **Prof JL Snoep** – Systems biology and bioinformatics
- **Prof FF Bauer** – Wine biotechnology and bioinformatics
- **Dr H Volschenk** – Microbial biotechnology and bioinformatics
- **Dr C Viljoen** – Population genetics and bioinformatics
- **Prof MA Vivier** – Wine biotechnology and bioinformatics
- **Prof S Sampson** – Infectious diseases, mycobacteriology and bioinformatics
- **Prof C Kinnear** – Human genomics and bioinformatics
- **Prof G van der Spuy** – Infectious diseases and bioinformatics
- **Prof M Moller** – Infectious diseases and bioinformatics
- **Dr E Maasdorp** – Infectious diseases and bioinformatics
- **Dr E Wilkinson** – Pathogen Genomics and bioinformatics
- **Dr J Greyling** – Agriculture related data analysis
- **Dr J Lashbrooke** – Viral genetics and bioinformatics
- **Dr C Uren** – Tuberculosis pharmacogenetics

RESEARCH HIGHLIGHTS

Significant strides in TB research

Prof M. Möller's group made significant strides in tuberculosis (TB) genetics, pharmacogenomics, and bioinformatics, contributing to several high-impact studies. Notably, a multi-ancestry Mendelian randomization study published in *The Lancet Microbe* identified altered IL-6 signalling as a risk factor for TB, while research published in *eLife* confirmed HLA-II associations with TB susceptibility in admixed African populations. The Project Africa GRADIENT initiative advanced pharmacogenetic research in Africa, promoting precision medicine (Drug Discovery Today). Her group also led efforts in genomic data harmonization, improving GWAS power for African populations (Current Protocols). Additionally, we secured major NIH funding to establish the African Tuberculosis Bioinformatics Training Program, addressing the critical shortage of TB-focused bioinformaticians. Beyond research, we engaged in DIPLOMICS-funded community outreach, promoting TB awareness and DNA extraction workshops in the Northern Cape. These efforts underscore our commitment to scientific discovery, capacity building, and public health impact

RESEARCH ACTIVITIES

Prof. H.G. Patterton continued with bioinformatics research in synthetic biology and evolution of metabolic pathways and biological complexity.

Prof. Emer. G.C. Tromp retired at the end of 2024 but is still active in an advisory capacity in a number of projects.

Prof. J.M. Rohwer chaired the organising committee of the 21st Conference of the International Study Group for Systems Biology, which was held in Stellenbosch during September 2024. The organising committee additionally comprised **Prof. J.L. Snoep** and **Dr D. van Niekerk**. Prof. Rohwer delivered an oral presentation at the conference, while two of his bioinformatics Masters students, Danica Heusdens and Coenraad de Beer, delivered poster presentations.

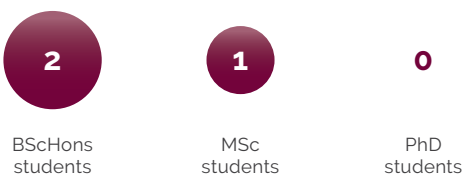
Prof. M. Möller's research activities encompassed high-impact publications, textbook contributions, student mentorship, and successful grant acquisitions. She co-edited the book *Population Genomics in the Developing World*, which explored genomic applications and challenges in resource-limited settings. Her group published extensively, with studies in *The Lancet Microbe*, *eLife*, *Journal of Clinical Investigation*, *Human Genetics*, and *Drug Discovery Today*, covering TB genetics, pharmacogenomics, and genomic data harmonization. She supervised and co-supervised multiple postgraduate students, including PhD candidates investigating TB susceptibility, pharmacogenetics, and host-pathogen interactions, as well as MSc students working on bioinformatics pipelines and genetic risk factors for infectious diseases. Additionally, she secured major NIH funding, including co-leading a $1.23M grant for the African Tuberculosis Bioinformatics Training Program and a $101K NIH R21 grant focused on regulatory variants in TB disease. Her leadership in scientific research, student development, and securing funding continues to advance the field of infectious disease genomics and precision medicine and this was underscored by the NRF C2 rating that she received.

