



Nelson Mandela
Metropolitan
University

for tomorrow

Port Elizabeth & George

2009 Research and Innovation Report

research
innovation

Vision

To be a dynamic African university, recognised for its leadership in generating cutting-edge knowledge for a sustainable future.

Mission

To offer a diverse range of quality educational opportunities that will make a critical and constructive contribution to regional, national and global sustainability.

Values



Respect for
diversity



Excellence



Ubuntu



Integrity



Respect for the
natural environment



Taking
responsibility

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INTRODUCTION



Prof Derrick Swartz, NMMU Vice-Chancellor

Embracing research to make a critical difference

At NMMU, we are actively promoting scholarship that has the potential to make a critical and constructive contribution to the many social, economic, cultural and technological challenges facing our young democracy in South Africa, and within the context of the wider world. NMMU is fully committed to playing a catalytic role – through knowledge production and dissemination – in promoting the goals of a free and fair society.

Our country faces huge challenges, born from its difficult past, in relation to social and economic inequalities, and we believe education is a vital tool in tackling these challenges.

NMMU's Vision 2020 is to become a dynamic African university, recognised for its leadership in generating cutting-edge knowledge for a sustainable future. Its mission is to offer a diverse range of quality educational opportunities that will make a critical and constructive contribution to regional, national and global sustainability. We believe that research and innovation constitute a critical component of this new vision and mission and, as readers will notice, have evolved a range of strategies to harness the intellectual skills of our academics and students to promote life-changing and pioneering research.

It seems that the problem is not our capacity for scientific and technological discovery, but the way we organise ourselves and the values on which we base our social system – and indeed the will to bring about lasting and effective change for the better of all humankind.

Our academics are making a life-changing and pioneering impact in society. Our students are increasingly engaged in postgraduate research that resonates with the critical challenges not only in South Africa, but in the wider African continent. Together, our academics and students are beginning to make a life-changing difference in the lives of thousands of people.

At NMMU, we are proud of our research successes. We are growing high-level research competence and innovation, and this is increasingly evidenced by a growing corpus of research outputs and scholarly works by the university community. We hope and believe that this trend will continue into the future as our university breaks new ground in promoting the goals of social equality, justice and sustainability for all.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'D Swartz', with a long horizontal line extending to the left.

Professor Derrick Swartz
Vice-Chancellor

Omvattende navorsing wat 'n kritieke verskil maak

By NMMU bevorder ons aktief kennis en navorsing met die potensiaal om 'n kritieke en konstruktiewe bydrae te maak tot die vele maatskaplike, kulturele en tegnologiese uitdagings wat ons jong Suid-Afrikaanse demokrasie en die wyer wêreld in die gesig staar. NMMU is ten volle daartoe verbind om deur die produsering en verspreiding van kennis 'n kataliserende rol te speel in die bevordering van die doelstellings van 'n vry en regverdige samelewing.

Ons land word gekonfronteer deur reuse uitdagings met betrekking tot maatskaplike en ekonomiese ongelykhede komende vanuit 'n moeilike verlede, en ons glo onderwys is 'n noodsaaklike instrument om hierdie uitdagings aan te pak.

NMMU se Visie 2020 is dié van 'n dinamiese Afrika-universiteit wat erken word vir leierskap om die jongste kennis te genereer vir 'n volhoubare toekoms. Ons missie is om 'n wye reeks gehalte onderwysgeleenthede te bied, wat 'n kritiese en konstruktiewe bydrae sal maak tot streeks-, nasionale en globale volhoubaarheid. Ons glo dat navorsing en innovering 'n kritieke komponent van hierdie nuwe visie en missie sal wees en, soos die lesers sal opmerk, 'n reeks strategieë sal voortbring om die intellektuele vaardighede van ons akademië en studente in te span om baanbrekersnavorsing te bevorder.

Dit blyk dat die probleem nie ons kapasiteit vir wetenskaplike en tegnologiese ontdekking is nie, maar die wyse waarop ons onself organiseer en die waardes waarop ons ons maatskaplike stelsel baseer - en inderdaad die wil om voortgesette en doeltreffende verandering ten goede van die mensdom teweeg te bring.

Ons akademië maak 'n ingrypende en baanbrekersimpak op die samelewing. Ons studente is toenemend betrokke by nagraadse navorsing wat nie net die kritieke uitdagings in Suid-Afrika nie, maar ook die wyer Afrikavasteland aanspreek. Saam is ons akademië en studente besig om 'n radikale verandering te maak in die lewens van duisende mense.

By NMMU is ons trots op ons navorsingsukses. Ons kweek hoëvlak navorsingsbevoegdheid en innovering, wat toenemend gestaaf word deur 'n groei in die universiteitsgemeenskap se navorsingsuitsette. Ons hoop en glo dat hierdie tendens voortgesit sal word in die toekoms soos wat ons universiteit baanbrekerswerk doen ter bevordering van die doelstellings van maatskaplike gelykheid, regverdigheid en volhoubaarheid vir almal.

Vriendelike groete

Derrick Swartz
Visekanselier

Ulwamkelo/Ubandakanyo lophando olwenza umahluko obalulekileyo

E-NMMU sixakekile sinyusa imali yemfundo enokwenza igalelo elibalulekileyo nelakhayo kwintlaninge yasekuhlaleni, kuqoqosho, kwinkcubeko kunye nemingeni yobugcisa ejongene nedemokrasie yethu entsha yaseMzantsi Afrika, kananjalo kuquka inkqubo yelizwe ngokubanzi. I-NMMU izinikele ngokupheleleyo ekudlaleni indima yotshintsho – ngokukhupha nokuhlwayela ulwazi – ekuphakamiseni iinjongo zoluntu ezikhululekileyo nezanelisayo.

Umbono wama2020 waseNMMU kukuba yidyunivesithi enotshintsho yaseAfrika eyaziwayo ngobunkokheli bayo ekuveliseni ulwazi olunenkqubela lwekamva elingahexiyo. Injongo yayo kukunikezela ngoluhlu lwamathuba emfundo esemgangathweni eyakwenza igalelo elakhayo nelibalulekileyo kummandla, kwisizwe nelizwe elinenkqubela. Sikholelwa ekubeni uphando nenguqulelo zenza inxalenye yalo mbono nale njongo intsha, kwaye nanjengoko abafundi bayakuqwalasela ukuba kuphuhliswe uluhlu lwezobuchule ukuphakamisa ubuchule bengqondo yabahloli kunye nabafundi ukukhulisa utshintsho lobomi nokuhlala indlela kuphando.

Kubonakala ukuba ingxaki ayibobungakanani bamandla ethu kuveliso lwezenzululwazi koko yindlela esizilungisa ngayo kunye neenqobo esibhekisa kuzo imo yentlalo yethu – kananjalo nentando yokuzisa utshintsho olugqibeleleyo noluneziphumo kusenzelwa ubungcono kumntu wonke.

Abahloli bethu benza uthshintsho kubomi kwaye bahlala indlela yempembelelo eluntwini. Abafundi bethu abaninzi bayanda kuphando lwabafundi abasele benemfundo enomsila ehlokomisayo ngemingeni ebalulekileyo hayi eMzantsi Afrika kuphela, kodwa kwilizwe lama-Afrika ngokubanzi. Abahloli bebambene nabafundi baqalisa ukwenza inguqu yobomi engumahluko ebomini yentlaninge yabantu.

E-NMMU sineqhayiya ngempumelelo yophando lwethu. Sikhulisa umgangatho ophezulu wobuchule bophando nenguqulelo, kwaye oku kunobungqina obukhulayo obubonakaliswa kukukhula kwengqokelela yeziphumo zophando nemisebenzi yezifundiswa eyenziwa luluntu lwedyunivesithi. Siyathemba kwaye sikhulwa ukuba le ndlela iza kuqhubeka kwikamva nanjengoko idyunivesithi yethu ibonakalisa umhlaba omtsha ekukhuliseni imigomo yentlalo elinganayo, ubulungisa nenkqubela kawonkewonke.

Owenu onyanisekileyo

Derrick Swartz
Inqununu

Leadership in generating cutting-edge knowledge for tomorrow



Prof Thoko Mayekiso, Deputy Vice-Chancellor: Research and Engagement

Research and Innovation at NMMU is one of the critical vehicles to give meaning and substance to the university's vision: "To be a dynamic African University, recognised for its leadership in generating cutting-edge knowledge for a sustainable future". In 2009, we embarked on a strategic drive to encourage all academics to engage in research and scholarship.

This was supported by a generous research incentive scheme as well as other endeavours to foster an environment that is conducive to knowledge generation. Our research endeavours continued to be informed by the following strategic goals:

- Conduct research that contributes to local, regional, national and global sustainability.
- Create and support an environment that fosters research quality and productivity.
- Develop and sustain the research capacity of staff and students.
- Promote a broad conceptualisation of research, scholarship and innovation.

All these strategic goals are substantively embedded in the Vision 2020 Strategic Plan. Particularly encouraging in 2009 was the increase in the number of staff active in research which is in line with our strategic objective of building a critical mass of researchers working on faculty research themes or institutional themes.

One of the positive developments in 2009 was the 26% increase in research publications from established as well as emerging researchers. There has been an increase in the number of publications in high quality journals both nationally and internationally.

NMMU has a number of productive research relationships with its industry partners and other external stakeholders and is constantly broadening its portfolio in this regard. On the global front, NMMU has had substantial engagement with international scholars, a number of which have been facilitated by our Office for International Education.

The university hosted a number of colloquia, conferences and workshops. NMMU is committed to research and innovation that improves the quality of life of South Africans. In this regard, our researchers are conscious of our location and conduct research that addresses local, national and international developmental priorities.

The research achievements of NMMU briefly sketched in this foreword and described in more detail in this annual report could not have been realised without the guidance and support of our University Council, university management and the rest of the NMMU community.

On behalf of the Research Office, I would like to extend our heartfelt gratitude for your support and guidance during 2009.

Siyabulela, nangamso
Baie dankie
Thank you

A handwritten signature in black ink, appearing to be 'Thoko Mayekiso', written in a fluid, cursive style.

Prof Thoko Mayekiso
Deputy Vice-Chancellor: Research and Engagement

Department of Research Management

In 2009, the research strategic priorities aligned to NMMU's Vision 2020 were formalised and good progress was made in obtaining consensus on faculty and cross-faculty research themes. This will greatly assist with future allocations of research resources.

2009 saw a dramatic increase of 26% in the number of Department of Education (DoE) research output subsidy units for articles in journals. This probably best illustrates the increased output of NMMU researchers. NMMU managed to retain its place among the top 10 South African universities, in terms of its National Research Foundation (NRF) rating. Internal research funding increased by 6%. However, external research funding from national and international funding agencies remained almost static and this requires attention. The exception was the R69m approved by NRF/DST (Department of Science and Technology) for the high resolution transmission electron microscope (HRTEM) project.

The further development of an internal research information management system (RIMS), which will run parallel to the DST/NRF InfoEd RIMS, has enabled management to take more informed decisions related to research.



Dr Pieter van Breda, Director: Research Management

A large number of established researchers managed to further enhance their international standing. Some of their achievements are profiled in this report.

Department of Research Capacity Development

Reflecting on the activities within the Department of Research Capacity Development during 2009, two main interrelated thrusts can be distilled. The first thrust relates to the pivotal role that building research capacity has in transforming a higher education institution such as NMMU. The second relates to the path to forge a new post merger vision that best reflects its unique position in the higher education landscape and foregrounds research.

Never has the higher education arena been more keenly aware of the need to focus on growing the next generation of researchers against the backdrop of an aging professoriate. Half the country's academics who are likely to retire in the next 10 years occupy the ranks of professors and associate professors and are essentially responsible for producing the bulk of the country's research outputs.

Coupled with the above, the imperative for transformation in line with the country's demographics has been an important consideration in conceptualising NMMU's response to addressing the development of the next cohort of academics. The demographic profile of NMMU staff reflects only 19.9% of academic positions are filled by blacks (African, coloured and Indian). Black women staff are under-represented at professorial and associate professoriate level.

In addressing the challenges outlined, RCD has received the support



Dr Blanche Pretorius, Director: Research Capacity Development

of the Ford Foundation and the NMMU Council to implement the Phuhlisa Programme. This intervention has focused on combining skills development with a mentoring programme and earmarked funding support for emerging researchers. The NRF's Thuthuka Programme and scholarship programmes for Masters and Doctoral students continues to be significant sources of support in bolstering the university's initiatives for researchers in training.

Department of Innovation Support and Technology Transfer

2009 was an incredibly exciting time for innovation support and technology transfer activities at NMMU: the number of Intellectual Property (IP) disclosures is slowly creeping upwards; many of our technologies are reaching the point of commercialisation; and we have licensed technologies and created spin-off companies based on NMMU's IP.

"Commercialisation" is sometimes considered a dirty word in academic circles, but we see it in the broader sense of the transfer of technology for the benefit of society. It is certainly not about income, but about seeing our research making a real difference in people's lives, whether through better products and services, improved health or service delivery, or increased jobs and economic benefit. Research should make an impact, and the commercialisation of products, processes and services is one mechanism to that end.

Of course, this activity does not come without long years of research before invention, and without many partners to provide assistance. For that reason, this department also undertakes innovation support activities that help academic staff to find research funding, provide contracting assistance and project investment funding where possible. In addition, it is involved with many prominent research entities, assisting with business plans and research proposals, particularly in the science, technology and engineering fields.

This provides a good support base for academic staff involved in both basic research and contract research projects. These need to be increased if NMMU is to support more postgraduate students and maintain its excellent laboratory facilities. If agreement activity (contract research agreements, non-disclosure agreements, memoranda of understanding and materials transfer agreements) can be seen as a proxy for innovation support activities, the growth from 41 in 2008 to 62 in 2009 shows a major increase in this area.



Jacqueline Barnett, Director: Innovation Support and Technology Transfer

However, while focusing internally is important, there remains a role for NMMU in the innovation debate and activities at provincial and national levels. The department remains committed to, and is actively creating, a technology transfer community of practice among the other Eastern Cape universities, and with other universities nationally. Innovation systems too are starting to be developed at regional level, between industry, academia and government, and NMMU remains part of those systems in fulfilling its mission to make a critical and constructive contribution to sustainability.

This is an electrifying time to be part of the innovation space in South Africa. NMMU is making, and will continue to make, a contribution for the benefit of society. Support from the broader NMMU community and NMMU management towards this end is overwhelming, and I am very proud to be part of this university during this exciting time.

PIONEERING RESEARCH AND INNOVATION

NMMU Researcher of the Year Award

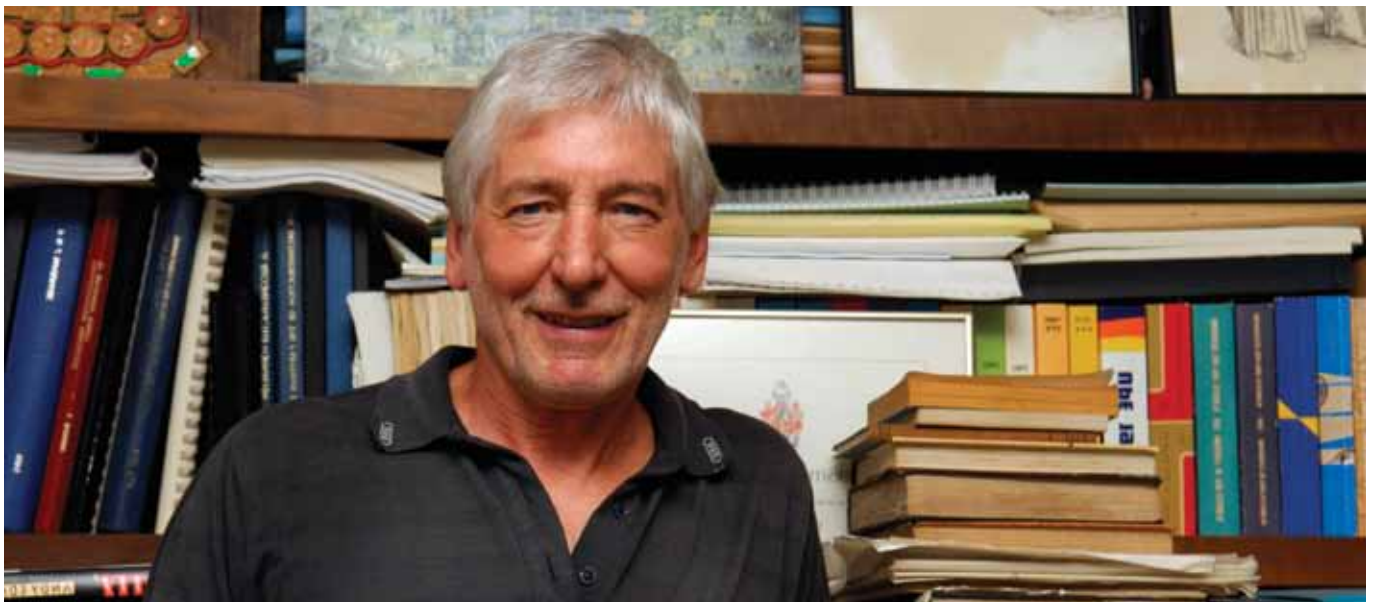
'Philosophical activist' for Earth

Professor of Philosophy Bert Olivier has always asked uncomfortable questions that challenge the status quo, but ultimately aim at improving life for all.

So it is not surprising that he has shifted his attention to a research focus area that has implications for every single person on Earth. "Given the looming crisis I have become increasingly aware that an emphasis on conservation, for example, while good in itself, is not sufficient – it is far too defensive, given the ongoing rampant destruction of ecosystems by human economic

Among the factors that spurred his interest in ecological philosophy was the recent economic recession, where it became apparent that capitalism generated wealth for a small handful of people, to the detriment of the majority. "There is the principle of endless growth in capitalism, which regards nature and people as resources for maximum profit. There is the attitude that 'it doesn't matter what we do, as long as we make a profit'."

In the world's oceans, for example, this has resulted in fish populations being wiped out by over-fishing, seas polluted by major oil



Prof Bert Olivier, NMMU Researcher of the Year

activities, and only tackles certain parts of the planet anyway. One virtually has to become a philosophical activist to draw the public's attention to the link between human economic practices (notably, capitalism today) and the destruction of the planetary biosphere."

Prof Olivier has not relinquished his other research interests – which include the philosophy of culture, art and architecture, cinema, music and literature, science, epistemology (the theory of knowledge) and psychoanalytic, social, media and discourse theory. Instead, he has combined them with his ecological interests.

In between delivering a number of papers on ecological philosophy both here and abroad, 2009 also saw Prof Olivier publishing a book trilogy, namely *Philosophy and Communication*, *Philosophy and Psychoanalytical Theory* and *Philosophy and the Arts*.

spills, and ecosystems destroyed by raised sea temperatures, due to anthropogenic (human-influenced) global warming. On land, the chemicals used in mining efforts, like cyanide, for example, have left ecosystems barren.

"Capitalism has brought the whole biosphere to a point where the buffering effect (Earth's ability to withstand what people inflict upon her) is no longer possible. Ecosystems are coming apart at the seams ..."

Prof Olivier's research has earned him a number of awards, most recently NMMU's top researcher of the year award for the past two years (2008 and 2009). As a lecturer at the then University of Port Elizabeth (UPE), he was named top researcher from 1999 to 2004. In addition to his awards from the university, he received the Stals Prize for Philosophy from the South African Academy for Arts and Sciences in 2004.

NMMU Performing and Creative Arts Awards

Translating a myth into visual language

Art and Design Lecturer Andrieta Wentzel's desire to translate the deeper, less obvious messages contained within mythology into a visual fine art form resulted in a striking abstract sculpture *Aspects of the Dark Other* – which has been included in the permanent collection of the Nelson Mandela Metropolitan Art Museum.

The 2009 acquisition of the sculpture by the metro's museum – one of five with national art gallery status in the country – saw Ms Wentzel receiving one of two prestigious NMMU Performing and Creative Arts Awards. Late last year, Ms Wentzel was also awarded the Helgaard Steyn prize, a national award for excellence in sculpture.



Andrieta Wentzel, Winner: NMMU Performing and Creative Arts Award

Ms Wentzel's sculpture, which consists of 12 towering wooden totems, between 1.8m and 4.5m tall, adorned with various objects (like animal skin, bones and horns) selected for their inherent symbolism, is a depiction of the myth of Hercules and the 12 labours (tasks) he was ordered to perform by the king. Rather than each pole representing a singular labour, elements representing various aspects of each labour are assembled across all the totems.

What inspired Ms Wentzel's interest in mythology was its link to familiar archetypes – stories which have been told and retold, relatively unchanged, since time in memoriam and are universally understood, e.g. children's stories where the forest is depicted as a frightening place filled with monsters, which must ultimately be faced and overcome by adult heroes. "The story will be interpreted according to the listener or reader's needs, which will differ from children to teens to grown-ups to grannies." For instance, a child will learn to be wary of strangers and stay close to the safety of home, while teenagers will recognise the need to move out of the familiar in their quest for independence. "They will also ultimately learn that they are responsible for some of the challenges they face, rather than always blaming others."

