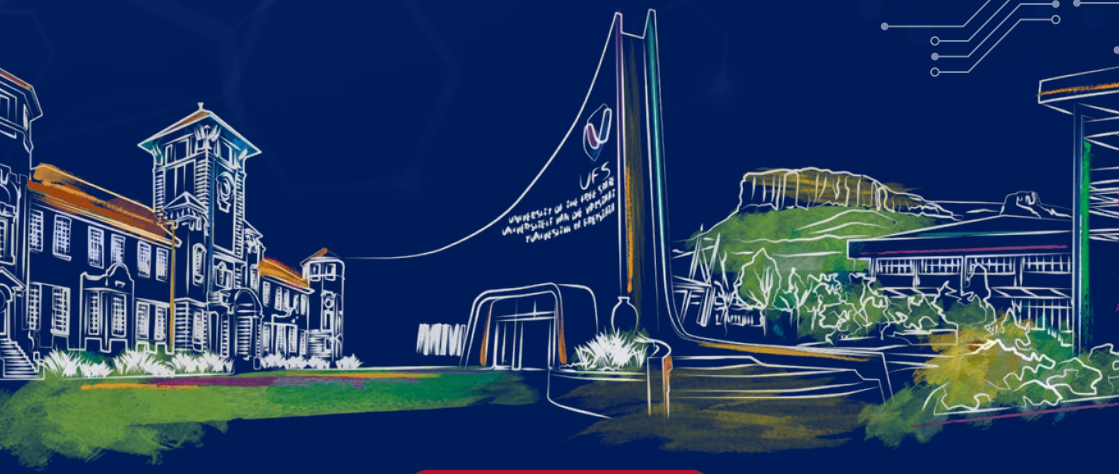
DRIVING INNOVATION AND COMMERCIALISATION AT THE

UNIVERSITY OF THE FREE STATE



2025

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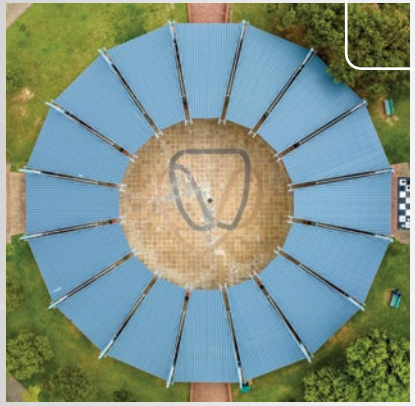
Inspiring excellence, transforming lives through quality, impact, and care.

UNIVERSITY OF THE **FREE STATE**
UNIVERSITEIT VAN DIE **VRYSTAAT**
YUNIVESITHI YA **FREISTATA**



MESSAGE FROM THE **VICE-CHANCELLOR AND PRINCIPAL**

At the University of the Free State (UFS), we stand at the intersection of African excellence and global innovation. As we navigate an era of unprecedented technological advancement, we have embraced a fundamental truth: the future belongs to institutions that dare to reimagine education entirely.

Our approach is centred around creating **responsible societal futures** and unlocking potential through collaboration and connection. We believe that the most groundbreaking discoveries emerge when diverse perspectives converge, when international minds collaborate, and when academic excellence meets real-world application.

Built on the values of *Excellence, Innovation and Impact, Sustainability, Accountability, Care,* and *Social Justice*, we are creating an entrepreneurial ecosystem where brilliant minds converge to address humanity's most pressing problems. Our vision extends beyond traditional research, as we are tackling climate change, inequality, and technological disruption through transdisciplinary partnerships that span continents.

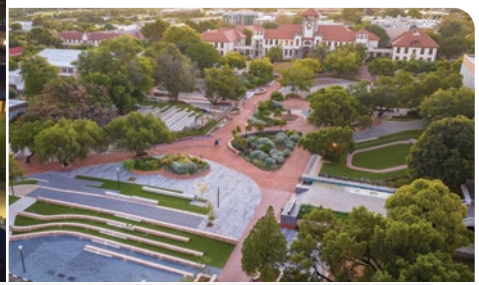
What sets the UFS apart is our commitment to responsible innovation, combined with our student support for student success strategies. As a student-centred institution, we produce well-rounded graduates, equipped with academic and personal skills that not only make them sought-after professionals in workplaces around the world, but also responsible, society-focused future leaders. To this end, we are establishing ourselves as Africa's premier destination for thought leadership.

