



Stellenbosch  
UNIVERSITY  
IYUNIVESITHI  
UNIVERSITEIT

2021  
ANNUAL  
REPORT



SCIENCE • EYENZULULWAZI NGEZENDALO • NATUURWETENSKAPPE

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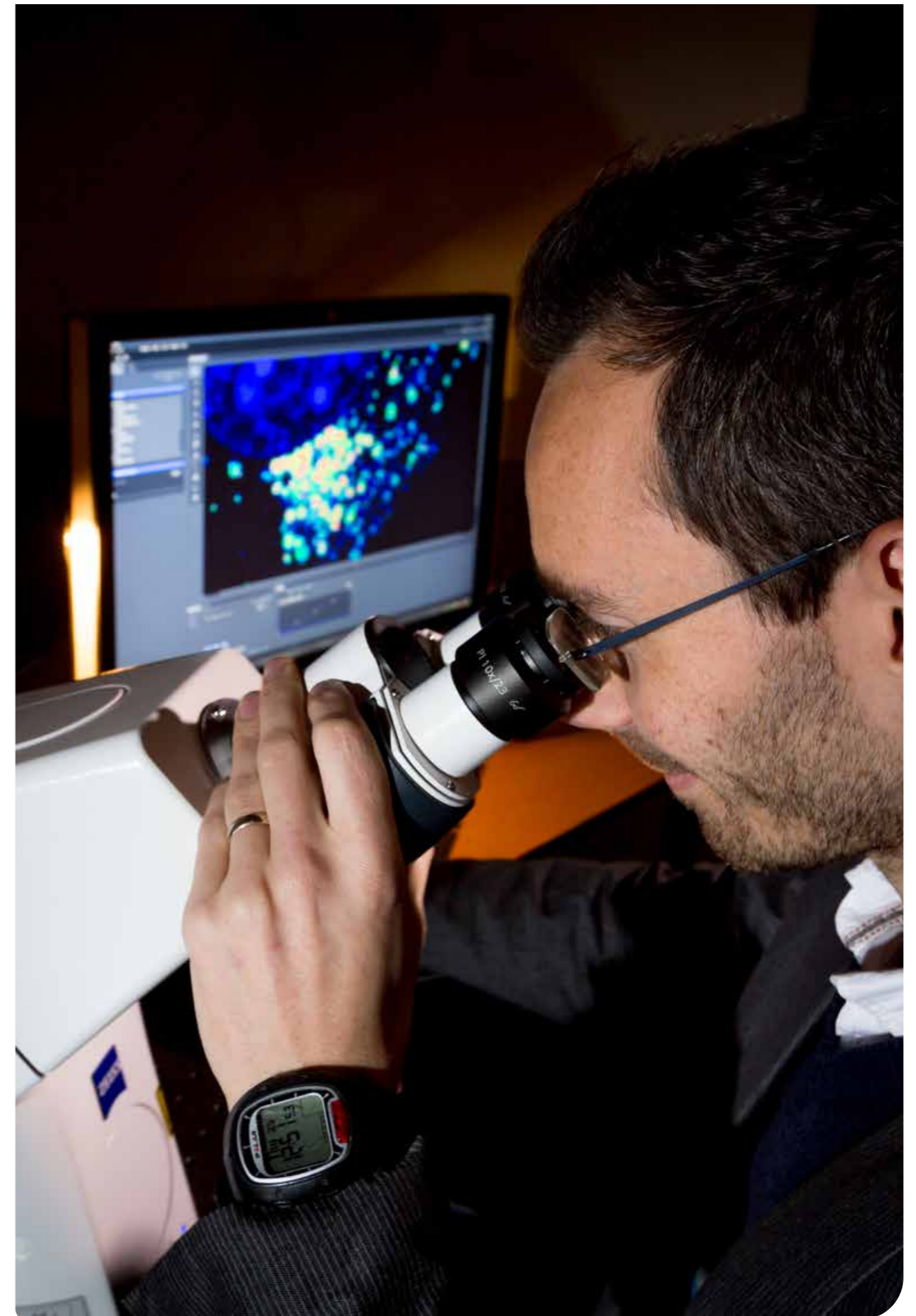
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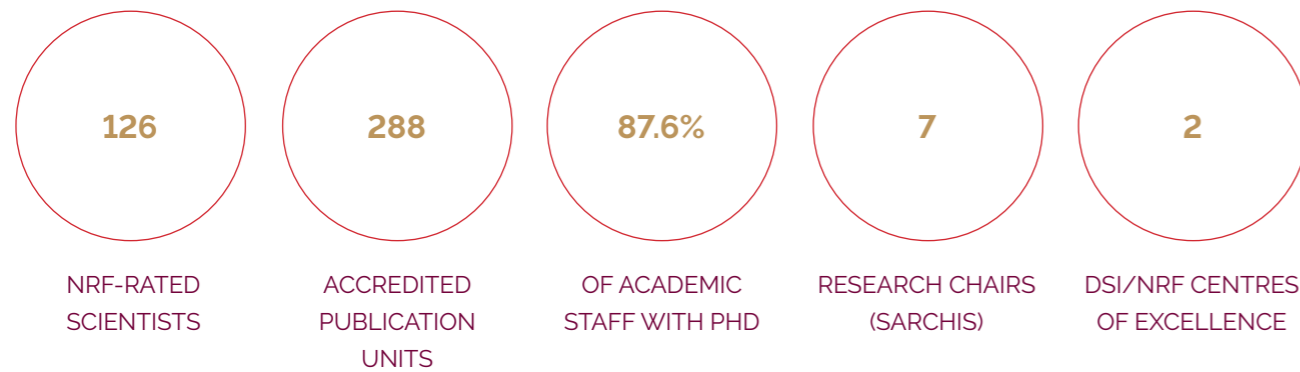
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# FACULTY OF SCIENCE – AT A GLANCE

## Our faculty

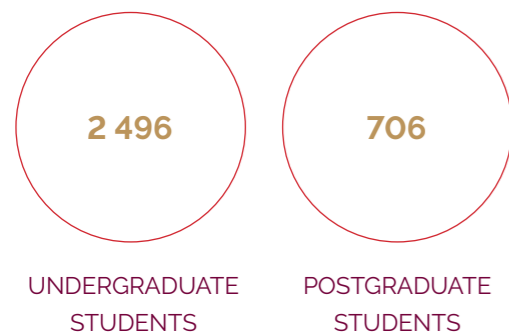
### Academic profile



## NFR-rated academic staff 2021



## Our students



## Undergraduate student diversity (race)

YEAR	WHITE	BCI	TOTAL	%BCI
2017	1429	769	2198	35.0%
2021	1529	967	2264	38.7%

## Postgraduate student diversity (race)

YEAR	WHITE	BCI	TOTAL	%BCI
2017	446	282	728	38.7%
2021	441	265	706	37.5%

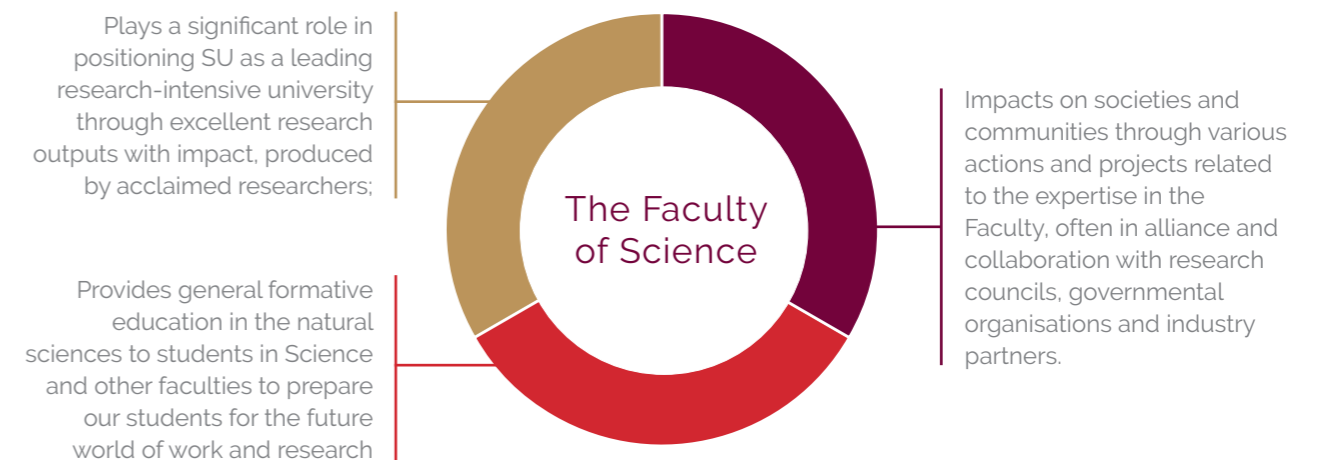
## Undergraduate student diversity (gender)

YEAR	MALE	FEMALE	TOTAL	%FEMALE
2017	886	1312	2198	58%
2021	1063	1433	2496	57%

## Postgraduate student diversity (gender)

YEAR	MALE	FEMALE	TOTAL	%FEMALE
2017	399	329	728	45%
2021	363	343	706	48%

## VALUE STATEMENT



## FROM THE DEAN

Over the past two years the ongoing COVID-19 pandemic has required an immense effort and agility from staff members to keep the academic programme on track and to adapt to ever changing circumstances. However, while the pandemic has certainly taken its toll on staff and student's morale, the Annual Report for 2021 reflects remarkable resilience and professionalism across teaching and learning, research and social impact initiatives.

### Teaching and learning

As the reader will gather from our departmental reports this year, offering Augmented Remote Teaching, Learning and Assessment (ARTLA) in 2021 has been even more challenging than the fully online approach followed in 2020 for most modules offered by the Faculty's departments. Challenges have included inspiring students to engage with self-learning, improving the effectiveness and integrity of assessments, balancing a more hybrid offering with some in-person activities, and becoming proficient with the on-campus protocols and Extended Learning Spaces (ELS) technology. In this regard, Prof Ingrid Rewitzky, vice-dean: teaching and learning, and her team did exceptional work to keep us on track to complete the academic year successfully.

On postgraduate level research activities in the laboratories and in the field could continue at a more rapid pace than in the previous year, although not yet at full capacity. We are therefore proud of the large cohort of postgraduate students who managed to complete their studies despite the major disruptions to their research due to very strict COVID-19 protocols in the



laboratories. It is a testament to their resilience that even under difficult circumstances they were able to produce high quality research.

However, the economic impact of recent developments, COVID-19 included, has had a significant impact on research funding and postgraduate

bursaries. This scenario has resulted in a continued decline in postgraduate student numbers since 2017. The Faculty is grateful for substantial funding from SU for postgraduate bursaries, but there is still a shortfall compared to bursary allocations received in previous years. The recently established Catalyst Fund is not yet able to sustain our current number of postgraduate students and the Faculty had to use a portion of its budget allocation to support bursary offers to postgraduate students. In future staff will have to dedicate more time and effort to secure research funding and bursaries from various sources.

Fortunately, the National Institute of Theoretical Physics (NITheP) has been restructured as the multidisciplinary National Institute for Theoretical and Computational Science (NITheCS) and funding for the next three years has already been secured. The Faculty can access this resource through multidisciplinary research activities such as Data Science, Machine Learning,

Computational Biology and Statistical Physics.

### Research and social impact

The Faculty maintains a strong ethos of research excellence and makes an important contribution to society through research outputs with impact. During 2021 this ethos was again made evident with an impressive list of national and international awards made to researchers and postgraduate students (see pages 7 to 8).

“  
The Annual Report for 2021 reflects remarkable resilience and professionalism across teaching, learning and research activities.”

From the research highlights in our departmental reports, the impact of our research on society is also evident. In this regard, I do have to single out the contributions made by Prof Juliet Pulliam and her research team at the South African Center for Epidemiological Modelling and Analysis (SACEMA) to South Africa's COVID-19 response strategy. From the Department of Microbiology and in collaboration with the Stellenbosch University Water Institute, Prof Gideon Wolfaardt and Dr Edward Archer implemented a wastewater-based surveillance platform to detect institutional SARS-CoV-2 outbreaks on two of SU's campuses. In both cases, the research and results were shared with the public via our media officer and the Faculty's Science Café Stellenbosch initiative. Of particular importance is also Prof Resia Pretorius' ongoing research on blood clotting associated with Long Covid. She is now part of an international network of researchers and clinicians working on this problem. Her research has received international media coverage in *The Guardian*, *The Scientist* and the *Mirror* newspaper in the UK, amongst others.

Virtual joint research activities and virtual conferences have once again been a major challenge in 2021. No internet intervention, be it, for example, with Zoom or Microsoft Teams, comes remotely close to physical presence and interaction when collaborating with a colleague or participating in an academic conference.

Some lecturers, such as Dr Pieter Neethling in the Department of Physics, started in 2020 already to encourage his postgraduate students to benefit from the opportunity offered by online conferences, which would otherwise have been difficult to assess. In 2021 this culminated in 14 presentations at five national and international conferences.

### In conclusion

This annual report provides a detailed overview of the year's activities. It is a testament to our staff and students' resilience and professionalism. I would like to acknowledge and thank our staff for their dedication, patience and for often going beyond the call of duty during another unusual year.

Despite the challenges, there are numerous exciting opportunities for growth and development in the Faculty of Science, especially in data science, climate studies and other interdisciplinary developments.



I would like to acknowledge and thank our staff for their dedication, patience and for often going beyond the call of duty during another unusual year.

Strategic priorities for 2022 include expansion of hybrid-learning and short course offerings, to recruit and maintain a steady flow of postgraduate students, conduct collaborative and interdisciplinary research and grow current national and international partnerships and networks.

Through our numerous research activities and graduates, we continue to contribute to South Africa's

global competitiveness in the science, technology and innovation sectors.

Prof Louise Warnich  
Dean: Faculty of Science

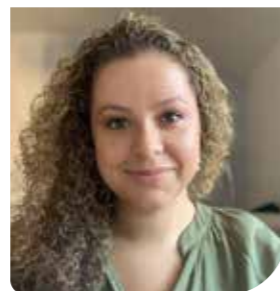
## AWARDS



**PROF LEN BARBOUR**  
(Department of Chemistry and Polymer Science) – **Royal Society of South Africa's Herschel Medal**



**DR KATHERINE DE VILLIERS** (Department of Chemistry and Polymer Science) – **South African Chemical Institute's Raikes Award**



**DR THERINA DU TOIT** (Department of Biochemistry) – **Marie Curie Fellowship**



**PROF FAADIEL ESSOP** (Department of Physiological Sciences) – **Teaching Advancement at University (TAU) Fellowship 2021-2022**



**PROF DELIA HAYNES** (Department of Chemistry and Polymer Science) – **President of the African Crystallographic Association (AfCA)**



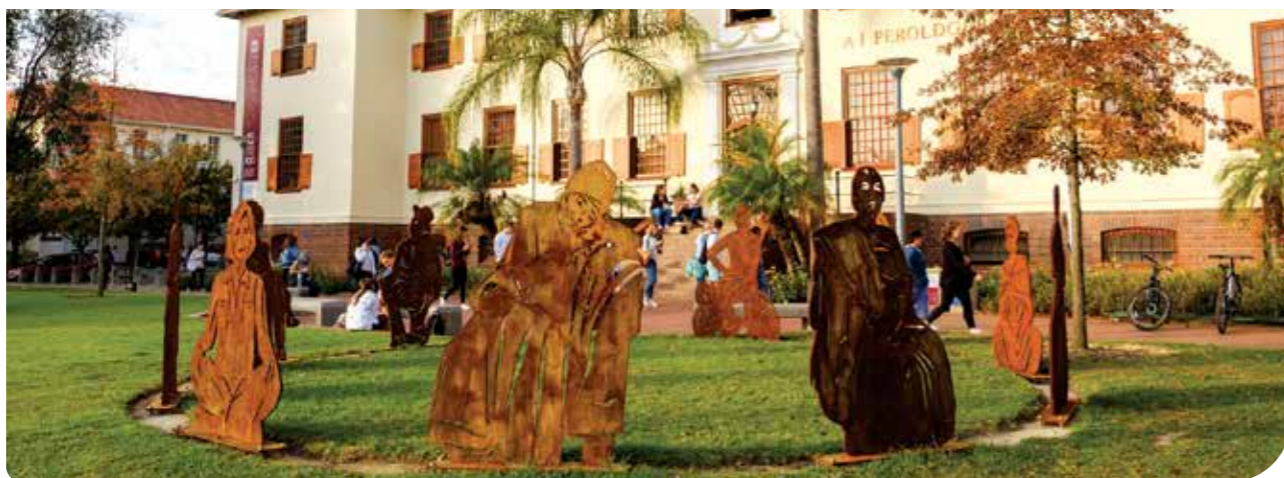
**PROF ZURAB JANELIDZE** (Department of Mathematical Sciences) – **President of the South African Mathematical Society (SAMS)**



**PROF ALEX KISTERS** (Department of Earth Sciences) – **Geological Society of South Africa's Draper Memorial Medal**



**PROF BERT KLUMPERMAN** (Department of Chemistry and Polymer Science) – **Vice-president of the Royal Society of South Africa**



**PROF NOX MAKUNGA** (Department of Botany and Zoology) – **Future Professors Programme, Department of Higher Education and Training**



**DR REHANA MALGAS-ENUS** (Department of Chemistry and Polymer Science) – **Future Professors Programme, Department of Higher Education and Training and Treasurer of the Royal Society of South Africa**



**PROF PETER MALLON** (Department of Chemistry and Polymer Science) – **Member of the International Union of Pure and Applied Chemistry (IUPAC) Polymer Division**



**PROF GUY MIDGLEY** (Department of Botany and Zoology) – **Reuters Hot List of 1 000 top climate scientists**



**PROF SONJA MOUTON** (Department of Mathematical Sciences) – **Representative on the South African Committee for the International Mathematics Union (SANCIMU)**



**PROF KATHY MYBURGH** (Department of Physiological Sciences) – **Renewal of the SARCHI in Integrative Skeletal Muscle Physiology, Biology and Biotechnology**



**PROF DAVE RICHARDSON** (DSI/NRF Centre of Excellence in Invasion Science) – **Web of Science Highly Cited Researchers 2021**



**PROF ERICH ROHWER** (Department of Physics) – **Optica Fellow Member**



**MS MARIETTA VAN DEN WORM** (Director: Faculty Management) – **SU Chancellor's award: Service**



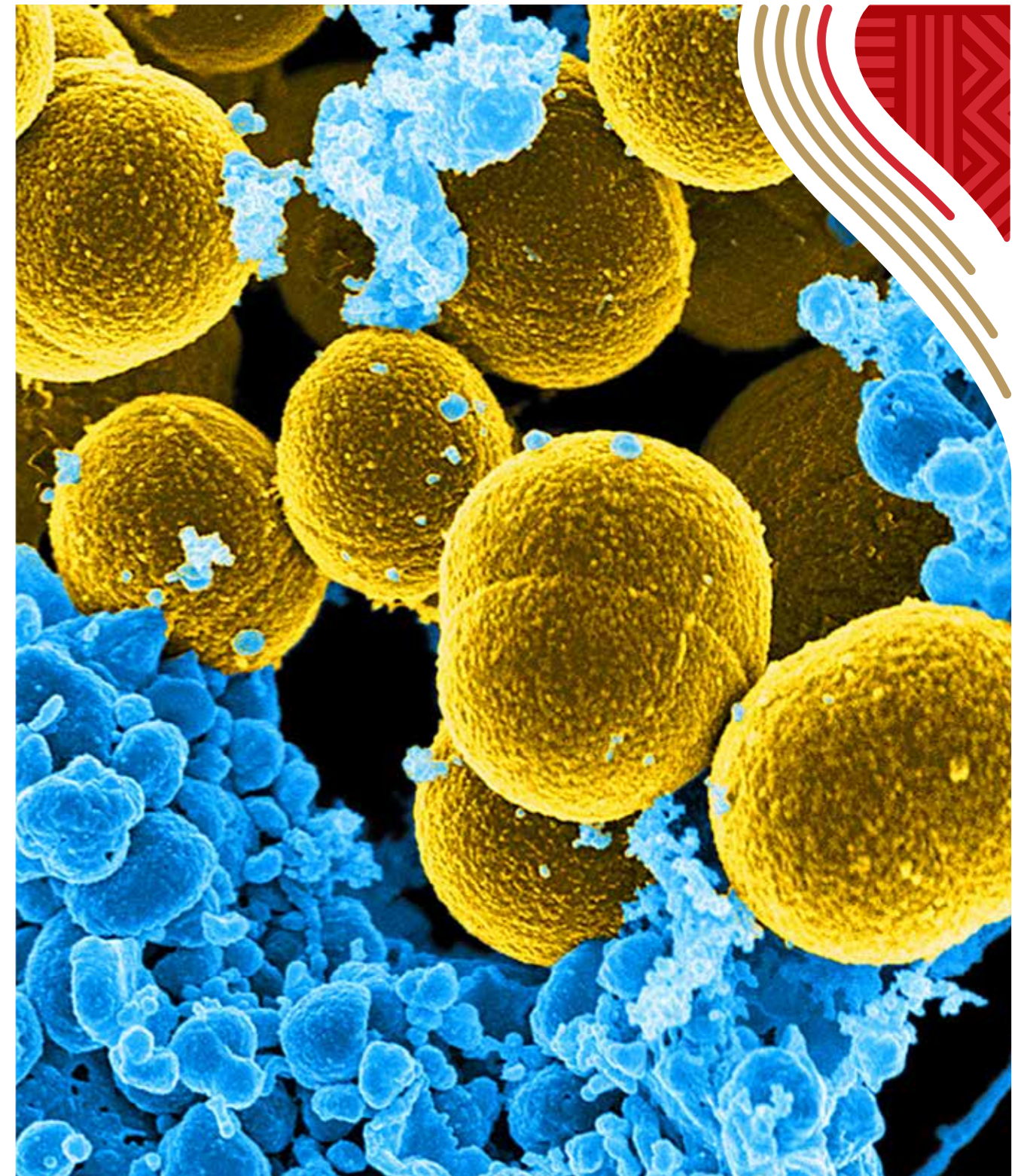
**PROF WILLEM VAN OTTERLO** (Department of Chemistry and Polymer Science) – **President of the South African Chemical Institute (SACI)**



**PROF ANDRÉ WEIDEMAN** (Applied Mathematics Division) – **SU Chancellor's award**



DEPARTMENTAL  
**REPORTS**



DEPARTMENT OF  
**BIOCHEMISTRY**



## RESEARCH INTERESTS

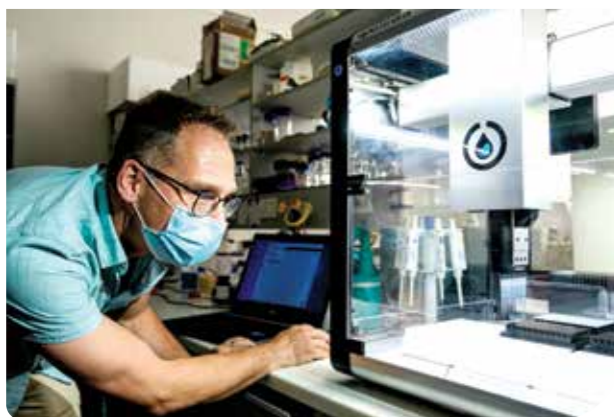
Steroid hormone and receptor function in health and disease; Plant and animal pathogen detection and evolution; Antimicrobial peptides and drugs;

Mathematical, computational and experimental systems biology; Mechanistic enzymology; Cell stress responses and protein folding

## RESEARCH HIGHLIGHTS

Grand Challenges Africa grant for development of molecule-based interventions

**Prof Erich Strauss** was awarded a grant under the auspices of the Grand Challenges Africa (GC Africa) programme's Drug Discovery Initiative. The aim of the programme is to promote Africa-led scientific innovations to help countries achieve the Sustainable Development Goals, by supporting "big, bold, impactful, innovative ideas that have a potential for impact, scale and sustainability". Prof. Strauss and his team will use this grant to develop small molecule-based interventions that support the human immune system during infections by the bacterial pathogen *Staphylococcus aureus*. The grant award made it possible to purchase new equipment that facilitates the discovery of new inhibitors, and will further strengthen the Strauss group's collaboration with the XChem team at DLS in the UK.



The brand new, state-of-the-art Opentrons OT-2 pipetting robot in Prof Erich Strauss' lab in the Department of Biochemistry at Stellenbosch University. This robotic pipet will enable researchers to discover new inhibitors faster and cheaper, thereby making new drug discovery more accessible to South African researchers. PHOTO: STEFAN ELS

“ The aim of the programme is to promote Africa-led scientific innovations.

Antigenic peptides for Hepatitis C diagnosis in 15 million patients per year

The BIOPEP Peptide Group, under the leadership of **Prof Marina Rautenbach**, has successfully produced and delivered antigenic peptides, fulfilling a SU contract with the international company DIASORIN, under taxing COVID restrictions. These high purity antigenic peptides are used for Hepatitis C diagnosis in about 15 million patients per year and it is globally one of the most sensitive tests for HCV infections.

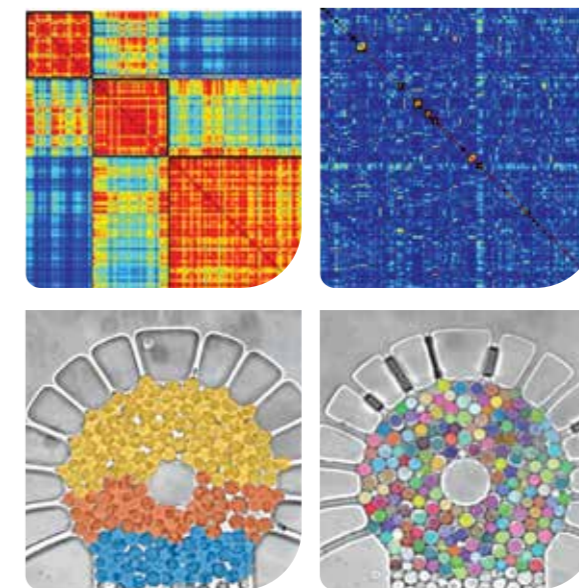
Face masks with removable antiviral and antimicrobial filters

**Prof Marina Rautenbach** and **Dr Wilma van Rensburg** received a South African Technology and Innovation Agency (TIA) grant for the development and testing of face masks with removable antiviral/antimicrobial filters. Their ergonomic washable face mask with a removable self-sterilising filter will fill the gap between respirator-type face masks offering personal protection and surgical masks that only offer source control and little protection to the wearer. First-line health workers, general medical practitioners and dentists will benefit from this innovation on face masks.

Simulation of community formation in yeast cells

In collaboration with the group of Prof Mattias Goksör and Dr Caroline Beck Adiels from the Department of Physics at the University of Gothenburg, **Prof Jacky Snoep** and **Dr Dawie van Niekerk** simulated, and experimentally validated, community formation and wave propagation in a diffusion-limited microfluidic

cell. Each of the yeast cells in the chamber is simulated with a detailed mathematical model based on enzyme kinetic data, and the cells are linked via extracellular metabolites leading to synchronisation. The model was developed at SU and correctly predicted the community structure and its dependence on external perturbations. The work was published in *PNAS* in 2021.



**Synchronized communities:** The adjacency matrices, showing signal correlation between individual yeast cells (red is synchronized, blue is desynchronized), and the resultant communities formed amongst 150-200 yeast cells in a microfluidic chamber, under synchronizing conditions (top figures), and de-synchronizing conditions (bottom figures). The chamber mimics an organ structure with diffusion limited substrate supply, leading to zonal differentiation. IMAGES: D VAN NIEKERK AND J SNOEP

“ First-line health workers will benefit from the development of face masks with removable antiviral and antimicrobial filters.

## RESEARCH ACTIVITIES

**Prof Donita Africander** served on the editorial board of the *Journal for Ethnopharmacology* and as guest editor for *Frontiers in Immunology* and the *Journal of Steroid Biochemistry and Molecular Biology*. She has active collaborations with Profs Jacky Snoep and Karl Storbeck from this department, Dr Carmen Pheiffer from the Medical Research Council, Prof Janet Hapgood from UCT, Dr Michele Tomasicchio from UCT, Dr Charles Morrison from Family Health International 360, Durham North Carolina, USA, and Dr Narendra Kumar from the Population Council at Rockefeller University, New York City, USA.

**Dr Mervyn Beukes** has an active collaboration with Dr Daniella Altschuh at the CNRS, University of Strasbourg, France. 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. He received a certificate of recognition from the Department of Science and Technology through the National Intellectual Property Management Office, for the patent "Detection method of detecting surrogate markers for active tuberculosis in serum". He is a member of the American Society for Microbiology and served as a guest editor on their editorial board.

**Prof Dirk Bellstedt** served on the South African Plant Checklist Committee of the South African National Biodiversity Institute, and as sub-editor of the journal *Phytotaxa* in 2021. He served as the Chair of the Research Ethics Committee: Animal Care and Use, of Stellenbosch University. He collaborated with Dr Ulrich Schliewen, Curator of Fishes from the Molecular Lab, SNSB-ZSM Bavarian State Collection of Zoology, Munich, Dr Mike Pirie, Dr Gudrun Kadereit, Prof Regine Claßen-Bockhoff and Dr Somayeh Naghiloo from the Institut für Spezielle Botanik und Botanischer Garten, Johannes Gutenberg Universität, Mainz, and Dr Michael Moeller from the Royal Botanic Gardens Edinburgh in Scotland.

**Dr Annelise Botes** has an active collaboration with Dr Adriaan Olivier who is the industry veterinarian for

the South African Ostrich Business Chamber.

Two postgraduate students from **Dr Marianne de Villiers'** research group presented their work at the sixth Malaria Research Conference 2021. They are Miss Savannah Minnie and Miss Michelle Kok. Miss Kok received the award for the best oral presentation at the conference. Internationally Dr de Villiers has active collaborations with Prof Kevin Saliba and Dr Christina Spry at the Australian National University's Research School of Biology. She also collaborates with Prof Ody Sibon at the University Medical Centre Groningen in the Netherlands. Nationally she collaborates with Prof Lyn-Marie Birkholtz at the Department of Biochemistry at the University of Pretoria, Dr Rencia van der Sluis in the focus area for human metabolomics at North-West University. She also collaborates with Prof Karl Storbeck, Prof Erick Strauss, Prof Tawanda Zininga and Prof Dirk Bellstedt at the Department of Biochemistry and Dr Katherine de Villiers at the Department of Chemistry and Polymer Science, all from Stellenbosch University.