Archetypes were widely explored by psychologist Carl Jung, who valued the study of myth as a model for understanding the modern psyche. Delving into Jung's research, Ms Wentzel linked the Hercules myth with Jung's notion of individuation (the process of psychological maturation). In the example mentioned above, Hercules would have to face the monsters, and recognise that these bad elements are actually part of the darker side of his own nature, and take responsibility for them.

"We need to face the negative parts of our psychological make-up without allowing them to tear us apart. We all possess light and dark within us. We can't always stay within the light. The overlap between mythology, archetypes and psychology is particularly interesting to me."

Ms Wentzel's work has been included in numerous exhibitions throughout South Africa. One of her many commissioned pieces was a bronze portrait of Nelson Mandela, commissioned by the Eastern Cape Provincial Legislature, and presented to him on his 86th birthday.

Connecting people through photography

His outstanding efforts in curating a major exhibition of artwork by NMMU photography alumni and staff at Nelson Mandela Metropolitan Art Museum culminated in one of two prestigious NMMU Performing and Creative Arts Awards for Senior Photography Lecturer Glenn Meyer.

Mr Meyer, who is also course co-ordinator of the Applied Design Department's photography programme, assembled 91 works by 51 photographers – local, national and international – in the RE...FLEX exhibition held from August 15 to October 12, 2008.



The exhibition began as a desire to highlight the photographic achievements of the university staff, students and alumni over the past 38 years ”

“The exhibition began as a desire to highlight the photographic achievements of the university staff, students and alumni over the last 38 years. The aim of the exhibition was to build a stronger profile for photography in the Eastern Cape and to create a dynamic interface with alumni to promote new networks and dialogues,” said Mr Meyer.

The event, attended by over 2 400 people, resulted in the publication of a substantial catalogue, which is the only existing reference to photographers originating from the Eastern Cape. The city's museum also purchased several works for its developing permanent photography collection. Mr Meyer used the exhibition to initiate the establishment of the NMMU photographic teaching collection, a nucleus of 45 works by major national and international photographers, including works donated by RE...FLEX exhibitors. It is a permanent exhibition, housed in the School of Music, Art and Design.

For Mr Meyer, one of the major spin-offs of the exhibition was being able to find and reconnect with many alumni with whom he had lost contact. “My aim was to set up a network and biographical database for future students and alumni in terms of potential research, photographic collaborations and projects.”



Glenn Meyer, Winner: NMMU Performing and Creative Arts Award

He is now developing a social media website to further enable the connections between participants in the 2008 exhibition.

Mr Meyer, who teaches several subjects relating to photography, visual communication and entrepreneurship, is particularly interested in how other institutions approach the discipline of photography and has extensively visited universities in South Africa and abroad. His current position as director-at-large on the Photo Imaging Education Association (PIEA) board, an international network of photography educators aiming to open dialogues and advance the profession, allows him access to colleagues at many institutions.

Mr Meyer holds a Masters degree in European Media at Portsmouth University, United Kingdom.

Key research successes

Cutting edge global research in marine biology

NMMU's Zoology Department is pioneering groundbreaking research in areas as diverse as the protection of microscopic fish larvae, the effects of climate change and other factors on the population of marine predators, and turtle conservation both here and abroad.

Marine Biologist and Senior Zoology Lecturer Dr Nadine Strydom is the only scientist in South Africa working on the ecology of the larval stages of coastal fish, which may provide the key to preventing looming wild fish extinction. Her colleague, Dr Ronel Nel, is the country's leading turtle authority, managing the portfolio of turtle conservation nationally and also representing the country on several international conventions for migrant species, while Dr Pierre Pistorius is monitoring the impact of environmental and ecological changes on animal populations in environmentally pristine areas, including the Falkland Islands, Marion Island and the Seychelles.

Dr Strydom said not enough was known about the fragile larval stage of marine fish. "The size and sustainability of any fish population is intricately linked to the success of its larval phase at the start of the fish life cycle, so it's imperative to find out what's needed for larval fish to be able to survive."

She said most species of marine fish had a larval stage after hatching from the egg during which time they float around as part of the microscopic world of ocean plankton. Once the larvae have developed tail fins and can swim, they head for coastal nurseries such as estuaries, where they are safer from predators. There, they feed and grow until they reach sexual



Dr Nadine Strydom, Senior Lecturer: Zoology

maturity. For some fish, like the dusky kob, a popular food fish whose dwindling population is estimated to be just one per cent of what it was 150 years ago, this means a five- to six-year waiting period, in which they grow to about one metre in size. But this is a fish whose survival is doomed, said Dr Strydom, as line fish restrictions place the minimum length in which the fish can be legally removed at 60cm – before they have even had a chance to reach sexual maturity and breed at least once.

Dr Strydom's Doctoral student Paula Pattrick is documenting the various species of larval fish larvae found in the shallow waters of Algoa Bay, as part of a bigger collaborative project with the South African National Parks (SANParks).



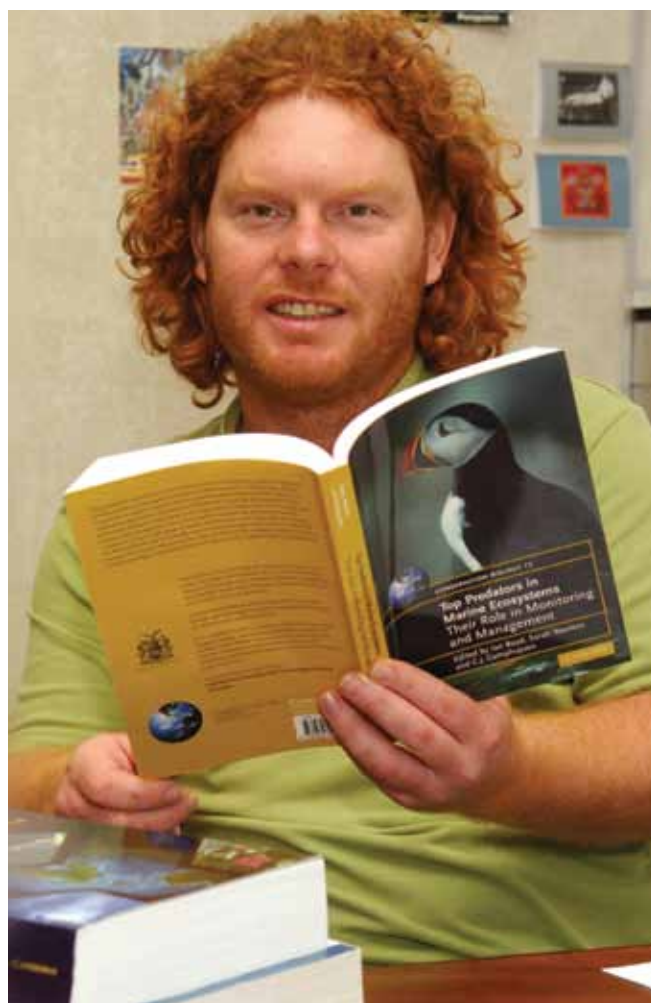
NMMU benefits from a coastal laboratory on its doorstep.



Dr Ronel Nel, Senior Lecturer: Zoology

Turtle expert Dr Nel, who previously headed turtle conservation at Kwazulu-Natal's provincial conservation agency Ezemvelo KZN Wildlife, said: "Turtles are marine migrants (nesting on the shores of various countries), so they must be managed differently – at both a national and a global level." Dr Nel's students are examining the effects of climate change on turtles. For example, turtles don't have sex chromosomes – their gender is determined by temperature (if the sand which covers the eggs is very hot, most hatchlings will be female, and vice versa). Dr Nel is also examining the effects of climate change on sandy beach ecology and is supervising a national project mapping different beaches for the entire South African coastline. In collaboration with Bayworld, she is also evaluating Sardinia Bay as a biodiversity and fisheries reserve.

Senior Lecturer: Zoology Dr Pistorius is continuing research he began in 2008 for the NGO, Falklands Conservation, researching the changing population numbers of three different species of penguins – rockhopper, gentoo and king penguins – on the Falkland Islands, and examining possible factors causing population change, such as sea surface temperature and commercial fishing activities. His work on Marion Island focuses on sub-Antarctic and Antarctic fur seals, where he is examining the long-term changes in diet composition. He is also conducting a population assessment of robber crabs at Aldabra in the Seychelles. In Port Elizabeth, he is involved with several ecological studies related to dolphins and Cape fur seals.



Dr Pierre Pistorius, Senior Lecturer: Zoology

World-first repair process will save power generation industry millions



Professor Danie Hattingh (third left) with Mechanical Engineer Dirk Odendaal (left) and postgraduate students Darren Samuel and Daniel Bulbring developed the novel repair process WeldCore™.

A team of postgraduate students and engineers won the institutional (NMMU) phase of the National Innovation Competition for their development of a novel repair process geared towards the power generation industry and trademarked as WeldCore™. They will participate in the national phase of the competition in August 2010. The unique repair process, which has two international patents associated with it, has the potential to save industry millions of rands in down time and repair costs. It will be implemented in industry in 2010.*

The team – working alongside Professor Danie Hattingh in his internationally-recognised research group in Friction Stir Processing (an alternative to conventional welding, in that it uses friction rather than external heat sources to generate the required heat) – developed a novel “on-line, *in situ* core removal and repair process”, which means the process takes place in the facility while the plant is still in operation.

Prof Hattingh, who also heads up NMMU’s Automotive Component Technology Station (ACTS), said Weldcore™ was a procedure, whereby a creep sample (a term indicating the degrading a material will experience over time in a component operating at a high temperature) can be removed for evaluation. The remaining hole is then plugged, using a process called Friction Taper Stud Welding, allowing down time to be kept to a minimum. “A high pressure steam pipe, for instance, could develop creep damage over time, which can’t be detected externally by visual inspection. From the creep sample, this damage can be quantified to determine the remaining safe life (period) or whether the material needs to be replaced.”

The process has the potential to save industry millions in down time and repair costs. “For instance, if there is a suspect area in a thick wall steam pipe, instead of cutting out a section for analysis and welding in a new section at significant high cost, we now have the technology and process whereby a purpose-designed platform can be placed on the pipe, to remove a sample for analysis and weld a plug into this area.”

Prof Hattingh and his team at ACTS have secured a R10-million research contract from industry to finance the late stage research and development of the Weldcore™ process. This funding will also assist with accelerating the commercialisation of the process. Apart from the Weldcore™ process, the ACTS team has also developed a Friction Stir Welding platform and weld procedure for the nuclear industry. This platform is currently considered one of the smallest units of its kind in the world. “Friction Stir and Taper Stud Welding differs from conventional welding, in that they use friction rather than any external heat sources to generate the required heat. Furthermore, in the case of Friction Stir Welding, no filler material is needed. Instead, a machine-controlled rotating tool produces frictional heat, “plasticising” the material along a joint line, forming a Friction Stir Welded joint. Friction Stir Welding is a process that has been developed for materials where conventional welding has proven to be difficult as the joint is formed below the melting temperature of the material to be joined.

The “internationalisation of research for bench marking purposes” is very important to Prof Hattingh, and his research is well-linked to a number of international institutes, including the University of Plymouth (UK), the University of Lund (Sweden), and the University of South Carolina (USA).

**The team went on to win the national phase of the National Innovation Competition on 5 August 2010.*

In pursuit of renewable sources of energy

With the country's energy resources under severe strain – and likely to steadily worsen as the recession lifts and manufacturing increases – finding alternative sources has become paramount.

“The possibility that demand will outweigh capacity is real,” said NMMU's Prof Ernest van Dyk, who heads the university's Centre for Energy Research (CER), which is at the forefront of renewable energy research in South Africa. Here, scientists, engineers, statisticians and other experts pool their knowledge to find sustainable energy alternatives in the form of solar and wind energy, along with energy efficiency, energy economics and energy materials.

“ *They are looking at putting up wind farms in the Eastern Cape. If they are all put up, a substantial portion of our electricity could be generated* ”

Prof Van Dyk, whose main area of research is photovoltaics (solar cells), said: “Once a solar cell is made, there is no harm done to the environment. It just takes up space, there are no harmful emissions.” But in terms of the demand for solar energy, South Africa lags far behind other parts of the world, like Germany and Spain, where there are strict policies in place, in terms of environmental or pollution targets, to meet energy demands. What puts people off pursuing solar energy in this country is the cost,” said Prof van Dyk. “With renewable energy sources, you basically pay up front for energy for the next 20 years.”

One of the innovative projects being researched at the centre, which works closely with industry, is the development of various types of concentrator photovoltaics (where reflectors concentrate sunlight onto solar cells), which is yielding better results and proving to be less expensive. The prototype developed for Low Concentration Photovoltaics (LCPV) has the potential to triple the energy produced by a normal solar cell for half the price. The prototype developed for High Concentration Photovoltaics (HCPV), using advanced triple junction cells, has the potential to achieve efficiencies in excess of 30%.

In terms of solar thermal energy, the CER's Dr Freddie Vorster, a Senior Lecturer in Physics, is focusing on improving current Solar Water Heating (SWH) systems, and also developing a new model and testing procedure for novel SWH equipment, as current evaluation techniques are out-dated. Another of Dr Vorster's projects, the Light Beam Induced Current (LBIC) system, uses concentrated light as a source to test if cells are working sufficiently. “Nobody else in South Africa is conducting research of this kind.”



Prof Ernest van Dyk, Director: Centre for Energy Research

In terms of wind energy, CER has a memorandum of understanding with wind-energy operator Innowind, allowing for collaborative research projects. Prof Van Dyk said: “They are looking at putting up wind farms in the Eastern Cape. If they are all put up, a substantial portion of our electricity could be generated.”

For his Doctoral research, the CER's Dr Russell Phillips, a Senior Lecturer in Mechanical Engineering, developed a unique vertical axis wind turbine (VAWT) – which is substantially quieter than traditional horizontal axis wind turbines (HAWTs) due to its slower rotational speed – for use in or near residential areas. “Conventional HAWTs are extremely noisy because their tips move so fast – at five to seven times wind-speed. The machine I developed (a reciprocating aerofoil wind energy harvester) is better suited to an urban environment,” said Phillips. Its slower rotational speed makes it a safer option than HAWTs.

Dr Phillips said the VAWT was best suited to electricity generation and water-pumping. It is particularly suited to the low pressure pumping of water required for desalination using reverse osmosis. While the innovation and refinement of small wind turbines is the CER's main focus area, in terms of wind energy, research on HAWTs has also recently commenced.

Pioneering cancer research

NMMU is conducting groundbreaking cross-faculty cancer research, which could ultimately improve existing treatments, and minimise harmful side-effects. Various research projects are underway, including the use of the metals technetium and rhenium, cyclic dipeptides (amino acid compounds), novel platinum and palladium pharmaceuticals and even medicinal plants. Tommy Gerber, Professor of Inorganic Chemistry, is one of a handful of scientists worldwide working on a revolutionary cancer treatment, whereby cancerous organs will be targeted by special metal compounds, injected intravenously, which will hone in on the diseased cells and destroy them internally with radiation – a process resulting in far fewer side effects than current cancer treatments.

“I work with technetium (a metal created by a nuclear reaction) and rhenium. They emit radiation, which is used in the diagnosis and treatment of cancer.” Compounds of these metal isotopes – created by binding them to other atoms and chemical groups, including phosphates, oxygen, nitrogen and sulphur – are chemically programmed to move via the bloodstream to specific organs. In the case of technetium, which is used for diagnostic purposes, gamma-radiation is emitted from inside the body when the compound reaches its destination organ – allowing doctors to obtain a nuclear image of the organ, using a special gamma-ray camera. “Doctors don’t have to cut you open to see what is wrong.”

Prof Pieter Milne, Head of NMMU’s Cyclic Peptide Research Unit, has found that cyclic dipeptides or diketopiperazines (DKPs) – heterocyclic (six-member ring) compounds comprising two amino acid residues linked to a central, rigid ring structure, some of which are found in fungi, bacteria and sea sponges – may be useful for the treatment of a number of conditions, including cancer.

Prof Milne and his research team have found that several synthetically-developed DKPs exhibited anti-tumour activity *in vitro* (in test-tubes), by reducing the viability of cancerous cells in cervical, oesophageal and mammary carcinoma.



Prof Tommy Gerber, Professor of Inorganic Chemistry



Prof Pieter Milne, Director of NMMU’s Cyclic Peptide Research Unit

Retired Chemistry Professor Jan du Preez, who remains a Research Associate at NMMU, is focusing on the development of novel platinum and palladium pharmaceuticals for the treatment of cancer, in collaboration with Shimoda Biotech and Platco Technologies (Shimoda Platco) in George. In 2009, Dr Debbie du Plessis-Stoman, then a Biochemistry Doctoral student under the supervision of Prof du Preez and Prof Maryna van de Venter, Associate Professor in the Department of Biochemistry and Microbiology, combined existing platinum anti-cancer drugs with a compound found in honeybush tea (*mangiferin*), and found that the tea extract strengthened the effect of the drugs.

Prof Van de Venter said: “It has also been found that people undergoing chemotherapy, who drink honeybush tea, experience reduced nausea, a side-effect of chemo-therapy.”

Conducting collaborative research on medicinal plants with the Department of Biochemistry and Microbiology is Prof Nanette Smith, a Lecturer in Biomedical Science. “We are testing plants used by traditional healers for anti-microbial (anti-bacteria and anti-fungal) activity and then are taking this further by testing for anti-cancer and anti-diabetic activity.”



Retired Chemistry Professor Jan du Preez (back, centre) together with his students (back, from left), Drs Lukas Oosthuizen, Yash Jaganath and Yolanda Bouwer and (front, from left), MSc graduates Marissa Louw and Jolanda Myburgh, who are among the latest group to have obtained their degrees on the development of platinum anticancer agents in the Research Unit for Platinum Group Chemistry. They all work at alumnus Greg Gilbert’s pharmaceutical company Shimoda Biotech.

Improving literacy through innovative Science and Maths teaching initiatives

In many South African classrooms, the teaching and learning of Science and Mathematics concepts takes place in the teachers' and learners' second language – English – perceived to be the language of socio-economic power and mobility.

But while the teachers talk, children remain silent and passive, understanding little. Not surprisingly, results in these two areas are poor and interest is waning – while literacy in both their mother tongue and English is stilted. This same scenario plays out elsewhere in the world, wherever children are taught in a second or foreign language.

To address this problem in South Africa, NMMU's Faculty of Education is pioneering research that is not only improving learners' problem-solving skills in these subjects, but also raising their general literacy levels in reading, writing and speaking in both English and their mother tongues. Such has been the success of this research that the science and mathematics literacy strategies implemented have been developed into short learning programmes to reach even more teachers, while the science strategy is even being applied internationally.

In terms of science literacy, Dr Mary-Grace Villanueva, working closely with supervisor Prof Paul Webb, Director of the Centre for Educational Research, Technology and Innovation, completed her Doctoral studies on whether a new strategy on enquiry-based science literacy education (using speaking, reading, writing and doing in the learners' home language to present and argue scientific concepts) would have an effect on learners' problem-solving and language abilities. The NMMU-led strategy was developed by Prof Webb, in collaboration with a team of North-Carolina academics. Prof Webb said: "Science literacy addresses the questions 'Can you make sense of Science?' and not 'How much Science do you know?' It's about being able to read, write, comment, investigate and present arguments about a scientific concept."

As part of her Doctoral studies, Dr Villanueva held workshops to present this strategy to intermediate science teachers (teaching grades 4 to 7), from seven rural schools in the Tyume Valley near Hogsback and 10 township schools in Missionvale, Port Elizabeth. She then worked with the teachers in the classroom, watching how the strategy was implemented and offering support. Essentially, learners, would brainstorm a few investigable questions about a science concept in their home language (isiXhosa). They would choose one question, and then use provided science ap-



Dr Mary-Grace Villanueva, Lecturer: Science Education



Dr Lyn Webb, Lecturer: Mathematics Reasoning

paratus to conduct an experiment to answer it. In the process, they would write down their predictions, record what they did, and what they found out, all in isiXhosa. They would then use a textbook or the Internet (shifting to English) to address the other questions. Dr Villanueva found that the strategy improved the learners' ability to reason in science and also strengthened their literacy skills.

The project has since been expanded through the DG Murray Trust into a short learning programme, and rolled out to a further 10 Port Elizabeth schools. The READ organisation also came on board to take the project to other South African provinces. The approach is also being introduced in Swedish schools with large numbers of non-native speakers as part of a NRF-funded South Africa-Sweden Links project.

