

FACULTY OF SCIENCE

DEAN: PROFESSOR N CHETTY BSc Hons (Natal) MS PhD (U. Illinois Urbana-Champaign) MASSAf MSAIP

Doctor of Philosophy

ABDALLA, Saga Elsayed Ibrahim

Physics

THESIS: Quantum mechanical local energy density applied to many-electron systems

Building on the foundational Chetty-Martin formalism and the recent theoretical framework proposed by Martin, Chetty, and Trinkle (2025), this thesis demonstrates that the local energy density of a many-electron system is uniquely defined when derived from the full many-body Hamiltonian, showing that non-uniqueness arises only from mean-field decompositions and not from the underlying physics.

Supervisors: Professor N Chetty and Dr R Warmbier

BECK, Thilo Florian

Animal, Plant and Environmental Sciences

THESIS: Thermal biology and activity patterns of the Cape cobra (*Naja nivea*): implications for climate change
How reptiles adjust activity patterns to the thermal environment allows for prediction of their responses to climate change. This thesis investigated thermoregulatory strategies and activity patterns of free-ranging Cape cobras in the Kalahari, focusing on physiological thresholds, environmental constraints, and how body condition affected activity patterns. Biologging was used to explore the relationship between thermal biology and seasonal activity.

Supervisors: Professor G Alexander and Professor B Maritz

BERRY, Adam James

Molecular and Cell Biology

THESIS: A comparison of the influence of candidate genetic variation on rotavirus, hepatitis B and pneumococcal conjugate vaccine immunogenicity in a black South African cohort

The candidate researched associations of genetic variation in histo-blood group antigens, innate immunity, vitamin D metabolism, and HLA class II expression with vaccine responses. He found that mutations in ABO, Secretor, and Lewis blood types and IL-4 pathways significantly influenced pneumococcal and hepatitis B vaccine responses in Black South Africans. This research provides important insights for future vaccine development.

Supervisors: Dr D De Assis Rosa and Associate Professor M Groome

BROTHWELL, Jessica Sian

Molecular and Cell Biology

THESIS: Investigating a potential association between FOXP2, TBR1 and PAX6 and the effect of this interaction on transcriptional regulation

This thesis investigates how the transcription factors FOXP2, PAX6, and TBR1 interact with each other and with DNA during brain development. It reveals novel protein-protein interactions that influence DNA binding, uncovering regulatory mechanisms that may underlie autism spectrum disorders and offering insights into transcriptional control in neural differentiation.

Supervisor: Dr S Fanucchi

DAVIDS, Bianca Leigh

Chemistry

THESIS: Valorisation of phenolics obtained from cashew nutshell liquid (CNSL) for the synthesis of novel aromatic compounds

The candidate presented a PhD thesis on the sustainable synthesis of novel isochromans, flavones, and naphthalenes, derived from the renewable waste feedstock, cashew nutshell liquid - derived phenolics. By integrating greener reagents, and catalytic routes, the candidate demonstrated efficient preparation of bio-derived aromatic compounds with potential in medicinal chemistry and as UV-protective materials, thereby advancing environmentally responsible approaches to organic synthesis.

Supervisors: Professor C de Koning and Dr K Ngwira

DAYA, Tasvi

Molecular and Cell Biology

THESIS: Investigating the effects of cholesterol-depletory agent, 2-hydroxypropyl- β -cyclodextrin, on Pancreatic Cancer and drug resistance *in vitro* and *in vivo*

This study explored cholesterol metabolism's role in chemoresistance in pancreatic cancer. Using cell and animal models, the cholesterol-lowering agent HP β CD was combined with standard therapies. Findings showed that targeting cholesterol improved responses to 5-FU, highlighting a potential therapeutic strategy to overcome drug resistance in advanced pancreatic cancer.

