

PROVISIONAL GRADUATION LIST

Graduation Date: 09 December 2024
Time: 09:30

The purpose of the provisional list is for you to check that **all** of your personal and academic details such as your name(s) and the title of your thesis, as well as the record of supervisor(s) is correct. Your names should appear as reflected in your ID or Passport. It is too late to correct these when the final graduation list is published.

FACULTY OF SCIENCE

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

Doctor of Philosophy

ALTOOM, Mohammed Bashir Adam

Geography, Archaeology and Environmental Studies

THESIS: Mapping and monitoring the impacts of climate variability on rainfed agriculture in Semiarid North Darfur, Sudan

The study integrates multi-source remote sensing data with machine-learning algorithms to understand the impact of rainfall variability and drought on rainfed agriculture dynamics in North Darfur, Sudan. It demonstrates remote sensing's capability in modelling these impacts. The thesis produces four research articles, with two published and two under review.

Supervisor: Associate Professor E Adam

CHABALALA, Yingisani Winny

Geography, Archaeology and Environmental Studies

THESIS: Integrating Sentinel-1/2 and machine learning models for mapping fruit tree species in heterogeneous landscapes of Limpopo

The research addresses uncertainty in modelling fruit tree spatial distribution using remote sensing data in Limpopo Province. The study illustrates the effectiveness of combining multisource remote sensing data with state-of-the-art deep learning algorithms to better understand tree crops in the heterogeneous smallholder landscape. The findings, which contribute to sustainable agricultural development, resulted in four articles published in the ISI journal.

Supervisor: Associate Professor E Adam

DUMELA, Khombo Eunice

Physics

THESIS: Optimisation of prostate plan in a pelvic prosthesis phantom

This project involves the design, development and fabrication of in-house pelvic phantom used to experimentally evaluate the high energy LINAC radiation therapy dose distribution of prostate cancer for specific patients with titanium hip prosthesis. The findings were highly commendable and compared with the state-of-the-art EGSnrc Monte Carlo simulation, which constitute a major advance in the field of medical physics.

Supervisors: Associate Professor I Usman and Professor O Oderinde

GAOLATLHE, Lesego

Chemistry

THESIS: Synthesis and electrochemical properties of high-entropy spinel oxides, cobalt atomic clusters and zinc oxide as electrode materials for rechargeable zinc-air batteries

This thesis investigated two types of cathode materials in RZAB applications: (a) cobalt carbon composites of (i) cobalt atomic clusters (Co AC@C_{BPDC}) and (ii) cobalt nanoparticles (Co NP@C_{BPDC}), and (b) high-entropy spinel oxide (HESOX). The activities of these materials toward oxygen reduction reaction (ORR) and oxygen evolution reaction (OER) were investigated in both half- and full-cell configurations as a proof-of-concept in RZAB cells in alkaline electrolyte. Considering that conventional zinc plate has several short-comings as an anode for RZAB, a new material, polydopamine-derived carbon-coated zinc oxide (ZnO@PDA-DC), was also synthesised and applied in RZAB as a possible alternative anode to the popular zinc plate.

Supervisor: Professor K Ozoemena

HAYLOCK, Kiara Avelyn

Animal, Plant and Environmental Sciences

THESIS: Behavioural and physiological responses of sable antelope to heat and aridity

This thesis quantitatively examined sable antelopes' behavioural and physiological responses to environmental stressors in Bwabwata National Park, Namibia. Using biologging and GPS tracking, the candidate found that during hot, dry conditions, sable made long journeys to water while reducing foraging time, with body temperature fluctuations indicating both dehydration and energy stress, highlighting challenges faced by water-dependent grazers under climate change.

Supervisors: Associate Professor R Hetem and Professor F Parrini

KUMALO, Sandile

Physics

THESIS: Efficiency enhancement in photovoltaic devices using light management and morphology tuning

The thesis addresses the critical challenge of meeting global energy demands through advanced solar technologies. By utilising plasmonic, magnetoplasmonic, and core-shell nanostructures, as well as optimising organic solar cell morphology with solvents, significant improvements in power conversion efficiency (PCE) are achieved, showcasing potential advancements in solar energy technologies.