**Prof Ann Louw** collaborates within her own department with Prof Johann Rohwer and Dr Nicky Verhoog on *Cyclopia*, Rooibos tea and GR dimerization, and with the Agricultural Research Centre (ARC) Infruitec-Nietvoorbij's Dr E Joubert and Prof D de Beer on *Cyclopia* and Rooibos tea; the Vlaams Institute voor Biotechnologie (VIB), and Prof Claude Libert from the University Ghent in Belgium, on GR dimerization; Prof Gunter Volmer and Oliver Zierau from the Technische Universität Dresden, Germany, on *Cyclopia* and breast cancer; and Prof Holger Reichardt from the University of Göttingen, Germany, on GR dimerization.

Prof Louw is an associate editor for *Frontiers in Pharmacology's* sub section, Ethnopharmacology.

**Prof Marina Rautenbach** serves on the editorial boards of *BBA Biomembranes* and *Journal of Microbiological Methods*. She has active collaborations with colleagues in Microbiology,

Prof Leon Dicks, Dr Heinrich Volschenk and Prof Wesaal Khan, in the search for new antibiotics from environmental samples. She also collaborates with Prof Bert Klumperman from the Department of Chemistry and Polymer Science on novel nanoformulations of antimicrobial peptides and with Drs S Abels and M Lilly from the Cape Peninsula Technical University on phospholipid metabolism in cancer cells. She also has a long-standing active collaboration with Prof Marietjie Stander from the LC-MS CAF on mass spectrometry of biomolecules. On international level she collaborates with Prof M-L Mangoni from Sapienza University in Rome, Italy, on the application of peptides in self-sterilising materials, specifically to create antiviral materials. Further collaborations are on the biophysical aspects of peptide self-assembly in which she works with Prof B Bechinger at Strasbourg University in France, Prof HH Paradies at Jacobs University in Bremen, Germany, Prof T Parker from the Science and Technology Council, UK, Dr P Neetling from SU's Department of Physics, and Dr JB Joshi at Dr HS Gour Central University, University in Sagar, India. Prof Rautenbach has licenced her patented innovations with KG Polymer compounds SA for commercialisation of self-sterilising antimicrobials and with Gowan USA for the utilisation of antimicrobial peptide formulations in agriculture.

**Prof Johann Rohwer** is a member of the international STRENDA (Standards for Reporting Enzymology Data) Commission and chairs AHASA, the Alexander von Humboldt Association of Southern Africa (South-Western chapter). He currently serves as associate editor for *BMC Bioinformatics*, *Frontiers in Plant Science* (section Plant Systems Biology), and *Biochemical Society Transactions*. He serves on the editorial advisory board of *In silico Plants*, a new online journal specialising in plant systems biology, and is statistics editor of the *Journal of Experimental Botany*.

Prof Rohwer has active collaborations with a number of groups, both nationally and internationally: with Dr Rencia van der Sluis, North-West University, on studying the kinetics of glycine N-acyltransferases; with Dr Che Pillay, University of KwaZulu-Natal, on the modelling of cellular redoxin networks; with

Dr Egils Stalidzans, University of Latvia, Riga, on bioengineering of the MEP pathway in plants; 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 Prof Jürgen Pleiss, University of Stuttgart, Germany, on developing workflows and computational tools for reproducible enzyme kinetics. He also presented an invited lecture at the University of Stuttgart in the context of a research visit to Prof Pleiss.

**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 MF Essop from Stellenbosch University; Prof L-M Birkholtz from the University of Pretoria; Prof V Mizrahi from the University of Cape Town; Prof B Bakker from the University of Groningen (Netherlands); Prof C Goble from the University of Manchester (UK); Prof HV Westerhoff from the Vrije Universiteit Amsterdam (Netherlands); Prof Mattias Goksör from the University of Gothenburg (Sweden); Dr Matthias König from the Humboldt-University Berlin (Germany); Prof Dr Bettina Siebers from the University of Duisburg-Essen (Germany).

**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. 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 H Reuter; from the ARC, Prof D de Beer and L Joubert; from the University of Johannesburg, Prof BE van Wyk.

**Prof Karl-Heinz 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*. Nationally, he serves as the treasurer for the South African Society for Biochemistry and Molecular

Biology (SASBMB) and is a member of the Chromatography Society of South Africa committee in the Western Cape. Prof Storbeck was invited to give a presentation on academic publishing and peer reviewing at the European Society of Endocrinology (ESE) Young Endocrinologists and Scientists' annual meeting (EYES), which was held virtually in September 2021. He also served as an abstract reviewer for the 23rd European Congress of Endocrinology and as an evaluator for the Eskom Expo for young scientists.

Prof Storbeck has active collaborations within the Department and with Prof Janet Hapgood from the University of Cape Town on the role of progestins in women's health. His international collaborators include Prof Wiebke Arlt from the University of Birmingham's Institute of Metabolism and Systems Research (UK) on the role of 11-oxygenated androgens in health and disease; Prof Jeremy Tomlinson from the Oxford Centre for Diabetes, Endocrinology and Metabolism at the University of Oxford (UK), on the role of AKR1D1 in steroid metabolism; Prof Tulay Guran from Marmara University (Turkey), steroid profiling in steroid disorders; with Prof Elahe Mostaghel from the Fred Hutchinson Cancer Research Center, Seattle (USA), on the role of 11-oxygenated androgens in castration resistant prostate cancer. These collaborations led to six papers being published in international journals, a highlight of which was the study led by Prof Storbeck's group which showed for the first time that 11-oxygenated androgens can be converted to 11-oxygenated estrogens, a novel class of human estrogens, published in *Endocrinology*.

**Prof Erick Strauss** has been serving on the editorial advisory board of the journal *ACS Infectious Diseases* since 2017. He has active collaborations with Prof Valeri Mizrahi at UCT's Molecular Mycobacteriology Research Unit, Prof Ody Sibon from the University Medical Centre Groningen, Department of Cell Biology in the Netherlands, Prof Cindy Dowd from George Washington University (USA) and the XChem team at Diamond Light Source (DLS) in the UK under leadership of Prof. Frank von Delft from Oxford

University, UK. In 2021 Prof Strauss was awarded a grant under the auspices of the Grand Challenges Africa (GC Africa) programme's Drug Discovery Initiative.

**Dr Dawie van Niekerk** is involved in the following collaborations: Prof MF Essop from Stellenbosch University; Prof L-M Birkholtz from the University of Pretoria; Prof C Goble from the University of Manchester (UK); Prof Mattias Goksör from the University of Gothenburg (Sweden); Dr Matthias König from the Humboldt-University Berlin (Germany).

**Dr Nicolette Verhoog** serves as the social media representative on the South African Society for Biochemistry and Molecular Biology (SASBMB) executive council. Dr Verhoog works closely with Prof Ann Louw in the Biochemistry Department on the role of indigenous South African plants such as honeybush and rooibos 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 from Ghent University (Belgium), Dr J Wober from the Technische Universität Dresden (Germany) and Dr N Salah Ahmed Mostafa from the German University Cairo (Egypt).

**Dr Tawanda Zininga** collaborates with Dr Ofentse Pooe and Prof Rajshekhar Karpoomath at the Department of Biochemistry and Pharmaceutical Chemistry, University of KwaZulu Natal; with Prof Karen Sliwa-Hahnle at the Cape Heart Institute and Hatter Institute for Cardiovascular Research in Africa, University of Cape Town; with Prof Addmore Shonhai and Dr Adelle Burger at the Department of Biochemistry, University of Venda; and with Prof Tim-Wolf Gilberger at the Bernardt Nocht Institute of Tropical Medicine, Hamburg, Germany. He is registered with the American Society of Clinical Pathology (ASCP) as International Medical Technologist, with the South African Council for Natural Scientific Professions (SACNASP) as Biological Scientist, and with the Medical Laboratory and Clinical Scientists Council Zimbabwe as Chemical Pathologist.

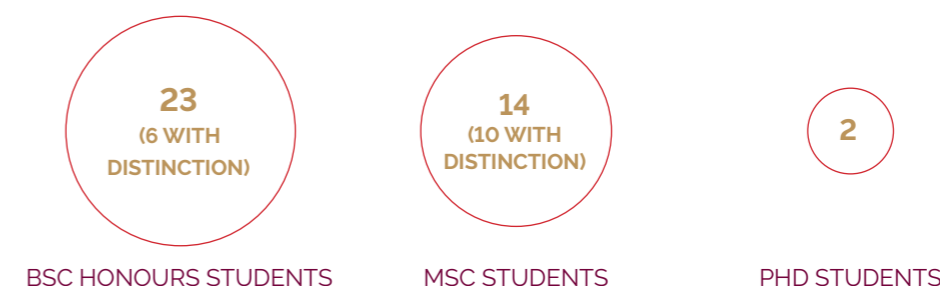
## ACADEMIC AFFAIRS

The continuing COVID-19 pandemic required an adjustment from emergency to augmented remote learning, teaching and assessment, with the bulk of undergraduate teaching activity still taking place on-line, but face-to-face training sessions were increased where possible, especially in the practical modules. This required an immense effort and agility from all staff members to keep the academic

programme on track and to adapt to ever changing circumstances. Despite these challenges, students in the undergraduate biochemistry modules achieved excellent pass rates.

Fortunately, the postgraduate research activities in the laboratories could continue at a more rapid pace than in the previous year, although not yet at full capacity.

### Number of graduates 2021



## STAFF MATTERS

**Olwethu Fana** joined the department on 1 April 2021 as a senior technical assistant. **Dr Dawie van Niekerk** and **Dr Marianne de Villiers** were promoted to senior lecturer in December 2021. **Prof Wentzel**

**"Blom" Gelderblom**, extraordinary professor in the Department with long-standing research ties and collaborations, passed away in March 2021.

## SOCIAL IMPACT

The Departments of Biochemistry, Microbiology and Genetics held virtual science week presentations for undergraduate and postgraduate students for the

first time, with the themes "Molecular solutions for a sustainable Africa" and "Antimicrobial development to ensure healthy lives".

## FUNDING

### Global

- Grand Challenges Africa (GC Africa)

### South Africa

- BIOPEPTM Peptide Fund
- Cancer Association of South Africa (CANSA)
- Medical Research Council (MRC)
- NRF Competitive Support for Unrated Researchers (CSUR)
- NRF Competitive Programme for Rated Researchers (CPRR)
- NRF SACEMA/SARCHI research chair in mechanistic modelling of health and epidemiology
- 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

- German Volkswagen Foundation

### United Kingdom

- Biotechnology and Biological Sciences Research Council (BBSRC), FAIRDOM grant
- National Institutes of Health GCRF START grant from the STFC/UKRI (UK)
- Royal Society of Chemistry (RSC)

### United States of America

- National Institutes of Health (NIH)

## STAFF LIST

### Academic

- Prof DJ Africander
- Dr M Beukes
- Dr A Botes
- Dr M de Villiers
- Prof A Louw (Head of Department)
- Prof M Rautenbach
- Prof JM Rohwer
- Prof JL Snoep
- Prof K Storbeck
- Prof E Strauss
- Prof MA Stander
- Dr DD van Niekerk
- Dr NJD Verhoog
- Dr T Zininga

### Extraordinary professors

- Prof WCA Gelderblom

### Emeritus professors

- Prof DU Bellstedt
- Prof J-HS Hofmeyr
- Prof AC Swart
- Prof P Swart

### Support staff

- Ms W Maart (Secretary)
- Mr AP Arends
- Mr KD Botha
- Mr R Brandt
- Dr H Bredell
- Mrs L du Toit

- Dr Y Engelbrecht

- Ms O Fana
- Mrs GD Gerstner
- Mr CR Jansen
- Dr R Louw-Du Toit
- Ms RP Louw
- Mrs L Prinsloo

### Postdoctoral fellows

- Dr B Balcomb
- Dr T du Toit
- Dr A Hamann
- Dr T Kouril
- Dr V Kumar
- Dr D Neveling
- Dr W Roos
- Dr W van Rensburg

## NRF-RATED RESEARCHERS

### INTERNATIONALLY ACCLAIMED RESEARCHERS

Prof Jacky Snoep	Computational Systems Biology
Prof Johann Rohwer	Computational Systems Biology
Prof Amanda Swart	Cytochrome P450 and Steroidogenesis

### ESTABLISHED RESEARCHERS

Prof Dirk Bellstedt	Plant Molecular Systematics and Molecular Plant Virology
Prof Ann Louw	Steroid Receptor Signal Transduction
Prof Marina Rautenbach	Antimicrobial Peptides
Dr Marietjie Stander	Mass Spectrometry and Analytical Chemistry
Prof Karl Storbeck	Steroid Biosynthesis and Metabolism
Dr Dawie van Niekerk	Computational Systems Biology

### PROMISING YOUNG RESEARCHERS

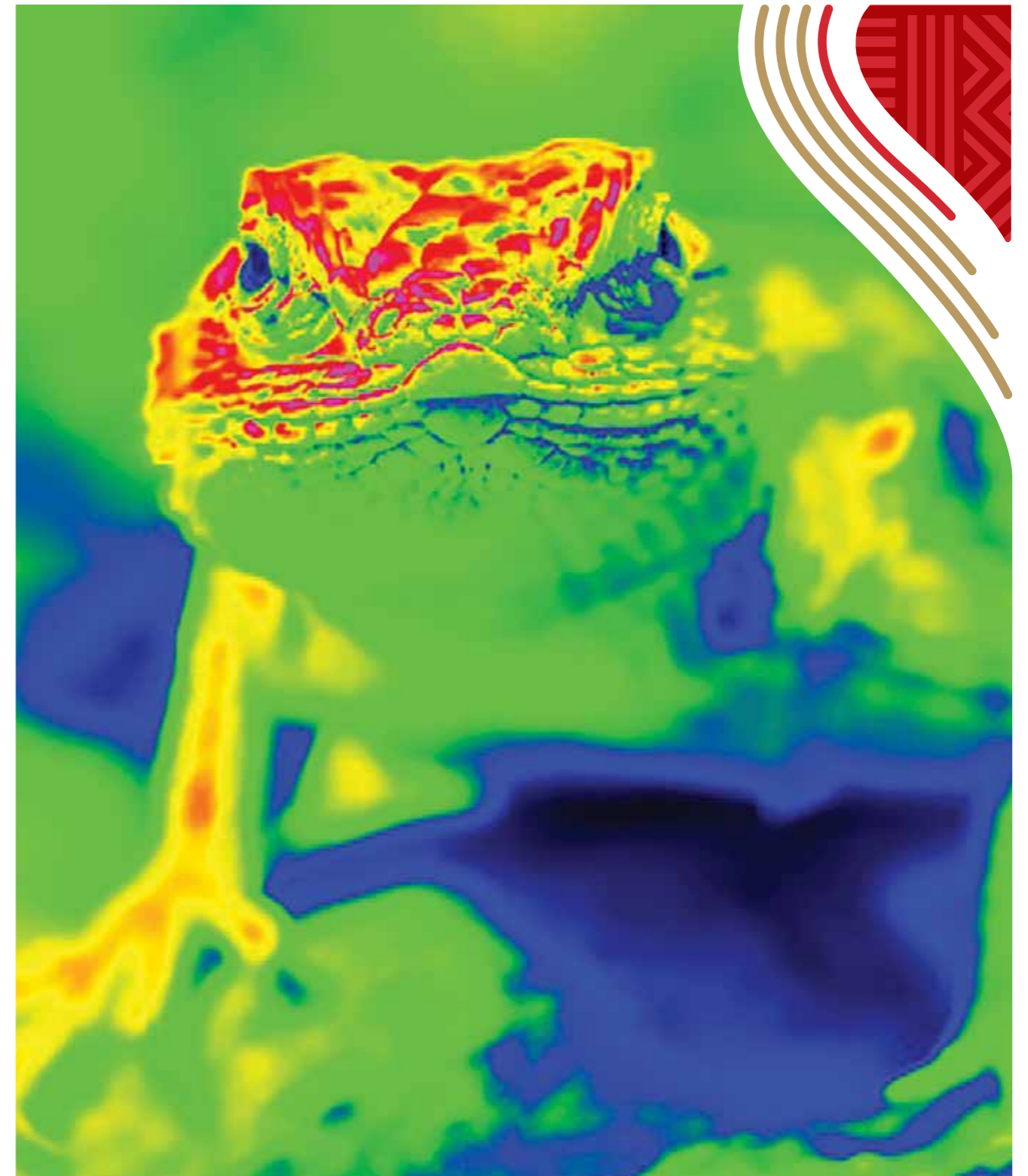
Dr Marianne de Villiers	Chemical Biology, Antimalarial drug design and discovery, infectious diseases, mechanistic enzymology
Dr Tawanda Zininga	Cell stress biology, antimalarial drug and biomarker discovery



### CONTACT DETAILS

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DEPARTMENT OF  
BOTANY AND ZOOLOGY

## RESEARCH INTERESTS

Biotic diversity and ecology of the Cape Region and its coastline; Systematics and molecular ecology; Evolutionary ecology; Marine biology; Medicinal plant biology; Global change biology; Invasion biology

## RESEARCH HIGHLIGHTS

### Functional diversity and trait filtering of insectivorous bats relate to forest biogeography and fragmentation in South Africa

Forest fragmentation is a major driver of biodiversity loss causing declines in species richness and functional diversity of biotic communities. Bats are essential components of ecosystems and are useful bio-indicators of habitat disturbance, yet the response of bats to fragmentation has been poorly studied in Africa.

Monika Moir, a PhD student supervised by **Dr Victor Rambau** and **Prof Michael Cherry** at SU's Department of Botany and Zoology, in collaboration with Dr Leigh Richards from the Durban Natural Science Museum, assessed the effects of forest biogeographical history and fragmentation on functional diversity of bats and their functional traits in South Africa.

They found Pondoland Scarp forests displayed high functional richness, while Eastern Cape Dune forests exhibited high functional divergence yet low functional richness. Also, two forest fragmentation metrics had significant effects on functional diversity: edge density had a positive effect on functional evenness; dispersion was negatively affected by the length of rivers transecting through forests. They attributed the high species and functional richness found in Scarp forests to events of their biogeographical history as they experienced less extreme climatic extinction filtering than Mistbelt forests during the Last Glacial Maximum, whereas the low diversity of Eastern Cape Dune forests results from their younger evolutionary history and homogenous vegetation structure.

Lastly, they showed forest patch size exhibited the strongest associations with species traits in that larger-sized insectivorous species and species exhibiting low wing loading may be more vulnerable to fragmentation. This work was published in the *Journal of Biogeography* – **Dr Monika Moir**



Dr Monika Moir holding a Wahlberg's epauletted fruit bat (*Epomophorus wahlbergi*) while catching bats in Mbotyi State Forest in the Eastern Cape. PHOTO: EMMANUEL MATAMBA

### Quantum dots and pollen wars

Quantum dots are fluorescent nano crystals which will glow in different colours when a UV light is shone on them. The Bio-interactions Lab, led by **Prof Bruce Anderson**, has pioneered their use in ecology and evolutionary studies. In particular, they have found that quantum dots can be used to label and distinguish pollen grains from different individuals, enabling them to answer questions about how pollen grains potentially compete with one another for limited space on the bodies of pollinators.

Dr Monika Moir, a post-doctoral fellow, found that the pollen grains found on pollinators are not randomly distributed but are placed in layers so that the top layers are from the most recently visited

flowers while the bottom layers are from the first flowers visited.

Furthermore, when a thick layer of pollen coats the body of a pollinator, it can prevent new pollen from attaching to pollinators. This means that visits to flowers will not necessarily result in effective pollen transfer from the flower to the pollinator. This brings up the interesting possibility that some plants may have evolved structures to clean pollen from pollinators before depositing their own. This exciting work is being continued by Prof Anderson. Dr Monika Moir is now studying COVID evolution at the Centre for Epidemiological Response and Innovation at Stellenbosch University.

– **Prof Bruce Anderson**



A fly visits a *Moraea lurida* flower and in doing so, it receives a thick layer of pollen on its thorax (left). The picture on the right shows pollen labelled with yellow quantum dots lying on top of pre-existing orange pollen. We found that the more pre-existing pollen on the fly, the fewer labelled pollen grains were placed onto the visiting flies. PHOTO: BRUCE ANDERSON

### Rivers serve as wildlife corridors for forest-dependent insectivorous birds in a fragmented landscape

In South Africa, where native forests are naturally fragmented, forest-dependent birds have undergone range declines since 1992, most notably among insectivores. These insectivores appear sensitive to the quality of natural matrix habitats, and it is unknown whether transformation of the landscape matrix has disrupted gene flow.

Postgraduate student Jake Mulvaney undertook a landscape genetics study of four forest-dependent

insectivorous songbirds across the Eastern Cape and southern KwaZulu-Natal, and detected pronounced declines in breeding population sizes over the past two centuries for the endemic forest specialist Chorister robin-chat and Cape Batis, alongside recent gene flow disruption in both these species and the Starred robin. The yellow-throated woodland warbler appears least reliant upon landscape features to maintain gene flow, and was least impacted by anthropogenic landscape transformation. Collectively, gene flow in all four species is improved at lower elevations, along river valleys, and riparian corridors — where native forest and dense thicket



Postgraduate student Jake Mulvaney with a Choister robin-chat from which he has just taken a blood sample for genetic analysis. PHOTO: MIKE CHERRY

better persist. This demonstrates the benefits of wildlife corridors for South African forest-dependent bird conservation, to ameliorate the extinction debts from past and present anthropogenic forest exploitation. – **Prof Mike Cherry**

#### Searching for fish in the mangroves

After a break from all field work in 2020, we were finally able to return to the field in 2021. MSc student Jamila Janna collected all her samples for metabarcoding analyses, first combing South Africa's mangroves on the east coast then heading up to Inhambane Bay, Mozambique. Her project, supervised by **Dr Nasreen Peer** and **Prof Sophie von der Heyden**, aims to look at whether or not fish diversity in mangroves, an important nursery habitat, is influenced by human activity using metabarcoding as well as baited remote underwater video (BRUV) systems. A highlight for Jamila was getting to meet the Inhambane Bay community collaborators who are closely involved and always looking for new ways to manage their bay. Her results will be useful to them as well in their continuous monitoring efforts. In another highlight of the year, Jamila participated in the SU FameLab heat and placed third, capping off an already successful year. – **Dr Nasreen Peer**



Jamila Janna collecting eDNA samples from the Beachwood mangroves in Durban. PHOTO: TSEPO MLAMBO



Senhor Luciano Nhamussua, a community collaborator, assists postgraduate student Jamila Janna with sampling. The Inhambane community is already familiar with the technique as they have been trained to collect eDNA samples for the last few years. PHOTO: JAMILA JANA

#### Dolphins love a good natter over breakfast

Animals transmit important information by making sounds and studying animal communication may provide clues about how they are feeling. A team from Stellenbosch University, Sea Search and the University of KwaZulu-Natal have been investigating what important information might be hidden within dolphin whistles.

**Dr Tess Gridley** and **Dr Simon Elwen**, both associated with SU's Department of Botany and Zoology, and PhD-student Rachel Probert from the University of KwaZulu-Natal, focused on ten dolphins housed at uShaka Sea World, Durban. They discovered that the dolphins were almost entirely silent overnight. However, in the morning when trainers arrived and particularly at feeding time, some dolphins became incredibly chatty. Dolphin calls are difficult to hear in-air, therefore they used underwater microphones, called hydrophones, to listen to the dolphins communicate. They found that certain individuals became particularly excited while waiting for food or being fed and the dolphins would whistle their signature whistle over and over again, which is similar to calling out their own name. The

study provides important insight into the emotions of dolphins and how underlying behavioural states, such as excitement or calmness, can be determined using acoustic monitoring. Now that they have a baseline understanding of each dolphin's whistling behaviour, any changes in this could potentially be linked to a change in the wellbeing of the animal.

– **Drs Tess Gridley and Simon Elwen**



One of the dolphins housed at uShaka Sea World, Durban, was one of ten dolphins monitored. PHOTO: SOUTH AFRICAN ASSOCIATION FOR MARINE BIOLOGICAL RESEARCH



## RESEARCH ACTIVITIES

**Prof Bruce Anderson** gave his inaugural lecture, titled "The Incredible Journey of Pollen" in hybrid format. He is an associate editor of the journals *Proceedings of the Royal Society B* and *Journal of Pollination Ecology*.

**Prof Mike Cherry** serves on the steering committee of the DSI-NRF Centre of Excellence in Birds as Keys to Biodiversity Conservation at the Percy FitzPatrick Institute for Ornithology. He is an associate editor of *Emu*. During 2021 he also published ten articles in the not-for-profit news agency *GroundUp* on COVID-related matters.

**Prof Susana Clusella-Trullas** is subject editor of *Ecography* and on the editorial advisory board of the *Journal of Experimental Biology*. She is a member of the IUCN Species Survival Commission's Ladybird Species Group. During 2021 she presented at two international conferences: "Exploring behavioural thermoregulation as a key moderator of climate change impacts" at the 23rd International Congress of Zoology, South Africa, from 22 to 24 November 2021; and "Mechanisms of infrasound detection in birds: a phylogenetic comparative test of middle and inner ear anatomical structures" in *Human Frontier Science Program*, from 5 to 8 July 2021.

**Prof Savel Daniels** is an editor of the *Journal of Zoological Systematics and Evolutionary Research* and frequently participates in the RSG radio program "Hoe verklaar jy dit?"

**Prof Léanne Dreyer** serves on the editorial board of *Botany Letters* and frequently gives interviews on RSG radio.

**Prof Allan Ellis** presented a popular research talk titled "Fly pollination of mass flowering daisies in the Succulent Karoo" to the Gobabeb Namib Desert Research Station, Namibia, in January 2021.

**Prof Nox Makunga** is on the editorial board of *Plants*.

**Prof Conrad Matthee** is an associate editor to *Molecular Phylogenetics and Evolution* and on the

editorial board of the *African Journal of Marine Science* and *Koedoe*. He also convenes the NRF Zoology rating panel, focusing on aquatic sciences.

**Prof Guy Midgley** is involved with several national and international policy relevant projects in the field of biodiversity and climate change, including lead author for the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), completed in 2021.

**Dr Marnel Mouton** is an associate member of the Legitimate Code Theory Centre, University of Sydney, Australia, and together with colleagues from Stellenbosch University, worked on a book, *Enhancing Science Education: Exploring knowledge practices with Legitimation Code Theory*, which will be published in 2022 as part of Routledge's series on the use of Legitimation Code Theory to enhance teaching and learning in higher education.

**Dr Nasreen Peer** attended the International Congress of Conservation Biology as an invited panelist. She presented a guest lecture at the University of Waterloo to Political Ecology undergraduates. She was appointed to a Department of Forestry, Fisheries and the Environment (DFFE) independent panel put together by Minister Barbara Creecy to investigate the impacts of artificially breaching the St Lucia estuary, a world heritage site. She will chair the panel until the end of March 2022.

**Dr Victor Rambau** is an associate editor of *African Zoology* and a board member of the Mammal Research Institute, University of Pretoria. He is also active on a number of NRF funding panels.

**Prof Tammy Robinson-Smythe** presented a paper, "Predator-driven biotic resistance: insights from native rock lobsters and alien mussel prey along the South African coast", at the First International Symposium on Coastal Ecosystems and Global Change, Xiaman, China, in April 2021. She is thematic editor of the *World Register of Introduced Marine Species (WRiMS)* and associate editor of *Aquatic Invasions and BioInvasion Records*.

**Prof Dave Richardson** is a member of the IUCN Species Survival Specialist Group on Invasive Organisms. He serves as an associate editor of *Biological Invasions and Neobiota* and as editorial advisory board member of *Forest Ecosystems, AoB PLANTS* and *Frontiers of Biogeography*.

**Prof Carol Simon** is chair of the local organizing committee of the 14th Polychaete Conference to be held in Stellenbosch in 2023. She presented a paper titled "Why taxonomy is increasingly important in the Anthropocene: A South African polychaete perspective" at the 23rd International Congress of Zoology, South Africa, from 22 to 24 November, including a webinar associated with organising the International Polychaete Conference, titled "Bristling with Biodiversity: Unravelling polychaete knowledge one 'Day' at a time" in July 2021.

**Prof Sophie von der Heyden** is chair of the steering committee of the South African Network for Coastal and Oceanographic Research (SANCOR) and a member of the Ocean Best Practices, Intergovernmental Oceanographic Commission, UNESCO. She is the secretary of the Conservation Genetics working group and on the Equity, Inclusion and Diversity (EID) committee of the Society for Conservation Biology.

**Prof Theresa Wossler** is co-editor-in chief of *African Zoology* and serves on the City of Cape Town Protected Areas Advisory Committee for the Helderberg Nature Reserve.

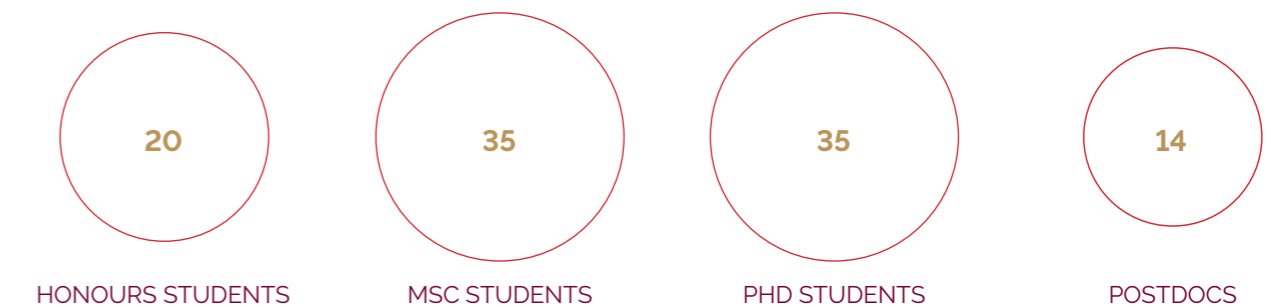
## ACADEMIC AFFAIRS

### Postgraduate student cohort 2021

The School for Climate Studies, launched in July 2021, aims to create a transdisciplinary vehicle to leverage the climate-related knowledge and capacity of relevant faculties, informing and informed by the public and private sectors' climate policies, initiatives and needs. This inter-faculty entity is hosted in the Department of Botany

and Zoology, under the Directorship of Prof Guy Midgley, and is currently developing research, policy and teaching capacity in a number of thematic areas. Social impact outcomes aligned with SU's mission are being addressed in both academic and applied ways, supporting a just transition to a climate resilient and low carbon society in South Africa.

