FINAL GRADUATION LIST

GRADUATION DATE: 14 JULY 2025
TIME: 09:30

FACULTY OF SCIENCE

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

Doctor of Philosophy

BEKKER, Jacob Andries Cornelius *Physics*
THESIS: PANDORA project: study of the photo-absorption response in light nuclei as input for UHECR propagation studies
The PANDORA (Photo-Absorption of Nuclei and Decay Observation for Reactions in Astrophysics) project is dedicated to both experimental and theoretical analysis of photo-nuclear reactions involving light nuclei. This thesis presents the first simultaneous measurements of the total photo-absorption and charged particle decay branching ratios for ^{12C} and ^{13C} for the PANDORA campaign.
Supervisors: Professor L Pellegri and Dr R Neveling

BHAGWAN, Nadya *Geography, Archaeology and Environmental Studies*
THESIS: An evaluation of the extent to which South African energy companies leverage industry 4.0 technologies to improve efficiencies in comparison with China and Germany
This PhD study investigated the degree to which South African energy-producing companies adopted Industry 4.0 technologies compared with Germany and China. Using empirical data from surveys and interviews, it reveals limited and fragmented adoption of 4IR-tech in South Africa, identifying disparities in technological integration, policy frameworks, and innovation capacity. The study offers insights on strategic, tech-driven energy reform, urging bold policy and visionary leadership for a smarter, more sustainable energy future.
Supervisor: Associate Professor M Evans

CHAVALALA, Edward Hlamulo *Chemistry*
THESIS: Synthesis and biological evaluation of *plasmodium falciparum* calcium-dependent protein kinase inhibitors for malaria treatment and transmission-blocking
Synthesis and biological evaluation of Plasmodium falciparum calcium-dependent protein kinase inhibitors for malaria treatment and transmission-blocking.
The PhD thesis reports the design, in silico study, development of synthetic protocols, complete synthesis, and biological evaluation of pyrrolo[2,3-d]pyrimidine- and 4,6-dichloropyrimidine-based compounds as potential inhibitors of Plasmodium falciparum calcium-dependent protein kinase 1 and 4 (*PfCDPK*1 & *PfCDPK*4), towards treating and preventing the spread of falciparum malaria.
Supervisors: Associate Professor AL Rousseau, Dr H Henning and Professor CB de Koning

ENEMUO, Ngozi Doris *Chemistry*
THESIS: Fabrication of fouling resistant and operationally stable nanocomposite membranes for BTEX wastewater treatment
The study details an investigation into the fabrication of a fouling-resistant and operationally stable membrane developed for removing BTEX (benzene, toluene, ethylbenzene, and xylene) from wastewater. Biogenic-synthesised iron oxide nanoparticles and polyvinyl alcohol were used as hydrophilic modifiers to enhance the membrane's antifouling ability and improve its operational stability. The fabricated membrane exhibited excellent performance in BTEX wastewater treatment.
Supervisors: Associate Professor H Richards and Dr M Daramola

HALES, Matthew Paul *Geosciences*
THESIS: Geological setting and genesis of vein-hosted copper mineralisation at the Onganja Mining District, Namibia
Using a multidisciplinary approach, the thesis provides a revised model of formation for the copper mineralisation at the Onganja Mining District. This model is compared to Cu deposits and, particularly, to Iron Oxide-Copper-Gold deposits. The work concludes that the mineralisation within the district is distinct from those of IOCGs but has significant similarities with other shear-hosted Cu deposits globally.
Supervisors: Professor JA Kinnaird and Professor PAM Nex

HARRIS, Christopher *Geosciences*
THESIS: Stratigraphy and depositional setting of the Witpoort formation (Witteberg Group, Late Devonian) in the Eastern Cape, South Africa
The thesis contains an investigation of the geological history of the Witpoort Formation, a geological unit that formed during the Devonian Period. Through sedimentary facies analysis, ichnology (study of trace fossils) and palaeocurrent analysis the student has formed a novel model as to how the sediments of the Witpoort Formation accumulated.
Supervisors: Professor Z Jinnah and Dr C Penn-Clarke

KAI-SIKHAKHANE, Refilwe Faith *Animal, Plant and Environmental Sciences*
THESIS: The concentration, transport and fate of nitrogen dioxide in the highveld atmosphere
This study investigated the spatial and temporal variability of nitrogen dioxide (NO_2) concentrations in Wakkerstroom, South Africa, using data from ground-based and satellite instruments. The findings highlight the importance of continuous long-term ground measurements in heavily polluted regions to provide essential context for interpreting satellite data and the use of satellite-derived NO_2 as a proxy in data-scarce areas.
Supervisors: Professor M Scholes and Professor S Piketh

