UNIVERSITY OF THE
WITWATERSRAND,
JOHANNESBURG

PhD

Graduation Ceremony

The Great Hall

Tuesday, 07 July 2020
14:30

Examinations and Graduation Office
2nd Floor, Room 2021, Solomon Mahlangu House
Tel: 011 717 1280/1
www.wits.ac.za/graduations

A MESSAGE TO GRADUATES FROM
THE CHANCELLOR

Congratulations to all the graduands! I know it takes hard work and focus to reach this point. I also know that you could not have achieved this on your own. So as I congratulate you, I also congratulate your parents and guardians for not only supporting you, but for creating an environment that allowed you to dream and achieve your dreams. Thank you to the lecturers who contributed to your success. Well done.

May this be the beginning of a life of continuous learning, investing in yourself, and investing in the communities that nurtured you. Nurture the relationships that you've formed and those that you will form as you journey through life. Umuntu umuntu ngabantu. Life is about collaboration with others.

Dream big, act consistently with integrity, self-respect and respect for others, and the universe will conspire to make you achieve your dream. A positive attitude and hard work will bring you closer to your dream. Use others' successes as your inspiration. Wits is full of those, from Nobel Prize Laureates to world leaders in different fields of society.

You have received a world class education. Use it to make a difference in other people's lives. Especially those that are less fortunate than yourself. We are a country with many needs, identify a role you can play to make a positive difference; you owe it to this country and people that invested in you.

Find your Purpose and Live it. Help Africa Rise!

Dr Judy Dlamini
Chancellor
Wits University

**There is no limit to what you can achieve,
if you put your mind and your best effort into it!**

A MESSAGE TO GRADUATES FROM
THE VICE-CHANCELLOR AND PRINCIPAL

Dear Wits Graduate

Congratulations on successfully completing your academic programme at Wits and becoming a member of an elite group of graduates of this esteemed University who are movers and shakers in government, business, civil society and the international arena. Our more than 180 000 alumni are national and international leaders in their fields, prosperous business people, successful politicians, inspiring activists and formidable intellectuals.

Wits is a vibrant microcosm of South African society that occupies a special place in the hearts and minds of its alumni. Over the more than 97 years of its history, the University has steadily evolved into a globally competitive and nationally responsive institution that is a respected leader in research, teaching, learning and community engagement. This is a proud legacy of which you are now an integral part.

Wits is also renowned for its intellectual leadership and for nurturing critical thinkers, creative innovators, problem-posers and problem solvers. Your success has furthered our commitment to equipping the future generation of South Africans with the skills and determination that they will need to find innovative and sustainable solutions to the national and global challenges of today. We know that you will enter the next stage of your journey with a passion to bring positive changes to tomorrow.

Your success also means that you are part of the small percentage of students in South Africa who complete their degrees. About half of the students who enter the country's higher education system leave university without a qualification. In an attempt to address this national challenge, Wits has revitalised its academic support programmes and throughput capacity by establishing a teaching and learning academy for students at risk. To this end, we are providing professional retooling and support for our academics in order to improve the quality of their teaching.

As a Wits graduate, you will have had access to an educational experience unlike any other. You will have been exposed to a world-class academic programme and derived the benefits of our pioneering research in South Africa, our continent and the world. I want to encourage you to remain part of the Wits family by participating in our alumni programme and further advancing the reputation of your alma mater.

You would have been part of a social milieu that is engaged on the big issues of the day that enables robust engagement, and prioritises the fashioning of solutions. In the process, you would have learned not only the skills required by your profession, but also developed the soft human skills necessary to an active, engaged citizen of our diverse and cosmopolitan world

A special thank you to your parents, guardians, spouses, partners and loved ones who have helped to make this day possible, sometimes at great cost. It is also appropriate to acknowledge your professors, tutors, mentors and everyone else who contributed to your success.

Best wishes for a very bright future.

Professor Adam Habib
Vice-Chancellor and Principal
Wits University

MESSAGE FROM
THE PRESIDENT OF CONVOCATION

There are a few defining moments in life – and it is without doubt that a PhD graduation is one of them!

As you leave this graduation hall, you leave with the prestigious honour of a grand title from one of the top universities on the African continent.

Today, you enter into a world of limitless possibilities, accessible only to a select group of people who have lived our University's motto: "Scientia et Labore" ("through knowledge and work"). May you meet all the challenges and opportunities that await with drive, pride, passion, innovation and positive-purpose.

While some of you are first time graduates of this university and others have already obtained degree's from Wits – this PhD cohort are united forever in association with a special group of individuals: the Convocation of Wits University. Convocation represents all the degreed graduates of Wits and forms a vital link between the University and the global community in which it operates. Membership to Convocation is free and serves as an official channel, allowing you, the members, to convey to the University management your views about the University. This membership comes with several unique privileges, which include nominating the Chancellor of the University. The Convocation has two executive members on the Wits Council and maintains other regular contact with the University, especially with the Alumni Relations Office, in order to ensure the voice of the Convocation is represented within The University.

There are now over 180 000 Wits alumni worldwide. Proudly diverse as we are, our shared experiences and memories of studying at Wits make for a very strong network indeed. So, in addition to congratulating you on your graduation, let me also welcome you to your lifelong relationship with Wits.

The distinction of our university is important to the prestige of our collective qualifications. We call upon you to nurture and enhance the value of the asset you have now acquired by promoting Wits' image, preserving our values and contributing towards our ongoing development, ensuring that we grow in stature as a globally competitive, proudly South African institution of higher learning.

Please connect and engage with us via Wits' multiple social media channels, or feel free to reach out to us via convocation@wits.ac.za

I would like to extend a warm welcome to you – you are now a Witsie for life!

Stacey-Lee Bolon
President of Convocation
Wits University

Convocation is a statutory body that includes all graduates of the University. Convocation is the largest constituency of the University (since the founding of the University in 1922, graduates number about 160 000). Its statutory mandate is to "… discuss and state its opinion upon any matters relating to the University including matters referred to it by the Council" and allows for the views of graduates to be represented at the highest levels of governance of the University.

ORDER OF PROCEDURE

Tuesday, 07 July 2020 | 14:30

The audience will rise as the academic procession enters the hall and will remain standing until the Chancellor is in place

The Wits Choir will perform

The Chancellor will constitute the congregation

The Chancellor will welcome the graduands

Address to the congregation

Conferment of degrees

The President of Convocation will address the graduates

The Chancellor will dissolve the congregation

The audience will stand while Ihele is played

Members of the audience are requested to stand while the academic procession leaves the hall and not to leave the hall before the end of the ceremony.

IMPORTANT NOTICE
In the event of load-shedding or power cuts, the Great Hall may become totally dark until the generator comes into operation.