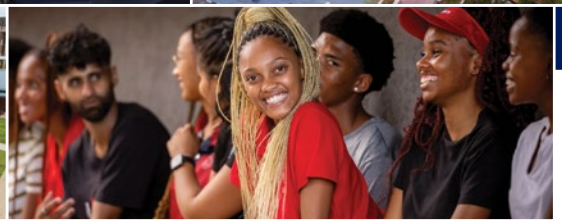
We invite you to join us in creating responsible societal futures. Whether through research partnerships, student exchanges, or collaborative projects, the UFS offers the perfect blend of African authenticity and global competitiveness.

The world is changing rapidly. Let's *lead* that change together.

Prof Hester C. Klopper

VICE-CHANCELLOR AND PRINCIPAL





INTRODUCTION

In the heart of South Africa stands a university with more than a century's worth of stories to tell. The UFS has grown from modest beginnings into a recognised hub of learning and innovation. Established in 1904 with just six students, the university now educates more than 39 000 students across the Bloemfontein, Qwaqwa, and South campuses.

As one of the country's oldest institutions, the UFS has a proud legacy – but it is our future-facing vision that sets us apart. We are committed to being a university of excellence, where engaged scholarship, teaching, and research make a meaningful difference in the world. At the UFS, academic achievement is not an end in itself; it is a pathway to real-world impact.

We are deeply rooted in society, whether local, national, or global. Our research addresses challenges that matter, and our innovations aim to improve lives. From agriculture and health sciences to education and social justice, our academic communities are shaping knowledge that supports progress and uplifts communities.

Diversity and inclusivity are cornerstones of the UFS culture. Here, competing ideas are welcomed in the spirit of academic freedom, and excellence goes hand in hand with empathy. We encourage multiple ways of thinking and doing, because true innovation thrives in a space where everyone has a voice.

Our campuses offer more than a place to study. They are places to grow, explore, connect, and belong. Whether through sports, arts and culture, or student leadership, the UFS experience shapes individuals who are not only career-ready, but also globally minded and socially aware.

At the UFS, we believe that knowledge is most powerful when it changes lives.

THE UNIVERSITY OF THE FREE STATE **AT A GLANCE**

Established in **1904**

Research output: Publishing in:
Q1[1] publications **1 067** and Q2[2] publications **1 001**

3 campuses
7 faculties

ECONOMIC AND MANAGEMENT SCIENCES | EDUCATION | HEALTH SCIENCES | THE HUMANITIES | LAW | NATURAL AND AGRICULTURAL SCIENCES | THEOLOGY AND RELIGION

Student enrolment numbers (2025)
39 639

Student graduates (2024)
9 250

Staff
5 018

Research chairs:
6 SARChI[3] Chairs

1 SANRAL[4] chair
in Mathematics, Natural Sciences and Technology Education

1 ETDP-SETA[5] chair
in Mathematics Education

7 Chairs under the Agricultural Research Council (ARC), the Department of Agriculture, and the University of the Free State (UFS) (ARC-DoA-UFS) research chair initiative

NRF-rated researchers
243

Postdoctoral fellows
193 (68% from outside the UFS)

Research fellows
496

Graduates:
Master's **650**
Doctoral **163**

International collaborating institutions
3 707

Co-authored publications
5 080 beyond national borders

Scholarly articles published in internationally indexed journals: **89,63%** of total journal output.

