



Beste Matie-graduandus

Hartlik geluk met die kwalifikasie wat u vandag hier verwerf. U is 'n sprekende voorbeeld van hierdie Universiteit se uitnemendheid. Mooi so, ons is trots op u!

Dit was vir ons 'n voorreg om u as student hier te hê. U verwerf eintlik baie meer as net 'n graad, want u het op vele maniere ontwikkel, en ook bygedra tot die vorming van ander – op die unieke Matie-maniër.

U doktorsgraad staan internasionaal gelyk met die beste. Die Universiteit verskyn gereeld op internasionale ranglyste, wat die instelling binne die top 2% van die wêreld se ongeveer 17 000 universiteite en onder die top drie universiteite in Afrika plaas. Met u navorsing het u bygedra tot ons akademiese uitnemendheid.

Ons streef daarna om 'n inklusiewe, innoverende en toekomsgerigte instelling te wees: 'n plek van ontdekking en uitnemendheid waar sowel personeel as studente denkleiers is wat tot diens van alle belanghebbendes kennis bevorder. Ons vertrou dat u ook wat u hier geleer en ervaar het tot voordeel van die gemeenskap sal aanwend.

Die Universiteit Stellenbosch is u akademiese tuiste. Bly asseblief 'n aktiewe lid van die Matie-familie via die alumni-webblad, sosiale media en gereelde alumni-funksies. Stuur vir die alumnikantoor (alumni@sun.ac.za) u nuwe kontakbesonderhede sodat u uitnodigings, nuusbriewe en die alumnitydskrif 'Matieland' kan ontvang.

Ons beste wense vergesel u!

Prof Wim de Villiers
Rektor en Visekanselier

Dear Matie Graduate

We warmly congratulate you on the qualification that you will be receiving here today. You exemplify the excellence that this institution strives for. Well done, we are proud of you!

It has been a privilege to have you here as a student. You have gained far more than just a degree, having developed in many ways and also having contributed to the growth of others – in the unique Matie way.

Your doctorate compares well with the best globally. The University regularly appears on a number of international rankings, placing it in the top 2% of the world's roughly 17 000 universities, and among the top three in Africa. With your research, you have contributed to our academic excellence.

We strive to be an inclusive, innovative and future-focused institution: a place of discovery and excellence where both staff and students are thought leaders in advancing knowledge in the service of all stakeholders. We trust that you will apply what you have learnt and experienced here to the benefit of the community.

Stellenbosch University remains your academic home. Please remain an active member of the Matie family via our alumni website, social media and regular alumni functions. Keep the alumni office (alumni@sun.ac.za) informed of your contact details so that you can receive invitations, newsletters and the alumni magazine 'Matieland'.

Our best wishes accompany you!

Prof Wim de Villiers
Rector and Vice-Chancellor

Mthwali-sidanga we-Matie othandekayo

Siyavuyisana nawe ngempumelelo yakho oza kuyifumana apha namhlanje. Wena ungumzekelo wobalasele elizamelana wona eli ziko. Wenze kakuhle, sinebhongo ngawe!

Besinenyhweba yokuba kunye nawe apha njengomfundi. Ufumene okuninzi okungaphaya kwesidanga: ukhulile apha ngeendlela ezininzi kwaye ube negalelo ekuhlumeni kwabanye – ngendlela ekhethekileyo ye-Matie.

Isidanga sakho sobugqirha sithlekiswa ngcono ehlabathini jikelele. Iyunivesithi bonakala rhoqo kuthotho lwezikali zasehlabathini, ziyibeka kwi-2% ephambili yeeyunivesithi eziphantse zibe li-17 000 ehlabathini, naphakathi kwezintathu eziphambili eAfrika. Ngophando lwakho wenze igalelo elikhulu kubalasele lwethu lwezemfundo.

Sizamela ekubeni liziko eligxile kuqukwano neziko elibalasele kwikamva: indawo yophando nobalasele apho bobabini abasebenzi nabafundi baziinkokheli ekuqhubeleni phambili ulwazi kwinkonzo yabo bonke abathathi-nxaxheba. Siyathemba ukuba uya kukusebenzisa oko ukufundileyo nokufumeneyo apha ekuxhamliseni abantu ekuhlaleni.

IYunivesithi yaseStellenbosch iya kuhlala ilikhaya lakho kwezemfundo. Nceda uhlale ulilungu lethu elikhutheleyo losapho lwe-Matie ngokuqhagamshelana nathi ngewebhusayithi yethu ye-alumni, amajelo eencoko kwakunye nemicimbi ye-alumni, ebanjwa rhoqo. Hlala uyazisa iofisi ye-alumni (alumni@sun.ac.za) ngeenkukacha zakho ukuze ukwazi ukufumana izimemo, iincwadi zeendaba kwakunye nemagazini yethu i-'Matieland'.

Iminqweno yethu emihle mayihambe nawe.

Njing Wim de Villiers
INqununu noSekela-Tshansila



KANSELIER:

Dr JP Rupert, DCom hc (Stell), DCom hc (NMMU)

REKTOR EN VISEKANSELIER:

Prof WJS de Villiers, MB, ChB, MMed (Int), FCP (SA), DPhil, MHCM

VOORSITTER VAN DIE RAAD:

Mnr GM Steyn, BA, LLB

BEDRYFSHOOF:

Prof L van Huyssteen, MScAgric, PhD (Agric)

VISEREKTOR (SOSIALE IMPAK, TRANSFORMASIE EN PERSONEEL):

Prof NN Koopman, BA, DTh (Waarnemend)

VISEREKTOR (LEER EN ONDERRIG):

Prof A Schoonwinkel, PrIng, MIng, MBA, PhD

VISEREKTOR (NAVORSING, INNOVASIE EN NAGRAADSE STUDIE):

Prof TE Cloete, MSc, DSc

REGISTRATEUR:

Mnr JA Aspeling, MCom, HOD

DEKANE:

Lettere en Sosiale Wetenskappe

Prof JP Hattingh, MA, DPhil

Natuurwetenskappe

Prof L Warnich, HonsBSc, MSc, PhD

Opvoedkunde

Prof M Robinson, BA, HDE, Drs Onderwijs, MEd, DED

Agriwetenskappe

Prof D Brink, HonsBSc, MScAgric, PhD (Waarnemend)

Regsgeleerdheid

Prof CS Human, BMil, LLM, LLD

Teologie

Prof H Bosman, HonsBA, DD (Waarnemend)

Ekonomiese en Bestuurswetenskappe

Prof SA du Plessis, HonsBCom, MPhil, PhD

Ingenieurswese

Prof JH Knoetze, BIng, PhD

Geneeskunde en Gesondheidswetenskappe

Prof JA Volmink, BSc, MB, ChB, DKG (SA), MPH, DPhil, MASSAf

Krygskunde

Prof MS Tshela, MSc, PhD

INTERESSANTHEDE VAN DIE SEREMONIE

Die prosesie, almal in akademiese drag, word so opgestel dat die mees junior lede eerste instap, maar die mees senior lid (gewoonlik die Kanselier of Visekanselier) lei die prosesie uit na die plegtigheid.

By Middeleeuse universiteite was die *cappa clausa*, 'n moulose mantel wat bo-oor 'n toga gedra is, die eerste vorm van akademiese drag. In die 16de eeu het Oxford en Cambridge weggedoen met die mantel en het akademiese drag bestaan uit die toga met moue, 'n kap met 'n lang 'stert' om die skouers en 'n hooftooisel. Streng riglyne het die ontwerp en kleure van akademiese drag bepaal. Hierdie tradisie het dus uit Europa oorgespoel na Suid-Afrika. Om ook erkenning te gee aan die Universiteit Stellenbosch se rol as integrale deel van die Afrika-vasteland, is die ampsdraers se togas herontwerp en met eenvoudige Afrika-motiewe geborduur.

Die taal verryk ook hierdie seremonie met interessante terme. Graduandi (persone wat op die punt staan om 'n graad te ontvang) stap met 'n kap oor die arm na die verhoog. Sodra die graad toegeken is, word die kap om die skouers van die graduati (persone wat pas 'n graad ontvang het) gehang. U kan elke fakulteit se kandidate uitken aan die kleur van die eerste graad se kap. Die honneursgraad se kap het 'n dubbele streep, die magistergraad s'n is swart met 'n geel satynvoering en die doktorsgraad s'n is maroen met geel satyn binne. Kandidate wat doktorsgrade ontvang, dra rooi togas.

Nuwe alumni kan gerus die alumni se webwerf, www.matiesalumni.net, dophou vir interessante nuus en konvokasievergaderings.

INTERESTING CEREMONIAL DETAILS

The procession, wearing academic dress, is set up so that the junior members walk in first, although the most senior member (usually the Chancellor or Vice-Chancellor) leads the procession out after the ceremony.

The *cappa clausa*, a sleeveless cloak that was worn over a toga, was the first form of academic dress in mediaeval universities. Oxford and Cambridge got rid of the cloak in the 16th century and academic dress then consisted of a toga with sleeves, a hood with a long 'tail' around the shoulders and a headdress. Strict guidelines determined the design and colours of academic dress. This tradition therefore came to South Africa from Europe. So as to acknowledge the role played by Stellenbosch University as an integral part of the African continent, the togas of the office-bearers were redesigned and embroidered with simple African motifs.

The language used also enriches the ceremony with interesting terms. Graduands (people who are on the point of receiving a degree) walk to the stage with the hood draped over their arm. As soon as the degree has been conferred, the hood is draped around the shoulders of the graduates (people who have just been awarded a degree). The candidates of the various faculties can be recognised by the colour of the hood for the first degree. The hood for an honours degree has two stripes, while that for a master's degree is black with a yellow satin lining. The hood for a doctorate is maroon with a yellow satin lining, while candidates receiving doctorates wear red togas.

New alumni should keep an eye on the alumni website, www.matiesalumni.net, for interesting news and information about convocation meetings.

INKCUKACHA ENOMDLA MALUNGA NEMISITHO

Umkhosi wemithika, onxibe umthika wemfundo, wenziwe ngohlobo lokuba amalungu asematsha ahambe kuqala, nangona elona lungu liphezulu kakhulu (lidla ngokuba yiTshansila okanye okanye liSekela-Tshansila) likhokela umkhosi wemithika ukuphuma emva komsitho.

I-*cappa clausa*, isambatho esingenamikhono esasinxitywa ngaphezu kwesinxibo somsitho (i-toga), sasiluhlobo lokuqala lesinxibo somthika wemfundo kwiiyunivesithi zamandulo. I-Oxford ne-Cambridge yahlukana neso sambatho kwinkulungwane ye-16 nomthika wemfundo owawunesinxibo esinemikhono, umxakatho 'onesisila' eside emagxeni nesinxibo sasentloko. Yimiyalelo engqongqo emiselwe uyilo nemibala yomthika wemfundo. Esi sithethe ngoko seza eMzantsi Afrika sisuka emaNtla. Ukuze sothulele umnqwazi iYunivesithi yaseStellenbosch ngendima eyidlalileyo njengxenye eqqibeleleyo yelizwekazi laseAfrika, izinxibo zomsitho (ii-toga) zamagosa olawulo zaphinda zayilwa ngokutsha zahonjiswa ngeemihombiso yesiAfrika.

Ulwimi olusetyeziswayo nalo luchumisa umsitho ngamagama enza umdla. Abathweswa izidanga baya eqongeni bethe bhije imixakatho ezingalweni zabo. Sakuba sinikeziwe isidanga, umxakatho uthiwa hatya emagxeni abo banikezwe izidanga. Abathweswa izidanga beefakhalthi ezahlukeneyo bangabonwa ngombala womxakatho kwisidanga sokuqala. Umxakatho wesidanga seeonazi unemigca emibini, ngelixa owesidanga semastazi umnyama unomaleko otyheli wesatini. Umxakatho wesidanga sobugqirha umaruni unomaleko otyheli wesatini, ngelixa abathweswa izidanga zobugqirha nabo benxiba izinxibo zomsitho ezibomvu.

Abo bangabathwali-zidanga abatsha bamelwe kukuqwalasela kwiwebhusayithi yabo babesakuba ngabathwali-zidanga (alumni), www.matiesalumni.net, ukufumana iindaba ezinika umdla kunye nenkcukacha emalunga neentlanganisano zekhonvokheyishini.

DOKTORALE PLEGTIGHEDE: MAART 2016

DOCTORAL CEREMONIES: MARCH 2016

IMISITHO YOTHWESO-ZIDANGA ZOBUGQIRHA: MATSHI 2016

Eerste Plegtigheid/ First Ceremony/ uMsitho Wokuqala 7
2016.03.16, 10:00

Fakulteite: Natuurwetenskappe
Agriwetenskappe
Ekonomiese en Bestuurswetenskappe
Ingenieurswese

Faculties: Science
Agrisciences
Economic and Management Sciences
Engineering

liFakhalthi: eyobuNzululwazi kwezobuGqi
eyezeeAgrisayensi
eyezeeNzululwazi kwezoQoqosho noLawulo
eyezobuNjineli

Tweede Plegtigheid/ Second Ceremony/ uMsitho Wesibini 25
2016.03.16, 14:00

Fakulteite: Lettere en Sosiale Wetenskappe
Opvoedkunde
Regsgeleerdheid
Teologie
Geneeskunde en Gesondheidswetenskappe

Faculties: Arts and Social Sciences
Education
Law
Theology
Medicine and Health Sciences

liFakhalthi: eyeAthsi neeNzululwazi zobuNtlalontle
eyezeMfundo
eyezoMthetho
eyezeNkolo
eyezamaChiza neeNzululwazi kwezeMpilo



PROGRAM VIR DIE EERSTE PLEGTIGHEID

DIE FAKULTEITE NATUURWETENSKAPPE, AGRIWETENSKAPPE, EKONOMIESE EN BESTUURSWETENSKAPPE, INGENIEURSWESE

'n Vriendelike beroep word op alle aanwesiges gedoen om selfone af te skakel en nie die saal tydens die plegtigheid te verlaat nie en sodoende te verseker dat die verrigtinge sonder ontwrigting verloop.

1. Akademiese prosesie kom die saal binne. U word versoek om te staan terwyl hulle die saal binnekom en te bly staan vir die sing van die Nasionale Lied.
2. Sing van die Nasionale Lied (kyk binneagterblad). Neem asseblief daarna u sitplekke in.
Begeleiding: Universiteit Stellenbosch Koperblaasensemble.
Orrelis: Brent Reynolds.
Voorsanger: Lunathi Ncumani.
3. Konstituering deur die Viserektor (Leer en Onderrig).
4. Verwelkoming deur die Viserektor (Leer en Onderrig) en prof M Dlali.
5. Voorstelling van doktorandi deur die dekanes van die betrokke fakulteite en toekenning van die grade deur die Viserektor (Leer en Onderrig).
6. Oorhandiging van die Kanselierstoekenning aan prof Helmut Prodinge deur die Viserektor (Leer en Onderrig).
7. Sluiting deur die Viserektor (Leer en Onderrig).
8. Akademiese prosesie verlaat die verhoog.

Die aanwesiges word versoek om te bly staan totdat die akademiese prosesie uitgestap het.

PROGRAMME FOR THE FIRST CEREMONY

THE FACULTIES OF SCIENCE, AGRISCIENCES, ECONOMIC AND MANAGEMENT SCIENCES, ENGINEERING

To help ensure that the proceedings run their course without disruption, will all those present kindly keep their cell phones switched off, and refrain from leaving the hall, while the ceremony is in progress.

1. Entrance of academic procession into the hall. You are requested to stand while it enters, and then to remain standing for the singing of the National Anthem.
2. Singing of the National Anthem (see inside back cover). Thereafter, please be seated.
Accompaniment: University of Stellenbosch Brass Ensemble.
Organist: Brent Reynolds.
Precentor: Lunathi Ncumani.
3. Congregation formally constituted by the Vice-Rector (Learning and Teaching).
4. Welcome by the Vice-Rector (Learning and Teaching) and Prof M Dhali.
5. Presentation of doctoral candidates by the deans of the respective faculties and conferment of degrees by the Vice-Rector (Learning and Teaching).
6. Presentation of Chancellor's Award to Prof Helmut Prodinge by the Vice-Rector (Learning and Teaching).
7. Closing by the Vice-Rector (Learning and Teaching).
8. The academic procession leaves the stage.

Those present are requested to remain standing until the entire academic procession has left the hall.

isiXhosa →

ISICWANGCISO-NKQUBO SOMSITHO WOKUQALA

IIFAKHALTHI EYOBUNZULULWAZI KWEZOBUGQI, EYEZEEAGRISAYENSI, EYOBUNZULULWAZI KWEZOQOQOSHO NOLAWULO NEYOBUNJINELI

Ukuqinisekisa ukuba umsitho uqala ngaphandle kwesiphazamiso, bonke abakhoyo bayacelwa ukuba bacime iiselfowuni zabo, kwaye bangaphumi eholweni ngeli xesha umsitho uqhubekayo.