In the area of Mathematics reasoning, Lecturer Dr Lyn Webb (supervised by Prof Webb) planned her Doctoral studies around developing literacy in mathematics. She conducted a study of two cohorts in grade 7 mathematics classrooms in township schools in Ibhayi and KwaZakhele, Port Elizabeth, where she taught teachers to encourage learners (in groups) to discuss mathematics problems using exploratory talk in their mother tongue. She conducted learner pre-tests (before the programme) and post-tests on numeracy, Mathematics reasoning and English literacy, and found all the target classes improved significantly. Dr Webb's project, with funding from the DG Murray Trust, has been developed into a mathematics reasoning short learning programme for grade 4, 5, 6 and 7 Mathematics teachers.

Linking childhood development with adult career choice

With the average adult changing jobs three to five times in a lifetime, it appears that many school-leavers are making poor career choices.



Prof Mark Watson, Professor of Psychology

In an attempt to get to the heart of why young people sometimes make misguided career choices, Senior Psychology Lecturer Prof Mark Watson has been tracking the same 45 children from pre-school level to high school (they matriculate in 2010), monitoring how and why their career aspirations have changed over the years. He has now teamed up with Psychology Head of Department Prof Louise Stroud, who specialises in measuring developmental trends indicative of mental growth in children up to age eight, to determine how a young child's development impacts on their career choices.

“ *This is the first research of its kind worldwide. It has been suggested in theory, but never tried out practically* ”

These novel studies, with which NMMU is collaborating with several universities and organisations overseas, are among a number of key research projects tackling childhood development within the Faculty of Health Sciences.

Prof Watson, an Adjunct Professor at three Australian universities and a Research Associate at the University of Warwick in the UK, has won many awards for his research, most recently as his faculty's Researcher of the Year for 2008 and 2009. His work has included international comparisons between South African and Australian children. More recently, he has included a sample of 274 Xhosa-speaking children, aged between 10 and 13, from lower socio-economic backgrounds. His results have been surprising. Among all the children – regardless of their backgrounds – more than 80 per cent aspired towards social (people-focused) careers or investigative-type careers, both of which were “high-status”, meaning they required professional

or tertiary level training. “While aspirations by their very nature are likely to be more idealistic than realistic, there is concern that grade 11 or 12 adolescents may still make career choices without considering reality factors both within themselves, and in the work environment that awaits them.”

His research has culminated in a valuable career assessment tool called My Systems of Career Influences (MSCI), developed in collaboration with two Australian academics, Dr Mary McMahon and Prof Wendy Patton, which helps pupils realistically identify career options and is used worldwide. Prof Watson's work with Prof Stroud, who is spearheading international research to update the Griffiths Mental Developmental Scales-Extended Revised (GMDS-ER) which assesses various areas of children's development from babies to age eight, involves assessing how a young child's level of development will impact on their career choices. “We are testing eight-year-old South African children, according to the Griffiths scales, and at the same time monitoring where they are in terms of their career thought process. If a child is more cognitively advanced, we expect to see different career aspirations,” said Prof Watson. “This is the first research of its kind worldwide. It has been suggested in theory, but never tried out practically.”



Prof Louise Stroud, Head of Department, Psychology

Clinical Psychologist Prof Stroud collaborates closely with the UK-based Association for Research in Infant and Child Development (ARICD), which monitors and controls the Griffiths test's use. She said the play-oriented tool provided an unbiased approach to assess children in a multi-cultural context. The tool assesses six key areas, including locomotor ability, personal and social skills, hearing and language, hand-eye co-ordination, performance and reasoning. A member of an international committee at ARICD, Prof Stroud is leading research which will see the tool updated to ensure it is up to date with the changing times (e.g. the advent of technology, which has impacted on children's development), and culturally relevant to the various countries in which it is used.

FACT FILE

The following section provides – at a glance – a broad overview of research at NMMU.

Postgraduate Students

	Coursework masters	Research masters	Total masters	Doctoral
Enrolled in 2009	994	473	1467	392
Graduates (graduating in 2010)	182	70	252	39

In 2009, 3 335 students enrolled for Honours, Masters and Doctoral degrees out of 25 495 contact and off-campus students, accounting for just over 13% of the NMMU student body. This is an increase from the previous year's 12%. The percentage of postgraduate international students has increased by more than 60% from 2005 to 2009. Of the 1 467 Masters students, 211 were international students. Of the 392 Doctoral students, 123 were international students. The majority of these students come from Botswana, Kenya, Uganda and Zimbabwe.

NMMU Cross-Faculty Themes

Co-ordinating faculty	Theme	Driver
Arts	Social cohesion	Prof Velile Notshulwana
Business and Economic Sciences	Regional economic development (includes Small, Medium and Micro Enterprises and entrepreneurship)	Prof Elmarie Venter
	Ethics, governance and leadership	Prof Piet Naude
Education	Curriculum development	Prof Paul Webb
Engineering, the Built Environment and Information Technology	Automotive and related manufacturing	Prof Henk de Jager
Health Sciences	Health and disease management responsive to regional needs	Prof Ilse Truter and Prof Mark Watson
Science	Natural resource management and energy	Prof Andrew Leitch

NRF Research Niche Areas (RNAs)

In 2009, the following four RNAs were allocated a budget of R2 802 000 by the NRF and NMMU to support 15 staff members and their students:

- Innovative Batch Chemical Technology for Downstream Chemical Products and Processes: Mr Geoff Ritson (team leader)
- Business Information Risk and Security: Prof Rossouw von Solms (team leader)
- Manufacturing Technology: Prof Danie Hattingh (team leader)
- Biodiversity-based economy in the Eastern Cape: Prof Graham Kerley (team leader)

2009 Researcher of the Year Awards

In recognition of research outputs and excellence in research, awards were presented to established and emerging researchers in September 2009.

NMMU Researcher of the Year

Prof Bert Olivier

Faculty Emerging Researchers of the Year

Arts:	Dr Adrian Konik
Business and Economic Sciences:	Dr Suzette Viviers
Education:	Prof Lesley Wood
Engineering, the Built Environment, and Information Technology:	Mrs Mariana Gerber
Health Sciences:	Dr Pierre Olivier
Science:	Dr Abubak'r Abrahams
George Campus:	Dr Darlington Onojaefe

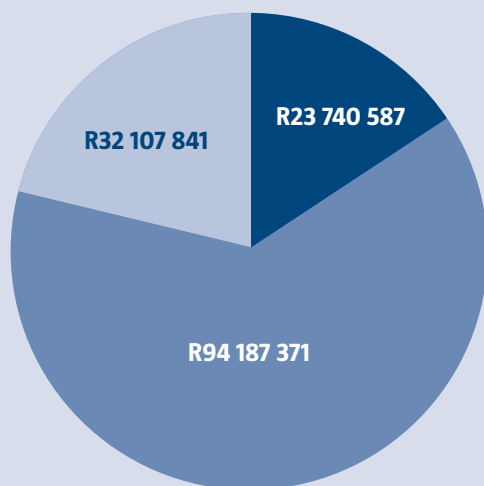
Faculty Researchers of the Year

Arts:	Prof Bert Olivier
Business and Economic Sciences:	Prof Piet Naude
Education:	Prof Tilla Olivier
Engineering, the Built Environment, and Information Technology:	Prof John Smallwood
Health Sciences:	Prof Mark Watson
Law:	Prof Henk Delpont
Science:	Prof Tommy Gerber
George Campus:	Dr Glen Taylor

National Research Foundation (NRF) Evaluation and Rating of Researchers

NMMU recognises the rating of researchers as an important benchmark of research excellence in South Africa. The number of NRF-rated researchers remained at 57 (same as 2008), ensuring that NMMU retained its place among the top 10 South African universities, in terms of NRF ratings. However, it remains a concern that NMMU only has one A-rated and five B-rated researchers. Of further concern is that, although there were newly-rated staff members, the same number of staff retired or left NMMU. Of the rated researchers, 52 are white, five are black and 20 are female.

Faculty	A	B	C	P	Y	L	Total
Arts	-	-	3	-	-	1	4
Business & Economic Sciences	-	-	2	-	1	2	5
Education	-	-	3	-	-	1	4
Engineering, the Built Environment and Information Technology	-	1	5	-	-	-	6
Health Sciences	-	1	2	-	-	-	3
Law	-	-	1	-	2	-	3
Science	1	3	20	-	3	3	30
Higher Education Access & Development Services	-	-	1	-	-	-	1
Sport Bureau	-	-	1	-	-	-	1
Total at NMMU	1	5	38	-	6	7	57



Research funding

- Internal funding including Masters & Doctoral bursaries
- NRF funding including the High Resolution Transmission Electron Microscope
- Other external funding including contract research and Masters & Doctoral bursaries

Research Chairs

NMMU has the following Research Chairs:

- Chair in Nanophotonics, allocated to Prof Reinhardt Botha of the Physics Department. It was established under the South African Research Chairs Initiative (SARChI).
- Chair in HIV/Aids Education, funded by the Faculty of Education. The incumbent is Prof Naydene de Lange.
- GMSA Chair of Mechatronics in the Faculty of Engineering, the Built Environment and Information Technology (EBEIT). The incumbent is Prof Igor Gorlach.
- VWSA-DAAD International Chair in Automotive Engineering in EBEIT was headed by Prof Hinrich Holdack-Janssen (since replaced by Prof Theo van Niekerk).

Department of Education (DoE) Research Output Subsidy

The research output subsidy allocated by the DoE represents a crucial benchmark of research excellence and is based on successful Doctoral and Masters graduates as well as subsidies generated through academic publications. The monetary value of the subsidy from this source increased from R47m (based on 2007 outputs) to R59m (based on 2008 outputs). [Note: confirmed outputs and figures for 2009 will only be available in 2011.] In 2008, there was an increase to 183.64 units for research publications from 179.90 units in 2007. Masters and Doctorate units also increased, from 257.46 units in 2007 to 321.20 units in 2008. This, together with the research publications, resulted in a 0.95 weighted output per staff member, compared with 0.83 in 2007. Subsequently, the normed output per staff member increased to 102% in 2008. This places NMMU seventh among South African universities. The audited submission to DoE of 2009 journal articles for subsidy increased from 156.44 units in 2008 to 197.89 units. This represents an increase of 26.5%. Of these articles, 69% were published in journals listed in the international indices of the Institute of Scientific Information (ISI) and the International Bibliography of Social Sciences (IBSS).

NMMU DoE RESEARCH OUTPUT UNITS 2006 – 2009

	Journal articles	Books	Conferences	Research M + D students	Total
2006	172.20	1.71	13.82	213.99	451.72
2007	165.04	0.33	14.33	257.46	437.16
2008	156.44	5.99	21.21	321.2	504.84
2009	197.89*	**	**	287.9	**

*Audited submission to DoE

** Available in February 2010

Internal Research Funding

Internal funding increased by 6% in 2009. The main funding categories are: incentives, research entities, top-up of NRF grants, payment of page fees and research capacity initiatives, such as the Research Development Fund.

NRF Research Funding

The NRF remains the largest external funder of research at NMMU and awarded R94m (R35m in 2008) in grant funding in 2009.

The main reason for this dramatic increase is the R69m that was awarded under the National Equipment Programme for a high-resolution transmission electron microscope (HRTEM). The decision to establish a HRTEM Centre at NMMU under the leadership of Professor Jan Neethling was the most significant external support for research in 2009. The NRF, in partnership with DST, agreed to take responsibility for securing the funds to buy a suite of instruments required for the centre. The project is supported by industry partners – R6m from Sasol and R5m from the Pebble Bed Modular Reactor (Pty) Ltd (PBMR) – and, as already indicated, by DST/NRF with R69m.

In terms of the total NRF research funding, 92 staff members were grant holders, participating in 27 programmes and sub-programmes of NMMU.

NRF Grants to NMMU in 2009

Programme	Total
Ad hoc grants – Institutional Capacity Development (ICD)	33 977
African Coelacanth Ecosystem Programme	438 276
Collaborative research with national facilities	400 000
Competitive support for unrated researchers	352 500
Conservation and management of ecosystems and biodiversity	1 056 058
Development grant for Knowledge Fields Development (KFD)	15 000
Distinct South African research opportunities	40 940
Economic growth and international competitiveness	406 094
Incentive funding for rated researchers	1 362 271
Indigenous knowledge systems	361 265
Information and communication technology	12 821
Institutional research development programme	1 973 875
International science and technology agreements	1 372 873
Knowledge interchange and collaboration	570 200
Marine and Coastal Management (MCM) provincial funding	473 904
Nanotechnology flagship programme	1 840 524
National equipment	69 000 000
National nanotechnology grant	670 510
Rediba (Thuthuka)	84 000
Research infrastructure support programme	217 000
Researchers in training (Thuthuka)	368 987
SA Research Chairs – open	2 231 280
Scholarships and fellowships programme	3 673 000
Sustainable livelihoods: the eradication of poverty	233 410
Technology and human resources for industry programme (THRIP)	6 665 360
Unlocking the future	25 000
Women in research	308 245
Total	R94 187 371

Other External Funding

Other statutory funding agencies contributed smaller amounts: Medical Research Council (MRC) – R259 000; African Laser Centre (ALC) – R100 200; National Laser Centre (NLC) – R721 400; Water Research Council (WRC) – R1 161 017.

In addition to external grant funding, contract research projects were externally funded in 2009 to the value of R24 296 224.

Bilateral Funding Received in 2009

NRF programmes

- SA-Germany: Prof JR Botha, Prof Theo van Niekerk
- SA-Poland: Dr Carmenita Frost, Dr Tommy Bornman, Prof Khaled Abou-El-Hossein
- SA-Sweden: Prof Paul Webb
- SA-UK: Dr Shawn Gouws
- NRF-DFG: Dr Nomakwezi Mzilikazi

Other Bilaterals

- IFS (Switzerland): Dr Carmenita Frost
- ALC funded project: Prof Andrew Leitch between NMMU and Moi University, Kenya.

Research Incentives

Various incentives are in place to encourage staff members to engage in research activities that will enhance the research strategy of NMMU. Examples are bonuses for obtaining NRF ratings, incentive funding for publications and postgraduate students qualifying for DoE subsidy, awards for the top faculty researchers and emerging researchers and recognition of top performers in the performing and creative arts. Based on 2007 publication outputs, R4 466 860 was allocated to individual researchers and R1 582 382 to Faculty RTI Committees. R672 000 was allocated to promoters and supervisors of Doctoral and Masters students.

Research Sabbaticals

Thirty-four staff members were granted research sabbaticals for non-qualification purposes during 2009. The main purpose of research sabbaticals is aligned to Vision 2020 – to maximise the human capital potential of staff. Linked to this is a strategic goal to create and support an environment that fosters research quality and productivity.

Developing Research Capacity

In order to achieve its strategic priority to create an enabling environment for research, NMMU engaged in a number of Research Capacity Development initiatives during 2009:

Postdoctoral Fellowships

30 Postdoctoral Fellows were hosted in 2009 in various faculties across NMMU. Half were funded by the NMMU Council, 7% by internal departments and 43% were externally funded. The NRF and Claude Leon Foundation remain the major sponsors of externally-funded postdoctoral fellowships.

Phuhlisa Programme

This programme was co-funded by the Ford Foundation and the DoE's Research Development Grant (R2 731 000) as an initiative towards growing the "next generation of academics". The participants comprised 31 staff members and 15 full-time postgraduate students, with 34 pursuing doctoral studies and 12 masters studies. Each participant received formal mentorship and seed funding to support his or her research. They also attended a range of Research Capacity Development workshops.

Thuthuka

The NRF Thuthuka Programme continues to be an important source of support for emerging researchers. However, given the moratorium while NRF undertook a review of this programme, a smaller

group of NMMU researchers (15) was funded in 2009, compared with previous years. The total allocation in this category was R1.74m, including grant holder-linked bursaries as listed below:

Doctoral bursary full-time	1
Masters - research based	11
Masters - coursework	3
Honours/BTech	4
Final year undergraduate	9

Research Development Fund (RDF)

Thirty-two emerging researchers at NMMU received internal funding support to the value of R597 000. The RDF is awarded on the basis of a research proposal, which is peer-reviewed by research associates and provides seed funding for staff that are either pursuing Doctoral studies or have recently attained a Doctoral qualification.

NMMU Masters and Doctoral bursaries

Some 241 Masters students received bursaries, totalling R4 622 500, while 118 Doctoral students were awarded bursaries to the value of R3 864 000. Research Capacity Development also managed NRF scholarships (grant holder-linked and free-standing) to the value of R4.6m. Other external postgraduate scholarships amounted to R970 000.

Research Capacity Development Workshops

Twenty-six formal Research Capacity Development workshops were presented during 2009, attended by 168 staff. Topics presented included aspects of research career development, research supervision, writing for publication, and research methodology.

Intellectual Property (IP) and Commercialisation of Research

NMMU manages, protects and commercialises Intellectual Property (IP) and innovations that have the potential to benefit society in the form of new services, products or processes. IP and innovations typically arise from research undertaken by staff or supervised students, and commercialisation provides the opportunity to transfer the results of this research to society. NMMU owns the IP, but any benefit from commercialisation is shared by the inventors, their departments and the university. The Department of Innovation Support & Technology Transfer (IS & TT) undertakes commercialisation in collaboration with the inventors. The innovations will typically be licensed to an external party or a start-up company will be formed to take the innovation to the market.

Innovation Statistics

	2007	2008	2009
Invention disclosures	7	10	11
Provisional patent applications	0	6	2
SA granted	1	0	0
Patent Cooperation Treaty (PCT) applications filed*	0	2	5
National filed (including SA)	11	0	1
National granted (excluding SA)	1	0	0
Assignments	1	3	0
Licenses	0	1	3
Spin-off companies formed	0	4	1
Commercialisation income	R250 000	R1 030 000	R85 000

* Patent Cooperation Treaty – a typical step taken when intending to file patents in other countries.

Products currently being commercialised include:

- Preservation technology for roses and foliage (InnoVenton): This technology has been assigned to a start-up company called African Floralush (www.africanfloralush.co.za) which has received significant venture capital funding from the Industrial Development Corporation (IDC). The company, which operates from Gauteng, has exhibited internationally and is starting to increase local and international sales.
- Insect repellent formulation and active production technology (InnoVenton): This technology has been assigned to a start-up company called Afrepell Technologies. A full-scale production facility is currently being designed and will be built in Port Elizabeth.
- Two patents related to the replacement of zinc oxide in rubber formulations (Chemistry): This technology has been assigned to a start-up company called Rubber Nano Products that owns a complimentary patent. The product is being produced near East London and has been sold locally. Discussions with European manufacturers are in progress.
- On-line *in situ* creep analysis (Mechanical Engineering): See article in on page 12.
- Battery sensor technology (Chemistry): Technology for sensing the temperature inside batteries is currently being tested in the field by an industry partner.
- Software products (Student Counselling Centre): Two software products for Student Counselling Centre use have been licensed non-exclusively to other higher education institutions.
- Technology for polarisation mode dispersion emulation in optical network systems (Physics).
- Technology for thermoelectric evaluation of the dopant density of narrow gap p-type semiconductors (Physics).
- Algae to energy technology (InnoVenton): This technology is currently being finalised for commercialisation through a start-up company.

NRF-rated researchers new or re-evaluated

NMMU is working hard to raise the research profile of its researchers by encouraging its academic staff to attain an NRF rating. In 2009, three researchers were newly-rated by the NRF while two were re-evaluated as featured below, along with the university's top-rated researcher. NMMU has 57 NRF-rated researchers.



Botany Research Professor Richard Cowling, A1-rated researcher

NMMU's top NRF-Rated Researcher

His widely-acclaimed work on threatened ecosystems – and determination to work closely with stakeholders to ensure that research actually leads to the implementation of solutions – saw Botany researcher Professor Richard Cowling, one of the world's leading authorities in conservation science, winning several prestigious research awards in 2009.

These included the Gold Medal from the Southern Africa Association for the Advancement of Science for 2009, which recognises exceptional contribution to the advancement of science, and a Special Award by Cape Nature's Gouritz Biodiversity Corridor for his outstanding contribution towards biodiversity conservation in the Gouritz Initiative domain. Furthermore, he was listed on www.ISIHighlyCited.com, a website for the world's most cited authors over the 25-year period, 1981 to 2005.

Prof Cowling knows full well the valuable services nature provides – from supplying water, fuel and fibre to mitigating climate change – and is doing all he can to ensure nature's safeguarding. Focusing predominantly on the Eastern Cape, he has identified areas that need to come under conservation man-

agement. He also maps the locality of "ecosystem services" – nature's services to man – and identifies strategies to safeguard them. "These are services we take for granted – like mountain catchments that ensure clean and adequate supplies of water, indigenous insects that pollinate our fruit crops, or veld that provides grazing, giving us meat and fibre."