Supervisors: Associate Professor D Wamwangi and Professor A Quandt

KUNG'U, Mercy Wambui

Molecular and Cell Biology

THESIS: Exploitation of natural resistance genes, mutation and phytosanitation to eliminate Cassava

Geminiviruses

The thesis describes innovative and novel approaches of mitigating cassava mosaic disease (CMD). The study revealed seven resistance genes that are responsible for CMD resistance. The effectiveness of hydrogen peroxide, hot water and salicylic acid treatment in elimination of CMD and the effectiveness of ethyl methane sulfonate in inducing mutation for genetic resistance to CMD was also explored.

Supervisors: Professor M Rey and Professor E Nyaboga

LANDWEHR, Gregory Brent

Geography, Archaeology and Environmental Studies

THESIS: The wind energy potential of South Africa's Eastern Cape Province in a changing climate

This thesis develops methodologies to assess the impact of climate change on South Africa's wind energy production potential by analysing synoptic drivers and projecting changes in circulation patterns. Focusing on the Eastern Cape, it quantifies wind energy production under different synoptic conditions, showing a decrease in future potential due to shifts in circulation patterns linked to the Hadley cell expansion.

Supervisors: Professor F Engelbrecht and Dr C Lennard

LESAOANA, Mahadi

Chemistry

THESIS: Application of oxidative enzymes in membrane systems for the bioremediation of triazines in wastewater

The research tackles the global concern of environmental contamination by s-triazine herbicides, which pose significant risks to ecosystems, water quality, and human health. It explores an innovative biocatalytic membrane system, integrating an oxidoreductase enzyme, laccase with polyethersulfone membranes, for efficient degradation of s-triazines in real wastewater samples, while providing cost projections for potential large-scale implementation in bioremediation.

Supervisors: Associate Professor H Richards, Professor D Brady and Professor R Sheldon

LIEBERMAN, Benjamin

Physics

THESIS: The use of semi-supervised machine learning techniques in the search for new bosons with the ATLAS detector

This thesis evaluates semi-supervised classifiers in particle physics, emphasising model-independent narrow resonance searches and the trials factor they introduce. Results confirm these models' efficacy in classifying LHC data and quantify additional look-elsewhere effects, underscoring the potential and challenges of semi-supervised techniques in resonance searches at the ATLAS detector.

Supervisor: Professor B Mellado

MABOWA, Mothepane Happy

Chemistry

THESIS: Towards the development and determination of trace impurities in battery grade nickel sulphate

This thesis approaches innovation to extract nickel from overlooked sources within industrial waste streams, broadening the resource base for extraction. To address the growing demand for battery-grade nickel sulphate, refining techniques including solvent extraction, precipitation, and analytical methodologies were devised and applied to effectively purify trace elements and determine nickel sulphate from fire assay waste.

Supervisors: Professor L Chimuka and Dr J Tshilongo

MAHONISI, Nyiku Clement

Physics

THESIS: The low-temperature properties of Boron-implanted diamond materials

The low-temperature properties of boron-implanted diamond materials are essential for fabricating semiconducting solid-state systems with high-temperature superconducting capabilities. This study focuses on enhancing the solubility limit of boron ions in diamonds through advanced implantation and annealing techniques. We accurately characterise spectral features that correlate boron-induced vibrational modes with their corresponding electronic conductivity properties, revealing novel implications for future research studies.

Supervisor: Associate Professor S Naidoo

MAKUYA, Lindelani

Animal, Plant and Environmental Sciences

THESIS: Costs and benefits of solitary living in the bush Karoo rat (*Otomys unisulcatus*)

The candidate's groundbreaking field research on solitary bush Karoo rats revealed an advanced social system. Females live alone but are part of a kinship neighbourhood structure, with preferential sharing of resources with kin. Solitary living is not marked by aggression but by selective cooperation. This challenges the view that solitary living in mammals is primitive.