KAKULI, Molahlehi Charles *Mathematics*
THESIS: On the application of the double reduction theory to (n+1)-dimensional scalar PDEs and systems of PDEs
This thesis advances the application of double reduction method for higher-dimensional partial differential equations (PDEs) and systems of PDEs by effectively exploiting symmetries and conservation laws to achieve systematic reductions. It introduces a novel variation of the method, by demonstrating that reductions could be achieved using only the canonical variables of the symmetries associated with conservation laws.
Supervisors: Dr P Masemola and Professor W Sinkala

KASERE, Stephen *Geography, Archaeology and Environmental Studies*
THESIS: Perspectives on the impacts of the fast track land reform programme on wildlife conservation and management in Zimbabwe
The thesis entitled perspectives on the impacts of the Fast Track Land Reform Programme on Wildlife Conservation and management in Zimbabwe is a socio-political and ecological diagnosis that shows how human interests prevailed over ecological interests to protect wildlife species that white farmers had stocked in their estates before Zimbabwe's volatile war for land began in 2000.

LESSING, De Villiers *Mathematics*
THESIS: On the packing chromatic numbers of some connected spanning subgraphs of $\mathbb{Z}^3$
This thesis proves that every four- or five-regular connected spanning subgraph of the infinite cubic lattice $\mathbb{Z}^3$ has an infinite packing chromatic number. It also addresses the sparsification problem, introducing a conjectured lower bound on the minimum proportion of edges that must be removed from $\mathbb{Z}^3$ to admit a finite packing colouring, thereby refining insight into lattice structure.
Supervisors: Professor E Jonck and Professor JH Hattingh

MANAMELA, Machoene Tshidi *Animal, Plant and Environmental Sciences*
THESIS: Development of a cryopreservation protocol for *in vitro* buds of South African sweet potato accessions
The study aimed to develop a cryopreservation protocol for sweet potato accessions at the South African NPGRC to conserve landrace food crops and ensure food security. Cryopreservation at -196°C in liquid nitrogen halts metabolic functions. 5% PVS2 resulted in 93% regeneration. A modified Plant Vitrification Solution 3 combined with PVS5%, osmoprotection and physical dehydration resulted in 83-87% regeneration rate without crystallisation.

MANZI, Shalene *Geosciences*
THESIS: Structural analysis of the lower Witwatersrand supergroup in the Vredefort Dome, South Africa
The candidate performed a systematic, multidisciplinary, geological structural analysis of the Vredefort Dome, the highly deformed central part of earth's largest and most deeply eroded impact structure. By combining field observation with 3D kinematic reconstruction, desktop analysis and numerical modelling, the candidate was able to link individual structural features to specific stages in the evolution of the crater and demonstrate the strain and stress histories and the processes that form them.
Supervisors: Professor R Gibson and Professor A Tshibubudze

MAPETLA, Sabetha Makoma *Chemistry*
THESIS: Profiling pharmaceutical residues in South African aquatic ecosystems: a dual approach using grab sampling and passive sampling techniques
This research investigated pharmaceutical pollution in South African aquatic ecosystems using both grab and passive sampling techniques. By analysing urban river and estuarine samples, the study identified pharmaceutical contamination patterns and evaluated sampling efficiency. The study highlighted the advantages of incorporating passive samplers in long-term pollution monitoring campaigns.
Supervisors: Professor L Chimuka and Associate Professor H Richards

MAREE, Matthew *Chemistry*
THESIS: Synthesis and evaluation of flexible pyrimethamine analogues as antifolates against drug-resistant malaria
An investigation has been conducted into the design and synthesis of novel flexible pyrimethamine analogues as antifolates in the treatment of drug-resistant malaria. The work includes detailed molecular modelling experiments which successfully identified favourable structural elements for potent enzyme binding, a comprehensive synthesis of the designed compounds, and various in vitro biological assessments to determine the activity of the synthesised compounds.
Supervisors: Professor A Rousseau and Dr K Ngwira