“*We are restoring an eco-system service ...*”

Where necessary, he and his team provide the research for developing strategies to restore these ecosystem services, like removing thirsty alien plants from mountain catchment areas. He is also part of a team of scientists spearheading a unique project, in which spekboom – a hardy succulent shrub with an extraordinary ability to store carbon – is being planted in degraded veld in several nature reserves, and 300 trial plots across the Eastern Cape. "We are restoring an ecosystem service, namely, the ability of natural systems to sequester carbon, thereby reducing the impacts of climate change ... This may be one of the biggest restoration trials in the Southern hemisphere."

Newly NRF-Rated Researchers



Prof Khaled Abou-El-Houssein, C3-rated researcher, Mechatronics Department

Breaking New Ground in Manufacturing Engineering

Prof Khaled Abou-El-Houssein, who joined NMMU's Mechatronics Department as an Associate Professor last year, specialises in manufacturing engineering, with a main focus on metal cutting, laser powder deposition and manufacturing systems.

In terms of metal-cutting, Prof Abou-El-Houssein has worked on aerospace alloys and tool steels. In terms of laser powder deposition, he is pioneering a research project in which he is trying to produce from titanium powder a functionally-graded structure that could be suitable for medical implants. "We want to make these implants successful for tissue ingrowth (the process whereby the body tends to grow tissue in, around and through foreign objects).

For his third project, as the leader of a consortium between NMMU, University of Pretoria and North-West University, he is working on the development of a virtual system to demonstrate the principles of reconfigurability in the production of dies and moulds. He ultimately hopes to improve existing technology by developing new and better machines (e.g. hybrid machines that are based on the combination of a variety of principles), thereby overcoming some of the challenges encountered in machining.

Prof Abou-El-Houssein, who hails from Saudi Arabia, studied manufacturing engineering to Doctoral level at the National Technical University of Ukraine (Kiev). He worked in Malaysia for five years at the University of Tenaga Nasional before heading up the Department of Mechanical Engineering at Curtin University of Technology (Miri Campus) for two years. He moved to South Africa in 2008, spending a year as a Senior Lecturer at the University of Pretoria before joining NMMU.

Groundbreaking hibernation studies

WHILE hibernation is typically associated with icy northern hemisphere conditions, Senior Zoology Lecturer Dr Kwezi Mzilikazi is making fascinating discoveries about this phenomenon in South Africa. Her pioneering research on small mammals has put her on the global science map, and saw her named among the Mail and Guardian's top 300 young South Africans for 2009. Dr Mzilikazi has found that woodland dormice in the Great Fish River area lower their body temperature to as little as 2°C to survive the worst of winter. "

This is groundbreaking as Africa has always been thought of as warm," said Dr Mzilikazi, Africa's first black expert in evolutionary physiology, an area which seeks to understand how animals function and how this impacts on their ability to reproduce – the ultimate measure of success in the wild. In the northern hemisphere, Arctic ground squirrels have been known to decrease their body temperature to -3°C, but this phenomenon is unexpected in Africa.



Zoology Senior Lecturer Dr Kwezi Mzilikazi, Y2-rated researcher

One of Dr Mzilikazi's students discovered a similar response in bush babies in the Limpopo area. "This is huge news since no primates, besides lemurs in Madagascar, have been known to become torpid." She is also concerned about how the advent of global warming will affect hibernation patterns, and is carrying out experiments to monitor how temperature increases affect animals. For her PhD, Dr Mzilikazi studied daily torpor – a short form of hibernation – in elephant shrews. This research saw her winning the first African Women Scientist Fellowship, worth R100 000, from the Department of Science and Technology in 2003.

Ethics expert

Ethics expert Prof Piet Naude, Director of NMMU's Business School, has a wide range of research interests, including professional ethics, global economic ethics, concepts of justice and ethics from a Christian theological perspective. He was the 2009 Faculty Researcher of the Year, Business and Economic Sciences. His profile is on page 29.



Botany Professor Janine Adams, C1-rated researcher

Re-evaluated NRF-rated researchers

Passion for Water-Related Research

Botany Professor Janine Adams is a Senior Scientist and researcher in the water sector, specialising in estuarine ecology and management.

Her extensive research in this area has not only led to her attaining one of the highest research outputs of any female scientist at NMMU, but also saw her appointed as chairman of South Africa's Water Research Commission (WRC). In this role, she is tasked with leading and coordinating all aspects of water-related research in this country, from water use and waste management to water-linked ecosystems and water utilisation in agriculture.

In terms of her research in estuarine ecology and management, Prof Adams is currently investigating the response of mangrove trees (the only trees that grow in salty water) to global climate change. "At the sea-land estuarine interface, which is occupied by diverse and specialised habitats such as mangroves and salt marsh, climate change translates into a modification of salinity and water-logging effects. An understanding of these environmental factors on plant growth and survival is required to predict, manage and adapt to climate change."

Prof Adams was involved in the implementation of the Integrated Coastal Management Act which requires the completion of estuary management plans for all South African estuaries. Together with Prof Tris Wooldrige and Ms Karien Bezuidenhout, both from NMMU, and Dr Ane Oosthuizen of South African National Parks (SANParks), she is developing an estuary management plan for the Sundays River Estuary. Prof Adams is a co-ordinator for FET-Water (the Framework for Education and Training in the water sector) and has acted as Forum Chairperson of the South African Network for Coastal and Oceanic Research (SANCOR).



Prof Pieter Milne, Director of NMMU's Cyclic Peptide Research Unit, C3-rated researcher

Innovative Cancer Research

With only a handful of diseases able to be treated with commercially available drugs, it is the medicinal chemist's task to identify potentially useful candidates from any possible source.

One of these chemists, Prof Pieter Milne, Head of NMMU's Cyclic Peptide Research Unit, has found that cyclic dipeptides or diketopiperazines may be useful in the treatment of a number of conditions, including cancer. He said the research was "completely new". Prof Milne has international links with the University of Gothenburg in Sweden and the University of Bordeaux in France. See page 14.

Dean's Overview



Prof Velile Notshulwana, Executive Dean, Faculty of Arts

2009: Continually Striving for Research Excellence

While the Faculty of Arts continues to maintain an excellent research and scholarly record, we are constantly striving to further improve the quality of both staff and student research. We want to be seen as a faculty that drives real issues, one that is determined to make a sizeable contribution not only to Nelson Mandela Bay, but to the province, country as a whole and beyond.

Since joining the faculty in late 2009, the faculty's aim at the start of 2009 focused on establishing a research, publishing and scholarship focus without neglecting other areas, as a way of sustaining a trajectory of excellence, scholarship and productivity; the activities of staff members reflect efforts to achieve this aim. In terms of research and publications, Prof Bert Olivier won the prestigious NMMU Researcher of the Year Award in 2009. A book, *Buddhism and Transgression: The Appropriation of Buddhism in the Contemporary West*, was published through Brill Academic Publishers in the Netherlands (Dr Adrian Konik) while faculty members also published numerous research articles. Related to this, 2009 saw a number of faculty members participating in numerous national and international conferences, like Prof Gavin McLachlan who was keynote speaker at the International Housing Sociology Conference.

The Faculty of Arts also hosted numerous international academics in our various departments including: a visitor from the United States who lectured on "Putting Sustainability into Practice"; from Norway, who presented "Oasis Green Lab Libraries"; from Germany, who lectured on "LED Lightning in Architecture".

Furthermore, as part of a Memorandum of Understanding, NMMU and the University of North Carolina in Wilmington (UNCW) collaborated on the development of a new UNCW Certificate programme in conflict management which was finalised in 2009. In 2009 a faculty member's work titled: "Aspects of the Dark Other", was acquired and exhibited at the Nelson Mandela Metropolitan Art Museum. A legacy of the previous dean was the formation of a partnership between Unisa and the Faculty of Arts (Department of Public Administration), on writing for publication, with workshops leading to the development of eight articles by faculty members which are due for publication in an accredited journal later this year. Ongoing support is also provided to our faculty members for their scholarship, teaching and research interests, as well as to harness their supervision of postgraduate students. To this end, discussions and workshops in these areas were held.

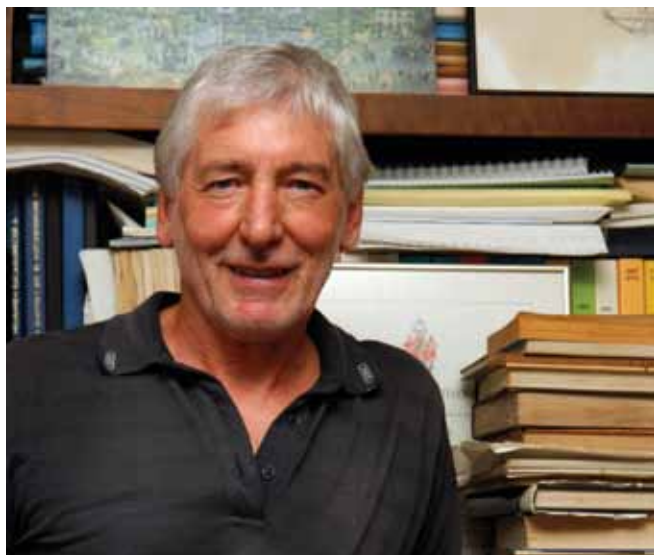
As Dean of the Faculty of Arts, I am pleased with the achievements of 2009, knowing that we are on the pathway to achieving our goals of increasing our throughputs in the years to come.

Yours sincerely

A handwritten signature in black ink, appearing to read 'V. Notshulwana'.

Prof Velile Notshulwana
Executive Dean: Faculty of Arts

Faculty Researcher of the Year



Prof Bert Olivier, NMMU Researcher of the Year. See page 7.

Emerging Faculty Researcher of the Year

Examining Changes in Society

Changes in socio-cultural dynamics – as a result of arbitrary power shifts, rather than evolution – are what most interest Dr Adrian Konik, Lecturer of Cultural Studies and Film Studies in the Department of Journalism, Media and Philosophy. “Related to this, I am also very interested in the tendency of people, since the 19th century, to regard the transformations of their own era as *necessarily* evolutionary – often in spite of great evidence to the contrary. For example, during the latter half of the 20th century, the belief in ‘development’ as the panacea for all social and environmental ills continued to be adhered to rigorously.”



Dr Adrian Konik, Emerging Faculty Researcher of the Year

This, despite it giving rise to both poverty (as capitalist economies of hyper-production and consumerism took the place of traditional economies of sufficiency and frugality) and pollution (through the environmental degradation associated with such development). He is also interested in the way in which discourse (the language of a given era – its dominant ideas, discussions and concerns) tends to define how people see themselves. “I am also interested in our capacity both to be critical of such inherited sentiments and concepts, and, following this, to change ourselves, through advancing new attitudes and innovative perspectives.” The highlight of Dr Konik’s research to date is the publication in 2009 of his book, *Buddhism and Transgression: The Appropriation of Buddhism in the Contemporary West*, in which he explores the above-mentioned issues in relation to Western interest in, and involvement with, Buddhism. His research is influenced by the works of philosophers such as Michel Foucault, Martin Heidegger and Friedrich Nietzsche. Dr Konik received a DLitt et Phil from the University of South Africa (Unisa) in 2007. He serves on the editorial board of *the South African Journal of Art History*.

Faculty Research Themes

Themes	Drivers
1. Media, communication and culture discourses in a developmental context	Prof Bert Olivier and Prof Danie Jordaan
2. Democracy and service delivery within a developmental context	Dr Wela Manona and Dr Mzikayise Shakespeare Binza
3. Creating space and place for people in South Africa’s developing urban regions	Prof Gavin McLachlan
4. Identity and marginality in South African literature	Prof Helize van Vuuren and Dr Mary West
5. Conflict and transformation in Africa	Dr Lyn Snodgrass and Dr Gavin Bradshaw
6. Transculturality in music, art and design	Ms Mary Duker
7. Creative practice	Ms Mary Duker
8. Political ideologies and thought, African socio-political development, and international relations: theory and practice	Dr Wendy Isaacs-Martin and Ms Joleen Steyn-Kotze

Staff Doctorates



Dr Theodore Petrus, a Senior Lecturer in the Department of Sociology and Anthropology, tackled the issue of witchcraft-related crime for his recently-attained DPhil in Anthropology at NMMU in a thesis titled: *An Anthropological Study of Witchcraft-related Crime in the Eastern Cape and its Implications for Law Enforcement Policy and Practice*.



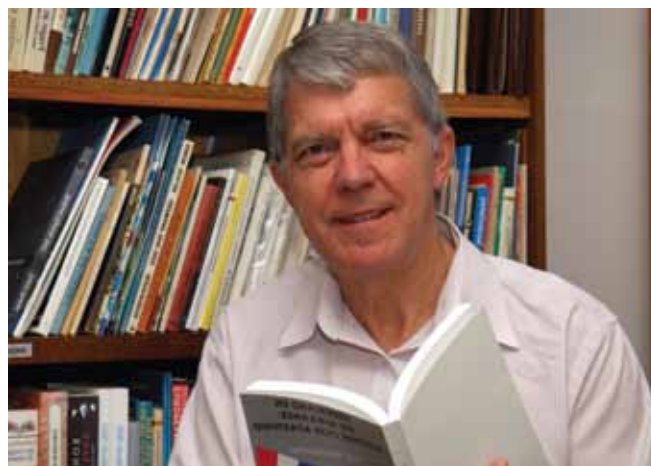
Dr Mzikayise Shakespeare "Shakes" Binza, Director of the faculty's Raymond Mhlaba Institute for Public Administration and Leadership, obtained his PhD in Public Administration for research which saw him developing a "public-private partnership model to improve local economic development in South African metropolitan governments".



With English perceived as the language of socio-economic power and mobility, South Africa's indigenous languages, including isiXhosa, are viewed in a negative light by a growing number of young mother-tongue speakers. In an attempt to re-introduce a love for the language, isiXhosa lecturer Dr Ruby Zauka completed her DLitt in Linguistics focusing on *An analysis of perceptions and attitudes to the study of isiXhosa at tertiary level: NMMU, a case study*.

Research Highlights

The power of SA's language link with the Netherlands and Belgium



Prof Otto Terblanche, Associate Professor of History

The Afrikaans language binds South Africa with both the Netherlands and Belgium's northern region Flanders, where Dutch, a language similar to Afrikaans, is spoken. It makes the countries family – a link loaded with all the emotion and, at times, animosity typical in relationships of kinship, especially when it comes to politics. Associate Professor of History, Prof Otto Terblanche, has been researching political and cultural relations (since 1945) between South Africa and its European cousins. His research is unique in that he has examined and compared South Africa's relationship with both the Netherlands and Belgium, instead of limiting it to just one of these countries. He spent nine years researching the Netherlands (1994 to 2003), working collaboratively with renowned Dutch historian Prof Gerrit Schutte, then a Professor at Amsterdam's Vrije Universiteit. His work resulted in a book titled *Nederland en die Afrikaner: Gesprek oor apartheid (The Netherlands and the Afrikaner: A conversation about apartheid)*. "During apartheid, the Netherlands was South Africa's most vicious critic, because of the ties of kinship between the two countries. This changed in 1990, after President FW de Klerk's speech spelling the end of apartheid and the release of Nelson Mandela. The Dutch reacted with jubilation to the release of Mandela." Since 2005, he has turned his attention to Flanders, working with Flemish historians Dr Jan Goris and Prof Annick Schramme (University of Antwerp) and was intrigued to discover that Flanders was much more sympathetic towards South Africa during apartheid. Prof Terblanche found that Flanders's sympathy was born out of a long and ongoing struggle (against the French south) to keep their language and thus maintain their autonomy and identity, similar to the struggle experienced by Afrikaners. A book is pending on the relations between South Africa and Flanders.



Joleen Steyn-Kotze, Political Sciences Lecturer

Can non-western democracy exist?

As a schoolgirl, Political Sciences Lecturer Ms Joleen Steyn-Kotze witnessed South Africa's transition from a nationalist, apartheid state to a democracy – sparking a deep fascination with the complex process of democratisation in a non-Western context. Her studies on the topic, the subject of her pending doctorate, received global recognition at last year's International Conference for Inter-Disciplinary Social Sciences in Greece, where her paper *An overdue appraisal: The need to rethink democracy theory* won the International Award for Excellence in Inter-Disciplinary Social Sciences, and was rated one of the highest-ranking papers at the conference. For this paper, she examined the shift towards a democratic culture in African, Asian and Latin-American contexts, juxtaposing it against Western contexts, where democracy has traditionally been deemed more successful. "I found the pressure on non-Western states to follow liberal democracy was often excessively high, given that the non-Western context is vastly different from its Western counterpart. Many non-Western states first have to deal with nation-building, state-building and economic performance – three extra pressures the Western world generally doesn't face. Western theorists often say Africa is incapable of achieving a democracy, but this is not the case. We need to find out what constitutes an African democracy." To compile her paper, Ms Steyn-Kotze used Freedom House data, which attempts to measure the extent of freedom in countries around the world, as well as the World Values Survey. "Some of my findings were unusual. For instance, I found that countries with increasing levels of inequality had the lowest levels of commitment to income equality, and countries considered authoritarian demonstrated the greatest commitment to political competition."

NRF-Rated Researchers

Janse van Vuuren, HE, Prof	C2
Hibbert, L, Prof	L
Kotze, EF, Prof	C2
Olivier, B, Prof	C1

Faculty Highlights and Achievements

National and International Research Collaboration

- Prof Helize Janse van Vuuren is involved in a Bible translation project (2006 to 2015), translating the Bible into more poetic Afrikaans language for modern use. She is part of a national team of translators, comprising theologians, experts in Hebrew and Greek, linguists and literature experts. The project is funded by the International Bible Society.
- Prof Janse van Vuuren was elected on to the literary advisory board of newly-accredited LitNet Akademies – the first online, peer-reviewed, academic literary journal in Afrikaans (www.litnet.ac.za).
- Prof Janse van Vuuren was also re-elected for a second term (2007-2010) as a member of the Literature Commission of the South African Academy for Science and Art.
- Prof Bench Mkonto serves on a number of important advisory bodies, allowing for potential national research collaboration. These include the Eastern Cape Arts and Culture Council, advising the MEC for Sport, Recreation, Arts and Culture, Eastern Cape Government; Inkolo kaNtu Heritage and Cultural Society, and Wordfest of the National Arts Festival (Grahamstown).
- Prof Annél Otto serves on the Language Commission of the SA Academy for Science and Art.

Visiting Scholar

Dr Gitte Postel, a postdoctoral student from the Netherlands, who is working on shamans and their role in South African literature, is visiting the faculty until March 2011.

Research Capacity Development

Related to the theme "Identity and Marginality in South African Literature", which has been identified by the Department of Language and Literature, attention is being given to cultivating the developing research culture of emerging and developing researchers through close attention to research methodology and postgraduate seminars, guiding the research progress through all its phases.

Awards

Prof Helize Janse van Vuuren was awarded an individual NRF grant (2008 to 2012) to support her writing of the book *The Interface Between San Orality and South African*, or more specifically, Afrikaans literature, which is based on her research. This initiative forms part of a larger team project (with co-researcher Dr Mary West and postgraduate students) called "Marginality and Identity in South African Literature".

Dean's Overview



Prof Niekie Dorfling, Executive Dean, Faculty of Business and Economic Sciences

Celebrating a Year of Research Growth

The faculty's aim in 2009 was to establish the basis for a long-term trajectory of research growth – producing research that addresses real world issues in a practical and sustainable manner. Our strategy was simple, yet effective – and it worked, with our research outputs markedly higher than previous years.

We identified two primary themes, Small, Medium and Micro Enterprise (SMME), Entrepreneurship and Local Economic Development; and Governance and African Leadership. In terms of SMME, Entrepreneurship and Local Economic Development, the faculty embraced a broad range of research projects which included the impact of the automotive industry on local economic development, the development of entrepreneurship and interpreneurship, family business, ensuring the sustainability of SMMEs, the role and impact of tourism on local economic development, and cluster and policy imperatives for local economic development.

In terms of Governance and African Leadership, projects included an investigation of the financial and operational efficiency of pension funds in Kenya, and the retention strategies of key talent at the Bank of Zambia.

To facilitate roll-out of these themes, we successfully established small teams under the leadership of a convener. Another key priority was to build capacity among our researchers.

The result has been a growing pool of competent researchers.

Ongoing support is also provided to our established researchers. In addition to financial support, the faculty also embarked on a process of better aligning individual workloads with research responsibilities. Furthermore, a comprehensive survey was conducted to gain a better understanding of research support needs. As a result, we are implementing strategies to address these, including freeing researchers from unnecessary demands. These initiatives are already paying off. We have seen a marked increase in the research output. Our research units from articles published in accredited journals in 2009 climbed to the highest obtained over the five-year period 2005 to 2009. We have also seen a dramatic increase in the number of Masters (by dissertation) and Doctoral students enrolling – the 23 students who enrolled in 2009 nearly doubled the average enrolment of 12 students per year for the preceding 2005 to 2008 period.

There was also a marked increase in conference participation which is reflected within this report.

I am extremely proud of our achievements during 2009 and am confident we are well on our way to achieving a growth trajectory that will see an even greater escalation in research outputs over the years to come.