South African Leader in Academic Career Advancement:
Transformation of the Professoriate Mentoring Programme

Future professoriate success
- **82%** of the first cohort promoted to **associate professor**
- **62%** now **NRF[6]-rated**
- **16 scholars** earned **Y or C ratings**

Emerging Researcher Accelerator Programme
- **96%** promoted to **senior lecturer**
- **15 scholars** earned **NRF ratings**
- **8 advanced** to **associate professor**

Research impact (2021–2024)
- **67 scholars** published:
  - **45 books**
  - **410 journal articles**
  - **65 book chapters**

Leadership achievements
- **5 Vice-deans**
- **10 heads of department**
- Numerous **programme directors**

Researcher Excellence Accelerator Programme
- **9 candidates** earned **PhDs** within their **first year**

Women Influencing Scholarship and Engagement
- **2 participants** submitted **NRF** rating applications in **2024**

**Research data is based on 2024 outputs.*

[1] Quartile 1. [2] Quartile 2. [3] South African Research Chairs Initiative. [4] South African National Roads Agency Limited.
[5] Education, Training and Development Practices Sector Education and Training Authority. [6] National Research Foundation.

TRANSLATING RESEARCH INTO
REAL-WORLD IMPACT

Research at the UFS is closely aligned with the needs of society, addressing real challenges such as food security, climate change, health, and sustainability. Through collaborative, solution-driven work, researchers help shape policies, improve lives, and build more resilient communities locally and across the continent.

Algae innovation transforms wastewater treatment in Africa

Sanitation and wastewater challenges remain critical across Africa, with half the population exposed to related health risks. **Prof Paul Oberholster**, environmental management researcher, is leading pioneering work in phycoremediation, using algae to treat wastewater naturally and affordably. His research, applied in municipalities such as Mossel Bay and across Africa, shows how algae can remove nutrients and pathogens from wastewater, offering a low-cost, eco-friendly solution ideal for rural areas with limited infrastructure.

Beyond water treatment, Prof Oberholster's work explores the value of algae as a sustainable resource. The resulting biomass can be used for high-value nutraceuticals that support human health, including carotenoids that boost vision and immunity, biofuels, and non-fuel products such as fertiliser and animal feed. These applications open the door to commercialisation opportunities, including spin-off companies that can contribute to the university's third-stream income.

A new algae plant installed on the UFS Bloemfontein Campus will use off-grid photobioreactors to cultivate algae and drive innovation in this space. The initiative is a collaboration with the CSIR and the Technology Innovation Agency and is expected to make the university a continental leader in algae technology.

Prof Oberholster's algae initiative addresses pressing environmental and health challenges, offering a sustainable solution with wide-reaching benefits. With its diverse applications, algae support multiple Sustainable Development Goals, making it a driver of scientific innovation, environmental resilience, and socio-economic growth.

Science with purpose

At the UFS, chemistry is not just about molecules and reactions, it is about finding smart, practical ways to make life better, solving everyday problems that affect people's health, livelihoods, and environments. The Department of Chemistry is a national leader addressing real-world problems through research across Analytical, Inorganic, Organic, and Physical Chemistry.

From developing slow-release fertilisers that conserve water, to extracting gold and other precious metals from e-waste, creating greener energy solutions, and designing new cancer-fighting and -imaging agents, innovation in the Department of Chemistry is deeply rooted in care for the community and the planet.

Through pioneering science and purpose-driven discovery, the department is showing how small elements can lead to life-changing breakthroughs.

Financing resilience

The new Research Chair in Agriculture Risk Financing, established in the UFS Business School and led by **Prof Cobus Oberholster**, is setting the stage for an era of climate-smart innovation. With climate change placing growing pressure on food systems and agricultural finance, this initiative brings a sharp, solution-driven focus to one of the world's most pressing challenges.

Prof Oberholster, who spent a large portion of his corporate career in the banking sector and the agribusiness environment, brings extensive expertise in climate finance, resource mobilisation, and sustainable economic practices. He also holds two doctorates in agriculture and agricultural finance, which directly inform the chair's direction.

Prof Oberholster is steering a research programme that explores how financial systems, digital technologies, and regulatory frameworks can work together to unlock practical pathways to sustainability. The chair focuses on the development and commercialisation of innovative financing models that can support adaptation, drive eco-innovation, and attract green investment across the agricultural value chain.

Anchored in a cross-disciplinary approach, the chair contributes to smarter policymaking and market design, with real potential to influence climate resilience and food security across South Africa and the wider African continent. Educational interventions and executive training programmes will further extend its impact by building capacity and addressing critical barriers to climate finance.