1. Kungena umkhosi wemithika eholweni. Niyacelwa ukuba nime ngeenyawo xa ungena, nihlale nime njalo ukuze kuculwe uMhobe weSizwe.
2. Kuculwa uMhobe weSizwe (Jonga kumphakathi weqweqwe lokugqibela). Emva koko, ningahlala phantsi.
Umculo: yi-University of Stellenbosch Brass Ensemble.
Umdlali wohadi: nguBrent Reynolds.
Umhlabeli: nguLunathi Ncumani.
3. UMsitho uvulwa ngokusesikweni nguSekela-Nqununu (wezeMfundo nokuFundisa).
4. Ulwamkelo lwenziwa nguSekela-Nqununu (wezeMfundo nokuFundisa) noNjing M Dlali.
5. Ukwaziswa kwabafundi bezidanga zobugqirha ziintloko zeefakhalthi (iiDin) ezichaphazelekayo nokuthweswa kwezidanga nguSekela-Nqununu (wezeMfundo nokuFundisa).
6. Ukunikezwa kweBhaso likaTshansila kuNjing Helmut Prodinger nguSekela-Nqununu (wezeMfundo nokuFundisa).
7. Ukuvalwa koMsitho nguSekela-Nqununu (wezeMfundo nokuFundisa).
8. Umkhosi wemithika uyalishiya iqonga.

Bonke abakhoyo bayacelwa ukuba beme ngeenyawo de umkhosi wemithika ube uphume wonke eholweni.

KANDIDATE WAT KWALIFIKASIES ONTVANG

Hier volg 'n lys van graduandi met hul studierigtings, proefskriftitels en opsommings van die navorsing. Die grade van graduandi wat nie by die gradeplegtigheid teenwoordig kan wees nie, word in hulle afwesigheid toegeken.

CANDIDATES RECEIVING QUALIFICATIONS

Here is a list of graduands with their fields of study, dissertation titles and summaries of research. The degrees of graduands who are unable to attend the graduation ceremony are awarded in absentia.

ABAFUNDI ABAFUMANA IZINGQINI ZEZEMFUNDO

Apha kulandela uluhlu lwabathweswayo kwiinkalo zesifundo, izihloko zeedizethyishini kunye nezishwankathelo zophando. Izidanga zabathweswayo abangakwazanga ukubakho ubuqu kumsitho wothweso-zidanga bathweswa bengekho benjalo.

Fakulteit Natuurwetenskappe

Faculty of Science

IFakhalthi yezobuNzululwazi kwezobuGqi

PhD

ABDALLA, Abdurahman Masoud (Mathematics)

Binary closure operators

The study introduces and studies so-called binary closure operators on ordered sets, and applies them in the theory of categorical closure operators, which is one of the main branches of modern categorical topology. The notion of a binary closure operator is a simultaneous self-dual generalisation of the notion of a closure operator and the notion of an interior operator on an ordered set. The study opens up a new research direction which lies at the overlap of order theory, topology and category theory.

Supervisor: Prof Z Janelidze

BABALOLA, Olusegun Oluwaseun (Zoology)

Ecotoxicological and potential endocrine disrupting effects of selected herbicides on life stages and development of the aquatic African clawed frog, Xenopus laevis

Manmade chemicals in the environment have been linked to a global decline in amphibians and endocrine disrupting effects in wildlife and humans. Although herbicides are designed to eradicate unwanted plants, these chemicals may have developmental and health effects in non-target animals. In South Africa, high volume use of herbicides in agriculture and alien plant eradication programmes is a real concern. Six herbicide formulations were tested, using different life stages of the African clawed frog, *Xenopus laevis*. The selected formulations showed differential health effects, including teratogenicity, thyroid and growth disruption, gonadotoxicity and skewed sex ratios following metamorphosis. Evaluating herbicides for weed control should include endocrine modulation studies before considered safe for wildlife and humans.

Supervisor: Prof JH van Wyk

BAKER, Andrea (Geology)

Bulk geochemical, biomarker and leaf wax isotope records of Mfabeni peatland, KwaZulu-Natal, South Africa since the late Pleistocene

A high-resolution geochemical proxy palaeoenvironmental reconstruction was undertaken on an 8 m Mfabeni peat core. The hydrologic reconstruction showed that substantial fluctuations occurred during both the glacial and interglacial periods and that plant assemblages responded to water levels as opposed to temperature variations. Terrestrial land plants were the major organic matter (OM) input, with the exception of elevated water levels when submerged macrophytes were dominant. A positive trend between temperature and precipitation, and definitive interchanges between C3 and C4 plants since peatland inception was observed. The dominant regional climate driver was the oscillations in Indian Ocean sea surface temperatures since the late Pleistocene.

Supervisor: Prof AN Roychoudhury

Co-supervisor: Dr J Routh

BARKHUYSEN, Shani (Chemistry)

High-resolution ^{119}Sn and ^{103}Rh NMR characterisation of stannous halide complexes of Rh(III) in aqueous and non-aqueous solutions

Since the discovery of Rhodium as a precious element by WH Wollaston in 1803, the origin of the signature intense deep-red colour that results when tin chloride is added to a solution of Rhodium in acidic solutions has remained obscure. Using modern ^{119}Sn and ^{103}Rh NMR spectroscopy, it was revealed that the characteristic colour is due to a complicated mixture of numerous Rhodium-tin-chloride complexes. Moreover the detailed chemical structure of more than ten of these complexes in solution was determined, which has not been possible before by any other spectroscopic technique to our knowledge.

Supervisor: Prof KR Koch

BEKELE, Bewketu Teshale (Mathematics)

Modelling the impact of early HIV treatment on the HIV and TB epidemic in South Africa

This study deals with HIV antiretroviral treatment (ART) in South Africa. The study starts by proposing a novel mathematical model,

which was analysed and fitted to HIV historical data in South Africa. The model was then used to project the impacts and costs of various levels of ART scale-up. To assess some of the challenges that ART scale-up faces, the proposed model was further extended to account for access to treatment, dropout from treatment and treatment failure. The model was used to assess the impact of these three factors on the effectiveness and cost-effectiveness of ART scale-up in South Africa.

Supervisor: Dr R Ouifki

Co-supervisors: Prof W Delva and Prof F Nyabadza

BENJAMIN, Ronalda Abigail Marsha (Wiskunde)

Fredholm theory in ordered Banach algebras

Fredholmteorie (relatief tot willekeurige homomorfismes) in abstrakte Banach-algebras, en in die besonder die Fredholm-, Weyl- en Browder-spektra, word reeds vir meer as dertig jaar bestudeer, en vorm 'n integrale deel van die spektraalteorie. Aan die ander kant word verskeie spektraalteoretiese aspekte van Banach-algebras met 'n parsiale ordening sedert die 1990s ondersoek. Hierdie twee teorieë word verenig deur die rol van positiwiteit in Fredholmteorie deeglik te verken. Die bo-Weyl- en bo-Browderspektra speel 'n sentrale rol in hierdie ondersoek. Die nuttigste teorie, wat ook by die klassieke Fredholmteorie aansluit, word verkry in die geval waar die betrokke homomorfisme die Riesz-eienskap het.

Promotor: Prof S Mouton

BOTHA, Roelf Cornelis (Physics)

Development of diode end-pumped Nd: YLF lasers at 1314 nm for high power operation

Several diode end-pumped 1,3 μm Nd: YLF lasers have been developed for lunar ranging applications with the final objective to measure sub-cm orbital positions of the moon. A novel laser diode end-pumping scheme, utilising YLF crystals with low average Nd doping and natural axial doping gradient, and pumping from the lower-doping crystal side has resulted in maximum cw laser output of 26,5 W and actively Q-switched pulse output of 5,6 mJ with pulse duration of 36 ns and average power of 18,6 W. These are the highest reported values for any actively Q-switched end-pumped Nd: YLF laser at 1314 nm.

Supervisor: Prof HM von Bergmann

Co-supervisors: Dr HJ Strauss and Prof WL Combrinck

BURGER, Liesl (Physics)

Novel implementation of the phase-only spatial light modulator in laser beam shaping

Novel laser beams were created using digital holograms written to a spatial light modulator – a miniature LCD display. A laser was demonstrated with such a device as the back mirror, creating a holographic mirror for laser beams on demand. Following this, laser beams were realised experimentally with the ability to self-heal after an obstruction. Firstly, a new means for the self-healing was discovered based on the angular momentum of light. Secondly, a new class of laser beam was produced that self-heals over distances extending to infinity. The

outcome has advanced our understanding of laser beams and resonators.

Supervisor: Prof A Forbes

Co-supervisors: Prof EG Rohwer and Dr I Litvin

COETZEE, Anina (Botany)

Nectar distribution and nectarivorous bird foraging behaviour at different spatial scales

The broad research question was: How do nectar-feeding birds and nectar-producing plants influence each other's distribution and abundance? To answer this, research focussed on the iconic sugarbirds and sunbirds that visit proteas and ericas. Field experiments were conducted, pre-existing geographical distribution databases were analysed, and data gathered on the use of urban gardens by birds. It was found that birds influence the structure of plant communities by acting as a selective agent, and by mediating competition and facilitation among plants. Birds, in turn, are restricted to areas of high nectar availability such as protea stands or suburban gardens with artificial nectar feeders.

Supervisor: Prof A Pauw

Co-supervisor: Dr P Barnard

COLLING, Janine (Plant Biotechnology)

Functional characterisation of a putative signalling peptide TAXIMIN in the model plant Arabidopsis thaliana and a medicinal plant Sutherlandia frutescens L.R. Br.

Signalling peptides fine-tune plant growth and development, allowing interaction between plants and the environment. TAXIMIN, a novel family of signalling peptides with a putative role in regulation of plant secondary metabolism, was discovered in *Taxu baccata*. Functional characterisation of TAXI, a homolog in *Arabidopsis thaliana*, displayed a role in organ boundary formation. TAXI over-expression reduced sinapoyl-malate abundance, but increased light-sensitivity. TAXIMIN homologs had little effect on sutherlandin and sutherlandioside production in *Sutherlandia frutescens*, suggesting different functional roles in different species. This study provided new insights into molecular function of signalling peptides in plants.

Supervisor: Prof NP Makunga

Co-supervisor: Prof A Goossens

GEBRU, Alem Kindeya (Physics)

Development of a kHz optical remote sensing system for in situ insect monitoring

A remote detection and ranging instrument was developed, using either sunlight or laser light, to monitor and identify flying insects over a range of up to several kilometres. Information such as size, species, sex, flight direction, prey-predator interactions, distribution and general insect activity can be obtained *in situ* and remotely. This information is essential for studying flying insect behaviour and distribution, and has been applied in real life environments measuring disease vectors and the spatial and temporal distribution of pollinators across agricultural fields. The information could lead to more efficient pesticide application and the conservation of ecologically important insects such as honeybees.

Supervisor: Prof EG Rohwer

Co-supervisors: Dr PH Neethling and Dr M Brydegaardt

GOOSEN, René (Biochemistry)

A comparative analysis of CoA biosynthesis in selected organisms: a metabolite study

The regulation of coenzyme A (CoA, an essential metabolic cofactor) production presents an important target for antimicrobial drug discovery. Previously, the first enzyme of the CoA biosynthetic pathway was thought to regulate the pathway and consequently to be the best drug target; this notion has been challenged by negative results in inhibitor development studies. New analytical procedures were developed to investigate the CoA pathway and used to construct a kinetic model for a systems analysis of regulation. Significantly, the results indicated that the last pathway enzyme in fact has the most control during biosynthesis, and should therefore be the focus of future inhibitor development studies.

Supervisor: Prof E Strauss

Co-supervisor: Prof JL Snoep

GREYLING, Guillaume Hermanus (Polymer Science)

Field-flow fractionation of amphiphilic block copolymers

The high demand for new materials with improved performance and tailored properties is one of the major driving forces behind the development of new and complex synthetic polymers. However, current analytical techniques are not well suited to analyse these new materials and to address this need. Thermal field-flow fractionation (ThFFF) has gained significant attention as an analytical tool to analyse complex materials. This study demonstrates that ThFFF exhibits greater sensitivity towards polymer chemical composition and microstructure than current techniques and that it is the only technique that can determine several important properties of polymer nanostructures from a single analysis.

Supervisor: Prof H Pasch

GROENEWALD, Ferdinand George (Chemistry)

Gold acting as Lewis base in the formation of hydrogen and halogen bonds

Hydrogen bonds are the most important and observed type of interaction between molecules. For the first time it was shown that gold(I) can act as a hydrogen bond acceptor, and thus as a Lewis base, counter to its normal behaviour as a Lewis acid. The hydrogen-bonding interaction between a variety of gold species and hydrogen bond donors was characterised with various theoretical tools, obtaining valuable insight into its nature and properties. Considering the many parallels between halogen and hydrogen bonding, it was also demonstrated that gold(I) can behave as a halogen bond acceptor, forming stronger interaction than with hydrogen bonds.

Supervisor: Prof C Esterhuysen

Co-supervisor: Prof JLM Dillen

HALL, Duncan James (Geology)

The processes of melt segregation, magma ascent and pluton emplacement in the continental crust of the Damara Belt, Namibia

Granite magmatism represents the most important process of heat and mass transport in the Earth's crust, but the physical characteristics

of this process are only poorly understood. Based on natural examples from the Damara Belt in central Namibia, the project describes the fracture-controlled segregation and accumulation of melts through self-organised, interconnected fracture networks. The far-field, buoyancy-driven magma ascent through the crust is accomplished by the episodic separation and ascent of magma pockets as hydrofractures. The eventual arrest and emplacement of the magmas as large granite plutons is determined by crustal heterogeneities or switches of stress states in the upper crust.

Supervisor: Prof AFM Kisters

HEYNS, Andries Michiel (Operational Research)

A multi-objective approach towards geospatial facility location

Geospatial facility location science places a strong emphasis on geographical and spatial factors influencing site suitability for networks of facilities with complex location requirements, such as radars, telecommunication towers, watchtowers and wind turbines. Traditional placement procedures are designed to accommodate one type of facility only according to one placement objective, and are typically highly problem-specific. A generic geospatial facility location framework for identifying facility location trade-off alternatives was designed and was implemented as a computerised decision support system. The system also contains a novel, highly effective, multi-objective facility placement optimisation algorithm inspired by the aggressive manner in which viruses spread in mammals.

Supervisor: Prof JH van Vuuren

ISUNJU, John Bosco (Geography and Environmental Studies)

Spatiotemporal analysis of encroachment on wetlands: hazards, vulnerability and adaptations in Kampala City, Uganda

This study assessed the spatiotemporal extents of human encroachment on wetlands, and the hazards, vulnerability and adaptations among wetland communities in Kampala, Uganda, to inform risk reduction endeavours. The study applied a mix of methods including GIS and remote sensing techniques for analysis of very high resolution data, a survey of 551 households, four focus group discussions and five key informant interviews. Findings show a 62% loss of wetland vegetation between 2002 and 2014 in the Nakivubo wetland, bordering Lake Victoria. The principal hazard was flood waters which mostly affected tenant households and those who could not afford to adapt.

Supervisor: Dr JN Kemp

Co-supervisor: Dr C Orach

KOEGELENBERG, Corné (Geology)

Geology, structural evolution and controls of hydrothermal gold mineralisation in the eastern Karagwe-Ankole fold belt, northwestern Tanzania

The geology and tectonic setting of the Karagwe-Ankole fold-and-thrust belt in northwestern Tanzania has, to date, only been captured by regional reconnaissance studies. The structural evolution of the eastern termination of the belt overlying Archaean rocks of the Tanzania Craton was documented. Geochronological results constrain

the timing of regional tectonism and allow for a correlation with similarly old belts to the south. Hydrothermal fluid flow and associated gold mineralisation are structurally controlled by the regional-scale detachment between thrustured supracrustal sequences and underlying basement gneisses and localised to specific structural sites of long-lived fluid flow.

Supervisor: Prof AFM Kisters

KOEN, Wayne Sean (Physics)

Middle-infrared laser sources

A range of novel near diffraction-limited 2 μm lasers and amplifiers based on Tm: YLF and Ho: YLF were demonstrated. These systems varied from compact and efficient master oscillator power amplifiers delivering high average powers, to high-energy, single-frequency oscillators and amplifiers. This was made possible by exploiting various advantageous properties of holmium- and thulium-doped YLF crystals while mitigating its detrimental properties through the use of novel pump and laser design approaches. An optically pumped molecular HBr laser and amplifier system was demonstrated for the first time. The candidate also developed and demonstrated the first wavelength tuneable optically pumped molecular HBr laser.