FACULTY OF
HEALTH SCIENCES

DEAN: PROFESSOR MG VELLER
MBBCh MMed(Surg)(Witwatersrand) FCS(SA)

Doctor of Philosophy

AGIZEW, Tefera Belachew *Public Health*
THESIS: Evaluating the performance of Xpert MTB/RIF and its impact on patient level outcomes among individuals attending routine health facilities for HIV care and treatment in Botswana
Evaluating the performance of Xpert MTB/RIF and Its impact on patient-level outcomes among individuals attending routine health facilities for HIV care and treatment in Botswana. The key findings elucidated the feasibility of Xpert MTB/RIF implementation at peripheral clinics and its diagnostic, therapeutic impact and patient-level treatment outcomes in programmatic settings.
Supervisors: Professor G Churchyard, Dr V Chihota, Dr P Lekonoe and Dr A Finlay

ANDERSON, David Graham *Human Genetics*
THESIS: The phenotype of huntington disease like 2 (HDL2)
Huntington's Disease Like 2 (HDL2) is a Huntington's disease (HD) phenocopy with the highest recorded frequency in South Africa. This study compared the two disease phenotypes. The findings showed that HDL2 is not a neuroacanthocytosis syndrome as previously described and defined the HDL2 phenotype spectrum with evidence of a similar, but more severe clinical syndrome than HD.
Supervisors: Professor A Krause, Dr R Margolis and Dr J Carroll

BAIRD, Kathleen *Clinical Microbiology & Infectious Diseases*
THESIS: Molecular epidemiology of Mycobacterium tuberculosis in a South African correctional centre
The candidate's research provides invaluable insight into the under-researched field of detainee health. Detainees entering a South African Correctional Centre with highly infectious tuberculosis were frequently released before TB treatment completion. This has profound TB public health implications. Treatment continuity after incarceration is critical to TB control in the community.
Supervisors: Professor A Duse and Professor H Koornhof

BOUA, Palwende Romuald *Human Genetics*
THESIS: Genome-wide association study of carotid intima-media thickness (cIMT) in Sub-Saharan African populations: an AWI-Gen study
The candidate investigated the genetic susceptibility to atherosclerosis within Sub-Saharan African populations (Burkina Faso, Ghana, Kenya and South Africa). This work identified new African-specific genetic variants associated with carotid intima-media thickness, as well as evidence of gene-smoking interactions. The results provided with new insight onto cardiovascular disease biology.
Supervisors: Dr A Choudhury, Prof M Ramsay, Prof C Mathew and Dr H Sorgho)

CROUS, Lizelle *Nursing Education*
THESIS: Development of a concept-based postgraduate course: Scholarship in Advanced Practice Nursing at a university in South Africa
Design and development research was used to develop an evidence-based postgraduate scholarship course for the postgraduate diploma in Nursing. The study included an international review of advanced practice in nursing and then developed the course to ensure local needs are met using a concept-based curriculum approach.
Supervisor: Dr S Armstrong

DICKSON, Lynnsay Marcia *Paediatrics and Child Health*
THESIS: Screening, diagnosis and lifestyle intervention program for gestational diabetes mellitus in an urban primary health clinic in South Africa
Gestational diabetes (GD) is a common complication of pregnancy. Inexpensive glucometers, traditionally used for monitoring rather than the diagnosis of diabetes, were compared with two independent laboratories to screen for GD in a low resource community health clinic. Laboratories had low agreement with only 34% of positive diagnoses common to both. Glucometers missed fewer diagnoses and results were immediately available.
In addition, a universally applied fasting blood glucose to screen for GD had greater sensitivity and specificity than currently applied selective risk-factor based screening.
Supervisors: Professor E Buchmann and Professor S Norris

GILIOMEE, Johnel *Pharmacy and Pharmacology*
THESIS: A bio-inspired 3D printed device for burn wounds
The candidate focused on the design, development and evaluation of 3D printed polypeptide-based hydrogel scaffolds as potential healing devices for burn wounds. She developed new 3D printable materials suitable for wound healing and studied the micro-architectures of 3D printed scaffolds to optimise their in vitro and in vivo wound healing performance.
Supervisors: Professor Y Choonara and Professor V Pillay

HELLFERSCEE, Orienka *Virology*
THESIS: Epidemiology and genotypes of enteroviruses in patients with respiratory illness in South Africa
Globally, lower respiratory tract infections are the leading cause of death in children aged less than 5 years. This study focused on enteroviruses, which are a known cause of respiratory illness but whose epidemiology and molecular characterization have not been well described in South Africa.
Supervisors: Dr C Cohen, Dr M Du Plessis and Dr F Treurnicht

JOHNSTON, Deanne Mary Graham *Pharmacy and Pharmacology*
THESIS: Development of a sustainable student-run clinic serving the homeless of the inner city
The candidate used a convergent parallel mixed method study design to establish and investigate various factors affecting the sustainability of Trinity Health Services, an interprofessional student-run healthcare clinic serving the inner-city homeless of Johannesburg.
Supervisors: Dr A Egan, Dr J Miot and Associate Professor P Mcinerney

LONE, Shabir Ahmad *Clinical Microbiology and Infectious Diseases*
THESIS: Modulation of cell death and pathogenicity by eugenol tosylate congeners in Candida albicans
Due to the inadequate antifungal therapy, fungal infections become a menace to global health. In response to this crisis, Shabir synthesized novel semi-synthetic compounds (Eugenol Tosylate Congeners) and investigated their antifungal activity.
Supervisors: Dr A Ahmad and Dr J Molepo

MABVAKURE, Batsirai Macdonald *Virology*
THESIS: Co-evolution of antibody lineages and HIV epitopes
The candidate identified HIV signatures unique to individuals with potent antibodies, informing HIV vaccine design. He also characterized HIV in the female genital tract, contributing to microbicides, using a home-built bioinformatics cluster, enabling others to conduct health research in low-income settings.
Supervisors: Professor L Morris, Dr C Scheepers and Professor P Moore

MATHEBULA, Evans Mantiri *Human Genetics*
THESIS: Rheumatoid arthritis in black South Africans: Genomic susceptibility and methotrexate response
In a genome-wide association study of rheumatoid arthritis in black South Africans, Evans Mathebula identified novel associations with CPT1A gene variants, which might have a role in immune dysregulation. He further showed that FPGS gene variants influence response to methotrexate treatment. These findings advance our understanding of the role of genetics in susceptibility and treatment response in South African rheumatoid arthritis patients.
Supervisors: Dr N Govind, Professor M Ramsay and Professor M Tikly

MCADAM, Jennifer Claire *Occupational Therapy*
THESIS: Development and validation of the rural ADL manual handling sort
In occupational therapy, Basic and Instrumental Activities of Daily Living are difficult to assess in less-resourced rural communities. The aim of the study was to develop a unique ADL assessment for rural dwellers in South Africa. The development of the Rural ADL Manual Handling Sort, including content validity, was completed.
Supervisors: Associate Professor J Casteleijn and Dr D Franszen