Dr E. Maasdorp contributed to conference presentations for the Society of Nuclear Medicine and Molecular Imaging (SNMMI) and the International Union against Tuberculosis and Lung Disease, through data analysis of a cohort of teenagers with pulmonary tuberculosis, bringing together imaging (PET-CT) and lung function tests, to elucidate for the first time TB pathology in teenagers. She also contributed to three publications in international, open access journals, on the themes of non-tuberculous mycobacterial disease, surveillance of *Priesta megaterium* and post-tuberculosis lung disease. Collaboration with researchers in Kenia, through the "Genomic surveillance to control pathogen infections in Africa" (GenPath Africa) European Union (EU) Commission / EDCTP (Horizon 2020) grant, produced a pipeline and dashboard for pathogen surveillance in wastewater. A new collaboration with the Division of Pulmonology at Stellenbosch University and The London School of Hygiene and Tropical Medicine, funded by UK-NIHR *(Post TB Care),* will comprehensively investigate post-tuberculosis lung disease in terms of its physiological, functional and economic impact. Dr Maasdorp is the data analyst for the project.

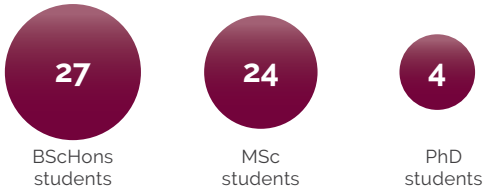
ACADEMIC AFFAIRS

The Council for Higher Education (CHE) and the South African Qualifications Authority (SAQA) approved and provided accreditation to a new structured MSc in Bioinformatics of Infectious Diseases and Pathogen Genomics. This new degree programme will kick off in 2026. It runs over two years, and will include lecturers from the faculties of Science, AgriSciences and Medicine and Health Sciences, and a research project component.

Number of graduates 2024



Number of postgraduate students



NRF-RATED RESEARCHERS	
Internationally acclaimed researchers	
Prof JL Snoep	Computational systems biology
Prof FF Bauer	Integrated wine sciences
Established researchers	
Prof C Kinnear	Human genomics and bioinformatics
Prof M Möller	Infectious diseases and bioinformatics
Y-rating	
Dr C Uren	TB pharmacogenetics

STAFF MATTERS

Prof. Emer. Gerard Trump retired at the end of 2024.