Supervisor: Professor M Kaur

DE MAAYER, Johanna Wlihelmina

Molecular and Cell Biology

THESIS: The WHO, WHERE and HOW of the bacteriome associated with pancreatic cancer

This thesis addresses the potential relationship of the bacteriome with PDAC through the use of 16S ribosomal RNA-based metataxonomic profiling to identify a PDAC-specific microbiome. It also represents the first investigation in Africa and globally to apply whole metagenome sequencing directly to pancreatic tissue to characterise the PDAC-associated microbiome.

Supervisor: Dr A Botes

DILEBO, Kabelo Bramley

Chemistry

THESIS: Bio-renewable based synthesis of oxygen and nitrogen containing heterocyclic natural products

The research explored the sustainable synthesis of valuable natural products from bio-based materials. Utilizing cashew nutshell liquid phenolics and vanillin, he developed efficient synthetic routes to complex anthraquinones and alkaloids. His work advances sustainable chemical syntheses by demonstrating the potential of renewable feedstocks in organic synthesis, contributing significantly to the field of green and renewable chemistry.

Supervisors: Dr K Ngwira and Professor C de Koning

FAKUDE, Colani Thembinkosi

Chemistry

THESIS: Electrocatalytic properties of palladium-based high-entropy materials toward ethanol oxidation and water-splitting reactions

This work explores the rational design of Pd-based high-entropy electrocatalysts using the modified Pechini method. It demonstrates enhanced activity/durability for ethanol oxidation and water splitting reactions in alkaline environments, outperforming the benchmark of the noble metal Pd/C. This showcases their promise for versatile, next-generation sustainable energy technologies.

Supervisor: Professor K Ozoemena

GOLDFEIN, Mande

Molecular and Cell Biology

THESIS: The effect of neurodevelopmental micronutrients on the structure, DNA binding and transcriptional regulation of FOXP2

This research examines the interactions between neurodevelopmental micronutrients (retinoic acid, folic acid, PQQ) and the FOXP2 transcription factor, crucial for speech and cognition. Through comprehensive *in silico*, *in vitro*, and cell based studies, the distinct impacts of these micronutrients on FOXP2's structure, DNA binding affinity, and transcriptional activity are demonstrated. This work provides foundational evidence to guide nutritional interventions for cognitive health.

Supervisor: Dr S Fanucchi

JARVIS, Devon

Computer Science

THESIS: Not all who wonder are lost: steps towards a theory of controlled semantic cognition

This thesis investigates controlled semantic cognition (CSC) using artificial neural networks. It extends prior work from deep linear to nonlinear models, showing they replicate six CSC properties but lack systematic generalisation. Meta-learning enables this ability but sacrifices simplicity. The research highlights both the promise and limitations of neural networks in modeling human cognition, pointing to challenges in achieving the flexibility and adaptability of the human mind.

Supervisors: Professor B Rosman, Professor A Saxe and Professor R Klein

JOSHUA, Alicia Celeste

Molecular and Cell Biology

THESIS: Investigating the effects of antioxidants on the transcriptional activity of YY1 and FOXP3

The thesis deciphered how the body fine-tunes its immune response. By revealing how antioxidants and specific DNA sequences modulate the partnership between transcription factors FOXP3 and YY1, this work provides a new molecular blueprint for immune control, paving the way for innovative treatments for immune-related disorders.

Supervisor: Dr S Fanucchi

KALPAKIOTIS, Photis

Geology, Palaeontology and Geophysics

THESIS: The lithostructural delineation of the Kinsevere Hill mineral system, Katanga province, DRC

The doctorate focussed on the study of the influential links of geological structures, geochemical trends, lithological links and rheological properties to copper mineralisation at the Kinsevere Mine, Katanga Province in the Democratic Republic of Congo. This study unveils the intricate interplay of these trends with three dimensional geospatial modelling.

Supervisors: Professor J Kinnaird and Associate Professor P Nex

KOCK, Simone

Geology, Palaeontology and Geophysics

THESIS: Palaeoclimate signature from Permian and Triassic fossil woods of Southern Africa

For a thesis which uses growth rings from Permian-Triassic fossil woods to investigate climate and wood diversity trends between four Karoo-age basins in southern Africa, as well as possible climate and wood diversity correlations with the end-Guadalupian and end-Permian mass extinction events.