Supervisor: Professor N Pillay

MALEKA, Prettier Morongoa

Physics

THESIS: First principle study of inorganic metal halide perovskites for solar cells application

This study involves investigation of the properties including structural, electronic, optical, mechanical and thermodynamics of all-inorganic halide perovskites using first principle-based density functional theory (DFT). The study explored the effects of halide mixing, and transition metal doping to enhance the material's photovoltaic performance and address its drawbacks, showing promise for future solar cell applications.

Supervisors: Professor O Ntwaeaborwa and Dr R Maphanga

MANGORO, Ngonidzashe

Geography, Archaeology and Environmental Studies

THESIS: A geographical analysis of the impacts of construction and demolition waste on wetland functionality in South Africa: a study of Gauteng Province

The study investigated the impacts of construction and demolition waste (CDW) on the ecological and environmental functionality of wetlands. The findings suggest that the inherent restrictiveness embedded in the current environmental legislative framework does not promote environmental compliance thereby triggering the disposal of CDW in undesigned locations. These findings have been shared in 2 journal publications.

Supervisors: Professor MD Simatele and Dr N Kubanza

MANQELE, Nkosinathi Michael

Geography, Archaeology and Environmental Studies

THESIS: Evaluating methodologies for monitoring the impact of marine mobile emissions, for use as air quality assessment tools, in South Africa

The candidate investigated the impact of a 3% reduction in sulphur content of marine fuel on human health and the economy of Durban in 2020. The results showed a reduction of 49 premature mortalities with an estimated monetary value of ZAR228,000,000. Such changes are significant to the growing city economy of a developing country like South Africa.

Supervisors: Dr R Moolla and Professor L Ramsay

MAPHANGA, Rivoningo

Mathematics

THESIS: A study of financial models and their symmetry driven analytical solutions

This thesis explores the application of Lie symmetries and boundary conditions in financial models, including the Black-Scholes, generalised bond-pricing, CEV type, and option-pricing models. By identifying invariant solutions and analysing boundary conditions, it enhances understanding and predictive power in option and bond pricing, providing insights into the behaviour, valuation, and risk management of financial instruments.

Supervisor: Associate Professor S Jamal

MARIOTTI, Elena

Animal, Plant and Environmental Sciences

THESIS: Quantity discriminatory capacity and choice preference between binary rewards in African elephants

The thesis quantitatively models elephants' choice behaviour by testing their preferred fruits, quantity discrimination skills, and learning effects capacity, focusing on individual differences. Using binary choice tasks with varying food quantities and Bayesian analysis, the study found that elephants can do basic arithmetic with learned improvements. These results provide a foundation for future research on elephant risk preferences.

Supervisors: Professor F Parrini and Professor D Ross

MASHIGO, Mpho Mary

Animal, Plant and Environmental Sciences

THESIS: Responses of *Carpobrotus edulis* (L.) Bolus to low and high temperature conditions

This thesis examined the effects of temperature extremes on the medicinal properties of *Carpobrotus edulis*, an indigenous medicinal plant in South Africa. Phytochemical analyses and bioactivity tests, including antibacterial, antioxidant, antidiabetic, and anticancer activities, revealed noteworthy changes. The findings highlight temperature's significant impact on the plant's medicinal efficacy, with implications for indigenous use, climate change adaptation, and pharmacological research.

Supervisors: Dr I Risenga, Dr K Ngwira and Dr M Choene

MATYUKIRA, Charles

Geography, Archaeology and Environmental Studies

THESIS: Multitemporal analysis of land cover and evaluation of landscape influences on vegetation dynamics using remote sensing data and machine learning in a karst environment: a case study of the Cradle Nature Reserve

This thesis investigates the use of geospatial technologies and machine learning to monitor vegetation dynamics and land degradation at the Cradle Nature Reserve, a World Heritage site in South Africa. The study highlights critical ecological changes and addresses research gaps. Seven papers based on this research were published in international refereed journals, contributing significantly to the field of environmental monitoring and conservation.