A handwritten signature in black ink, appearing to read 'N. Dorfling'.

Prof Niekie Dorfling

Executive Dean, Faculty of Business and Economic Sciences

Faculty Researcher of the Year



Prof Piet Naude, Faculty Researcher of the Year

Values and Ethics

NMMU's ethics expert Prof Piet Naude received the Faculty Researcher of the Year Award for the second consecutive year. His research interests include professional ethics, global economic ethics and concepts of justice and ethics from a Christian theological perspective. Prof Naude strongly believes that academic freedom should be used for the public good. His ability to link theory and practice has made him a much sought-after speaker on matters of values and ethics in public life. He hopes to examine the ethics of cultural, economic and political globalisation, and its effect on the continent of Africa. Prof Naude is a member of the prestigious Alexander von Humboldt Foundation, a visiting academic at the University of Heidelberg, Germany, and a life member of the Centre for Theological Inquiry at Princeton University, United States. He has published more than 60 articles in academic journals in Afrikaans, English, German and Dutch – and recently completed a major academic publication on ethics and public issues in the United States. He also contributed a chapter on Africa and fair global trade in a book (to be published in 2010) under the auspices of the International Society of Business, Economics, and Ethics.

Emerging Faculty Researcher of the Year

'Green' Investments

Dr Suzette Viviers, who teaches advanced financial and investment management in the Department of Business Management, is driving landmark research into socially responsible and "green" investing, where the returns are as healthy as the long-term global benefits. "Socially responsible investing refers to an investment strategy whereby ethical as well as environmental, social and corporate governance concerns are evaluated alongside traditional financial performance measures." Dr Viviers's research, which formed part of her Doctoral studies, saw her analysing a broad spectrum of South African investment funds from 1991 to 2006 to determine the existence and extent of "green" and socially responsible investment funds in South Africa. She then measured the financial performance of these funds against more conventional funds and stock market indices – using advanced statistical techniques – and found that the risk-adjusted returns of socially responsible funds were no different from their conventional counterparts. "It's no better and no worse ... Many people don't want to invest in socially responsible funds as they are concerned about financial returns. The research however shows that they won't lose out."



Dr Suzette Viviers, Emerging Faculty Researcher of the Year

Faculty Research Themes

Themes	Drivers
1. Leadership, governance and ethics	Prof Piet Naudé
2. SMME, entrepreneurship and local economic development	Prof Elmarie Venter

Staff Doctorate



For her Doctorate in Business Management, Lecturer Dr Shelley Farrington – one of the founders of NMMU’s Family Business Unit – pinned down the success factors in sibling-run businesses.

Research Highlights

Testing Success Factors of Spouse-Run Businesses



Family business experts (from left), Prof Elmarie Venter, Carey Eybers.

Copreneurships – husband and wife or life-partner teams running businesses together – are playing an increasingly important role in the economies of many countries, yet very little research attention has been given to these family businesses.

To plug the gap, Business Management student Ms Carey Eybers completed her Masters (*cum laude*) on “Copreneurships in Family Businesses”, one of the first large-scale investigations of this nature worldwide. Her study is being replicated by researchers in the Netherlands. Ms Eybers’s research led to two papers

addressing the factors influencing the success of copreneurships, one by her treatise supervisors Professor Elmarie Venter and Dr Shelley Farrington (both founding members of NMMU’s Family Business Unit), which was nominated as best paper at the Ninth Annual International Family Enterprise Research Academy (IFERA) World Family Business Conference in Cyprus in June, 2009. The second, penned by the three women and Stellenbosch University’s Prof Christo Boshoff, won Best Paper Award at the 21st conference of the South African Institute for Management Sciences (SAIMS) in Port Elizabeth in September, 2009.

Ms Eybers found that a good spousal relationship proved to have the greatest influence on the success of a copreneurship. Other factors contributing positively included spouses’ commitment to the business and each other, the implementation of sound business principles, and the involvement of non-family members. The only factor that had a significant negative influence on the business was when the two spouses were viewed as having equal status in their business. “A possible explanation for this result is that employees and stakeholders may become confused and frustrated in dealing with two bosses,” said Ms Eybers.

Inter-Faculty Collaboration Between Entrepreneurship and Chemistry Students

When InnoVenton, the university’s Institute for Chemical Technology, launched the country’s first BSc Honours degree in Formulation Science in 2009, students were taught the basics behind the blending and mixing of products – and then expected to blend their own usable product, which may be commercialised.

To ensure these students were able to develop a workable marketing plan – and actually get products to market – an agreement was reached between InnoVenton and the Faculty of Business and Economic Sciences, whereby BCom Hons (Entrepreneurship) students would work with the Science students to develop strong business plans. Dr Shelley Farrington, who lectures Entrepreneurship, said: “The inter-faculty collaboration opportunity enabled our students to create business plans for real, unique products (including a new mosquito repellent, perfume sticks and a lotion that assists in the removal of hair braids) rather than hypothetical ones, as has been the case in the past.”

As the project moves into 2010, the role of the entrepreneurship students has been further streamlined. They will be divided into groups, each focusing on the same project – InnoVenton’s innovative algae-to-energy project, which is converting algal biomass into a bio-oil, not unlike crude oil, and other useful



With Dr Shelley Farrington (front, centre) are BCom Hons (Entrepreneurship) students, who won best business plan for 2009 (back, from left) Claire Darné, Johan Demeyer and Benjamin Frolich and (front, from left) Mandisa Mangisa and Angela Guscott.

products. The photo-bioreactor system that is used for growing the algae can also be used to recover fresh, clean water from non-potable water sources such as waste water or salt water. NMMU has established a private company, Zalgen, to

commercialise the project. Dr Farrington said: "Zalgen is trying to establish the viability of commercialising the water recovery, especially in water scarce areas – and our students will be working on business plans for this."

Empowering the Poor through Community-Managed Savings and Lending

A collaborative research project between the Department of Development Studies and various grass-roots organisations has led to the adoption of an innovative Community-Managed Savings and Lending (CMSL) programme – which has already proved successful throughout Africa – in township communities in Jeffreys Bay.

Programme Leader Amanda van den Berg, from the Department of Development Studies, said the three-year project ends in December 2010. It is aimed at enhancing the economic resilience of low income households in the Jeffreys Bay area and, in doing so, ensuring the well-being of children through their caregivers' membership in 52 established CMSL groups.

"CMSL is a methodology based on the successful experience of CARE International in Niger and, subsequently, several other African countries. The methodology builds and improves upon traditional methods of mobilising internal resources by low-income population groups (referred to as "stokvel" or "oorgooi" in South Africa) in which group members pool their own savings to create an internal fund from which they lend each other money at an agreed-upon interest rate. CARE's methodology adds value to this traditional system by incorporating training in internal fund management and group dynamics, and formulating a group constitution that guides the savings and lending process."

Ms van den Berg said that where this methodology had been



Prof Richard Haines (from left), Amanda van den Berg and Candice Bezuidenhout, from the Department of Development Studies

introduced, it had, without exception, enabled low income earners to eradicate debt to money lenders, increase their household assets, provide additional income streams to the household (e.g. by starting small businesses), and increase the number of children they are able to send to school. Directing the project, which is funded by World Vision and the Kellogg Foundation, is Ms Jill Thompson, who ran similar projects in other African countries. She is assisted by four training officers and an administrator from the community – all trained by NMMU – who have helped community members to set up and manage the various CMSL groups.

NRF-Rated Researchers

Radder, L, Prof	C2
Struwig, FW, Prof	L
Smith, EE, Prof	L
Venter, E, Prof	Y2
Naude, P, Prof	C3

Faculty Highlights and Achievements

National and International Research Collaboration

- In the School of Industrial Psychology and Human Resources, Prof Rob Snelgar collaborated with Dr Mark Bussin and Dr Lucas de Swardt from the University of Johannesburg in research on group and individual incentives.
- Dr Michelle Mey from the Department of Human Resources Management contributed to the South Africa Board of Personnel Practice comments on the King III Report and Code of Governance and assisted with the 2009 national survey and report for the American Society for Training and Development. The Labour Relations and Human Resources Unit also contributed in these two areas.
- At postgraduate level, the Unit for Professional Ethics conducted research into media ethics and sustainable business (MBA elective) in close cooperation with visiting scholars Prof Frans Krueger (Wits) and Prof Oliver Williams (Notre Dame, USA).
- The Department of Development Studies (DDS) has been involved in inter-disciplinary collaborative research with Prof Terence Jackson and Mr Frederick Claeys, both from Middlesex University, UK, on the ongoing DDS-Middlesex University School research project on cross-cultural management and HIV/Aids in South and southern Africa.
- Prof Jackson, Mr Claeys and Prof Richard Haines, of NMMU's Department of Development Studies, have also been conducting collaborative work in the intersecting fields of post-colonial theory, cross-cultural management and development theory.
- Prof Geoffrey Wood, Professor of Strategic Management and Deputy-Dean of Sheffield University School of Management, and Prof Haines conducted collaborative research in the area of comparative human resource management and the global economy, which has resulted in a book chapter (to be published in 2010).
- Collaboration between Prof Marc Miller of NMMU's Department of Developmental Studies and Prof Vlad Kaczynski of the University of Washington's School of Marine Affairs, on areas of marine affairs and maritime studies, is an ongoing partnership. Prof Miller and Prof Haines are working on select areas in marine and coastal tourism, and a longer-term exploration of the changing discourse of maritime studies and its relationship to development and global studies.



Visiting Scholars

- Visiting Professor Arie Buijs, from Utrecht University, the Netherlands, presented lectures in the BCom Hons (Business Management) programme, Advanced Investment Management, from 12 to 15 September 2009.
- Prof Mark Anstey and Prof John Beck of Michigan State University visited the School of Industrial Psychology and Human Resources to discuss future collaboration in terms of research projects.

Conference Facilitation

- Dr Suzette Viviers, from the School of Management Sciences, was conference organiser of the 21st Annual Conference of the Southern African Institute for Management Scientists (SAIMS). The conference, hosted by the Department of Business Management, was held from 13 to 16 September 2009.
- The Department of Development Studies hosted the First International Conference on Offsets and Industrial Co-operation from 12 to 13 November 2009.

Research Capacity Development

- Two established researchers, Prof Madéle Tait and Prof Laetitia Radder, were mentors in the Phuhlisha Research Development Programme in 2009. Emerging researchers Chantal Rootman and Tania Shrobbree were selected for participation in the Phuhlisha mentoring programme.
- Beverley Gray was involved in the PE Regional Chamber of Commerce and Industry (PERCCI) mentorship programme in 2009. As a volunteer in the programme, she acted as mentor for small business owners in Nelson Mandela Bay. She was also a volunteer mentor for youth-owned SMMEs (through the Umsobomvu Youth Fund) and businesses owned and managed by women through the Business Women's Association.
- Four staff members in the School of Industrial Psychology and Human Resources received advanced training in research methodology.
- The Department of Development Studies' Doctoral programme is one of the largest in the faculty and NMMU generally. It is inculcating higher order research skills and the production of research and accredited articles. The programme is responding directly to national government's emphasis on expanding Doctoral level research training and capacity building.

Inter-Disciplinary and Multi-Disciplinary Scholarship and Research

- Dr Suzette Viviers was invited to teach a financial management module at the American University of Kuwait (AUK) in June/July 2009. This formed part of an exchange programme with the AUK.
- Dr Viviers also conducted research with colleagues at UNISA and UCT on the topic of socially responsible investing in South Africa. One paper was published in 2009 and another was submitted for evaluation.
- The Unit for Professional Ethics continued its research into innovative professional curricula for the financial services industry. Ethics and governance has now become a standard and compulsory part of the BCom in Accounting and the BCom in Financial Planning degrees.

Awards

- A paper by Dr Shelley Farrington, Prof Elmarie Venter, Ms Carey Eybers and Prof Christo Boshoff (University of Stellenbosch) won the best paper award at the 21st annual SAIMS conference in Port Elizabeth. The paper was titled: *Copreneurial business in South Africa: Factors influencing success*.
- Prof Miemie Struwig was appointed on the Academic Board for the *Journal of Contemporary Economics* in Poland.

Dean's Overview



Prof Denise Zinn, Executive Dean, Faculty of Education

A Year of Significant Change and Significant Achievement

2009 was a year of many changes, including the appointment of a new Dean in July, and the development of a new structure by the end of that year. Despite these changes, I am pleased to report a year of significant activity in the area of research. Our first success was the upgrading of the Faculty of Education Research, Technology and Innovation Unit into the Centre for Educational Research, Technology and Innovation (CERTI).

A legacy of the previous Dean was the establishment of a Faculty Research Chair (HIV/AIDS), filled by Prof Naydene de Lange. This new initiative aims to promote research and engagement within educational settings generally, and poor communities, specifically. Another significant achievement was the completion of research by eight doctoral students, which included four members of staff, all supervised by Prof Paul Webb.

Their research in the areas of science, mathematics and technology education has impacted on our work. We are, for instance, already incorporating their findings into aspects of coursework and planning in the arena of teaching and learning. In the area of outreach and engagement, short learning programmes have been developed, while work with schools in the related areas of their research is continuing. Of particular note was Dr Mary-Grace Villanueva and Dr Lyn Webb's respective research on literacy in science and mathematics education. The study of the impact of HIV/Aids in educational arenas and the challenges this epidemic poses to stakeholders within the education field is another research focus area. Looking to the future, research in the faculty has to have

impact in areas of critical importance within education. We have to find ways to ensure that our research findings can be taken up in various ways by different stakeholders, from the Department of Education policy through to communities of practice in schools.

The faculty's emerging vision will frame our future research plans: The first is the potential for educators to be change agents. We need to reflect on our research activities, and determine the extent to which our research energy, skills and knowledge are able to impact on change. Secondly, we cannot ignore the connection between community development, social responsibility and education. We will be embarking on engagement and research initiatives which focus on the connection between schools, communities and the university and its impact on teaching and learning, and community development. Thirdly, we will be exploring the theme of multi-literacies, where literacy is recognised as a contextualised skill, and engaging in research and programme development that focuses on Grade R and Foundation Phase literacy practices right through to the different kinds of literacy competences required of more senior students. A fourth area of research is mathematics and science education.

Yours sincerely,

A handwritten signature in dark ink, appearing to read 'D Zinn'.

Prof Denise Zinn
Executive Dean: Faculty of Education

Faculty Researcher of the Year



Prof Tilla Olivier, Faculty Researcher of the Year

Changing Lives

For the past 10 years, Educational Psychology Professor Tilla Olivier has been the top researcher in the Faculty of Education for her extensive work on special needs in education and the wellness of people.

She and her students have explored *anorexia nervosa*, Tourette's syndrome, autism and Attention-Deficit Hyperactivity Disorder (ADHD) among learners, parents, teachers and principals. Olivier's wellness research included a study on how academics at NMMU handle stress – cognitively, emotionally and physically. Another wellness study, completed in collaboration with the University of Alberta, Canada, focused on teenage sexuality.

"I conduct most of my research in Port Elizabeth's townships, but am also moving out into rural areas." An innovative project on family dynamics called "Teddy Diaries", run in Joubertina by

Prof Olivier and Prof Naydene de Lange, sees young learners adopting a teddy bear for a day, and then drawing pictures or writing a journal about everything they do with their teddy. "We code their drawings or writing, which gives us a fair indication of the family dynamics in their homes." Prof Olivier plans to share this information with parents and teachers, for action to be taken when problems are picked up.

For Prof Olivier, a NRF C3-rated researcher, each research project is an accomplishment. "If my research culminates in a published, accredited article, book chapter or book, that's an achievement. Every grant I receive, every postgraduate student that walks across the stage, the community service my research enables – these are all achievements." Prof Olivier, in collaboration with Prof De Lange and Prof Lesley Wood, last year published the book *Picturing Hope*, focusing on their research in the townships.

Emerging Faculty Researcher of the Year

Leading the Way in HIV/Aids Education

In addition to pioneering landmark research in the field of HIV/Aids education, Prof Lesley Wood is recognised as a leader in the field of action research – where in-service teachers work together with university students and staff to improve schools.

"HIV/Aids is one of many problems in schools, but it makes all the other problems worse," said Prof Wood, who heads up NMMU's Action Research Unit. Her successes in the area of HIV/Aids education include her book, *Dealing with HIV/Aids in the Classroom*, the first of its kind to be written from an education perspective, and the development of the country's first course on HIV/Aids in teaching. This two-year, part-time programme encourages teachers to analyse their own attitudes and values about HIV/Aids before exploring a host of topics on the disease.

Faculty Research Themes

Themes	Drivers
1. Educational management and leadership	Prof Prakash Singh
2. Special educational needs	Prof Tilla Olivier
3. Curriculum studies	Prof Sylvan Blignaut
4. HIV and Aids in education	Prof Lesley Wood
5. Science and mathematics education	Prof Paul Webb
6. Initial teacher education	Dr Noluthando Toni



Prof Lesley Wood, Emerging Faculty Researcher of the Year

She is currently collaborating with the University of the Western Cape to develop similar short-learning programmes on HIV/Aids education.

In addition, she has led or participated in a number of research projects, some involving international collaboration, concerned with equipping teachers to undertake HIV/Aids prevention education and offer care and support. She is also the Eastern Cape investigator in a South African Netherlands Research Programme on Alternative Development (SanPad) project,

“Read me to resilience!” aimed at empowering Aids orphans. In 2008, she spent two months at the HIV/Aids centre at Columbia University, New York, after being awarded a Fellowship to develop a HIV/Aids prevention programme focusing on gender issues. The programme has since been successfully implemented at 17 disadvantaged schools in South Africa.

Prof Wood, a NRF L-rated researcher, was named Emerging Researcher of the Year and Faculty Teacher of the Year for 2008 and 2009. She was NMMU’s Teacher of the Year in 2008.

Research Highlights

Using Arts-Based Research to Beat Aids



Prof Naydene de Lange, HIV/Aids Chair in Education

Prof Naydene de Lange, who occupies South Africa’s first HIV/Aids Chair in Education, is using arts-based research to tackle the spread of HIV/Aids in South African schools and communities. Prof De Lange, who is responsible for a number of key research projects both in the Eastern Cape and KwaZulu-Natal, is pioneering visual participatory methodology (VPM) – a new methodology in education

in South Africa – whereby participants in research engage with issues relating to HIV/Aids by taking photographs or making videos. She was one of the founding members of the Centre for Visual Methodologies for Social change (CVMSC) at the University

of KwaZulu-Natal (UKZN), where she lectured before taking up the NMMU appointment last year, and has since established a Visual Methodologies for Social Change unit within NMMU’s Faculty of Education. Explaining the concept of VPM, Prof de Lange said: “There is a technique called photovoice, for example, where we give participants a prompt (e.g. around stigma or gender-based violence, which they themselves would have identified as a key issue) and a camera and they direct their own photographs to illustrate the issue, and then discuss solutions.

“It gives people a voice, an artefact over which they can engage in debate. It works particularly well in marginalised and under-represented communities, and also when there are language barriers. We believe that this kind of ‘research as social change’ is necessary in South Africa and in work around HIV/Aids in particular.” Prof De Lange’s VPM research led to the publication in 2007 of a co-edited book called *Putting people in the picture: Visual Methodologies for social change*.

Changing Teachers' Attitudes Towards Technology



Dr Andre du Plessis, Education Lecturer

Working closely with NMMU's Centre for Educational Research, Technology and Innovation (CERTI) Project Manager Vernon Naidoo and Director Prof Paul Webb, and in collaboration with Lecturer Shaun Vincent and senior students from the Department of Information Technology (IT), Dr Andre du Plessis spearheaded a two-year community engagement project, which saw the

distribution of 120 computers (sponsored by the Dell Foundation) to six needy Missionvale schools and the introduction of a comprehensive computer literacy teacher development programme for 50 teachers.

As part of this programme, Dr Du Plessis successfully introduced an innovative Internet learning strategy, in which teachers (and ultimately, learners, when the Internet is launched in their schools in 2010) design "cyberhunts", to investigate whether this design approach would assist learners in attaining the critical and developmental outcomes set out in the National Curriculum Statement (NCS). This research formed the basis of his completed doctoral studies (graduating 2010).

The concept of the cyberhunt is simple. The teacher will define a topic in the curriculum in any learning area. Together, the teacher and learners will brainstorm key words and phrases that the learners should search for, using a search engine such as Google.

Once they have the necessary information (attained via the websites tracked by the search engines), they need to determine whether it is usable, and then generate questions on this information, relating to six levels in the cognitive domain (as indicated in Bloom's Taxonomy), namely knowledge (e.g. What are examples of pollution?), comprehension (e.g. Why has pollution resulted?), application (e.g. How can pollution be prevented?), analysis (e.g. Which countries have introduced anti-pollution initiatives?), synthesis (e.g. Are any of these initiatives taking place in South Africa?) and evaluation (e.g. Which websites explained pollution in the best possible way?).