By integrating environmental, ethical, and social considerations into financing decisions, the chair supports multiple Sustainable Development Goals: from climate action and zero hunger to inclusive economic growth.

Putting African traditional medicine on the global stage

Prof Motlalepula Matsabisa, Director of Pharmacology and the African Medicines Innovations and Technologies Development (AMITD) platform at the UFS, is at the forefront of efforts to integrate traditional African medicine into modern health care. A passionate advocate for indigenous knowledge, Prof Matsabisa leads research to develop scientifically validated herbal medicines that draw from Africa's deep well of traditional healing practices.

With the growing failure of many current drugs due to resistance to anti-infectives, cancer treatments, and insulin therapy, Prof Matsabisa highlights the need for alternative solutions. He points out that plant-derived medicines already treat more than 90% of known human diseases and that the global use of traditional medicines is expanding rapidly.

His vision includes the establishment of South Africa's first Natural Medicines Institute at the UFS and the BRICS Natural Medicines Institute, which he will lead. Under his leadership, the AMITD platform has become a hub for high-quality research, innovation, and product development, rooted in African biodiversity and traditional health systems.

Prof Matsabisa also helped position the UFS on the global stage by hosting G20 Research and Innovation Working Group events. His work demonstrates the value of African traditional medicines in addressing modern health challenges. A key outcome of the G20 visit to the UFS is a series of planned collaboration agreements with international universities from G20 countries. These partnerships aim to further integrate traditional medicine into global health systems.

With plans to introduce accredited courses in traditional medicine and establish a WHO-standard herbal pharmaceutical company, Prof Matsabisa is committed to a future where traditional and modern medicine work side by side, creating a truly integrated medicine and health-care system for universal health coverage.

Innovation in crop science is securing Africa's food future

Prof Maryke Labuschagne, Professor of Plant Breeding at the UFS, focuses on practical scientific solutions to meet growing global food and nutrition challenges. As Chair of both the Research Chair: Breeding Climate-Resilient Vegetables and Grains and the NRF SARChI Chair in Diseases and Quality of Field Crops, she is working to make Africa's food systems more resilient by breeding crops that can thrive under environmental stress conditions – nutritionally, environmentally, and economically.

From vitamin A-rich maize to exploring the potential of underutilised crops such as cowpea, cassava, indigenous vegetables, and particularly sorghum – known for its resilience and dual benefits as a source of protein and starch – Prof Labuschagne's work is unlocking the power of plants to feed vulnerable populations. This is not just science in the lab, this is impact in the field.

With more than three decades of training the next generation of plant breeders across Africa, her legacy grows through the cultivars her students release and the lives these crops improve. Prof Labuschagne's approach embodies agricultural research that not only adapts to the changing climate but actively changes futures.

Driving innovation for environmental sustainability

Under the leadership of **Dr Mariana Erasmus**, the UFS Centre for Mineral Biogeochemistry is at the forefront of developing innovative, eco-friendly solutions for some of South Africa's most pressing environmental challenges. The centre focuses on nature-based approaches for remediating polluted water and soil, rehabilitating degraded ecosystems, conserving natural resources, and improving agricultural productivity for long-term food security.

Prof Wayne Truter, working within the centre and the Green Futures Hub, leads an interdisciplinary team focused on rehabilitating degraded agricultural and mined land. Their work explores sustainable coexistence between mining and agriculture through soil restoration using agricultural and industrial by-products. The team also cultivates pastures, forages, and regenerative bioenergy crops irrigated with mine-impacted water under carefully managed conditions.

Key focus areas include phytoremediation and phytomining to recover value from contaminated soil, as well as land use optimisation to create a sustainable food-water-energy nexus to support a just transition and long-term community and land regeneration. The centre also examines the integration of agricultural systems into rehabilitated landscapes, ensuring biomass quality through ecotoxicology monitoring and a holistic understanding of soil-plant-water-climate interactions. These efforts contribute to scalable carbon farming solutions that align with climate resilience and sustainable land stewardship.