Supervisor: Professor P Mhangara

MCKENZIE, Ryan Peter

Physics

THESIS: Development and reliability testing of a new low-voltage power supply for the ATLAS Hadronic Tile-Calorimeter Phase-II upgrade

In this thesis, the development of a radiation hard transformer coupled buck converted for the ATLAS Hadronic Tile-calorimeter Phase-II Upgrade is presented with an emphasis placed on its thermal performance and reliability. A thermal analysis of the proposed upgrade power supply is presented followed by an irradiation campaign and reliability analysis. It culminates in the quality assurance procedure that is applied to the new buck converter post production.

Supervisors: Professor B Mellado and Dr C Solans Sanchez

MOFOKENG, Nondumiso Nomonde

Chemistry

THESIS: Source apportionment, transport and fate of pollutants in the paper recycling chain - an analytical exploration of the South African context

This thesis analytically explored pollutants present at key stages of the South African paper recycling chain, using chromatography-based methods. Chemometrics, literature and interviews were used to investigate the possible sources, transport and fate of identified pollutants. Findings showed that pollutant prevalence was linked to manufacturing additives, retail activities, consumer usage and waste mingling from the collection and sorting protocols used.

Supervisors: Professor L Chimuka and Professor L Madikizela

MOHAMED, Mohamed Khalfan

Geography, Archaeology and Environmental Studies

THESIS: Remote sensing-based assessment of mangrove forest changes and related regulatory frameworks for the sustainability and conservation of coastal ecosystems in Zanzibar Island, Tanzania-East Africa

This thesis develops a remote sensing approach for sustainable mangrove monitoring in Zanzibar, analysing management history from 1890 to the present. It emphasises the impact of legal frameworks and community involvement, integrating historical policy analysis with modern geospatial techniques. The research generates four ISI-published articles for better decision-making for effective mangrove conservation and management.

Supervisor: Associate Professor E Adam

MOKGATITSWANE, Gaogalalwe

Physics

THESIS: Search for high-mass resonances in the Z_γ channel and quality assurance of Scintillation detector modules of Tile Calorimeter Phase-I upgrade of the ATLAS detector

The research focused on the search for new high-mass particles decaying into a Z boson and photon using data from the ATLAS experiment at CERN's Large Hadron Collider. The candidate also contributed to significant upgrades of the ATLAS detector, ensuring its continued role in advancing high energy physics research.

Supervisors: Professor B Mellado, Dr X Ruan and Dr O Solovyanov

MOL, Bronwyn Ashleigh

Molecular and Cell Biology

THESIS: Immunomodulation of the innate immune system: the role of vitamin D in the context of monocytes and macrophages

Biologically active vitamin D₃, 1,25(OH)₂D₃, is a known immunomodulator. The role of 1,25(OH)₂D₃ in monocytes, macrophages and the process of monocyte-to-macrophage differentiation using the THP-1 cell line was investigated. Analyses indicated that though not an inducer of differentiation alone, 1,25(OH)₂D₃ in combination with PMA greatly altered the morphology and transcriptomic landscape of the macrophages generated.

Supervisors: Dr V Meyer and Dr N Gentle

MOTLOGELOA, Ogone Warona

Geography, Archaeology and Environmental Studies

THESIS: Assessing the inter-annual and inter- seasonal climate-induced variation in case load of respiratory diseases

This thesis delved into the interplay between climatic factors and acute upper respiratory diseases in South Africa, with a concentration on four pivotal aspects: establishing the primary disease season from May to September, evaluating how climatic variables such as temperature impact disease occurrence, investigating the effects of extreme climate events over twelve years and assessing the overarching climate-health relationship. It underscores the necessity of understanding consistent seasonal patterns in climate to enhance healthcare strategies and disease management.