NRF-Rated Researchers

De Lange, N, Prof C3

Olivier, MAJ, Prof C3

Webb, P, Prof C3

Wood, LA, Prof L

Research Entities

Centre for Educational Research, Technology and Innovation (CERTI)



Prof Paul Webb, Director

The purpose of the Centre for Educational Research, Technology and Innovation (CERTI) is to promote established and new research projects; provide supervision of postgraduate degrees; stimulate community involvement, engagement and outreach; generate financial income for the Faculty of Education and the university; and expand research opportunities within the faculty.

CERTI's goals for 2009 included, among others, continuing to run various engagement projects (namely and including Science, Mathematics and IT in Schools (SMIS); Scientific Literacy; Family Maths & Science; Mathematical Reasoning; Key Teacher; Ripple Programme; Walmer Project; Teaching English to Speakers of Other Languages, our Video-Based Self Regulated Learning (VBSRL) project. We also aimed to promote action research, international and national co-operation in terms of our research and engagement projects, and equal or exceed the 2008 outputs in terms of Masters and PhD students and academic papers. All goals were met with the exception of accredited journal article outputs, which dropped.

Highlights included the appointment of Prof Naydene de Lange as HIV/Aids Education Research Chair, the achievements of the Scientific Literacy project (profiled on page 15), a R3.4-million grant from the DG Murray Trust for the integrated schools project, as well as four members of the Faculty of Education completing their Doctoral studies in Science and Mathematics Education.

Faculty Highlights and Achievements

National and International Research Collaboration

- Swedish-South Africa Links - Scientific Literacy: This science literacy project is a collaborative effort between three academics, respectively, from the faculties of education at NMMU and University of Gothenburg. In 2009, joint workshops were held in both cities.
- The Masilingane Project: Funded by the Mac Aids Fund (MAF) Leadership Initiative in collaboration with Columbia University and the University of California, Los Angeles (UCLA), this action research initiative focused on gender sensitivity around HIV/ Aids. It culminated in a symposium in February 2009.
- Prof Lesley Wood is the Eastern Cape investigator of a South African Netherlands Research Programme on Alternative Development (SanPad) project, headed up by the University of the Witwatersrand. It is a quasi-experimental reading study, aimed at the empowerment of AIDS orphans. Nokhanyo Mayaba is completing her Doctoral studies on the project.



Visiting Scholars

- Professor Goran Lassbo from the University of Gothenburg visited Port Elizabeth as part of the Swedish-SA Links project.
- Professor Dr Corinna Hoessle and Dr Katja Reitschert from the Carl Ossietsky University of Oldenburg, Germany, visited the faculty in July 2009 as part of the TERDAL (Teacher Education and Research with an Emphasis on Disadvantaged Learners in Selected Subject-Fields) agreement. Their personal areas of expertise are Biology Education and Life Sciences Education.
- Dr Ben Khumalo-Seegelken, part-time Lecturer of Intercultural and Diversity Education and Theology at the Carl von Ossietzky University in Oldenburg, Germany, also visited the faculty as part of the TERDAL project. A member of the Centre for South-North Cooperation in Educational Research and Practice at the University of Oldenburg, the aim of his visit was to renew contacts and exchange experiences with colleagues and students at NMMU in order to intensify the ongoing cooperation between the two partner universities and explore possible avenues for future joint ventures.
- Prof John Fischetti of the Department of Educational Leadership at the Watson School of Education, University of North Carolina Wilmington, visited the faculty with 10 of his PhD candidates (all teachers or principals), to spend time in local schools, observe the faculty's various CERTI projects and have interactive sessions with faculty academics.
- Prof Jean McNiff from York St John University, United Kingdom, who is a world-renowned leader in the field of action research of the practitioner self-enquiry genre, visited the faculty in July to hold a selection of workshops and one-on-one interviews with colleagues on action research.
- Prof Mary Alice, a Fulbright Scholar (US Department of State) from Virginia Polytechnic Institute and State University in Blacksburg, Virginia, undertook a participatory action research project at John Masiza Primary School in Walmer township in 2009. Five Foundation Phase teachers were involved in the project. They worked collaboratively with Ms Alice on developing and implementing ideas for improving literacy learning through writing.

Conference Facilitation

Scientific Literacy Colloquium: The Scientific Literacy Short Learning Programme (SLP) was offered to both external persons and academics in the Department of Science & Technology Education in order to expand capacity to promote Scientific literacy in schools.

Research Capacity Development

Two writing retreats were run, one for five emerging researchers and the other for eight established researchers.

Inter-Disciplinary and Multi-Disciplinary Scholarship and Research

- In celebration of a decade of fruitful academic partnership between South Africa and Norway, the Norwegian Ministry of Education and Research offered research grants for four researchers, two from Norway and two from South Africa, to pursue research on education and gender. NMMU academics Dr Laetitia Greyling and Ms Pam Austin's applications were successful and both received a South African Oslo Celebration Grant. Dr Greyling's research study focuses on barriers to learning in education, while Ms Austin's focuses on promoting mathematics education according to the family maths equity principles. They spent two weeks at the University of Oslo in March 2009 to initiate their respective research interests.
- A cross-faculty TESOL (Teaching English to Speakers of Other Languages) study between the Department of Applied Language Studies (Faculty of Arts) and the Faculty of Education resulted in community engagement with the Human Dignity Centre in Walmer. The study resulted in a paper, titled: *Disclosure to persons other than sexual partners: Choices and patterns in a South African township*.

Awards

Prof Lesley Wood was awarded the Young Researcher of the Year medal by the Education Association of South Africa (EASA). This medal is conferred on the researcher who is considered to have achieved outstanding research accomplishments within five years of obtaining their Doctorate. The conference was held at the Vaal Triangle Campus of North-West University.

Faculty of Engineering, the Built Environment and Information Technology

Technology for tomorrow

Dean's Overview



Prof Henk de Jager, Executive Dean, Faculty of Engineering, the Built Environment and Information Technology

A Year Defined by Increasing Research Excellence

2009 was significant in the development of the faculty's research profile. Our aim for research excellence gained remarkable momentum, with both staff and students involved in applied, developmental and industry-related research and technology transfer. The faculty also succeeded in securing major research grants and strengthening our strategic partnerships.

We continued to operate in close relationship with a number of leading national and international universities and research institutes, and also participated in several key research programmes, including the SA-Finland Knowledge Partnership on Information Communication and Technology (ICT), the Advanced Manufacturing Technology Strategy and a programme funded by the European Union. The faculty was also involved in projects with Eskom, Volkswagen SA, General Motors SA, SAP, the Council for Scientific and Industrial Research (CSIR) and the SAP Meraka Unit for Technology Development (UTD). Extensive progress was made in our research entities, which were restructured as part of our ongoing drive to establish world-recognised niche areas. In this respect, the Friction Processing Research Institute (FPRI) was registered as an NMMU entity. Research in the field of ICT focused mainly on information security governance, technology service management, health Information, and usability and user experience aspects. Researchers were also involved in a number of community-oriented research projects (see page 43). Research activities in the Built Environment included construction health and safety, facilities/maintenance management, and logistics management. The VWWSA-DAAD Chair in Automotive Engineering

spearheaded many research initiatives. These research activities are supported by the Automotive Industries Development Corporation (AIDC) for Human Resource Development purposes. As a result of such research has ensured continued financial support from VWWSA as well as the German funding agency, DAAD. The establishment of the GMSA Chair in Mechatronics in 2009 added significant momentum to research and development in the field of Mechatronics. Furthermore, research in the field of alternative energy has been initiated, focusing mainly on wind turbine design, electrical generator design and power electronics in collaboration with the Centre for Energy Research.

Our postgraduate students continually prove themselves among the best in the country and 2009 was no exception. We have also increased our pool of staff holding doctorates and NRF-research ratings. I would like to thank all staff members and students, including university management and the research division, for their contribution. We will continue to meet the challenges innovation demands through quality research in our endeavours to establish ourselves as international leaders in our respective research areas.

Yours sincerely

A handwritten signature in black ink, appearing to read 'H. de Jager'.

Prof Henk de Jager
Executive Dean: Faculty of Engineering, the
Built Environment and Information Technology

Faculty Researcher of the Year



Prof John Smallwood, Faculty Researcher of the Year

Commitment to construction

Construction Management Professor John Smallwood attributes his extensive research outputs to his highly-disciplined approach. "I believe in chiselling away a little bit every day. I tell my students that even if you just read one paper a day, it is one paper more than zero." It is an approach which has helped him successfully tackle a vast array of research interests in construction, among them occupational health and safety, occupational health, ergonomics, primary health promotion, quality and industry performance, education and training, and image.

From an educational perspective, he focuses on the practice of construction management, periodically conducting surveys to determine the importance and use of knowledge areas and skills, in relation to the requirements of industry. He is also concerned about the integration of construction subjects across the various years of study. "When managing construction, you cannot manage in a fragmented manner – we need to simulate that integrated environment." Prof Smallwood's notable achievements include co-authoring a chapter on Health and Safety in the *Royal Institute of British Architecture's Construction*

Project Management Handbook. His future research goals include investigating the role of EQ (Emotional Quotient), and personality type in terms of managing construction health and safety, and the role of core competencies, such as aptitude, for new graduates to be outstanding construction managers.

Emerging Faculty Researcher of the Year

Securing Information



Mariana Gerber, Emerging Faculty Researcher of the Year

In today's e-business oriented world, information has become one of the most important assets in any organisation. "It is imperative that information is properly protected from a growing set of risks that have proliferated over the last decade and became increasingly more sophisticated," says Emerging Faculty Researcher of the Year Ms Mariana Gerber, whose research interests include information security management and governance, risk analysis and risk management.

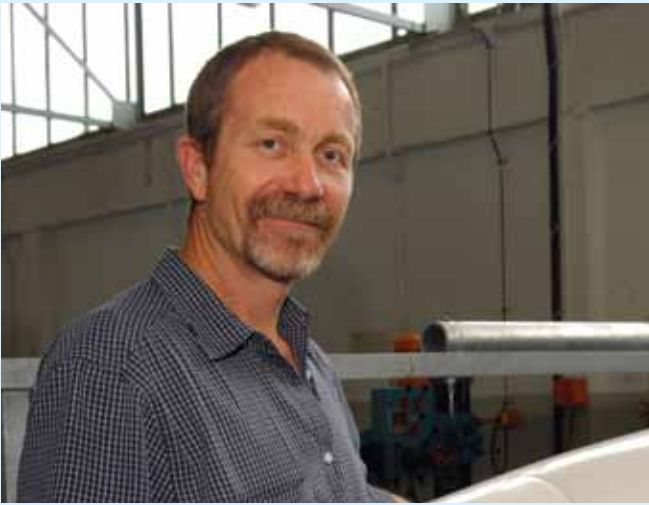
Ms Gerber's research has led to four internationally-recognised journal publications. One of these, appearing in the journal *Computers & Security*, was that journal's top-rated article for 2005 and the first term of 2006, as it was the article most downloaded and viewed for that time period.

Ms Gerber is an active member of the Information Security Management and Governance Group, led by Professor Rossouw von Solms, Director of NMMU's Institute for Information and Communication Technology Advancement (IICTA) and one of the country's leading experts in information security.

Faculty Research Themes

Themes	Drivers
1. Manufacturing technology	Prof Danie Hattingh
2. Management development for the Built Environment	Prof John Smallwood
3. Secure ICT Services	Prof Rossouw von Solms

Staff Doctorates



Mechanical Engineering Senior Lecturer Dr Russell Phillips was awarded his DTech (Mechanical Engineering) for his research on the development of a unique vertical axis wind turbine (VAWT), which is substantially quieter than traditional horizontal axis wind turbines (HAWTs) due to its slower rotational speed, for use in or near residential areas.



It is often reported that South Africa lacks capacity for low-income housing delivery, particularly in terms of management. To help plug this gap, Prof Kobus van Wyk from the Department of Building and Quantity Surveying, conducted Doctoral research on the formulation of a housing management model for developing countries, with specific reference to South Africa. He graduated with a DPhil in Public Administration.

Research Highlights

Pioneering e-safety Research

Professor Rossouw von Solms, Director of Nelson Mandela Metropolitan University's Institute for Information and Communication Technology Advancement (IICTA), is one of the country's leading experts in information security.

Focusing specifically on the human aspects of information security, he is determined to instil a culture of e-safety through education, tackling such issues as safe banking habits, avoiding email scams, cyber-bullying and the risks associated with social networking sites like Facebook.

He is also spearheading a unique facial recognition programme for the elderly, which will replace the need for user-ID's and passwords (which the elderly are apt to forget and unwisely write down), when using email, Skype and other Internet programmes – and is testing this programme within Port Elizabeth retirement villages.

In the corporate environment, Prof Von Solms has conducted collaborative research on workplace Information Technology issues with Judge Mervyn King. "As ICT forms such a core component of every modern-day organisation, it is important that it is properly governed. Every organisation should ensure that all its ICT resources and services are properly protected and



Prof Rossouw von Solms, Director of the Institute for Information and Communication Technology Advancement

secured as the well-being of the organisation depends on it. Policies and procedures should also be developed and utilised to ensure employees behave in a secure manner." This would include typical behavioural issues like not sharing or writing down passwords, logging off before leaving their offices and never opening attachments from senders they don't recognise. "Whether we are very young or very old, we have been forced into the electronic age, and must learn to use it safely, so that we are not robbed of our money or our identities or worse. Modern technology has got a lot to offer – it must just be used correctly. A culture of e-safety needs to be cultivated."

Addressing the Human Factor in Technology Development



Prof Darelle van Greunen, Associate Professor of Information Communication and Technology

While huge advances have been made in the area of digital technology, one of the challenges for developers is ensuring that devices can be used easily by people. Professor Darelle van Greunen, an Associate Professor of Information Communication and Technology (ICT), specialises in “user experience”, which deals with how a human being interacts with technology. In this capacity, she is involved in a number

of projects through the SAP Research Campus-Based Engineering Centre (CEC) Pretoria and the SAP Meraka Unit for Technology Development (UTD), based at the Council for Scientific and Industrial Research (CSIR). One of the projects she was involved in for CSIR Meraka was working on a “voice interface” using a mobile phone for HIV/Aids care workers in Botswana. Care workers could

dial a specific number and get information via a series of voice prompts. Van Greunen trained CSIR’s human language technology team to conduct field studies and interviews about what was required. She was then involved in designing and evaluating the speech interfaces, which have since been translated into several languages. “I look at ICT as an enabler in the community, especially the rural community ... I investigate what is required for people to successfully use technology – the aesthetics, navigability, accessibility for people with visual impairment for example, as well as the impact of culture and context of use. There is a very strong human element in my research.”

She is currently one of five user experience champions within SAP globally, their role being to dictate user experience trends for the organisation as a whole. “We look at trends internationally within the user-interface design sphere.” Within SAP CEC Pretoria, she heads up the Brazil, Russia, India, China, South Africa (BRICS) research interest group, which identifies technologies for emerging economies. Related to this role, she is involved in Project Overture, a mobile business application that deals with procurement in very small enterprises. “It will allow a plumber, for instance, to place orders and send invoices over his cell phone.”

Key Projects Emerging from NMMU/Meraka Link

Eight PhD and Masters students from NMMU’s Information and Communication Technology (ICT) Department are working on cutting-edge ICT projects through the Meraka Institute of the Council for Scientific and Industrial Research (CSIR). The students are being co-supervised by three adjunct professors in NMMU’s ICT Department, namely, Prof Paula Kotzé, Prof Alta van der Merwe and Prof Marlien Herselman. They are full-time employees at the Meraka Institute of the CSIR, which receives a parliamentary grant to fund research in both government and private industry-related ICT projects. There are three main Meraka projects currently linked to NMMU. The first two, falling under Meraka’s Enterprise Knowledge Engineering and Management Research Group (MEKE), are the Enterprise Architecture Skills Development Project and the Technology Champions Project. Enterprise architecture, a new field, focuses on the structure of an enterprise (a business or business unit) and includes enterprise goals, business functions, software applications and computer systems. The Technology Champions Project focuses on the introduction of new technologies into rural communities. The third project, which falls under Meraka’s Living Labs Research Group, is directed towards identifying user needs and requirements for developing community-driven healthcare services, using mobile phone technology. “The Living Labs methodology focuses on how ICT users in South Africa can become co-creators of innovation within their communities, and how different stakeholders can all benefit from this collaboration,” said Prof



Adjunct professors Prof Paula Kotzé, Prof Alta van der Merwe and Prof Marlien Herselman

Herselman. The three adjunct professors are all highly-qualified researchers. NRF B-rated researcher Prof Kotzé, a chief researcher and MEKE Research Group Leader, is the current Vice-President of the South African Institute of Computer Science and Information Technology (SAICSIT) and an elected member of the European Academy of Science. Prof Van der Merwe, a NRF C-rated researcher, is a principal researcher at the Meraka Institute. She is the Institute of Electrical and Electronics Engineers (IEEE) Systems, Man and Cybernetics (SMC) Chapter Chair in South Africa, serves on the SAICSIT Council and was one of the founding members of the Enterprise Architecture Research Forum (EARF). Prof Herselman, also a NRF C-rated researcher, won the IEEE Women in Engineering: Female Scientist of the Year award (South African section) in 2009.

Driving Manufacturing Technology Research



Prof Annelize Els-Botes, Director of the Friction Processing Research Institute

As Director of the Friction Processing Research Institute, Research Manager of the Manufacturing Technology Research Centre and a consultant for industry through the Automotive Component Technology Station (ACTS), Prof Annelize Els-Botes is pushing manufacturing technology research within the faculty to new heights.

Prof Els-Botes, a qualified Metallurgical Engineer, is involved in two main research projects – namely friction stir processing, the joining of metals using a rotating tool (friction) as an alternative to traditional welding for enhanced weld-joint properties, and laser materials processing.

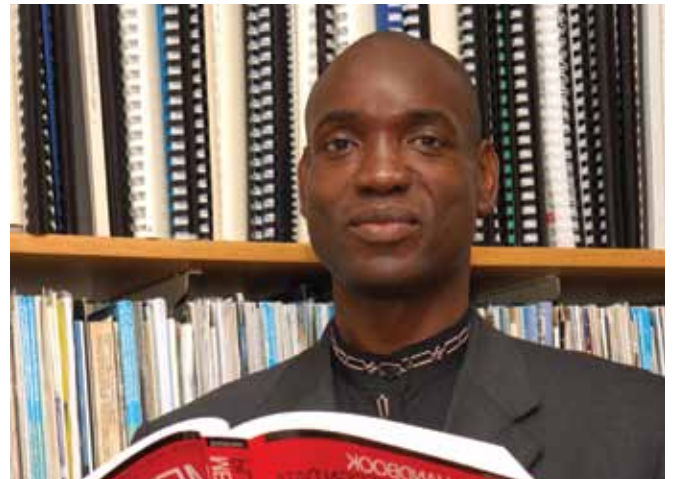
“Friction stir welding is our most advanced research area and has received international accolades. It is typically used in the aerospace industry, as well as industries that use large containers, like the petrochemical industry. Currently, the friction stir welding research platform at NMMU is the only one in South Africa.” The laser materials processing project, which began 10 years ago in collaboration with the National Laser Centre (NLC), was sparked by a government initiative to develop laser applications in South Africa for the manufacturing industry. “Government wanted to encourage tertiary institutions to apply for funding and use the facilities available at the NLC.” The project received a boost with the donation of a two kilowatt laser system from Volkswagen South Africa. No other university in South Africa has such a high-power laser system, which opens the potential for the faculty to become a leader in the field of laser materials processing. NMMU is also the only institution in South Africa researching laser forming, which is the use of laser beams to bend and shape metals.

Investigation into SMME Development Initiatives Leads to Top Award

Professor of Construction Management Winston Shakantu’s in-depth research into whether the efforts of government to grow Small, Medium and Micro Enterprises (SMMEs) in the construction industry were paying off, in terms of improving infrastructure delivery, creating jobs and enhancing competitiveness within the industry, saw him winning top honours at a leading construction conference.

Prof Shakantu, Director of NMMU’s Institute for Built Environment Research and Development (IBERD), won Best Overall Paper for his work *Gazing into the construction SMME crystal ball: Deciphering the cryptograph* at the Sixth Annual Construction Industry Development Board (CIBD) Postgraduate Conference in September 2009. His paper was one of the research outputs resulting from a three-year project (ending in 2010), financed by the NRF, and conducted in collaboration with the University of Cape Town (UCT).

Prof Shakantu explained that municipalities, driving the initiative with government funding, would divide large municipal construction jobs into smaller ones, respectively tackled by a number of SMMEs. “It was essentially a training ground for small contractors.” But while the initiative appeared sound in theory, major challenges remained. “The problem is that there



Prof Winston Shakantu, Director of the Institute for Built Environment Research and Development

are about 40 000 SMMEs in the country’s construction industry. Despite government’s good intentions to provide jobs for many of these, they can’t satisfy everybody.” Prof Shakantu’s paper also highlighted the many hurdles faced by SMMEs, among them financial, legal, skills-related and technological barriers, which has stilted their development. “It requires the concerted efforts of all the stakeholders – clients, consultants, contractors and the government – to work in a collaborative way to reduce the binding constraints and move towards achieving the goals of SMME development.”

