

FACULTY OF SCIENCE

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

Doctor of Philosophy

ABDULLA, Naaziyah

Molecular and Cell Biology

THESIS: Delineating the role of cholesterol in colorectal cancer progression and CD8+ T-lymphocyte functionality in a South African patient cohort

The thesis investigated cholesterol metabolism as a key immunometabolic regulator in colorectal cancer progression and immune evasion within a South African context. Employing patient-derived organoid and CD8 T-lymphocyte co-cultures, The candidate identified stage-specific metabolic dependencies and demonstrated that cholesterol modulation, particularly with 2-hydroxypropyl- β -cyclodextrin (HP β CD), can enhance anti-tumour immunity and reprogram immune-cold tumours towards a state of responsiveness.

Supervisor/s: Prof M Kaur

AHMED, Alhussein Mohamed Alhussein

Computational and Applied Mathematics

THESIS: Symmetries, conservation laws, solitons and numerical analysis for classes of PDEs in applications
This thesis investigates classes of nonlinear partial differential equations arising in applied mathematics and physics. It employs symmetry analysis, conservation laws, soliton theory, and numerical methods to derive exact and approximate solutions. Applications include heat transfer through fins, chemotaxis models, and nonlinear wave equations, providing insights into the analytical structure, physical behaviour, and computational modelling of complex systems.

Supervisor/s: Prof R Moitsheki and Prof A Kara

BEUKES, Philip Rudolph

Physics

THESIS: Radiation protection basis of design for the South African isotope facility

The thesis examines the radiological protection basis of design for the brownfield redevelopment of a legacy hadron therapy facility into a cyclotron-driven radioisotope production facility. By integrating Monte Carlo simulations, in-situ radiation measurements and risk-based engineering, it characterises prompt radiation sources, validates shielding performance and optimises structural shielding and labyrinth design. The work delivers ALARA-compliant solutions, supports regulatory assurance and advances the safe, sustainable production of radioisotopes for nuclear medicine applications in high-intensity accelerator environments.

Supervisor/s: Prof M Wiedeking

CHAUKE, Hleko

Chemistry

THESIS: Development of graphene-based SERS substrate for monitoring levels of glucose and cholesterol

This study advances highly sensitive chemical sensing technologies by developing graphene and silver nanostructures for surface-enhanced Raman spectroscopy. The results demonstrate that silver nanowires significantly improve glucose and cholesterol detection, while highlighting graphene as a viable alternative sensing platform. These findings contribute to the development of more accurate, accessible diagnostic and analytical tools.

Supervisor/s: Dr S Nyembe, Prof L Sikhivhilu and Prof N Moloto

CHIILA, Litruda

Geography, Archaeology and Environmental Studies

THESIS: Perspectives on adaptive strategies to climate change and variability among the youth in street situations in Lusaka's central business district in Zambia

This study investigated the myriad ways in which changes in climate variability impact the youth in street situations (YISS) in Lusaka's CBD and how they respond in building their adaptive capacity and resilience. The findings suggest that the YISS are not passive actors but are actively involved in responding to climate change challenges through the deployment of various assets such as social networks. These findings have been shared in two publications.

Supervisor/s: Prof D Simatele and Dr E Imasiku

DAKA, Chisomo

Physics

THESIS: Variational quantum convolutional neural network framework for near-term quantum-classical simulations. "Applications in simulation of diamond NV center Hamiltonian, quantum phase recognition and quantum-enhanced image classification"

This research advances quantum computing and machine learning through the development of the novel quantum convolutional neural network (No-QCNN) framework. By conceptualising a quantum ready QML workflow that addresses NISQ-era constraints, this work demonstrates practical quantum utility using noise-resilient, physics-informed variational quantum circuits. The framework successfully models diamond NV center dynamics, detects criticality and topological phases in many-body systems, and enhances low-data image classification through implicit regularisation. This thesis establishes hybrid quantum-classical architectures as viable pathways toward scalable quantum-native computation.