Supervisor: Prof MJD Esser

Co-supervisors: Prof EG Rohwer, Dr HJ Strauss and Dr LR Botha

MAGADLELA, Anathi (Botany)

*Variation of phosphorus (P) supply alter nitrogen (N) metabolism in the nodules and roots of *Virgilia divaricata*, a Cape fynbos indigenous legume from the Cape Floristic Region (CFR)*

Phosphorus (P) deficiency affects the ability of legumes to acquire and metabolise available nitrogen (N). This research investigated the N metabolism of the legume *Virgilia divaricata*, in P-poor soils of the Cape fynbos. It was found that during P stress, this legume relies largely on symbiotic N_2 -fixation and can alter the composition of organic N exported in xylem sap. In addition the P-stressed plants can also recycle their amino acids via glutamate dehydrogenase, to fuel the mitochondrial respiration with organic acids. This suggests that this legume species has evolved functional flexibility in N metabolism to overcome soil P stress.

Supervisor: Prof AJ Valentine

Co-supervisor: Prof E Steenkamp

MERT, Marlin John (Microbiology)

Saccharomyces cerevisiae engineered for xylan utilisation

Bioethanol from plant biomass (lignocellulose) is an attractive alternative to fossil fuels and does not compete with human food supplies. Xylan, made up of xylose units, represents a large component of lignocellulose. A Baker's yeast strain was constructed that expresses enzymes required for xylan utilisation. To better understand the utilisation of xylan, the underlying principles of recombinant xylose metabolism was investigated using a metabolomics approach. The central carbon metabolism revealed that transaldolase activity in the pentose phosphate pathway is rate-limiting. In addition, the flux

through glucose 1-phosphate and pyruvate in glycolysis limit the rate of xylose metabolism.

Supervisor: Prof WH van Zyl

Co-supervisors: Dr SH Rose and Dr DC la Grange

MINOARIVÉLO, Henintsoa Onivola (Mathematics)

The eco-evolutionary dynamics of mutualistic networks:

from pattern of emergence to stability

Mutualistic networks such as pollination networks are assembled in well-organised patterns. The study aims at understanding ecological and evolutionary mechanisms that contribute to the emergence of these patterns and the overall ecological and evolutionary stability of mutualistic communities. The candidate developed a mathematical and simulation model of the ecological dynamics of population densities and the evolutionary dynamics of functional traits of a mutualistic community. It was found that specific structures of mutualistic networks emerge when interactions are trait-dependent. Moreover, mutualism plays a determinant role in sustaining evolutionary stability and the productivity of the community. In the face of biological invasion, the stability of a mutualistic community primarily depends on invader characteristics relative to those of native species.

Supervisor: Prof C Hui

NDAYISHIMYE, Joram (Physics)

Multiple chiral bands in ^{193}Tl

Since the introduction of multi-chiral bands in nuclear physics, the investigation of chirality in the $A \sim 190$ mass region has attracted a significant amount of interest in nuclear structure physics. Data on ^{192}Tl , and ^{193}Tl have, until recently, been insufficient to make any clear conclusions on the existence of multi-chiral bands in the ^{192}Tl and ^{193}Tl isotopes. A new experimental study was performed at iThemba LABS, investigating the possible existence of multi-chiral bands in ^{192}Tl and ^{193}Tl , using the Afrodite gamma array. The results show agreement with the most popular theoretical studies on these two isotopes.

Supervisor: Prof SM Wyngaardt

Co-supervisor: Dr EA Lawrie

PHIRI, Justice Mohau (Polymer Science)

Multidimensional analytical approach for the characterisation of complex ethylene propylene copolymers

Impact polypropylene copolymers are complex multiphase materials having ethylene-propylene rubber (EPR) particles incorporated in a semi-crystalline isotactic polypropylene matrix. The EPR particles form the most critical part of the material being continuously dispersed in the matrix to prevent crack propagation under mechanical stress. Molecular properties of the EPR phase were investigated. A multi-dimensional analytical approach has been developed to investigate EPR in terms of molar mass and chemical composition distributions. A combination of selective fractionation techniques was used to obtain components with different chemical compositions that were subsequently analysed by advanced spectroscopic techniques.

Supervisor: Prof H Pasch

POSTMA, Ferdinand (Microbiology)

Rhizofiltration of urban effluent: microbial ecology and conceptual treatment mechanisms.

South African rivers are increasingly being polluted by urban runoff, one of the most common sources of diffuse pollution. Rhizofiltration is a novel type of phytoremediation mimicking riparian ecology. The rhizofilter was designed to rapidly filter large volumes of polluted urban runoff before it enters river systems. Analyses of chemical, physical and microbiological parameters, in combination with metagenomic analyses, revealed that the rhizofilter design and the composition of waste water selects for copiotrophic aerobic microorganisms capable of mineralising potentially recalcitrant organic carbon sources, while driving oxidative processes such as nitrification. Simultaneously, intestinal microbial commensalists and pathogens are removed by the system.

Supervisor: Prof A Botha

Co-supervisor: Dr M Mouton

RIGBY, Charles Ian (Physics)

Development and characterisation of an Nd: YAG pumped wavelength tunable VUV light source

Laser light in the vacuum ultraviolet spectral range was generated by focussing two visible laser beams into magnesium vapour. This source provided a vacuum ultraviolet intensity 440 times higher than previously available. Evidence was found for several nonlinear optical processes playing a role in the conversion process at high input power. The source was applied to measure rovibronic excitation spectra of carbon monoxide molecules, with individual rotational lines resolved. It facilitated the detection of forbidden spectral lines and calculation of molecular constants that are important to space science, as carbon monoxide is the second most abundant molecule in space.

Supervisor: Dr CM Steenkamp

Co-supervisor: Prof EG Rohwer

SHACKLETON, Ross Taylor (Botany)

A multi-scaled, transdisciplinary study on the impacts and management of Prosopis, one of the world's worst woody invasive plant taxa

A social-ecological approach was used to study a conflict-of-interest tree genus *Prosopis*, which is recognised as a major invader globally and in South Africa. Substantial insights into the negative impacts of this invader on biodiversity and local livelihoods, and evidence to support the integrated management of this tree was provided. A national strategy to guide the management of *Prosopis* in South Africa was also developed, which highlighted the urgent need for improved collaboration between stakeholders, the introduction of more biological control agents, and improved multi-level planning and prioritisation to improve use and efficiency of limited funding.

Supervisor: Prof DM Richardson

Co-supervisor: Dr DC le Maitre

VAN NIEKERK, Daniel Malan Emmanuel (Chemistry)

Experimental and computational approaches to investigate high oxidation state redox chemistry of osmium

Three simultaneous reactions that occur on different timescales during the reduction of OsVIII with methanol were investigated. The study combined detailed experimental and quantum mechanical computational work with regard to oxo/hydroxide, high oxidation state osmium (Os) chemistry. The kinetics and thermodynamics of the three reactions were shown to fit a well-defined set of chemical reactions. The comproportionation reaction of OsVIII and OsVI was found to occur via concerted electron-proton transfer whereas the rate-determining step of the reduction of OsVIII with methanol was found to occur via α -C-H (not O-H) hydrogen atom transfer.

Supervisor: Dr W Gerber

Co-supervisor: Prof KR Koch

VILJOEN, Monet (Physiological Sciences)

Correlations between stress-associated anxiety and physiological determinants of health in adolescents

Anxiety disorders are among the most prevalent of psychiatric disorders, with onset typically in childhood or early adolescence. Furthermore, risk for development of anxiety disorders increases with exposure to trauma/childhood maltreatment. Little is known about biomarkers of resilience/vulnerability in relation to subclinical anxiety, especially in trauma-exposed adolescents. Central and peripheral neuroendocrine and immunological profiles were elucidated in adolescents, in association with anxiety proneness and childhood trauma. Results indicated a relatively larger causative association of neurophysiological maladaptations, with anxiety proneness, compared to childhood trauma. Potential clinical outcome modulators, and thus therapeutic targets, were identified and included resilience and self-esteem.

Supervisor: Prof C Smith

Co-supervisor: Prof S Seedat

VOSLOO, Johan Arnold (Biochemistry)

Optimised bacterial production and characterisation of natural antimicrobial peptides with potential application in agriculture

A group of antimicrobial (antibiotic) peptides, the tyrocidines from soil bacteria, was identified as potential nature-friendly biocides. The optimised production of tyrocidines in bacterial cultures delivered appreciable amounts of these high value peptides. A novel mathematical model of the production was generated and applied to produce tailored peptide subsets. Tailored production eased purification of six peptides, which were then biophysically characterised in different solvent systems that were utilised in formulations. These peptides alone and in combination have potent antifungal and antibacterial activities, while they were not toxic towards beneficial insects such as bees. There is also a limited potential for resistance towards the tyrocidines due to their rapid membranolytic activity and alternate cellular targets.

Supervisor: Prof M Rautenbach

Co-supervisor: Prof J Snoep

DSc

PRODINGER, Helmut (Mathematics)

Contributions to the analysis of approximate counting

Approximate counting is a classical technique in computer science to handle large quantities of data with limited capacities. Over the course of several decades, Helmut Prodingger has contributed significantly to the analysis of this method. His work was instrumental in developing the mathematical toolkit required for the challenging asymptotic analysis of approximate counting and its performance parameters, and many ideas can also be applied to related topics such as digital search trees. A variety of different mathematical tools play a role in this context, and surprising connection to seemingly unrelated topics as q-analysis and partition theory can be found.

Supervisor: Prof S Wagner

Fakulteit Agriwetenskappe **Faculty of Agrisciences** **IFakhalthi yezeeAgrisayensi**

PhD

AYOOLA, Mathew Oluwaseyi (Animal Science)

Application of dietary bentonite clay as feed additive on feed quality, water quality and production performance of African catfish (Clarias gariepinus)

Poor feed quality, feed utilisation and water quality are hindering the growth of aquaculture. Effects of natural bentonite and its acid-activated form as additives in aquafeeds for African catfish (*Clarias gariepinus*) were investigated. Dietary clay improved aquafeeds' physical qualities, increased the rate of feed evacuation in the gut, enhanced production performance and maintained good water quality. An optimum level of performance was recorded at 1 500 mg/kg inclusion of natural bentonite and up to 50% combination blends (acid-activated: natural) at low inclusion levels of 500 mg/kg. The research provided important information on the application of clay mineral products at recommended inclusion levels as feed additives in aquaculture.

Supervisor: Dr K Salie

External Co-supervisor: Mr L de Wet

BALA, Shuaibu Mallam (Food Science)

Effect of forced convection roasting on physicochemical and antioxidant properties of whole grain maize (Zea mays L.) and optimisation of roasting conditions

Roasting of whole maize grain can be used as a value-adding pre-processing method during food manufacturing. Forced convection continuous tumble roasting was investigated and showed to improve pasting properties of hard and soft maize varieties. Roasting also did not negatively affect the nutritional quality and antioxidant properties of whole grain flour. Roasting conditions (roasting temperature, rotating speed) were optimised using response surface methodology, central composite design and desirability profiling. The candidate

illustrated different optimisation conditions for different varieties. Higher optimum temperatures and rotating speeds were required for the harder compared to the soft white maize varieties.

Supervisor: Prof M Manley

Co-supervisor: Prof UL Opara

BEELDERS, Theresa (Food Science)

Xanthenes and benzophenones from Cyclopia genistoides (honeybush): chemical characterisation and assessment of thermal stability

High-temperature processing of honeybush, important for development of the characteristic sensory properties of this herbal tea, leads to losses in bioactive phenolic compounds responsible for its health properties. The phenolic composition of unprocessed and processed *Cyclopia genistoides* was extensively characterised, including isolation and structure elucidation of a novel benzophenone diglucoside. Thermal degradation of the major xanthenes and benzophenones was modelled in the plant material and aqueous solutions for the first time. These models provide insight into the effects of temperature, pH and structure on degradation kinetics. The models could be used to predict and subsequently minimise losses during thermal processing.

Supervisor: Prof E Joubert

Co-supervisors: Dr D de Beer (External) and Dr GO Sigge

BITALO, Daphne Nyachaki (Genetics)

Regional population dynamics of three elasmobranch species occurring in southern African waters: Galeorhinus galeus, Carcharhinus brachyurus and Rhinobatos annulatus

Elasmobranchs (sharks, skates and rays) are highly exploited worldwide and more vulnerable than most teleost fishes due to their life history traits. The tope shark *Galeorhinus galeus*, the copper shark *Carcharhinus brachyurus* and the endemic lesser sandshark *Rhinobatos annulatus* are targeted locally in commercial and recreational fisheries and considered either as "vulnerable" or "data deficient" within southern Africa. This study provided the first information on genetic diversity, population connectivity and evolutionary history of these species on a regional scale. Most significantly, the study confirmed the diverse gene flow patterns found across species, highlighting the urgent need for an integrated ecosystems approach to fisheries monitoring and biodiversity conservation.

Supervisor: Dr AE van der Merwe

Co-supervisor: Prof R Roodt-Wilding

CHIDI, Boredi Silas (Wine Biotechnology)

Organic acid metabolism in Saccharomyces cerevisiae: genetic and metabolic regulation

Acidity is a primary driver of wine sensory perception, and is a function of the concentration of organic acids. While total acidity is monitored in wine, little attention is given to individual acids, although each presents a different sensory profile. In this study, the production of fermentation-derived organic acids was investigated as a function of yeast strain and of environmental parameters including temperature and pH. Transcriptomic data were used to identify genes that are relevant for acid production. The data provide novel insights into the

metabolic and genetic regulation of acid metabolism and will be useful for winemakers.

Supervisor: Prof FF Bauer

Co-supervisor: Dr D Rossouw

CHUKWUMALUME, Rufina Chinelo (Food Science)

Assessment of persistent organic contaminants in selected marine fish species along the South African coastline

Seafood is an excellent source of essential and non-essential nutrients and has numerous health benefits when consumed regularly. However, consumption can also pose health risks as marine organisms can contain and accumulate harmful persistent organic contaminants. This dissertation outlined crucial baseline information (presence, concentration, source and safety) in this understudied topic, examining nine consumed marine species over seven locations within South Africa. DDT levels were considered low and of no immediate risk to consumers. The PAHs identified were from a common input source, petroleum, indicating marine pollution, where benzo(a)pyrene, a highly carcinogenic PAH was detected above safety limits in predatory species examined.

Supervisor: Prof LC Hoffman

Co-supervisors: Prof UL Opara, Dr M Stander and Dr B O'Neil (External)

ENGELBRECHT, Adriaan (Conservation Ecology)

Phylogeography of the rodent mites Laelaps giganteus and Laelaps muricola using mitochondrial and nuclear DNA markers: an evolutionary approach to host-parasite interactions

Laelaps giganteus and *Laelaps muricola* (Mesostigmata: Laelapidae) are widespread and locally abundant mites on small mammals in southern Africa. A comparative phylogeographic approach was followed to study the evolution and taxonomy of the parasites and their host species. Strong support for evolutionarily distinct lineages within *L. giganteus* was found, and restricted dispersal ability has resulted in significant co-divergence with its rodent host. Novel insights into the host ranges of *L. giganteus* and *L. muricola* are also described and this study further provides the first evidence of putative cryptic lineages with both mite species.

Supervisor: Dr S Matthee

Co-supervisor: Prof CA Matthee

GAO, Yu (Wine Biotechnology)

Parameters involved in the enzymatic deconstruction of the wine grape cell wall during winemaking

In this study it was evaluated how wine enzymes worked on deconstructing the complex nature of grape berry cell walls during winemaking. New cell wall profiling tools were tested and used in-depth for the first time. The study revealed that two pectin-rich layers are found in grape berries. Commercial enzymes were shown to decrease intra-vineyard variation in harvested grapes for winemaking. Recombinant enzymes were used to develop a model of the grape berry cell wall. This new grape berry cell wall model will help in

designing tailor-made enzymes for use in different winemaking scenarios.

Supervisor: Dr JP Moore

Co-supervisor: Prof MA Vivier

MARAIS, Jeannine (Food Science)

Factors influencing the flavour of the meat derived from South African game species

Game meat is derived from female and male animals from a variety of species, located throughout southern Africa. This study investigated the influence of farm location, species and gender on the flavour of the meat derived from various economically important South African game species. This was the first research quantifying the chemical flavour profile (volatile compounds) of South African game meat through SPME-GC-MS. The latter was correlated to the descriptive sensory analysis profile of game meat. The data indicates that game meat should be marketed according to the species from which it is derived, while the influence of farm location and gender was species-specific.