### Postgraduate student cohort





## AWARDS TO STAFF AND STUDENTS

**Prof Guy Midgley** was ranked 180th (out of 1000) in the world of the most influential climate academics according to Reuters. **Prof Dave Richardson** was listed as a Highly Cited Researcher 2021, according to the Web of Science. He was also recognised by Stellenbosch University for his research contributions in 2018. **Prof Bruce Anderson** received a B2-rating from the National Research Foundation.

**Kayla Liebenberg**, a BScHons student with Prof Dave Richardson, was awarded the prize for the best student presentation at the Fynbos Forum, 2021. **Kaylan Reddy**, a PhD student with Prof Nox Makunga, received two awards at international conferences. One for the best poster in Ethnobotany at Botany 2021 Virtual, hosted by the Botanical Society of America; and the other for the best PhD presentation at the International Symposium of Phytochemicals in Medicine and Food 2021, hosted by the Phytochemical Society of Europe and the Phytochemical Society of Asia.

In 2021, the Zoological Society of South Africa recognised **Grace Warner** and **Jessica Stephens** as the best BScHonours and third year students in zoology at Stellenbosch University for 2020.

The Marine Genomics and Conservation Lab under the leadership of **Prof Sophie von der Heyden** won the Inqaba Biotech Genome Sequencing challenge to have *Zostera capensis* genome sequenced at no cost.

## STAFF MATTERS

**Prof Alex Valentine**, a plant physiologist within the Department, resigned to take up a position at Yara in the United Kingdom as a Research and



PhD-student Kaylan Reddy. PHOTO CREDIT: STEFAN ELS

“ PhD-student Kaylan Reddy won the best poster and the best PhD presentation awards at two international conferences.

Development Scientist. **Mr Benjamin Peterson** resigned due to personal reasons.

## SOCIAL IMPACT

### limbovane Outreach Project

limbovane is a science education programme that provides curricular support to learners and educators in the field of biodiversity and environmental science while it raises awareness of science as an interesting and attractive career among learners.

The most important highlight of 2021 was the limbovane team's return to the classroom in person. After a year without any practical work in 2020, both the limbovane team and learners were thrilled to get outside for field investigations. Despite direct school-based engagements remaining constrained due to COVID-19 restrictions, shortened school terms and rotational teaching schedules, the limbovane team still managed to conduct 41 school-based lessons at partner schools. These lessons included biodiversity theory as well as fieldwork that enabled participating learners to develop basic practical scientific skills. During these school visits limbovane trained 841 high school learners.

Mr Ivan Dwashu, a Life Science educator at Diazville High School in Saldanha, highlighted the value of the practical component of limbovane and how educators and learners benefit from it:

*"The limbovane Project is beneficial to Grade 10 learners as it ties in with the topic of biodiversity. It essentially shows biodiversity in action. Learners can be assessed on this topic by inserting it as a case study in an assignment or test or exam paper. It is also helpful in explaining the topic of classification as learners learn valuable skills such as using scientific keys to identify ants, which can also be assessed in an assignment, test or exam."*

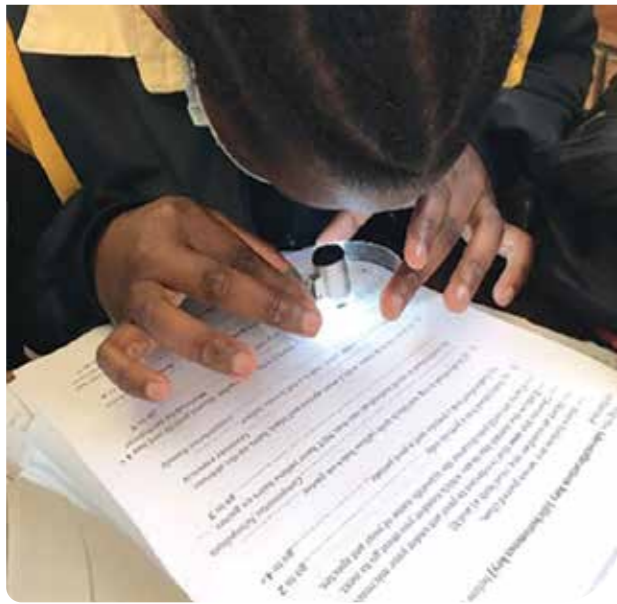
limbovane also collaborated with the Iziko South African Museum in hosting a series of educator workshops, titled *An Afternoon with Ants*. These workshops took place at the Museum's new Biodiversity Laboratory, giving the attendees the opportunity to use the laboratory's high-quality microscopes. The workshops were attended by curriculum planners and educators from the Western Cape Education Department (WCED)

and environmental educators from Contour Enviro Group, the Wildlife and Environment Society of South Africa (WESSA), Iziko South African Museum and Cape Nature. Feedback indicated that these workshops were successful in increasing educators' enthusiasm and capacity in teaching the topic of biological classification at the Grade 7 and Grade 10 level.

According to Ms Suanne Rampou, deputy chief education specialist for natural sciences in the WCED, classification is a challenging concept in the Grade 7 curriculum: "The workshop demystified the concept and process of classification by using ant species. It can be useful to educators and learners and can be used for practical assignments and as part of formal assessments."

limbovane had the privilege of hosting five learner workshops in collaboration with partners from its education network, including Nature Connect, SANBI, SANParks, Contour Enviro Group and the Cape Leopard Trust. A total of 118 learners were trained during these workshops.

Another highlight of 2021 is limbovane's collaboration on a project funded by the Foundational Biodiversity Information Programme (FBIP) to review an important ant group. limbovane's role in the project is the contribution of ant specimens from the Anoplolepis genus that were collected by learners who participated in limbovane between 2006 and 2014. These specimens were barcoded, and the resulting molecular data will help to confirm species identification and update identification keys to the genus. limbovane also provided researchers on the project with a platform to share their expertise with the public. MSc student Abusisiwe Ndaba, a taxonomist at the Iziko South African Museum, assisted the limbovane team in presenting classroom lessons during the team's school visits and workshops. She said limbovane gave her the perfect platform to engage with the learners and teach them about taxonomy and the diversity of ants around them.



A Grade 10 learner from Luhlaza Secondary School in Khayelitsha learning basic scientific tools – using a microscope and a dichotomous key. PHOTO: DORETTE DU PLESSIS

The project is very grateful to schools and educators who made it possible for us to continue with our school-based activities despite the restrictions. A big thank you to Rand Merchant Bank, Mapula Trust, BRO Trust and the Het Jan Marais Fonds for financial support. – Ms Dorette du Plessis

“ The limbovane Project is beneficial to Grade 10 learners as it ties in with the topic of biodiversity. It essentially shows biodiversity in action.



Learners learning valuable practical scientific skills, such as following a scientific protocol, measuring and observing, while conducting biodiversity surveys in their school grounds. PHOTO: DORETTE DU PLESSIS

## COLLABORATION

### Australia

- Macquarie University
- Royal Melbourne Institute of Technology (RMIT) University
- Belgium
- Royal Museum Central Africa
- Ghent University

### Canada

- University of British Columbia
- University of Toronto

### China

- Academy of Science and Technology
- Huazhong Agricultural University
- Zhejiang Chinese Medical University

### France

- Foundation for Biodiversity Research
- Museum national d'histoire naturelle
- University of Montpellier

### Germany

- Technical University of Dresden
- University of Frankfurt

### Mozambique

- Eduardo Mondlane University
- Ocean Revolution and Community Council of Fishers

### South Africa

- Cape Peninsula University of Technology
- Council for Scientific and Industrial Research (CSIR)
- Department of Environment, Forestry and Fisheries
- Durban Natural Science Museum
- Nelson Mandela University
- Rhodes University
- South African National Biodiversity Institute (SANBI)
- South African Institute of Aquatic Biodiversity
- University of Cape Town
- University of the Free State
- University of Johannesburg

- University of KwaZulu-Natal
- University of Pretoria
- University of the Western Cape
- Wild Bird Trust

### Switzerland

- University of Fribourg
- University of Lausanne

### United Kingdom/Ireland

- Cambridge University
- Kew Botanical Gardens
- Oxford University
- University of Leeds

### United States of America

- Harvard University
- Hofstra University
- Northern Michigan
- Trinity College
- University of Arizona
- University of California
- Washington University

### Other

- Charles University, Prague, Czech Republic
- National University of Singapore, Singapore
- Severtsov Institute of Ecology and Evolution, Russia.
- University of Leiden, Netherlands
- Universidad Pablo de Olavida, Spain
- University of Vienna, Austria
- Wageningen University, Netherlands

## FUNDING

### Belgium

- Directorate-general Development Cooperation
- Belgium, Flanders – South Africa National Research Foundation (NRF) International
- Centre for Agriculture and Bioscience International (CABI)

### Germany

- Centre for Energy Technology
- Thünen Institute of Climate-Smart Agriculture

### South Africa

- Council for Scientific and Industrial Research (CSIR)
- Department of Science and Innovation
- Escom Annual Koeberg Monitoring
- Forestry and Agricultural Biotechnology Institute (FABI)
- Foundational Biodiversity Information Programme (FBIP)

- Human Frontier Science Programme
- Het Jan Marais National Fund
- Marine and Coastal Research
- National Research Foundation Competitive Programme for Rated Researchers
- Newton Mobility Grant
- Oppenheimer Memorial Trust
- Royal Museum of Central Africa
- SA Berry Producers
- South African National Biodiversity Institute
- Stellenbosch University
- SA-Mozambique-Zambia Trilateral Joint Science and Technology collaboration
- Western Indian Ocean Marine Science Association
- Wild Bird Trust

### United Kingdom

- Royal Society
- University of East Anglia

## 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 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
Extraordinary Prof WJ Przybylowicz	Applications of nuclear microprobes in biology

### ESTABLISHED RESEARCHERS

Prof S Clusella-Trullas	Thermal adaptation of ectotherms and implications for climate
Prof LL Dreyer	Evolution of Cape Flora
Prof NP Makunga	Medicinal plant bio-technology
Prof TB Robinson	Drivers, patterns and impacts of marine invasions
Prof CA Simon	Marine invertebrates; reproduction and polychaete worm taxonomy
Prof S von der Heyden	Marine molecular ecology and conservation
Dr S Kumschick (CIB)	Invasion biology
Prof J Measey (CIB)	Conservation and ecology of invasive species
Extraordinary Prof L Foxcroft	Invasion ecophysiology
Extraordinary Prof JM Mesjasz-Przybylowicz	Plant ecophysiology

## STAFF LIST

### Academic

- Prof BA Anderson
- Prof MI Cherry
- Prof S Clusella-Trullas
- Prof SR Daniels
- Prof LL Dreyer
- Prof AG Ellis
- Dr AF Flemming
- Prof NP Makunga
- Prof CA Matthee
- Prof GF Midgley
- Dr M Mouton
- Prof CA Pauw
- Dr N Peer
- Dr VR Rambau
- Prof DM Richardson
- Prof TB Robinson-Smythe
- Ms Z Shaik
- Prof CA Simon
- Prof S Von der Heyden
- Prof TC Wossler (Head of Department)

Academic Staff: Centre of Excellence for Invasion

### Biology

- Dr S Kumchick
- Prof J Measey
- Prof J Wilson (Extraordinary professor)
- Prof B van Wilgen (Emeritus professor)

### Extraordinary Appointments

- Dr S Elwen
- Prof W Foden
- Prof L Foxcroft
- Dr T Gridley
- Prof J Le Roux
- Prof W Przybylowicz
- Prof J Przybylowicz
- Prof JR Wilson

### Emeritus professors

- Prof D Baird
- Prof J Gilomee
- Prof JAJ Nel
- Prof AJ Reinecke
- Prof SA Reinecke
- Prof TJ Robinson

- Prof VR Smith
- Prof DE van Dijk
- Prof B van Wilgen
- Prof H Van Wyk

### Support staff

- Ms J Basson
- Ms F Gordon
- Ms S Jacobs
- Ms S Johnson-Abrahams
- Ms DJD Julies
- Ms J Hutton
- Ms MJ Mathese
- Ms AC Nel
- Mr R Robertson
- Ms MP Sauerman
- Mr N Solomons
- Mr JP Williams
- Mr H Witbooi

### Support staff: Centre of Excellence for Invasion Biology

- Ms D du Plessis
- Ms S Kritzing-Klopper

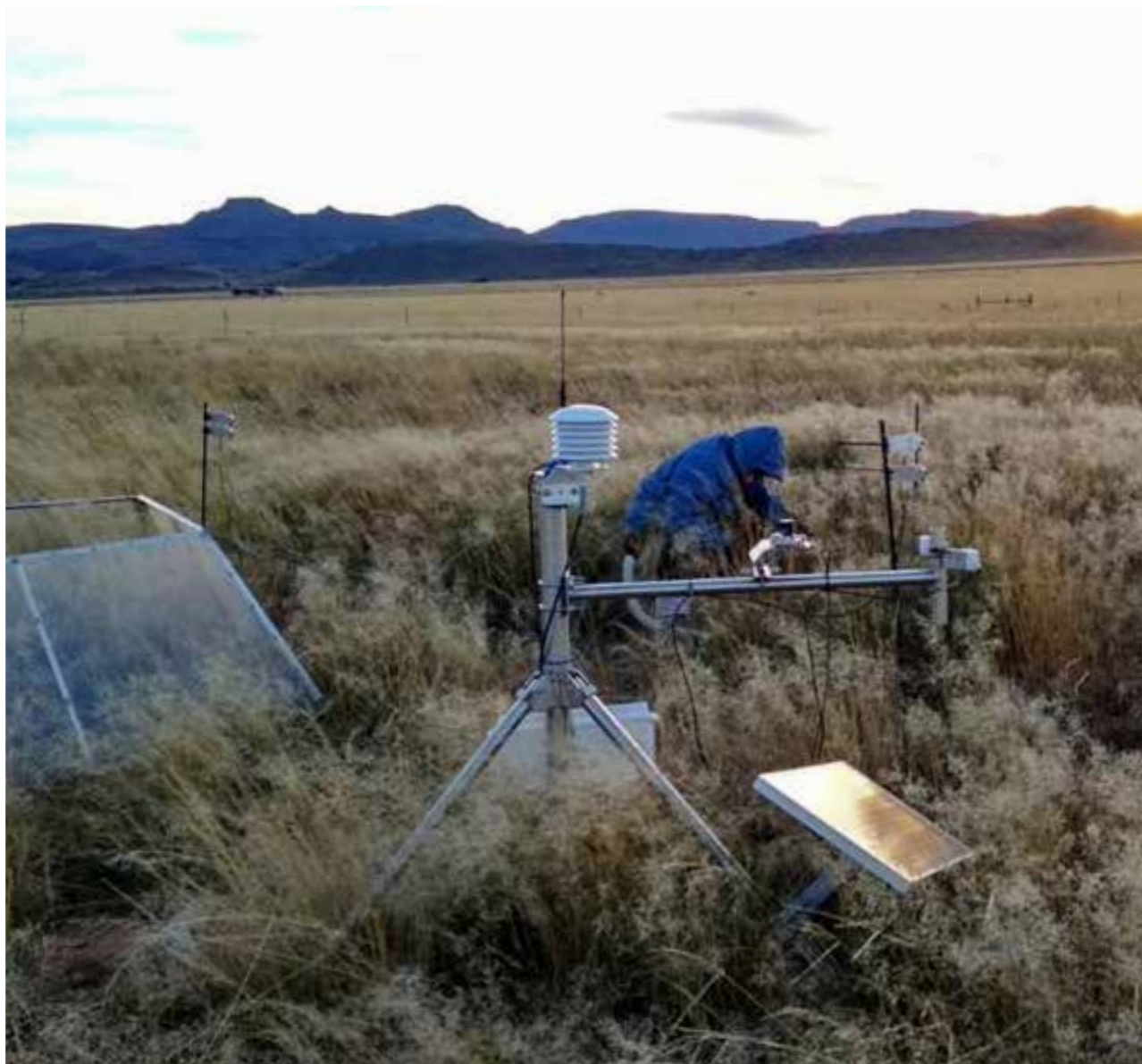
- Ms C Momberg
- Ms L Msomi
- Ms E Nortjé

Postdoctoral fellows

- Dr A Alvarez Aguilar
- Dr S Andreotti
- Dr J Baxter-Gilbert

- Dr H Beckett
- Dr C Botella
- Dr A Da camara dandas Ferreira
- Dr H Hirsch
- Dr JH Keet
- Dr B Loedolff
- Dr NA Masondo

- Dr A Melotto
- Dr M Moir
- Dr A Ndhlovu
- DR MM Nsikani
- Dr N Stevens
- Dr JL Van Velden



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**DEPARTMENT OF  
CHEMISTRY AND POLYMER SCIENCE**

## RESEARCH INTERESTS

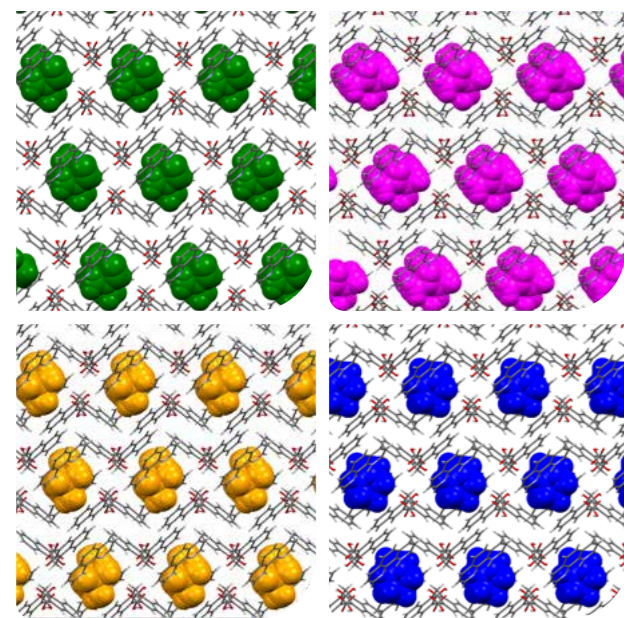
Organic and medicinal chemistry; Inorganic and organometallic chemistry; Analytical chemistry; Polymer science; Materials technology (Performance properties of functional textiles);

Physical and computational chemistry; Supramolecular and materials chemistry; Chemistry education; Nanotechnology

## RESEARCH HIGHLIGHTS

### Basic research opens prospects for development of flexible light-weight devices

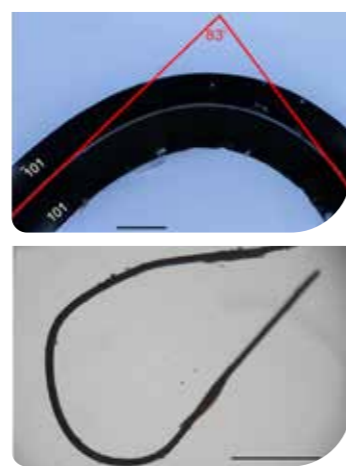
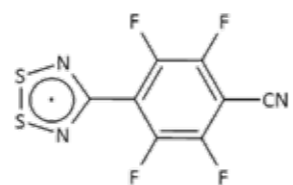
Dithiadiazolyl radicals are non-metal containing molecules that can show magnetic ordering. One particular radical forms mechanically compliant crystals, that is, the crystals bend. In collaboration with Prof Pance Naumov from New York University (NYU) Abu Dhabi, Prof Delia Haynes and her research group showed that the magnetic behaviour of this radical changes when the crystal is bent, as a result of changes in the intermolecular interactions between molecules in the crystal. This work, which opens prospects for the development of flexible light-weight devices, was published in *Chemical Science*. – **Prof Delia Haynes**



Crystal structures of four isostructural host-guest complexes that show selectivity via mechanochemistry. IMAGE CREDIT: PROF DELIA HAYNES

### Focus on mechanochemistry

Mechanochemistry involves the use of mechanical energy (such as grinding) to carry out chemical reactions. Prof Delia Haynes' research group has used mechanochemistry to study selectivity and exchange of guests in crystalline host-guest systems. In these crystals, one molecule (the guest) is captured in pockets or channels in the crystal of another molecule(s) (the host). Some crystals selectively include one guest in preference to another. This study showed that carrying out guest selection or exchange mechanochemically can give a different selectivity profile than what is observed in analogous experiments in solution. This work was featured on the cover of *CrystEngComm*.

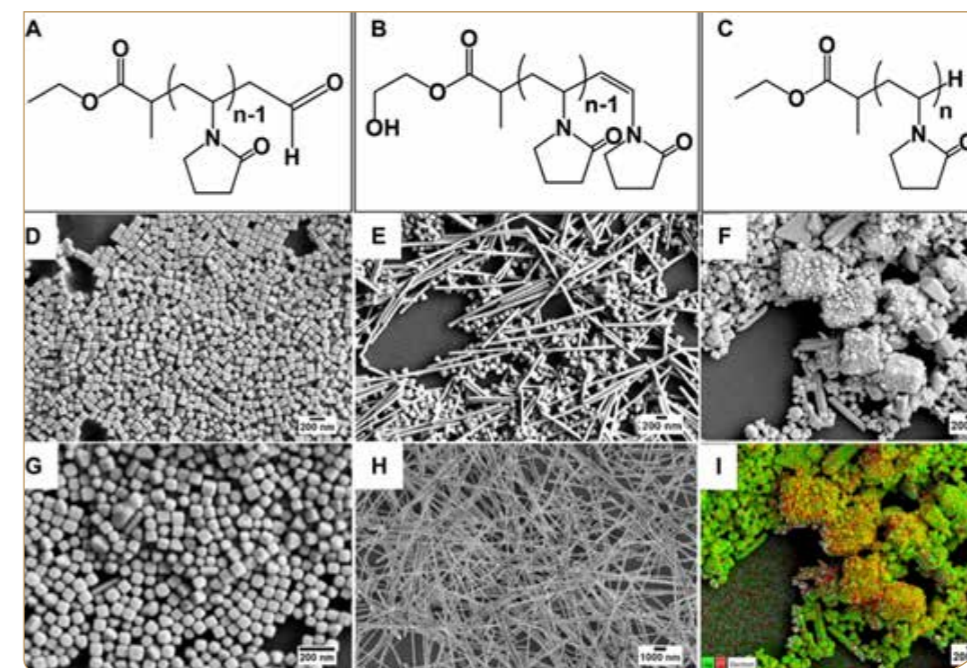


A particular dithiadiazolyl radical (above) shows changes in magnetic behaviour when crystals of the material are bent (below). IMAGE CREDIT: PROF DELIA HAYNES

### Poly(*N*-vinylpyrrolidone)

Prof Bert Klumperman and his research group collaborated with Prof Rob Rioux and his team at Pennsylvania State University (USA) to investigate the effect of poly(*N*-vinylpyrrolidone) (PVP) end groups on the formation of silver nanostructures.

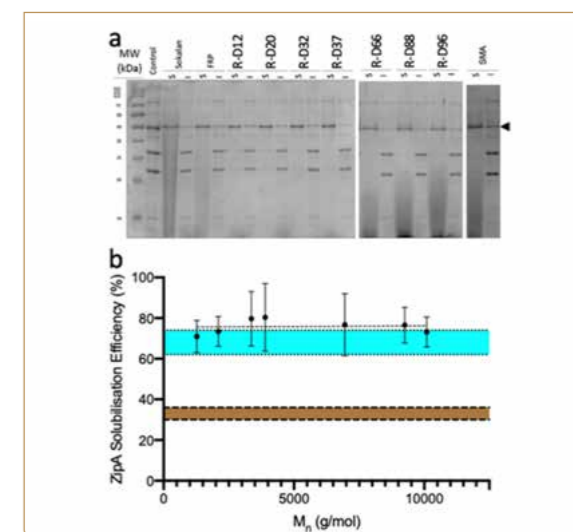
To that end, PVP with well-defined aldehyde and hydroxy end groups were synthesized and used in the reduction of AgCl to metallic Ag nanostructures. The variety of morphologies that resulted from the experiments is shown in this figure from the publication that emanated from this work.



The results of this work was published in the *Journal of the American Chemical Society*. SOURCE: S. JHARIMUNE ET AL. – J. AM. CHEM. SOC. 2021, 143, 184-195.

### Isolation of membrane proteins

In recent years, the use of amphiphilic copolymers for the isolation of membrane proteins has grown into an important research topic in Prof Bert Klumperman's group. In 2021 we investigated the effect of molar mass of poly(diisobutylene-alt-maleic acid) (DIBMA) for this application. It turned out that the solubilisation efficiency of DIBMA with narrow molar mass distribution far exceeded that of commercially available DIBMA (with a broad MMD). The graph below shows experimental data points for RAFT-synthesized DIBMA relative to commercial DIBMA (brown band) and the current gold standard (SMA, blue band). Relative to SMA it was shown that the RAFT-synthesized DIBMA showed improved resistance to divalent cations and enhanced stability over a broader pH range. – **Prof Bert Klumperman**



The results of this study was published in the journal *Biomacromolecules*. Source: L.E. Ball et al. *Biomacromolecules* 2021, 22, 763-772

## RESEARCH ACTIVITIES

**Prof Len Barbour** is Associate Editor of *Crystal Growth and Design*, which is published by the American Chemical Society (ACS). He 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 Margaret Blackie** continues to serve as treasurer for the Western Cape division of the South African Chemical Institute (SACI). She serves on the committee for the International Conference for Chemical Education and on the committee for the Suellen Shay Memorial Symposium.

**Dr Ebrahiem Botha** is a member of the South African Chemical Institute (SACI).

**Dr Prinessa Chellan** was elected as an African Academy of Sciences Affiliate fellow and appointed to the Early Career Editorial Board for the *ChemBioChem* journal. She was an invited speaker at the 2021 International Symposium on Bioorganometallic Chemistry (being held virtually due to COVID-19) where she presented the latest research from her group on organometallic platinum group metal (PGM) complexes as antiplasmodial agents.

**Prof André de Villiers** serves as chair of the Western Cape division of the Chromatographic Society of South Africa (ChromSA). He is also a member of the Editorial Advisory Boards of the *Journal of Chromatography*, *Analytical Chemistry*, *Chromatographia* and *LCGC*.

**Prof Catharine Esterhuysen** represented South Africa at the 25th Congress of the International Union of Crystallography (IUCr) held online and in Prague, August 2021, and is the chair of the Special Interest Group on Molecular Interaction and Recognition of the European Crystallographic Association. She is also a member of the International Advisory Boards of the *Canadian Journal of Chemistry* and the International Symposium on Halogen Bonding and an Associate Editor of *New Journal of Chemistry*. In 2021, she was made a Fellow of the Royal Society

of Chemistry. She presented an invited talk at the International Union of Crystallography (IUCr) Convention and helped curate a special collection of papers in celebration of the fourth International Symposium on Halogen Bonding (ISXB-4).

**Mrs Adine Gericke** submitted her PhD dissertation in Textile Science at the end of 2021.

**Prof Delia Haynes** was elected the first president of the African Crystallographic Association and is an elected member of the Executive Committee of the European Crystallographic Association (2018 – present). She is also the regional editor for Africa for the International Union of Crystallography Newsletter (2018 – present), and a member of the SACI Western Cape Committee (2014-present). She was elected a Fellow of the Royal Society of South Africa in 2021 and is a member of the Advisory Board of the RSC journal *CrystEngComm*. She gave a keynote lecture at the International Union of Crystallography Congress and was on the organising committee of the online Pan African Conference on Crystallography (ePCCr).

**Dr Catherine Kaschula** gave an invited lecture in August at the International Research Symposium on Cancer Disparities (ICCHD-2021, Texas, USA). She gave another invited lecture in September as part of the International Centre for Genetic Engineering and Biotechnology (ICGEB) international seminar series.

**Prof Bert Klumperman** is an Associate Editor of *Macromolecules* (ACS) and Editor-in-Chief of the *Transactions of the Royal Society of South Africa*. He has been elected Vice-President of the Royal Society of South Africa. In November 2021 he gave an invited lecture at the American Chemical Society (ACS) Symposium on Living Radical Polymerization in Charleston, SC, USA.

**Prof Alben Lederer** is a member of the editorial board of the *International Journal of Polymer Analysis and Characterization* (Taylor and Francis) and of *Materials* (MDPI). She is vice-chair of the scientific committee for the International Symposia

on Field and Flow Fractionation and a member of the scientific committees of the International Symposium on Separation and Characterization of Natural and Synthetic Macromolecules (SCM-X, 2021, Amsterdam).

**Dr Rehana Malgas-Enus** serves as an editor for *Springer Nature Applied Sciences*. She also serves on the NRF Thuthuka review panel, as well as the SU Social Impact committee and the SU Transformation committee.

**Prof Peter Mallon** serves as a member 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. Prof Mallon also serves as a founding executive board member of the Commonwealth Chemical (the Federation of Commonwealth

Chemistry Societies) and is the immediate past president of the South African Chemical Institute.

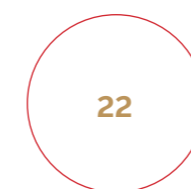
**Prof Selwyn Mapolie** continues to serve as committee member of the Catalysis Society of South Africa (CATSA).

**Dr Carla Pretorius** won the SU Distinguished teaching award.

**Prof Willem van Otterlo** currently serves as President of the South African Chemical Institute and as one of two Alexander von Humboldt (AvH) Ambassador Scientists for South Africa, appointed from 2019 to 2022. He is on the editorial board of the Platinum open-access journal, *Archives of Organic Chemistry – Arkivoc*. In 2021, he spent a short research sabbatical (May-August) in the research group of Dr Dennis C. Liotta at Emory University, Atlanta, USA.