Supervisor: Professor M Bamford

KUBAYI, Jollet Truth

Mathematics

THESIS: On the symmetry analysis of ordinary difference equations and polynomial time fractional equations

This thesis applies Lie symmetry analysis to ordinary difference equations and polynomial time-fractional differential equations. Extending symmetry methods to higher-order recurrence relations and fractional calculus, simplifying nonlinear evolution equations. Examines third- and fifth-order time-fractional polynomial equations, deriving power series solutions and analysing their convergence. The findings enhance understanding and solution techniques with applications in mathematics computational sciences.

Supervisors: Professor S Jamal and Associate Professor M Folly-Gbetoula

LAU, Tracy Anne

Chemistry

THESIS: Molecular dynamics from slow diffraction experiments

This thesis reports on the use of X-ray diffraction to monitor the movements of molecules during photochemical or thermochemical reaction in organic charge transfer co-crystals. The information will add to the body of work regarding crystal engineering and its role in solid-state reactions.

Supervisors: Associate Professor M Fernandes and Professor D Levendis

MAPILOKO, Mabatho

Geology, Palaeontology and Geophysics

THESIS: Chromite and sulphide mineralization of the Uitloop ultramafic bodies in the northern limb of the bushveld complex, South Africa

Integrating petrological, geochemical, chromite chemistry, and multiple sulphur isotope systematics, this study resolves the stratigraphy of the Rustenburg Layered Suite on Uitloop Farm in the northern limb of the Bushveld Complex. Results reveal a previously unrecognized Platreef offshoot, establishing this area's potential for Ni-Cu-PGE resources and refining layered intrusion metallogeny.

Supervisors: Associate Professor M Ludovskaia and Associate Professor P Nex

MASEMOLA, Clinton Michael

Chemistry

THESIS: Microwave synthesis of nickel selenides and nickel sulfides supported on hollow carbon spheres and polyaniline nanocomposites for chemical sensors and hydrogen evolution reaction

Thesis explores PANI- and HCSs-based nanocomposites for environmental and energy applications. The research focuses on developing room-temperature chemiresistive sensors for volatile organic compound detection at room temperature and enhancing alkaline hydrogen production via nickel-based electrocatalysts. Using eco-friendly microwave-assisted synthesis, the study demonstrates improved sensor sensitivity, selectivity, and catalytic performance, contributing to sustainable technologies aligned with global climate and energy goals.

Supervisors: Dr E Liganiso, Professor Z Tetana and Professor N Moloto

MBONANI, Siphon Ebenezer

Animal, Plant and Environmental Sciences

THESIS: Assessing the morphological, physiological and genomic variability of *Opuntia engelmannii* Salm-Dyck (Opuntioideae: Cactaceae) populations in South Africa as the basis for host-selection by potential biocontrol agents. The candidate investigated the ecological, morphological, physiological, and genomic variability in diploid and polyploid *Opuntia engelmannii* populations in South Africa to understand their invasion success. Results show that polyploidy enhances phenotypic plasticity and expression, influencing host suitability for biological control agents. This research was conducted jointly at the University of the Witwatersrand and the University of Florida as part of a prestigious Fulbright Fellowship.

Supervisors: Professor M Byrne, Associate Professor K Glennon and Dr S Mayonde

MHLANA, Yongezile

Chemistry

THESIS: Conventional and microwave-assisted synthesis of transition metal oxides supported on nitrogen-doped multiwalled carbon nanotubes for application in hydrogen evolution and oxygen evolution reactions. Transition metal oxides supported on Nitrogen-doped multiwalled carbon nanotubes (N-MWCNTs) were explored by two approaches. The first was microwave-assisted synthesis, where cobalt oxide and iron oxide were produced and then combined with (N-MWCNTs) to form a composite. The second approach involved an in-situ preparation of mono-, bi-, and tri-metallic oxides of nickel, iron, and cobalt supported on N-MWCNTs using chemical vapor deposition. Both composites were tested for their catalytic activity in hydrogen evolution reaction and oxygen evolution reaction.