MCCARTHY, Kerrigan Mary *Public Health*
THESIS: A critical review of the XTEND trial comparing Xpert MTB/RIF with smear microscopy for the diagnosis of tuberculosis under routine settings: Why a highly sensitive test failed to improve patient outcomes
The candidate used quantitative and qualitative methods to show that the increased sensitivity of Xpert was offset by additional efforts to diagnosis tuberculosis in persons at higher risk of death, including the provision of empiric TB treatment, and this balanced mortality rates across XTEND study arms.
Supervisors: Professor G Churchyard, Dr K Kielmann and Professor K Fielding

MUTSAERTS, Eleonora Alexandra Marie Louise *Clinical Microbiology and Infectious Diseases*
THESIS: Safety and immunogenicity of measles vaccine, varicella vaccine and hepatitis-A vaccine in HIV-exposed and HIV-unexposed South African children
A two-dose measles vaccine schedule, with the first dose administered at 6 months of age, induced antibody responses in the majority of HIV-unexposed and HIV-exposed-uninfected children. Hepatitis-A vaccination resulted in most children achieving seropositive antibody levels. Varicella vaccination yielded modest seroconversion rates, which were lower than expected in both groups.
Supervisors: Associate Professor M Nunes, Professor S Madhi, Professor K Klipstein-Grobusch and Dr D Grobbee

NYUNDU, Franswell Thamsanqa *Physiology*
THESIS: The prevalence of masked hypertension subtypes: it's association with cardiovascular organ changes and renal dysfunction in a population of African descent
The candidate investigated the prevalence of the subtypes of masked hypertension and its association with cardiovascular target organs and renal dysfunction. This thesis has made a significant contribution to the understanding of the influencing factors and the detrimental effects of masked hypertension and strategies required to overcome it in people of African descent.
Supervisors: Associate Professor M Maseko and Professor H Majane

OBIORA, Oluchukwu Loveth *Nursing Education*
THESIS: The experiences and perceptions of genitally mutilated females and healthcare practitioners in South Eastern Nigeria
The candidate undertook a multi-method study on the experiences and perceptions of genitally mutilated females and the healthcare practitioners who cared for them.
Supervisors: Dr N Mafutha and Professor J Maree

PADAYACHEE, Neelaveni *Pharmacy and Pharmacology*
THESIS: Utilisation of Over The Counter medicines in Medical schemes in South Africa
The candidate studied OTC or over-the-counter medicines used by members of medical schemes. Results showed that OTCs are poorly regulated and inadequately managed in South Africa. Pharmacists and members access OTCs according to available funds and not cost-effectiveness. In patients with chronic diseases OTCs may interact adversely with doctor-prescribed medicines.
Supervisors: Dr N Butkow and Professor A Rothberg

PATHIRANA, Jayani Chitramali *Public Health*
THESIS: Congenital cytomegalovirus in a high HIV prevalent setting, South Africa
The candidate's research advanced the knowledge of congenital cytomegalovirus in South Africa, a frequent but scarcely known infection. She identified that vertical HIV transmission was more frequent in neonates with congenital cytomegalovirus. HIV and cytomegalovirus co-infection may partly account for the residual maternal-to-foetal HIV transmission in the antiretroviral therapy era.
Supervisors: Dr M Groome and Professor S Madhi

PELDERS, Jodi Lyndall *Public Health*
THESIS: Tired of socio-economic stress: socio-demographic contributors to fatigue of mine workers in South Africa
This research employed mixed methods to assess the association of various demographic characteristics, socio-economic and living conditions, and lifestyle, health, safety and wellness factors, with fatigue of mine workers in South Africa. The findings can be used towards interventions to improve health, safety and productivity in the mining industry.
Supervisors: Associate Professor G Nelson, Dr S Phakathi and Dr S Schutte

ZEILER, Gareth Edward *Physiology*
THESIS: Physiological effects of rapid intravenous infusion of fluids for the treatment of hypovolaemic hypotension in anaesthetised cats
Blood loss and inappropriate fluid replacement are major factors contributing to death in cats during surgery. By making extensive clinical measurements, and by systematically comparing different treatments, the candidate has provided the first comprehensive knowledge on the physiology of cats during haemorrhage and fluid resuscitation, as well as proper treatment protocols.
Supervisors: Professor A Fuller, Professor L Meyer and Professor P Kammerman

FACULTY OF SCIENCE

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

Doctor of Philosophy

BANZE, Nkulu Mulunda Frank *Geography, Archaeology and Environmental Studies*
THESIS: The role of environmental legislation in promoting sustainable mining in the Democratic Republic of Congo: a study of the Katanga Copper Belt
The study investigated the role of environmental legislation in environmental preservation and conservation in the mining sector of the Democratic Republic of the Congo. The findings suggest that the absence of a comprehensive and well-coordinated legal system, coupled with a weak and corrupt institutional framework, have combined to negatively impact the well-being of the environment and the associated ecosystem.
Supervisor: Professor MD Simatele

BARDE, Abdu *Physics*
THESIS: A first principles study of structural stabilities and electronic, optical and photocatalytic properties of Seleno-Germanates A_2GeSe_4 (A = Mg, Ca, y-Sr and Ba) compounds
The candidate used state-of-the-art numerical simulation techniques to investigate Electronic, Optical and Photo-catalytic properties of Seleno-Germanate ternary compounds. His research contributed to the global search for novel materials for splitting water to generate renewable hydrogen fuel and for manufacturing efficient solar cells.
Supervisor: Professor DP Joubert

BRENNER, Mareike Juliane *Geography, Archaeology and Environmental Studies*
THESIS: The MIS 5 lithic assemblages of Klasies River
The thesis by publications entails the analysis of lithic technology at the Middle Stone Age site Klasies River. A new approach of combining lithic and shellfish material reveals coastal adaptation in relation to mobility. Furthermore, comparisons to other sites are presented and give insights to possible connections over large distances.
Supervisor: Professor S Wurz

BURGER, Kyle Glynn *Animal, Plant and Environmental Sciences*
THESIS: The relationship between flooding parameters and grazing herbivores in the south-western Okavango Delta
The candidate studied how flooding patterns influenced the structure of the grazing community in the Okavango Delta. He found that larger, generalist grazers were more resilient to changing flooding patterns than smaller, specialist grazers. This research provides insights into the consequences of anthropogenically-induced changes for large herbivore diversity in wetlands.
Supervisor: Professor F Parrini

DE CARVALHO, Shaun *Physics*
THESIS: Construction of the Emergent Yang-Mills Theory
The candidate has demonstrated, for the first time that relativistic non-Abelian Yang-Mills theories, and their local symmetries, can emerge as the world volume description of fundamental membranes. These results will have important consequence for the unification of gravity and quantum mechanics.
Supervisor: Professor R De Mello Koch