## ACADEMIC AFFAIRS

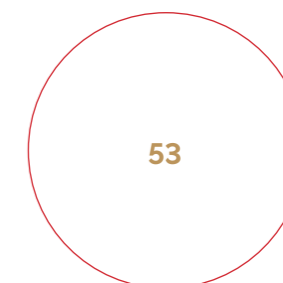
### Postgraduate student cohort 2021



HONOURS STUDENTS



MSC STUDENTS



PHD STUDENTS

## AWARDS TO STAFF AND STUDENTS



**Dr Katherine de Villiers**

**Dr Katherine de Villiers** received the Raikes Medal of the South African Chemical Institute (SACI). This prestigious award is given to an outstanding member of the Institute below the age of 40 that has produced high quality research as is evidenced by their published research.

## SOCIAL IMPACT

Dr Catherine Kaschula wrote an opinion piece for Health24 published on 15 October 2021 as part of

World Food Day: "Let food be thy medicine and medicine be thy food: Could that food be garlic?".

## NRF-RATED RESEARCHERS

### LEADING INTERNATIONAL RESEARCHERS

Prof Len Barbour	nanostructured functional materials
Prof Bert Klumperman	living radical polymerization and advanced macromolecular architectures

### INTERNATIONALLY ACCLAIMED RESEARCHERS

Prof Ben Burger	chemical communication in living organisms
Prof Harald Pasch	analytical polymer science, multidimensional chromatography
Prof Helgard Raubenheimer	ligand design aimed at applications in homogeneous catalysis, gold chemistry
Prof Willem van Otterlo	organic synthesis and medicinal chemistry
Prof André de Villiers	separation science fundamentals and applications
Prof Delia Haynes	crystal engineering of non-metal containing materials

### ESTABLISHED RESEARCHERS

Prof Gareth Arnott	inherently chiral calixarenes; asymmetric methodology
Dr Margaret Blackie	organic chemistry
Dr Katherine de Villiers	antimalarial agents
Prof Jan Dillen	computational studies
Prof Catharine Esterhuysen	intermolecular interactions
Prof Ivan Green	small molecule syntheses for medicinal application
Dr Robbie Luckay	ligand design for metal ion coordination in industrial and medical applications
Prof Peter Mallon	complex polymer materials and polymer nano-composites
Prof Selwyn Mapolie	catalytic transformations using late transition metal complexes
Prof Albert van Reenen	Polyolefins

### PROMISING YOUNG RESEARCHERS

Dr Helen Pfukwa	biomass valorisation and polymer characterisation
Dr Rueben Pfukwa	living radical polymerisation

## 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

### Africa

- University of Yaoundé, Cameroon

### Australia

- Queensland University of Technology, Griffith University

### Austria

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

### Belgium

- Ghent University, Free University Brussels

### Canada

- University of Waterloo, McGill University, University of Alberta

### Czech Republic

- Technical University of Liberec

### France

- Université de Lorraine, University of Strasbourg

### Germany

- Leibniz-Institut für Polymerforschung Dresden, Albert Ludwig University of Freiburg, Dortmund Technical University

### India

- Jawaharlal Nehru University

### Ireland

- University of Limerick

### Italy

- Turin University, University of Naples Federico II

### Japan

- Nagoya University

### Netherlands

- University of Amsterdam, Vrije University Amsterdam

### Poland

- University of Warsaw, Adam Mickiewicz University

### Portugal

- NOVA University Lisbon

### Prague

- University of Chemistry and Technology

### United Arab Emirates

- New York University Abu Dhabi

### United Kingdom

- Lancaster University
- National History Museum
- University of Birmingham
- University of Glasgow
- University of Nottingham
- University of Warwick

### United States of America

- Emory University
- Georgetown University
- Georgia Institute of Technology
- Gustavus Adolphus College
- Texas State University (TSU)
- University of Texas Southwestern Medical Centre
- Virginia Polytechnic Institute

## FUNDING

- Academic Consortium 21 (AC21)
- African Academy of Sciences
- DST/NRF SARCHI Programme
- European Union (M-ERA-NET Initiative)
- Medical Research Council (MRC)
- National Institutes of Health (NIH)
- NRF Competitive Programme for Rated Researchers
- NRF National Equipment Programme
- NRF Thutuka Programme
- Royal Society
- Sasol
- Stellenbosch University
- Technology Innovation Agency (TIA)

## STAFF LIST

### Academic staff

- Research Chairs
- Prof LJ Barbour
- Prof L Klumperman
- Prof H Pasch

### Professors / Associate Professors

- Prof GE Arnott
- Prof AJ de Villiers
- Prof JLM Dillen
- Prof C Esterhuysen
- Prof DA Haynes
- Prof PE Mallon (Departmental Head)
- Prof SF Mapolie
- Prof WAL van Otterlo
- Prof AJ van Reenen

### Senior Lecturers / Lecturers

- Dr MAL Blackie
- Dr P Chellan
- Dr KA de Villiers
- Dr WJ Gerber
- Mrs A Gericke
- Dr CH Kaschula
- Dr T le Roex
- Dr RC Luckay
- Dr M Lutz
- Dr R Malgas-Enus
- Dr C Pretorius

- Dr R Pretorius

### Senior Researchers / Research associates / Fellows

- Dr NP Gule
- Dr R Pfukwa
- Dr AGJ Tredoux

### Extraordinary professors

- Prof IR Green
- Prof A Lederer
- Prof W Mackenroth

### Emeritus professors

- Prof BV Burger
- Prof HG Raubenheimer

### Support staff

#### Administrative staff

- Mrs MMG Cooper
- Mr MK Dlodlu
- Dr M du Plessis
- Mr JG Goldie
- Mrs SG May

#### Technical staff

- Mr EJ Lukhele
- Mr MG Marupula
- Mr MA Mclean

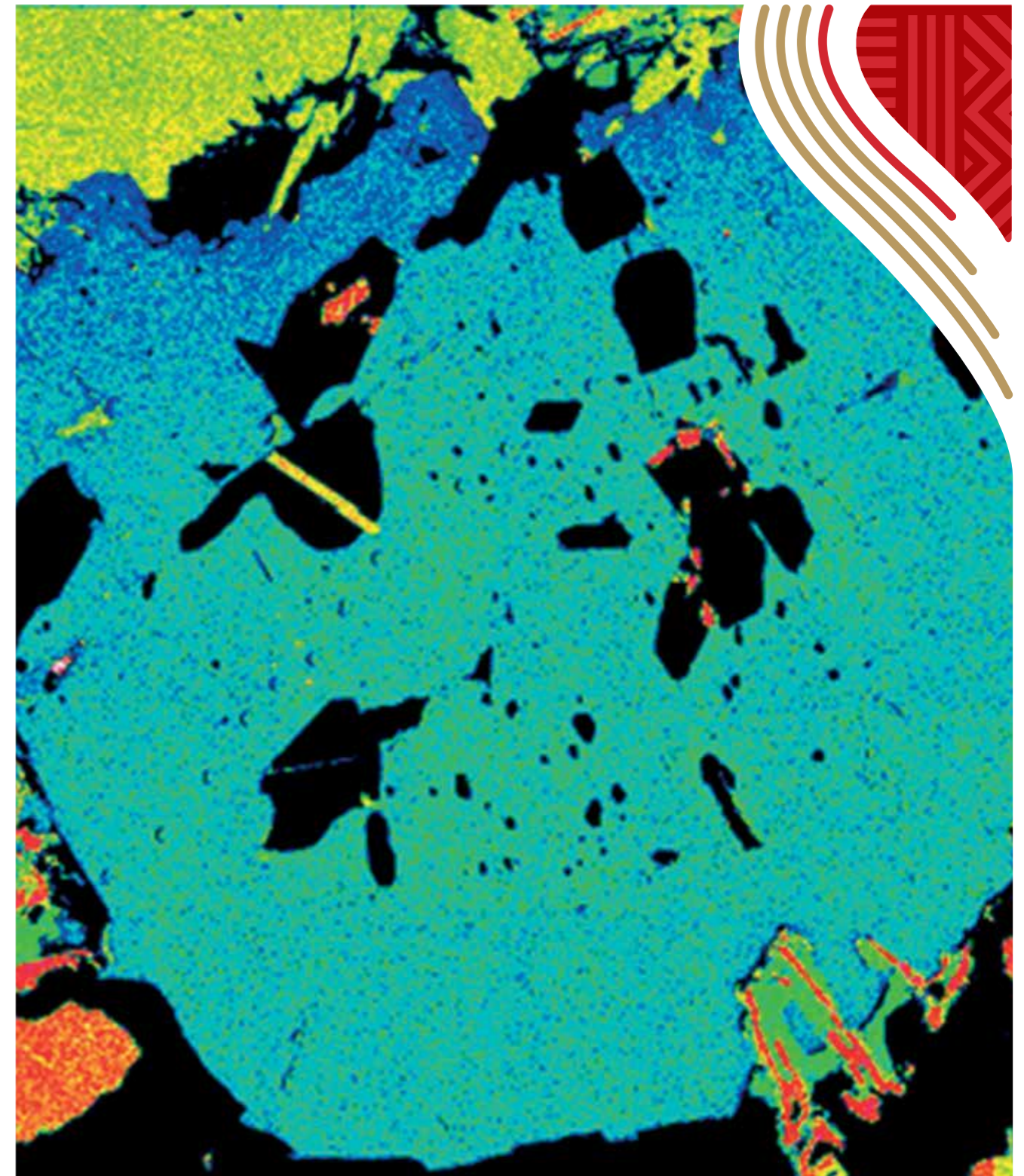
- Mr S Mohamed
- Mr JS Motshweni
- Mr A Nxopo
- Dr H Pfukwa
- Mrs PJ Steyn
- Mr GR Willemse

### Assistants

- Ms F de Vries
- Ms D Isaacs
- Ms M Jones
- Mr CW Maart
- Ms Y Mgqala
- Ms NS Ntwana
- Ms CJ van Reenen
- Mr M Wakens
- Ms DC Wenn

### Post-doctoral fellows

- Dr I Barnard
- Dr D Berthold
- Dr PS Eselem Bungu
- Dr WAS Hadasha
- Dr A Hazra
- Dr S Jokonya
- Dr L Loots
- Dr A Ndiripo
- Dr HA Nkabyo
- Dr J October
- Dr S Sanyal
- Dr P Sikiti



DEPARTMENT OF  
EARTH SCIENCES

## CONTACT DETAILS

+27 21 808 3172 | [ec@sun.ac.za](mailto:ec@sun.ac.za) | [www.sun.ac.za/chemistry](http://www.sun.ac.za/chemistry)



## RESEARCH INTERESTS

### Geology

Archean geology; Experimental petrology; Geometallurgy; Gold- and base-metal mineralisation; Heavy mineral deposits; Igneous petrogenesis; Metamorphic petrology; Sedimentology and palaeontology; Tectonics and orogenic processes

### Environmental geochemistry

Environmental geochemistry; Hydro-geochemistry; Hydrogeology; Isotope hydrology; Marine geochemistry; Trace-element and isotope geochemistry

## RESEARCH HIGHLIGHTS

### Economic geology research

The economic geology research unit around **Dr Bjorn von der Heyden** continues to investigate a broad range of mineralisation phenomena in the southern African region. Commodities studied in 2021 include cobalt, copper, diamonds, gold and zinc; and the research study areas spanned between South Africa, Namibia, Tanzania, and the Democratic Republic of Congo. This body of work culminated in a total of four peer-reviewed international journal publications, and graduation of one PhD, two MSc, and two BSc Honours students over the course of the year. – **Dr B. von der Heyden**

### Southern Ocean and climate change

**Prof Alakendra Roychoudhury** and his research group are involved in understanding the Southern Ocean in a changing climate scenario. Their recent results show that the Southern Ocean is not dormant during winter, as previously believed. Rather, phytoplankton growth is ubiquitous through various adaptation strategies, including a seasonal change in community structure, when it comes to the uptake of micro-nutrients that are known to limit their growth. Consequently, the role of the Southern Ocean in annual carbon dioxide drawdown may be underestimated. Indeed, one of the PhD students from the group has shown that large parts of the Weddell gyre are acting as an enhanced sink of carbon dioxide and, despite environmental variability over the last decade, little decrease in the carbon sink could be ascertained for the South Atlantic along the zero meridian. – **Prof A. Roychoudhury**



The TracEx research group aboard the South African research vessel the SA Agulhas II prior to leaving for a sampling trip in the Southern Ocean. PHOTO: AGULHAS II CREW MEMBER

### Sedimentology and paleontology

Despite the COVID pandemic, **Dr Ryan Tucker**, spent time in the field around Cathedral Valley, Central Utah (USA) as part of his ongoing work in the Western Interior. This collaborative project is currently funded by the American National Science Foundation (NSF), Frontier Research in Earth Sciences. The aim of the project is to contextualize sedimentary environments for a suite of newly discovered vertebrate fossil assemblages in the upper Cedar Mountain Formation.

Key discoveries, thus far, include the basal Tyrannosauroid *Moros intrepidus* and multiple new *Caenagnathasia* egg shell assemblages. In the same area, MSc student Ray Renaut is currently focusing on the near-shore Naturita Sandstone and the marine Tununk with key implications for age placement for both sedimentary successions.

Through this work, Dr Tucker and collaborators hope to address numerous inconsistencies in the poorly contextualized "mid-Cretaceous" of North America's Western Interior Basin. – **Dr Ryan Tucker**

### A return to fieldwork and active north-south collaboration

Members of the international research project BuCoMO (Building Continents from Mantle to Ore) recently met to conduct field work in the Barberton greenstone belt and associated granitoids. From Stellenbosch University, the researchers involved are Prof Alex Kisters, Dr Bjorn von der Heyden and Prof Gary Stevens and postgraduate students Tahnee Otto (PhD), Mariana Werle (MSc), Marcel Santos Leandro (PhD) from Stellenbosch University. External collaborators are Prof Jean-François Moyen from the University of Saint Etienne, and Prof Alain Chauvet and PhD-student Laurine Travers from the University of Montpellier, as well as Steve Kitoga (PhD student) who is doing a joint degree between the University of Clermont in Auvergne and Stellenbosch University.

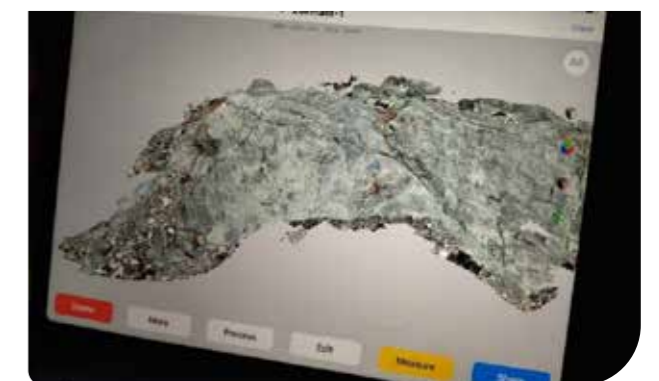
The researchers tackled three projects during November 2021: structures associated with gold mineralisation in sites of active and historical mining; the petrogenesis of ~3.1 Ga syenites and syenogranites, probably the oldest syenitic bodies on Earth; and the search for seafloor alteration signatures in TTG plutons. For most of the participants this was the first major period of field work since the start of the COVID pandemic and it was a truly glorious experience to once again be actively engaged in research in the field. – **Dr B. von der Heyden**



From the left, Ms Laurine Travers and Prof Alain Chauvet from the University of Montpellier) with SU's Dr Bjorn von der Heyden in front of an old adit in the Barberton gold district. PHOTO: B VON DER HEYDEN

### Collaboration with Switzerland

In July 2021, **Dr Matthew Mayne** conducted a research visit to Bern University in Switzerland in order to collaborate with Dr Pierre Lanari and to obtain research and teaching samples from Alpine orogen which were missing from the existing metamorphic teaching specimens. Pristine metamorphic rock samples were collected including unique high-pressure rock types of blueschists and eclogites from Blüemlisalp and Zermatt. During his stay in Bern Dr Mayne forged new research collaborations and was invited to present a research seminar entitled "Trace elements, accessory phases, activity calculations and oxygen fugacity buffers. The latest advances to Rcrust in creating an integrated software tool for phase petrology". – **Dr M. Mayne**



Dr Matthew Mayne ascended the high slopes of the Blüemlisalp in Switzerland in order to obtain metamorphic rock samples for the Stellenbosch University teaching collection. During his visit Dr Mayne explored new teaching methods, including a virtual scan of field areas which could prove helpful for remote teaching of field skills. IMAGE: DR PIERRE LANARI, UNIVERSITÄT BERN, SWITZERLAND.

## RESEARCH ACTIVITIES

**Dr Susanne Fietz** is editor of the journal *International Review of Hydrobiology*. She is also a SU BIOGRIP Steering Committee Member and a Steering Committee Member and national representative of the international initiative GEOTRACES. During 2021 she attended mainly online conferences, namely the Blowing South, Southern Hemisphere Dust Symposium, an online event from 8 to 10 November 2021; a Geotraces workshop titled "Iron at the Air-Sea Interface" from 26 to 30 July; and acted as session chair at the SCALE Workshop from 29 July to 2 August 2021. She actively collaborates with Dr Thulani Makhalanyane at the University of Pretoria; Drs Sarah Fawcett, Katye Altieri and Frank Eckardt at the University of Cape Town; Drs Sandy Thomalla and Thomas Ryan-Keogh at the CSIR; René Toesie at the Saldanha Bay Municipality; Dr Eugene Bergh at Iziko Musuem; Dr Lynwill Martin at the South African Weather Service; Dr Reza Zolfaghari at the National Institute of Genetic Engineering and Biotechnology, Iran, Dr Reza Zolfaghari and Prof Christian Sohlenkamp at the National Autonomous University of Mexico (UNAM); Prof Joyanto Routh at Linköping University, Sweden; and Dr Lars-Eric Heimbürger-Boavida at the Mediterranean Institute of Oceanography at the CNRS in France.

In April 2022 **Dr Matthew Mayne** presented a virtual poster at the European Geosciences Union (EGU) General Assembly taking place in Vienna, Austria. The poster, titled "Adapting phase equilibria modelling to crustal and planetary scale problems", details the latest advances to the Stellenbosch University Rcrust software and its application to planetary sciences. One of his MSc students, Sean Hoffman, presented a virtual poster titled "A new methodology for considering minor elements of geologic importance in phase equilibria modelling" detailing his contribution to Rcrust, which consists of a new methodology for considering minor elements. In April 2021 Dr Mayne presented the same talk at the Metamorphic Studies Group Research in Progress session (MSG Rip) hosted online from the University of Cambridge in collaboration with the Mineralogical

Society. In May 2021 he attended the Metamorphic Extravaganza Workshop as part of GeoConvention 2021 hosted in Calgary, Canada. In August 2021 Dr Mayne attended the third European Mineralogical Conference in Cracow, Poland, and in November 2021 the Moon and Early Earth Virtual Conference hosted by the Geological Society and the Royal Astronomical Society.

**Prof Gary Stevens** is an editorial board member of the *Journal of Metamorphic Geology*, and a Specialist Assessor for the Australian Research Council.

**Dr Ryan Tucker** served on the auction committee of the Society of Vertebrate Paleontology. He was also an editorial board member of the journals *Frontiers in Ecology and Evolution* and *Earth Science*, and a review editor for *Paleontology and Earth Sciences*.

**Dr Bjorn von der Heyden** was an invited speaker at the third African Light Source Conference in November 2021 with a talk titled "Synchrotron light applied to the African earth sciences". He continues with his role in the organisation of the Geological Society of South Africa's Geocongress national conference planned for 2023. He is a committee member of the Mineralogical Society of South Africa (MINSa), external moderator for the undergraduate programme at Rhodes University, a member of the organising committee for the African Light Sources international conference; a member of the International Science Council's Special Committee on Oceanographic Research (SCOR), and representative for the Earth Sciences in the African Strategy for Fundamental and Applied Physics (ASFAP). He continues to collaborate with researchers from the University of Johannesburg, the University of the Witwatersrand and the University of Cape Town, as well as the Namdeb Diamond Corporation in Namibia. From Canada he collaborates with researchers from the University of Alberta and the Institut national de la recherche scientifique (INRS), and from France, the Université Jean-Monnet and the Université de Montpellier.

## ACADEMIC AFFAIRS

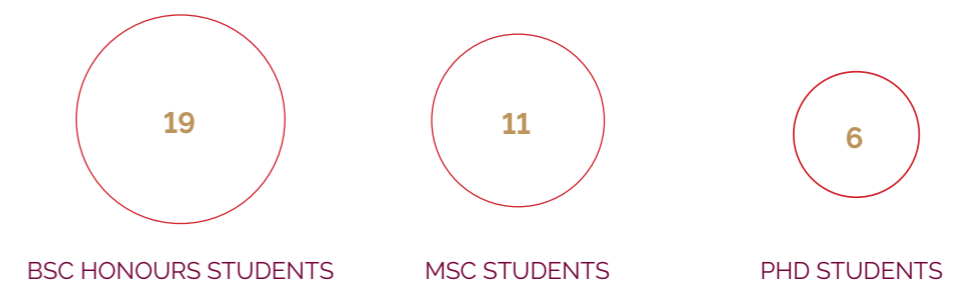
As part of SU's Quality Assurance System, the Department underwent a comprehensive external review of its teaching and research, staff and student profile, support and administrative structure and logistics. The last review of this kind of the Department was in 2011. Three external reviewers visited the Department over three days in June 2021 to interview staff and students and inspect the building and infrastructure. Excerpts from the referee's report read as follow:

*Staff and students appear to be very happy with the current situation in the Department of Earth Sciences (DES), and the whole department should be commended for their efforts in making it a good place to work and study. The courses are*

*perceived as being strong and internationally recognised. The department's move to on-line instruction was considered very well organised by the undergraduate students. The panel would like to commend the international reputation of the DES, the high Honours class numbers, the publication outputs, links to the mining industry, and the general stability and satisfaction of the DES as viewed by all students and staff. It is clear to the panel that this is a strong department, both by national and international standards.*

What did not feature in the departmental review report at that time was that the Department graduated a record number of 36 postgraduate students in 2021.

### Postgraduate students graduating in 2021



## AWARDS TO STAFF AND STUDENTS

In 2021 **Prof Alex Kisters** was the recipient of the prestigious Draper Memorial Medal, the highest scientific award of the Geological Society of South Africa (GSSA). The award is made annually to a member of the GSSA for career-long exceptional contributions to geological science, with particular reference to the advancement of South African geology. The Draper Memorial Medal was instituted in 1932 in honour of Dr David Draper, who was the main driving force behind the founding of the GSSA in 1895. Prof Kisters was honoured for

the significant contributions he has made during his career to the understanding of the crustal architecture of Southern Africa, in several tectonic domains, and for a career-long commitment to student teaching and guidance.

Stellenbosch University annually honours its top performing post-doctoral research fellows. This year, **Dr Jared van Rooyen**, a post-doctoral researcher in the Department of Earth Sciences, isotope hydrologist in the Biogrip unit of SU's Central



Prof Alex Kisters, head of the Department of Earth Sciences and recipient of the 2021 Draper Memorial Medal, awarded by the Geological Society of South Africa. PHOTO: STEFAN ELS

Analytical Facility, and chair of the Early Career Hydrogeologist Network (ECHN), was one of 20 postdocs at SU to receive this award. His recent publications considered the distribution of tritium (a hydrogen isotope) in ground waters, and how this distribution can be used to inform detailed hydrogeological models.



Dr Jared van Rooyen was honoured as a top-performing postdoctoral research fellow at Stellenbosch University. PHOTO: STEFAN ELS

In 2021, **Bjorn von der Heyden** was inducted as a Fellow into the Society of Economic Geologists (SEG), an international community focussed on ore geology. He was also nominated for the SEG's Lindgren Award for early career researchers.

MSc student **Muofhe Tshibalanganda** was recently awarded first prize for the best MSc level presentation at the Imaging and Radiation (IMRAD) 2021 virtual conference. Her M.Sc. research focusses on utilizing X-ray Computed Tomography (XCT) for characterizing microfossils, with particular focus and application on those used as exploration vectors in the Oil and Gas industry. She works as an analyst at the X-ray Tomography Unit at SU's Central Analytical Facility.



MSc student Muofhe Tshibalanganda was awarded first prize for the best M.Sc. level presentation at the Imaging and Radiation (IMRAD) 2021 virtual conference.

“ Prof Alex Kisters was the recipient of the prestigious Draper Memorial Medal, the highest scientific award of the Geological Society of South Africa (GSSA).

## STAFF MATTERS

**Dr Martina Frei** left the Department of Earth Sciences in October 2021 for the position of coordinator of postgraduate programmes in the Faculty of Engineering. Martina was instrumental for anything related to postgraduate administration, the processes of student admission, registration and graduation, student and research statistics, progress monitoring, and designing and maintaining the departmental website. She is sorely missed in the Department and we wish her well in her new endeavours.

The Department is delighted to announce the eventual arrival of **Dr Reynold Chow** in early 2021. Reynold was appointed as resident hydrogeologist already in June 2020, but visa complications and the COVID pandemic delayed his advent by almost nine months. All the while, he managed to cover the 2020 under- and postgraduate teaching remotely from his office in Switzerland. Once arrived, he hit the ground running and already established research grants,

projects and postgraduate students. We wish him and his family not only a productive, but also a most enjoyable time in Stellenbosch and South Africa.



Dr Reynold Chow was appointed as resident hydrogeologist in June 2020.

## SOCIAL IMPACT

**Prof Alakendra Roychoudhury** was a guest speaker for Science Café Stellenbosch as part of the 2021 Woordfees offering on DSTV, where he spoke about climate change and the role of the Southern Ocean in the earth's climate systems.

**Dr Bjorn von der Heyden** was invited to present to physics tertiary-level students from all over the African continent on the broad theme of Earth

Sciences. The invited lecture took place in July 2021 during the sixth edition of the biennial African School of Fundamental Physics and Applications.

The Department has embraced several new social media platforms to promote earth sciences and our activities – this includes Facebook, Instagram, Twitter and TikTok.

## FUNDING

### South Africa

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

## NRF-RATED RESEARCHERS

### INTERNATIONALLY ACCLAIMED RESEARCHERS

Prof JD Clemens (retired)	Granite petrogenesis
Prof A Kisters	Structural geology
Prof G Stevens	Experimental petrology
Prof A Roychoudhury	Environmental geochemistry, biogeochemistry and hydrogeology

### ESTABLISHED RESEARCHERS

Dr S Fietz	environmental geochemistry, biogeochemistry
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### PROMISING YOUNG RESEARCHERS

Dr B von der Heyden	Economic geology
Dr R Tucker	Sedimentology and paleontology

## STAFF LIST

### Academic

- Dr R Chow
- Dr S Fietz
- Dr R Heyn
- Prof A Kisters
- Dr M Klausen
- Dr M Mayne
- Prof A Roychoudhury
- Prof G Stevens
- Dr R Tucker
- Dr B von der Heyden

### Extraordinary researchers

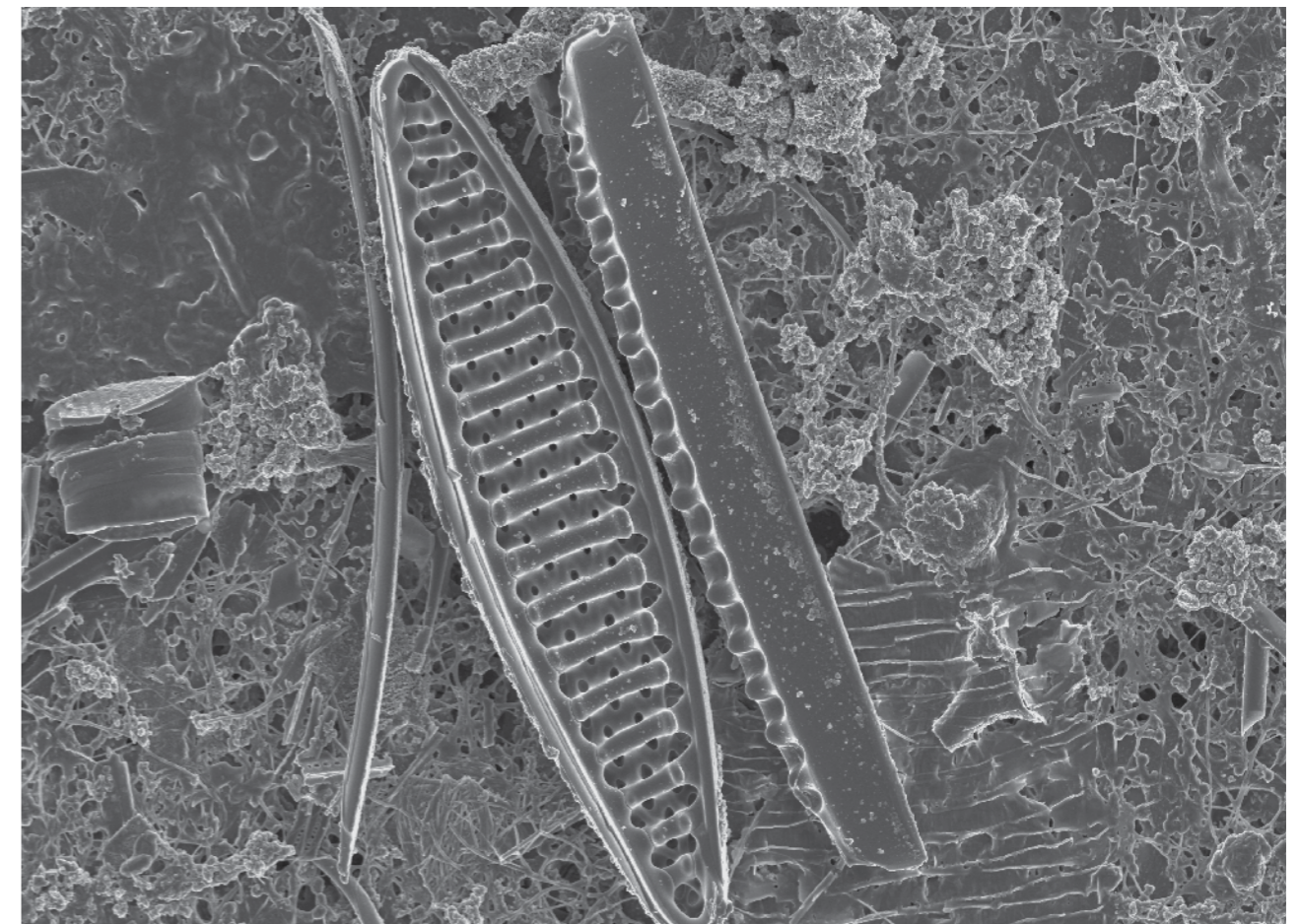
- Dr I Basson, Tect Consultancy
- Dr G Brown, Boswell Capital, Toronto Canada
- Dr D Cornell, formerly Gothenburg University, Sweden
- Dr M De Wit, consultant
- Dr C Koegelenberg, Tect Consultancy
- Dr N Phillips, Phillipsgold, Australia