Supervisor/s: Prof S Bhattacharyya

DLAMINI, Sibusiso Trevor

Animal, Plant and Environmental Sciences

THESIS: Soil microbial dynamics in response to fire and warming in Afromontane Grassland of South Africa

This thesis investigated how fire and global warming shape plant-microbial interactions in South Africa's high altitude Maloti-Drakensberg grasslands. Through long term experiments, it reveals how soil microbes, carbon processes, and grasses respond to fire and warming. By showing how resilience is sustained from microbes to grass species, this research advances ecological understanding and informs climate adaptive conservation of these vital mountain ecosystems.

Supervisor/s: Dr S Situngu and Dr M te Beest

GERBER, Jacques

Geology, Palaeontology and Geophysics

THESIS: Quality of preserved microanatomical structures in fossilised woody material

Scanning electron microscopy of selected fossil woods from different ages and types of preservation showed that plasmodesmata were very rarely preserved in plants. Charcoal buried under anoxic conditions was found to be best at preserving cell wall surfaces. Thermal spring travertine preserved calcite leaf endocasts also preserved plasmodesmal pits. A pyrolysed wood from the Permian confirmed the unique anatomy of the group that was the major component of southern hemisphere coals.

Supervisor/s: Prof M Bamford

GOMO, Sikelela

Geology, Palaeontology and Geophysics

THESIS: Tackling select mining challenges using near-surface geophysical imaging

This thesis evaluates near-surface geophysics to enhance subsurface understanding, safety, and operational efficiency in challenging mining conditions. Integrated geophysical data, including magnetics, seismics, resistivity, and ground-penetrating radar, reduce geological uncertainty, delineate hazards, and support decision-making. Research conducted at mines in the Bushveld Complex and Witwatersrand Basin validates these approaches.

Supervisor/s: Prof G Cooper, Aspf M Manzi and Dr R Durrheim

GOVENDER, Verona

Animal, Plant and Environmental Sciences

THESIS: Floral factors influencing pollinator visitation and efficacy in selected species of grass aloes, and the role of colour in pollinator-driven diversification in aloes

Pollinator-mediated floral evolution in threatened grass aloes, integrating ecological and macroevolutionary analyses, is the focus of this study. While floral traits shape pollinator interactions and reproductive success, outcomes are dependent on temporal variability, antagonistic interactions, and fire disturbance. Flower colour in Aloe reflects ecological flexibility rather than directional, pollinator-driven macroevolutionary change.

Supervisor/s: Aspf G Goodman and Prof E Witkowski

HARTMAN, Raymond Michael

Molecular and Cell Biology

THESIS: Structural and functional insights into the TBR1 DNA-binding domain: crystallisation with DNA and FOXP2 FHD

The research provides a molecular characterisation of how transcription factors TBR1 and FOXP2 regulate DNA binding. Integrating structural biology, biophysics, and computational modeling, demonstrated subtle allosteric changes within TBR1 influence partner interactions. This work establishes a mechanistic framework for understanding how regulatory disruptions contribute to complex neurodevelopmental disorders like autism. Ultimately, these findings provide a vital foundation for future advances in molecular neurogenetics and precision genomic medicine research.

Supervisor/s: Aspf S Fanucchi

IDRIS AHMAD, Ismail Abdalla

Geography, Archaeology and Environmental Studies

THESIS: Urbanisation and surface urban heat island dynamics in a hot-arid region: an earth observation study of Khartoum State, Sudan

Rapid urbanisation in Khartoum State, Sudan, has intensified urban thermal stress in its hot-arid environment. Using multi-temporal EO data (1982–2025) and GEE, this study analysed urban growth, land surface temperature, SUHI intensity, blue-green infrastructure effects, and thermal discomfort. Results show rapid built-up expansion, increasing summer temperatures, and worsening heat stress. Water bodies provided stronger cooling effects than vegetation, while bare land exhibited the highest temperatures. The findings support climate-responsive urban planning and targeted heat mitigation strategies in arid cities.

Supervisor/s: Prof E Adam

KABISA, Mulako

Animal, Plant and Environmental Sciences

THESIS: Exploring preferable nature futures for biodiversity and climate governance in the Barotse cultural landscape

This study explored visions of nature futures in the Barotse Cultural Landscape of Zambia using the Nature Futures Framework. It showed that co-produced qualitative narratives can have plural values that integrate indigenous and local knowledge for potentially transformative pathways that meet biodiversity and climate aspirations in social-ecological systems.