As host of the Mineral BIOGRIP Node, researchers and students are provided with access to advanced infrastructure, translating scientific insights into practical interventions that support environmental conservation and responsible resource management.

At the centre of a circular economy

At the UFS, circular economy thinking is more than just a buzzword – it is becoming a way of working, researching, and teaching. Through its Green Futures Hub, the UFS is placing sustainability at the centre of agricultural innovation, with a focus on reducing waste, reusing resources, and reimagining the way we interact with land and water.

The circular economy initiative, backed by the Department of Science, Technology and Innovation, is giving the university a platform to rethink agriculture in a country where food security and environmental pressures are daily realities. Running until March 2026, the initiative brings together researchers, students, and industry experts to find solutions that work for both people and the planet.

By developing strategies that reduce input costs, recover waste materials, and regenerate soil and water systems, the initiative is creating a model for agriculture to be both productive and sustainable. Workshops and collaborative forums help ensure that ideas are tested, shared, and applied in real-world settings – particularly in rural communities where resilience matters most.

Importantly, students are directly involved. This means future graduates leave the university not only with academic knowledge, but also with insight into how circular practices can shape a more balanced and fair agricultural economy.

RESEARCH-DRIVEN

INNOVATION INFRASTRUCTURE

Innovation is made possible not only by ideas, but by the tools that bring them to life. At the UFS, world-class laboratories, specialised facilities, and advanced analytical equipment provide the foundation for research that drives practical solutions in science.

PROJECTS

Transforming cervical cancer care through technology

Cervical cancer remains one of the leading causes of cancer-related deaths in low-resource settings. At the UFS, innovation is meeting this challenge head-on. A dynamic team led by medical physicist Dr Willie Shaw and oncologist **Prof Alicia Sherriff** is leading advanced technological solutions that promise to reshape cancer care.

Central to this effort is the Radiation Planning Assistant – a web-based tool developed in collaboration with global partners. This innovation automates the contouring of organs and radiotherapy treatment planning, enabling precision care in clinics that lack sophisticated infrastructure. By removing the need for specialised equipment and intensive manpower, it levels the playing field between well-resourced hospitals and underserved communities.

The UFS recently became the first institution in the world to successfully treat a cervical cancer patient using this innovative AI system, with the entire treatment process executed by the AI technology itself but evaluated by a panel of specialists. As this technology is rolled out globally, it stands to revolutionise treatment delivery, reduce planning time, and significantly improve outcomes for thousands of patients.

Advancing science safely

At the heart of advanced infectious disease research in central South Africa is the UFS Biosafety Level 3 (BSL-3) Pathogen Research Laboratory, a critical institutional asset made available to researchers working on high-consequence pathogens. This advanced, high-containment facility enables work on emerging, vector-borne, and zoonotic diseases, and is jointly used by leading researchers across disciplines to support the university's One Health research agenda.

Among the key users are **Prof Felicity Burt**, Research Chair in Vector-Borne and Zoonotic Diseases and expert arbovirologist, and Prof Wynand Goosen, Head of the Kovsie One Health Research Unit. Together, they lead complementary research streams: Prof Burt focusing on vector-borne viruses, and Prof Goosen specialising in zoonotic tuberculosis, non-tuberculous mycobacteria, brucellosis, and anti-microbial resistance. Their collaboration reflects a growing institutional effort to address health challenges at the human-animal-environment interface.

The BSL-3 facility operates under strict safety protocols, including negative air pressure, HEPA-filtered exhaust systems, and full protective equipment, ensuring the safe handling of high-risk agents. In addition to advancing cutting-edge science, the laboratory serves as a training platform that prepares the next generation of virologists, microbiologists, and One Health researchers through hands-on experience in high-containment settings.

Grounded in the One Health philosophy, the work of Profs Burt and Goosen contributes to the vision of the UFS One Health Centre of Excellence, a hub designed to reimagine how global health challenges are addressed through transdisciplinary science. The centre integrates expertise in zoonotic and emerging infectious diseases, AMR, environmental health, climate change, and sustainable agriculture. Through inclusive partnerships with academia, government, and industry, and by leveraging tools such as pathogen surveillance, molecular diagnostics, data integration, and agricultural innovation, the UFS One Health Centre is advancing practical, evidence-based solutions to improve health outcomes and sustainability in South Africa and beyond.