Supervisors: Professor Z Tetana, Dr L Lingano and Professor J Moma

MINNAAR, Jessica Jaime

Animal, Plant and Environmental Sciences

THESIS: Circumscription of *Galtonia* (Hyacinthaceae), a Drakensberg near-endemic genus, and potential drivers of speciation

The study assesses the generic circumscription and drivers of speciation in *Galtonia*. The monophyly of the genus is confirmed, and a new monotypic genus, *Estella saundersiae*, is described. Adaptations to ecological factors, pollinators and microhabitat differences, are reflected in their floral and vegetative traits.

Supervisors: Professor G Goodman and Professor S Steenhuisen

MMOTONG, Surprise Cleopatra

Geography, Archaeology and Environmental Studies

THESIS: Education for an emerging green economy in South Africa: perspectives on skills development in water resource management; a study of Johannesburg

The study examined the extent to which South African universities are embedding green skills in their curriculum, in response to South Africa's aspirations to be carbon neutral by 2050. The findings suggest a significant gap between curricula development and the strategic needs of the green economy, noting limited sustainability focus, insufficient practical training, and lack of specialised water resource content, thus, producing graduates who are ill-equipped and unprepared to understand the complex nature of the water sector's evolving demands.

Supervisor: Professor D Simatela

MODISANE, Kamogelo

Chemistry

THESIS: Microwave-assisted synthesis of nitrogen-doped carbon dots for applications in sodium-ion batteries

This thesis reports the microwave-assisted synthesis of nitrogen-doped carbon dots (NCDs) from citric acid and ethylenediamine, with optimisation of their structural and optoelectronic properties. It further investigates their structural evolution into carbon sheets and spheres through annealing in argon, hydrogen, and acetylene, and demonstrates their potential as sustainable anode materials for sodium-ion batteries.

Supervisors: Dr M Maubane-Nkadimeng, Associate Professor D Wamwangi and Professor N Coville

MODISE, Refiloe Petronella

Chemistry

THESIS: Microwave-assisted synthesis of iron tetrapyrrolineporphyrane and molybdenum nickel nanomaterials and their electrocatalytic properties toward tramadol oxidation and oxygen reactions

This study demonstrated a microwave-assisted method as a fast and cost-effective approach towards the synthesis of iron (ii) tetrapyrrolineporphyrane and molybdenum nickel nanomaterials, as well as their electrocatalytic performance in oxygen and tramadol reactions. The findings contributed new knowledge on the use of iron (ii) tetrapyrrolineporphyrane for next-generation rechargeable zinc-air batteries and addressed matrix effects towards the sensitive detection of tramadol in real saliva.

Supervisor: Professor K Ozoemena

MOGONONG, Buster Percy

Animal, Plant and Environmental Sciences

THESIS: Deagrarianisation in South Africa: past and current spatio- temporal trends of small-scale crop farming and its drivers of change in rural South Africa

This research assessed the spatio-temporal changes and associated drivers in small-scale crop farming in two former apartheid homelands in South Africa across multiple spatial scales, spanning across three provinces, KwaZulu-Natal, Northern Cape and Free State. The results highlighted climate variability as a driver of small-scale crop farming abandonment, and these findings were corroborated by local perceptions in the study areas.

Supervisors: Dr J Fisher, Dr G Feig, Dr H van der Merwe and Associate Professor W Twine

MOKOTO, Tebogo Matlhogonolo

Molecular and Cell Biology

THESIS: Supramolecular synthesis of cis-1-amino-2-indanol derivatives: an *in vitro* and *in silico* analysis of drug efficacy against HIV-1 South African subtype c protease

The candidate synthesised novel cis-1-amino-2-indanol compounds and elucidated the crystal structures at the molecular level. The compounds were screened for activity against the HIV-1 South African subtype C protease. The compounds showed promise as potential protease inhibitors. The work revealed supramolecular finesse, blending pharmaceutical relevance with structural artistry.

