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SPOTLIGHT ON

PRIS 2025

SCHOOL OF AGRICULTURE
&
SCIENCE

Postgraduate research within the School of Agriculture and Science is characterised by its depth, diversity and significant societal impact. Within the agricultural sphere, students engage in transformative research on food security, crop improvement and sustainable farming systems, building on a sixty-year legacy of influencing continental agricultural policy. In the physical sciences, state-of-the-art infrastructure supports cutting-edge exploration in materials science, quantum physics and environmental chemistry. Biological science postgraduates contribute to vital studies on South Africa's unique biodiversity, conservation and microbial biotechnology; while those in mathematics, statistics and computer science drive interdisciplinary advancements in data science, machine learning and AI.



**Professor Ademola
Olaniran**

Dean & Head of School

POSTGRADUATE RESEARCH PROJECTS

Could wastewater help grow healthier crops while saving fertiliser and freshwater? 🌱



Mr Emmanuel Valentine

Master’s candidate in Crop Science, Mr Emmanuel Valentine, is testing exactly that through hydroponics — but with a twist. Instead of using complex, power-hungry systems, his research explores a simple, non-circulating method known as the Kratky system. By supplementing treated municipal wastewater with a commercial hydroponic fertiliser mix for tomato production, his study shows that moderate supplementation of wastewater can boost plant growth and performance while cutting down on chemical fertilisers. The findings point to a sustainable, low-cost solution that tackles two challenges at once: food production and wastewater management, an innovative approach that could shape the future of agriculture and resource use.

🍲 Food Environments and Diet Quality in Marginalised Urban Communities

What shapes the diets of low-income urban households — and why are ultra-processed foods becoming more common? Ms Zodidi Cebiso’s PhD study in Agricultural Economics explores the food environments of four neighbourhoods in KwaZulu-Natal’s Msunduzi Municipality, where hunger, limited income, and reliance on public transport drive food choices. While staple carbohydrates and sugary drinks dominate diets, access to formal food outlets and socio-economic challenges further increase consumption of ultra-processed foods, undermining diet quality. The findings highlight the urgent need for interventions that improve access to affordable, nutritious options while tackling the deeper inequalities influencing what ends up on people’s plates



Ms Zodidi Cebiso

POSTGRADUATE RESEARCH PROJECTS

📊 Solving Equations with Today's Quantum Computers



Mr Thalente Mthembu

Quantum computers aren't just science fiction — they already exist, but they're small and noisy. Mr Thalente Mthembu's master's research in Physics explores how to make the most of these early machines using Variational Quantum Algorithms (VQAs) — clever hybrids of classical and quantum computing.

The study focuses on the Variational Quantum Linear Solver (VQLS), a new algorithm designed to solve systems of linear equations — a problem that appears everywhere, from engineering to economics. By testing the algorithm on real examples, the research shows how quantum computers could already start helping with practical problems, even before they reach full power.

🔧 Cracking Down on Fuel Adulteration in South Africa

Did you know some petrol stations in South Africa secretly mix paraffin into fuel? This illegal practice damages engines, worsens air pollution, and costs the country millions in lost tax revenue. With local refineries closing and fuel imports on the rise, the problem is growing.

Ms Keleish Pillay's master's research in Chemistry is developing chemical “fingerprints” — known as biomarkers — that can quickly detect when fuel has been tampered with. Using advanced techniques like gas chromatography-mass spectrometry, the project aims to protect consumers, improve air quality, and support policy enforcement by making it harder for unscrupulous operators to cheat the system.



Ms Keleish Pillay

POSTGRADUATE RESEARCH PROJECTS

🌍 Smarter Carbon Policies for a Greener Future



Mr Ali Haroon

How can governments design carbon taxes and subsidies that actually work — without crippling industry? Mr Ali Haroon’s Applied Mathematics PhD research takes on the challenge by building a dynamic optimisation model that simulates the “game” between policymakers (who want to cut emissions) and producers (who want to maximise profits).

Using an adaptive genetic algorithm inspired by natural selection, the study finds strategies that push high-carbon energy sources out quickly, keep medium-carbon sources under control, and provide smart, time-limited subsidies to encourage the growth of low-carbon technologies.

This research gives policymakers a powerful tool to test and fine-tune climate policies before rolling them out — supporting a more effective, data-driven transition to a sustainable energy future.

🦠🔪 Modelling the Battle Against Hepatitis C: Finding the Best Moves

What happens when you turn a virus-immune system battle into maths? Ms Amna Ibrahim’s PhD research does exactly that, using equations to model the complex tug-of-war between Hepatitis C Virus (HCV), liver cells, and the immune system. By mapping how the infection grows or dies out, the study pinpoints a critical threshold — the moment when the virus can no longer sustain itself.

But the work doesn’t stop at theory. Using optimal control techniques, the researcher tests different “treatment strategies” on the model to see which ones most effectively reduce infection while keeping costs low. The results offer insight into how carefully timed treatments could tip the balance in favour of the immune system and bring us closer to the global goal of HCV elimination.



Ms Amna Ibrahim

POSTGRADUATE RESEARCH PROJECTS

📊 Unpacking Africa's Growth Puzzle



Mr Ben Malope

What really drives economic and industrial growth across African countries? Mr Ben Malope's Statistics PhD study dives into over four decades of data (1980–2023) from ten African economies to uncover how trade openness, foreign investment, tariffs, inflation, and government spending shape GDP growth and manufacturing output.

Using advanced statistical tools — including Principal Component Analysis and Seemingly Unrelated Regression models — the research reveals that foreign direct investment (FDI) and greater trade openness significantly boost GDP growth, while moderate tariffs can help protect and grow local manufacturing industries. The findings suggest that smart, balanced policies — encouraging investment and trade but applying strategic protection where needed — are key to building resilient African economies.

🐛🍞 Would You Eat Insect-Infused Bread?

It might sound surprising, but adding mopane worms and termites to your daily loaf could be the key to fighting malnutrition! Master's candidate Ms Nkanyezi Radebe will present her research in Biology which shows that supplementing wheat flour with just 5 – 10% insect meal can pack bread with extra protein and minerals — nutrients many diets are missing.

With bread being one of the world's favourite foods, this simple tweak could help tackle hunger and nutrient deficiencies in a deliciously unexpected way.



Ms Nkanyezi Radebe

POSTGRADUATE RESEARCH PROJECTS

✨ Glowing Nanoparticles with a Health Boost



Mr Adhir Sahadeo

Imagine tiny particles so small they can't be seen with the naked eye — and that glow under certain lights. Mr Adhir Sahadeo's master's research in Biochemistry explores carbon quantum dots (CQDs), innovative nanoparticles made from simple carbon sources, which could one day help fight disease and improve health.

Initial results show that these glowing CQDs have powerful antioxidant properties, rivalling vitamin C in neutralising harmful free radicals. While the CQDs alone showed little antibacterial effect, combining them with metals like silver or cerium is expected to unlock potent antimicrobial activity.

This research is a peek into the future of nanomedicine, where tiny, engineered particles could one day aid in drug delivery, disease prevention, and more.

PROGRAMME



Professor Val Zwiller

KTH Royal Institute of Technology

PRIS KEYNOTE SPEAKER



Dr Happy Sithole

NICIS Centre Manager

GALA DINNER KEYNOTE SPEAKER



Dr Ntsapokazi Deppa

*Executive, Scientific Services
uMngeni-uThukela Water*

GUEST SPEAKER



Professor Thomas Konrad

Director Designate, CQCTec, UKZN

SCIENCE WITH JAZZ SPEAKER

HIGHLIGHT VIDEO



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