ETALE, Linda Sarah Mutesi *Geography, Archaeology and Environmental Studies*
THESIS: Exploring the relationship between gender-differentiated land rights and climate change adaptation for food security in western Kenya
The study investigated the relationship between land access, climate variety and food security of female headed households in Western Kenya. Using a system thinking approach, the results suggest that gendered-land rights, under increased climate induced extreme weather conditions undermines efforts towards achieving sustainable household food and nutrition security.
Supervisor: Professor MD Simatele

GOSSMAN, David Michael *Physics*
THESIS: Non-perturbative string theory dynamics from the gauge / gravity duality
The gauge gravity duality is a profound equivalence between quantum gravity and quantum field theories. The candidate has developed ground breaking methods allowing the study of non-perturbative quantum gravity phenomena for the first time. His work opens new avenues through which quantum gravity can be studied.
Supervisor: Professor R De Mello Koch

HUNT, Tamsin Helen *Geography, Archaeology and Environmental Studies*
THESIS: The Platberg Wesleyan mission station, 1833-1865: a landscape revealed
The Platberg Wesleyan mission station was occupied during a tumultuous period of South African history. This study explores the dialectic between permanence and transience on this frontier station; as well as how notions of intimacy and privacy were negotiated on a landscape designed to be visible and public.
Supervisor: Dr A Esterhuysen

ISMAILA, Abdulsalam *Physics*
THESIS: Optical Characterization of Ion Implanted Carbon Thin Films for Energy Application
The thesis investigated the properties of accelerator based Silver implantation into amorphous carbon thin films. In this work he showed that the silver aggregates form nanoparticles in the amorphous carbon matrix. and this technique offers a unique way to obtain tunable optical properties by altering the type, size, geometry or inter-particle distance of the metallic nanoparticles. The carbon nanocomposites were incorporated into a silicon solar cell in an effort to enhance the performance of the solar cell.
Supervisor: Dr SR Naidoo

JINGILI, Nuru Mohamed *Computer Science and Applied Mathematics*
THESIS: Syntactic generation of similar pictures
This study used bag context and random context grammars to generate a finite number of similar, but not identical, pictures in a controlled manner. For the generated pictures, the human perception of similarity was compared with the mathematical similarity. The research led to two journal articles and one conference paper.
Supervisors: Professor S Ewert and Professor I Sanders

KADZUTU-SITHOLE, Rudo *Chemistry*
THESIS: Colloidal Cu3N and Zn3N2 nanoparticles: from the single-source precursor approach to photocatalysis
The project involved the syntheses and characterisation of copper nitride and zinc nitride using a single-source precursor method for use as catalysts in water purification in a process called photocatalysis. Photocatalysis is the acceleration of a chemical reaction by the irradiation of a catalyst that in turn lowers the activation energy for the primary reaction to occur.
Supervisors: Professor N Moloto and Dr J Van Wyk

KOTANE, Lesias Morake *Physics*
THESIS: Efficiency and opto-electrical studies of solution processed bulk heterojuction organic photovoltaic devices
Ternary organic solar cells are investigated as suitable devices for efficiency enhancement due to their fast electronic transfer and extended optical absorption. The thesis elucidates the excellent opto-electrical properties of two electron donors and one acceptor for photovoltaic applications. Additionally, using Carbon nanostructures their role in charge transport is determined.
Supervisors: Professor D Wamwangi and Dr Z Chiguvare

MACHOGO-PHAO, Lerato Florence Eugenia *Chemistry*
THESIS: Synthesis and characterisation of novel colloidal gold selenide nanostructures and their application as counter electrodes for dye-sensitized solar cells
The project involved the beneficiation of gold through the synthesis of gold selenide nanostructures and use as electrocatalysts in dye-sensitized solar cells. Dye-sensitized solar cells are 3rd generation solar cells that offer the possibility of low-cost solar panels. However, their efficiency is low hence the search for new materials to bolster the efficiency.
Supervisors: Professor N Moloto and Professor P Shumbula

MASHIYANE, James Addelly *Physics*
THESIS: Higher derivative gravity black holes and the attractor mechanism in higher dimensions
This thesis is consisted of the investigation of black hole solutions in higher derivative gravity and the generalisation of the attractor mechanism to non-extremal black holes in arbitrary dimensions. A significant result of this research was the conclusion that black hole no-hair theorems effectively hold, at least up to fourth order in the derivative expansion.
Supervisor: Dr K Goldstein

MATHETSA, Steven Matome *Geography, Archaeology and Environmental Studies*
THESIS: Water-energy and climate change nexus in South Africa: application of the integrated water resource management approach for sustainable development
The study investigated the impacts of the water, energy and climate change (WECC) nexus on energy security in South Africa. The findings indicate that South Africa's silo approach to managing the WECC nexus has negatively combined to compromise its energy security and socio-economic development. Supervisors:
Professor MD Simatele and Professor I Rampedi

MATINDI, Tresor Balembo *Physics*
THESIS: Investigation of defects in diamond implanted with N-O molecular ions
The thesis is the first work that has produced credible evidence that a new defect in diamond was created relating to the N-O molecule diamond. The defect was created using ion implantation and annealing and identified by Photo-luminescence and X-ray photo electron spectroscopy.
Supervisors: Dr SR Naidoo and Professor MO Ntwaeaborwa

MOHAMMED, Hamza Adam Haroun *Physics*
THESIS: A numerical study of thermoelectric properties of layered platinum chalcogenides and oxide
The candidate used state-of-the-art numerical simulation techniques to investigate electronic and thermo-electric properties of thin layer Platinum Chalcogenides and Oxide. His research contributed to the global search for novel materials for manufacturing efficient thermo-electric devices to convert waste heat directly into electricity.
Supervisors: Professor DP Joubert and Professor GM Dongho-Nguimdo

MUKARUGWIRO, Jeanne d'Arc *Animal, Plant and Environmental Sciences*
THESIS: The occurrence and extent of water hyacinth in Rwanda and the selection of appropriate biological control
Remote sensing was used to detect water hyacinth in Rwanda, showing the weed coverage varied from 3 to 40%. High turbidity in these water bodies prevented establishment of the weed's biological control agent. Climate matching analysis revealed that other available biocontrol agents, which are unaffected by turbidity, should establish and perform well in Rwanda.
Supervisors: Professor M Byrne and Dr S Newete

NEUMANN, Saniye *Geosciences*
THESIS: Taxonomic revision of the short-snouted Tapinocephalid Dinocephalia (Amniota - Therapsida) - the key to understanding Middle Permian Tetrapod biodiversity
The middle Permian (270 million years ago) marks the origin of therapsid mammal-like reptiles, of which tapinocephalid dinocephalians were dominant. They have a global distribution, but their taxonomy was in disarray. This major study sorted out tapinocephalid taxonomy and enables future work on the effect of the major global extinction 260 million years ago.
Supervisors: Professor BS Rubidge and Dr NF Abdala