Supervisor/s: Prof L Pereira and Aspf G Karuri-Sebina

KADER, Zubayr

Molecular and Cell Biology

THESIS: Genomic analysis of South African colorectal cancer patient samples using whole genome sequencing and RNA sequencing

Colorectal cancer (CRC) continues to exhibit an increase in local and global incidence, yet a notable research gap exists for African genomic databases. The study aims to address the research gap through generation and analysis of Whole Genome and RNA sequencing data of local South African patient tissue samples to elucidate the molecular landscape of CRC, as well as discover novel potential biomarkers.

Supervisor/s: Prof M Kaur, Aspf A Choudhury and Prof C Kinnear

LAWRIE, Graham David

Physics

THESIS: The study of the neutral hydrogen content of galaxies across cosmic time

This thesis investigates the neutral hydrogen content of galaxies across cosmic time to trace galaxy evolution. Utilising the MeerKAT radio telescope, the research identifies a local galaxy group serendipitously, and achieves the highest-redshift detection of HI emission at $z \sim 0.725$ via gravitational lensing. Additionally, it highlights commensal radio continuum science by characterising the diffuse radio halo in Abell 370.

Supervisor/s: Prof R Deane

LE ROUX, Wilhelm Heinrich

Chemistry

THESIS: Investigating metal-polymer composites for the alkaline hydrogen evolution reaction
Poly(vinyl alcohol) (PVA) was investigated as a sustainable alternative binder for the alkaline hydrogen evolution reaction (HER). The study first examined PVA-based hydrogels to assess their influence on substrate-driven HER activity. Subsequently the focus shifted to PVA films, evaluating how the molecular weight and loading of the polymer, together with the electrocatalyst composition (noble versus non-noble), affected electrochemical performance. Overall, this work broadened the binder “toolbox” and advanced development in the field.
Supervisor/s: Dr A Falch, Dr R Pfukwa and Prof JJ Weigand

MAAKE, Reabetswe

Molecular and Cell Biology

THESIS: Structural and functional insight into *Klebsiella pneumoniae* protein adenylyltransferase through biophysical and computational modelling analysis: a proof of concept

This thesis characterised protein adenylyltransferase from *Klebsiella pneumoniae* (KpPrAT) using biochemical, spectroscopic, thermodynamic, and computational approaches. The study examined its structure, ligand binding, thermostability, conformational dynamics, and catalytic activity. Findings confirmed the enzyme’s AMPylation capability and demonstrated its potential role in regulating post-translational modification, supporting future therapeutic-targeting studies.

Supervisor/s: Aspf I Achilonu

MACUNGO, Zanildo Augusto

Geology, Palaeontology and Geophysics

THESIS: The early evolution of Gorgonopsia (Therapsida, Synapsida), new data from the middle Permian of South Africa and early late Permian of Mozambique

This thesis reassesses the early evolution, diversification, and macroevolutionary history of gorgonopsians through new fossil discoveries, phylogenetic analyses, and quantitative comparative methods. It demonstrates that large-bodied and ecologically diverse gorgonopsians evolved earlier than previously recognised, fundamentally redefining their role in Permian terrestrial ecosystems across Gondwana before the end-Permian mass extinction.

Supervisor/s: Aspf J Benoit and Prof R Araújo

MAGAGULA, Sebenzile Pretty Engelinah

Physics

THESIS: Indirect experimental method for constraining the $^{193,194}\text{Ir}(n,\gamma)$ cross sections and s-process branching point 192Ir

This work focused on calculating the neutron capture cross sections and Maxwellian averaged cross sections of the 193,194 Iridium isotopes. The cross sections were

constrained using gamma-ray strength functions and nuclear level densities extracted through the Oslo method.

These statistical nuclear properties were then incorporated

into the Hauser-Feshbach formalism to compute

the neutron capture cross sections. The resulting Maxwellian averaged cross sections were subsequently applied in astrophysical calculations to predict the overproduction of the s-only platinum isotopes. Notably, this study reduced the model uncertainty in the overproduction of the 192Pt isotope by up to 20%.