NRF-Rated Researchers

Abou-El-Hossein, Dr	C3
Botha, RA, Prof	C3
Hattingh, DG, Prof	C1
Smallwood, JJ, Prof	C3
Von Solms, R, Prof	B3
McGrath, P, Prof	C3

Research Entities

Research entities in the Faculty of Engineering, the Built Environment and Information Technology include two research institutes and one research centre, profiled below:

Friction Processing Research Institute (FPRI)

The research function of the Friction Processing Research Institute (FPRI) is to: engage in research to grow knowledge in the field of friction processing (the joining of metals using a rotating tool to generate friction as an alternative to traditional welding), with a focus on process optimisation, modelling and material characterisation; develop and optimise innovative friction processing techniques; encourage publication in quality journals with high impact factors to strengthen the institute's international standing; strengthen the existing NRF-manufacturing technology niche area; and create a platform for expanding international collaboration through increased bilateral agreements with leading universities.

The entity's research achievements for 2009 included several international experiments, which were conducted by Prof Danie Hattingh in collaboration with various European testing facilities. These included Experimental Report III-Salsa Experiment 1-02-31. The aim of this study was to determine the effect of welding with nickel-based consumables on creep-aged alloys used in power plants and to investigate the influence of these weld repairs on existing residual life prediction models. The institute was also involved in the design and manufacturing of a portable taper stud welding platform, and were invited to take part in four international neutron and synchrotron diffraction experiments in France to the value of R3.5m. Furthermore, it participated in experiments on the characterisation of induction heat treatment effects on residual stress in friction taper stud welds at the University of Plymouth in March 2009. Another significant research highlight included the final commissioning of the R6.5m MTS-ISTIR friction stir welding research platform, enabling NMMU to make the first titanium friction stir welds in South Africa – placing it among an elite group of researchers in the world who are capable of this achievement.

Institute for Information and Communication Technology Advancement (IICTA)

The Institute for Information and Communication Technology Advancement (IICTA) significantly enhanced its research capacity in 2009.

Three active and prominent researchers from the Meraka Institute, all NRF-rated, were appointed as adjunct professors in the faculty and IICTA. Professors Paula Kotze, Alta van der Merwe and Marlien Herselman have boosted the supervision capacity of IICTA and have already enrolled many new Masters and PhD students. During 2009, IICTA was also involved in a number of community-oriented research projects. One was initiated at a local retirement village, with the objective of developing computer technology and software to enable pensioners to use electronic services like email and Skype in a secure and user-friendly manner.

The group working in the Health Informatics domain started a number of community-based research projects, while a "Living Labs" project was launched in Limpopo, with the aim of developing usable systems for use by entrepreneurs and spaza shop owners. IICTA also produced 12 papers at international conferences (including one that received a Best Paper Award), six papers at national conferences, four invited and keynote presentations, five journal articles and one book published.

Centre for Mechatronics and Manufacturing (CMM)

The Centre for Mechatronics and Manufacturing (CMM) endeavours to familiarise Mechatronics Engineering students with recent trends in advanced manufacturing technologies and mechatronics engineering.

CMM aims to conduct research activities that are strongly relevant to industry and, as such, is expected to play a vital role in establishing strong collaborative links between industry and academia. This is being achieved by the centre's focus on applying the principles of Mechatronics in order to realise innovative solutions for the technical issues encountered in various manufacturing environments. In 2009, CMM projects included: the design of a reconfigurable manufacturing system for die and mould production, the manufacturing of titanium clinical implants by laser-based technologies, and the accuracy of aluminium automotive components fabricated by machining. CMM currently has one MEng student focusing on "tool wear monitoring" and a PhD student studying "advanced machining of titanium".

Faculty Highlights and Achievements

National and International Research Collaboration

- National research collaboration included research undertaken as part of the Advanced Metals Initiative (AMI), which is managed by the Council for Scientific and Industrial Research (CSIR), with a specific focus on friction stir processing, laser cladding and friction stir welding (FSW) of light metals, such as titanium and its alloys. Furthermore, major contract research was completed for Eskom in the field of friction processing.
- Research was undertaken to establish whether thinner gauge sheet material could be used for the same safety requirements as their mechanically formed counterparts. Another project which concentrated on characterising the welding of titanium alloys for aerospace applications formed part of this programme. These projects were conducted in collaboration with the National Laser Centre.
- Other collaborative projects include the Lateral SA/Poland programme in the Manufacturing of Titanium Clinical Implants by Laser Based Technologies; Mechatronics and Digital Manufacturing through the Advanced Manufacturing Technology Strategy (AMTS) projects with the University of Pretoria and North-West University; and Information Security Governance with the University of Johannesburg.
- Social impact research reports, co-authored by Prof Kobus van Wyk, were produced in collaboration with the Camdeboo and Oudtshoorn municipalities.
- International research collaboration during 2009 included joint research projects with international partners including, among others, the ESRF (European Synchrotron Radiation Facility) in Grenoble, France, in the area of friction stir processing; the University of Plymouth and the Rutherford Appleton Laboratory at Oxford, UK, in the area of residual stress measurement; Steinbeiss Transfer Centre in Germany in the area of engineering structures; Silesian University of Technology (Poland) in the Manufacturing of Titanium Clinical Implants by Laser Based Technologies; Curtin University of Technology (Malaysia Campus) in the area of micromachining of ceramics; Chartered Institute of Housing (CIH) in the UK and the Institute of Housing Studies (IHS) in Rotterdam in housing; the International Council for Information Technology in government administration in the area of the impact of the cultural-context dimension on web design.
- Extensive collaboration with SAP Research Campus-Based Engineering Centre (CEC) led to a number of international projects, some of which have a local context, namely:
 - Project Tafari: a project under the auspices of the European Union FP7 programme, in collaboration with industries from Spain, Portugal and Germany, the CSIR in South Africa, and a university in Portugal.
 - A BRICS (Brazil, Russia, India, China, South Africa) research interest group collaboration initiative, benchmarking the ISO User Experience Standards in these countries.
 - C@R (Collaboration and Rural) Project: a “Living Labs” project under the auspices of the EU in collaboration with SAP Research and the CSIR Meraka, with the aim of developing usable systems for use by entrepreneurs and spaza shop owners in Limpopo.
 - Project Skua: a project to investigate the impact of culture on business processes in emerging economies, including Brazil, China, India, Turkey, Israel and South Africa.

Visiting Scholars

Visiting scholars included Prof Neil James, Plymouth University, UK; Prof Axel Steuwer, University of Lund, Sweden; Prof Lothar Issler, University of Applied Sciences, Esslingen, Germany; Dr Reinhardt Freudenburg and Mr Bjorn Dietrich, Aachen University; Prof Gloria Wiens, University of Florida in Gainesville, USA; Drs Giacomo Bianchi and Irene Fassi, Institute for Industrial Technologies and Automation, Italy; Prof Lech Janczewski, University of Auckland, New Zealand; and Prof Mikko Korpela, University of Eastern Finland, Finland.

Conference Facilitation

- Prof Danie Hattingh was requested by Apollo Scientific to be a guest speaker at the 18th Zwick TestXpo Materials Testing seminar in Germany, from 19 to 22 October 2009.
- Prof Annelize Els-Botes was a session chair at the Ninth International Conference on Computational Methods and Experiments, held in Carvoeiro, Portugal, from 9 to 11 June 2009.
- A workshop chaired by Prof Kobus van Wyk was facilitated between seven municipalities from South Africa and the Netherlands respectively, as part of an international twinning process, on 9 and 10 November 2009.
- The School of ICT hosted the 11th Annual Conference on World Wide Web Applications (ZA WWW), together with the Cape Peninsula University of Technology (CPUT), from 2 to 4 September 2009 in Port Elizabeth.

Research Capacity Development

- Continued funding from VWSA and DAAD ensured the International Chair in Automotive Engineering could maintain its momentum and required research outputs.
- The newly-acquired GMSA Chair in Mechatronics ensured the establishment of research opportunities in the field of mechatronics.
- Research facilitation was further developed by the research institutes and centres in the faculty. The Research and Outreach Unit for Technology Education (RoUTE) was established as a new unit during 2009, along with the Lean Interest Group.
- A number of staff members received funding from the faculty FresCAD programme during 2009. Further funding to facilitate research capacity was received from the NRF (Institutional Research Development Programme), NMMU, International Science Liaison, Technology and Human Resources for Industry Programme (THRIP), and the Phuhlisla Programme. In addition, financial assistance was provided to PhD students through the use of schools research funds.

Inter-Disciplinary and Multi-Disciplinary Scholarship and Research

Prof Darelle van Greunen was selected as one of 10 successful candidates, from 85 applicants, to participate in a knowledge exchange visit to Finland, a world leader in ICT Innovation. She visited Nokia Headquarters, Nokia Research, Aalto University, Tampere University of Technology and the University of Helsinki. Her visit focused on using mobile technologies to the advantage of poor communities in Small and Medium Enterprise (SME) sustainability, health services, education and government service delivery.

Awards

- An article co-authored by professors Neil James, Danie Hattingh and Dr Hannalie Lombard was awarded a certificate from the Elsevier Journal *Engineering Failure Analysis* for being the most-cited article for the period 2004 to 2008. The article was titled: *Residual stresses and fatigue performance*.
- Mechanical Engineering students Daniel Bulbring, Dirk Odendaal, Ian Wedderburn and Louis von Wielligh received first place at the NMMU Innovation Competition Awards Ceremony.
- Prof Winston Shakantu was awarded Winner of Best Overall Paper for his paper *Gazing into the construction SMME crystal ball: Deciphering the cryptograph* at the Sixth Construction Industry Development Board (CIBD) Postgraduate Conference in September 2009.
- Dr Kerry-Lynn Thomson received the Best Paper Award at the Eighth Annual Security Conference in Las Vegas, Nevada.
- Prof Marlien Herselman, an adjunct professor, received the Institute of Electrical and Electronics Engineers (IEEE) Women in Engineering Female Scientist of the Year Award.

Dean's Overview



Prof Raj Naidoo, Executive Dean, Faculty of Health Sciences

Investing in the Long-Term

In South Africa, the challenges related to Health Sciences are many – among them improving the quality of nursing in our public hospitals, promoting responsible drug use and pioneering new therapeutic agents in the fight against diseases like HIV/Aids, cancer and diabetes. The development of healthy children into contented adults, determined to reach their potential, remains another challenge. In all these areas, NMMU's Faculty of Health Sciences strives to make a difference. Staff continue to conduct quality research relating to our overarching theme, Optimising Lifespan Development and Performance, along with the established sub-theme, Lifespan Career Development (see page 16). Another key theme which has developed across several faculties is Health and Disease Management Responsive to Regional Needs. Such research includes: therapeutic interventions for chronic disease management, clinical health psychology, the prevention and management of lifestyle diseases (e.g. diabetes, obesity) through physical activity, environmental health and disease management, health and welfare systems research, care of vulnerable groups, medicinal plants (biological screening), pharmacological drug and product development and optimisation (specifically, cyclo peptide research).

2009 was a busy year for the Drug Utilisation Research Unit (DURU) and the Cyclic Dipeptide Research Unit (CDRU) resulting in a number of DOE-accredited journal articles, with many others included in professional journals. Also to be commended is the Department of Nursing Science, for their efforts in improving the quality of nursing across the province. Working hand-in-hand with the Department of Health, Dr Esmeralda Ricks is project-managing a United States funded R13.8-million three-year project – called

Sokhula Sonke (see page 51). 2009 saw a total of 33 Masters degrees (10 for research Masters) and five Doctoral degrees awarded in 2009. We also have 39 Masters dissertations, 74 Masters treatises and 42 Doctoral theses in progress. Our staff members continue to serve on a number of journal review boards. Special mention must be made of Prof Dalena van Rooyen and Ms Portia Jordan in the Department of Nursing Science, who were two of the editors of the book *Foundations of Nursing Practice: Fundamentals of Holistic Care* (African edition), published in 2009. Contributors included nursing science staff Prof Nita Strumpher, Dr Ricks and Mr Herman Willemse.

Our research once again benefited from extensive international collaboration, with Prof Watson, Prof Stroud and Dr Zinzi Nqweni, from the Psychology Department, forging stronger ties with their international collaborators in Australia, the United Kingdom and the United States. Dr Ricks is about to embark on a project in collaboration with the University of Gothenburg in Sweden on "Barriers to health care and the right to health for mental illness sufferers in South Africa: how can access be improved". We continue to strive for research excellence, and are confident that 2010 will build on the successes of 2009.

Yours sincerely,

A handwritten signature in black ink, reading "R. Naidoo".

Prof Raj Naidoo
Executive Dean: Faculty of Health Sciences

Faculty Researcher of the Year



Prof Mark Watson, Faculty Researcher of the Year

For more than a decade, Psychology Professor Mark Watson has studied the changing career aspirations and occupational knowledge of 45 children – following them from grade R to grade 12 – in an attempt to understand why young people sometimes make the wrong career choices.

His work has led to a valuable career assessment tool, *My Systems of Career Influences* (MSCI), which helps pupils realistically identify career options. The tool, which is being translated for use overseas, has proven especially effective when used among black adolescents (from varying socio-economic backgrounds) in South Africa. It has also been adapted for adults and following successful trials in South Africa is now also used in Australia and the United Kingdom.

Prof Watson recently embarked on collaborative career research with Psychology Head of Department Prof Louise Stroud, who specialises in measuring developmental trends indicative of mental growth in young children, using the Griffiths Mental Developmental Scales-Extended Revised (GMDS-ER), to test whether a child who is advanced at a young age will have career aspirations that differ from his peers.

In terms of adult career development, Prof Watson has extended his focus to include the career choices of women aged 45 to 65, as part of an international study in collaboration with The University of Queensland, Australia, and The University of Warwick in England. "For the South African sample, I am focusing specifically on isiXhosa-speaking women across a range of careers. The idea is to look at the transitions they have had to face along their career paths." The study has since been expanded to include women in Italy and Germany.

Prof Watson is also a Research Associate of The Institute of Employment Research at The University of Warwick and an adjunct professor at three Australian universities.

Emerging Faculty Researcher of the Year

Neck Strength: Implications for Sport and General Health

With back and neck pain one of the highest reasons for absenteeism at work, and neck strength one of the much-discussed factors in sports like rugby, Biokineticist Dr Pierre Olivier chose this little-researched area for both his Masters and recently-completed Doctoral studies.



Dr Pierre Olivier (right), Emerging Faculty Researcher of the Year, tests the neck strength of HMS student Wade Cummings.

Faculty Research Theme

Theme	Driver
Optimising lifespan development and performance	Prof Mark Watson

"I've always been interested in rugby – that sparked my interest in neck strength." His Masters research saw him analysing the neck strength of key provincial players, including members of the Sharks, Lions, Free State and Border. "I wanted to determine if there was a difference in the neck strength of players in different positions, and found that the neck strength of the forwards was definitely stronger than the backline players, in terms of their dynamic movements." He was also able to compare his data with school-boy data, collected by another Masters student, to compare the neck strength of senior players to that of school boys in the same positions on the field. "I wanted to test whether playing in a certain position resulted in developed neck strength, for instance, as a player moves from being a prop at school to playing at club level."

His DPhil studies saw him determining whether neck strength between men and women differed and whether changes in neck strength occurred as men and women aged. His sample group of 221 men and 231 women ranged from 19 to 69 years in age. Using dynamic isokinetic measurements, Dr Olivier found there was indeed a difference in the neck strength between men and women. "What was also interesting was that women's neck strength did not change as they became older, whereas the neck strength of men in the older age group was definitely weaker than their younger counterparts." Both studies highlighted the need for regular neck muscle exercises.

Staff Doctorates

Dr Hester de Mendonca obtained a DCur for her research on *Guidelines for the management of patients with diabetes mellitus at health care clinics in the Cacadu Region of the Eastern Cape province in South Africa*.

Former Nursing Science employee Dr Louisa Jantjes obtained a DCur for her research on the *Inter-level health referral of labouring women*.

Dr Nomazwi Tembani, a part-time student in the Department of Nursing Science, obtained a DCur for her research on *Strategies to facilitate collaboration between allopathic and traditional health practitioner*.

Biokineticist Dr Pierre Olivier, a Lecturer in the Department of Human Movement Science, obtained his DPhil in 2009, with his thesis titled: *Isokinetic force profile of the cervical spine in a healthy adult urban South African population*. (See above).

Dr Maria Hüttenrauch, currently in Canada, obtained a DPhil for her study, *Utility of the cognitive system (CAS) to predict reading proficiency in Grade 1*.

Research Highlights

Monitoring Medicine Use in South Africa



Prof Ilse Truter, Director of the Drug Utilisation Research Unit

Through her work in the under-researched area of medicine use in South Africa, Prof Ilse Truter, Director of NMMU's Drug Utilisation Research Unit (DURU), is hoping to detect and monitor patterns of medicine abuse and misuse and, in doing so, promote responsible medicine use.

Prof Truter said most people had developed a casual attitude towards Western medicine, forgetting that it was "a chemical ingredient they are taking into their bodies, which will alter them in some way". Consequently, over-the-counter abuse and over- and under-prescription can easily go unnoticed – especially in countries like South Africa, where there are few established norms for drug use. To plug this gap, Prof Truter is developing accurate patterns of usage for a variety of medicines, including those that affect the central nervous system, among them painkillers, antidepressants, anxiolytics (anti-anxiety medicine), drugs prescribed for Attention-Deficit Hyperactivity Disorder (ADHD) and, most recently, Alzheimer medication and medicine for Parkinson's disease.

"Alzheimer's disease is increasing worldwide. However, it is a condition for which there is a limited and very expensive spectrum of available medicines that are effective. Furthermore, more elderly people are often being prescribed anti-psychotic drugs, despite a number of warnings that this can lead to a higher mortality rate, especially when given to people with dementia."

Prof Truter, who holds Doctoral degrees in both Business Management and Pharmacoepidemiology, is also conducting follow-up research on studies conducted by two of her postgraduate students some years back on the high usage of antidepressants among children. "Again, there have been warnings

worldwide about giving children anti-depressants. We want to see if these have made a difference on the prescription and use of these drugs for children.” She said some research had shown that anti-depressant use by children can lead to an increase in suicidal tendencies.

Prof Truter’s research unit has produced 48 refereed research articles and delivered more than 300 local and international conference presentations.

Pioneering Community Nursing Research



Dr Esmeralda Ricks, Senior Lecturer, Community Nursing Science

As a young girl, Dr Esmeralda Ricks dreamed of working in medicine – yet her father’s untimely death and a lack of resources saw her dropping out of school at 17 and working in a zip factory. The mind-numbing work did little to crush her dreams though, and she followed the advice of a friend to finish her matric part-time and go into nursing. “I just always wanted to be successful.”

Today, Dr Ricks – a Senior Lecturer and Programme Manager for Community Nursing Science – is determined to improve the lives of nurses and patients, through various innovative community nursing research projects.

Firstly, working hand-in-hand with the Department of Health, she is managing a R13.8-million three-year project – called *Sokhula Sonke* (we will grow and build together) – which aims to improve the training and research capacity of Lilitha College of Nursing, which produces the majority of nurses in the Eastern Cape. The project is being funded by Atlantic Philanthropies in the United States.

As part of her research, she has completed an assessment phase to identify areas of improvement, which has led to the implementation of a number of short-learning programmes

for both academic and administrative staff. The project will also address governance structures at Lilitha, bringing it more in line with higher education institutions, with the aim of improving students’ qualifications.

Dr Ricks also spearheaded a highly-successful project, funded by US-based AED-Satellife, which saw a trial group of 50 nurses at the Port Elizabeth Hospital Complex being able to access information (e.g. on HIV/Aids or TB, for example) via a smart phone at the point of care (the patient’s bedside). “I conducted the research necessary to implement this project, and then evaluated its success.” The concept will ultimately be rolled out elsewhere. “It will be particularly useful in deep rural areas.” Dr Ricks presented her findings at conferences in the United States and South Africa.

NRF-Rated Researchers

Milne, PJ, Prof	C3
Truter, I, Prof	C2
Watson, MB, Prof	B3

Faculty Highlights and Achievements

National and International Research Collaboration

International research collaboration included the following:

- The Nursing Science Department’s Dr Esmeralda Ricks, with BCur Hons student Valencia Benjamin completed a study for a US-based private company (AED-Satellife) marketing hand-held mobile computing devices. It involved doing a situational analysis to determine the knowledge needs of professional nurses working in primary health care clinics. The computing device was then utilised by the nurses and an evaluation of the success of the project was completed.
- In the Psychology Department, several researchers forged strong ties with international research collaborators. Prof Mark Watson worked closely with Dr Mary McMahon from the School of Education, University of Queensland in Australia. Prof Louise Stroud developed links with the Association for Research in Infant and Child Development (ARICD), United Kingdom, while Dr Zinzi Nqweni worked closely with Prof Ellen Pinderhughes, of Tufts University, Boston, in the USA.
- In the Health Sciences Department, Prof Rosa du Randt was elected as a South African representative to the Council of Representatives of the International Association for Physical Education and Sport for Girls and Women, in August 2009.