NORTON, Luke Allan *Geosciences*
THESIS: Tooth replacement patterns in Eutheriodontia Synapsida, Therapsida from the South African Karoo Supergroup
Karoo fossils provide the best record of mammal origins. A character of mammals is having only two sets of teeth. This, the first study of tooth replacement patterns in therapsid mammal-like reptiles by researching both ontogeny and phylogeny, showed that reduction in replacement activity is an adaptation for precise occlusion.
Supervisors: Professor BS Rubidge, Dr NF Abdala and Dr J Botha

OBAIDO, George Rabeshi *Computer Science and Applied Mathematics*
THESIS: SQL comprehension and synthesis
This work presents new techniques for SQL comprehension and synthesis. In a part, we created tools that explained SQL queries in plain text, and in another part, we created tools that generate queries from pictures, narrations, and speeches. Evaluations suggest that these tools will find applications in aiding SQL comprehension.
Supervisors: Dr HB Vadapalli and Professor A Ade-ibijola

OGBUOKIRI, Blessing Ogechi *Computer Science and Applied Mathematics*
THESIS: Generation of similar images using bag context shape grammars
This research demonstrated a new approach to generating an infinite number of similar images using a new shape grammar class called Bag Context Shape Grammars (BCSGs). In BCSGs, an image generation process is controlled by a vector of integers called the bag.
Supervisors: Dr M Raborife and Professor R Moitsheki

OLORUNFUNMI, Sunday Daniel *Physics*
THESIS: Investigation of the isoscalar giant monopole resonance as a function of neutron excess in the $^{40;42;44;48}$Ca isotope chain
The candidate's excellent and timely experimental high energy-resolution investigation of the giant monopole resonance in neutron-rich calcium isotopes were performed at the iThemba LABS Cape Town cyclotron using the world-class K600 magnetic spectrometer. The complex damping mechanisms of the resonance were elucidated in a comparison with state-of-the-art theoretical models, providing a major advance in the field of nuclear structure physics.
Supervisors: Dr I Usman and Professor J Carter

ONYEBUEKE, Emmanuel Onyebuchi *Geosciences*
THESIS: Integrated geophysical methods for near-surface site characterization in South Africa
Knowledge of the shallow subsurface is essential to ensure the sound construction and safe use of the infrastructure on which modern society depends. The candidate integrated seismic, electrical and magnetic methods to assess the stability of undermined ground, determine the response to strong earthquake shaking, and to evaluate ground water resources.
Supervisors: Professor R Durrheim and Professor M Manzi

OTGAAR, Tyrone Chad *Molecular and Cell Biology*
THESIS: 37 kDa LRP::FLAG enhances telomerase activity and reduces ageing markers in vitro and in vivo
This thesis investigated the effect of LRP::FLAG, an endogenous protein, as possible alternative tool to hamper the ageing process. Cell culture models showed that LRP::FLAG reduced senescent markers possibly through enhanced telomerase activity. Studies in aged mice confirmed an impediment of the ageing process by LRP::FLAG, through enhanced telomerase activity and extended telomeres. The treated animals improved significantly in various biochemical, histopathological and physiological tests. This thesis recommends LRP::FLAG as an alternative powerful anti-ageing drug.
Supervisors: Professor SFT Weiss and Dr E Van der Merwe

PAUMGARTEN, Fiona Elizabeth *Animal, Plant and Environmental Sciences*
THESIS: Household vulnerabilities and responses to climatic and socio-economic stressors in southern African dry forests and woodlands
This thesis contributes to our overall understanding of household vulnerabilities and responses to climatic and socio-economic stressors in the dry forests and woodlands of Southern Africa. In doing so, it contributes towards addressing the current dearth of such local-level assessments in the region.
Supervisor: Professor E Witkowski

RUGUT, Elkana Kipkogei *Physics*
THESIS: Photocatalytic and thermoelectric properties of Cu3(V,Nb,Ta) Se4 and Cd(Ga,Al)2O4: a numerical investigation
The candidate used state-of-the-art numerical simulation techniques to investigate photo-catalytic and thermo-electric properties of sulvanite and spinel ternary compounds. His research contributed to the global search for novel materials for splitting water to generate renewable hydrogen fuel and for manufacturing efficient thermo-electric devices to convert waste heat into electricity.
Supervisors: Professor DP Joubert and Dr G Jones

SHERWOOD, Nicole Leoni *Geography, Archaeology and Environmental Studies*
THESIS: Analysing lithic raw material qualities and hominid selectivity in the early Palaeolithic
Using both experimental toolmaking and other quality-related assessments of the local rock properties, the candidate evaluated raw materials used at the Palaeolithic sites of Sterkfontein and Swartkrans (South Africa) and Danjiangkou Reservoir Region (China) during the Early and Middle Pleistocene. Her work provides a significant analysis of how such populations understood, selected and used their raw materials.
Supervisors: Professor K Kuman and Professor D Stratford

SINGH, Shivani *Mathematics*
THESIS: Combinatorial aspects of colorings on groups
This research is devoted to combinatorial and algebraic properties of colorings of groups. Monochromatic symmetric subsets in r-colorings of finite Abelian groups are examined. The numbers of 2-alternating r-colorings and 2-alternating r-ary necklaces of cyclic group are counted.
Supervisor: Dr Y Zelenyuk

SWART, Joane *Geography, Archaeology and Environmental Studies*
THESIS: Engendering San rock art: masculinity and femininity in the rock art of Zimri Shelter and the Cederberg region, Western Cape, South Africa
The San rock paintings of human and animal bodies at Zimri Shelter, and other Cederberg sites depict constructed gender and identity categories. The rock art is a socially regulated activity concerned with bodily transformations, liminality and ambiguity encapsulated in San life-cycle rituals deeply intertwined with ideas of supernatural potency.
Supervisors: Dr G Blundell and Professor S Wurz

SWEMMER, Louise Katherine *Animal, Plant and Environmental Sciences*
THESIS: Towards improved benefit sharing: approaches and processes for assessing and reflecting on the societal impact of biodiversity conservation
The candidate used a case study of the Kruger National Park to develop and test a framework for more effective assessment of benefit-sharing in conservation. The novel framework includes both ecosystem services and dis-services provided by protected areas and provides a tool for reporting on benefit-sharing to manage trade-offs between these.
Supervisor: Professor W Twine