Supervisor: Prof LC Hoffman

Co-supervisor: Ms M Muller

MPHAHLELE, Rebogile Ramaesele (Horticultural Science)

Impacts of postharvest handling and processing on bioactive compounds and functional properties of pomegranate fruit fractions and by-products

Commercial production of pomegranates has grown rapidly in South Africa and other parts of the world due to increasing scientific evidence linking fruit consumption to better health outcomes. However, incidence of postharvest fruit losses remains high. This study investigated the effects of preharvest factors, postharvest handling and processing techniques on quality, nutritional value and medicinal properties of pomegranate fruit and its by-products. Results showed variation in fruit quality at different maturities and growing location. Fruit waste and by-products such as peel and seed contained substantial amounts of valuable bioactive compounds which are valuable ingredients in the health and pharmaceutical industries.

Supervisor: Prof UL Opara

Co-supervisors: Dr OA Fawole and Dr M Stander

MUZIRI, Tavagwisa (Horticultural Science)

The influence of cell wall bound calcium, cell number and size on the development of mealiness in 'Forelle' pear. Evaluation of X-ray CT and NIR as non-destructive techniques for mealiness detection

'Forelle', the second most exported South African pear, is prone to mealiness, a dry textural disorder leading to postharvest losses. This study established that mealy tissues were associated with elevated levels of free Ca²⁺, larger cells and intercellular airspaces, a higher porosity (defects) in the neck of the fruit even before ripening, and higher total soluble solid levels. This study demonstrated that fruit have a predisposition to mealiness, which can be identified with X-ray computed tomography before ripening and mealiness occurs. Discriminant analysis using NIR spectra successfully classified mealy and non-mealy fruit and merits research on commercial scale.

Supervisor: Dr EM Crouch

Co-supervisor: Prof KI Theron

NEETHLING, Nikki Elrita (Food Science)

Factors influencing colour variations and oxidative stability of South African game meat species

Meat colour is the only quality factor that can be evaluated by consumers at the time of purchase. Thus, maintaining a desirable meat colour is wanted to maximise profits. This study investigated the colour stability of game meat from three different game species (springbok, blesbok and fallow deer) by measuring various surface colour attributes, surface myoglobin redox forms and biochemical factors which influence muscle colour stability. The study indicated that game meat colour varies between species and that its colour stability differs from that of beef. Furthermore, valuable baseline data was also provided for future studies.

Supervisor: Prof LC Hoffman

Co-supervisors: Dr GO Sigge and Prof SP Suman (External)

OMEJE, Victor Okonkwo (Aquaculture)

Effects of Carica papaya seed powder on the reproductive, endocrine and immune systems of Oreochromis mossambicus

The study investigated the potential of pawpaw (*Carica papaya*) seed powder (PSM), when included as part of Mozambique tilapia diets, to produce all-male populations for culture purposes, in an effort to overcome overcrowding and non-uniform growth in pond systems. The study indicated the safety of PSM to be included in Mozambique tilapia diets, as evident in the liver function and immune system functioning that was unaffected by the PSM. An inclusion level of 20 g PSM/kg basal tilapia diet resulted in 77,8% masculinisation, with female fish being more sensitive to the treatment.

Supervisor: Dr H Lambrechts

Co-supervisor: Prof D Brink

ROSE, Lindy Joy (Plant Pathology)

Investigating maize inbred line responses following infection by the mycotogenic fungus Fusarium verticillioides

The fungus *Fusarium verticillioides* causes Fusarium ear rot (FER) and deposits toxins harmful to humans and animals, called fumonisins, in maize grain. Host-plant resistance is considered the most feasible, economical and environmentally sound approach to manage *F. verticillioides* and its fumonisins. South African and Kenyan maize inbred lines resistant to *F. verticillioides* were identified in this study. Resistant plants were also generated by gamma irradiation. Candidate genes have been identified by using next-generation RNA sequencing that could enhance resistance in maize to *F. verticillioides* and fumonisins.

Supervisor: Prof A Viljoen

Co-supervisors: Dr C van der Vyver and Prof BC Flett (External)

SSALI, Reuben Tendo (Plant Pathology)

The identification and characterisation of resistance in banana to Fusarium oxysporum f. sp. cubense race 1

The soil-borne fungus *Fusarium oxysporum f. sp. cubense* (Foc) can cause losses of up to 100% in banana fields. Host plant resistance is con-

sidered the only feasible method to control the disease. This study demonstrated that resistance to Foc race 1 is provided by a single recessive gene, named *pd1*. Candidate molecular markers and genes linked to resistance were identified by DArT analysis and RNA sequencing respectively. These markers and genes could be used for marker-assisted selection in conventional breeding and for genetic engineering of bananas for Fusarium wilt resistance.

Supervisor: Prof A Viljoen

External Co-supervisor: Dr A Kiggundu

STOKWE, Nomakholwa Faith (Entomology)

Potential control of the woolly apple aphid (Eriosoma lanigerum) using entomopathogens

The woolly apple aphid is an important insect pest of apples. Infestation can lead to severe damage to roots on the form of galls and the destruction of developing buds. Rising interest in environmentally sustainable farming has increased the demand for environmentally friendly pest control methods. The overall aim of the study was to determine the potential of insect parasitic nematodes and fungi to control the soil stages of the woolly apple aphid. The use of nematodes was found not to be ineffective, while promising results were obtained in laboratory and field trials with the application of entomopathogenic fungi.

Supervisor: Dr AP Malan

Co-supervisor: Dr P Addison

SWANEPOEL, Mon-Lee (Conservation Ecology)

Distribution, management and utilisation of the extra-limital common warthog (Phacochoerus africanus) in parts of the Northern Cape and Free State provinces, South Africa

The common warthog has been extra-liminally introduced to parts of South Africa and is simultaneously managed as an agricultural pest and valuable game animal by farmers. The study proposed the production of warthog meat as a strategy to sustainably manage introduced warthogs. Results indicated that warthog meat is high in protein and low in fat with a favourable fatty acid profile, and suitable for producing healthy processed meat products. In totality, the study provides baseline information on warthog meat quality characteristics, and concluded that warthogs can be safely utilised for sustainable meat production and utilisation.

Supervisor: Prof LC Hoffman

Co-supervisor: Dr A Leslie

UMEUGOCHUKWU, Obiageli Patience (Soil Science)

Mitigation of soil and ground water pollution caused by on-land disposal of olive mill waste water

The on-land disposal of the olive mill effluents has a significant negative effect on soil quality and may contaminate ground waters with phenols. Direct application to wheat trails resulted in up to 40% reduction in crop growth parameters. The effects on legumes was less detrimental. Pinewood biochar (pyrolised biomass) was shown to rapidly sorb phenols and reduce the effluent COD. The mechanism was shown as

mainly chemisorption following pseudo-second-order kinetics. The studied biochar was successfully used as a filtration material *ex situ* and as a soil amendment *in situ* to treat the olive mill waste waters and prevent water pollution.

Supervisor: Dr A Rozanov

Co-supervisor: Dr AG Hardie

WHITENER, Margaret Elizabeth Beckner (Wine Biotechnology)

Metabolomic profiling on non-Saccharomyces yeasts in wine

This study used metabolomics-based methodologies to study thoroughly non-Saccharomyces yeasts in the context of their contribution to wine aroma. A combination of targeted and untargeted gas chromatography-mass spectrometry analytical methods was developed. Results clearly demonstrated the differences in aroma compound production between the different non-Saccharomyces species in the initial stages of alcoholic fermentation and at the end of fermentation produced distinct profiles both sensorially and chemically. This study was the first to assess the impact of *Kazachstania* as a novel yeast associated with winemaking. This study expanded the scope of wine metabolomics and also our understanding on the contribution of non-Saccharomyces yeasts to wine aroma.

Supervisor: Prof M du Toit

Co-supervisors: Dr B Divol and Dr U Vrhovsek (External)

YEKWAYO, Inam (Conservation Ecology)

Biodiversity value of afro-montane forest patches within KwaZulu-Natal timber production areas

Natural forests are important habitats for many species. This study determined the state of arthropod diversity in natural forest patches within a timber production landscape, and assessed the best way to conserve them in the future using ground-living arthropod diversity. Small patches had higher arthropod diversity than expected, although large and close patches are of greatest conservation priority. Pine plantations are not extensions of natural forests and it is best to conserve forests neighbouring natural grasslands. Critically, most populations of detritivores in this production system originate from forests, highlighting the importance of forests in the conservation of biodiversity and ecosystem processes.

Supervisor: Dr JS Pryke

Co-supervisors: Prof MJ Samways and Dr F Roets

PhD (Agric)

HOWELL, Carolyn Louise (Soil Science)

Using diluted winery effluent for irrigation of Vitis vinifera L. cv. Cabernet Sauvignon and the impact thereof on soil properties with special reference to selected grapevine responses

Wineries produce large volumes of poor quality waste water, particularly during harvest. The possible re-use of this waste water for vineyard irrigation was investigated in a field trial. Diluted winery waste water increased soil potassium and sodium after waste water application. Irrigation of grapevines using diluted winery waste water did not affect grapevine water status, vegetative growth, production, juice

characteristics or wine sensorial characteristics. It must be noted that vineyard irrigation using diluted winery waste water was only investigated under one given set of conditions. Therefore, at this stage, it can only be recommended for vineyard irrigation in sandy soils in regions with high winter rainfall.

Supervisor: Dr JE Hoffman

External Co-supervisor: Dr PA Myburgh

STOFBERG, Algina Maria Johanna (Animal Science)

A protocol for liquid storage and cryopreservation of ostrich (Struthio camelus) semen

Storage of ostrich semen followed by artificial insemination could ease industry limitations like poor egg fertility and poor survival of embryos and chicks. This study developed a species-specific protocol for short- and long-term storage of ostrich semen. An ostrich-specific diluent maintained sperm function during short-term liquid storage for up to 48 hours at 5°C while maintaining sperm quality. Ostrich semen stored indefinitely in liquid nitrogen with an added cryo-protectant maintained sufficient sperm function to fertilise eggs after thawing. Semen subjected to liquid storage and cryopreservation resulted in the production of fertile eggs in inseminated females.

Supervisor: Prof SWP Cloete

Co-supervisors: Prof K Dzama and Dr IA Malecki (External)

PhD (Food Sc)

HUNLUN, Cindy (Food Science)

Characterising the flavonoid profile of various citrus varieties and investigating the effect of processing on the flavonoid content

Citrus bioactive compounds are reported as being beneficial in cancer prevention, with citrus flavonoids being involved. Knowledge of the chemical composition of South African citrus cultivars, their products, and what effect seasonal and varietal differences have, was lacking in South Africa. This research can be used as a baseline, the first attempt at establishing a phenolic profile specific to South African citrus fruit varieties, also highlighting the importance of varietal and regional effects. It was also found that the phenolic composition of orange juice found in the South African market were much lower than those reported elsewhere in the world.

Supervisor: Dr GO Sigge

External Co-supervisors: Dr D de Beer and Prof J van Wyk

PhD (For)

MAGALHAES, Tarquinio Mateus (Forest Science)

Estimation of tree biomass, measurement uncertainties and morphological topology of Androstachys Johnsonii prain

Biomass content and carbon sequestration of tree-based ecosystems are important information for assessing the climate-relevant impact as done by the IPCC. This information provides substantial arguments for protecting woodlands against exploitation and degradation. With this study the aboveground and belowground tree biomass in Mecrusse Woodlands in Mozambique was assessed for the first time. Mathe-

matial models for the quantification of biomass and carbon in forest inventories have been developed. In the course of the work several novel solutions for modelling biomass and descriptions of belowground biomass in particular were found, which will be useful for other studies in the future.

Supervisor: Prof T Seifert

Fakulteit Ekonomiese en Bestuurswetenskappe

Faculty of Economic and Management Sciences

IFakhalthi yezeeNzululwazi kwezoQoqosho noLawulo

PhD

AKINSOLA, Foluso Abioye (Development Finance)

Implication of financial crisis, financial regulation and business cycle for bank lending in South Africa

The candidate investigated using econometric techniques to determine the exact nature of the relationship between business cycles, financial crises, financial regulation and credit availability, especially for micro small and medium scale enterprises (MSMEs) in South Africa. The study found that financial regulation occasioned by a financial crisis tends to amplify a downturn in the business cycle. Thus, financial regulators must balance the benefits of financial stability against the need to ensure a free flow of credit to MSMEs during a crisis. Policy makers must consider intervention policies for the survival of MSMEs in a depression.

Supervisor: Prof S Ikhide

AMBOLE, Lorraine Amollo (Public and Development Management)

Understanding co-production through sanitation intervention case studies in South Africa

This dissertation presents three case studies of sanitation interventions in informal settlements in South Africa in order to advance an argument concerning the co-production of knowledge and the importance of an emerging field related to the way urban design and sustainability are understood and practiced. The central problem that the candidate strives to tackle is the question of, or possibility for, collaborative knowledge production on the provision of sanitation services in informal settlements.

Supervisor: Prof M Swilling

BURGER, Jacobus Wilhelm (Economics)

A structural approach to modelling South African labour market decisions

As statistics suggest, high employment mobility amongst black South African youths, their high unemployment and slow absorption into employment is surprising. After investigating whether the labour market is truly as mobile as reported, it is concluded that the high

transition rates in labour market status rather reflect misclassification error or unobserved individual heterogeneity. The role of reservation wages in unemployment is examined by building a job search model to recover the reservation wages that are consistent with observed labour market behaviour, instead of using self-reported reservation wages. Finally the role of education in labour market outcomes is investigated through a dynamic programming model that mimics schooling decisions for forward-looking optimising agents, to determine whether ability bias is present and whether returns to education are inflated.

Supervisor: Prof S van der Berg

CILLIERS, Jeanne Alexandra (Economics)

A demographic history of Settler South Africa

The Western demographic transition of the late nineteenth century has had a profound effect on living conditions globally. Instead of having six or more children, most women today have only two. It is therefore surprising that so little is known about the demographic history of South Africa. In this dissertation, the candidate uses a novel and large genealogical dataset of settler families in South Africa to investigate the fertility transition, birth spacing and intergenerational mobility of South Africans before unification. Her pioneering results contribute to important debates within the fields of economic history, population studies and development economics.

Supervisor: Prof J Fourie

NABE, Tembela (Public and Development Management)

Impediments to meaningful and effective public participation in the formulation of local government budgeting in the Western Cape

The study endeavoured to identify the problems that impede meaningful and effective public participation in decision making with specific reference to local sphere of government in the Western Cape. The delimitation, scoping and scaling of the study are evident from the research aims and objectives and pertain to the examination of policy frameworks for public participation at the local sphere of government in South Africa, the identification of the challenges facing municipalities with regard to public participation in the budgeting process, learning from Brazil's experience regarding participatory budgeting and proposing an appropriate public participation model for the Western Cape.