### Support staff

- Dr M Frei
- Mr G Olivier
- Ms G Strydom
- Mr F Timney

### Emeritus professors

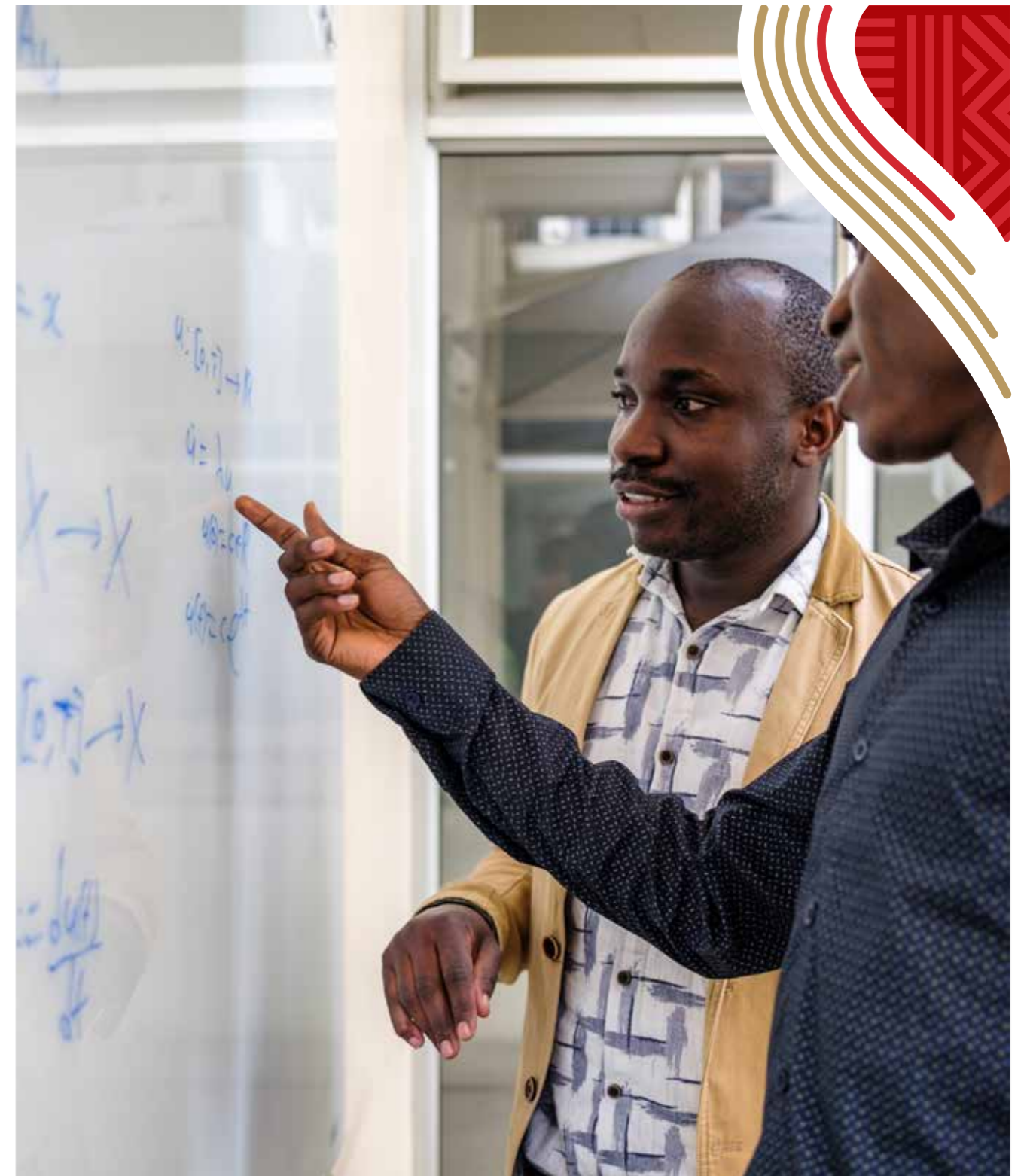
- Prof JD Clemens
- Prof A Rozendaal
- Postdoctoral fellows
- Dr S Saumik
- Dr R Cloete
- Dr A Ferreira



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DEPARTMENT OF  
MATHEMATICAL SCIENCES

## RESEARCH INTERESTS

### Applied Mathematics Division

Applied discrete mathematics; Computer vision, pattern recognition and machine learning; Dynamical systems; Fluid dynamics and modelling; Numerical analysis and scientific computing; Probability theory; Stochastic processes

### Computer Science Division

Automata and grammars: theory and applications;

Data Science; Machine learning, computational intelligence and artificial intelligence; Software engineering; program testing and verification

### Mathematics Division

Algebra; Analytic number theory; Biomathematics; Category theory; Discrete mathematics and algorithms; Functional analysis; Model theory

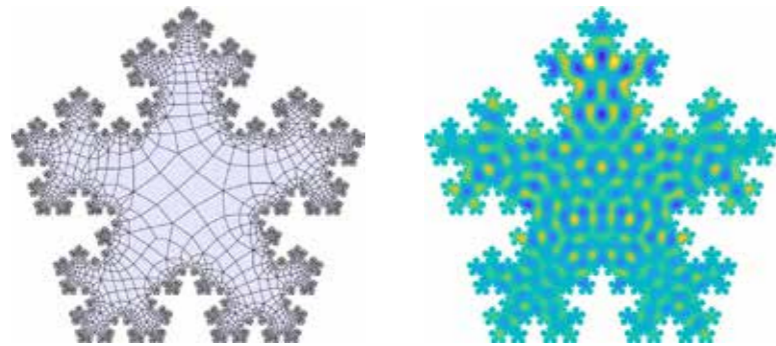
## RESEARCH HIGHLIGHTS

**Dr James Gray** completed a research project in which several notions of completeness have been introduced and studied and whose decomposition theorem essentially recovered, as a special case, a characterisation of complete groups of Baer published in 1946. These results have been published in a paper entitled "Complete objects in categories" in the *Journal of Pure and Applied Algebra* in 2022.

### Research on spectral methods

A long running research project of **Prof Nick Hale** culminated in a publication in the prestigious

*Journal of Computational Physics*. The paper outlines the derivation and implementation of the ultraspherical spectral element method, the combination of a fast and highly accurate spectral method with a fast and highly parallelizable domain decomposition technique, allowing spectral methods to be implemented on complicated geometries and to be competitive with more traditional finite element and spectral element discretisations. The method was implemented as open-source MATLAB software, available at <http://ultrasem.org>



The gravity Helmholtz equation solved on a 'Penrose Snowflake' using the ultraspherical spectral element method on an unstructured quad mesh. IMAGES: NICK HALE

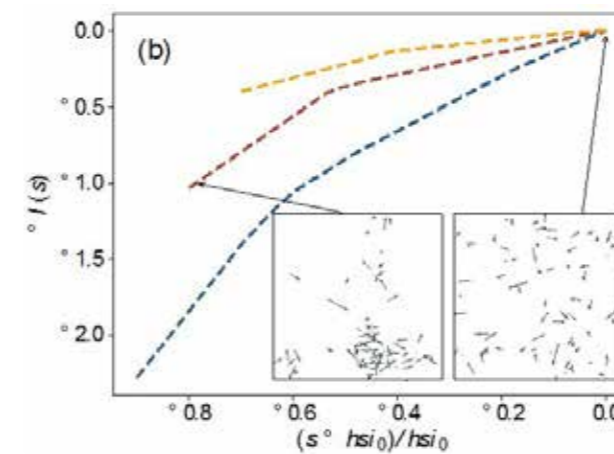
Collaboration with first-year mathematics student results in publication

**Dr Michael Hoefnagel, Prof Zurab Janelidze** and Dr Pierre-Alain Jacqmin from the Catholic University Louvain have collaborated with an undergraduate student in the Faculty of Science, Mr Emil van der Walt, on an original research project in mathematics. Collaboration began in 2020, when Mr Van der Walt was a first-year student. A joint research paper based on this collaboration, entitled "On binary matrix properties", was submitted for publication towards the end of 2021.

**Prof Zurab Janelidze** co-authored with Dr Pierre-Alain Jacqmin a 50-page paper "On linear exactness properties" published in 2021 in *Journal of Algebra* and a 55-page paper "On stability of exactness properties under the pro-completion" published also in 2021, in *Advances in Mathematics*.

### Neural networks research published in *Physical Review E*

**Prof Hugo Touchette** completed a research project with collaborators at Stanford University in the USA, on using neural networks for sampling rare events in interacting particle systems. Their work was published in *Physical Review E* and has applications in chemistry and physics.



Potential characterising the likelihood of rare configurations in a gas of interacting and active particles. Typical configurations are gas-like whereas rare configurations show particles bunching together. GRAPH: HUGO TOUCHETTE

SACEMA researchers make substantial contribution to SA's COVID-19 response

SACEMA researchers made substantial contributions to the South African COVID-19 response, including ongoing monitoring of reinfection risk and epidemic resurgence, estimating time-varying reproduction numbers, provision of short-term forecasts of case numbers and hospital admissions, and service to various national bodies, including the Ministerial Advisory Committee on COVID-19. SACEMA continued to be a core partner in the South African COVID-19 Modelling Consortium, which is coordinated by the National Centre for Infectious Diseases (NCID). SACEMA's work on reinfection trends, led by the director Prof Juliet Pulliam, provided the first evidence globally of the Omicron variant's ability to evade immunity from prior infection. Prof Pulliam and Prof Alex Welte dealt extensively with the media. From 2020 to 2021 they were quoted or referred to in 256 media articles, with an Advertising Value Estimate (AVE) of R21 643 142 and reaching a potential 79 683 602 people.

“ SACEMA's work on reinfection trends, led by Prof Juliet Pulliam, provided the first evidence globally of the Omicron variant's ability to evade immunity from prior infection.

## RESEARCH ACTIVITIES

Virtual joint research activities and virtual conferences have once again been a major challenge in 2021. No internet intervention, be it, for example, with Zoom or Microsoft Teams, comes remotely close to physical presence and interaction when collaborating with a colleague or participating in an academic conference. As one colleague described, "The pace of progress during virtual joint research versus progress during physical presence can be compared to 'snail' mail versus e-mail; there is simply no comparison".

**Dr Bruce Bartlett** published with his former PhD student, Dr Gerrit Goosen, a paper in *Communications in Contemporary Mathematics*. He was invited to deliver two international talks: "Asymptotics of the classical  $6j$  symbols" at a topological quantum field theory (TQFT) club seminar at the Instituto Superior Tecnico on 21 May 2021; and "In search of an integral formula for the quantum  $6j$  symbols" as an online seminar for Prof Uli Kraehmer's research group at the Technical University (TU) Dresden on 29 November 2021. He also delivered two local talks "Hilbert's third problem and the geometry of tetrahedra" at the Stellenbosch University Mathematics Society on 15 April 2021 and " $6j$  symbols, rational tetrahedra and unlikely intersections" at a Stellenbosch Number Theory and Geometry Seminar on 8 March 2021. His PhD student, Hosana Ranaivomanana, gave a half-hour online talk on her work in the Hamburg seminar for Algebra and Mathematical Physics earlier in the year. Dr Bartlett was the host for four speakers (Bernd Schroers, Karin Howell, David Holgate and Bernardo Rodrigues) for the online African Mathematics Seminar.

**Dr RONALDA BENJAMIN** is a member of the Functional Analysis Steering Committee since 2021. She supervised, together with Dr Kevin Muzundu, the master's project of Mr Sonick Mumba from the University of Zambia and studied, in collaboration with Dr Kelvin Muzundu and Mr Mumba, the upper Browder spectrum in the context of commutatively ordered Banach algebras (submitted). On 21 September 2021, she gave an invited talk in a

departmental (online) seminar at the University of Johannesburg. From 29 November to 1 December 2021 she attended the online SAMS National Congress.

**Dr Gareth Boxall** gave two international talks: an online talk titled "Some finiteness results concerning points on a curve with a power on a curve" at the Lancashire Yorkshire Model Theory Seminar; and an online seminar "Topological and Differential Expansions of O-minimal Structures".

**Prof Willie Brink** presented at the Southern African Conference on Artificial Intelligence Research and pursued his research collaborations with InstaDeep, Benjamin Rosman at the University of the Witwatersrand and Ulrich Paquet at DeepMind.

**Dr Hanno Coetzer** published two papers in 2021. The first paper was in collaboration with Jacques Swanepoel of Flightscope in South Africa and Robert Sabourin of the École de technologie supérieure (ETS) in Montreal, Canada. The authors demonstrated how human and machine decisions can be optimally combined within the context of cost-sensitive biometric authentication. The second paper was in collaboration with Aviwe Kohlakala, a PhD student at Stellenbosch University, in which they demonstrated how convolutional neural networks can be used for ear-based biometric authentication. Dr Coetzer is continuing his collaboration with Robert Sabourin of ETS. He is also collaborating with Dirk Vandermeulen and Jeroen Bertels of the Catholic University (KU) Leuven in Belgium within the context of deep learning-based dental implant recognition.

**Dr Andie de Villiers** is the vice-chairperson of the South African Association for Theoretical and Applied Mechanics (SAAM). In 2021 she attended the South African Computational and Applied Mechanics (SACAM) conference. Prof Andrew McBride of the University of Glasgow visited her. She started working on a visco-elastic formulation of continuum-kinematics inspired peridynamics in collaboration with Ali Javili from Bilkent University, Turkey.

**Dr Hardus Diedericks** published in the *African Journal of Marine Science* a paper describing the hydrodynamics in False Bay. His collaboration with Dr Neill Goosen from the Process Engineering Department continued and he contributed to the reporting of the European AquaVita project as part of Work Package 6. The Norwegian fish farm accrediting company, Åkerblå, approached Dr Diedericks to collaborate on one of their research projects.

**Prof Andries Engelbrecht** is associate editor of several journals. They are: *IEEE Transactions on Evolutionary Computation*, *IEEE Transactions on Neural Networks and Learning Systems*, *Swarm Intelligence Journal*, *Complex & Intelligence Systems*, *Engineering Applications of Artificial Intelligence* and *Artificial Intelligence*. He is also Artificial Intelligence series editor for *IntechOpen Series* and serves on the editorial board of *Evolutionary Computation Journal* and the Springer book series *Studies in Autonomic, Data-Driven and Industrial Computing*. He is Deputy Editor-in-Chief of *Engineering Applications in Artificial Intelligence*. Prof Engelbrecht presented the following keynotes: "Multi-guide particle swarm optimization for multi- and many-objective optimization" at the International Conference on Scientific and Natural Computing, Greater Noida, India (virtual conference in February 2021) and at the 21st International Conference on Hybrid Intelligent Systems, an online conference that took place in December 2021; "A hyper-heuristic framework for real-valued dynamic optimization" at the fifth International Joint Conference on Advances in Computational Intelligence (held virtually in October 2021); "Large-scale optimization using particle swarm optimization" at the fourth International Conference on Computing and Information Systems, a hybrid conference held in Karachi, Pakistan, in November 2021; and "Forecasting non-stationary time series without recurrent connections" at the third International Symposium on New Trends in Computational Intelligence, a hybrid conference hosted in Qingdao, China, in December 2021.

**Prof Engelbrecht** co-presented the tutorial, "Advances in particle swarm optimization development, analysis, and understanding" at the

Institute of Electrical and Electronics Engineers (IEEE) Congress on Evolutionary Computation in June 2021 and at the Genetic and Evolutionary Computation Conference in July 2021. He served on the international advisory board of the IEEE International Conference on Computational Intelligence and Computing Applications and the International Conference on Scientific and Natural Computing. He was publications co-chair of the fifth International Conference on Intelligent Systems, Metaheuristics and Swarm Intelligence, and the seventh International Conference on Soft Computing and Machine Intelligence. He was general co-chair and proceedings co-editor of the 12th International Conference on Soft Computing and Pattern Recognition, and the 13th World Congress on Nature and Biologically Inspired Computing. He was technical co-chair of the IEEE Congress on Evolutionary Computation. Prof Engelbrecht reviewed articles for 24 different journals and ten international conferences.

**Prof Sonia Fidder-Woudberg** continued collaboration with the Department of Energy and Environmental Systems at IMT Atlantique in Nantes, France, on "Predicting the permeability and specific surface area of compressed and uncompressed fibrous media including the Klinkenberg effect" which was published in the *Powder Technology* journal. This project formed part of the MSc thesis of Esmari Maré, who is co-author of the paper. Prof Fidder-Woudberg is also the vice-president of the Southern African Society of Rheology (SASOR).

**Prof Bernd Fischer** is chair of the steering committee of the Automated Software Engineering conference series and member of the ASE/ESEC-FSE/ICSE conference coordination group; and of the International Federation for Information Processing Technical Committee-2 (IFIP TC-2) Working Group 2.11. He is a member of the Program Committee and Board of the International Conference on Automated Software Engineering (ASE), the Symposium on Foundations of Software Engineering (FSE), the International Symposium on Formal Methods (FM), the Mining Software Repositories Conference (MSR), the International Conference on Software Language Engineering (SLE), and the International Conference

on Software Analysis, Evolution and Reengineering (SANER). He is also an editorial board member of the journal *Science of Computer Programming's* Software Section and serves as General Chair for Software Language Engineering (SLE) 2022. He visited the University of Molise in Italy in July and August 2021, funded by an Italian government grant Bando GNCS 2021 for visiting professors.

**Dr James Gray** had two papers published in 2021. The first was a joint paper with Dr Xabier Garcia Martínez from the University of Vigo in Spain – they showed that each category of Lie objects, defined with respect to a monoidal structure on an abelian category satisfying certain conditions, is fiberwise algebraically cartesian closed. The second paper was a joint paper with Prof Marino Gran from the Catholic University Louvain in Belgium – they showed under suitable conditions that action representability of a category lifts to the category of internal groupoids in it. He also gave two research talks online. The first entitled "The first cohomology object in semi-abelian categories" was at the Algebra, Logic and Topology Seminar (CMUC) of the Centre for Mathematics at the University of Coimbra in Portugal, and the second, entitled "On the category of pointed frames", was at the 64th South African Mathematical Congress hosted by the University of the Free State.

**Dr Trienko Grobler** presented two papers at the Institute of Electrical and Electronics Engineers (IEEE) International Geoscience and Remote Sensing Symposium which was held in Brussels, Belgium, in 2021. The one is "A Parsimonious Neural Network for the Classification of Modis Time-Series" and the other "Using the GAF Transform and MODIS Time-Series to Perform Landcover Classification and Change Detection".

**Prof Nick Hale** continued work with collaborators at Cornell University and the Flatiron Institute in the USA, resulting in the ultraspherical spectral element method (ultrasem.org) and a new collaboration with Ashleigh Hutchinson and David Mason at the University of the Witwatersrand, resulting in a paper in the *Proceedings of the Royal Society A*. He is chair of the local organising committee for the fifth BRICS Mathematics and Statistics Conference to be hosted in Stellenbosch in 2022.

**Dr Retha Heymann** published a paper "Extrapolation of operator-valued multiplication operators" in *Quaestiones Mathematicae*, resulting from her collaboration with Christian Budde from North-West University.

**Dr Michael Hoefnagel** published a single-author paper "Anticommutativity and the triangular lemma" in the prestigious journal *Algebra Universalis* and presented a talk "Deciding implications of matrix properties" at the Centre for Mathematics, University of Coimbra in Portugal.

**Dr Karin-Therese Howell** is a member of the executive council of the African Institute for Mathematical Sciences South Africa (AIMS-SA). She is also AIMS-SA Associate Faculty, serves on the Advisory Council for Mathematics of the South African Mathematics Foundation and the Mathematics Committee of the National Graduate Academy. She is the secretary of the South African Mathematical Society's council and serves on the organising committee for the fifth BRICS Mathematics and Statistics Conference to be hosted in Stellenbosch in 2022. She gave two international talks, titled "The weird and wonderful world of near-vector spaces" at the virtual AAA conference and at the African Mathematics Union Seminar Series. She continued working on research projects with Prof Nancy Neudauer from the Pacific University in the USA, looking at the matroid theory of near-vector spaces. She also works with Dr Sophie Marques and Dr Lee Boonzaaier at SU looking at regular inner product near-spaces. A paper with MSc student Jacques Rabie, which looks at the geometry of non-commutative joins and their application to near-vector spaces, was accepted for publication in the journal *Quaestiones Mathematicae*. Mr Rabie's application for an upgrade to a PhD was granted. During this time Dr Howell also worked on an article about the Nigerian mathematician Grace Alele-Williams and a book chapter on building mathematical communities with Nancy Neudauer, both to be published by the American Mathematical Society in 2022.

**Prof Cang Hui** serves as reviewer editor and contributing author for ongoing global assessment

on invasive species led by the International Panel on Biodiversity and Ecosystem Services (IPBES). He is a trustee of the International Initiative for Theoretical Ecology (IITE, London) and member of the advisory board of two consortiums: Global Urban Biological Invasions Consortium (GUBIC) hosted by the University of Toronto and the International Development Research Centre (IDRC, Canada) project "Towards Equitable and Sustainable Nature-based Solutions" (TES NbS). He serves on the Mathematics, Statistics and ICT Standing Panel at the NRF for 2021-2024. In 2021, he was part of an organised session in the Ecological Society of America (ESA) conference and participated in the IPBES workshop on modelling Nature Futures scenarios. He is associate editor of the journals *Global Ecology and Biogeography*, *Biological Invasions*, *Ecological Complexity*, *BMC Ecology and Evolution*, *Frontiers in Ecology and Evolution*, *Journal of Dynamics and Games*, and *Bulletin of Mathematical Biology*.

**Dr Cornelia Inggs** successfully supervised to completion the MSc research of Ms Nicole du Toit who graduated *cum laude* for her thesis titled "Concrete and Symbolic Linearisability Checking of Non-Blocking Concurrent Data Structures".

**Prof Zurab Janelidze** was elected as President of the South African Mathematical Society for the two-year term 2022-2023. He is an editorial board member of the journals *Cahiers de Topologie et Géométrie Différentielle Catégoriques* and *Applied Categorical Structures*. He delivered a joint online plenary address with Dr Amartya Goswami from the University of Johannesburg at the fourth BRICS Mathematics Conference held in a hybrid mode in December 2021 in India and gave online talks at the annual SAMS congress and the SIC (French seminar in category theory). He served, by invitation, on the Keynote Panel of the SU Scholarship of Teaching and Learning Conference 2021 and as a judge at the same conference for best presentation. Together with colleagues across different universities in South Africa, he conceptualised a research programme at the National Institute of Theoretical and Computational Sciences (NITheCS), which has been approved for 2022 with a major budget and

includes 20 researchers. He co-supervised with Dr Amartya Goswami the MSc studies of Kishan Dayaram at the University of Johannesburg, where the candidate graduated *cum laude* after one year of study and was awarded the Chancellor's medal for the best thesis in science. He was invited jointly with Dr Goswami to give a mini school in category theory at NITheCS in October 2021. The mini school was attended by postgraduate students and academics across different universities in South Africa.

**Dr Sophie Marques** presented a plenary talk at the Association for Mathematics Education (AMESA) titled "Empowering learners with critical life skills in our current world by exploring the human side of mathematics" as well as a talk on her joint work "Building a community empowered with 21st century skills within an inclusive and innovative vision through mathematics" together with John Gilmour, founder of the LEAP science and maths schools, and Dr John Volmink, chair Umalusi Council. She continued with her collaborative project with SU's Dr Karin Howell and Dr Lee Boonzaaier on describing an inner product structure induced by the usual inner product on regular near vector space and their properties. With her collaborator Ben Blum Smith from New York, she is studying the Cohen Macaulyness of invariant rings. Doing so they have encountered the importance of understanding Henselian rings and are currently translating and detailing some work from the French mathematicians Michel Raynaud and Alexandre Grothendieck. In particular, an important theorem of Grothendieck will be crucial for completing one of their theorems. During 2021, Dr Marques received two guests: Prof Marco Garuti, academic director at AIMS Cameroon and researcher at Padova University in Italy, and Dr Fabien Pazuki from the University of Copenhagen in Denmark. She is an external editor for Pearson Global and the SU representative for the ALGANT (Algebra, Geometry and Number Theory) programme.

**Prof Sonja Mouton** published two single-authored papers in 2021 and was appointed to serve on SANCIMU (South African Committee for the International Mathematical Union), since 2021. Her PhD student, Dimby Rabearivony, presented



a successful talk at the Virtual SAMS Conference in 2021. The title was "Generalized Domination in Ordered Banach Algebras".

**Dr Naina Ralaivaosaona** serves as a junior coordinator for the Number Theory Focus Area for the DSI-NRF Centre of Excellence in Mathematical and Statistical Sciences (CoEMaSS). He gave a plenary talk at the Topology, Algebra, Analysis, Geometry and Applications 2021 online conference (TAAG-A 2021) at the University of Botswana with the title "The phase transition in random digraphs". He was an invited speaker at the 32nd International Conference on Probabilistic, Combinatorial and Asymptotic Methods for the Analysis of Algorithms (AofA2021) and delivered a short talk entitled "The number of distinct parts in  $\Pi$ -partitions".

**Prof Ingrid Rewitzky** is a member of the International Mathematical Union Committee on Electronic Information and Communication (CEIC) and an associate editor for *Quaestiones Mathematicae*. She is serving on the local organising committee for the fifth BRICS Mathematics and Statistics Conference to be hosted in Stellenbosch in 2022.

**Dr Riana Roux** presented an online seminar at Simon Fraser University, Canada, on localization games on graphs, co-hosted a graph theory workshop for South African Universities at AIMS, and strengthened ongoing collaboration with Drs Magda Dettlaff and Magdalena Lemańska from Gdańsk University of Technology in Poland.

**Prof Francois Smit** published a paper with his collaborators Dr Jeanine Vonkeman and Prof Gerrit Basson from the Faculty of Engineering and has another collaborative paper with colleagues from Rheinmetall accepted for presentation at the 32nd International Symposium on Ballistics to be held in Nevada, USA in May 2022.

**Prof Hugo Touchette** was an invited speaker at the Joint European Thermodynamics Conference (JETC) in Prague; at the Bangalore School on Statistical Physics in Bangalore, India; and at the South African Numerical and Applied Mathematics (SANUM2020) conference in Stellenbosch. In addition, he presented his research

work at the 13th International Workshop on Rare-Event Simulation in Paris, France; the Workshop on Statistical Physics of Complex Systems at the International Centre for Theoretical Physics (ICTP) in Trieste, Italy; the Department of Mathematics, University of Wisconsin, USA; the Mathematics Institute at the University of Warwick, UK; and the Dutch Institute for Emergent Phenomena in The Netherlands. He served as a member of the Editorial Board of *Physical Review E* and of the American Physical Society and he is an AIMS research fellow.

**Prof Bill Tucker** is a member of ACM SIGCHI (the premier international society for professionals, academics and students interested in human-technology and human-computer interaction (HCI)). He is associate editor of *Information Technology and International Development*, member of the programme committee for the International Conference on Information and Communication Technologies and Development (ICTD), board member of the not-for-profit company Zenzeleni Networks, and is extraordinary (adjunct) professor of computer science at the University of the Western Cape.

**Prof Brink van der Merwe** is associate editor for the *Journal of Universal Computer Science*. He was on the program committee of the conference on implementation and application of automata (CIAA 2021) that was held in Bremen, where he also presented a paper.

**Prof Leon van Wyk** is associate editor of *Afrika Matematika* and editor of *Miskolc Mathematical Notes*. He published two papers which resulted from the continuing cooperation with his Hungarian collaborators, Prof Szilvia Homolya and Jenő Szigeti from the Institute of Mathematics at the University of Miskolc in Hungary, and his Polish collaborators Prof Grzegorz Bajor and Prof Michał Ziemkowski from the Warsaw University of Technology in Poland. The one paper appeared in the prestigious *Journal of Algebra*, widely considered the top algebra journal and the other in the excellent general mathematics journal *Forum Mathematicum*.

**Prof Lynette van Zijl** is associate editor of the *Journal of Universal Computer Science*.

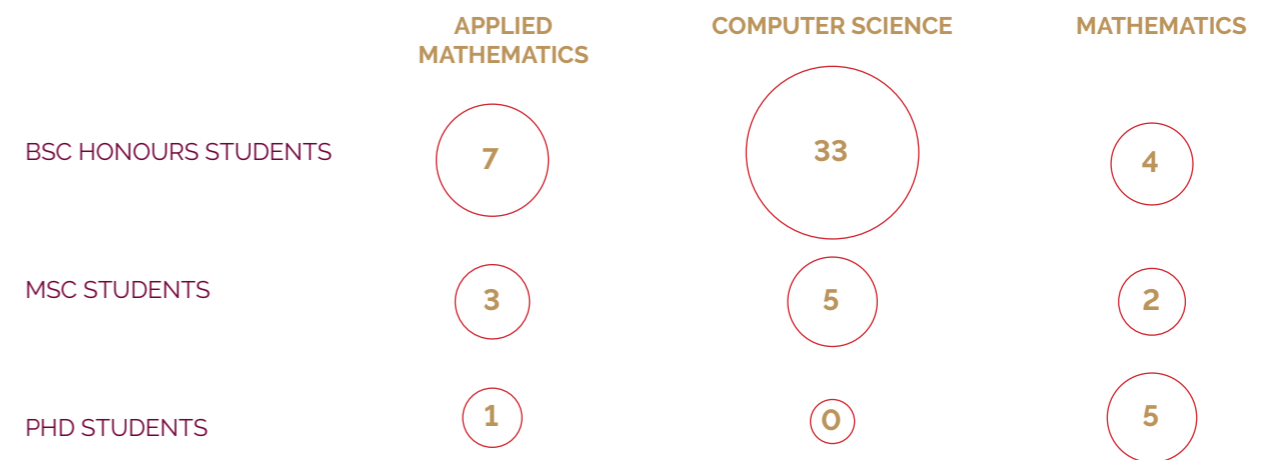
**Prof Willem Visser** is associate editor of *IEEE Transactions on Software Engineering (TSE)*.