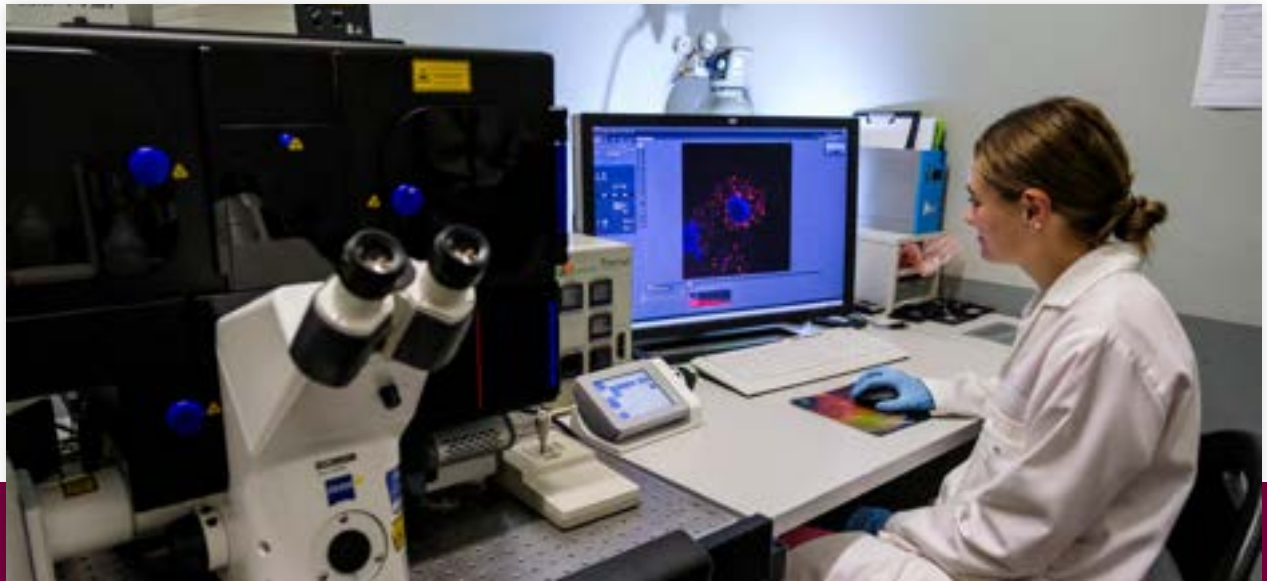
FUNDING

International

- Abbott Pandemic Defense Coalition
- Beilstein Institute (Germany)
- Bill and Melinda Gates Foundation
- DAAD
- DIPLOMICS
- European Union (EU) Commission / EDCTP (Horizon 2020)
- EU COST Action COZYME
- GIZ commissioned by the Government of the Federal Republic of Germany
- H3ABioNet
- Health Emergency Preparedness and Response Umbrella Program (HEPR Program), managed by the World Bank Group
- National Institutes of Health (NIH)
- National Institute for Health and Care Research (UK)
- Rockefeller Foundation
- South African Medical Research Council (SAMRC)
- South African mRNA Vaccine Consortium (SAMVAC)
- SAMRC/GSK-Novartis

South Africa

- DSI/NRF SARChI in Mycobactomics
- NRF Competitive Programme for Rated Researchers (CPRR)
- NRF/DSI funding for SARChI project "Mechanistic modelling of health and epidemiology"
- Stellenbosch University Faculty of Science
- Stellenbosch University Subcommittee B
- Winetech



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Stellenbosch University Water Institute

INTRODUCTION

The Stellenbosch University Water Institute (SUWI) focusses on South Africa's complex water security challenges through multi-disciplinary research and outreach, as well as the hosting of the Platform of Vocational Excellence in Water. Representing all faculties, SUWI assembles teams with expertise tailored to specific challenges and needs. This approach allows researchers and students from all levels to collaborate, network, and adapt to new opportunities.

Anchored in the Faculty of Science, a core team supports this dynamic environment, enhancing water security in a water-scarce country. SUWI contributes to Stellenbosch University's vision of advancing knowledge in service to society, drawing from a large pool of researchers and postgraduate students across Faculties. SUWI recognizes the critical need for sustainable management of water resources in a global context of growing water insecurity. Innovation is crucial to addressing the rising demand for potable water and the health problems linked to contaminated supplies, while also considering environmental concerns and economic development. Through these initiatives, the Institute stays focused on linking the University's resources and expertise to contribute to the SU Vision 2040, addressing strategic research areas at the interface between water and society in the following spheres:

- Water resource quality and protection, and
- Vocational Excellence in Water

Water resource quality and protection

With most of South Africa's rivers being in a crisis due to pollution that impacts human health, agriculture and ecosystems, most of the current research projects at SUWI have a strong focus on this valuable resource from a One-Health perspective.

Notably, the team leads or are involved as senior partners in several ongoing collaborative efforts to study contaminants of emerging concern in water resources, and the associated risks to humans and ecosystems. Recent discoveries by the team include the detection of cancer in animals, captured in polluted dams, with strong indication that chemical pollution is the cause. The core consortium includes members of SUWI and the Cancer Research Group in SU's Department of Physiological Sciences, which was recently expanded to include the SU School for Data and Computational Thinking, as well as collaborators from the University of Pretoria and University of Limpopo.

Collaboration involves the City of Cape Town, NGOs, and other local partners, and further extends to international partners such as Eduardo Mondlane University

Sampling locations of ongoing research projects to understand the effects of mine and sewage impacted water on humans and ecosystems. Images: Christoff Truter

(MZ), Zurich University of Applied Sciences (CH) and North Carolina State University (USA). Furthermore, industrial partners, municipalities and different levels of government are valuable contributors on most of the projects and initiatives.