Supervisor: Prof G Woods

NAUDÉ, Jan (Futures Study)

Constructive environmental scanning: a method in creating positive world paradigms for more sustainable alternative futures

Environmental scanners at the Litany Level of Knowing generally do not have good judgement and foresight about the contextual future and are, therefore, ill-equipped to influence thought leaders to adopt measures necessary to develop sustainable alternative global futures. Constructive Environmental Scanning (CES), as a more balanced and holistic approach, is posited to enhance people's future consciousness to pursue sustainable alternative futures. CES is a critical thinking approach based on a proposed new Matrix Integral Layered Environ-

mental Scanning (MILES) method. The purpose is to create depth in the environmental scanning inquiry to transcend superficial information and understanding encountered by scanning practitioners.
Supervisor: Prof A Roux

NELMAPIUS, Albert Hugo (Ondernemingsbestuur)

A motivational perspective on the user acceptance of social media

Die ontstaan van sosiale media het die manier hoe individue met mekaar kommunikeer verander deur hulle te bemagtig om inligting, idees en menings met mekaar te deel, te leer, handel te dryf en vermaak te word. Hierdie reeks gebruikte het sosiale media eksponensieel laat groei, wat dit 'n belangrike bemarkingskommunikasiekanaal maak wat op 'n toepaslike manier benader moet word om maatpas-bemarkingsaanbiedinge te lewer. Hierdie studie ondersoek die motiverings, struikelblokke en belonings wat sowel gebruikers as nie-gebruikers van sosiale media najaag. Die studie het bevind dat spesifieke belonings, eerder as persoonlike eienskappe, die hoofdryfveer vir die gebruik van sosiale media is. Die bevindinge van die studie sal bemarkers in staat stel om hierdie nuwe kommunikasiekanaal optimaal te benut.
Promotor: Prof C Boshoff

SMITH, Anna Maria (Economics)

Health care reform priorities for South Africa: four essays on the financing, delivery and user acceptability of health care

South Africa has public health expenditure similar to that of upper-middle-income peer countries, but achieves health outcomes comparable to that of low-income countries. This dissertation examines the tension between high expenditure and poor health outcomes with four essays on the financing, user acceptability and delivery of health care. It considers how the user acceptability of health care services influences the ability of health care services to impact health outcomes in the context of the medical schemes market, TB care and antenatal care. Greater user acceptability is necessary to ensure that the health system can successfully prevent, detect and treat disease.
Supervisor: Prof R Burger

STEENKAMP, Pieter (Business Management and Administration)

Towards a client-based brand equity framework for selected business-to-business services

Brand equity is an important activity in which organisations should engage if they are to differentiate themselves in a competitive market. Traditionally, brand equity has been researched as it applies to products in a B2C setting, with less attention paid to the development in the B2B services context. The study investigates the short-term insurance industry as a provider of a service to a specific group, namely hotels in the Western Cape. The qualitative research that has been conducted results in the proposal of a CBBE model for brokers and for selected B2B services.
External Supervisor: Prof FJ Herbst
Internal Co-supervisor: Prof M Terblanche-Smit

VAN BROEKHUIZEN, Hendrik (Economics)

Graduate unemployment, higher education access and success, and teacher production in South Africa

This dissertation examines the nexus between schools, universities and the labour market. Using a probabilistic approach to link labour force and university data, graduate unemployment is found to be neither high nor rising rapidly, and interracial variation can be explained by types of institutions attended. University access, success and dropout of Western Cape matriculants are strongly correlated with matric performance, which also explains most racial differentials. Universities could begin to produce enough teacher graduates to satisfy teacher demand within the next decade, but only if current enrolment growth and throughput rates are maintained. Greater emphasis is needed to ensure that education students complete their programmes, specialise in high-demand subjects and phases, and quickly proceed into teaching.
Supervisor: Prof S van der Berg

WILLS, Gabrielle (Economics)

An economic perspective on school leadership and teachers' unions in South Africa

This dissertation considers two factors regarded as critical to disrupting an existing culture of inefficiency in the production of learning in South Africa, namely school leadership and teachers' unions. Using a unique administrative dataset of payroll and education data, the first part of the study constructs a quantitative profile of the labour market for school principals with implications for policy reforms in raising the calibre of school leadership. A key finding is that increasing numbers of principal replacements are taking place, given a rising age profile of principals, with implications for school performance. The final part explores teacher union membership and investigates a disruption hypothesis that student learning is lost as a consequence of teacher participation in strike action.
Supervisor: Prof S van der Berg

Fakulteit Ingenieurswese

Faculty of Engineering

IFakhalthi yezobuNjineli

PhD

AGUDELO AGUIRRE, Roberto Arturo (Chemical Engineering)

Integrated optimisation of pretreatment conditions for bioethanol production from steam-treated triticale straw

The impacts of cultivar/environmental variabilities on pretreatment-hydrolysis for triticale straw conversion-to-bioethanol were addressed for triticale grown in South Africa. Successive pretreatment optimisations of preferred cultivars with dilute-acid steam explosion improved the combined sugars yield up to 11%. Optimisation improved the lignocellulosic ethanol yield per hectare of triticale by nearly 28%.

A maximum experimental ethanol yield of approximately 200 L_{ha}⁻¹ was obtained from simultaneous saccharification and fermentation of steam explosion pretreated straw at 13% solids loading. The selection of cultivars and further pretreatment optimisation improved the areal ethanol yield without compromising the grain yield.

Supervisor: Prof JF Görgens

BRINK, Isobel Christine (Civil Engineering)

Design of storm water ponds towards the reduction of metal toxins in surface waters that are utilised for South African primary food production

This research addressed metals pollution in storm water runoff. Metals removal efficiencies in storm water detention and retention ponds were investigated. The dissertation argued that a focus on relationships between pond efficiency and design could generate information towards augmenting prominent international design methodologies. Statistics and probability theory were the main analysis tools. Hydrodynamic modelling was used to theoretically test the validity of trends indicated from the statistical analysis. Prominent international design methods were found to be inadequate for efficient design. The results were used to improve design theory. Recommendations were made specifically for the South African context and focussed on pond hydraulics and sedimentation.

Supervisor: Prof GR Basson

Co-supervisor: Mr W Kamish

COMBRINCK, Riaan (Civil Engineering)

Cracking of plastic concrete in slab-like elements

Plastic settlement and plastic shrinkage cracking results in aesthetical and durability issues for mainly slab-like concrete elements within the first few hours after casting the concrete. This study uses various experiments to provide the fundamental understanding of both cracking types individually as well as combined. The tests revealed multiple plastic settlement cracks, followed by a singular plastic shrinkage crack, while both cracking types could be present internally without being visible at the surface. Finally, the experimental results of tensile material properties and volume change were used to develop a numerical model that can simulate the cracking behaviour of plastic concrete.

Supervisor: Prof WP Boshoff

CONRADIE, Pieter Johannes Theron (Industrial Engineering)

Cost modelling – a systematic approach for performance improvement of milling titanium alloys

South Africa is the second largest producer of titanium mineral concentrates, but has no market position to benefit further along the value chain. Concurrently, there is a lack of knowledge base for advanced and cost-effective manufacturing of titanium alloys. Cost modelling remains one of the key challenges faced by modern manufacturing industries. Due to technological advancements and complexities associated with theoretical models, implementation is limited. With a focus on titanium alloys, a practical approach to cost modelling is developed with a software user interface, allowing industry to establish benchmarks and improve machining performance for competitive manufacturing. At the same time it enables transfer of

knowledge from academic institutions to industrial environments, underlining its relevance and thereby contributing to high-end skills development.

Supervisor: Prof D Dimitrov

Co-supervisor: Dr GA Oosthuizen

GERBER, Johan Andries Kritzing (Civil Engineering)

Numerical modelling of performance and failure criteria for road seals

This study quantified single, double and cape seal deterioration according to three failure mechanisms which are: surface ravelling, surface cracking and surface texture loss. Each seal type was modelled with the finite element method to investigate the structural response and performance in accordance with a predefined list of seal design variables. The list was populated with a range of geometrical, material and traffic-related variables of typical seal layers. The outcome of this study demonstrated that finite element surfacing seal models can be used to reflect reality and serve as a powerful tool to investigate seal design adequacy prior to construction.

Supervisor: Prof KJ Jenkins

GILMORE, Jacki (Electronic Engineering)

Design of a dual-polarised dense dipole array for SKA mid-frequency aperture array

In the popular imagination, the Square Kilometer Array (SKA) telescope is a sea of dishes. However, the aperture array components – which will provide coverage of the scientifically crucial lower frequency bands – are equally important. SKA Phase 2 (scheduled for the 2020s) includes the Mid-Frequency Aperture Array (MFAA) and this dissertation proposes a new prototype design for this telescope component. A design methodology is proposed, implemented and verified by measurements of a prototype manufactured in collaboration with ASTRON, the Netherlands Institute for Radio Astronomy. The new prototype shows interesting potential as an MFAA candidate antenna.

Supervisor: Prof DB Davidson

GOUWS, Stephan (Electronic Engineering)

Training neural word embeddings for transfer learning and translation

Modern-day information processing systems like Google Translate and Siri are still notoriously bad at really understanding language. They require expensive human supervision and extensive tuning for each different task. This dissertation proposes neural word embeddings – automatically learned representations that use continuous values to represent language in a learned vector space of meaning – as an automated approach to learning representations of natural languages that are useful for predicting various aspects related to their meaning. We show experimental results which support this hypothesis, and present several contributions which make inducing these representations faster for translation and various other cross-lingual prediction tasks.

Supervisor: Prof G-J van Rooyen

Co-supervisors: Prof Y Bengio and Prof E Hovey

HEUNIS, Tosca-Marie (Mechatronic Engineering)

Early detection of risk of autism spectrum disorder based on recurrence quantification analysis of electroencephalographic signals

Autism spectrum disorder (ASD) is a neurodevelopmental disorder that responds to early treatment, but most people are diagnosed late. We therefore need biomarkers for ASD that do not require highly trained professionals. Electroencephalography (EEG) might help the search for early biomarkers. In this interdisciplinary project recurrence quantification analysis of 5-second segments of resting state EEG data was used to identify a potential biomarker for ASD. In three studies, the biomarker was able to differentiate between ASD and typically developing children, ASD and non-ASD within a genetic syndrome, and between non-syndromal ASD and syndromal ASD, all with greater than 90% accuracy.

Supervisor: Prof MJ Nieuwoudt

Co-supervisors: Prof C Aldrich and Prof PJ de Vries

JORDAAN, Hendrik Willem (Electronic Engineering)

Spinning solar sail: the deployment and control of a spinning solar sail satellite

Solar sailing has become a viable and practical option for current satellite missions. A novel tri-spin solar sail and tri-spin gyro-controlled satellite configuration are proposed that combines the advantages of spinning and three-axis stabilised sail designs. The tri-spin solar sail satellite is able to perform faster attitude manoeuvres than a standard spinning solar sail. This will enable the satellite to produce the required solar thrust to change its orbit. Attitude changes results in oscillations of non-rigid elements of the sail, which influences the attitude dynamics of the satellite. This dissertation focuses on the deployment control of the sail and attitude control of this satellite.

Supervisor: Prof WH Steyn

KRIEL, Steven Cornelius (Electronic Engineering)

Automated aerial refuelling of a large receiver aircraft

Performing aerial refuelling with a large receiver aircraft is an extremely strenuous task for a pilot. While significant research has been performed on autonomous aerial refuelling of unmanned and fighter-sized aircraft, the challenges of autonomously refuelling a large receiver are largely unknown. This dissertation sheds light on these challenges. Primarily it determines that the long distance between the centre of gravity and refuelling receptacle creates challenging problems. A novel controller is designed, using a new architecture that takes the relative dynamics of the centre of gravity and refuelling receptacle into account in order to overcome these challenges.

Supervisor: Prof T Jones

Co-supervisor: Mr JAA Engelbrecht

KRISHNANNAIR, Syamala (Chemical Engineering)

Nonlinear singular spectrum analysis and its application in multivariate statistical process monitoring

Multivariate statistical process monitoring methods based on nonlinear singular spectrum analysis and using nonlinear principal component

analysis, multidimensional scaling and kernel multidimensional scaling are proposed. A multimodal representation is obtained that can be used together with existing statistical process control methods to develop novel process monitoring schemes. The method was compared with classical principal component analysis and multimodal singular spectrum analysis on base metal flotation plant data and the Tennessee Eastman process benchmark data. The nonlinear singular spectrum analysis method better captured nonlinearities and yielded improved detection rates for various faults in nonlinear data compared with alternative competing multivariate methods.

Supervisor: Prof C Aldrich

Co-supervisor: Prof SM Bradshaw

KWISANGA, Christian (Electronic Engineering)

SQUIDS (superconducting quantum interference devices), geomagnetic signal analysis and modelling of Schumann resonances in the earth-ionosphere cavity

Superconducting quantum interference devices (SQUIDS) are very sensitive magnetometers. Schumann resonance in the Earth-ionosphere cavity, which is pumped by lightning, shows up in these geomagnetic measurements. A model was developed to allow numerical simulation of the entire Earth-ionosphere cavity, and variations in amplitude, frequency and quality factor of the Schumann resonance harmonics are found to agree with theory. From the results, Schumann resonances can be predicted and identified in the French data, while Hermanus data is shown to be too noisy.

Supervisor: Prof CJ Fourie

MALAN, Antonie du Toit (Civil Engineering)

Delay and disruption claims and damages in relation to construction projects

The delay and disruption matters in relation to the Joint Building Contracts Committee (JBCC) standard Principal Building Agreement of 2014 was researched. This was done through an analysis of the application of the concepts of extension of time, penalties, critical path, ownership of float, concurrent delays, delay analysis methods and time at large. This analysis revealed certain shortcomings in dealing with the above concepts which may impact on material terms such as penalties, termination, risk of damage to the works, insurance, security and time barring. It is also argued that the current legal position and status of the programme is unsatisfactory and creates uncertainty, which may lead to disputes. Appropriate amendments to the standard document are accordingly recommended.

Supervisor: Dr JAvB Strasheim

Co-supervisor: Prof G Lubbe

MSADALA, Vincent (Civil Engineering)

Sediment transport dynamics in dam-break modelling

Overtopping of dams during floods is the cause of more than 50% of South African dam incidents. Earth dams are characterised by steep embankment slopes. The application of sediment transport equations that were derived from data on mild or moderately steep slopes is one of the sources of uncertainty in dam-break modelling. This research developed new empirical sediment transport equations based on steep

slopes and are suitable for application in homogeneous earth embankment dam-break modelling. An analysis of the dam-break modelling results showed that the newly developed sediment transport equations performed better on steep embankment slopes in predicting the dam breaching and outflow flood hydrograph.

Supervisor: Prof GR Basson

MWANDAWANDE, Ikukumbuta (Chemical Engineering)

Investigation of the gas dispersion and mixing characteristics in column flotation using computational fluid dynamics

In this study, computational fluid dynamics (CFD) was employed to investigate gas dispersion and mixing in column flotation. Gas dispersion and mixing parameters affect flotation column performance. However, these two themes have not been adequately studied by previous CFD models in the literature. In the gas dispersion component, two-phase (air-water) systems were simulated in order to predict the average and local gas holdup and flow regime transition in bubble columns. Mixing in industrial columns was investigated, using three-phase (gas-liquid-solid) simulations. The predicted (simulated) results were in good agreement with experimental data in the literature.

Supervisor: Prof G Akdogan

Co-supervisor: Prof SM Bradshaw

NASSAR, Shamim Omar (Electronic Engineering)

Miniaturised multilayer RF and microwave circuits

The use of ceramic and laminate multi-layered technologies are investigated in this work for the implementation of passive microwave circuits. New pedestal resonators and folded waveguide resonators in Surface-Integrated-Waveguide are proposed, and evaluated through the design of a number of filters and diplexers. The implementation of polyphase filters and a PIN diode limiter switch in low-temperature co-fired ceramic is evaluated. The new structures find use in communication and RADAR receivers, offer reductions in size, weight and cost, and allow for high-volume manufacturing.

Supervisor: Prof P Meyer

Co-supervisor: Prof PW van der Walt

NIEUWOUDT, Pieter Daniel (Civil Engineering)

Time-dependent behaviour of cracked steel fibre reinforced concrete: from single fibre level to macroscopic level

The candidate investigated and quantified the time-dependent crack width opening behaviour of cracked steel fibre reinforced concrete (SFRC) under sustained uni-axial tensile loading and developed a model to simulate this behaviour. Experimental investigations on a single fibre level showed that matrix creep and micro cracking are the dominant mechanisms causing the crack widening over time due to sustained loading. The developed model is based on the mechanisms and factors that affect the time-dependent single fibre pull-out behaviour. This work is the first step for creating a design model which includes the time-dependant behaviour of cracked SFRC.

Supervisor: Prof WP Boshoff

OLAWUYI, Babatunde James (Civil Engineering)

Understanding the mechanical behaviour of high-performance concrete with superabsorbent polymers (SAP)

Superabsorbent polymers (SAP) as internal curing agent (IC-agent) in high-performance concrete (HPC) is reported to be promising. This study quantified and modelled the mechanical behaviour of HPC containing SAP. Concentration of cement pore solution on SAP absorption, SAP's influence on concrete rheology, cement hydration and strength development were examined. Concrete microstructure was also investigated, using X-ray CT and SEM. A slight decrease in compressive strength of the HPC was reported as SAP contents increased, but no such effect was observed on the elastic and fracture properties. The study further postulates 12,5 g/g as the optimum additional water for SAP's effective internal curing.

Supervisor: Prof WP Boshoff

PIENAAR, Hardie (Electronic Engineering)

Karoo array telescope site shielding: laboratory, computational and multi-copter studies

The Northern Cape has been chosen to host the Square Kilometer Array (SKA) due to the area's overall radio quietness. Necessary infrastructure required on site, especially the Karoo Array Processing Building (KAPB), potentially threatens this pristine area with undesired radio frequency interference (RFI). This dissertation focussed on understanding the shielding and propagation characteristics of both the KAPB, as well as a man-made soil berm. Scale models, computational models and on-site measurements, using a multi-copter vehicle developed by the candidate, were used to investigate the local electromagnetic environment. The work has resulted in a detailed appreciation of RFI shielding levels on the SKA-SA site.