Supervisor/s: Prof M Wiedeking, Aspf L Pellegrini and Prof BV Kheswa

MAGOLEGO, Isaac Selaelo

Physics

THESIS: MeerKAT’s view of galaxy clusters in the South Pole Telescope 100 square degree deep field survey

This thesis presents a comprehensive study of diffuse radio emission in galaxy clusters using deep MeerKAT observations of the South Pole Telescope survey. It reports the discovery of two ultra-steep spectrum radio halos, including the highest-redshift example known, and a radio relic in a low-mass merging cluster. Statistical upper-limit analysis provides new constraints on their occurrence. These results extend the known parameter space of cluster-scale synchrotron emission, support turbulence-driven particle acceleration models, and led to discovery papers in MNRAS letters.

Supervisor/s: Prof R Deane and Dr K Thorat

MAMPANE, Lizzie

Chemistry

THESIS: Synthesis of two-dimensional graphitic carbon nitride and tungsten disulfide nanomaterials for applications in electrochemical sensing, adsorption, photocatalysis, and RO desalination membrane

The thesis investigates the controlled synthesis of few-layer g-C₃N₄ and monolayer WS₂ nanosheets, evaluating their enhanced electrochemical, photocatalytic, and filtration properties, with WS₂ showing superior catalytic performance and scalability for water treatment.

Supervisor/s: Prof N Moloto and Prof L Sikhwivhilu

MARAKALLA, Paballo Marry

Geology, Palaeontology and Geophysics

THESIS: Assessment of radon and associated radionuclides in the vicinity of gold and coal mines, South Africa
This research quantified radon, a radioactive gas of significant health concern, in gold mining areas of the Gauteng Province and coal mining regions of the Mpumalanga Province where the status of public exposure was largely unknown. The study identified key factors influencing indoor radon concentrations, developed models describing the relationship between uranium and radon, established seasonal adjustment factors, produced regional indoor radon maps and assessed public radiological exposures to support radiological risk assessment and inform regulatory decision-making for radiological protection.

Supervisor/s: Prof T Abiye

MLILO, Trust

Geography, Archaeology and Environmental Studies

THESIS: Indigenous voices, collective memory and heritage management on the Makgabeng and Mapungubwe Cultural landscape in South Africa

The study sought to highlight gaps in implementing decoloniality and indigeneity approaches within South African heritage management. The research also explored indigenous perspectives. Additionally, it examined decolonisation of nomenclature and its connection with indigenous cultural practices. It employed qualitative and quantitative methods using two case studies. The research highlighted that the implementation of these concepts is problematic, and coloniality persists.

Supervisor/s: Dr C Namono and Dr N Ndlovu

MOODLEY, Dylan

Molecular and Cell Biology

THESIS: Synthetic reconstruction of the cannabinoid biosynthetic pathway in *Komagataella phaffii*

This research reconstructed the cannabinoid biosynthetic pathway in *Komagataella phaffii* using 2A-mediated polycistronic expression, enabling the production of olivetolic acid and cannabigerolic acid. Additionally, a novel cannabidiolic acid synthase from the Swazi Gold *Cannabis sativa* landrace was characterised, providing insights into cannabinoid biosynthesis, enzyme characterisation and microbial metabolic engineering.

Supervisor/s: Dr A Botes

MOYO, Mthokozisi Shelton

Animal, Plant and Environmental Sciences

THESIS: Wet-dry seasonality as a selective force and driver of ecosystem processes in Africa

Wet-dry seasonality drives ecological structure and function in African ecosystems, shaping species traits, community composition and vegetation patterns. The study evaluates seasonality metrics and their spatial patterns across the continent. It examines functional traits associated with seasonal water limitation across taxa, and how species composition and vegetation distribution respond to variation in seasonality and rainfall.