TESFAI, Redae Teclai *Animal, Plant and Environmental Sciences*
THESIS: African wild ass (Equus africanus) key resources overlap with livestock and population viability in the Danakil Ecosystem (Eritrea)
A very important breeding population of African wild ass occurs in the Messir Plateau within the Danakil desert. The candidate undertook the first comprehensive study on the effect that competition with domestic livestock has on diet and water access of this population, crucial for the long-term conservation of this species.
Supervisors: Professor F Parrini, Dr PD Moehlman and Professor N Owen-Smith

THABENG, Olaotse Lokwalo *Geography, Archaeology and Environmental Studies*
THESIS: Remote Sensing Survey of Archaeological Sites in the Shashi- Limpopo Region
Using the Shashi-Limpopo confluence case study, the research demonstrates that remote sensing techniques can identify and map archaeological sites previously occupied by farming communities of the Iron Age period in Southern Africa. Both advanced pixel and object based algorithms applied to high resolution imagery are employed successfully.
Supervisors: Dr S Merlo and Dr E Adam

TOMESCU, Mihai Silviu *Molecular and Cell Biology*
THESIS: In-field and in silico bioprospecting for hydroxynitrile lyases and terpenoid synthases from flora in South Africa
Biocatalysis is using enzymes capable of stereoselective biotransformation of precursors to industrially relevant products alleviating the requirement for costly hazardous chemical catalysts. The candidate developed methodologies for bioprospecting novel sources of enzymes from the rich diversity of our sub-saharan flora. By screening more than 600 plant species, he found 32 plants possessing hydroxynitrile lyases and terpenoid synthases, amongst them the famous African potatoe, Hypoxis hemerocallidea. These new enzymes are currently commercialized by our local industry, therefore creating new and much needed market opportunities for industrial biotechnology and biocatalysis in South Africa.
Supervisor: Dr K Rumbold

TOMIWA, Kehinde Gbenga *Physics*
THESIS: The readout electronics of the BM@N and ATLAS TileCal experiments and the search of new scalar bosons with ATLAS detector
The doctoral studies focused on instrumentation and search for new scalar boson (named Madala Boson) in the Large Hadron collider at CERN. He has explored the ATLAS Run 1 and Run 2 data set. His results showed some evidence of the existence of a particle around the mass of the predicted Madala boson.
Supervisors: Professor B Mellado and Dr X Ruan

VAN DEN BRANDT, Marc Johan *Geology, Palaentology and Geophysics*
THESIS: Morphology, taxonomy, phylogeny and stratigraphic ranges of South African middle Permian pareiasaurs
Pareiasaurs were some of the first large reptiles to live on land, and the oldest species are from South Africa. This study determined the number of valid species from the middle Permian and for the first time determined their stratigraphic ranges, thus enabling understanding of biodiversity change leading to the global extinction 260 million years ago.
Supervisors: Professor BS Rubidge and Dr NF Abdala

VANIA, Leila *Molecular and Cell Biology*
THESIS: Evaluating the effect of LRP/LR antibodies in colorectal carcinoma mouse models and assessing the molecular mechanism of LRP/LR on apoptotic pathways in colorectal carcinoma cells
This thesis investigated the effect of LRP/LR antibodies in colorectal carcinoma mouse models. In colorectal carcinoma cell culture models of early and late stages, siRNA-mediated LRP knockdown induced apoptosis, recommending siRNAs as promising tools for anti-cancer therapy. Cutting edge proteomic analysis identified proteins involved in LRP/LR-associated apoptotic and autophagic signalling pathways. This thesis provided profound insights into the processes of colorectal carcinoma with a novel link to telomerase and recommends alternative molecules for colorectal cancer therapy.
Supervisors: Professor SFT Weiss and Dr E Van der Merwe

VON BUDDENBROCK, Stefan Erich *Physics*
THESIS: The construction of a scalar extension to the standard model and the search for a heavy scalar at $\sqrt{s}$ = 13 TeV with the ATLAS detector
Having identified a set of anomalous observations in the LHC data, a new-physics model was developed to simultaneously explain them. The model introduces two new scalar bosons to the Standard Model which produce multiple lepton signatures. One of these was searched for using the ATLAS detector at CERN.
Supervisors: Professor B Mellado and Professor A Cornell

WILSON, Hayden Thorburn *Animal, Plant and Environmental Sciences*
THESIS: An analysis of the physiological mechanisms for the uptake, accumulation and excretion of gold by Tamarix usneoides E. Mey ex. Bunge
The study investigated the physiological processes that allow Tamarix usneoides to accumulate gold and other elements within the plant tissues and determined its potential use in the recovery of gold from contaminated sites. The species thus shows potential in mine rehabilitation.
Supervisor: Professor D Mycock

WORTH, Roland *Molecular and Cell Biology*
THESIS: Understanding the inhibition and post-translational modification of soluble CLIC1 and its structural homologs
Chloride, the major anion in humans, is involved in numerous biochemical processes that impacts our health and well being. This thesis reports novel work on the structural biology and interaction between the drug IAA-94 and chloride intracellular channel protein 1 (CLIC1), a major protein involved in the transport of chloride ions across membranes. This work was complemented with those done on structural homologues of CLIC1. His studies also investigated the modification of CLIC1 during oxidative stress via S-nitrosylation. The candidate's work contributed significantly towards a better understanding of how CLIC1 functions during health and disease.
Supervisor: Prof HW Dirr

ZIMUWANDEYI, Memory *Chemistry*
THESIS: Total synthesis of the analogues of pavettamine
This thesis describes the development of synthetic methodology leading to the first total synthesis of the enantiomer of the South African natural product pavettamine. In addition, suitable methods for the synthesis of reduced functionality analogues needed for structure activity studies are also presented.
Supervisors: Professor M Bode and Professor A Rousseau

GRADUATION AWARDS
FACULTY OF SCIENCE

Prize to be presented at the Faculty's prize giving ceremony

Shimadzu Top Achiever Award:
A prize of R5 000.00 is awarded to the best postgraduate student (MSc/PhD) in Biochemistry in the School of Molecular and Cell Biology.
Roland Worth

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President of Convocation
MS S BOLON BA Hons MA (Witwatersrand)

IHELE THE PROCESSION

IHELE
Words and music by S.B.P. Mnomiya

Anhom
Falalala
Obani labo?
Baphi Ahhom?

Ngibona beza
Beyikazela
Bathwel 'ongiyane
Bavela kuphi na?
Obani labo?
Ongqondongqondo
Osibakhulu
Yibo labo hhom!

Yini na leyo?
Ihele
Ihele lezingwazi zakithi
Ahhom udwendwe
Ahhom
Udwendwe lwezingqwele zakithi
Nant' ihele
Longqondongqondo
Nant' ihele
Losibakhulu
Udwendwe
Udwendwe lwezingqwele zakithi

THE PROCESSION

Who are those?
Which, Falalala?