Supervisors: Professor J Fitchett and Dr N Sweijd

MTILENI, Masingitla Promise

Animal, Plant and Environmental Sciences

THESIS: Examining intraspecific ploidy variation and functional traits that facilitate the environmental distribution of the Drakensberg near-endemic species, *Rhodohypoxis Baurii* (Baker) Nel. var. *Platypetala* Hilliard & Burt

The candidate addressed the ecological consequences of polyploidy by (1) reviewing evidence for an elevation-driven polyploid distribution across plant species and (2) detailed studies of *Rhodohypoxis baurii* var. *platypetala*. The overall conclusions are that scale is important for understanding distributions of polyploid plants relative to their diploid progenitors, and that the implications of polyploidy in plants may be species-specific.

Supervisor: Associate Professor K Glennon

MUDAU, Phuluso

Animal, Plant and Environmental Sciences

THESIS: Integrated management of *Campuloclinium macrocephalum* (pompom weed) (Less.) DC. (Asteraceae) in South Africa

The key purpose of this science expedition was to establish an improved management strategy against pompom weed, one of the worst invasive weeds in South Africa. The use of a sub-lethal herbicide dose was found to be incompatible with the biocontrol agent. However, the integration of fire and herbicide was found to be an effective management approach against pompom weed.

Supervisors: Professor MJ Byrne, Professor ETF Witkowski and Dr J Goodall

MXAKAZA, Lineo Florence

Chemistry

THESIS: Preparation of nitrogen-doped multiwalled carbon nanotubes anchored 2D platinum dichalcogenides for application as hydrogen evolution reaction catalysts

This research focuses on developing nitrogen-doped carbon nanotubes anchored on novel 2D platinum dichalcogenides for hydrogen production, a clean energy source crucial for a sustainable future. Using a new colloidal method, this work offers significant advancements in producing hydrogen more efficiently, benefitting both energy security and environmental health.

Supervisors: Dr Z Tetana and Prof N Moloto

NANGUE TASSE, Geraud

Computer Science

THESIS: Towards lifelong reinforcement learning through temporal logics and zero-shot composition

This thesis proposes a framework to develop AI agents with three key abilities: Flexibility, Instructability, and Reliability (FIRE). This is achieved by introducing: the logical composition of arbitrary tasks, world value functions for zero-shot skill composition and lifelong sample efficiency, and methods for agents to understand and execute language instructions.

Supervisors: Professor B Rosman and Dr S James

NGWENYA, Mthulisi

Geography, Archaeology and Environmental Studies

THESIS: Modelling to determine optimal water availability scenarios under drought conditions in agricultural environments: A study of the Western Cape Province, South Africa

This study investigated the impacts of climate change on future water availability and utilisation for agricultural development and food security in the Western Cape Province of South Africa using CMIP6 climate scenarios. The findings have been shared through 3 publications in peer reviewed international journals.

Supervisor: Professor MD Simatele

NTOMBELA, Silindile Cynthia

Chemistry

THESIS: Mineral beneficiation from seawater: development and optimisation of selective extraction techniques for essential minerals from seawater

The study tried to develop extraction methods for recovery of minerals in seawater and desalination brine using polymer inclusion membrane. The results showed much promise for recovery of magnesium and calcium. In another approach a method that removes major competitors for lithium extraction was achieved. The study contributes to the blue economy extraction of valuable minerals.

Supervisors: Professor L Chimuka, Professor H Tutu, Associate Professor H Richards and Dr K Ndungu

NYAMAI, Nancy Akoth

Chemistry

THESIS: Thermo-photocatalytic production of hydrogen from water with methanol/formaldehyde as sacrificial agent under mild conditions

The study covered the thermo - photocatalytic water splitting using synthesized TiO₂ photocatalysts composited with carbon nanofibers, and Pt, Au, Ir, Zn, Cu as co-catalysts at 1 - 6% loading with methanol as sacrificial agent and the most active photocatalyst, 10%_TiO₂/CNFs/5%_Zn produced 0.53 mol (h g cat.)⁻¹ of H₂ which was 90-100 folds the amount produced by the commercial TiO₂ photocatalyst.