Supervisor/s: Prof S Archibald, Aspf J Muvengwi and Dr R Scholes

MPATANI, Ongeziwe

Physics

THESIS: Optical properties and hyperfine interactions in Si- and Fe-doped $\text{In}_x\text{Ga}_{1-x}\text{N}$

$\text{In}_x\text{Ga}_{1-x}\text{N}$ is a versatile III-V alloy with a tunable band gap, widely used in optoelectronic devices. This study investigates the effects of Fe doping in $\text{In}_{0.10}\text{Ga}_{0.90}\text{N}$ (and $\text{In}_x\text{Ga}_{1-x}\text{N}$ at different concentration), focusing on lattice sites, charge states, and magnetic properties using emission Mössbauer spectroscopy. It also explores how alloying and Si doping affect the optical properties of $\text{In}_x\text{Ga}_{1-x}\text{N}$ thin films, highlighting their roles in enhancing electronic properties while addressing potential disorder and its impact on carrier localisation and dynamics.

Supervisor/s: Dr H Masenda

MPHEPHU, Rotondwa

Chemistry

THESIS: Synthesis and catalytic applications of Ruthenium(II) and Nickel(II) pyrazolyl-pyridine complexes in dehydrogenation, transfer hydrogenation and water oxidation reactions

This thesis investigated the design and application of Ruthenium(II) and Nickel(II) complexes in sustainable energy-related transformations, with a focus on formic acid dehydrogenation, transfer hydrogenation of ammonia borane, and electrochemical water oxidation. The study provides insights into the catalyst structure, activity and reaction mechanisms. The findings contribute to the development of efficient catalytic systems for hydrogen generation, hydrogen transfer processes and renewable energy conversion, advancing the role of transition metal complexes in addressing global energy and sustainability challenges.

Supervisor/s: Aspf A Swarts

MUDEDE, Marko Freddy

Animal, Plant and Environmental Sciences

THESIS: Mapping the impact of the polyphagous shot hole borer (*Euwallacea fornicatus*) on infested and vulnerable urban trees using remote sensing in the City of Johannesburg, South Africa

The candidate investigated the value of Citizen Science, Google Street View, and satellite remote sensing to detect, map and monitor Polyphagous shot hole borer, an introduced pest of trees in Johannesburg's urban forests. The shot hole borer was first detectable in 2017 via Google Street View. Citizen Science effectively complements traditional pest surveillance, and satellite imagery allows monitoring of invasive pests and urban forest management.

Supervisor/s: Prof M Byrne, Prof K Abutaleb and Aspf S Newete

NDALISO, Xola

Physics

THESIS: Neutral hydrogen and x-ray signatures of environmental impact on galaxies in dense environments

The thesis develops and validates a semi-automated pipeline for modelling the neutral hydrogen kinematics of galaxies using MeerKAT observations and cosmological simulations. Applying the pipeline to galaxies in the Abell 3408 cluster and its surrounding environments, the study investigates the impact of environment on galaxy evolution, identifies evidence of ram-pressure stripping, and examines galaxy scaling relations. The work provides a scalable framework for analysing the large datasets expected from current and future radio surveys.

Supervisor/s: Prof R Deane and Prof E Elson

NETSHIYA, Adivhaho Andrew

Physics

THESIS: The photon strength functions from (p, γ) capture reactions

This thesis successfully utilised the $^{50}\text{Cr}(p,\gamma)^{51}\text{Mn}$ proton-capture reactions to measure the Photon Strength Function (PSF) of ^{51}Mn using the Average Resonance Proton Capture (ARPC) and Shape methods. The PSF was used as input in the Hauser-Feshbach statistical model to indirectly calculate $^{50}\text{Cr}(p,\gamma)$ cross-sections which agree with those measured directly. The study also reports 171 newly measured relative intensities, 46 newly assigned multiplicities and 37 newly observed levels.

Supervisor/s: Prof M Wiedeking and Aspf L Pellegrini

NIEMANN, Hendrik Johannes

Animal, Plant and Environmental Sciences

THESIS: Where there's smoke, there's polyploidy: fire as a driver of genome size evolution in southern African Hypoxidaceae

This thesis highlighted fire's key role in plant genome evolution. Integrating phylogenomics, genome size data, and experimental evidence, it demonstrates that fire can promote polyploid formation and persistence in southern African Hypoxidaceae, advancing our mechanistic understanding of species diversification in fire-prone ecosystems.