I see them coming
Walking with swinging garments
They are wearing head rings
Where do they come from?
Who are those?
They are people with knowledge
They are people in authority
These are the ones

What is that?
It is a procession
A procession of our heroes

It is a procession
A procession of our champions
Here is a procession
Of people of knowledge
Here is a procession
Of people of knowledge
A procession
A procession of our heroes

Ihele is known as the 'Black' *Gaudeamus Igitur*. In song, the writer, Mnomiya uses very poetic language to describe a graduation ceremony. The soloist sings of the 'strange' procession of people in long robes and head gear. The choir responds by saying that these people are academics who read profound books of knowledge.

Mnomiya goes on to say that the graduates are an inspiration to all of us, and we will also graduate like them one day. The song goes on to wish the graduates well and it ends with a resounding "Halala" (well done!).

GAUDEAMUS

Gaudeamus igitur	Let us rejoice therefore
Juvenes dum sumus	While we are young.
Post jucundum juventutem	After a pleasant youth
Post molestam senectutem	After a troublesome old age
Nos habebit humus.	The earth will have us.
Ubi sunt qui ante nos	Where are they
In mundo fuere?	Who were in the world before us?
Vadite ad superos	You may cross over to heaven
Transite in inferos	You may go to hell
Hos si vis videre.	If you wish to see them.
Vita nostra brevis est	Our life is brief
Brevi finietur.	It will be finished shortly.
Venit mors velociter	Death comes quickly
Rapit nos atrociter	Atrociously, it snatches us away.
Nemini parcetur.	No one is spared.
Vivat academia	Long live the academy!
Vivant professores	Long live the teachers!
Vivat membrum quodlibet	Long live each male student!
Vivat membra quaelibet	Long live each female student!
Semper sint in flore.	May they always flourish!
Vivant omnes virgines	Long live all maidens
Faciles, formosae.	Easy and beautiful!
Vivant et mulieres	Long live mature women also,
Tenerae amabiles	Tender and loveable
Bonae laboriosae.	And full of good labor.
Vivant et republica	Long live the State
et qui illam regit.	And the One who rules it!
Vivat nostra civitas,	Long live our City
Maecenatum caritas	And the charity of benefactors
Quae nos hic protegit.	Which protects us here!
Pereat tristitia,	Let sadness perish!
Pereant osores.	Let haters perish!
Pereat diabolus,	Let the devil perish!
Quivis antiburschius	Let whoever is against our school
Atque irrisores.	Who laughs at it, perish!

ACADEMIC DRESS

The academic dress of this University is patterned on that of the Universities of Oxford and Cambridge, with modifications based on the model of the University of London and certain individual features, particularly in the costumes of office bearers and the hoods of degreesof bachelor and master.

Dress for Office Bearers

- The Chancellor wears a scarlet silk gown with a broad facing of black velvet down each side, embroidered in gold and a black velvet cap with gold cord and tassels.
- The Vice-Chancellor and Principal wears a blue silk gown with a broad facing of gold silk down each side, embroidered in blue, the sleeves being lined with gold silk. The cap is of the same design as that of the Chancellor.
- The Chairman of Council wears a black silk gown with a broad facing of red velvet down each side and around the neck, the sleeves being lined with gold silk. The cap is of the same design as that of the Chancellor.
- The academic dress of the Deputy Vice-Chancellors and the Executive Directors is the same as that of the Vice-Chancellor and Principal, except that the colour of the facing and sleeves of the gown and of the cord and tassels of the cap is silver-grey.
- The gown of the President of Convocation is of blue silk, with a broad facing of gold silk down each side, the sleeves being lined with white silk. The cap is the same as that of the Chancellor, but with a blue cord and tassels.
- The Registrar wears a black silk gown with a broad facing of blue silk down each side, bordered with gold braid. The cap is the same as that of the President of Convocation.
- A member of Council wears a black silk gown with a broad facing of gold silk. The cap is the same as that of the Chancellor.
- The gown of the President of the Students' Representative Council is black with a broad facing of blue satin.

Graduands' Gowns

- The gowns for all degrees of bachelor and master of the University are black, of the same pattern as the gown for a Master of Arts at the University of Oxford.
- The gown for the degree of Doctor of Philosophy is scarlet, after the University of London pattern.
- The gown for a senior doctorate is the same as that for the PhD, but with a gold satin facing on each side of the gown and with the sleeve button and cord in gold.

The Academic Hood

The academic hood is the principal feature of the costume for holders of our degrees of bachelor and master. The hood for the PhD is standard, regardless of the Faculty in which the degree was obtained. It is scarlet silk, lined with white silk.

Degree Colours

The hoods reflect the colour or colours of a particular degree or associated degrees.

THE UNIVERSITY MACE

Maces were originally weapons of defence, designed to break through armour. In medieval times, bishops carried a mace instead of a sword into battle to enable them to defend themselves in accordance with the canonical rule that forbade a priest to shed blood. In time, the mace has come to be regarded as a symbol of delegated authority vested in a person or an institution. At this University, it is a symbol of the authority vested in the Chancellor and a reminder of the mandate given by the legislature of this country to the University to grant degrees.

The University mace is the work of the Edinburgh designer, silversmith and engraver, William Kirk, who designed and made the mace of the University of Stirling and of other institutions. It is silver-and gold-plated, is 1070 millimetres long and 180 millimetres broad and weighs seven kilograms. The heraldic devices used in the decoration reflect the character of this University as an institution of learning, set in a mining centre within the Republic of South Africa.

The head of the mace with its spreading vertical blades is symbolic of the horns of a springbok. The central vertical spike is representative of a rock drill on the mine, and the amber stone set in the head is intended as a tribute to a past Chancellor through its association with his name, Bernstein, which in German means amber stone. The heavy quality of the head is consistent with the traditional concept of the mace as a weapon of defence. The collar repeats the shape of the head. It consists of eight cogs which symbolise the cog-wheel in the University coat of arms and represents mining and industry. The shaft is octagonal and divided into three sections. The coat of arms of the University is placed on the shaft under the collar. Below this the words *Universitas Witwatersrandensis Johannesburgi:* are inscribed, followed by the date in Roman numerals – MCMLXXVI (1977) – which signifies the year of the dedication of the mace.

The mace is a symbolic portrayal of this University, this city, the Witwatersrand and the Republic of South Africa. It is a constant reminder to members of Council and Senate to uphold at all times the rights, powers and privileges of the University and its governing bodies.