The engine behind complex research at the UFS

The university is one of only a few universities in South Africa equipped with a High-Performance Computing (HPC) Unit. This advanced research technology gives researchers a competitive edge. The HPC Unit is a powerful engine that drives innovation across disciplines. By providing advanced computational resources, it enables researchers to address complex problems and run massive simulations far beyond the reach of standard computers. Supporting more than 582 users from 60 departments, ranging from Natural and Agricultural Sciences to Health Sciences and The Humanities, the HPC is truly interdisciplinary.

Building futures through science

At the UFS, science and mathematics education are breaking out of the box – and into parks, classrooms, and communities. With the Science-for-the-Future unit (S4F) in the Faculty of Education and its continued partnership with external funders, the UFS is reshaping how science and mathematics are facilitated and experienced in South Africa through innovative teacher professional development initiatives, impacting teachers, learners, and parents.

To extend its impact and footprint, S4F recently established the Sci-Ed Science Education Centre on the UFS Bloemfontein Campus. This modern facility represents advancement in science and mathematics education and is more than just a building; Sci-Ed is an interactive space where curiosity comes to life. With an outdoor Science Park and an indoor Science Discovery Centre, it offers hands-on exhibits and experiential learning tools that support student teachers, learners, and in-service educators alike. These are not just displays – they are interactive and dynamic teaching aids that bring abstract scientific concepts into everyday understanding.

Science takes flight

At the UFS, innovation is not just a buzzword – it is in flight. Through the Merensky Group for Aerial Geological Image Classification (MAGIC), led by **Dr Martin Clark**, state-of-the-art drone technology is reshaping how natural scientists explore, monitor, and manage South Africa's vast landscapes.

From mapping base metals in the Northern Cape to exploring groundwater interactions with geological structures, the drone enables high resolution, sensor-driven data collection precisely where and when it is needed. This precision gives researchers the power to detect features too small for satellites, opening new possibilities in mineral exploration and sustainable water use.

With support from the Hans Merensky Legacy Foundation and operated under UAV Industries certification, MAGIC's drone-based research is setting new standards in geoscientific observation. As Dr Clark puts it: "It's not just about the drone – it's about unlocking insight by positioning the right tool in the right place at the right time."

Science at the UFS is truly taking off.

Technology takes centre stage

The university boasts state-of-the-art laboratories, high-end infrastructure, and advanced instruments that support a thriving research environment. These facilities serve both undergraduate and postgraduate students, while also enabling industry collaboration and advanced analytical capabilities.

Innovation is giving animals a fighting chance

Innovation is breathing life into endangered wildlife, and at the centre of it all is **Prof Francois Deacon**, a wildlife habitat expert at the UFS. Prof Deacon's team tracked 255 giraffes with satellite GPS devices and designed the first custom-fitted head harness for these iconic animals.

Building on this success, Prof Deacon has expanded his research to include rhinos, both in South Africa and through international efforts in Indonesia and Pakistan, where the team has worked with the critically endangered Javan and Sumatran rhinos. Now even the Himalayas are part of his mission, where he and his team have successfully GPS-collared three critically endangered brown bears.

Learning meets real life

The Clinical Simulation and Skills Unit in the School of Biomedical Sciences at the UFS offers a dynamic, hands-on learning space where undergraduate students train, using a full range of medical simulators. In this safe, non-threatening environment, students can practise procedures repeatedly until they reach confidence and competence, mastering skills before applying them in real-world settings.

Training is further elevated by the Medtronic and UFS Cardiac Simulation Unit, where cardiothoracic surgery, cardiology, vascular surgery, and anaesthesiology teams refine their techniques using advanced virtual reality laparoscopic and endoscopic simulators. These tools give postgraduate students a realistic, risk-free introduction to complex procedures before they enter the operating room. In the near future, a dedicated postgraduate simulation unit will be established to expand the capacity of the simulation-based training for future specialists.