Supervisor/s: Aspf K Glennon

O'CONNOR, Ryan

Chemistry

THESIS: Triplite ($\text{Mn}_2\text{PO}_4\text{F}$) as an efficient electrode material for Pseudocapacitors and zinc-ion batteries

This thesis investigates triplite manganese fluorophosphate ($\text{Mn}_2\text{PO}_4\text{F}$, MPF) as a versatile electrode material for aqueous energy storage. MPF is evaluated as a positive electrode in asymmetric supercapacitors, where surface modifications improve charge-transfer kinetics and cycling stability, and as a cathode in aqueous zinc-ion batteries, where it delivers exceptionally high capacity through a combination of bulk ion insertion, dissolution-deposition, and pseudocapacitive mechanisms. The work establishes MPF as a promising, low-cost fluorophosphate electrode adaptable in both high-power and high-energy electrochemical energy storage.

Supervisor/s: Prof K Ozoemena and Dr D Barrett

PALMER, Katharine Mary

Mathematics

THESIS: The probabilities of mapping errors for different seeding algorithms in genetic sequence alignment: a combinatorial approach

This thesis uses combinatorial techniques such as transfer matrices and weighted generating functions to estimate the probabilities of certain mapping errors being produced by the seeding algorithms used in the alignment of genetic sequences. This results in the development of a computationally efficient method for estimating the probability of such alignment errors, catering for a range of modern seeding algorithms and underlying sequencing technologies. This has the potential to enable further optimisation of seeding algorithms.

Supervisor/s: Aspf M Archibald

RABBANI, Fehmida Qaddus

Geography, Archaeology and Environmental Studies

THESIS: Recycling in the city: itinerant informal recyclers in Johannesburg

This thesis explores the spatial practices and resilience of itinerant informal recyclers in Fietas, Johannesburg, during COVID-19. Through ethnographic methods, it reveals how their movements reconfigure urban space and challenge exclusion. The study reframes informal recyclers as agents of sustainability and calls for inclusive urban policies recognising their contributions to resilience and justice.

Supervisor/s: Dr A Wafer and Aspf Raeesa Moolla

RAMAREMISA, Gibbon Khathutshelo

Chemistry

THESIS: Microplastics in water: determination of their occurrence, sources, distribution, and modelling of their physical-chemical behaviour

The research investigated the occurrence, sources, distribution, and physical-chemical properties of microplastics in tap water, groundwater, bottled water and beverages. Microplastics were detected mainly as PE, PET, and PP fibres. Further, experimental data from the adsorption of metals onto microplastics were used to calibrate PHREEQC–PEST models and simulate metal–microplastic interactions and environmental behaviour.

Supervisor/s: Dr D Saad and Prof H Tutu

RAMPJAPEDI, Maria Tebogo

Geography, Archaeology and Environmental Studies

THESIS: Assessing the role of institutional & policy frameworks in the management of absorbent hygiene product waste in South Africa: a case study of the Polokwane Local Municipality

The study explored the institutional and policy frameworks for Absorbent Hygiene Product (AHP) waste management. It identified barriers that hinder sustainable practices of AHP waste management. The study proposed an urgent need to categorise AHP waste as a waste stream and develop targeted policy aligned with principles of 4R theory to achieve sustainable AHP waste management.

Supervisor/s: Prof D Simatele

RASAKANYA, William Tabudi

Physics

THESIS: Exotic radio source morphologies in the MeerKAT-South Pole telescope UHF 100 square-degree survey
The research explores rare and unusual radio galaxies discovered using the MeerKAT radio telescope, revealing how supermassive black holes interact with their cosmic environments. By studying rare galaxy shapes, bent radio jets, and ancient radio emission across deep sky surveys, the research provides new insight into galaxy evolution, large-scale cosmic structures, and the growth of galaxy clusters in the early universe. The work also demonstrates the power of next-generation radio astronomy surveys to uncover previously hidden populations of galaxies.