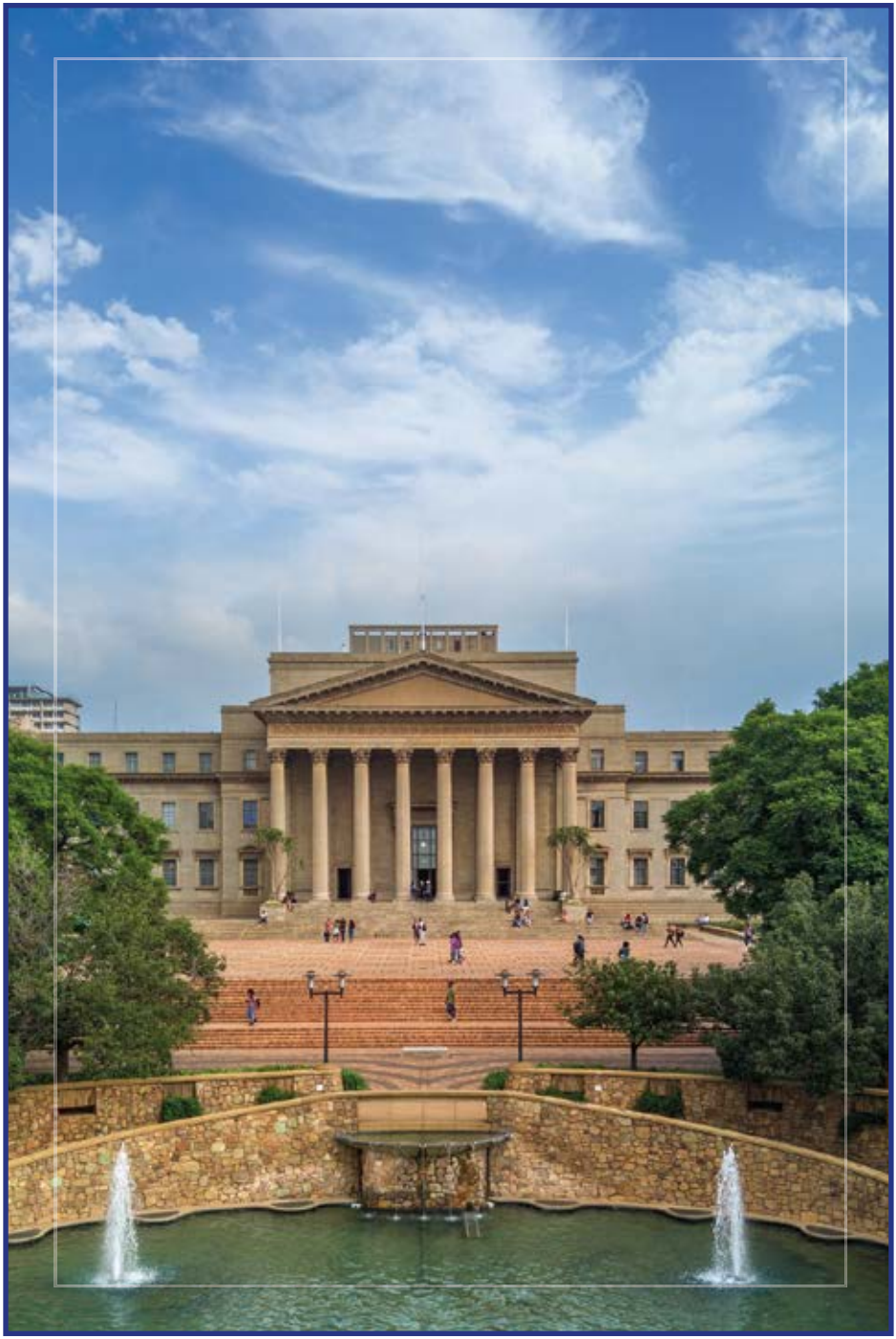
EMERGENCY AND FIRE PLANS
DURING GRADUATIONS

1. In the event of an emergency and/or fire:

- The presiding official (Chancellor/Vice-Chancellor/Deputy Vice-Chancellor) will make an announcement requesting guests, graduands and staff to keep calm and remain seated;
- The Ushers will assist guests to proceed to the nearest Emergency exits in order to evacuate the Great Hall in an orderly fashion;
- Emergency exit signs are visible in red above all exit doors situated on your left and right hand sides as well as the back of the Hall;
- The Ushers will assist the elderly and disabled guests out of the building;
- The academic procession on stage must exit through the back stage door;
- Once outside the Great Hall all guests, graduands and staff must proceed to the main assembly point on the piazza.

2. In the event of a Bomb threat

All bomb threats will be treated as real in order to protect lives and property and the premises will be evacuated immediately.



DISTINCTLY WITS

Wits is one of only two universities in Africa to be placed in the top 200 (from amongst 23 000 universities world-wide) in two separate international rankings. A world-class research university, Wits aims to be in the top league of world leading universities built on intellectual excellence, international competitiveness and measurable impact.

Wits is:

- internationally recognised for its research and its accredited academic programmes
- an active leader that takes a stand on social issues
- an engaged University committed to the advancement of the public good
- The latest 2017 alma mater survey by Times Higher education ranking placed Wits amongst the world's top 100 universities from which Fortune 500 CEOs graduated
- a University that boasts highly skilled teams working in astronomy, physics and related areas on the SKA project and other SA telescopes, and at CERN in Switzerland where Wits academics made a significant contribution to finding the Higgs Boson
- the institution that maintains the highest proportion of independent financial support
- a leader in the evolutionary sciences and the curators of priceless faunal, floral and hominid collections including the Taung Skull, Little Foot, Sediba and Naledi fossils
- proud of the four Nobel laureates and the 91 Rhodes Scholars that have emanated from the University
- the intellectual hub of Africa and has over 40 key projects actively running on the continent
- proud of its more than 180 000 graduates. More than 97% of Wits graduates obtain permanent employment within 6 months of graduation
- renowned for its balanced approach to all disciplines. Half of all enrolments are in the Science, Engineering and Technology fields
- proud of it academics who wrote four research articles that are ranked in the world's top 0.1% best articles in 2016
- pleased to collaborate with peers across 179 countries, including all the countries in Africa, bar two. Outside of South Africa, Wits produces most of its research in collaboration with leading universities and research centres in the world.

NATIONAL ANTHEM

Nkosi sikelel' iAfrika
Maluphakanyisw' uphondo lwayo,

Yizwa imithandazo yethu,
Nkosi sikelela
Thina lusapho lwayo.

Morena boloka setjhaba sa heso,
O fedise dintwa le matshwenyeho,
O se boloke, O se boloke setjhaba sa heso,
Setjhaba sa, South Afrika — South Afrika.

Uit die blou van onse hemel,
Uit die diepte van ons see,
Oor ons ewige gebergtes,
Waar die kranse antwoord gee,

Sounds the call to come together,
And united we shall stand,
Let us live and strive for freedom
In South Africa our land.

The Wits Choir

The Wits Choir has been under the direction of conductor and trainer, Dalene Hoogenhout, since 1995. Their repertoire is colourful and vibrant. They perform regularly at graduations and important ceremonies. The Wits Choir has toured internationally as well as playing host to other choirs here. They are also active in the community, undertaking choral outreach programmes.