In the School of Nursing, the development of exceptional nurses goes beyond classroom learning and is grounded in real-life experience. Nursing students benefit from immersive, hands-on training in high-tech simulation laboratories and skills units. These environments feature a mix of high-fidelity human patient simulators, low-fidelity mannequins, and trained standardised patients, enabling students to build technical skills, clinical reasoning, and compassionate care. Realistic moulage, such as simulated burns and trauma wounds, adds authenticity and urgency to each scenario, anchoring learning in the complexities of real-world health care.

FROM RESEARCH TO BUSINESS:

SPIN-OUT SUCCESS STORIES

Spin-out companies at the UFS play an important role in driving innovation and economic growth. By commercialising intellectual property and supporting entrepreneurship, these ventures extend the university's impact beyond academia into industry and society.

Cultivating innovation for a sustainable future

In a bold leap towards sustainable agriculture and innovation, the UFS and South African fresh-produce giant ZZ2 have launched NovaLogix – a pioneering joint venture with the power to transform the future of food production. Born from a five-year journey of collaboration and scientific discovery, NovaLogix focuses on developing advanced probiotic solutions that boost plant health and growth, setting a new standard for fresh produce farming.

The company represents more than just product development; it demonstrates how academic insight and commercial agility can create new business models, unlock local potential, and contribute to a more resilient and sustainable agricultural future.

Advancing African cardiovascular research and innovation

A patented UFS innovation with global relevance is paving the way for commercialisation in cardiovascular medicine. The Robert WM Frater Cardiovascular Research Centre holds a worldwide patent for a unique decellularisation and sterilisation process, developed for use in implantable or transplantable biological material of human or animal origin. This technology, which has particular application in cardiovascular devices for younger patients and those in developing countries, positions the UFS as a key contributor to health innovation. The Frater Centre is a leading cardiovascular research institution in South Africa and sub-Saharan Africa.

The centre has three main divisions. The Clinical Research Division addresses cardiovascular diseases on a broad front, ranging from population and prevalence studies to health-care solutions and clinical outcome studies in a specific South African and African context.

The Research, Development and Commercialisation division is divided into Tissue Engineering and Cell Biology, Tissue Banking and Large Animal Studies and includes bio-

engineering to develop African solutions and technology within these domains. The Simulation Programme provides an integrated interdisciplinary platform for the education and training of individuals and teams in the field of cardiovascular, thoracic, anaesthetic, perfusion technology, and related nursing fields in a state-of-the-art simulation unit.

The Frater Centre also houses the only homograft tissue bank in Southern Africa.

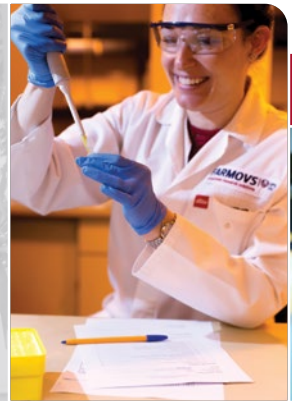
Prof Francis Smit from the UFS Department of Cardiothoracic Surgery and a pioneer in adult and paediatric cardiac surgery, is leading this transformative work.

Turning discovery into healing

FARMOVS, a clinical research organisation with a global footprint, has more than 50 years of experience and close to 4 000 clinical trials to its name. It stands at the forefront of Phase 1-2a clinical research – driving progress from bench to bedside. Its state-of-the-art facility includes Africa's largest GLP-certified bioanalytical laboratory, offering world-class drug development services ranging from first-in-human trials to biosimilar studies.

FARMOVS has approval from all the major regulatory authorities worldwide and has gained extensive expertise in more than thirteen therapeutic areas, including autoimmune, cardiovascular, central nervous system, oncology, and tuberculosis. This brings access to diverse patient populations and more than 580 validated analytical methods.

Its powerful research alliance serves as an extension of the university's commitment to impactful science, allowing UFS researchers to collaborate in an ecosystem that supports ICH-GCP-compliant clinical trials. For the UFS, this partnership amplifies its ability to advance health care, unlocking knowledge, and shaping a healthier tomorrow.



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