Supervisor: Prof DB Davidson

Co-supervisor: Prof H Reader

RIDOUT, Angelo Mark Christopher Juan Johan (Chemical Engineering)

Valorisation of paper waste sludge using pyrolysis processing

Pyrolysis of low and high ash paper waste sludge (PWS), and its fermentation residues (FR), was assessed using various reactor configurations and operating conditions. Performance of fast, slow and vacuum pyrolysis was statistically compared based on the yield and quality of the liquid and solid products. Differences were rationalised in terms of transfer phenomena and chemical degradation mechanisms respectively linked to the operating conditions and nature of PWS/FR. Characteristics of the products (biomaterials, chemicals and fuels) revealed the potential of raw and treated PWS to be considered as a commodity feedstock for a stand-alone or integrated bio-refinery.

Supervisor: Prof JF Görgens

Co-supervisor: Dr M Carrier

ROODT, Louis de Villiers (Civil Engineering)

Maintenance engineering standards to fulfil the legal duty of road authorities towards safe roads

Roads are essential for mobility of people and goods. South Africa has one of the worst accident rates in the world. Legislation, policy and common law place a legal duty on road authorities to provide reasonably safe roads. Lack of maintenance results in hazardous conditions, accidents and claims that could have been avoided. The study proposes standards for maintenance for roadway characteristics such as potholes, texture, traffic control such as signs and markings, drainage and roadside elements such as vegetation and barriers. It gives standards for maintenance inspection and response procedures to ensure asset and risk management for safety.

Supervisor: Prof CJ Bester

STRUWIG, Claudia Bernadine (Civil Engineering)

Management by measurement

The candidate developed an all-encompassing performance measurement framework and tool for managing transport technology projects. Current approaches are often modular and inconsistent, and therefore not able to provide a holistic view and true reflection of the projects' health. Extensive verification and validation processes were performed within the context of the project life cycle, with specific attention to sustainable deployment in the developing country environment. She managed to combine and apply various seemingly unrelated and diverse research fields, coupled with multi-criteria decision-making principles, to establish a comprehensive performance measurement structure to enable the continuous management and assessment of transport technology projects.

Supervisor: Prof CJ Bester

THERON, André Karl (Civil Engineering)

Methods for determination of coastal setback lines in South Africa

This dissertation describes the author's research on methods for determination of coastal development setback lines in South Africa, focussing strongly on the abiotic (geophysical) components. In view of South Africa's generally very exposed coastline, the escalating South African coastal development, and problems with some previous methods, the need for appropriate and implementable methodologies is clear. Suitable setback line methods were developed for use in "data poor" environments that are efficient to apply in extensive study areas, and that are robust and defensible. Recommendations and guidelines are provided for practical methodologies to determine coastal development setback lines in South Africa.

Supervisor: Mr G Toms

Co-supervisor: Prof GR Basson

TOMLINSON, Daniel Males (Electrical Engineering)

A fixed switching frequency technique for finite-control-set model predictive control for the control of single-phase converters

Predictive control is similar to a chess game where the player predicts all the possible moves up to the point of victory. The same principle was applied to the control of power electronic converters. The scheme provided a simplified solution to allow longer predictions to be made in less time. Micro-controllers require some time to do calculations. By reducing the time needed to do the calculations, more predictions can be done further into the future, which leads to a better control result. Experimental results showed that the scheme was effective in providing a fast and accurate control response.

Supervisor: Prof HdT Mouton

DIng

GOLIGER, Adam Mikolaj Witald (Civil Engineering)

Wind engineering science and its role in optimising the design of the built environment

In this dissertation the candidate presents an overview of wind engineering research activities and outputs over his extensive career in the field. Significant contributions to wind engineering practice both internationally and under South African conditions are presented. The research involved wind-tunnel modelling of structural loading and environmental conditions, analyses of wind damage and disasters, full-scale measurements, development of predictive models, design guides and standards, as well as consulting inputs to the construction industry. The knowledge and experience he gained in this specialised field aided him in providing unequalled advice and direction to the Civil Engineering industry in South Africa and further afield.

Supervisor: Prof JV Retief

KANSELIERSTOEKENNING / CHANCELLOR'S AWARD / IBHASO LIKATSHANSILA

Fakulteit Natuurwetenskappe

Faculty of Science

IFakhalthi yezobuNzululwazi kwezobuGqi

PROFESSOR HELMUT PRODINGER

Prof Prodinge word as een van die vaders van moderne analise van algoritmes en analitiese kombinatorika beskou. Van sy vele wetenskaplike prestasies is sy werk oor digitale stelsels veral invloedryk, en het dit ons begrip van die asimptotiese eienskappe van digitale stelsels verruim deur nuwe tegnieke soos die Mellin-transformasie bekend te stel. Sy baanbrekersartikel oor die toepassing van die Mellin-transformasie op syfersomme is reeds meer as 100 keer aangehaal en dien as kernbron op sy vakgebied. Prodinge het meer as 300 gekeurde vaktydskrifartikels saam met meer as 60 medeouteurs gepubliseer. Hierdie ontvanger van 'n goue medalje en navorsingstoekenning van die Suid-Afrikaanse Wiskunde-vereniging dien ook in verskeie konferensieprogramkomitees en in die redaksiekommissies van sommige van die voorste vaktydskrifte op sy gebied, soos *Theoretical Computer Science*.

Prof Prodinge is regarded as one of the fathers of modern analysis of algorithms and analytic combinatorics. Among his many scientific achievements, his work on digital systems has been particularly influential and has greatly enhanced our understanding of the asymptotic properties of digital systems by introducing novel techniques such as the Mellin transform. His groundbreaking article on applying the Mellin transform to digital sums has been cited more than 100 times and serves as an integral resource in his field. Collaborating with more than 60 co-authors, Prodinge has published over 300 reviewed journal articles. This recipient of a gold medal and research award from the South African Mathematical Society also serves on various conference programme committees as well as the editorial boards of some of the leading journals in his field, such as *Theoretical Computer Science*.

PROGRAM VIR DIE TWEEDE PLEGTIGHEID

DIE FAKULTEITE LETTERE EN SOSIALE WETENSKAPPE, OPVOEDKUNDE, REGSGELEERDHEID, TEOLOGIE, GENEESKUNDE EN GESONDHEIDSWETENSKAPPE

'n Vriendelike beroep word op alle aanwesiges gedoen om selfone af te skakel en nie die saal tydens die plegtigheid te verlaat nie en sodoende te verseker dat die verrigtinge sonder ontwrigting verloop.

1. Akademiese prosesie kom die saal binne. U word versoek om te staan terwyl hulle die saal binnekom en te bly staan vir die sing van die Nasionale Lied.
2. Sing van die Nasionale Lied (kyk binneagterblad). Neem asseblief daarna u sitplekke in.
Begeleiding: Universiteit Stellenbosch Koperblaasensemble.
Orrelis: Brent Reynolds.
Voorsanger: Lunathi Ncumani.
3. Konstituering deur die Viserektor (Navorsing, Innovasie en Nagraadse Studie).
4. Verwelkoming deur die Viserektor (Navorsing, Innovasie en Nagraadse Studie) en dr NS Cezula.
5. Voorstelling van doktorandi deur die dekane van die betrokke fakulteite en toekenning van grade deur die Viserektor (Navorsing, Innovasie en Nagraadse Studie).
6. Sluiting deur die Viserektor (Navorsing, Innovasie en Nagraadse Studie).
7. Akademiese prosesie verlaat die verhoog.

Die aanwesiges word versoek om te bly staan totdat die akademiese prosesie uitgestap het.

PROGRAMME FOR THE SECOND CEREMONY

THE FACULTIES OF ARTS AND SOCIAL SCIENCES, EDUCATION, LAW, THEOLOGY, MEDICINE AND HEALTH SCIENCES

To help ensure that the proceedings run their course without disruption, will all those present kindly keep their cell phones switched off, and refrain from leaving the hall, while the ceremony is in progress.

1. Entrance of academic procession into the hall. You are requested to stand while it enters, and then to remain standing for the singing of the National Anthem.
2. Singing of the National Anthem (see inside back cover). Thereafter, please be seated.
Accompaniment: University of Stellenbosch Brass Ensemble.
Organist: Brent Reynolds.
Precentor: Lunathi Ncumani.
3. Congregation formally constituted by the Vice-Rector (Research, Innovation and Postgraduate Studies).
4. Welcome by the Vice-Rector (Research, Innovation and Postgraduate Studies) and Dr NS Cezula.
5. Presentation of doctoral candidates by the deans of the respective faculties and conferment of degrees by the Vice-Rector (Research, Innovation and Postgraduate Studies).
6. Closing by the Vice-Rector (Research, Innovation and Postgraduate Studies).
7. The academic procession leaves the stage.

Those present are requested to remain standing until the entire academic procession has left the hall.

ISICWANGCISO-NKQUBO SOMSITHO WESIBINI

IIFAKHALTHI EYEATHSI NEENZULULWAZI ZOBUNTLALONTLE, EYEZEMFUNDO, EYEZOMTHETHO, EYEZENKOLO, EYEZAMACHIZA NOBUNZULULWAZI KWEZEMPILO

Ukuqinisekisa ukuba umsitho uqala ngaphandle kwesiphazamiso, bonke abakhoyo bayacelwa ukuba bacime iiselfowuni zabo, kwaye bangaphumi eholweni ngeli xesha umsitho uqhubekayo.

1. Kungena umkhosi wemithika eholweni. Niyacelwa ukuba nime ngeenyawo xa ungena, nihlale nime njalo ukuze kuculwe uMhobe weSizwe.
2. Kukulwa uMhobe weSizwe (Jonga kumphakathi weqweqwe lokugqibela). Emva koko, ningahlala phantsi.
Umculo: yi-University of Stellenbosch Brass Ensemble.
Umdlali wohadi: nguBrent Reynolds.
Umhlabeli: nguLunathi Ncumani.
3. UMsitho uvulwa ngokusesikweni nguSekela-Nqununu (wezoPhando, izinto ezintsha neZifundo zaBasele beneZidanga).
4. Ulwamkelo lwenziwa nguSekela-Nqununu (wezoPhando, izinto ezintsha neZifundo zaBasele beneZidanga) noGqr NS Cezula.
5. Ukwaziswa kwabafundi bezidanga zobugqirha ziintloko zeefakhalthi (iiDin) ezichaphazelekayo nokuthweswa kwezidanga nguSekela-Nqununu (wezoPhando, izinto ezintsha neZifundo zaBasele beneZidanga).
6. Ukuvalwa koMsitho nguSekela-Nqununu (wezoPhando, izinto ezintsha neZifundo zaBasele beneZidanga).
7. Umkhosi wemithika uyalishiya iqonga.

Bonke abakhoyo bayacelwa ukuba beme ngeenyawo de umkhosi wemithika ube uphume wonke eholweni.

KANDIDATE WAT KWALIFIKASIES ONTVANG

Hier volg 'n lys van graduandi met hul studierigtings, proefskriftitels en opsommings van die navorsing. Die grade van graduandi wat nie by die gradeplegtigheid teenwoordig kan wees nie, word in hulle afwesigheid toegeken.

CANDIDATES RECEIVING QUALIFICATIONS

Here is a list of graduands with their fields of study, dissertation titles and summaries of research. The degrees of graduands who are unable to attend the graduation ceremony are awarded in absentia.

ABAFUNDI ABAFUMANA IZINGQINI ZEZEMFUNDO

Apha kulandela uluhlu lwabathweswayo kwiinkalo zesifundo, izihloko zeedizethyishini kunye nezishwankathelo zophando. Izidanga zabathweswayo abangakwazanga ukubakho ubuqu kumsitho wothweso-zidanga bathweswa bengekho benjalo.

Fakulteit Lettere en Sosiale Wetenskappe

Faculty of Arts and Social Sciences

IFakhalthi yezeAthsi neeNzululwazi zobuNtlalontle

PhD

ANDRASON, Alexander (African Languages)

A complex system of complex predicates: tense, taxis, aspect and mood in Basse Mandinka from a grammaticalisation and cognitive perspective

The present work analyses the Basse Mandinka tense-taxis-aspect-mood verbal system within the framework of cognitive and grammaticalisation linguistics and from the perspective of complexity theory. The candidate builds his study by perusing the objectives of, among others (a) a description of the entire semantic potential of all the Basse Mandinka verbal grams; (b) a representation of the synchronic inventories of senses of each Basse Mandinka verbal construction as a coherent phenomenon; (c) an introduction of the information concerning the prototypicality of the map and the development of a representation of the meaning as a wave; and (d) a modelling of the entire Basse Mandinka verbal organisation into a system of currents.

Supervisor: Prof MW Visser

BAYIGA, Florence Tendo (General Linguistics)

Profiles of multilingualism in Kampala: an analysis of language biographics and linguistic repertoires of university students

This sociolinguistic study investigated the language biographics and repertoires of young adults in Kampala, Uganda, to disclose pertinent aspects of the multilingualism extant among students at a tertiary educational institution. The study highlights the difficulties of applying standard definitions of bilingualism and multilingualism to speakers and communities in an African country with highly diverse and mobile multilingual populations. The findings explain much of the communicative practices encountered among students, particularly showing how the official and social status of local languages contribute to the

development of linguistic resources for their use in academic and professional domains.

Supervisor: Prof C Anthonissen

Co-supervisor: Dr O van Dulm

CAPRI, Charlotte Henriette (Psychology)

Thinking about intellectual disability care: an intersubjective approach

Disabling care continues to confront South African individuals who live and work with intellectual disability. Intellectual impairment care can be conceptualised as more than the performance of tasks involving giving and receiving, but can be understood as intersubjective and relational person-making exchanges that also unfold in broader socio-political spaces. This study introduces fresh perspectives on psychiatric intellectual disability care by bringing together the fields of relational psychoanalysis, intersubjectivity, and contemporary models of disability. In such intersubjective spaces the experience of impairment can be voiced by the *real* experts – those who live and work with intellectual impairment in a disabling world.

Supervisor: Prof LP Swartz

COX, Alexia Georgina (English Studies)

The application and modification of human resource management in the critical analysis of fiction: Harry Potter as case study

This dissertation revisits the much discredited idea of a “common sense” way of reading a literary text. It proposes that a common sense reading – one that treats narrative fictions as reflections of the real world, and that focuses on the didactic message of the story – can provide particular kinds of insights about social life. To this end, it enlists human resource management as a tool for literary analysis and for exploring common sense assumptions about human behaviour in the context of neoliberal Western culture. It advances this proposition through a reading of JK Rowling’s *Harry Potter* series.

Supervisor: Dr D Roux

DE VILLIERS, Annemarie (Classical Literature)

Catullus decentred: the poetics of the periphery

This dissertation presents a careful analysis of the identity of the Roman poet Catullus, who did not quite fit the cultural environment in which he lived, even when he ostensibly bought into the prevailing culture completely. The impact of the unintended marginalisation suffered by such a person is carefully documented. Given the large scale movements of peoples in the global community with its inevitable impact on the individual's experience of identity, the findings of this study contribute significantly to the understanding of the complexity of the topos of identity, and the role of poetry in negotiating such an identity.

Supervisor: Dr S Thom

Co-supervisor: Prof JC Thom

FUSEINI, Issahaka (Geography and Environmental Studies)

Urban governance and spatial planning for sustainable development in Tamale, Ghana

Urban governance and spatial planning are crucial for sustainable urban development in the 21st century. The candidate's study contributes to this by investigating urban governance practices and outcomes in Tamale, Ghana, regarding provision of and access to urban infrastructure and basic services. The results showed that Tamale's growth has been phenomenal, but access to urban infrastructure and services lagged behind, and there was limited stakeholder engagement in urban governance. The study recommends efforts to reform urban governance laws and initiatives to engender participatory and partnership-based governance and service delivery in the city to achieve social justice, economic viability and environmental health and sustainability.

Supervisor: Dr JN Kemp

GARDNER, Jillian Brigette (Philosophy)

Moral responsibility for prenatal harm to children: the case of Fetal Alcohol Syndrome

This dissertation considers the ethical-legal aspects of Fetal Alcohol Syndrome (FAS) in South Africa. At the level of individual morality it defends a position that pregnant women who have the legal option to terminate a pregnancy, by deciding to continue a pregnancy, have *prima facie* moral obligations to not harm the fetus, which entails an obligation to abstain from alcohol during pregnancy. On the social level, it considers the legitimacy and effectiveness of punitive approaches and delictual action to prevent FAS. Punitive approaches are found undesirable, whereas a policy of allowing children with FAS to sue their mothers is equally ineffective at preventing FAS.

Supervisor: Prof AA van Niekerk

KIGURU, Doseline Wanjiru (English Studies)

Prizing African literature: awards and cultural value

This study investigates the centrality of international literary awards in African literary production with an emphasis on the Caine and the Commonwealth Short Story Prizes. The major focus of the dis-

sertation is the process through which contemporary African literature, mediated through the international prize, acquires value in the global literary marketplace.