MARILELE, Mkateko Hlongo *Geography, Archaeology and Environmental Studies*
THESIS: A critical analysis of the environmental and social impacts of human settlement development projects in Gauteng, South Africa: a study of City of Ekurhuleni
This study analysed human settlement development projects' environmental and social impacts in the City of Ekurhuleni, Gauteng Province. Of particular interest was investigating the contribution of urbanisation and population growth to environmental pollution, which negatively impact the social well-being of urban dwellers. The study blended sustainable human settlement initiatives with environmental regulations.
Supervisor: Dr NS Kubanza

MAZIYA, Khona *Chemistry*
THESIS: Tuning the separation properties of thin-film nanocomposite membranes and aerogels by polymeric functionalisation of graphene oxide nanosheets and cellulose nanocrystals
This research focuses on developing innovative thin-film nanocomposite membranes and aerogels using graphene oxide and cellulose nanocrystals modified with polymer brushes. The study enhances membrane performance for efficient removal of dyes and salts from wastewater, promoting sustainable and efficient treatment methods to address industrial pollution and safeguard aquatic environments.
Supervisors: Associate Professor H Richards and Dr A Etale

MOKGEHLE, Dineo Revinwa *Geography, Archaeology and Environmental Studies*
THESIS: Examining the climate sensitivity of tourists in South Africa using TripAdvisor: a big data approach through web-scraping
This study explored the potential of utilising web-scraping techniques to create a broader database of TripAdvisor reviews for examining tourists' sensitivities to weather conditions. The study compared manual and web-scraped data to assess the efficacy of web-scraping. Regional variations in the frequency, sentiment and proportion of weather-related mentions were investigated to comprehend the impact of climate on tourist perceptions. This study validates web-scraping as an efficient method for real-time big data collection, enhancing the analysis of tourists' sensitivity to climate.
Supervisor: Professor J Fitchett

MOKHOSI, Itumeleng Seotsanyana *Chemistry*
THESIS: Physico-chemistry of ceria-coated nickel-rich manganese cobalt oxides as cathode materials for lithium-ion batteries
Nickel-rich NMC material were modified with ceria to design efficient cathodes for Lithium-ion batteries. Heat and microwave treatment were also applied to alter their structural parameters. The findings suggest
Ceria-coating/doping as possible deterrents to NMC's surface instability. This draws us closer to seeing widespread application of NMC cathodes as the world moves towards renewable and sustainable energy.
Supervisor: Professor KI Ozoemena

MOKOENA, Rethabile Julieta *Molecular and Cell Biology*
THESIS: Investigating potential plasma nephrotoxicity biomarkers associated with first-line antiretroviral therapy regimens in people living with HIV in South Africa
The candidate investigated blood plasma proteins to identify potential biomarkers of acute kidney injury in people living with HIV receiving antiretroviral therapy. The study identified thirty-four proteins that showed significant change in abundance between patients with and without acute kidney injury. These findings suggest that these proteins can distinguish between patients with and without acute kidney injury and aid in improving clinical detection of the condition
Supervisors: Dr S Fanucchi, Dr I Govender and Dr P Naicker

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 form 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

NAIK, Hiral *Animal, Plant and Environmental Sciences*
THESIS: What makes a snake bite? A South Africa perspective
This thesis examined the behavioural ecology of medically important snake species and snakebite epidemiology in South Africa. The results provide insight on the driving factors of the spatial and demographic patterns of snakebite incidences, emphasising the importance of empirical snake behavioural data in creating effective prevention strategies.
Supervisors: Professor G Alexander and Dr M Petford

NHAMUTOLE, Nelson Ernesto *Geosciences*
THESIS: Palynology and organic geochemistry analysis of borehole cores from the Maniamba Basin, northern of Mozambique: potential for hydrocarbon
This research has combined multiproxy methods to assess the hydrocarbon potential of a little overlooked basin in northern Mozambique that is around 250 million years old. The results have unveiled that that there is potential for oil and gas reserves, but the quantities and viability for mining are unknown.
Supervisors: Professor M Bamford, Professor P Alves de Souza and Professor D Aparecido do Carmo

NYAWALI, John Alfred *Geography, Archaeology and Environmental Studies*
THESIS: Role of edible insects in food security and livelihoods in Mumbwa District, Central Province, Zambia
This study investigated the contribution of edible insects to household food security and livelihoods in rural communities in Zambia using questionnaires, focus groups and ethnographic observations. Results show that the majority of households consumed insects as part of the Kaonde food culture. Edible insects were also a source of livelihood, with incomes much higher than for maize. Impediments to the utilisation of edible insects include reduction in insect populations and availability, lack of infrastructure to promote trade, and lack of environmental stewardship.
Supervisor: Professor J Knight