Supervisors: Professor Y Sayed and Professor M Smith

MONYATSI, Thabo Nelson

Chemistry

THESIS: An investigation on the development of ionic functionalised iron(II) complexes derived from bis(imino)pyridyl ligands for ethylene oligomerisation

This study reports on the preparation of new iron (II) complexes derived from 2,6-diiminepyridine ligands and their performance as catalysts for ethylene transformation. This research contributes new knowledge on the development of biphasic catalyst for ethylene transformation in ionic liquids.

Supervisor: Dr J Van Wyk

MOONSAMY, Darisia

Molecular and Cell Biology

THESIS: Expression profiling of interferon-stimulated genes in peripheral blood mononuclear cells derived from healthy Individuals and individuals infected with SARS-CoV-2

This work introduces SASCRiP, a robust single cell RNA-sequencing pipeline integrating widely used tools to uncover cell-type specific interferon-driven responses. In stimulated PBMCs, monocytes exhibited a unique IFN- α/β ISG signature that was described for the first time in this study. These insights deepen our understanding of type I IFN biology and its roles in diseases like COVID-19.

Supervisor: Dr N Gentle

MPHAHLELE, Malehlogonolo Ramogohlo Rosemary

Chemistry

THESIS: Silica-anchored acylthioureas and amines as adsorbents for the extraction of platinum group metals

This project explored silica-anchored acylthioureas as effective extractants for recovering platinum group metals (PGMs) from aqueous solutions simulating industrial PGMs waste. It details the synthesis and characterization of novel acylthiourea-modified silica adsorbents. The extractants demonstrated high efficiency (56-99%), selectivity, and reusability for platinum and palladium extraction in both batch and fixed-bed column systems, outperforming conventional amine adsorbents. This offers a sustainable solution to PGMs' demand and environmental pollution.

Supervisors: Associate Professor I Kotze, Dr A Mosai and Professor H Tutu

MULAUDZI, Rudzani

Computer Science

THESIS: Deep learning-based Bayesian network parameter learning approach for high dimensional and low data quality contexts

Bayesian networks, key to explainable and transparent AI, are complex to learn in high-dimensional and low-data-quality contexts. This thesis introduces Deep Parameters, a technique integrating Deep Learning into Bayesian networks to enable parameter learning in complex domains. The method excels in noisy, imbalanced, and high-dimension settings.

Supervisor: Professor R Ajoodha

MUPENDA, Mutuza Lupepe Jacques

Geography, Archaeology and Environmental Studies

THESIS: Social and entrepreneurial networks in the cross-border fish trade between Democratic Republic of Congo and South Africa

The study examines social and entrepreneurial networks in the cross-border fish trade between the Democratic Republic of Congo and South Africa, focusing on Johannesburg. It aims to map fish imports and analyse partnerships within emerging entrepreneurial firms based on interviews with 100 entrepreneurs. Key findings highlight the role of social capital and trust in EEF performance, indicating that stronger network ties contribute to success.

Supervisor: Dr A Wafer

MWENDWA, Geoffrey Mutua

Physics

THESIS: Correlation of ferroic orders in multiferroic rare-earth composite thin films

This research reveals critical temperature-dependent ferroic correlations in TbMnO₃, TbMn₂O₅, and EuTiO₃ thin films, highlighting fundamental limitations and pathways for optimizing ferroic coupling for next-generation memory and energy storage technologies. While magnetoelastic coupling is suppressed at room temperature due to weak spin-lattice interactions, measurable magnetoelectric coupling coefficients ($3 \times 10^{-9} - 10^{-8}$ V/cm·Oe) persist through local mechanisms involving short-range spin clusters.