Supervisor: Dr M Slabbert

Co-supervisor: Dr D Roux

LOOTS, Sonja (Afrikaans en Nederlands)

Ensiklopediese fiksie in die oeuvre van Marlene van Niekerk

Die proefskrif handel oor die voorkoms van ensiklopediese elemente in die romans van Marlene van Niekerk. Die ensiklopediese fiksiegenre word bespreek teen die agtergrond van Verligtingsera-ensiklopedisme en die fiksie van vroegmoderne skrywers soos Miguel de Cervantes, Francois Rabelais, Robert Burton en Laurence Sterne. Oeuvrepatrone in Van Niekerk se werk word herlei na hierdie eeue-oue antesedente en aan die hand van teoretiese bydraes deur onder andere Northrop Frye, Edward Mendelson en Mikhail Bakhtin ontleed. Die klem val op hoe Van Niekerk oorgeërfde tradisies in lokale konteks uitdaag en wysig. Dit word beskou as deel van 'n komplekse kreatiewe en politieke gebaar.

Promotor: Prof L Viljoen

MARTENS, Peter (Music)

Contemporary performance of the sonatas for cello and piano by Ludwig van Beethoven as informed by Carl Czerny

Peter Martens' work is a ground-breaking contribution to the fledgling field of practice-based research in music. It demonstrates in an exemplary manner how the fields of rigorous scholarly enquiry and high-level musical performance can be made to complement one another in order to generate new knowledge. By examining sources very close to the composer, the candidate not only makes a solid argument for performing Beethoven's six sonatas for piano and cello in a way that comes close to reflecting the composer's intentions in respect of tempo, but he also made an award-winning recording of these works himself.

Supervisor: Prof WA Lüdemann

MILLIN, Tracey Jane (General Linguistics)

Scaffolding academic literacy using the reading-to-learn methodology: an evaluative study

A literacy development programme developed in Australia to support the educational success of marginalised learners was introduced to grade 11 learners in two Western Cape schools over a period of six months. Relying on recent work which confirms a correlation between literacy performance at school, social conditions and educational practices, this study checked for measurable outcomes in selected academic writing conventions. From a cross-sectional perspective (across schools) the greatest overall improvement was among the weaker cohort of students from the school in a low socio-economic area. Similar greater overall gains of initially weaker students were also evidenced from a time series (within school) perspective. This indicates a possible convergence (or 'catch-up') effect for learners who showed a lag in pre-intervention testing.

Supervisor: Prof C Anthonissen

MKWESHA, Faith (English Studies)

Zimbabwean women writers from 1950 to the present: recreating gender images

The study focuses on Zimbabwean women as writers and as producers, testers and negotiators of gendered images, and the ways in which they write gender identities in and of the nation. The questions which the dissertation explores include: What role do women as writers and characters play in the construction and redefinition of their images and those of their male counterparts? In what ways do these representations of gender participate in the (re)imagining of the nation? This study explores the rebellious questing heroine who stakes all on the attainment of individuality and freedom in contexts of powerful patriarchies.

Supervisor: Dr NJ Bangeni

Co-supervisor: Prof MA Samuelson

MOKHELE, Masilonyane (Geography and Environmental Studies)

Spatial economic attributes of airport-centric developments at Cape Town and Johannesburg

The study contributes towards a better understanding of the locations and driving forces behind airport and airport-centric developments at Cape Town International and OR Tambo airports. The study, (i) established the mix and reasons for the locations of firms on and around the two airports; (ii) identified and analysed the propulsive qualities of land uses in the areas; (iii) analysed the economic and structural linkages between firms on the airports and their surrounding areas within metropolitan, regional, national and international contexts; and (iv) studied the changes that have occurred in the airport and airport-centric developments of the two airports over time.

Supervisor: Prof HS Geyer

MORODI, Thabiso John (Philosophy)

The precautionary principle and public environmental decision making in South Africa: an ethical appraisal

How does society make decisions about environmental risks when confronted with complexity and scientific uncertainty? This dissertation investigated how the precautionary principle can be conceptualised and applied in concert with other decision-making methods such as qualitative risk assessment to prevent, and sometimes also to address, human-induced environmental catastrophes. This approach was tested in a case study of acid mine drainage (AMD) in South Africa and it was found that the precautionary principle can help to overcome expert bias in environmental decision making that can fail to prevent environmental catastrophes, and often excludes lay people, indigenous knowledge, affected parties and marginalised groups.

Supervisor: Prof JP Hattingh

NEVHUTALU, Helen Khanyisa (Philosophy)

Patients' rights in South Africa's public health system: moral-critical perspectives

This dissertation critically investigated the nature, status and efficacy of the application of patients' rights in the context of public health care in

South Africa (particularly public hospitals in urban settings). Perspectives on the core of patients' rights – the moral principles of autonomy, respect, informed consent, and confidentiality and privacy – were discussed in detail. An ethics audit of the Chris Hani Baragwanath Hospital was done to identify key problems hindering the realisation of patients' rights, leading to wide-ranging recommendations to various stakeholders, such as the national Department of Health, provincial health departments, professional associations and regulatory bodies, community-based organisations and non-governmental organisations to overcome these obstacles.

Supervisor: Prof JP Hattingh

VAN DEN BERG, Estelle (Sielkunde)

Die identifisering, beskrywing en riglyne vir die ontwikkeling van veerkragtigheidskenmerke in gesinne waarvan 'n ouer alkohol misbruik: 'n gesinsperspektief

Ten spyte van die negatiewe impak wat oerlike alkoholmisbruik op gesinne kan hê, is sommige gesinne in staat om suksesvol daarby aan te pas. Die hoofdoelstelling van hierdie ondersoek was om vas te stel watter gesinskenmerke geassosieer kan word met goeie aanpassing van gesinne. Die sekondêre doelstelling was om op grond van hierdie kenmerke riglyne neer te lê aan die hand waarvan gesinne gehelp kan word om alkoholmisbruik te hanteer. Positiewe gesinskenmerke is gesinsprobleem-oplossingskommunikasie, gesinstyd en -roetines, godsdiens, ondersteuning van gemeenskapshulpbronne en sosiale ondersteuning. 'n Intervensieprogram behoort op hierdie kenmerke te fokus en moet langdurig en deurlopend wees, terwyl gesinslede ook rehabilitasie, berading of terapie ontvang.

Promotor: Prof AP Greeff

VAN DIJK, Renate Marian (Ancient Studies)

The form, function and symbolism of standards in Ancient Mesopotamia during the third and fourth millennia BCE: an iconographical study

Standards (a long shaft with a sign or emblem attached to the top; held or standing on the ground) are represented in Mesopotamia from the fourth millennium until the first millennium BCE. This study examines how standards are depicted in the iconographic record of the third and fourth millennia BCE by examining their form, function and symbolism. These examples are presented and compared, and commonalities and differences are identified and examined. Standards can function as battle standards, divine standards, royal standards, city standards, architectural standards, and standards in ritual contexts and judicial procedures.

Supervisor: Prof I Cornelius

VENTER, Gustav Barend (History)

Gone and almost forgotten? The dynamics of professional white football in South Africa, 1959-1990

This study contributes to the emerging literature on sport and society in South Africa by exploring historical changes in the demographics of professional soccer. Through extensive archival work, contemporary media material and oral sources, it examines the political, economic

and social factors which impinged on white professional soccer under apartheid. Moreover, it provides a conclusive analysis of the variety of forces that account for the disappearance of the whites-only National Football League as well as the way in which certain clubs struggled for survival in the new environment ushered in by political changes in the country.

Supervisor: Prof AM Grundlingh

VERGUNST, Richard (Psychology)

Access to health for persons with disabilities in rural Madwaleni, Eastern Cape, South Africa

There is a paucity of research in South Africa examining the impact of the combined vulnerabilities of poverty, rurality and disability. This study used a quantitative survey method to explore the challenges experienced by persons with disabilities, both in their day-to-day living and in access to health care in Madwaleni, a poor rural isiXhosa-speaking community in South Africa. Results suggest that persons with disabilities in Madwaleni experience more problems in terms of daily living and health compared to persons with no disabilities. Recommendations for the future are discussed in order to suggest some concrete and practical solutions.

Supervisor: Prof LP Swartz

VIVIERS, Etienne (Music)

A critique of the survival anxieties that inform South African discourses about Western art music

This study investigates how Oswald Spengler's and Arnold Toynbee's anxious theories about civilisation's decline and survival have impacted on South African discourses about Western art music. The case studies that demonstrate a resultant and enduring obsession with the *voortbestaan* of "white" musical culture in South Africa include the following: JM Coetzee's writings on Bach, the apartheid-era national anthem's situatedness inside the landscape of Bloedrivier, the reception discourse of Hendrik Hofmeyr's *Sinfonia africana*, and Winfried Lüdemann's inaugural lecture petition for the institutional safekeeping of "Western" and "South African" art music at the Stellenbosch University Music Department.

Supervisor: Prof SjøZ Muller

Fakulteit Opvoedkunde

Faculty of Education

IFakhalthi yezeMfundo

PhD

DORFLING, Pieter Stephanus (Educational Psychology)

A knowledge network model for teachers supporting learners with disabilities in an inclusive education system

Teachers play an important role in implementing inclusive education. However, their role is often compromised by their perceived inadequate knowledge and competence to provide quality education to all

children, especially those with disabilities. This study employed a mixed-methods research design to determine the current use of knowledge management in inclusive education, describe the knowledge and skills that teachers need to teach and support children with disabilities, and develop and evaluate a knowledge network model for teachers' continuous personal professional learning. The candidate proposed a Personal Continuous Knowledge Development (PCKD) model as a conceptual model for teachers teaching children with disabilities. The model contributes to an improved understanding of the potential use of knowledge management in preparing and supporting teachers to include children with disabilities in their classrooms.

Supervisor: Prof E Swart

Co-supervisor: Prof E Schwella

EDWARDS, Nazeem (Curriculum Studies)

Using design-based research to analyse the development of an inquiry-based approach for teaching direct current electricity to pre-service teachers

This study uses a design-based research (DBR) approach to develop pre-service science teachers' (PSSTs) conceptual understanding in the domain of direct current electricity. A transformative conjecture-driven teaching experiment was conducted with three cohorts of PSSTs from 2011 to 2013. The findings show that an inquiry-based science teaching approach can help to foster a better conceptual understanding of direct current electricity with varying degrees of success. An important design principle to emerge is that inquiry-based science teaching strategies are effective only when integrated with traditional expository teaching strategies, aimed to develop students' conceptual understanding of direct current electricity.

Supervisor: Prof LL le Grange

FAASEN, Marinda (Curriculum Studies)

A learning design framework for active learning using audience response systems

The aim of this study was to analyse the use of audience response activities to promote active learning, and to map out strategies for the most effective use of audience response technology. Using activity theory as analytical lens, the candidate interpreted the data gathered from lecturers and students in the following five courses at Stellenbosch University: Chemistry, Biochemistry, Logistics, Mathematics Education and English Education. The candidate proposes an integrated approach, including aspects of instructivism and constructivism to the design of audience response activities. The framework developed by the candidate encompasses a process and design model and the study highlights the importance of immediate feedback and motivation for audience response activities to promote active learning.

Supervisor: Prof M Fourie-Malherbe

Co-supervisor: Prof JC Cronje

FELDMAN, Jennifer Ann (Education Policy Studies)

Eliciting pedagogical learning among teachers in a professional learning community

Presented in article format, this dissertation is based on practice-based research that focuses on a group of teachers' pedagogical learning in a

professional learning community (PLC). The PLC was run over a two-year period, informed by a social justice approach to pedagogical learning. Drawing on Bourdieu's thinking tools, the dissertation develops a conceptualisation of habitus engagement and teachers' pedagogical habitus to understand the constraints and possibilities of teachers' pedagogical adaptation and change. The study concludes by arguing that PLC dialogue, as a form of habitus engagement, must engage with the teachers' embodied pedagogical habitus in order to effect sustained change in their pedagogical practices.

Supervisor: Prof A Fataar

KASSIM, Alimi Yau (Curriculum Studies)

Perceptions of pre-service teachers in Foundation Phase Mathematics about their professional development

This study investigated prospective Foundation Phase Mathematics teachers' perceptions on professional development at the beginning and end of their 3rd academic year. Qualitative and quantitative strategies were used to collect data. Analysis of this data gave detailed information. Findings from both strategies were merged to reveal confirmatory and contradictory views of the participants. The participants perceived remarkable improvements in like: overcoming their feelings of incompetence to engage in problem-solving activities; understanding of how to assist learners to make connections between ideas and strategies in solving problems; and understanding of how to access and assess learners' thinking and comprehension.

Supervisor: Prof DCJ Wessels

MATIMBO, Fulgence John (Higher Education)

Towards understanding programmatic quality in private universities in Tanzania

Private higher education in Tanzania has grown exponentially. Questions arose, however, as to the quality of the undergraduate degrees private universities offer. The study explored institutional internal quality assurance processes that formed part of a larger quality assurance project in East Africa. It analysed the use and application of the quality concept in undergraduate programmes at five private universities to better understand how these universities interpret and apply the quality concept. By suggesting a conceptual framework for programmatic quality, the study contributed to an improved understanding of how private universities interpret and use the concept of quality in undergraduate programme self-evaluation, which has direct implications for the implementation of programme quality assurance in Tanzania.

Supervisor: Prof EM Bitzer

McCREANOR, Christopher Paul Andrew (Curriculum Studies)

A curriculum framework for the professional development of corporate social responsibility practitioners in South Africa

This study investigated the core competencies needed by corporate social responsibility (CSR) practitioners in businesses in South Africa. It is common knowledge that decisions about corporate social responsibility are often made by persons who have little background in or

training for this area of work and practice. The proposed framework emerged from extensive work with corporate officials, academics and CSR practitioners and was validated through several research cycles. For the first time in CSR literature in South Africa this research suggests a framework which may serve as a guideline for curriculum designers and policy makers when considering the design, development and implementation of entry-level to mid-career CSR practitioner programmes or qualifications.

Supervisor: Prof EM Bitzer

Co-supervisor: Prof PGW Jansen

NAUKUSHU, Shiwana Teeleleni (Curriculum Studies)

A critical theory enquiry in the development of number sense in Namibian first-year pre-service secondary Mathematics teachers

The candidate's pragmatic study used a mixed-methods approach to enquire into the efficacy of a Critical Theory intervention to enhance pre-service secondary Mathematics teachers' number sense competences. Using a concurrent format of the mixed-methods design and a five-tier number sense instrument multilinear regression analysis, yielded statistically significant differences as well as large effect sizes in which a randomly selected experimental group of 30 outperformed a control group of 30 in both number sense proficiency and reasoning. Qualitative analysis revealed significant improvements in the quality of responses to number sense items on both reasoning and proficiency variables.

Supervisors: Prof M Ndlovu and Dr F Gierdien

ORR, David (Curriculum Studies)

Higher education strategic partnerships: the impact of Stellenbosch University's community interaction agreements on local development

This research study was designed to measure the impact of Stellenbosch University's interaction agreements with the local surrounding communities. The research highlighted current local public policy practices of Stellenbosch University's interaction with the surrounding community. From the study results, a new integrated conceptual framework was proposed to capture the full socio-economic impact of higher education institutions. Furthermore, the 2012-2013 data illustrated that Stellenbosch University has a substantial social and economic impact on the surrounding municipalities of Stellenbosch and Drakenstein. Additionally, the findings include a list of social and economic performance indicators related to the University's community engagement and economic development efforts.

Supervisor: Prof R Newmark

OWUSU-AGYEMAN, Yaw (Curriculum Studies)

The relevance of telecommunications and electrical engineering programmes to the needs of adult learners in Ghana

The study investigated the relevance of telecommunications and electrical engineering programmes to the needs of adult learners at three diverse universities in Ghana. Framed along an interpretive paradigm, relative ontology, transactional epistemology and embedded multiple case study methodology, an integrated constructivist model was proposed for developing telecommunications and electrical

engineering programmes for adult learners. The study revealed that while various learning theories may be appropriate when designing programmes for adult learners in engineering, constructivism, when amplified by other theories such as transformative, behavioural and experiential learning, provides effective pedagogic methods that enhance the knowledge and skills of adult learners.

Supervisor: Prof M Fourie-Malherbe

Co-supervisors: Prof L Frick and Dr DMO Adjin

PETERS, Barbara Ilona (Curriculum Studies)

Realistic Mathematics education and professional development: a case study of the experiences of primary school Mathematics teachers in Namibia

This study reports on the experiences of primary school Mathematics teachers in a school in Namibia. The teachers participated in a professional development (PD) project based on realistic Mathematics education (RME) and lesson study principles, which aimed at improving subject knowledge as well as teaching. Data was collected over a period of three school terms. Findings show that the teachers were positively disposed towards the use and development of RME-based materials. The study concludes with the importance of PD in general and the need for collaboration between the teachers and Mathematics educators from the University of Namibia.