PERUMAL, Shanen *Molecular and Cell Biology*

THESIS: Elucidating the role of cholesterol pathways in the Epithelial-to-Mesenchymal transition in breast cancer cells

This study explored the relationship between cellular cholesterol and the epithelial-to-mesenchymal transition in breast cancer. Lowering cellular cholesterol using HPßCD reversed gene expression patterns associated with the epithelial-to-mesenchymal transition, thus reducing invasive cellular behaviour associated with aggressive cancers, and demonstrating the potential of cholesterol depletion as a novel anticancer strategy.

Supervisor: Professor M Kaur

PRINSLOO, Ariel Sarah *Geography, Archaeology and Environmental Studies*

THESIS: Quantifying climate suitability for tourism in Réunion Island

This thesis quantified the climate suitability for tourism in Réunion Island using four tourism climate indices over 33 years. It is the first assessment of climate suitability for tourism in the southwest Indian Ocean and the first multi-index approach for tourism in the southern hemisphere. This study reveals broad locational, seasonal and activity-dependent climatic variability for tourism on the island.

Supervisor: Professor J Fitchett

QUARTEY, Awo Ama Dede *Geography, Archaeology and Environmental Studies*

THESIS: University curriculum development for hospitality management programmes: a perception from the South African hospitality industry

This study explored South Africa's hospitality and tourism curriculum development at universities. Of interest was to assess the degree to which the hospitality and tourism industry influences pedagogical activities. Findings suggest minimal interactions between academic institutions and industry, although industry seems satisfied with graduates and work-integrated learners.

Supervisors: Professor D Simatele and Dr R Adom

RAPHEEHA, Ntsoko Phuti *Physics*

THESIS: A search for Zγ resonances and TileCal performance studies in the ATLAS experiment

The thesis searched for high-mass spin-0 and spin-2 resonances decaying into the Zγ final state using the ATLAS detector's Run 2 data at $\sqrt{s}$ = 13 TeV. It observed a mild excess at 250 GeV, with upper limits set on the production cross-section times decay branching ratio for resonances between 220 GeV and 3400 GeV. Additionally, it studied the performance of the ATLAS Tile calorimeter by analysing the response of scintillators to collision muons. Furthermore, preliminary luminosity measurements using the Tile Calorimeter were conducted to monitor drifts in the primary luminosity measurements during the 2022 data-taking at $\sqrt{s}$ = 13.6 TeV.

Supervisor: Professor B Mellado

SAMUEL, Richard Taiwo Abayomi *Statistics and Actuarial Science*

THESIS: Stochastic modelling of volatility, leverage effects, long-memory and extremal dependence of financial markets

This research focused on using a three-stage simulation approach verified empirically for improved volatility modelling, relevant for robust risk management. The first two stages of the study were used to develop simulation procedures in volatility modelling through the fGARCH and GAS models. The third stage of the study was used to estimate six features of financial return.

Supervisors: Professor C Chimedza and Professor C Sigauke

TEFFO, Thabiso Katlego *Animal, Plant and Environmental Sciences*

THESIS: An assessment of bioactive compound profiles and biological activities in selected *Bulbine* species under short-term exposure to concurrent elevated carbon dioxide and temperatures

The research investigated the influence of the combined effects of elevated carbon dioxide and temperatures on the phytochemical content, in-vitro antioxidant activity and antimicrobial properties of *Bulbine abyssinica*, *Bulbine frutescens* and *Bulbine natalensis*. This was performed over an eight-day exposure period using climate model future estimates of global atmospheric CO_2 and South African summer temperatures.

Supervisors: Dr Ida Risenga, Associate Professor S Dukhan and Mr P Ramalepe

XUMA-TONI, Tutuzwa Nokonwaba *Animal, Plant and Environmental Sciences*

THESIS: Ultrastructure of cell death in *Prorocentrum redfieldii*, a bloom-forming dinoflagellate

Harmful algal blooms (HABs) frequent the South African west coast and when they collapse the surrounding marine environment and commercial fishing are negatively impacted. This thesis investigates cell death in a bloom causative organism at an ultrastructural and biochemical level during a declining HAB. The findings add to the fundamental knowledge required to mitigate declining HABs in the Benguela region.