**Prof JAC Weideman** is associate editor of the journals *Numerical Algorithms and Electronic Transactions of Numerical Analysis*. He serves on the editorial board of *Quaestiones Mathematicae*.

He gave virtual presentations at two international conferences: In July 2021, he was the main speaker at ENSPM2021 (the national meeting of the Portuguese Math Society) and in November 2021 he was a speaker at NMSC21 (Numerical Methods and Scientific Computing), dedicated to Claude Brezinski on his 80th birthday in November 2021

## ACADEMIC AFFAIRS

### Postgraduate students graduating in 2021



The BSc-degree in Computer Science was approved for implementation from 2022. All non-final year students enrolled for the Computer Science stream of the BSc in Mathematical Sciences in 2021 were given and accepted the option to change to the new BSc in Computer Science from 2022.

In 2021, the new inter-faculty programme Bachelor of Data Science (BdatSci), including streams for Computer Science, and Applied Mathematics, was launched. The enrolment for these streams was 14 students. With much interest among prospective students for 2022 and an increase in applications for these streams, the expectation is that the enrolments will triple in 2022.

Preparations are underway for the launch of the new structured MSc-degree in Machine Learning and Artificial Intelligence in 2022. Prof Willie Brink

together with Extraordinary Professor Ulrich Paquet secured R1.8 million in DeepMind Scholarship for students enrolling for the programme.

Offering Augmented Remote Teaching, Learning and Assessment (ARTLA) in 2021 has been even more challenging than the fully online approach followed in 2020 for most modules offered by the department. Challenges have included inspiring students to engage with self-learning, improving the effectiveness and integrity of assessments, balancing a more hybrid offering with some in-person activities, and becoming proficient with the on-campus protocols and Extended Learning Spaces (ELS) technology. A small pilot project that emerged during ARTLA is the CodeTester project of Mr Willem Bester and Dr Cornelia Inggs for research into the acquisition of basic programming skills (for hybrid learning).

## AWARDS TO STAFF AND STUDENTS

New NRF ratings were awarded to four colleagues: **Prof Andries Engelbrecht** the outstanding A1 rating, **Prof Zurab Janelidze** a B1 Rating, **Prof Steve Kroon** a C2 rating, and **Prof Sonja Mouton** a C1 rating.

At the First-year Achievement Awards evening three colleagues were recognised by top-performing first-year students in 2020 as their most inspiring lecturers: **Dr Hanno Coetzer** (one student from the Faculty of Engineering), **Dr James Gray** (one student from the Faculty of Science), and **Prof Zurab Janelidze** (two students from the Faculty of Science).

An MSc student in Computer Science, **Elan van Biljon**, was co-author on a paper which received one of the two inaugural Wikimedia Foundation Research Awards of the Year.

DAAD In-Region awarded seven MSc and two PhD full scholarships for students to pursue postgraduate studies in Mathematics from 2022. These are the scholarships **Dr Bruce Bartlett** secured in 2020, with 2021 being the first intake. The new students are massively bolstering our postgraduate numbers in Mathematics. The students are, on MSc level: Michael Okone from Nigeria with supervisor Dr M Hoefnagel, Tosin Osikoya from Nigeria with supervisor Prof C Hui, Victoria Okeowo from Nigeria with supervisor Prof C Hui; Precious Chiwira from Zimbabwe with supervisor Prof C Hui; Tolo Andrianarisoa from Madagascar with supervisor Dr N Ralaivaosaona; Mukhtar Muhammed from Nigeria with supervisor Prof C Hui; and Brian Muciri from Kenya with supervisor Dr B Bartlett. On PhD-level, the students are Joseph Atalaye from Cameroon with supervisors Dr S Marques and Dr L Baker; and Masreshaw Kassaye from Ethiopia with supervisor Dr N Ralaivaosaona.

DAAD In-Region PhD Scholarships through AIMS-SA were awarded to Dimby Rabearivony (supervisor Prof Sonja Mouton) and Yannick Harrison Nkocko Awountsa (supervisors Prof Sonia Fidler-Woudberg and Dr Hardus Diedericks).

Two first year students in the Mathematical Sciences programme, **Ms D Kleyn** and **Mr J Weight**, were included in the Hall of Fame of the ASSA South African Tertiary Mathematics Olympiad (SATMO).

**Mr Brandon Laing** and **Ms Ineke van der Berg** were awarded an NRF-Nuffic Doctoral Scholarship to pursue their PhD studies jointly at SU and the Vrije Universiteit Amsterdam in the Netherlands, supervised by Prof Zurab Janelidze and Prof Alessandra Palmigiano from The Netherlands.

**Ms Esmari Maré** received the Wilhelm Frank Scholarship for her PhD studies under the supervision of Prof Sonia Fidler-Woudberg.

Top achievers in Applied Mathematics for the 2020 academic year were: Bernardus Wessels (best first year student), Hans Klusman (best second year student), Kirsten Robinson (best third year student) and Philip Schall (best Honours student). They will be rewarded for their hard work with certificates and book prizes sponsored by Cambridge University Press at an in-person event in 2022.

The following students received book prizes as part of the Rubbi Awards for Mathematics for the 2020 academic year: Liam Brain, Chris Langeveldt, and Emil van der Walt (best first year students); Retief Louw and Bradley Buchanan (best first year engineering mathematics students); Jean Durand and Brendan Watling (best second year students); Devon Crowther and Samantha Parle (best third year students); Dario Trincherro and Jade Viljoen (best Honours students).

Industry-sponsored prizes were awarded to the top-achieving Computer Sciences students for the 2020 academic year: Bernardus Wessels (best first year student) with Liam Foxcroft and Emil van der Walt as first and second runner up respectively; Brendan Watling (best second year student) with Alexander Roodt, Gareth Dalton, Gregor Feierabend as first, second, third runner up respectively. Caleb Zeeman received the Van der Walt Medal in recognition of being the best third year student and Jacobie

Mouton received the prize for the best honours student as well as the prize for the best honours project. Matthew Baas was the best honours student in machine learning.



Prof Berndt Fischer with BScHons-student Jacobie Mouton. She received the prize for the best honours student as well as the prize for the best honours project in Computer Science for 2021. PHOTO: WIIDA FOURIE-BASSON

## STAFF MATTERS

**Prof Bill Tucker** joined the Computer Science Division as Professor of Computer Science from 1 June 2021. His research interest is computing and society which he describes as an inter-disciplinary space, combining Computer Science with all kinds of different disciplines in very interesting ways.

**Mrs Gaynor Fortuin** was appointed Departmental Officer of the Computer Science Division with effect from 1 April 2021.

**Prof Brink van der Merwe** was appointed Division Head of Computer Science from 1 January 2022 to 31 December 2023.

**Dr Gareth Boxall** and **Dr Karin-Therese Howell** were promoted to Associate Professor in Mathematics and **Dr Riana Roux** was promoted to Senior Lecturer, all with effect from 1 January 2022.

**Mr Adrian Roman** retired on 30 April 2021 from his position as technical assistant in Applied Mathematics.

## SOCIAL IMPACT

**Dr Bruce Bartlett** was contacted by Thulasizwe Simelane's team from eNCA after the local government elections and he gave a live interview on eNCA on 3 November 2021 about voter turnout. This was in response to his article in The Conversation from 2019 about voter turnout in the national elections.

**Dr RONALDA Benjamin** was a mentor on the AIMS Ghana Girls in Mathematical Sciences Program.

On 20 October 2021 she was the guest speaker at the examination numbers handover ceremony of the matriculants/inmates at Brandvlei Correctional Services.

**Mr Willem Bester** served as mentor for the UmojaHack data science competition.

**Prof Willie Brink** participated in the Deep Learning Indaba mentorship programme and co-organised Maties Machine Learning (with Herman Kamper).

**Dr Karin Howell**, together with the African Women in Mathematics (AwiM) conference, organised a symposium on 12 May which consisted of snapshot plenary talks, two panel discussions and a screening of a movie about Maryam Mirzakhani.

**Prof Zurab Janelidze** was invited to two online discussions with the Student Parliament of Georgia centred around the theme of abstract mathematics and its relation to linguistics and music.

**Dr Sophie Marques** is a member of the founding team of the Ubuntu Mathematics Institute (UMI), is

the founder and managing director of *Wisaarkhu*, and assists with the African Women in Mathematics (AwiM) events.

**Prof Francois Smit** held an advanced workshop on V/L modelling from 3-7 May at Rheinmetall Denel Munition (RDM) in Potchefstroom.

Zenzeleni, on whose Board **Prof Bill Tucker** sits, currently serves broadband internet to thousands of local community members at R25/month uncapped in the rural Eastern Cape. This low rate is subsidised by anchor clients such as Zithulele Hospital, Mdumbi Backpackers, local schools, and businesses.

## COLLABORATION

### Australia

- Griffith University
- University of New South Wales

### Belgium

- KU-Leuven
- Ghent University
- Vrije University

### Canada

- Brock University
- University of Quebec

### Czech Republic

- Tomas Bata University of Zlin

### Cyprus

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

### France

- IMT Atlantique in Nantes

### Germany

- Braunschweig University of Technology

### Hungary

- Renyi Institute of Mathematics
- University of Miskolc

### India

- Indian Institute of Technology Roorkee

### Ireland

- Trinity College, Dublin

### Nigeria

- Federal University of Dutse

### Poland

- Gdansk University of Technology
- Warsaw University of Technology

### South Africa

- Council for Scientific and Industrial Research (CSIR)
- 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

### Sweden

- Nordita, Stockholm
- Umeå University
- The Netherlands
- Vrije Universiteit Amsterdam

### Turkey

- Bilkent University

### United Kingdom

- Aberystwyth University

- Imperial College London
- Lancaster University
- University of Manchester
- University of Oxford
- University of Glasgow

### United States of America

- University of Louisiana at Lafayette
- Machine Intelligence Research Labs, Auburn, Washington
- Pacific State University
- Stanford University

### Zambia

- University of Zambia

## FUNDING

### South Africa

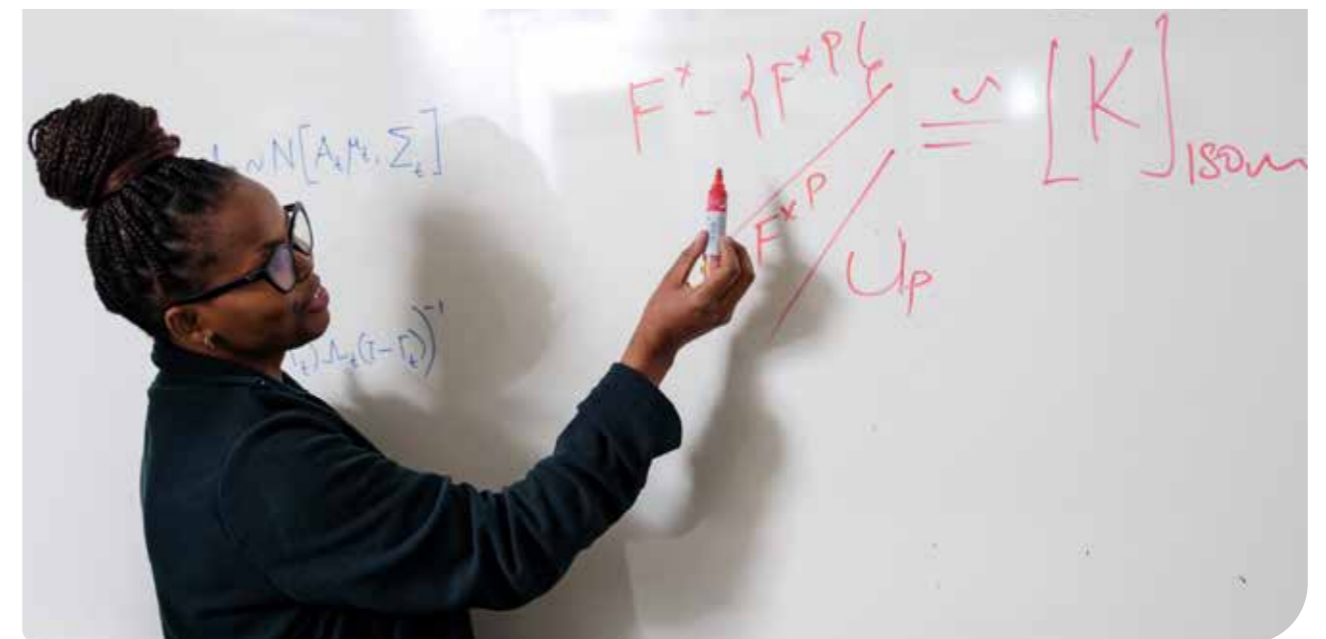
- DST/NRF SARCHI Programme
- NRF Thuthuka Programme and Rated Researchers Programme

### International SA / France (NRF-PROTEA)

- Stellenbosch University – Subcommittee B

### International

- Australian Research Council (DP200101680)
- Natural Environment Research Council, United Kingdom



## NRF-RATED RESEARCHERS

### LEADING INTERNATIONAL RESEARCHERS

Prof A Engelbrecht	Artificial Intelligence
Prof H Prodinge	Analysis of algorithms, number theory and combinatorics
Prof W Visser	Software failure, software engineering and software development

### INTERNATIONALLY ACCLAIMED RESEARCHERS

Prof B Fischer	Software engineering
Prof Z Janelidze	Category theory
Prof C Hui	Biomathematics and ecological modelling
Prof L van Wyk	Matrix algebras, Lie properties in associative algebras, Leavitt path algebras
Prof H Touchette	Theory of large deviations
Prof JAC Weideman	Numerical analysis and scientific computing

### ESTABLISHED RESEARCHERS

Dr G Boxall	Model theory and some aspects of number theory
Prof J Geldenhuys	Software engineering and specifically model checking and process algebra
Dr K-T Howell	Near-vector spaces
Prof RS Kroon	Machine learning
Prof S Mouton	Banach algebras and spectral theory
Prof WD Tucker	Computing and society
Prof AB van der Merwe	Automata theory
Prof L van Zijl	Automata theory

### PROMISING YOUNG RESEARCHERS

Prof S Fidler-Woudberg	Fluid modelling
Dr J Gray	Category theory
Dr T Grobler	Remote sensing data
Prof N Hale	Numerical analysis and scientific computing
Dr N Ralaivaosaona	Analytic number theory, Probabilistic combinatorics
Dr R Roux	Graph theory

## STAFF LIST

### Academic

- Dr B Bah (jointly with AIMS-SA)
- Dr L Baker
- Dr B Bartlett
- Dr DJ Basson
- Dr R Benjamin
- Mr W Bester
- Dr G Boxall
- Prof W Brink (Division Head: Applied Mathematics)
- Mrs EJ Burger
- Dr M Cloete
- Dr H Coetzer
- Dr A de Villiers
- Dr H Diedericks
- Dr M Dunaiski (joint appointment with the School for Data Science and Computational Thinking)
- Prof A Engelbrecht (joint appointment with the Department of Process Engineering)
- Prof S Fidler-Woudberg
- Prof B Fischer (Division Head: Computer Science)
- Dr JRA Gray
- Prof N Hale
- Dr R Heymann
- Dr M Hoefnagel
- Dr K-T Howell
- Prof C Hui (SARCHi)
- Dr CP Inggs

- Prof Z Janelidze
- Mr S Josias (joint appointment with the School for Data Science and Computational Thinking)
- Prof RS Kroon
- Dr P Landi
- Dr MF Maritz
- Dr S Marques
- Dr J Masuret
- Prof S Mouton
- Mr S Mungwe
- Dr M Ngxande
- Dr D Ralaivaosaona
- Prof IM Rewitzky (Executive Head)
- Dr R Roux
- Prof F Smit
- Prof H Touchette
- Prof WD Tucker
- Prof AB van der Merwe
- Prof L van Wyk (Division Head: Mathematics)
- Prof L van Zijl
- Prof WC Visser
- Prof JAC Weideman
- Dr L Wessels
- Prof M Wild

### Extraordinary appointments

- Prof J Bishop (Extraordinary Professor, Computer Science)
- Prof B Herbst (Extraordinary Professor, Applied

- Mathematics)
- Dr M Hoffmann (Extraordinary Senior Lecturer, Computer Science)
- Dr U Paquet (Extraordinary Professor, Applied Mathematics)
- Prof H-E Porst (Extraordinary Professor, Mathematics)

### Emeritus professor

- Prof AE Krzesinski
- Prof H Prodinge

### Support staff

- Mrs L Adams
- Mrs H du Plessis
- Mrs S Fortuin
- Mrs W Isaacs
- Mrs H Lamb
- Mrs L Muller
- Mr A Roman (until 30 April 2021)
- Ms M Sebastians


### Postdoctoral Fellows

- Dr D Nickelsen, joint with AIMS and NITheP
- Dr J Rodger
- Dr S MacFadyen
- Dr S Gumede (until 30 Aug 2021)

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DEPARTMENT OF  
**MICROBIOLOGY**

## RESEARCH INTERESTS

Biofilm ecology; Bioprocessing; Biotechnologies for water treatment; Eco-toxicology; Environmental analytical chemistry; Functional microbial bioinformatics; Fungal biotechnology for bioenergy and the bioeconomy; Interactions of opportunistic

pathogens; Lactic acid bacteria; Microbial ecology and mycology; Secondary metabolite production and antifouling potential; Synthetic and systems biology; Wastewater-based epidemiology; Water treatment

## RESEARCH HIGHLIGHTS

### Research on the expression of recombinant proteins in yeasts

**Prof Marinda Viljoen--Bloom**'s research programme focuses on the expression of recombinant proteins in yeasts. Her group, supported by Dr Rosemary Cripwell, develops genetically modified yeast strains expressing enzymes to hydrolyse different starch substrates for bioethanol production.

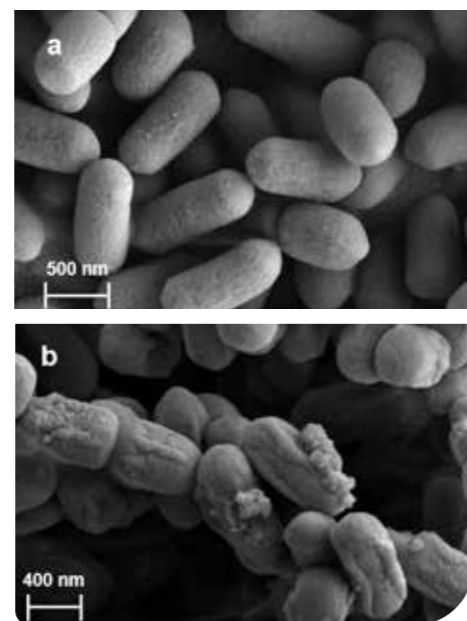
In 2020, PhD-student Wessel Myburgh initiated a new project on the recombinant expression of a polyester hydrolase in yeast for the microbial hydrolysis of commercial polylactic acid-based bioplastics. Both

Wessel and Johannes Malherbe participated in student exchanges at the University of Padova as part of a Biowaste-to-energy bilateral project in 2021.

In another new initiative, PhD-student Michelle Rossouw developed a novel antimicrobial expression system to clone and express different types of antimicrobial peptides in *S. cerevisiae*. She was placed in the Top Ten in the 2021 Stellenbosch University FameLab competition and will present her results at the Federation of European Microbiological Societies (FEMS) meeting in Belgrade, Serbia, in June 2022.



Inhibition zone from antimicrobial peptide (AMP) against bacteria growing on an agar plate. IMAGE: MICHELLE ROSSOUW



Scanning Electron Microscopy (SEM) showing the damage incurred by the antimicrobial peptide (AMP) on a cellular level (a: control without AMP; b: after AMP treatment). IMAGES: MICHELLE ROSSOUW

### Wastewater surveillance platform to detect COVID-19 outbreaks on campus

During 2021 **Prof Gideon Wolfaardt**'s research group worked hard to implement a wastewater-based surveillance platform to detect institutional SARS-CoV-2 outbreaks on two of SU's campuses. The wastewater-based surveillance platform was developed in collaboration with researchers from the University of Bath, in partnership with the South African Medical Research Council (MRC) and funded by the United Kingdom's Newton Fund. The campus-based platform was supported by a grant from Prof Eugene Cloete, Vice-Rector: Research, Innovation and Postgraduate Studies.

For the two Stellenbosch University campuses, passive sampling devices were placed at specific settings to sample sewer lines from student residences on certain days of the week. Since the outbreak of the COVID-19 pandemic in South Africa in 2020, Dr Edward Archer, a research associate in Prof Wolfaardt's group, has been working with Prof Wolfgang Preiser from SU's Medical Virology Division and Dr Rabia Johnson, deputy-director of the MRC's Biomedical Research and Innovation Platform (BRIP), to pilot the concept at SU's Tygerberg campus.

Early in the global COVID-19 pandemic, it was established that genetic material of the SARS-CoV-2 virus, consisting of RNA genomic fragments, passes through the digestive system of infected persons,

landing up in their faeces. These genomic fragments serve as a molecular fingerprint of the original virus, regardless of whether an infected individual presents with symptoms or not. Higher levels of viral RNA in wastewater treatment works therefore can serve as a valuable early warning system for a rise in the number of infections. It can also be used to evaluate the spread of the disease in communities. The pilot-project at the Tygerberg campus proved that data obtained through this method allowed us to pinpoint blocks or even buildings where infected individuals lived or worked.

The researchers are also involved with SACCESS, the South African Collaborative Covid-19 Environmental Surveillance System. This network, consisting of researchers, health care practitioners and epidemiologists, was established in April 2020 to evaluate the spread of COVID-19 in communities through wastewater-based epidemiology. As part of this network, Dr Archer and Prof Preiser have been working with the MRC to perform routine community-wide wastewater surveillance for the Cape Town metropolitan area and Stellenbosch.

The result of this work was published in the *South African Medical Journal*, titled "Qualitative and Quantitative detection of SARSCoV-2 RNA from untreated wastewater in the Western Cape, South Africa".



Aerial view of the Stellenbosch University campus showing residences with manholes. Image: Edward Archer

### Reducing contaminants of emerging concern from WWTPs

**Prof Gideon Wolfaardt** and his research group commenced with a new project in September 2021 in collaboration with the Stellenbosch University Water Institute (SUWI), the Fraunhofer Institute for Surface Engineering and Thin Films (IST), the Fraunhofer Institute for Solar Energy Systems (ISE) and other European partners. The project investigates sustainable electrochemical reduction of contaminants of emerging concern and pathogens in WWTP effluent for irrigation of crops (SERPIC). The aim is to develop an integral technology, based on a multi-barrier approach, to treat the effluents of wastewater treatment plants (WWTPs) to maximise the reduction of contaminants of emerging concern (CECs).

### Finding a canary in the coliform mine

**Prof Gideon Wolfaardt** is working with the Water Research Council (WRC), SUWI and Chris Swartz

Water Utilisation Engineers to develop a real-time water sensing alert system for substances of concern. The project will provide knowledge and data on the occurrence and fate of a selected list of CECs, ranging from contaminants that are shown to be persistent through WWTW processes and contaminants that are known to be discharged from non-sewer networks, that may be present in raw water feed and monitoring programmes and capabilities, and which will form the basis for local guidelines to be drawn up for regulatory purposes. It will also guide the application of treatment systems and process configurations that can be applied to remove these contaminants successfully. This three-year project started in April 2021. The research has already led to the publication of an article titled "Canary in the Coliform Mine: Exploring the Industrial Application Limits of a Microbial Respiration Alarm System" in the journal *PLOS ONE*.

method development. Two students from her group won awards at the 2021 South African Society for Microbiology meeting: Dominique Rocher won the best oral presentation award for her talk on the genetic engineering of the yeast *Saccharomyces cerevisiae* for the hydrolysis of laminarin from brown macroalgae, and Kirstie Schwerdtfeger won the best poster award for her HonsBSc project on different promoter-intron combinations for enhanced amylase expression in *Saccharomyces cerevisiae*. Ms Schwerdtfeger also presented at the International Conference for Undergraduate Research (ICUR), organised by Monash Warwick Alliance with virtual participation by Stellenbosch University, 28-29 September 2021. Ms R Cripwell presented at the virtual meeting of the International Congress on Yeast and International Conference on Yeast

Genetics and Molecular Biology in Vienna from 23 to 27 August 2021.

**Dr Heinrich Volschenk** serves as president of the South African Society for Microbiology (SASM) 2021.

**Prof Gideon Wolfaardt** is director of the Stellenbosch University Water Institute (SUWI) and holds the ERWAT research chair in Water Research. During 2021 his research group produced seven research articles published in national and international journals such as the *South African Medical Journal*, *PLOS ONE*, *Water Environment Research*, *Chemosphere* and the *Journal of Environmental Management*.

## RESEARCH ACTIVITIES

**Prof Alf Botha** is a member of the editorial board of *FEMS Yeast Research* (2008 – present); and 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 Karen Jacobs** is a member of the editorial boards of *Mycology: An International Journal of Fungal Biology* (Taylor and Francis) and *Bothalia* (AOSIS).

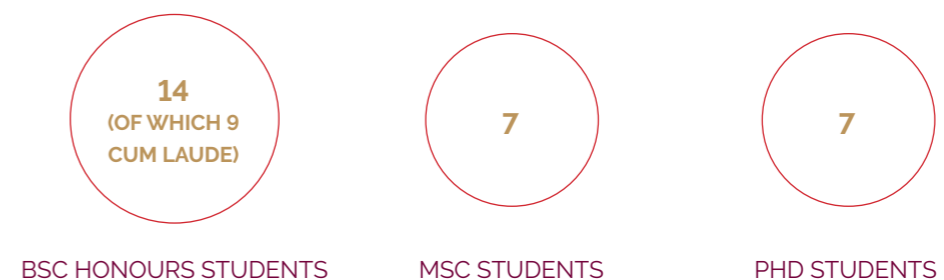
**Prof Wesaal Khan** forms part of the South African Higher Education Community Engagement Forum and formed part of the organising committee of a virtual symposium for the third annual South African World Health Organisation (WHO) World Antimicrobial Awareness Week, titled, "Antimicrobials: Handle with care – Spread awareness, Stop resistance". The virtual symposium was jointly hosted by the Faculty of Health Sciences at the University of Johannesburg, the Water Research Commission (WRC), North-West University and SU's Department of Microbiology from 22 to 23 November 2021. During the symposium Dr Brandon Reyneke presented a keynote talk titled "ESKAPE'ing antibiotic resistance: surveillance, risk assessment and biocontrol".

**Prof Marinda Viljoen-Bloom** hosted Mr Valentino Pizzocchero from the University of Padova, Italy, who assisted postgraduate students with high-performance liquid chromatography (HPLC)

## ACADEMIC AFFAIRS

The Department is home to 11 Postdoctoral fellows.

### Postgraduate students who graduated in 2021



“ This project investigates sustainable electrochemical reduction of contaminants of emerging concern and pathogens in WWTP effluent for irrigation of crops (SERPIC).

## AWARDS TO STAFF AND STUDENTS

**Dr Winschau van Zyl** from Prof Leon Dicks' lab and **Dr Brandon Reyneke** from Prof Wesaal Khan's lab each received an award for exceptional achievement as postdoctoral fellows from SU's Deputy Vice-Chancellor: Research, Innovation and Postgraduate Studies.



Dr Brandon Reyneke



Dr Winschau van Zyl

Three postgraduate students in the Department of Microbiology won awards at the recent virtual meeting of the South African Society for Microbiology that was held from 4 to 6 May 2021, including best oral and best poster presentation. **Dominique Rocher** won the award for the best oral presentation for her talk on the genetic engineering of the yeast *Saccharomyces cerevisiae* for the hydrolysis of laminarin from brown macroalgae. Her research, which was conducted for her BScHons project, showed that enzyme treatment of seaweed can release valuable components, including sugars that can be used for bioethanol production. The work was published in the journal *Algal Research*. Dominique, who works under the guidance of Prof Marinda Viljoen-Bloom, is currently participating in the JICA programme in Environmental Sciences at

Tsukuba University, Japan, and will continue with her research on macroalgae hydrolysis upon her return.

**Caylin Bosch**, a PhD student in Prof Alf Botha's laboratory, was a runner-up for the presentation award. Her talk was about her research on the transcriptomic response of the opportunistic pathogenic yeast, *Cryptococcus neoformans*, to low nitrogen levels. She found that low nitrogen conditions (as found in nature) modulate the expression of the virulence and antifungal tolerance-related genes of the yeast. Overall, her findings provide insight into the survival of *C. neoformans* in nitrogen-poor ecological niches and suggest that pre-adaptation to these conditions may influence the pathobiology of this yeast. Her work was recently accepted for publication in *FEMS Yeast Research*.

**Kirstie Schwerdtfeger** won the best poster award for her BSc Honours project on different promoter-intron combinations for enhanced amylase expression in *Saccharomyces cerevisiae*. Strong promoters can significantly increase transcription of a recombinant gene and yield higher protein levels, but these were even further enhanced with the introduction of promoter-introns. She is currently continuing the work for her MSc-degree under the guidance of Prof Viljoen-Bloom.

The SASM online conference was attended by 159 postgraduate students and researchers from tertiary and research institutions from South Africa and Namibia. The Department of Microbiology at Stellenbosch University had a strong presence at the conference, with 14 students and researchers representing the nine research laboratories in the Department.

## SOCIAL IMPACT

**Science Café Stellenbosch on developing a risk prediction platform for COVID-19**

**Dr Edward Archer** and Prof Wolfgang Preiser, together with Dr Rubia Johnson from the Medical Research Council, presented their work on the development of a risk prediction platform for COVID-19 using sewage during a virtual Science Café Stellenbosch event on 19 May 2021. Science Café Stellenbosch in an initiative of the Faculty of Science to promote the discussion of scientific issues in a language that everyone can understand.

**Other outreach activities**

**Prof Karin Jacobs** presents the Microbial Ecology course MKB364 for third year BSc students. For the practical component of the course, the students plan, optimise and complete a research project. In a major feat, an article titled "Impact of cigarette butts on bacterial community structure in soil," which focused on one of these research projects, was published in *Environmental Science and Pollution Research* (impact factor: 4.223). The

students who conducted the research as well as Prof Jacobs proceeded to present a series of radio and television interviews, highlighting the key aspects of the article.