Supervisor: Dr F Gierdien

(PhD Sport Science)

FRYER, Bradley James (Sport Sc)

A community-based lifestyle intervention programme for adults with type 2 diabetes mellitus in a low socio-economic status community

Community-led lifestyle interventions have shown promise in combating T2DM and other lifestyle diseases; however, there is a paucity of data on comprehensive lifestyle interventions in communities of low socio-economic status (SES) in South Africa. This study investigated the effectiveness of a low-cost, community-based, 10-week lifestyle intervention on physiological, psychological and health-related outcomes in adults with T2DM in a low SES community. The programme significantly improved various health-related parameters, functional exercise capacity, most aspects related to quality of life, as well as dietary habits and lifestyle behaviours. This study showed that a low-cost, easy-to-implement lifestyle programme can significantly assist the primary health care sector in the management and prevention of T2DM in under-resourced communities.

Supervisor: Prof E Terblanche

Fakulteit Regsgeleerdheid

Faculty of Law

IFakhalthi yezoMthetho

LLD

DURHAM, Carryn Melissa (Private Law)

Comparative perspectives on the role of the trustees and the managing agent as dramatis personae in the governance of sectional title schemes in South Africa

This dissertation concerns the day-to-day management of a sectional title scheme by the trustees and a managing agent. The majority of trustees must be owners; they need no specific qualifications nor special knowledge of sectional title management. They work for love and charity and are only liable for gross negligence. The managing agent who provides the necessary management skills is basically considered to be a mere employee. Therefore the candidate proposes that the position of the managing agent should be elevated to that of a professional manager who would be liable for professional negligence in the performance of his functions and that the trustees should perform a mere advisory and monitoring function.

Supervisor: Prof CG van der Merwe

KARJALA, Tuuli Maria (Public Law)

Sixty years of silence: gender discrimination under international refugee law

This dissertation argues that the definition of 'refugee' under international refugee law is obsolete and in dire need of reconceptualisation in order to adequately encompass the unique persecution that women face because of their gender. It seeks to establish the reasons behind the inadequate protection of victims of gender-related persecution. To examine this question, a detailed analysis of various aspects that have an impact on the interpretation and implementation of the international refugee law framework was carried out. As a result of this analysis, this dissertation reveals how the patriarchal nature of the international law regime as a whole has had a negative impact on gender-related asylum claims.

Supervisor: Prof EAB Rudman

MAGASHI, Salim Bashir (Public Law)

The human right to development in Nigeria

This dissertation examines the role of the right to development as a tool for genuine human development in Africa and specifically in Nigeria. It analyses the legal character of the right from the international, regional and domestic legal perspectives. This dissertation argues that the right to development is a human right capable of enforcement in Nigeria. Its enforceability is found within the Nigerian legal system itself through international and domestic legal arrangements. Similarly the dissertation notes that, aside from the justiciability of the right, good governance, legislative and development planning approaches can aid the effective realisation of this right.

Supervisor: Prof EAB Rudman

Fakulteit Teologie
Faculty of Theology
IFakhalthi yezeNkolo

PhD

BANDA, Collium (Systematic Theology)

Empowering hope? Jürgen Moltmann's eschatological challenge to ecclesiological responses in the Zimbabwean context of poverty

In search of an empowering ecclesiological-ethical framework in response to poverty, Banda analyses Moltmann's eschatological theology in terms of the historicity of the trinitarian God of hope, the kingdom of God that promotes the restoration of life and the communality of the church of hope. Criticising the responses of both the colonial and prosperity churches in the history of Zimbabwe, the metaphor of the church as an African kraal is employed discerningly. Hence the historicity of God becomes a place for human capacitation of the poor and the kingdom calls for a public-theological model that rejects the church's co-optation by the ruling elite.

Supervisor: Dr IJ van der Merwe

FORTEIN, Eugene André (Ekklesiologie)

Allan Boesak en die Nederduitse Gereformeerde Sendingkerk: 'n teologies-historiese ondersoek

Die hoofokus van hierdie studie val op die rol wat Allan Boesak van 1976 tot 1990 as predikant van die Nederduitse Gereformeerde Sendingkerk (NGSK) binne dié kerk, sowel as binne die breër kader van die kerkstryd teen apartheid, gespeel het. As teologies-historiese ondersoek ontleed die proefskrif 'n aantal sleuteltekste om aan te toon hoe Boesak insigte vanuit bevrydingsteologie, swartteologie en Gereformeerde teologie ontgin en met mekaar verbind het om 'n "teologie van profetiese weerstand" te ontwikkel. Hierdeur het Boesak 'n sleutelrol gespeel om 'n belangrike teologiese wending ten opsigte van apartheid binne die NGSK, asook in sekere ekumeniese kringe, te bring.

Promotor: Prof RR Vosloo

HASSAN, John (Missiology)

Mission as prophetic dialogue in Christian-Muslim encounters, Northern Nigeria

Religious conflicts and responses of religious adherents have influenced practices of peace-building and reconciliation in Northern Nigeria. This dissertation analyses and evaluates dialogical and prophetic practices of Christian and Muslim leaders in literature, policy documents and other resources of the Programme for Christian-Muslim Relations in Africa (PROCMURA). It develops factors of interreligious encounters, identity formation and transformation within an emerging conceptual model ('Mission as Prophetic Dialogue') and its praxis-cycle approach in Intercultural Theology of Religions. The candidate demonstrates

how the approach, which links institutional policy and research, and practice and theory, can guide and continuously transform leaders of PROCMURA who practice peaceful co-existence or reconciliation.

Supervisor: Prof DX Simon

MSABAH, Anzuruni Barnabe (Practical Theology)

Empowerment by hope: a phenomenological study on the perspectives of hope vis-a-vis the well-being of African refugees

This study is a lens through which the question of refugee migrants and their health and well-being could be approached from a practical theological perspective. The study engaged with a wide range of existing literature on hope – from, amongst others, the late theologian Prof Russel Botman – as well as empirical research with refugee migrants in Cape Town with regard to grounded meanings of hope in line with participants' lived experiences. Among other things, the findings of this research show that, in addition to being an indicator of human dignity, hope is a practical tool for holistic development. Thus, hope and empowerment are an inseparable binary with affective dimensions on being and belonging. In this way, putting hope into practice is an asset for improved holistic well-being.

Supervisor: Dr NF Bowers Du Toit

Fakulteit Geneeskunde en
Gesondheidswetenskappe

Faculty of Medicine and
Health Sciences

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neeNzululwazi kwezeMpilo

PhD

CHILIZA, Bonginkosi (Psychiatry)

A prospective study of clinical, biological and functional aspects of outcome in first-episode psychosis in South Africa

This prospective, non-comparative study assessed the efficacy and tolerability of a depot antipsychotic combined with an assertive monitoring programme over 12 months in first-episode schizophrenia. There were high rates of acceptance and adherence to the treatment. Seventy percent completed the 12 months of treatment and 60% achieved remission. Patients experienced significant improvements in quality of life and social and occupational functioning. Adverse drug effects were generally mild. Three percent developed transient dyskinesia. However, considerable adipogenic and dyslipidaemic effects were observed. Twelve percent met our pre-defined criteria for non-response. This novel intervention may be particularly suitable for resource-constrained settings.

Supervisor: Prof RA Emsley

FISHER, Randall Graeme (Geneeskundige Virologie)

Next generation sequencing of minor variant HIV drug resistance testing in South Africa: optimisation of upstream sample preparation for different sequencing platforms

Die kandidaat het laevoorkoms- menslike immuunbrekavirus (MIV) middelweerstandige haplotipes met nuwegenerasie-nukleïensuur-basispaaropeenvolgingbepaling (NGS) in monsters van Suid-Afrikaanse pasiënte ondersoek. Gapings in kennis is hiermee aangeroe. Dit het geblyk dat sonder volgehoue middeldruk-protease-inhibitorweerstandigheid in pasiënte wat tweedelyn-terapie ontvang, beperk bly tot enkelmutasie- minor haplotipes. NGS het meer mutasies as standaard-middelweerstandigheid-genotipering aangetoon in kinders wat, ten spyte van profilakse, infeksie opgedoen het. Die werk het ook streng standaarde vir DNA-verryking voor NGS daargestel en verbeterings in die proses ondersoek. Die werk is reeds in twee eweknie-beoordeelde publikasies vervat en 'n derde word tans voorberei.

Promotor: Prof GU van Zyl

FLINT, Margot Gwyneth (Medical Physiology)

Gamete proteomic profile of male patients suffering from sexually transmitted infections

A number of men suffering from idiopathic infertility also present with sexually transmitted infections (STIs). Using highly advanced techniques, the impact of *N. gonorrhoea*, *C. trachomatis* and *T. vaginalis* were investigated on functional characteristics and protein profiles of human spermatozoa. Apart from the negative bearing on concentration, motility and morphology, it was also shown that these STIs led to generation of seminal reactive oxygen species which correlated with DNA fragmentation. Proteomic analysis furthermore revealed a plethora of proteins, specifically involved in metabolic pathways and cell structure of spermatozoa, to be differentially expressed. This archetype study was able to truly explain novel mechanisms through which STIs can contribute to male infertility.

Supervisor: Prof SS du Plessis

External Co-supervisor: Prof G van der Horst

GLANZMANN, Brigitte (Human Genetics)

Identification of novel Parkinson's disease genes in the South African population using a whole exome-sequencing approach

Parkinson's disease (PD), a debilitating neurological disorder, has a significant genetic component, but the genetic aetiology has been understudied in Africa. This candidate investigated the genetic causes in the Afrikaner population, and genealogical analysis revealed that 40 Afrikaner patients were related to a founder couple who arrived in South Africa in the 1600s. She applied a whole exome-sequencing strategy to identify the causative mutation and variants in candidate genes (*SYNJ1* and *USP17*) were found. Also, she designed a novel bioinformatics tool to analyse this data. Identification of new disease genes is essential as it may reveal exciting insights into the underlying pathobiology.

Supervisor: Prof S Barden-Kruger

External Co-supervisor: Dr J Gamielien

JANSON, Jacques Teran (Torakschirurgie)

Die evaluering van 'n bioprostetiese mitraalklep van jugulêre vena en politetrafluoroetileen (Gore-Tex) chordae in 'n skaapmodel

Hierdie studie ondersoek die gebruik van 'n interne jugulêre vena-segment vir die maak van 'n anterior mitraalklepsuil. Die ondersoek, in 'n skaapmodel, wys dat die nuwe mitraalklepsuil histologies die karakter van lewende weefsel behou en dat die klepsuil bevredigend funksioneer. Belangrike waarnemings is gemaak, soos dat die suspensie van die klepsuil van kritieke belang is om mitraalklepbulging en mitraalklep-inkompetensie te voorkom. Hierdie benadering het potensiaal vir mitraalklepvervanging en -herstel. Dit sou die gebruik van antistol, wat in die Suider-Afrikaanse konteks steeds problematies is wanneer vreemde materiaal vir mitraalklepvervanging gebruik word, kon omseil.

Promotor: Prof AR Coetzee

KAVOO LINGE, Augustine Peter (Medical Physiology)

The dietary ionic effects on sex selection in animal models and its use in the prevention of X-linked disorders

X-linked disorders are more expressed in male offspring and prevention of these hereditary diseases is the only recourse to date. Influencing conception towards female offspring can circumvent this problem; however, sex ratio adjustment remains highly contentious. By exposing two animal models (fish and mice) to combinations of ionic supplements, the candidate was able to demonstrate subsequent alterations in the oolemma's membrane potential. Based on galvanotropism, single valence cations caused a negative state and attraction of the androsperm, while double valence cations caused a positive state and attraction of the gynnosperm, thereby leading to a female conceptus and plausible dietary method to preclude X-linked disorders.

Supervisor: Prof SS du Plessis

External Co-supervisor: Dr C Kimivele

LANGENEGGER, Eduard Jacobus (Obstetrics and Gynaecology)

Establishing an Obstetric Critical Care Unit in a South African tertiary hospital

South Africa has a high rate of maternal mortality. The causes and avoidable factors are well documented. Insufficient critical care resources are commonly noted. Dr Langenegger compiled and implemented a detailed design blueprint for an Obstetric Critical Care Unit and conducted pre- and post-establishment audits of this service. Careful analysis was performed to evaluate the appropriate provision of advanced care and the outcomes in terms of mortality and morbidity. The results demonstrated a statistically significant decrease in maternal mortality. The blueprint will enable comparable obstetric services to establish similar units.

Supervisor: Prof DR Hall

External Co-supervisor: Dr FJ Mattheyse

ODUNAIYA, Nse Ayooluna (Physiotherapy)

Cardiovascular disease risk factors among adolescents attending school in rural Nigeria

The candidate developed a culturally appropriate lifestyle cardiovascular disease (CVD) risk factors questionnaire to determine CVD risk factors among adolescents in rural Nigeria. The first phase involved the development of the CVD risk factors questionnaire. The second phase comprised its cross-cultural validation. The final phases involved the investigation into CVD risk factors and objective factors, including blood pressure, BMI and waist hip ratio. She found that rural Nigerian youth are at a high risk of adult CVD. There is thus an urgent need for prevention.

Supervisor: Prof QA Louw

External Co-supervisor: Prof K Grimmer

VAN DER MERWE, Celia (Human Genetics)

Analysis of copy number variation and disease mechanisms underlying Parkinson's disease

Parkinson's disease (PD) is an incurable neurological disorder for which the underlying mechanisms are unknown. This candidate produced a cellular model of PD to study disease pathways and tested the effect of curcumin, an antioxidant, for its therapeutic properties on this model. She found conclusive evidence for mitochondrial dysfunction, and that curcumin was able to rescue these defects. Also, she demonstrated that copy number changes are a rare cause of the disorder in South African patients. This study is important as it provided novel insights into PD pathways and paved the way for future therapeutic strategies involving curcumin and other compounds.

Supervisor: Prof S Barden-Kruger

Co-supervisor: Dr B Loos

VAN DER MERWE, Nicole (Anatomical Pathology)

Development and application of a pathology-supported pharmacogenetic test for improved clinical management of South African patients with breast cancer and associated co-morbidities

The study led to the development of a pharmacogenetic test used to select breast cancer patients for whole exome sequencing (WES), beyond single-gene BRCA1/2 mutation detection routinely applied in familial cases. Stratification of breast cancer survivors according to oestrogen receptor status supported the evaluation of polymorphic variation in drug metabolising enzymes (CYP2D6) and those dependent on vitamin co-factors (MTHFR) across diagnostic boundaries. Detection of variants of uncertain clinical significance in the DNA mismatch repair pathway confirmed the value of a combined research and service delivery platform. This approach facilitates clinical interpretation of genomic information, while striving to meet patient expectations.

Supervisor: Prof MJ Kotze

Co-supervisor: Prof S Janse van Rensburg

External Co-supervisors: Prof J Bezuidenhout and Dr R Pienaar

YOUNG, Taryn Natalie (Community Health)

Development of a best practice model for teaching and learning evidence-based health care at Stellenbosch University, South Africa

The best strategies for learning and teaching evidence-based health care (EBHC) have not yet been elucidated. A mixed-methods approach was used to investigate how EBHC can best be integrated in medical student training. Clinically integrated, multifaceted strategies, with assessment, were found to be more effective than single or no interventions for enhancing EBHC knowledge, attitudes and skills. Global experience on initiating and implementing EBHC learning is reported, along with information on the challenges, opportunities and critical success factors for implementing EBHC in different countries. Finally, teaching and learning of EBHC at Stellenbosch University are explored, and recommendations made for programme strengthening.

Supervisor: Prof J Volmink

External Co-supervisor: Prof M Clarke

ZUNZA, Moleen (Paediatrics)

Outcomes of different feeding regimes in a birth cohort of HIV-exposed infants in public health care settings

The candidate conducted a prospective cohort study of HIV-exposed uninfected infants to evaluate HIV+ mothers' self-selection of either breast- or formula-feeding and the influence on growth or hospitalisation due to infectious diseases. The study occurred during transition from subsidised formula to exclusive breast-feeding. Adherence to exclusive breast-feeding was poor. Most mothers switched early to formula-feeding. There were no differences in outcomes between the two groups of infants. A qualitative study revealed conflicts as mothers decided between breast-feeding with its health-promoting benefits, but risk of HIV transmission versus formula with no risk of HIV transmission, but an increased likelihood of serious infections.

Supervisor: Prof MF Cotton

Co-supervisor: Prof M Esser