OBAID, Altayeb Adam Alsafi

Geography, Archaeology and Environmental Studies

THESIS: Capability of multi-remote sensing satellite data in detecting and monitoring cyanobacteria and algal blooms in the Vaal Dam, South Africa

The thesis models water quality in the Vaal Dam using in situ measurements, historical data, and remote sensing. Findings reveal pollution levels beyond acceptable standards and confirm that remote sensing effectively provides valuable information for managing water quality in the Dam. This research resulted in four ISI journal publications.

Supervisors: Associate Professor E Adam and Professor KA Ali

ONISURU, Olalekan Olugbenga

Molecular and Cell Biology

THESIS: Discovering potential inhibitors for *Plasmodium falciparum* and *vivax* glutathione transferases through systematic integration of empirical with theoretical studies

The thesis is a cumulative study that reports the inhibition of Glutathione S-Transferases (GSTs) from *Plasmodium falciparum* and *Plasmodium vivax* - as potential targets for novel antimalarial treatment and/or drug discovery and development of three compounds namely Bromosulphophthalein, Baicalin, and 5,7,3'-Trihydroxy-6,4',5'-trimethoxyflavone.

Supervisor: Associate Professor I Achilonu

OYIOGU, Blessing Oluebube

Molecular and Cell Biology

THESIS: Biophysical evaluation of the kinetics, thermodynamics, and structure-stability relationship of *Wuchereria bancrofti* glutathione transferase in comparison with human and glutathione transferases

Rational drug discovery leverages a detailed understanding of protein structure to design and develop new effective therapeutics. The candidate investigated the structural impact of ligand inhibition on WbGST, a pivotal enzyme to the survival of *Wuchereria bancrofti*, the parasitic culprit behind lymphatic filariasis. The ligands more efficiently inhibited WbGST than the human GSTs, and structural studies suggest that the ligands could be repurposed as alternative therapeutic agents against lymphatic filariasis.

Supervisor: Associate Professor I Achilonu

PATEL, Jasmin Bharatkumar

Molecular and Cell Biology

THESIS: Genome sequencing of the Southern Ground Hornbill (*Bucorvus leadbeateri*)

This study presents the first whole genome sequence, assembly, and annotation of the Southern Ground Hornbill, a flagship species of the African savannah. Using comparative genomics, genetic variant, and selection analysis, the research provides valuable insights into the bird's genetic makeup, evolution, and adaptation. These findings will support conservation efforts and aid in preserving the genetic history of these birds.

Supervisors: Professor P De Maayer and Dr J Mollett

PETENI, Siwaphiwe

Chemistry

THESIS: Electroanalytical detection of biomarkers of tuberculosis and cervical cancer

The need for simple, easy-to-use diagnostic methods will not only relieve our heavily burdened health care system but it will also assist in early detection and curb the spread diseases. In this thesis, nanosensor based platforms were designed for the detection of tuberculosis and cervical cancer biomarkers using electrochemical methods.

Supervisor: Professor K Ozoemena

RAMASHALA, Kanyane Nonhlanhla Eugenia

Chemistry

THESIS: Microwave-assisted synthesis of palladium-based ferrous alloy electrocatalysts for application in alkaline direct alcohol fuel cells

This thesis develops carbon-supported Pd-based ferrous alloy electrocatalysts for alkaline direct alcohol fuel cells (DAFCs) using a microwave-assisted technique to improve particle size, crystallinity, and morphology. Incorporating 3d transition metals into Pd/C electrocatalysts enhances activity, durability, and resistance to poisoning during alcohol oxidation, making these electrocatalysts promising for DAFC applications.

Supervisors: Professor K Ozoemena, Associate Professor C Billing and Dr RM Modibedi

RAZUWIKI, Rufaro

Chemistry

THESIS: Studies on the chemistry and biochemistry of gold(III) carboxamide pincer chelates

This study investigated new carboxamide pincer ligands and their gold(III) complexes, synthesised and characterised for chiral properties using CD spectroscopy and X-ray crystallography. The stability of these complexes with glutathione (GSH) and their binding to DNA and human serum albumin (HAS) were evaluated to explore potential applications in cancer treatment. NCI assays conducted on HT-29 and MCF-7 cell lines revealed significant activity of one complex, particularly against MCF-7 cells.