Supervisors: Associate Professor D Wamwangi, Dr L Kotane and Professor H Dil

NDADI, Ilenikemanya Diinineni Opawa

Computational and Applied Mathematics

THESIS: A transformed wavelet numerical technique for the optimal control of geomagnetic disturbances' effects focusing on geomagnetically induced current

The thesis focused on the modelling of Geomagnetic Induced Current (GIC) in a power network with the aim of minimising the energy in the GIC signal using transformed wavelet techniques for optimal control. The results from the model revealed the time of the day when GIC is optimal. Comparisons were also made between the results of the discrete as well as the continuous wavelet transformation. The latter proves to be a good tool when it comes to GIC modelling and monitoring

Supervisors: Professor M Ali and Professor S Reju

NGXONGO, Nduduzo Andrias

Geography, Archaeology and Environmental Studies

THESIS: Climate change risk and adaptation strategies among tourism operators in Ethekeeni, South Africa

This doctoral study investigates the impacts of climate change on tourism operators in the eThekweni Metropolitan Municipality. It explores operators' perceptions of risks and adaptive responses. The research contributes to understanding climate risks and adaptation in urban tourism contexts, offering recommendations for enhancing resilience in the Global South's tourism sector.

Supervisor: Professor J Fitchett

NKUNA, Oscar

Mathematics

THESIS: Packing chromatic numbers of regular graphs

The thesis investigates packing chromatic numbers of regular graphs, characterizing cubic and quartic graphs with minimal values, establishing tight lower bounds by diameter, and constructing extremal examples. It also explores hypercube graphs, offering partial results and linking future progress to binary code availability. A general lower bound for r-regular connected graphs is provided.

Supervisors: Professor E Jonck and Professor J Hattingh

OBERHOLZER, Zane

Molecular and Cell Biology

THESIS: Identification of gonad-specific, cis-acting enhancers in *Gallus gallus*

This thesis examines the regulatory mechanisms driving avian gonadal development. Through ATAC-Seq, comparative genomics, and a novel Tol2-based enhancer reporter construct, two male-specific DMRT1 enhancers were functionally tested. The research establishes the first enhancer screening platform in chick gonads, advancing understanding of sex-determining gene regulation and offering implications for human health and poultry science.

Supervisors: Associate Professor N Nikitina and Dr D Hockman

OGADA, Jimodo Joretta

Chemistry

THESIS: Electrocatalytic properties of high-entropy inverse spinel oxides toward water-splitting reactions

This thesis explores novel high-entropy inverse spinel oxides, synthesising and characterising these nanomaterials for green hydrogen production. By optimising synthesis parameters, this work demonstrates their exceptional performance as electrocatalysts for alkaline water splitting. This research provides significant advancements in the field of sustainable energy, offering a promising pathway toward efficient and scalable hydrogen fuel generation.

Supervisor: Professor K Ozoemena

ONYEOGU, Tariye

Geology, Palaeontology and Geophysics

THESIS: Sedimentological, geochemical and palaeoclimatic significance of Lefika la Noka tufa, Cradle of Humankind, South Africa

This study applies integrated field studies, core drilling and laboratory hyperspectral imaging, sedimentological, petrographic and geochemical techniques to explore Quaternary environmental and climate variability preserved in the Lefika la Noka tufa deposits within South Africa's Cradle of Humankind.

Supervisors: Dr Z Jinnah, Dr T Makhubela and Professor L Berger

PILLAY, Ruvesh Pascal

Molecular and Cell Biology

THESIS: Investigating the role of KS-01 as an anti-cancer agent in Colorectal Cancer

Colorectal cancer (CRC) poses treatment challenges due to its heterogeneity and cholesterol-rich phenotype. This study investigates KS-01, a cyclodextrin that depletes cholesterol, in combination with 5-Fluorouracil and Oxaliplatin. KS-01 co-treatment reduces tumour size by up to 75% and inhibits WNT signalling through β -catenin and LRP5/6 downregulation. These findings highlight KS-01 as a promising novel therapeutic approach for CRC.

Supervisor: Professor M Kaur

PLAKAS, Alexandra Mary

Chemistry

THESIS: Synthesis and characterisation of novel functionalised indolin-2-ones as potential antimalarial agents

The thesis reports the synthesis of a novel series of 3-amino-3-phenethylindolin-2-ones as part of lead optimisation of the antimalarial hit compound, Cipargamin. This work identified an unusual chemoselectivity in the Grignard addition to isatin-derived imines, yielding a series of 3-imino-2-phenethylindolin-2-ols that displayed antiplasmodial activity in vitro against the drug-resistant FCR-3 strain of *P. falciparum*.