**Prof Gideon Wolfaardt** received funding from the Stellenbosch University Social Impact Division to implement a demonstration aquaponics system that will provide fresh protein (fish) and vegetables for children at the Heartland Baby Sanctuary in Somerset West.

In celebration of National Science Week, postgraduate students in Microbiology, Biochemistry and Genetics presented a series of talks on how their research achieves a better and more sustainable future for the world population. **Profs Wesaal Khan** (Microbiology), Donita Africander (Biochemistry) and Aletta van der Merwe (Genetics, Faculty of AgriSciences) co-ordinated and hosted the series of presentations.

## FUNDING

**South Africa**

- Central Analytical Facilities (CAF), Stellenbosch University
- Cipla MedPro
- Claude Leon Foundation
- Department of Science and Innovation, South Africa
- East Rand Water Care Association (ERWAT)
- Energy and Water Sector Education and Training Authority (EWSETA)
- First Rand
- FirstRand Foundation
- National Research Foundation
- NRF SARChI research chair for Biofuels
- Rand Water

- South African Biosystematics Initiative
- South African National Energy Research Institute
- Stellenbosch University
- Water Research Commission
- Western Cape Government, Environmental Affairs and Development Planning

**International**

- EPSRC/GCRF Global Challenges Research Fund
- European Commission Horizon 2020
- Fraunhofer Alliances
- Fraunhofer-Gesellschaft
- Global Challenges Research Fund
- UKRI GCRF/Newton Fund Agile Response call to address COVID-19



## NRF-RATED RESEARCHERS

### INTERNATIONALLY ACCLAIMED RESEARCHERS

Prof LMT Dicks	Probiotics and antimicrobial peptides of lactic acid bacteria; nano-biosensor point-of-care devices
Prof WH van Zyl	Yeast biotechnology with a focus on cellulosic ethanol and biorefineries (SARChI Chair)
Prof GM Wolfaardt	Applied and environmental microbiology
Prof A Botha	Yeast ecology

### 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

## STAFF LIST

### Academic staff

- Prof A Botha (Departmental chair)
- Prof LMT Dicks (Distinguished Professor)
- Prof K Jacobs
- Prof W Khan
- Prof WH van Zyl (Distinguished Professor; Biofuels Research Chair)
- Prof M Viljoen-Bloom
- Dr H Volschenk
- Dr T Jansen
- Prof GM Wolfaardt (Director, Stellenbosch University Water Institute and ERWAT Chair in Water Research)

### Extraordinary professors

- Prof P Weimer
- Prof S Liss
- Prof LM Joubert

### Affiliated

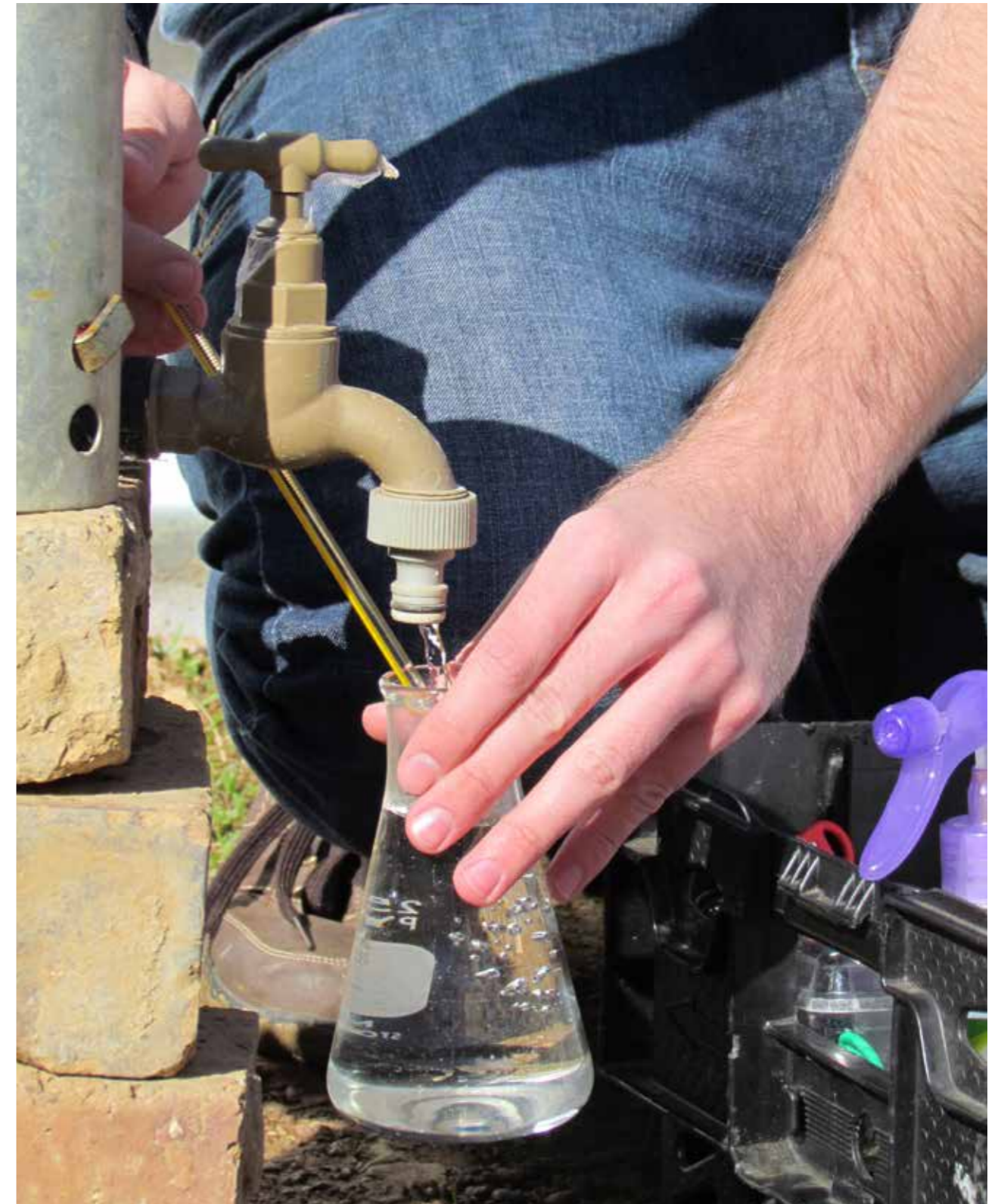
- Prof TE Cloete (vice-rector: research and innovation)

### Support staff

- J Daniels
- LJ Daniels
- J de Kock
- M Gey van Pittius
- M Stuurman
- T van der Merwe
- W Wentzel

### Postdoctoral fellows and researchers

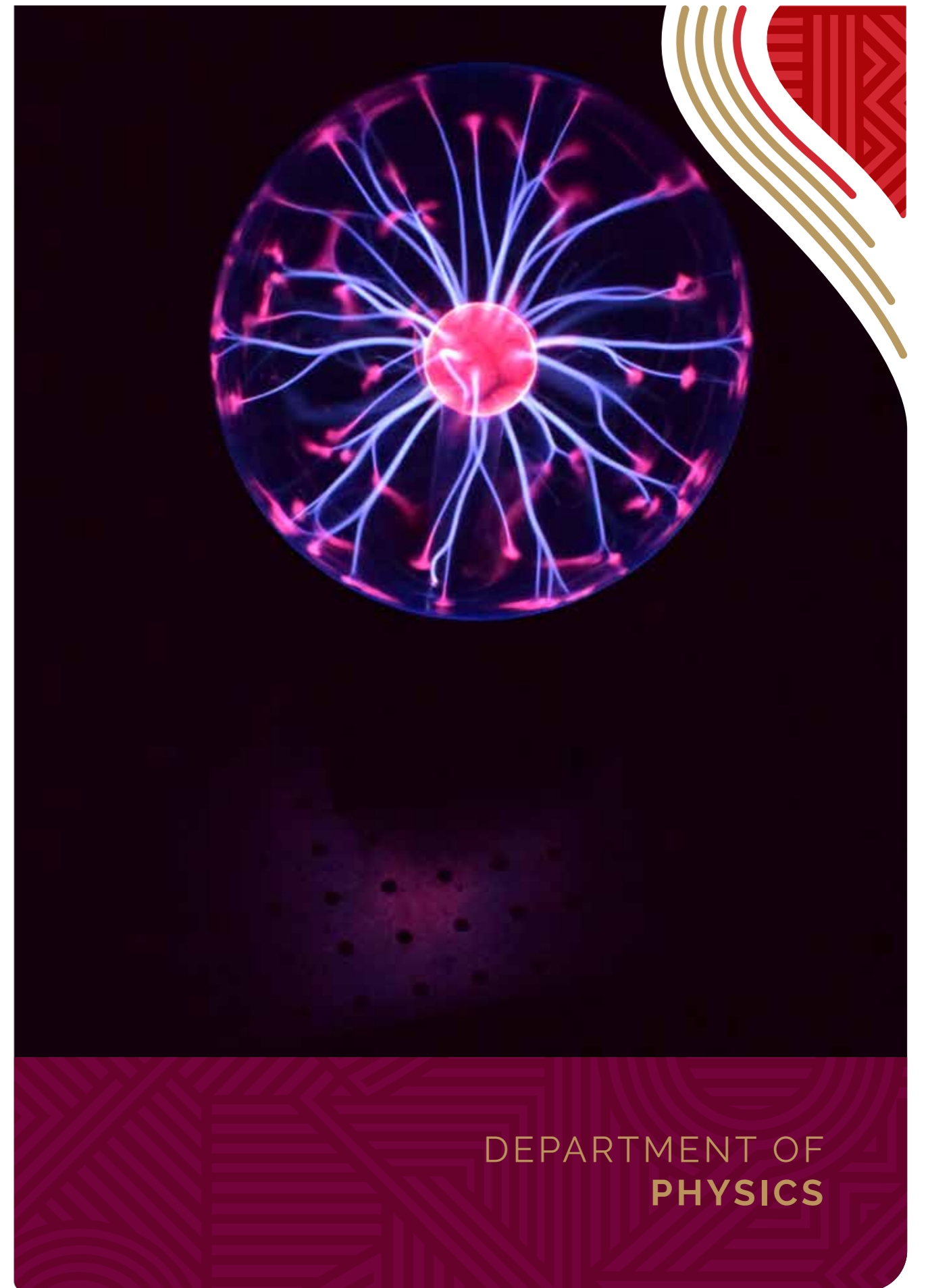
- Dr Edward Archer
- Dr Elanna Bester
- Dr Kim Bester
- Dr Marelize Botes
- Mr Casper Brink
- Dr Tanya Clements
- Dr Rose Cripwell
- Dr Tersia Conradie
- Dr Shelley Deane
- Dr Brandon Reyneke
- Dr Shaunita Rose
- Dr Wendy Stone
- Dr Du Preez van Staden
- Dr Winschau van Zyl
- Mrs Lisa Warburg
- Dr Monique Waso



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DEPARTMENT OF  
PHYSICS

## RESEARCH INTERESTS

### 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

Co-linear cluster tripartition mode in ternary fission; Fundamentals of single particle properties on nucleons inside a nucleus; New radiation detector technologies; Nuclear structure and interactions; Nuclear techniques and technologies to study nuclear radiation in the environment; Nuclear radiation in the medical and health sector; Nuclear clustering phenomenon in light and heavy

nuclei; Pygmy resonance within nuclei; Structural properties on the atomic nuclear and fundamental interactions within the nucleus;

### Laser Physics

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

## RESEARCH HIGHLIGHTS

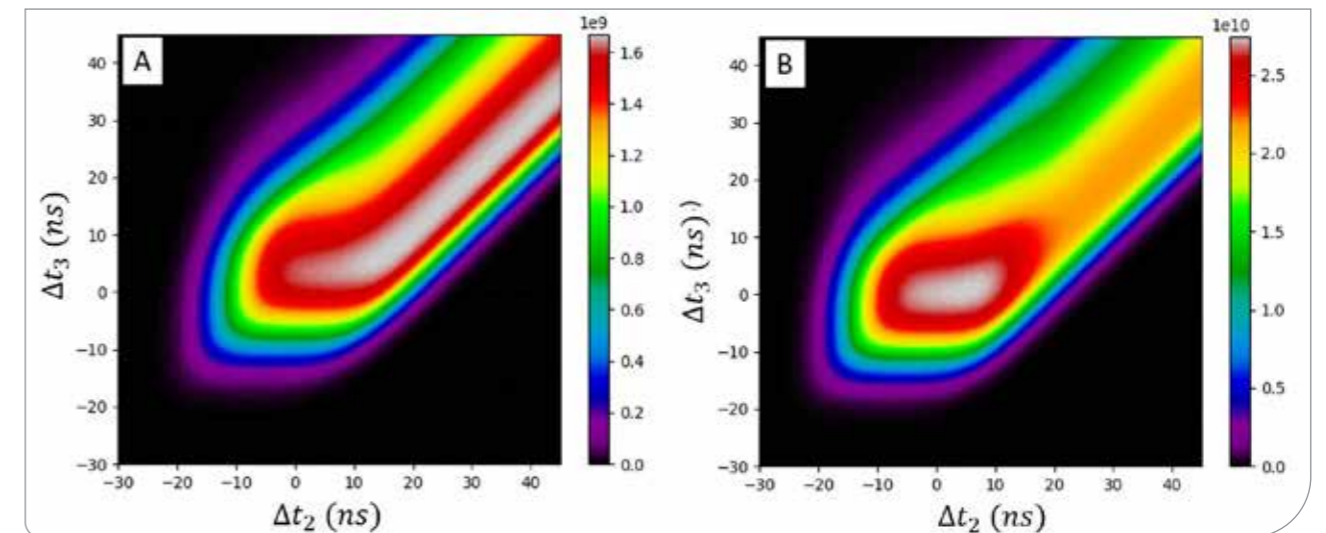
### Towards new methods for commercial production of radiopharmaceuticals

The experimental project on resonance laser ionisation has reached a level of maturity where valuable results for industry could be generated in future. Progress was made towards funding from industry. Collaboration with industry will be working towards the development of new methods for commercial production of radiopharmaceuticals (for application in medical research, cancer diagnostics and therapy). Stable isotopes must be purified, to serve as starting materials for the cyclotron-based production of radioactive isotopes used to produce radiopharmaceuticals for medical diagnostic scans. Cyclotron methods are considered more sustainable alternatives to methods that rely on nuclear reactors.

– Dr Christine Steenkamp



A time-of-flight mass spectrometer is used to measure the masses of the ions that are produced. PHOTO CREDIT: DR CHRISTINE STEENKAMP



These figures, from a recent PhD thesis, are from a numerical model and shows the effect of the relative time delays of the laser pulses on the ion production. IMAGE CREDIT: ANDRÉ DE BRUYN

### MSc-student in quantum computing publishes results in Nature Scientific Reports

One of Prof Mark Tame's postgraduate students, Mr Unathi Skosana, published a paper based on his MSc thesis on quantum computing in the journal *Nature Scientific Reports*. The article is a proof-of-concept demonstration of a quantum order-finding algorithm for factoring the integer 21. It has been cited ten times already in the past few months and downloaded over 350 times. The work attracted some media attention and featured on the front page of the Stellenbosch University website. Prof Tame holds the South African research chair in photonics in SU's Department of Physics.

“ The article is a proof-of-concept demonstration of a quantum order-finding algorithm for factoring the integer 21.



Mr Unathi Skosana is an MSc-student in quantum computing. Photo credit: Stefan Els

## RESEARCH ACTIVITIES

**Dr Gurthwin Bosman** produced an output on the fabrication and thermal stability of a class of organic solar cells in collaboration with former SU alumnus Dr Neway Tegene. The work was done under the African Laser Centre Africa collaboration grant. Together with I Badrodien and Dr PH Neethling, Dr Bosman presented a paper titled "Light Sheet Microscope Development" at the South African Institute of Physics (SAIP) 2021 conference at North-West University in July 2021. Dr Bosman was also co-author of two papers presented at the Optical Society of America (OSA) – SA Photonics conference, held at SPIER wine estate in September 2021. They are "Simultaneous high and low resolution light sheet microscopy" and "Advantages of time domain ptychography for vibrational spectroscopy".

**Prof Anton du Plessis** holds editorial positions in the journals *Additive Manufacturing*, *Material Design and Processing Communications* and *Scientific African*. He is also a member of the editorial boards of the journals *3D Printing and Additive Manufacturing*, *GigaByte* journal and *Research in Nondestructive Evaluation*. He has an adjunct faculty position at Nelson Mandela University's Faculty of Engineering. He serves on the managing board of the International Association for Computed Tomography for 2020-2022. He was co-editor of a book titled "Fundamentals of Laser Powder Bed Fusion of Metals", published in 2021. Prof Du Plessis was a finalist at the National Science and Technology Foundation (NSTF) awards in 2021 in the researcher category. He also received international recognition for his research in additive manufacturing with an award at the ASTM international conference on additive manufacturing in November 2021. He serves on the European Synchrotron beamline review panel for ID19; on the board of the International Association for Computed Tomography (IntACT); on the scientific committee of the International Conference on Additive Manufacturing (ICAM) hosted by ASTM International annually; and on the scientific committee of the conference Additive Manufacturing Meets Medicine. During 2021 Prof Du Toit was inducted to the African Academy of Science and the South African Academy of Science. A new project, the

Nature4Nature project in the European Commission Horizon program, will commence in 2023.

**Dr Hannes Kriel** is part of the AIMS (African Institute for Mathematical Science) executive team.

**Dr Pieter Neethling** is interim chairman of the Photonics Division of the South African Institute of Physics and director of the Laser Research Institute (LRI). During 2021 he presented an invited lecture at the BRICS Biophysics workshop in September 2021. During the COVID-19 pandemic several of Dr Neethling's postgraduate students made use of the opportunity to present at a range of online conferences, which would otherwise have been inaccessible. This includes two presentations at the Biophysics in and for Africa conference in March 2021; one presentation at the Conference on Lasers and Electro-Optics/Europe – European Quantum Electronics Conference (CLEO/EUROPE-EQEC 2021) from 21 to 25 June; one presentation at the European Conference on Biomedical Optics (ECBO) in June 2021; five presentations at the OSA-SA Photonics conference in September 2021; and four presentations at the South African Institute of Physics' annual conference. Dr Neethling presented an invited lecture at the BRICS Biophysics workshop in September 2021.

**Prof Erich Rohwer** and his postgraduate students participated in and presented papers at several conferences during 2021. Dr Ruan Viljoen presented a paper titled "Targeted single-beam CARS using phase-and-polarization shaping" at the Conference on Lasers and Electro-Optics/Europe – European Quantum Electronics Conference (CLEO/EUROPE-EQEC 2021) in Germany; Dr George Dwapanyin presented a paper titled "Advances in Microscopic Imaging: Novel time domain ptychography, i2PIE, for improved contrast in nonlinear microscopy" at the European Conferences on Biomedical Optics. Together with Prof Andrew Forbes and Dr Pieter Neethling they organised an Optica in-person conference at Spier with the title SA Photonics Conference. Postgraduates from all over South Africa and SU participated. Several of his postgraduate

students participated in the Biophotonics in Africa online conference. Prof Rohwer presented a paper titled "Effective pulse compression for non-linear microscopy" at the BRICS workshop on biophotonics.

**Dr Phillip Southey** is part of the Physics and Astronomy Education Research Group.

**Prof Frederik Scholtz** refereed papers for the journals *Physical Review Letters*, *Physical Review C&D*, *Physics Letters A*, *European Journal of Physics* and *European Physics Letters*. He was able to give a natural explanation for the occurrence of the quantum-to-classical transition within a non-commutative space. The results were published on arXiv in a paper titled "Double Slit Experiment in the Non-Commutative Plane and the Quantum-to-Classical Transition".

**Dr Christine Steenkamp** attended the 2021 Optical Society of America (OSA) Education and Training in Optics conference. She presented papers at several conferences, including an oral presentation titled "Quantum optical modelling of a 4-level atomic system" at the OSA-SA Photonics Conference 2021 from 19 to 21 September 2021 at Spier; as well as an oral presentation titled "Comparison of different techniques for resonance ionization spectroscopy" at the SAIP annual conference (virtual) from 26 to 30 July 2021. She authored a paper on physics education, and a chapter in a book *Enhancing Science Education: Exploring knowledge practices with Legitimation Code Theory* that has been accepted for publication.

**Prof Mark Tame's** group published papers in the international journals *Nature Physics*, *Scientific Reports* and *Chemical Reviews*. He gave a talk at the XXV Saratov Fall Meeting 2021 BRICS and served on the Technical Program Committee of Metamaterials 2021. He was a visiting professor at the Pennsylvania State University in the United States and appointed as an associate of the National Institute for Theoretical and Computational Sciences (NITheCS) until 2026. Prof Tame refereed for the international journals *Nano Letters*, *Nature Communications* and *Physical Review A*. He also reviewed grants for the National Research Foundation (NRF) and continued as an editorial board

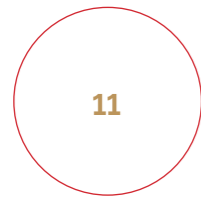
member for the international journal *IOP Journal of Optics*. Two PhD-students, Mr Mhlambululi Mpofo and Mr Jason Francis, and one BScHons student, Mr Fouche, successfully graduated at the end of 2021. They were supported by the SARChI project in the form of bursaries and equipment. Dr Mpofo was subsequently appointed as senior lecturer at the Botswana International University of Science and Technology. Another MSc-graduate, Mr Unathi Skosana, will do an internship at IBM while continuing with his PhD research under Prof Tame's guidance. Prof Tame was a consultant for the children's book *Youniverse: The Quantum Kaleidoscope of You* by Lizelle van der Merwe, aimed at children aged nine to twelve. He was also widely quoted in the media during 2021, including in TechSmart ("South Africa's progress in becoming quantum ready begins with empowering the youth") and on the IBM blog ("IBM working with students to make South Africa quantum ready" and "South Africa's progress in becoming quantum ready").

**Prof Herbert Weigel** presented at the virtual SIAM Conference on Applications of Dynamical Systems (DS21) with a paper titled "Fluctuations about Solitons in One Space Dimension". He gave a plenary talk titled "Quantum Corrections to the ANO Vortex" at the SIG IX Workshop: Solitons at Work (virtual). He was invited to contribute an article on "Quantum Effects for Solitons" to the review volume *The State of the Quantum Vacuum: Casimir Physics in the 2020s* edited by Prof K.A. Milton, a world leading researcher in the field.

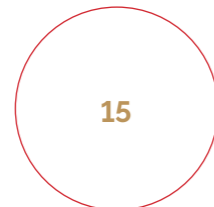
“ During the COVID-19 pandemic several of Dr Neethling's postgraduate students made use of the opportunity to present at a range of online conferences, which would otherwise have been inaccessible.

## ACADEMIC AFFAIRS

Posgraduate student cohort in 2021



BSC HONOURS STUDENTS



MSC STUDENTS



PHD STUDENTS



POSTDOCTORAL FELLOWS

## AWARDS TO STAFF AND STUDENTS

In December 2021 **Prof Erich Rohwer** was honoured for his leadership and service to photonics in Africa when he was elected as a Fellow Member of OPTICA – the leading organization for scientists, engineers and industry interested in the science of light.



Prof Erich Rohwer. PHOTO CREDIT: WIIDA FOURIE-BASSON

**Ms Emma King** was the recipient of the S2A3 Masters Medal for the most outstanding MSc thesis in a scientific subject at Stellenbosch University. Her study leader, Dr Hannes Kriel, received the same medal when he was an MSc-student in 2005.



Ms Emma King was the recipient of the S2A3 Masters Medal for the most outstanding MSc thesis. PHOTO CREDIT: STEFAN ELS

PhD student **André de Bruyn's** research was praised by the external examiner Prof Iain Moore from the University of Jyväskylä, Finland. He is an expert in the field of resonance laser ionisation. Dr De Bruyn was offered a position and appointed by the company ASML in Veldhoven, The Netherlands, shortly after graduation in December 2021.

**Mr Imraan Badrodien** received prizes for best PhD presentation at both the SAIP 2021 and the OSA-SA Photonics conference. MSc-student **Anthonie de Beer** won the prize for the best poster in spectroscopy by an MSc student, also at the SAIP conference.

## STAFF MATTERS

**Ms Sandra Josias** has been appointed as an administrative officer.

## SOCIAL IMPACT

### Optica/SPIE student chapter outreach activities

The Optica/SPIE student chapter had an active year despite the limitation imposed by lockdown. They arranged several public lectures, listed below: Public lecture by Dr Anslyn John in celebration of the International Day of Light on 10 May 2021; Asmitha Singh was a guest speaker on the topic "Physics open doors" on 15 June 2021; Virtual lunch series on the topic "Prominent Women in Physics" from 10 to 12 August 2021; Public lecture by Dr G.W. Bosman titled "Lasers: A tale of organized light" on 14 September 2021; and a special talk by Optica Ambassador Linhui Yu on 20 October 2021.

### Physics outreach kits for WC schools

The Optica/SPIE student chapter developed outreach kits, which they delivered to five schools in the Western Cape during the second semester of 2021 in lieu of them not being able to visit the schools in person. They funded these kits through grants obtained from Optica and SPIE.

### Other outreach activities

The department again hosted the annual "Public lectures about the science behind the Nobel Prizes" awarded in the year, in collaboration with the departments of Chemistry and Polymer Science and Physiological Sciences on 28 October 2021.



Physics outreach kits were delivered to five schools in the Western Cape.

**Dr Pieter Neethling** was interviewed by the Weekend Argus in March 2021 on the use of Ultraviolet Light to sanitise surfaces and the air against COVID-19. This was followed up with a radio interview on TruFM.

“ Prof Erich Rohwer was honoured for his leadership and service to photonics in Africa when he was elected as a Fellow Member of OPTICA

## 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)

### Belgium

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

### Ethiopia

- Addis Adaba University

### 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

### 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
- The Netherlands
- University of Groningen

### 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

- 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)

### 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

### 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

## NRF-RATED RESEARCHERS

### LEADING INTERNATIONAL RESEARCHER

Prof Dieter Heiss      Physical effects and significance of spectral singularities

### INTERNATIONALLY ACCLAIMED RESEARCHERS

Prof Anthony Cowley      Mechanism of proton-induced pre-equilibrium nuclear reactions, alpha-particle clusters in atomic nuclei and light-ion transfer reactions

Prof Herbert Weigel      Quantum field theories emphasising 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 Fredrick Scholtz      Non-commutative quantum mechanics and quantum field theory

### ESTABLISHED RESEARCHERS

Prof Erich Rohwer      Laser development, laser techniques and applications, laser spectroscopy and microscopy

Prof Anton du Plessis      Additive Manufacturing, X-ray tomography, Biomimicry

Prof Richard Newman      Radionuclide metrology, environmental radioactivity, dosimetry, radiation transport modelling, radiation safety, elemental analysis, physics education

### PROMISING YOUNG RESEARCHERS

Dr Hannes Kriel      Condensed matter physics with a focus on interacting quantum systems and closed quantum systems out of equilibrium, with applications of methods such as continuous unitary transformations (CUTS) and algebraic techniques within this setting

## FUNDING

### South Africa

- African Laser Centre
- ARMSCOR – Virtual Defense Engagement Programme and Laser Defense Research Project (DESUP)
- 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
- Institute for Maritime Technology (IMT)
- National Research Foundation (NRF)
- Nkosi Innovations
- NRF SA-China bilateral collaboration funding
- NRF unrated researchers funding
- NRF/DST SARChi Chair in Quantum Information Processing

## STAFF LIST

### Academic

- Mr Gary Andrews
- Dr Gurthwin Bosman
- Prof Anton du Plessis
- Dr Anslyn John
- Dr Hannes Kriel
- Prof Kristian Müller-Nedebock (Departmental Head)
- Dr Pieter Neethling
- Prof Richard Newman
- Prof Erich Rohwer
- Prof Frikkie Scholtz
- Dr Philip Southey
- Dr Christine Steenkamp
- Prof Mark Tame
- Prof Brandon van der Ventel
- Dr JJ van Zyl

- Prof Herbert Weigel
- Prof Shaun Wyngaardt

### Extraordinary Professors

- Dr Faiçal Azaiez
- Prof Andrew Forbes
- Prof Dieter Heiss
- Dr Pieter Kotze
- Dr Noel Mkhaza
- Prof Jie Meng
- Prof Tony Parker
- Prof F Petruccione
- Dr Einar Ronander
- Prof Herbert Stafast