Recent media coverage by Carte Blanche (27 Oct 2024) provides a good overview to demonstrate the relevance of the work - https://www.youtube.com/watch?v=ZHOfS3OaVq4

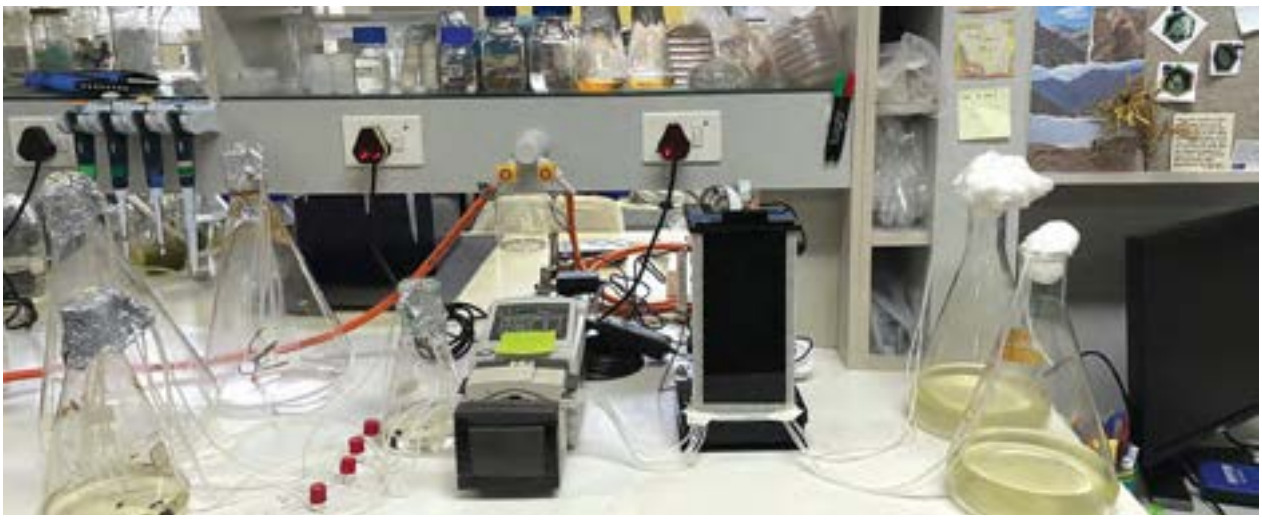
Examples of recently concluded and ongoing projects include:

MAR2PROTECT

This European Union funded (Horizon 2022) project titled "Preventing groundwater contamination and protecting its quality against harmful impacts of global and climate change through a holistic approach on managed aquifer recharge" is coordinated by NOVA University (Portugal). The consortium consists of European partners from Portugal, Spain, Italy, Netherlands, Switzerland, Lithuania, with Stellenbosch University, City of Cape Town and the Higher Institute of Applied Biological Sciences of Tunisia Africa being the African partners (ends in 2026).

Notable highlights of the project include:

- Development of an online continuous flow estrogenicity biosensor based on the response of by-engineered microorganisms to pollutants in real time through the Internet of Things. This system has the potential to revolutionize water quality monitoring through automation coupled with real-time data capture and state-of-the-art telemetry, to enable rapid response to accidental pollution events as well as intentional or illegal dumping.
- Creation of a living lab consisting of public and private sector representatives. This initiative has boosted academic-public sector interaction with the joint goal of protecting water quality through collaboration to facilitate awareness and enhancing social impact.



Development of an online continuous flow estrogenicity biosensor based on the response of by-engineered microorganisms to pollutants in real time through the Internet of Things.

Rand Water Chair in Public Health

From its inception in 2020 until its final year in 2025, the Chair supported numerous student projects working on the topic of drinking water quality that relates to human health risk assessment, epidemiology and the One Health concept. The high degree of complementarity with MAR2PROTECT was of great benefit to ensure the research maintains a focus on real-world challenges; an example being the development of biosensors noted above.

WASA

This is a project with Karlsruhe Institute of Technology to coordinate the implementation, utilization and transfer of scientific knowledge, services and technologies of seven projects supported by the BMBF (German Federal Ministry of Education and Research) WASA Program to increase water security in Sub-Saharan Africa. https://www.fona.de/en/measures/funding-measures/water-security-in-africa-wasa.php (2028)

SERPIC

The "Sustainable Electrochemical Reduction of contaminants of emerging concern and Pathogens in WWTP effluent for Irrigation of Crops" projects is jointly funded by the EU JPI program and the South African Water Research Commission. https://www.jpiamr.eu/projects/serpic/ (2025).