Supervisors: Associate Professor A Rousseau, Dr S Ntsimango and Professor M Bode

RATSHIEDANA, Phathutshedzo Eugene

Geography, Archaeology and Environmental Studies

THESIS: Integrating remote sensing and smart-field based approaches for assessing irrigated crop water use in arid environments

This research addresses the evapotranspiration data gap in South Africa's arid irrigated areas combining field smart measuring tools data with satellite observations. The study findings inform sustainable irrigation practices and offer scientifically validated methods that can guide agricultural water use policies, contribute to the national efforts toward climate-resilient and water-efficient food production systems.

Supervisors: Professor. Mohamed Abd Elbasit, Associate Professor E Adam and Professor J Chirima

RICHMAN, Ronald David

Statistics and Actuarial Science

THESIS: Applying deep learning in actuarial science

The thesis explores interpretable deep learning for actuarial modeling. It introduces novel architectures like LocalGLMnet, ICEnet, and multi-task networks to enhance model explainability, perform variable selection, and address issues of fairness and uncertainty quantification in actuarial practice.

Supervisors: Professor R Harris and Professor M Wuthrich

RUDRA, Anik

Physics

THESIS: Study of type IIB superstring solutions through lower-dimensional dyonically gauged supergravity

The thesis investigates supersymmetric solutions to non-geometric backgrounds in Type IIB supergravity within the specific framework of lower-dimensional gauged extended supergravity featuring 1/2-maximal SUSY vacua with marginal deformations. In this setting, we construct BPS black-holes and scale-separated solutions and uplift them to Type IIB J-fold backgrounds. We also develop a new method for systematically obtaining consistent truncations of the maximal theory, providing a controlled framework to study marginal deformations, holographic duals, and reduced low-energy models.

Supervisor: Professor K Goldstein

SELLO, Tlotliso Cornelius

Molecular and Cell Biology

THESIS: Molecular classification and next-generation sequencing analysis of potential insect parasitic nematodes and their associated gut-bacteria

Chemical insecticides pose threat to non-target organisms and lack activity as pests develop resistance against them. Therefore, more ecofriendly pest control approaches are needed. Biological pest control methods such as the use of entomopathogenic nematodes are a promising approach in the integrated pest management systems. This study focused on the identification and characterisation of potential insect parasitic nematodes and their associated bacteria.

Supervisor: Dr T Lephoto

SETATI, Boitumelo

Chemistry

THESIS: Optimisation of green extraction of Moringa leaf powder using pressurised hot water extraction and testing of the extract as biostimulants to increase food security

This research explored how Moringa leaves, extracted using Pressurised Hot Water Extraction, a green extraction technique, can be utilised to develop effective natural biostimulants. These extracts enhanced seed germination, plant growth and nutrient uptake when applied to crops. The findings offer a promising approach to reducing synthetic fertiliser use and promoting sustainable farming practices for improved food security.

Supervisor: Professor L Chimuka

SMITH, Tasha Giulia

Geography, Archaeology and Environmental Studies

THESIS: Investigating the role of mesoscale eddies on heat and carbon in the South Atlantic Ocean

This thesis investigates the role of mesoscale eddies on heat and carbon using a high-resolution (1/12°) physical-biogeochemical coupled model. It explores how different eddy types influence air-sea heat and CO₂ fluxes and storage. Eddy dynamics are investigated using tracer budgets, and the role of long-lived eddies on air-sea fluxes is explored considering regional, seasonal and life cycle variability.