Supervisor/s: Prof R Deane and Dr K Thorat

SEMANE, Shibre Sete

Physics

THESIS: A WIMP dark matter search in dwarf galaxies of the local group using the MeerKAT telescope

The research covered one of the open problems in astrophysics and cosmology - the particle nature of dark-matter using the MeerKAT telescope. The work delivers the first MeerKAT constraints on dark-matter properties in dwarf-galaxies, establishes improved limits, advances the methodology for radio dark-matter searches, and lays important groundwork for the next-generation instruments like the Square Kilometre Array.

Supervisor/s: Dr G Beck and Dr S Makhathini

SIBIYA-ZULU, Nozipho Patience

Animal, Plant and Environmental Sciences

THESIS: Understanding climate risks with local communities: the case of eMadlangeni, KwaZulu-Natal

Climate change poses significant risks globally, particularly for rural communities, which face heightened vulnerability to extreme weather events. This research explores how Indigenous and Local Knowledge systems strengthen community resilience to climate-induced disasters in eMadlangeni, South Africa. Using qualitative methods, the study demonstrates that ILK is rooted in cultural, moral, and coping practices, evolving across generations. This thesis highlights the value of integrating indigenous, local, and scientific knowledge for inclusive, context-specific, effective disaster risk reduction and climate change adaptation strategies.

Supervisor/s: Prof C Vogel and Dr C Mandikonza

TSEKELI, Tebogo Retsepire

Chemistry

THESIS: Multi-functional roles of microwave irradiation on manganese-rich and lithium-manganese-rich nickel manganese cobalt layered oxides as cathode materials for lithium-ion batteries

This thesis demonstrates microwave irradiation as a powerful, sustainable, and cost-effective method for synthesising high-performance manganese-based lithium-ion battery cathodes. This approach significantly improves electrochemical properties, including cycling stability, energy density retention, and kinetics, while mitigating voltage decay and shortening synthesis times. It offers a crucial pathway for developing next-generation LIB materials.

Supervisor/s: Prof K Ozoemena and Dr A Haruna

TSHIVHASE, Fhatuwani Thomas

Geography, Archaeology and Environmental Studies

THESIS: Perspectives on license compliance and enforcement in sustaining the lifespan of landfills in South Africa: a study of the City of Tshwane, Gauteng Province

The study investigated landfill license compliance and enforcement in the City of Tshwane, South Africa. The findings suggest that poor governance systems coupled with weak implementation, limited capacity, lack of funding, and reactive enforcement reduce landfill lifespan. The findings have been shared in three international journal publications.

Supervisor/s: Prof D Simatele and Dr N Kubanza

TSHIVHASE, Funani

Geography, Archaeology and Environmental Studies

THESIS: Assessing the impacts of flooding on informal settlements: a case study of Zakheleni Informal Settlements in Umlazi S-S3 Township, eThekweni Metropolitan Municipality, Kwazulu-Natal, South Africa

This thesis examines the socio-economic and environmental impacts of recurrent flooding in eThekweni's Zakheleni informal settlement. Using mixed-methods and geospatial mapping, the research highlights how systemic inequality and fragmented governance exacerbate community vulnerability. While residents employ localised coping mechanisms, institutional responses remain largely reactive and insufficient. The study advocates for a shift toward proactive, participatory governance that integrates community knowledge with infrastructural investment. Ultimately, it emphasises that sustainable resilience requires addressing the structural drivers of urban marginalisation and climate risk.

Supervisor/s: Dr N Kubanza

WRIGHT, Sarah Joy

Chemistry

THESIS: The synthesis of cyclobutenones and their nucleophilic and annulation reactions

The study describes the synthesis of cyclobutenones, obtained through the [2+2]-cycloaddition reaction of alkynes and ketenes and their unusual nucleophilic reactions. Further derivatisation of the brominated-analogue via the Suzuki coupling reaction provided a novel route to cyclobutenedienones. The candidate investigated transannular reactions of cyclobutenones, enroute to bicyclo[1.1.0]butanes, uncovering an unprecedented SmI₂-induced cyclobutenone dimerisation.

Supervisor/s: Dr M Zimuwandeyi and Dr S Ntsimango