### Professors Emeritus

- Prof Piet Walters
- Prof Anthony Cowley

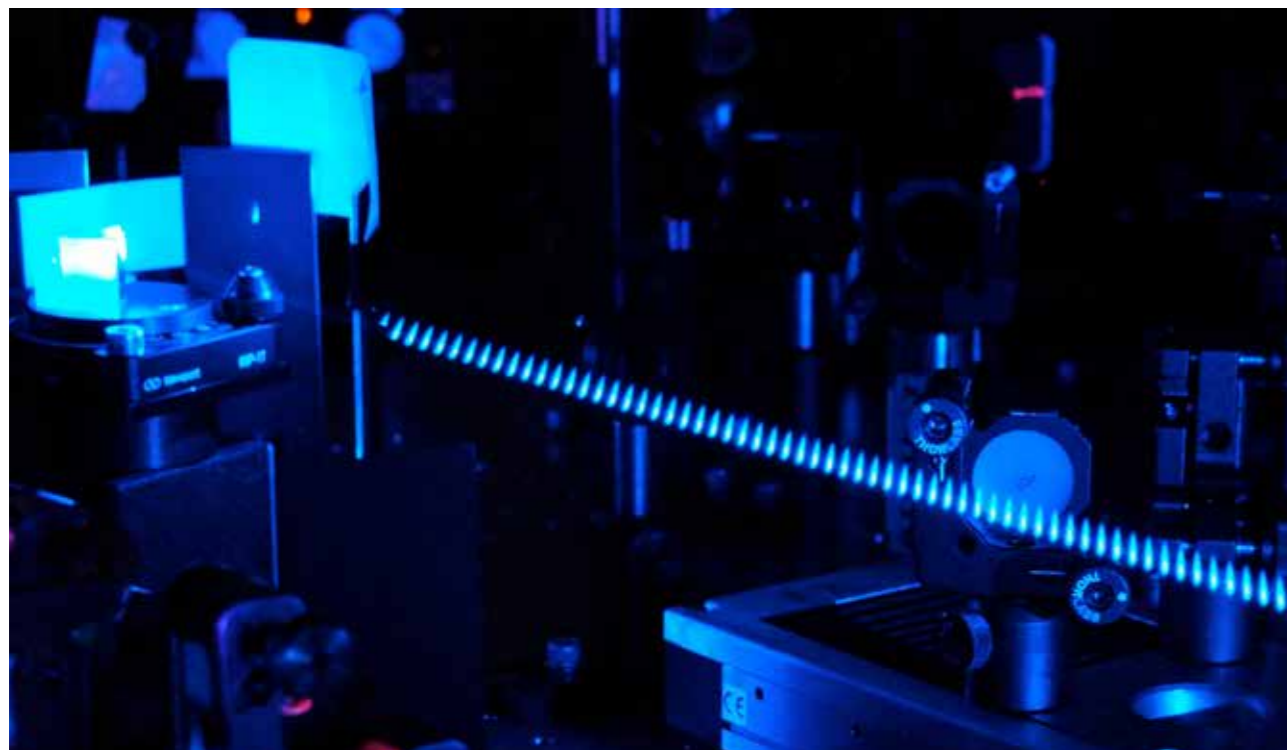
- Prof Hubertus von Bergmann

### Support staff

- Mr Stanley February
- Ms Ursula Isaacs
- Ms Sandra Josias
- Mr Cashwall Pool

### Technical staff

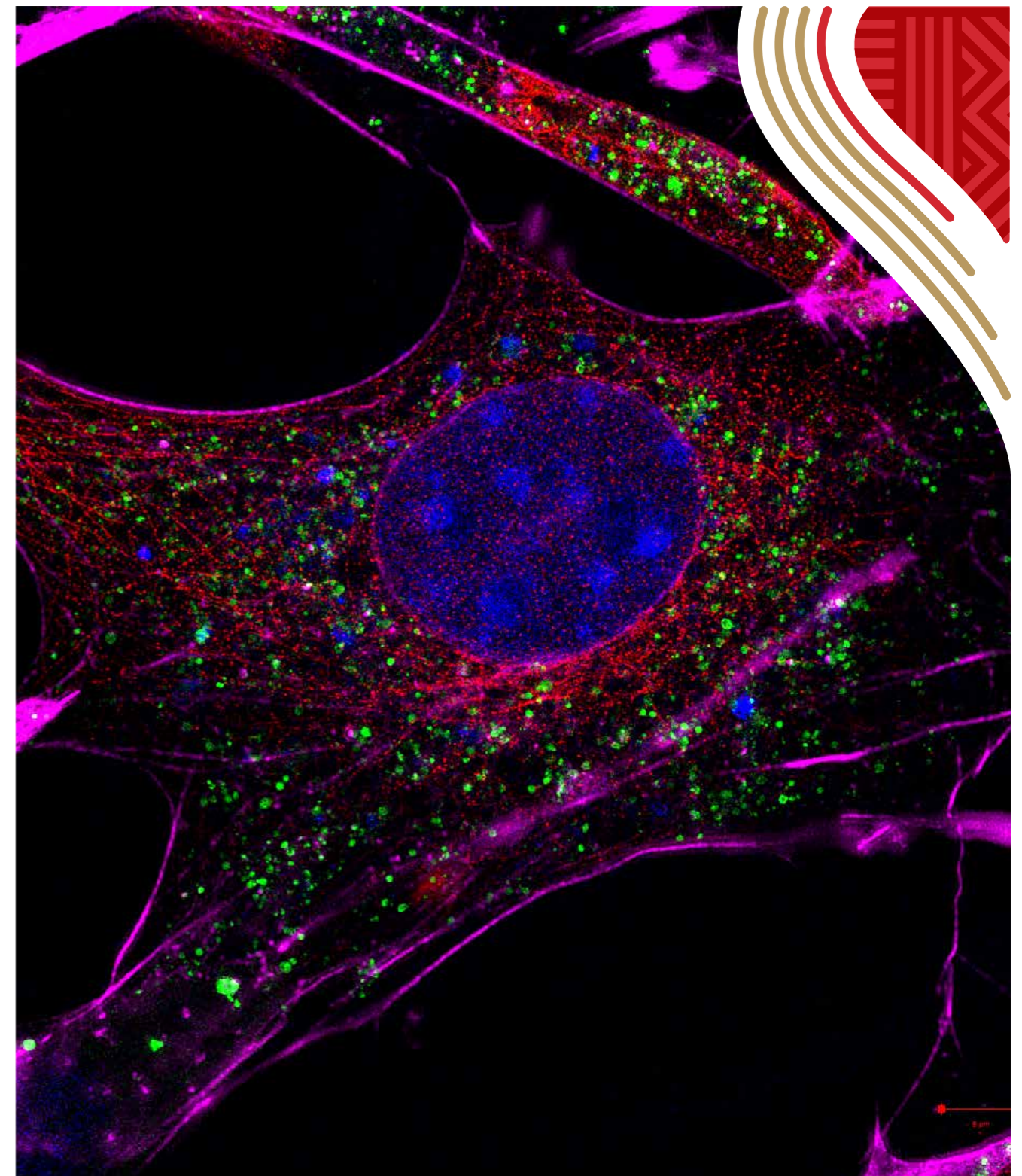
- Mr Tinus Botha
- Mr Patrick Benting
- Mr Phlip Cornelissen
- Mr Johan Germishuizen
- Mr Joshwine Gertze
- Mr Eben Shields



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[www.sun.ac.za/physics](http://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; Metabolic physiology and health; Multidisciplinary stress biology; Muscle physiology research; Neuro research

## RESEARCH HIGHLIGHTS

Investigating the effects of Serum Amyloid A in cancer tumours in mice

**Prof Anna-Mart Engelbrecht's** group published ten articles and successfully completed three animal studies where the effects of Serum Amyloid A were investigated in a tumour-bearing mouse model of breast cancer as well as in colitis associated cancer. This work was done in collaboration with Prof Wim de Villiers and co-investigators at the University of Kentucky.

SU researchers contribute to *Methods in Cell Biology*

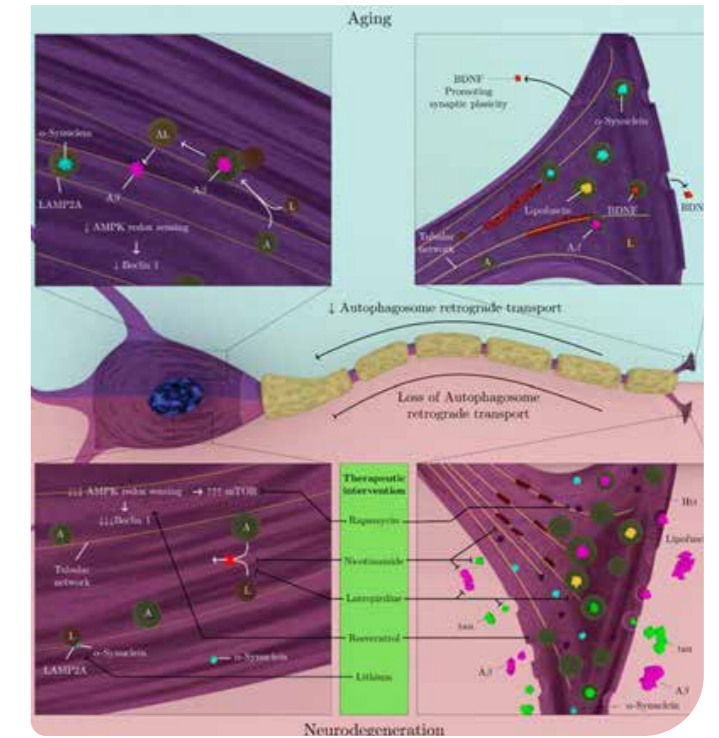
**Prof Ben Loos** and postgraduate students in his neuro research group was able to capitalise on their experience in employing super-resolution

techniques when they were asked to contribute to a book chapter in *Methods in Cell Biology*, edited by Oliver Kepp and Lorenzo Galluzzi and published by Elsevier. In the chapter they showcase a step-by-step guide to perform SR-SIM and STORM to describe the autophagy machinery. This work was the result of a close collaboration with Dumisile Lumkwana and Lize Engelbrecht in SU's Central Analytical Facility's Microscopy Unit and will serve as a reference guide for users in South Africa to perform such techniques. Moreover, a multi-author article with the Global BioImaging community was compiled that highlights the need for image-standards and guidelines on how to quality control image data.

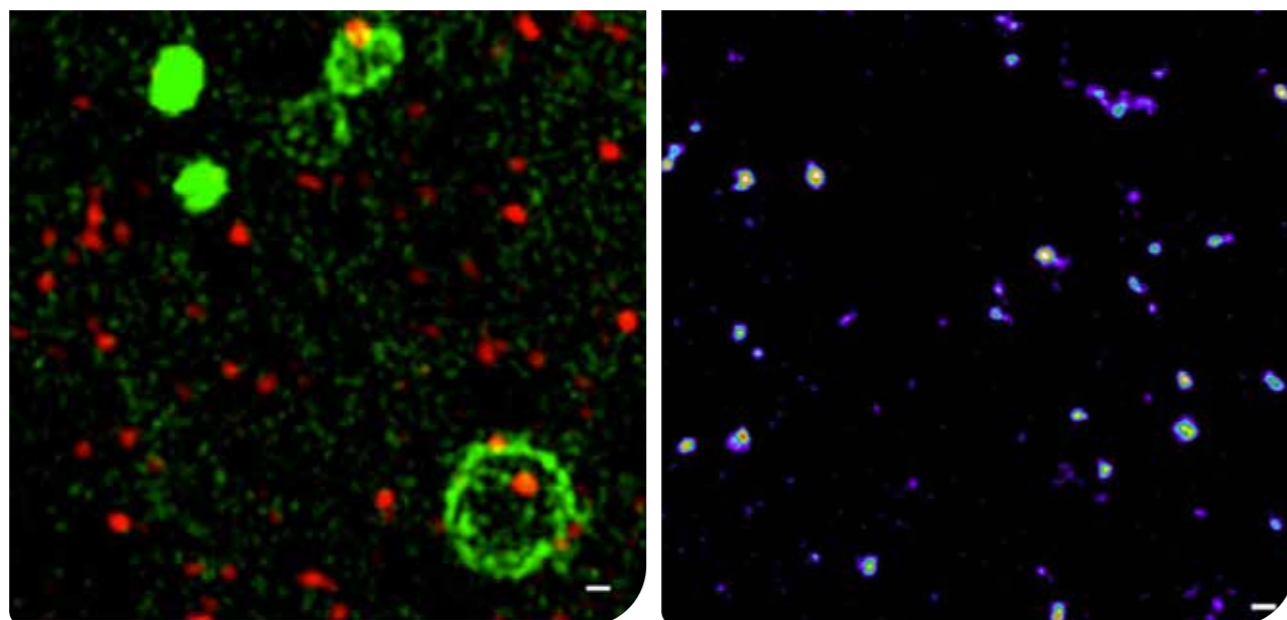
Role of macroautophagy in neuronal degeneration

Another highlight from **Prof Ben Loos'** group was the progress made in understanding the role of macroautophagy in neuronal degeneration. Here, **Dr Claudia Ntsapi** revealed that neurons, in the context of Alzheimer's disease, die with heightened but still functional autophagy activity. This suggests that autophagy control remains a therapeutic option at any stage in the disease progression, which was not previously clear. Another highlight was to bring together both macro- and chaperone mediated autophagy and their role in aging. This work, put together by **Dr Tando Maduna**, was published as a book chapter.

Other highlights include work on the role of autophagy dependent cell death (Dr Jurgen Kriel), the impact of medications such as spermidine and rapamycin on autophagy activity (Sholto De Wet) and the successful implementation of various exciting imaging techniques in the context of gliomas and brain injury. Finally, substantial progress has been made in the spinout company Phagoflux, where a prototype sensing device has been developed. – **Prof Ben Loos**



The role of autophagy in aging and degenerating neuron. IMAGE: DR TANDO MADUNA AND DR ANDRÉ DU TOIT



SR-SIM and STORM micrographs depicting autophagy machinery (green, left micrograph) and adaptor protein clusters (red and blue, right micrograph). MICROGRAPHS: B LOOS

## RESEARCH ACTIVITIES

**Prof Anna-Mart Engelbrecht** serves on the editorial boards of the journals *Frontiers in Pharmacology* and the *International Journal of Biomedical Sciences*. She serves on governing board and management committee of the African Cancer Institute (ACI); and on the governing board and management committee of the Institute of Biomedical Engineering (IBE).

**Prof MF Essop** delivered a talk at the 65th Annual Research Day of SU's Faculty of Medicine and Health Sciences, and as an invited speaker at the 10th Society for Free Radical Research International and the eighth Pan-African Environmental Mutagen and Genomic Society (PAEMGS) congress from

15 to 17 September 2021. He was invited to serve on the editorial board of the International Union of Physiological Sciences (IUPS) Book Series. He was elected as President of the African Association of Physiological Sciences (AAPS) for a four-year term, and as chairperson of the South African National Committee of the International Union of Physiological Sciences' (IUPS) committee. Prof Essop was also selected to participate as a Fellow in the Teaching Advancement at University Fellowship Programme for 2021-2022 – this is a nation-wide intervention to advance teaching quality and the professionalisation of teaching and learning in the public higher education sphere.



**Prof Ben Loos** presented at the International Cell Death Society (ICDS) during an online symposium on the use of the Mitochondrial Event Localiser (MEL), a tool developed in collaboration with Dr Rensu Theart and Prof Thomas Niesler in the Department of Electric and Electronic Engineering, to quantitatively describe mitochondrial fission and fusion events. He also gave a talk organised by the Microscopy Society of South Africa (MSSA), titled "Mitochondrial Event Localiser (MEL) – a novel tool to quantitatively describe mitochondrial fission, fusion and depolarisation". PhD-student Sholto De Wet presented at the annual conference of the Physiology Society of Southern Africa (PSSA) on the role of memantine on mitochondrial quality control. As part of his editorial activities, Prof Loos served as associate editor for the journal *Autophagy*. Prof Loos maintains active collaborations with a number of researchers: Prof Craig Kinnear (Department of Human Genetics, Faculty of Medicine and Health Sciences, Stellenbosch University); Prof Ian Vlok, Department of Neurosurgery, SU's Faculty of Medicine and Health Sciences; Prof Gerald Widhalm, Department of Neurosurgery, Vienna University, Austria; Prof Gerhard Walzl, Department of Biomedical Sciences, Faculty of Medicine and Health Sciences at SU as part of the Crick African Network's CAN study; and Dr Lucy Collinson, Francis Crick Institute in London.

**Prof Kathryn Myburgh** serves on the editorial board of the *Journal of Muscle Research and Cell Motility*. She refereed articles for the *Journal of Applied Physiology* and the *American Journal of Human Biology*. She served as reviewer for the National Research Foundation Standing Panel for Natural and Life Sciences, and on international level for the University of Liverpool and the University of Newcastle upon Tyne in the United Kingdom and the University of Massachusetts in the United States of America. She maintains active collaboration with a number of researchers: Dr Amy Mendham at the University of Cape Town; Prof Carola U Niesler at the University of KwaZulu Natal; Prof Dirk Lund-Christensen at the University of Copenhagen, Denmark; Prof Ivan Vechetti at the University of Nebraska in the USA; Dr Naomi Brooks and Prof Ian Galagher at Stirling University, Scotland.

**Prof Resia Pretorius** served as a panel member of CardioRNA COST Action CA17129, a collaborative pan-European network aiming to accelerate the understanding of transcriptomics in cardiovascular disease and further the translation of experimental data into usable applications to improve personalised medicine in this field. She is a scientific advisory board member of Phys2biomed in Italy, a project aimed at the development of advanced physical tools for innovative early diagnosis. She was a panel member for a World Health Organisation discussion on "Expanding our understanding of post COVID-19 conditions". She serves as scientific advisory board member on the Long COVID-19 Foundation, based in Leeds in the United Kingdom. During 2021 she presented at several conferences: a talk titled "Consequences of coagulation in health and disease: the use of fluorescent markers" at the Ebba Biotech webinar in November; an online talk titled "The consequences of coagulation in COVID-10 and Long COVID/PASC" for the SA Heart Foundation in October; and an online presentation titled "The consequences of acute COVID-19 infections, similarities with Long COVID" for the PolyBio Research Foundation and Harvard University seminar in May. In November 2021, Prof Pretorius, Dr Chantelle Venter, Este Burger and Simone Turner travelled to Mulheim, Germany, to work with Dr Beate Jaeger in her HELP Apheresis clinic on treatment options for individuals suffering from Long COVID. Based on her work on the incidence of persistent microclots in the blood samples of individuals suffering from Long COVID, Prof Pretorius has become part of an international network of researchers and clinicians from all over the world, including Dr Ranjeev Gupta, Dr Vanya Gant and Dr Paul Glynn (University College London and University College London Hospitals); Dr Ashely Woodcock (University of Manchester); Dr Martin Kräter (Max-Planck-Zentrum für Physik und Medizin); Dr Ilene Ruhoy (EDS/Chiari Center at Mount Sinai South Nassau Hospital); Dr David Lee (NYU Grossman School of Medicine); Dr Amy Proal (PolyBio Research Foundation); Dr Anna Brooks (University of Auckland); Dr David Putrino (Mt Sinai Health System); Dr Anne Maitland (Icahn School of Medicine at Mount Sinai); Prof Patrick Moriarty (University of Kansas Medical Center); Prof Beate

Jaeger (University of Kansas Medical Center); Dr Leshan Dhammika (King Chulalongkorn Memorial Hospital, Chulalongkorn University, Thailand).

**Dr Balindiwe Sishi** was a member of the local organising committee for the virtual congress of the Physiological Society of Southern Africa (PSSA), combined with the African Association of Physiological Sciences from 12 to 15 September 2021. She also presented a poster, titled "Identification of potential biomarkers for

cardiotoxicity induced by cancer and/or Doxorubicin therapy, in a tumour bearing model by targeting specific micro-RNAs". She attended and presented the same content in an oral presentation at the South African Heart Association (SAHA) congress (virtual) from 29 to 31 October 2021. She will serve a second term as Secretary/Treasurer of the Physiological Society of Southern Africa (PSSA), and as Treasurer of the African Association of Physiological Sciences (AAPS).

## ACADEMIC AFFAIRS

**Dr Theo Nell** is head of the Departmental Undergraduate Academic Affairs and module coordinator for F 334/364. He was the study leader of two BSc honours graduates (one cum laude).

**Dr Bandiliwe Sishi** was the study leader for two BSc honours graduates (one cum laude). As course coordinator, she achieved a 98.7% pass rate for F314 and a 100% pass rate for F344.

**Prof MF Essop** trialed a new BScHons module dealing with the Nature of Science, as part of an attempt to better equip life science students to operate in the public domain in a post-truth world.

**Prof Ben Loos** was the study leader of one PhD graduate and one MSc graduate.

### Postgraduate student cohort



## AWARDS TO STAFF AND STUDENTS

**Dr Bandiliwe Sishi** received the award for the best general poster presentation at the Physiological Society of Southern Africa (PSSA) congress 2021, virtually held with the African Association of Physiological Sciences from 12 to 15 September.

**Prof Katherine Myburgh** was elected fellow of the Academy of the International Union of Physiology Societies. The DSI/NRF South African Research Chair for Integrative Skeletal Muscle Physiology, Biology and Biotechnology was awarded for a

second cycle and her NRF B2-rating was re-awarded. From her research group, Ms Tracy Ollewagen was awarded the second place in the PSSA's Wyndham Competition for the best oral presentation by a young researcher, while Ms Maia Rawlins earned third place in the Johnny van der Walt Poster Competition.

**Prof MF Essop** was awarded the prestigious Lifetime Career Award by the Physiology Society of Southern Africa (PSSA).

## STAFF MATTERS

**Prof Carine Smith** and **Prof Faadiel Essop** both took up positions in the Faculty of Health and Medical Sciences at SU's Tygerberg campus. **Dr Danzil**

**Joseph, Dr Sanjeev Rambharose,** and **Dr Carin de Villiers** joined the team as academic staff members.



Dr Carin de Villiers, Dr Danzil Joseph and Dr Sanjeev Rambharose.

## SOCIAL IMPACT

**Dr Bandiliwe Sishi** was involved in the organisation of various symposia in her capacity as member of the management committee of the Centre for Cardio-metabolic Research in Africa (CARMA). The symposia covered the following themes: "The Nature of Science"; "Revelations from the Pandemic

– what we know now" and "Graduate student mental health: national trends and strategies".

**Prof Anna-Mart Engelbrecht** gave several media interviews: "Personalised Medicine – biotechnology offer new hope for cancer patients" for Media24; a

live interview with Cape Talk on World Cancer Day, as well as an interview with Lizma van Zyl on aging for Netwerk 24. Her cancer research work was also featured by the blog "Peering into the Gene Pool".

**Drs Danzil Joseph, Bandiliwe Sishi and Theo Nell** were involved in the third annual SU Life Science Outreach initiative. It involves the presentation of Life Science practical sessions for Grade 10-12 learners at Lückhoff Secondary School in Idas Valley, Stellenbosch. The initiative is managed in partnership with the school's Life Science teacher. Practical sessions involve experiments where learners make use of household items to explore various concepts in their Life Science curriculum. COVID-19 and resultant restrictions limited in-person facilitation of the practical sessions in 2021. The programme continued successfully through provision of practical material and resources in the form of individually packaged kits to the school (prepared by the staff members involved), while

the teacher was able to facilitate the sessions and assessments based on the experience gained in 2019 and early 2020. This approach enabled the successful completion of the required practical programme in 2021 and provided valuable lessons for the long-term sustainability of the initiative.

**Prof Resia Pretorius'** work on the prevalence of persistent microclots in blood samples from individuals suffering from Long COVID received international media coverage in *The Guardian*, *The Scientist* and the *Mirror* newspaper in the UK, amongst others.

The artwork created in collaboration between **Prof Ben Loos'** research group and the Department of Visual Arts was exhibited as "Science meets Art" at the Rupert Museum in 2021. The aim was to raise awareness on the stigma associated with mental illness in South Africa. The artwork is now on display in SU's new learning center.

## COLLABORATION

### Austria

- Vienna University, Austria

### Denmark

- University of Copenhagen

### Germany

- Max-Planck-Zentrum für Physik und Medizin

### Israel

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

### New Zealand

- University of Auckland

### Scotland

- Stirling University

### South Africa

- 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

- Francis Crick Institute, London, UK
- University College London (UCL)
- University College London Hospitals (UCLH)
- University of Manchester

### United States of America

- NYU Grossman School of Medicine
- PolyBio Research Foundation
- University of Kansas Medical Center
- University of Nebraska

## FUNDING

### Denmark

- Steno Institute, Denmark

### South Africa

- Cancer Association of South Africa (CANSA)
- Department of Science and Innovation (DSI)
- Medical Research Council (SAMRC)
- National Research Foundation
- Rooibos Council

- Technology Innovation Agency (TIA)
- University Technology Fund (UTF) grant
- Water Research Commission

### United Kingdom

- Royal Society

### United States of America

- Carnegie Fellowship

## NRF-RATED RESEARCHERS

### INTERNATIONALLY ACCLAIMED RESEARCHERS

Prof ME Essop	Cardio-metabolic research
Prof K Myburgh	Biomedical sciences
Prof E Pretorius	Inflammatory blood biomarkers and blood coagulation

### ESTABLISHED RESEARCHERS

Prof Ben Loos	Autophagy and cell death
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## STAFF LIST

### Academic

- Dr C de Villiers
- Prof A-M Engelbrecht
- Dr D Joseph
- Prof B Loos
- Prof KH Myburgh
- Dr T Nell
- Prof E Pretorius (Departmental Head)
- Dr S Rambharose
- Dr B Sishi

### Extraordinary professors

- Prof DB Kell
- Prof I Laher (University of British Columbia)
- Prof Zara Zakeri (Queens College, New York)
- Prof Angus Dalgleish (St George University, London)

### Research fellows

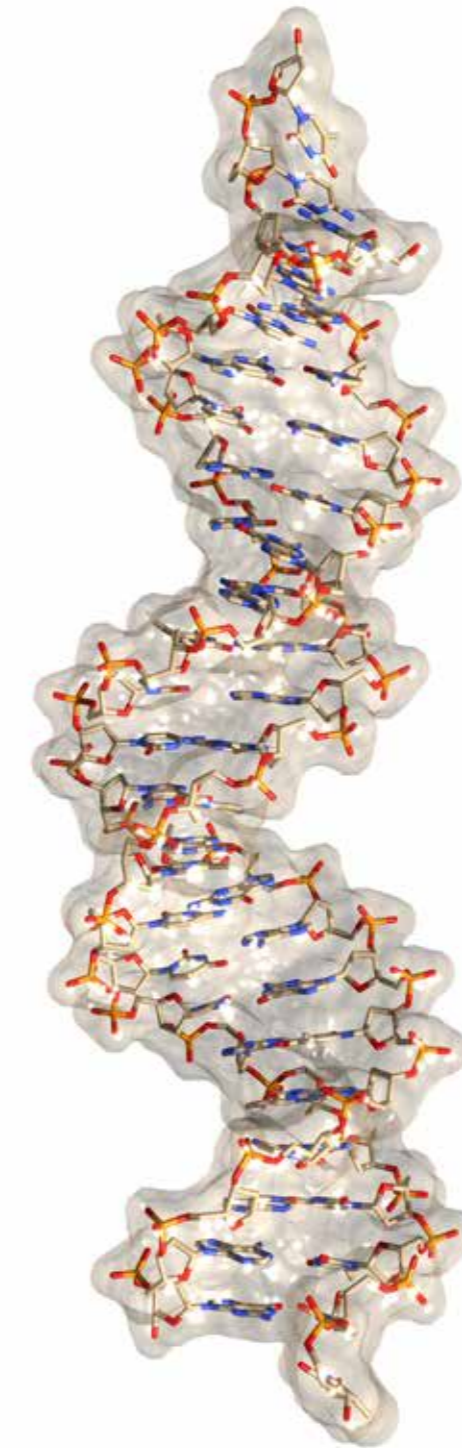
- Dr Graham Ellis
- Dr Johann Riedemann
- Dr Paula Ansley

### Support staff

- Dr A Krygsman
- Dr C Venter
- Mrs G Simon
- Mr J Isaacs

### Postdoctoral fellows

- Dr A du Toit
- Dr E Teer
- Dr G Van Niekerk
- Dr C Venter



### CONTACT DETAILS

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CENTRE FOR  
BIOINFORMATICS AND  
COMPUTATIONAL BIOLOGY

## RESEARCH INTERESTS

Epigenomics, synthetic biology and bioinformatics; Human genomics and bioinformatics; Infectious diseases and bioinformatics; Infectious diseases and biotechnology and bioinformatics; Infectious diseases, biostatistics and bioinformatics; Microbial

biotechnology and bioinformatics; Population genetics and bioinformatics; Systems biology and bioinformatics; Viral genetics and bioinformatics; Wine biotechnology and bioinformatics

## RESEARCH HIGHLIGHTS

In April 2021, The CBCB invited **Prof Tulio de Oliveira** to present an online talk for the Stellenbosch Science Café related to his current research on variants of concern and interest in Africa scientific characterisation in real time. In this regard, he worked with Prof Koleka Mlisana, Prof Alex Sigal, Prof Penny Moore, Prof John Nkengasong and Dr Sofonias Tessema on the Network for Genomic Surveillance South Africa (NGS-SA) and Africa CDC Pathogen Genomics Initiative (PGI).



**Prof Tulio de Oliveira**

## RESEARCH ACTIVITIES

CBCB members continued to work with internationally acclaimed researchers on the development of bioinformatics tools, and the

bioinformatics analysis of diverse genomic, transcriptomic, proteomic and health science datasets.

## ACADEMIC AFFAIRS

During 2021, the continuing Covid-19 pandemic required augmented remote learning, teaching and assessment, with the undergraduate and postgraduate teaching activity still taking place online. Face-to-face training sessions were scheduled where necessary or requested, especially in the practical modules. This required a great amount of effort and agility from all staff members to keep the academic programme on track and to adapt to the continuously changing circumstances. This was

the first year that the CBCB BScHons Programme classes ran with a group intake. However, due to Covid-19 it was also presented online as with the other classes.

Fortunately, the postgraduate research activities in the laboratories could continue at a more constant and increased pace than in 2020, however, not yet at full capacity.

## Number of graduates 2021



BSC HONOURS STUDENTS



MSC STUDENTS

## STAFF MATTERS

Several new members were welcomed to the CBCB in 2021. They are **Dr C Viljoen, Prof S Sampson, Prof C Kinneer, Prof M Moller** and **Dr E Maasdorp**.

## FUNDING

### Global

- H3ABioNet

### South Africa

- Stellenbosch University Subcommittee B
- Stellenbosch University Faculty of Science

## NRF-RATED RESEARCHERS

### INTERNATIONALLY ACCLAIMED RESEARCHERS

Prof Jacky Snoep	Computational Systems Biolog
Prof Johann Rohwer	Computational Systems Biology

## STAFF LIST

### Academic

- Prof H-G Patterson
- Support staff
- Ms O van Wyk

### Members & Associate Members

- Prof GC Tromp, Department

of Biomedical Sciences, Faculty of Medicine and Health Sciences

- Prof JT Burger, Department of Genetics, Faculty of AgriScience
- Prof JM Rohwer, Department of Biochemistry, Faculty of

Science

- Prof JL Snoep, Department of Biochemistry, Faculty of Science
- Prof FF Bauer, South African research chair in Integrated Wine Science, Faculty of AgriScience

- Dr H Volschenk, Department of Microbiology, Faculty of Science
- Dr C Viljoen, XXXX?
- Prof MA Vivier, Institute for Wine Biotechnology, Faculty of AgriScience

- Prof S Sampson, South African research chair in Mycobactomics, DSI/NRF Centre of Excellence in Biomedical Tuberculosis Research, Faculty of Medicine and Health Sciences

- Prof C Kinnear
- Prof G van der Spuy
- Prof M Moller
- Dr E Maasdo



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