DIVAGRI

The "Revenue diversification pathways in Africa through bio-based and circular agricultural innovations" project https://divagri.org/ is focused on the primary production sector related to the food and bio-based industries, with an emphasis on new partnerships between producers, processors, retailers and consumers to open new sustainable avenues for businesses, services and value chains in support of rural communities. The technologies are adapted to specific conditions in target countries to promote ecosystem restoration in combination with

diverse crop production in regenerative agricultural systems, mobile biorefineries for biomass conversion to high-value compounds and bioenergy, "SLECI", a Self-regulating, Low Energy, Clay based Irrigation system (2025).

DwaOx

The "Drinking Water Reclamation from Final Effluent through Improved Advanced Oxidation" project is funded by the Department of Science, Technology and Innovation (DSTI) to boost socio-economic development in South Africa through research and innovation, which supports selected completed projects funded under the EU Framework Programmes – in this case it was the EU Horizon funded Safe Water Africa project (https://cordis.europa.eu/project/id/689925). The project developed two demonstrator plants that were installed in South Africa at Ekurhuleni Water Care Company (ERWAT) and in Mozambique, respectively, each with the capacity to produce up to 100m^3 of WHO-quality water per day. Project partners include Virtual Consulting Engineering, ERWAT, Fraunhofer (Germany) and the University of Limpopo (2027).

Low-Tech Resource-oriented Water Treatment Solutions for Off-grid Communities

The project is funded by the Ave Fenix Foundation and involves the testing, and further development of a greywater treatment technology, originally developed at Zürich University of Applied Sciences (ZHAW). Together with the Public Benefit Organization, Violence Prevention through Urban Upgrading (VPUU), the technology is implemented at the community center in Monwabisi Park in Khayelitsha with the further aim to develop the technology to treat blackwater. Through implementation of a participatory approach, the project engages with the local community to ensure that the solutions focus on their specific needs (2028).

Vocational Excellence in Water

Stellenbosch University Platform of Vocational Excellence in Water

The Platform of Vocational Excellence (PoVE) in Water Scale Up is a project funded by the EU Erasmus+ programme with the "*objective of the project to integrate Vocational Excellence in the Water sector ensuring high quality skills and competences of graduates that leads to quality jobs and careers, meeting the needs of an innovative, inclusive, and sustainable water sector*".

Stellenbosch University as a coordinating institution established the Platform for Vocational Excellence (PoVE) Water Scale-up. This is a joint initiative of several European Universities and training institutions, and water industry professionals bodies. Four Centers of Vocational Excellence (CoVE) were established across Europe with the fifth one in South Africa. The four CoVE include CoVE Western Europe under the coordination of CIV Water in the Netherlands, CoVE Mediterranean, CoVE Water Baltics under the coordination of Riga Technical University, and CoVE Central Europe under the coordination of Mendel University in Czechoslovakia. The project focusses on establishing North-South collaboration by connecting institutions across Europe to institutions in Southern Africa who are active in vocational excellence.

In SA the fifth platform recognizes local support structures which include AUDA-NEPAD Southern African Network for Water Centers of Excellence (SANWATCE), the Department of Water and Sanitation (DWS), Rand Water Academy, CSIR, Umgeni uThukela, the Energy Water Sector Education Training Authority (EWSETA), Drakenstein Municipality, and a number of colleges which include Vhembe, Capricorn, West Coast, False Bay, Lovedale, and Nkangala.

The EWSETA as lead partner contributed significantly to the establishment of the partnership in South Africa by providing funding for capacity building activities with the following outcomes in 2024:

- Fourteen undergraduate science and engineering students in need from Stellenbosch University received bursary contributions towards their cost of attendance based on actual need to the maximum allowance of R80 000.
- Thirty-five participants successfully completed the SU registered short course "Water Quality Management and Risk Assessment at Water Treatment Works". The two courses were held in the Western Cape (14 - 16 August 2024) and Mpumalanga (18 - 20 September 2024) and attended by lecturers from Boland, West Coast, Northlink, Nkangala colleges and as well staff from City of Cape Town, Drakenstein, Stellenbosch, Witzenberg, Steve Tshwete, Thembisile Hani, and Emalahleni municipalities.
- Twenty-seven participants successfully completed the SU registered short course "Water and Wastewater Treatment Process Management". This course was held in Polokwane (28 – 30 August 2024) and attended by lecturers from Vhembe and Capricorn TVET colleges and municipal staff from Polokwane, and Capricorn municipalities.