Supervisor: Professor F Engelbrecht

SODZIDZI, Zizikazi

Chemistry

THESIS: Synthesis of graphene-reinforced nanocomposite polymers for building and construction technology

This thesis investigates two-dimensional nanomaterials: graphene nanoplatelets (GNPs), nitrogen-doped GNPs (N-GNPs), boron-doped GNPs (B-GNPs) and porous hexagonal boron nitride (p-BN) as nanofillers in polyvinyl chloride (PVC). Composites were synthesised by melt blending with the mentioned nanofillers. The mechanical and thermal properties of PVC were improved because 2D nanofillers offer strong interfacial interactions and can replace the conventional fillers in PVC production.

Supervisors: Professor Z Tetana, Dr S Mhlanga and Professor J Moma

SOOBRAMONEY, Lee Anne Odelle

Molecular and Cell Biology

THESIS: The genomics of the South-African entomopathogenic nematode, *Steinernema* sp. strain LAS-2021

This thesis investigates the accurate protein-coding gene repertoire of a South-African entomopathogenic nematode by acquiring the organism's whole-genome and transcriptome through next-generation sequencing and devising a unique strategy for computational genome annotation. This thesis is the first to predict the lowest number of evidence-supported protein-coding genes for a steinernematid species and establishes a new standard for future steinernematid genome projects.

Supervisor: Professor V Gray

SZEWCZUK, Alekzandra Mari

Animal, Plant and Environmental Sciences

THESIS: Mapping and modelling invasive alien plants at landscape scales: remote sensing applications of distribution maps and ecological niche models using Google Earth Engine

Combining remote sensing classification with ecological niche modelling in Google Earth Engine, this work delivers a scalable method for monitoring invasive plants. The novel contribution is the first landscape-scale, growth-pattern-driven, satellite-based classification of invasive alien plants. Case studies on pompom weed and invasive Tamarix trees show improved accuracy by tracking phenology of species over time, enabling evidence-based management across South Africa.

Supervisors: Professor E Witkowski and Professor M Byrne

TORPEY, David

Computer Science

THESIS: Towards understanding visual self-supervised learning: robustness, properties, and applications

The behaviour and properties of visual self-supervised learning (SSL) is not well-understood, particularly in comparison to supervised learning. Various factors of SSL were explored, including covariance properties, viewpoint invariance, performance in non-natural, non-object-centric domains, and model type analyses. It was found that SSL was more viewpoint invariant, benefitted from transformation covariance, and had mixed benefits in non-natural domains.

Supervisor: Professor R Klein

WEISS, Bailey Mark

Geology, Palaeontology and Geophysics

THESIS: The origin of crocodylomorpha: growth history, systematics, and body size evolution

The research sought to understand the relationships, growth, and evolution of early crocodilians from South Africa's Elliot Formation. Using cutting edge micro-CT images, osteohistology, and comparative anatomy, he described a new gigantic predator, developed a hypothesis for the evolution of crocodilian growth, and clarified the identity of historical specimens collected more than 100 years ago.

Supervisors: Professor J Choiniere, Professor J Botha and Dr K Dollman

WHITTAKER, Gregory Angus

Statistics and Actuarial Science

THESIS: Equity in compensation for damages in delict

This thesis addresses inequities in South African delictual compensation by advancing data-driven contingency modelling, expanding actuarial participation through the *amicus curiae* mechanism, reforming compensation for non-serious injuries, and promoting evidence-based actuarial costing for medical malpractice claims. These methodologies enhance equity and strengthen sustainability in the assessment of pecuniary losses and policy reform.

Supervisor: Professor R Harris

ZOWA, Peace

Geology, Palaeontology and Geophysics

THESIS: An apatite to unravel magma chamber dynamics, mantle sources and metallogenesis in the Bushveld Complex

The research explores how the world's largest layered intrusion, the Bushveld Complex, and its satellite bodies formed. By analysing apatite mineral chemistry, his research uncovered evidence of mixing between different magmas and contamination from surrounding rocks. results reveal significant strontium-neodymium isotopic variability and decoupling in apatite, contrasting homogeneous zircon hafnium data. These findings provide fresh insights into how these ancient magmatic systems evolved and became enriched in valuable metals such as PGEs.

Supervisors: Professor G Bybee and Dr B Hayes