SEMWAYO, Daniel Tembinkosi

Computer Science

THESIS: Incorporating complex adaptive systems concepts in ontology driven Bayesian Network Models: towards resolving wicked problems

The thesis presents an advanced artificial intelligence (AI) Bayesian modelling framework which, by incorporating complexity sciences' concepts as constructs, out-performs baseline AI modelling frameworks at designing explainable models and machine learning algorithms for resolving diverse complex problems such as pandemics, traffic jams, climate change effects, and financial market crashes.

Supervisor: Associate Professor R Ajoodha

SEPENG, Motshwaedi Collen

Geography, Archaeology and Environmental Studies

THESIS: Constructed wetlands: additional heterogeneous configurations on existing infrastructures in Silvertown, Alexandra Township, Johannesburg

The thesis explored the integration of constructed wetlands into existing infrastructure in Silvertown, an informal settlement in Alexandra Township, Johannesburg. The study explored innovative, heterogeneous infrastructure configurations that enhanced greywater treatment while simultaneously addressing several, local environmental challenges. They looked at how this intervention improved water quality, promoted sustainable urban development, and offered a scalable solution for under-resourced areas facing similar issues by integrating with existing systems. The research blended ecological engineering with community-focused design.

Supervisor: Professor A Thatcher

SHAKU, Bokome

Chemistry

THESIS: Synthesis and characterisation of marula nut derived carbon and modified manganese fluorophosphates for electrochemical energy storage applications

This thesis focused on marula nut derived carbon and modified manganese fluorophosphate for use in energy storage with emphasis on the development of positive and negative electrodes for asymmetric supercapacitors. The results displayed excellent energy storage characteristics and cycling stability in both neutral and alkaline electrolytes. In a real-life application, the cell was used to successfully light a 1.6 W red LED bulb.

Supervisors: Dr M Maubane-Nkadimeng, Professor N Coville and Professor K Ozoemena

SIMOOYA, Steriah Monica

Geography, Archaeology and Environmental Studies

THESIS: Assessing the impacts of urbanisation on land use change in Zambia: A study of Lusaka urban district

This study assessed the impacts of urbanisation on land use change and urban livelihoods of poor and marginalised households and communities in the Greater City of Lusaka. Of particular interest was investigating the myriad ways and avenues through which the urban poor people, especially female headed households navigate and negotiate their citizenry in a landscape highly defined by a capitalist mode of production. The findings of this study have been shared in international journal platforms

Supervisors: Professor MD Simatele and Dr N Kubanza

SINGH, Keshaan

Physics

THESIS: Digital toolbox for the generation and detection of vectorial structured light

The candidate has developed and optimised a set of tools for the low-cost, versatile generation and detection of light fields exhibiting structured polarisation, phase, and amplitude. The candidate also demonstrated these tools through the creation of new structured light fields, measurement applications and to achieve robust communication in atmospheric turbulence.

Supervisor/: Dr A Dudley and Professor A Forbes

SODISETTI, Venkateswara Rao

Physics

THESIS: Low-temperature electronic transport of metal doped carbon nanotube molecular hybrids and nitrogen-doped nanocrystalline diamond

This thesis investigates electronic transport and magnetism in metal-doped CNT-SMM hybrids and nitrogen-doped nanocrystalline diamond. Key findings include spin-phonon coupling, Kondo lattice behaviour in CNT hybrids, and 3D weak localisation and variable-range hopping in NCD, providing insights into microstructural effects on magnetoresistance and transport properties, advancing carbon-based electronics and spintronics.