Other highlights of the project include:

- Stellenbosch University hosted the fourth regional mission from 18 -22 November 2024, which was attended by members from four CoVEs which include Netherlands, Germany, Malta, Latvia, Czech Republic, and the fifth established CoVE in South Africa. One of the objectives of the week was to strengthen the North and South collaboration, and to learn about how the Western Cape dealt with day zero.
- This event also coincided with a hackathon with more than 80 participants which included EU partners, local TVET colleges, Umgeni Water Board, the Energy and Water Sector Education Training Authority (EWSETA) board members, Western Cape Government, Department of Water and Sanitation, as well as SU and UWC post graduate students.
- The official launch of the regional partnership took place on 19 November 2024 and included Rand Water, EWSETA, Agriculture Sector Education Training

Authority (AgriSETA), Nkangala, Vhembe, Capricorn, and Lovedale TVET colleges.
- SUWI received the Recognition of Excellence for Strategic Partnerships – National award from the EWSETA at its Annual General Meeting in December 2024.

Centres of Vocational Excellence in Climate Smart Agriculture in South Africa

The **Centers of Vocational Excellence in Climate Smart Agriculture in South Africa (CoVE SA)** is funded by Erasmus+ programme of the European Union. The objective of the project is "to integrate vocational excellence in the climate-smart agriculture sector, thereby ensuring high quality skills and competences that lead to quality jobs and careers, meeting the needs of an innovative, inclusive, and sustainable rural economy".

The consortium consists of Boland, West Coast and Lovedale TVET colleges, AgriColleges International, Maastricht School of Management, Mendel University, and Stellenbosch University.

Recent highlights of the project include:

- The launch of the three regional CoVEs at Boland (4 – 5 March 2024), Lovedale (8 – 11 March), and West Coast (14 – 15 March 2024) TVET colleges. In total 87 individuals attended the respective events with 22 stakeholders signing a Letter of Intent to participate in project-related activities.
- Twelve staff members from Boland, West Coast and Lovedale TVET colleges successfully completed the "Executive Programme: Project Management" course, registered and facilitated by Maastricht School of Management.
- Thirty-one staff members from Lovedale (14 – 15 November 2024) and West Coast (20 – 21 November 2024) TVET colleges attended the "Online and Blended Learning Delivery" workshop facilitated by AgriColleges International.
- Stellenbosch University hosted the Project Meeting and Training Week from 14 to 18 October 2024, which was attended by members from the Netherlands, Czech Republic, and South Africa.

Delegates from Boland, Lovedale, and West Coast TVET Colleges, AgriColleges International, Stellenbosch University, Mendel University (Ceczh Republic) and Maastricht University (Netherlands) attended the Project Meeting and Training Week in October 2024.

Capacity Building for Integration of Renewable Energy in Water Efficient Protected Vegetable Production

The Orange Knowledge Programme Tailor-Made Training Plus (TMT+) project was funded by NUFFIC, the Dutch organization for internalization of education. The aim of the project was to strengthen the capacities of TVET colleges and Agricultural Training Institutes (ATI) by focusing on enhancing skills in food security, water-efficient agriculture and climate smart agriculture.

The main beneficiary of the project was Elangeni TVET College although staff from numerous TVET colleges and ATIs also attended the specific training sessions. The programme was supported by Stellenbosch University and the Dutch partners, Aeres MBO and HAS University of Applied Sciences.

Key highlights of the project for 2024 include:

- A new medium-technology greenhouse was established at the Mpumalanga Campus of Elangeni TVET College. This demonstration site will be used as

an educational tool for college students as well as a demonstration tool for local producers.

- 31 Lecturing staff members from Elangeni, Capricorn, Coastal, Esayidi, Majuba, Mnambithi, Orbit, Umfolozi, Umgungundlovu, and Vhembe TVET colleges attended the Company Incubation Training Week at the Mpumalanga Campus of Elangeni TVET College (12 – 15 February 2024). This training week was facilitated by Aeres MBO and HAS University of Applied Sciences.
- The project also consisted of a Technical Protected Horticulture Training series, consisting of three training weeks. 26 Staff members from Elangeni, Capricorn, Majuba, Mnambithi, Orbit, Umfolozi, and Vhembe attended Part 1 (Horticulture - Water) of the series from 8 to 12 April. 28 Staff members from Elangeni, Capricorn, Coastal, Esayidi, Majuba, Mnambithi, Orbit, and Vhembe TVET colleges attended Part 2 (Horticulture - Crop) of the series from 6 – 10 May 2024. The last week of the training series (Part 3, Horticulture - Integrated Pest Management) was attended by 33 members from Elangeni, Capricorn, Esayidi, Majuba, Mnambithi, Orbit, uMgungundlovu, and Vhembe TVET colleges. All three training weeks were facilitated by knowledge experts from Aeres MBO, HAS University of Applied Sciences and Stellenbosch University and took place at the Mpumalanga campus of Elangeni TVET College.

Rustenburg Agricultural Development Support Programme

The Rustenburg Agricultural Development Support Programme (RADSP) is funded by the Sibanye Rustenburg Mine Community Development Trust (SRMCDT) with the objective to "focus on Food and Nutrition Security and to combine the promotion of agriculture growth and sustainable climate smart agriculture in Rustenburg". The consortium consists of Orbit TVET College, Stellenbosch University and the Rustenburg Local Municipality.

The project strives to create "Vocational Excellence" in the climate- and water-smart horticulture sector, thereby ensuring high quality skills and competences that lead to quality jobs and careers, meeting the needs of an innovative, inclusive, and sustainable rural economy.

Key highlights of the project for 2024 include:

- 41 Emerging farmers and 52 staff members from the college successfully completed the "Crop Strategy and Crop Rotation and Integrated Production of Arable Crops" short courses, respectively. The short courses were registered and facilitated by Stellenbosch University. Both short courses took place at the Rustenburg Campus of Orbit TVET College from 19 to 21 June and 14 to 16 August, respectively.
- 27 Emerging farmers and ten staff members from the college attended the workshops titled "Small Business Development in an Agricultural Context" and "Introduction to Hydroponics and Aquaponics", respectively. The workshops were facilitated by a knowledge expert from Stellenbosch University and took place at the Rustenburg Campus of Orbit TVET College on 1 November and from 11 to 13 December, respectively.

Managing (South) Africa and Senegal Sustainability Targets Through Economic Diversification of Rural Areas

The Managing (South) Africa and Senegal Sustainability Targets through Economic diversification of Rural Areas (MASSTER) project is funded by the Erasmus+ programme of the European Union. The overall objective of the project is "to develop and offer innovative educational and training tools, implemented through Higher Education Institutions (HEIs), as well as to facilitate greater involvement in community development and whole of society approach within the agricultural/rural development and migration/ mobility nexus".

The consortium consists of three HEIs in Senegal (Universite Du Sine El-Hadj Ibrahima Niass, Universite Gaston Berger De Saint Louis, and Universite Assane Seck de Ziguinchor), and South Africa (University of the Free State, Tshwane University of Technology, and Stellenbosch University) as well as five HEIs in Europe (Hochschule Weihenstephan-Triesdorf, Universite D'Aix Marseille, Academy of Professional Studies South Serbia, Western Balkans Institute, Universita Degli Studi Napoli Federico II).

Key highlights of the project for 2024 include:

- The kick-off meeting took place from 29 January to 3 February 2024 at the University of Applied Sciences Triesdorf, Germany.
- The second meeting took place at the Universite Gaston Berger in Saint Louis, Senegal, from 14 to 18 October 2024. In the meeting the project team worked on four short courses in the areas of: agro-tourism development; farm management and income generation; farm management and climate change resilience; and food value chain. Both meetings were attended by two Stellenbosch University staff members.

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