Supervisor: Professor S Bhattacharyya

SOOBEN, Marushka

Molecular and Cell Biology

THESIS: *In Silico* exploration of Endocannabinoid Receptor-CB₁ and CB₂-interactions comparing Cannabidiol and Cannabidiol Diacetate: a comprehensive computational study

This computational study analysed interactions between natural cannabidiol (CBD) and its acetylated form, cannabidiol diacetate (CBDDA), with pseudo-CB₁ and CB₂ receptors. Using bioinformatics, molecular docking, and molecular dynamics in a TIP3P solvated 1-palmitoyl-2-oleoyl-sn-glycero-3-phosphocholine environment, CBDDA exhibited stronger receptor interactions, suggesting acetylation changes protein behaviour and potentially enhances potency and modifies endocannabinoid receptor signalling, offering promising therapeutic leads for cannabinoid-based therapies.

Supervisors: Associate Professor I Achilonu and Professor Y Sayed

TEFU, Lebogang

Chemistry

THESIS: The synthesis and biological evaluation of isoquinoline derivatives as new, potential transmission-blocking compounds in the fight against malaria

The study involved the design, synthesis and *in vitro* antimalarial testing of isoquinoline derivatives as potential transmission-blocking agents targeting late-stage (IV/V) gametocytes of *Plasmodium falciparum*. The derivatives maintained potency while demonstrating improved solubility, microsomal stability and lower cytotoxicity in the biological assays. The iron-binding properties of the derivatives were also studied, and key structural elements essential for iron binding were identified.

Supervisor: Associate Professor A Rousseau

TEMAUGEE, Samuel Terungwa

Physics

THESIS: Evaluation of radiation damage on lutetium-aluminium and gold for practical applications using proton irradiation as a surrogate for neutrons

The candidate's excellent and timely investigation of resilience of lutetium-aluminium and gold to radiation damage, using both Monte-Carlos simulations methods and the experimental proton irradiation techniques carried out at the CLASS Accelerator in MIT, USA. The complex microstructure properties were elucidated with the state-of-the-art characterisation techniques, providing a major advance in the field of nuclear materials and their applications.

Supervisors: Associate Professor I Usman and Dr RD Mavunda

THWALA, Siphwe Anthony

Physics

THESIS: An unsupervised search of non-thermal diffuse emission in extended sources

Radio astronomy is undergoing a transformation, requiring data mining methods for optimal scientific utilisation. We implemented the first architecture that uses multi-frequency and multi-scale radio continuum data cubes for unsupervised machine learning model training. This design automates the detection and clustering of related sources in continuum radio surveys.

Supervisor: Dr G Beck

TOLCHARD, Frederick Bruce

Geosciences

THESIS: An analysis of the macroevolutionary dynamics of diet in amniotes

The candidate examined distributions of diets and body sizes of amniotes. The candidate tested how feeding guilds partition dietary variation, how these guilds evolve, and how dietary composition affects the macroevolution of amniote body size and found that invertivorous taxa had the smallest body sizes, but that there was surprisingly little difference in body size distributions among other feeding guilds.

Supervisors: Professor JN Choiniere and Professor RBJ Benson

TSHISEKEDI, Kalonji Abondance

Molecular and Cell Biology

THESIS: Exploring temporal changes in the malting barley seed microbiome with meta-omics to understand nitrogen content effects

This thesis investigates the barley seed microbiome using meta-omics to examine the effects of nitrogen levels and storage duration. Analysing eight South African barley samples, the study reveals that storage time influences microbial diversity. These findings advance our understanding of microbial interactions in barley, offering valuable insights for improving seed health and brewing quality.

Supervisors: Dr A Botes and Professor P De Maayer

VAN NIEKERK, Karen Elizabeth

Geosciences

THESIS: The molecular evolution of C14 peptidases in microbial eukaryotes

This thesis examines C14 peptidases within sets of eukaryotic predicted proteins, incorporating genomic and transcriptomic data from a wide range of microbial eukaryotes. It uses a computational approach of sequence similarity networks and protein structural analysis to explore proteomes across the eukaryote tree of life, presenting a novel perspective on the diversity within the C14 peptidase family.

Supervisor: Associate Professor PM Durand