National research collaboration included the following:

- Prof Ilse Truter, of the Pharmacy Department, has been recognised by the National Research Foundation in that she serves on a panel to review applications for rating in Health Sciences, serves on the NRF panel to evaluate proposals for funding for non-rated scientists in Health Sciences, and reviewed three funding proposals of postgraduate students for the NRF.
- Also in the Pharmacy Department, Prof Pieter Milne collaborated closely with the Medicine Control Council (MCC) on a number of research-based reviews, namely: new chemical entities, and the safety, quality and efficacy on medicines for drug registration by the Medicine Control Council.
- Pharmacy's Shirley-Anne Boschmans was elected to the South African Pharmacy Council (2009 to 2013). She serves on the following committees: Education Committee of the South African Pharmacy Council, Practice Committee of the South African Pharmacy Council and the Continuous Professional Development (CPD) Committee of the South African Pharmacy Council.
- Health Sciences' Prof Rosa du Randt serves on the Executive Board of the South African Association for Human Movement Sciences (SAAHMS), where she is responsible for the research portfolio.
- Prof Du Randt also serves on the Scientific Advisory Committee of the National Department of Sport and Recreation (Sport and Recreation South Africa) and advises on research matters.

Visiting Scholars

The Department of Pharmacy's Prof Pieter Milne hosted Ms Chris Jansson from the University of Gothenburg, Sweden, from August to October 2009, to investigate the medicinal properties of selected halogenated cyclic dipeptides or diketopiperazines (DKPs).

Research Capacity Development

- The faculty's Research Technology and Innovation Committee organises an annual Prestigious Student Research Conference where selected fourth year/Honours, Masters degree and Doctoral students present podium and poster presentations. This event took place on 8 October last year.
- In the Biomedical Technology Department, three students from the Southern African Development Community (SADC) region completed their MTech research degrees during 2009. Robert Chinyama studied the biological activities of medicinal plants traditionally used to treat septicaemia in the Eastern Cape (*cum laude*). Keneuoe Mohlakoana studied the microbial activity of selected Eastern Cape medicinal plants and David Lubasi researched optimising the recovery rate of *mycobacterium* species from gastric lavages in children at an urban Zambian hospital.



Inter-Disciplinary and Multi-Disciplinary Scholarship and Research

- Inter-faculty research on the biological activities of medicinal natural products involving the Department of Biochemistry and Microbiology in the Faculty of Science and the programme of Biomedical Technology in the Faculty of Health Science resulted in the publication of an article in *Pharmaceutical Biology*.
- DCur student Hester de Mendonca's study on guidelines for the management of *diabetes mellitus* at health care clinics in the Cacadu region of the Eastern Cape was part of interdepartmental health research between the departments of Nursing Science and Biochemistry and Microbiology (Science Faculty).
- A Masters study conducted by Joy Cairncross on *The effect of strength-based resistance training on insulin resistance* resulted in interdepartmental co-operation between the Human Movement Science (Health Sciences) and Biochemistry and Microbiology (Science) departments in that the blood analyses required for the project were conducted under the supervision and guidance of Prof Saartjie Roux. This project has paved the way for further collaborative work in future.

Awards

- In 2009, Prof Ilse Truter from the Pharmacy Department received an award from the Academy of Pharmaceutical Sciences for the best publication in Pharmacy Practice in South Africa in 2008. The title of the publication was *The Women's Health Initiative Study: Individualisation of Hormone Replacement Therapy in a Defined South African Population*. It appeared in *The International Journal of Pharmacy Practice*. She was also the co-recipient of the Best Publication Award in Clinical Pharmacology in South Africa in 2008 (received from the South African Society for Basic and Clinical Pharmacology). The title of the publication was *Prevalence of possible drug-drug interactions between antiretroviral agents in different age groups in a section of the private health care sector setting in South Africa*. It appeared in the *Journal of Clinical Pharmacy and Therapeutics*. She was also the recipient of a Senior Investigator Bursary from the European Association for Clinical



Pharmacology and Therapeutics (EACPT), and her name will be included in *Marquis Who's Who in the World*, 27th edition (in 2010).

- Prof Truter has also been appointed as an evaluator of courses for The South African Pharmacy Council. Her role is an *ad hoc* evaluator of courses leading to a certificate of qualification for pharmacist's assistants (basic and post-basic) in all sectors (that is, community, hospital, wholesale and manufacturing pharmacy) as well as of short courses/continuing professional development (CPD) courses - 2009 to 2011.
- Prof Truter evaluated (graded) abstracts for the Scientific Committee of the 25th International Conference on Pharmacoepidemiology & Therapeutic Risk Management on Rhode Island, USA, from 16 to 19 August 2009.

Dean's Overview



Prof Vivienne Lawack-Davids, Executive Dean, Faculty of Law

Determination to Further Extend our Research Capability

One of the strategic objectives of the Faculty of Law is to create an environment which is conducive to research and innovation. Accordingly, 2009 was abuzz with research activity within the faculty – largely due to our new mentorship programme.

In 2008, we “connected” established researchers with emerging researchers through informal mentorship arrangements in an effort to heighten the faculty’s research activity. The formalisation of these mentorship arrangements was identified as a key strategic objective for 2009 in our Research Strategic Plan. This was achieved in partnership with Dr Blanche Pretorius, Director of Research Capacity Development, who conducted two mentorship workshops within our faculty.

As 2009 progressed, it became clear that the mentorship project was bearing fruit, as evidenced by the continuing heightened research activity in the faculty and the spirit of enthusiasm which accompanied the cementing of relationships between mentors and mentees. Two of the mentees are featured in this year’s report, namely David Abrahams, whose area of expertise is International Humanitarian Law, and Lynn Biggs, who specialises in Legal Skills and Labour Law.

The faculty’s other successes included our hosting of the Seventh Eastern and Western Cape Law Conference in January 2009, which is aimed at emerging researchers in law. This conference has since been expanded to include emerging researchers in law from across the country. The conference was capably organised by Prof Elmarie Knoetze, assisted by third-year law student Silicia

Scheppel. All four of the departments within the faculty finalised their research themes in alignment with the overall faculty research theme: Legal Research in Response to Societal Needs. The golden thread to it, equity and justice, is apparent. To this end, the Department of Public Law held a colloquium, organised by David Abrahams, where members of the department, together with Family Law and Law of Persons expert Adv Razaana Denson, examined the issue of Palestine vs Israel from a legal point of view, showing our students how one can conduct research and examine highly emotive issues from a legal perspective.

The Department of Private Law showcased their research and organisational abilities in hosting the university’s first International Private Law conference (see page 56), with the conference theme being ‘The Role of Private Law in the Context of Social Justice’. The Faculty of Law values and recognises the contributions made by all its legal scholars, hence our first “Law Oscars” early in December 2009. I am positive that the broadening of our research base in 2009 and the creation of a research spirit within the faculty will continue to bear fruit and advance our legal scholarship.

I would like to use this opportunity to thank all the scholars in the faculty who tirelessly contributed to our research mission and vision, despite their challenging teaching engagements.

A handwritten signature in black ink, reading 'Vivienne A Lawack-Davids'.

Prof Vivienne A Lawack-Davids
Executive Dean: Faculty of Law

Faculty researcher of the year



Prof Henk Delpont, Faculty Researcher of the Year

When it comes to property and estate agency law, Mercantile Law Professor Henk Delpont is one of the South Africa's leading experts. His research has been quoted favourably in the Supreme Court of Appeal, and his book *South African Property Practice and the Law*, now in its sixteenth revised edition, is still regarded as a must-have reference tool by practitioners across the country.

"The dynamics of property law cannot be understood properly without ongoing dedicated research," said Prof Delpont, who has always been determined to "be an authority" in the subjects he teaches. "I have always been eager to get to the bottom of a matter – to know exactly what the law says about specific issues."

Prof Delpont, who completed his studies up to LLD level at the University of Pretoria, has also completed extensive research on the sale and lease of land, as well as estate agency practice and ethics. In the future, he aims to delve more comprehensively into land tenure law.

Prof Delpont joined NMMU (then the University of Port Elizabeth) in 1979 and, four years later, established the Bureau for Mercantile Law which, over 26 years, published 155 editions of *Commercial Law Bulletin*. He is the author of the code of conduct for estate agents as well as the code of conduct for managing agents,

adopted by the National Association of Managing Agents. He has acted as an arbitrator in many property-related disputes and has presented over 400 property practice seminars both nationally and abroad. Prof Delpont retired as Head of the Department of Mercantile Law last year.

Emerging Faculty Researcher of the Year

There was no Emerging Researcher of the Year for 2009.

Research Highlights



David Abrahams, Law Lecturer

Playing Fair in War

In 2008, Law Lecturer David Abrahams became the first South African to obtain an international Masters degree in International Humanitarian Law – the laws of war – a highly-specialised branch of International Law. Prior to completing this degree at the University of Geneva in Switzerland – studies which delved into the protection of civilians during armed conflict, and the means and methods in which conflict-ing parties should engage during war – he had already developed the country's first stand-alone elective module in this area. He is about to embark on his Doctorate in this field, also in Switzerland.

Faculty Research Theme

Theme	Driver
Legal research in response to societal needs (social responsiveness)	Prof Vivienne Lawack-Davids

Mr Abrahams's paper investigating whether the United States has the right to intervene in Iran's nuclear weapons programme was published in the *South African Yearbook of International Law*, while another paper on gang violence in South Africa was accepted by the *International Review of the Red Cross*, an accredited international journal based in Switzerland.

For his Masters thesis, he examined the missing penal element in South Africa's Truth and Reconciliation Commission (TRC). "The TRC had forgiveness at its core, and turned a blind eye to international criminal justice, despite instances of gross human rights violations in South Africa at the hands of the apartheid government."

Mr Abrahams, who also has a Masters degree in Labour Law, has been lecturing at NMMU since 2007. As part of the Law Faculty's initiative to grow emerging researchers, he is being mentored by Public Law Associate Professor Avinash Govindjee, and was jointly named the 2009 Faculty of Law Mentee of the Year.

Examining How Law Students Learn



Lynn Biggs, Law Lecturer

Law Lecturer Ms Lynn Biggs is conducting innovative research into the impact of teaching and learning strategies in the little-researched area of Legal Skills, a compulsory module in South African Law degrees. She was one of several up-and-coming researchers selected for an intensive mentoring programme to grow the research output within the Law Faculty.

Mentored by Public Law Associate Professor Avinash Govindjee, Ms Biggs was jointly named the 2009 Faculty of Law Mentee of the Year. She has several research papers in the offing, and is in the process of publishing articles together with the Faculty of Education.

Ms Biggs presents the module Legal Skills, which covers the literacy and numeracy skills (taught in collaboration with NMMU's Mathematics Department) required in Law. Topics include where

to find legal information, how to write legal papers, advocacy skills (arguing a case) and numeracy (e.g. working out the necessary percentages and ratios required to calculate damages, maintenance, etc). "This is a skills-based area, so the teaching is very different to the more traditional fields of Law. You have to change the presentation, assignment and assessment styles. I make use of blended learning – a combination of classroom-type learning and e-learning (where the students work online)." Her research examines how students embrace this type of learning, what changes are involved (compared to traditional teaching) and how this impacts on student results.

Ms Biggs works closely with the Centre for Access, Assessment and Research (CAAR), which assesses all first year law students' levels of numeracy and literacy. She then compares these results with those the students achieve on completing her module. "I categorise the students according to these results, with the lower-level students expected to attend more contact sessions ... I would like to track the students' progress over the four years of their law degree studies." Teaching and learning strategies will be adapted according to the needs of the students. Ms Biggs graduated with her Masters degree (*cum laude*) in Labour Law in 2009.

Highlighting the Emerging Social Slant of Private Law



Prof André Mukheibir, Head of the Department of Private Law

Prof André Mukheibir, Head of the Department of Private Law, organised NMMU's first international private law conference on the role of private law in the context of social justice, which took place from August 25 to 26, 2009.

The conference coincided with the inaugural lecture of the Law Faculty's first Honorary Professor, Prof Eltjo Schrage of the University of Amsterdam – one of Europe's leading private law professors. Other speakers included academics from law faculties across the country and abroad.

Prof Mukheibir explained that Private Law was traditionally seen

as “elitist” as it governed individual relationships (for example, the parties to a contract), but took little notice of the broader social context, in terms of which the parties in a private law relationship are not necessarily equal. “The Consumer Protection Act will make certain contractual provisions illegal and unenforceable, which will essentially prevent people from entering into contracts that could be prejudicial to them. Whereas before the notion of contractual freedom and the resultant rule that parties are bound to contracts concluded by them applied, now the fact that a party consented to a term in a contract will not necessarily mean that party is bound – if that term is prohibited in terms of the Consumer Protection Act, it will be unenforceable.”

The social aspect of Private Law can also be seen in other branches of the Law, namely Family Law and Law of Property. Prof Mukheibir, who specialises in the Law of Delict, began her Law studies at NMMU, and went on to obtain her Doctorate at the University of Amsterdam.

NRF-Rated Researchers

Bohler-Muller, N, Prof	Y2
Knoetze, E, Prof	Y2
Vrancken, PHG, Prof	C3

Faculty Highlights and Achievements

Visiting Scholar

On 26 August 2009, the first Honorary Professor of NMMU’s Faculty of Law, Prof Eltjo Schrage, delivered his inaugural lecture ‘The Role of Private Law in Promoting Social Justice’ at the university’s first international Private Law Conference (which was arranged to include the inaugural lecture).

Conference Facilitation

- The Department of Private Law held its inaugural Private Law Conference with the theme “The Role of Private Law in Promoting Social Justice” on 27 and 28 August 2009. The conference featured a variety of speakers of national and international renown and covered the traditional themes in Private Law, namely Contract, Delict, Unjustified Enrichment and Property Law.
- The Department of Public Law held a panel discussion on 27 February 2009 titled *Hamas v Israel – Separating ius ad bellum from ius in bello*. The panel discussion, which highlighted International Humanitarian Law, focused on the legal and humanitarian issues surrounding ‘Operation Cast Lead’. This was an attack which took place on 27 December 2008, when Israel launched a wave

of airstrikes on the Gaza Strip with the stated intention of stopping rocket fire from Gaza. Both Hamas and the Israeli armed forces engaged in hostilities until 21 January 2009, resulting in about 1 400 Palestinian and about 13 Israeli fatalities. A number of academics delivered papers, including Advocate Razaana Denson.

Research Capacity Development

- The Faculty of Law conducted three postgraduate workshops in 2009, which culminated in panel discussions during which LLM and LLD students presented their research proposals to research panels, consisting of supervisors and departmental members of faculty. In addition, some of the faculty staff and students participated in a joint postgraduate research workshop with staff and students from the respective faculties of Law at Rhodes University and Fort Hare.
- Lecturer Lynn Biggs has been participating in the NMMU Phuhlisca Programme since January 2009 and attended a number of workshops. The Phuhlisca programme requires that a mentor/mentee relationship be established. The programme sponsors R10 000 research funding to each mentee each year.

Awards

The first “Law Oscars” included the following research awards:

- The Best Mentor Award went to Prof Avinash Govindjee. The Best Mentee award was shared by David Abrahams and Lynn Biggs (both mentored by Prof Govindjee), who respectively published articles in accredited law journals and delivered papers at conferences. Biggs delivered a paper on *Legal Skills at the Law Conference* for the Universities of the Eastern and Western Cape, while Abrahams delivered a paper at the Law Teachers’ Conference in July 2009 and was appointed on the editorial board of the African Yearbook on International Humanitarian Law. An award for Publication in High Quality/International Journals with a high impact factor was made to Prof Patrick Vrancken for his consistent contributions to international journals.
- The Most Improved Researcher award was received by Advocate Razaana Denson, who produced a number of publications in 2009. She also delivered a paper at the Law Teachers Conference and her paper at the inaugural Private Law Conference was selected by Prof Eltjo Schrage as the best paper delivered at conference.
- Two awards were made in the category of Researcher most aligned to Faculty Research Theme – one to Prof Adriaan Van der Walt for the research he conducted in South Africa and Mauritius under the auspices of the Labour and Social Security Law Unit. The second award went to Prof Narnia Bohler-Muller who, under the auspices of the Research, Technology and Innovation (RTI) committee, hosted two postgraduate workshops this year, thereby building the capacity of our postgraduate students.

Dean's Overview



Prof Andrew Leitch, Executive Dean, Faculty of Science

Faculty of Science becomes an African and Global Leader

The Faculty of Science had an excellent year in the way of research and innovation activities during 2009. A record number of 47 Masters (by research) and 18 Doctoral students graduated in 2009. This may be directly attributed to the hard work of the previous year to improve throughput rates of its research students. Our Doctoral graduates included four academic staff to bring the number of faculty members with completed Doctorates to 60% of its academic complement. Our postgraduate activities continue to draw increasing numbers of students from other parts of the country – attracted to NMMU by the unique focus of our research programmes. Similarly, the number of international postgraduate students continued to increase in 2009.

The faculty also had a record number of papers in Department of Education-accredited journals. In fact, the Science Faculty's contribution made up 40% of NMMU's contribution. The majority of these publication outputs were in international journals listed by the Institute of Scientific information (ISI). Furthermore, one provisional patent application was filed (Physics), one South African patent application was filed (Chemistry), and three Patent Cooperation Treaty (PCT) applications were filed (one from Physics and two from research undertaken by InnoVenton, the Institute of Chemical Technology). For all the patent applications, discussions are under way with the private sector to take them to the market (see page 20).

An application by Prof Jan Neethling (Department of Physics) for a high resolution transmission electron microscope (HRTEM) was

approved by the Department of Science and Technology. The cost of the project (R130m) is enormous: it will cover the acquisition of a series of high quality electron microscopes, and the construction of a special building to house the equipment. Sufficient space has been incorporated in the design to host visiting students and academics. This will enable the faculty to become the leader in Africa – and one of the leading institutions in the world – in the area of electron microscopy studies down to atomic resolution. The delivery of the high resolution electron microscope (currently being built in Japan), is planned for mid-2011. Several new research projects that cut across traditional disciplinary lines were initiated during 2009. They include a project in the Department of Statistics to study the wind energy distribution statistics for future wind turbines in the Eastern Cape, in partnership with the Centre for Energy Research (CER). The faculty was engaged in many other research and innovation projects funded by government, industry and NGOs during 2009 – far too many to list.

The excellent research achievements of 2009 would not be possible without the commitment of the highly-qualified academic and professional support staff, who are an asset to NMMU. Many of them have NRF ratings and are experts in their fields of expertise; many of them are internationally-recognised as leaders. Their dedication is gratefully acknowledged.

A handwritten signature in black ink, appearing to read 'A. Leitch'.

Prof Andrew Leitch
Executive Dean: Faculty of Science

Faculty Researcher of the Year



Prof Tommy Gerber, Faculty Researcher of the Year

Cutting-Edge Cancer Treatment with Fewer Side Effects

Professor of Inorganic Chemistry Tommy Gerber is conducting revolutionary cancer research, which could ultimately minimise the harmful side-effects of existing treatment.

"I work with technetium (a metal created by a nuclear reaction) and rhenium. They emit radiation, which is used in the diagnosis and treatment of cancer respectively." Compounds of these metal isotopes – created by binding them to other atoms and chemical groups, including phosphates, oxygen, nitrogen and sulphur – are chemically programmed to move via the bloodstream to specific organs. "For instance, if you bind technetium to a phosphate, it will locate in the skeleton."

Technetium, which is used for diagnostic purposes, emits gamma-radiation from inside the body when the compound reaches its destination organ – allowing doctors to obtain a nuclear image

of the organ, using a special gamma-ray camera. "Doctors don't have to cut you open to see what is wrong." Rhenium, which emits beta-radiation, actually irradiates cancer from inside the body. "It allows for localised *in-vivo* treatment of cancer." While some technetium compounds are already on the market worldwide, rhenium is still undergoing clinical trials. "Current cancer treatments – chemo-therapy and radiation from outside of the body – have so many side-effects as they damage healthy cells along with cancer cells. This technique specifically targets the tumours, leaving the healthy cells unharmed."

Prof Gerber, who collaborates with scientists from all over the world, has published 146 international papers on his work, which have appeared in top scientific journals on every continent in the world, bar Antarctica. He has chaired 11 international conferences on the topic, and has been external examiner of 38 PhD theses from universities worldwide.

In addition to his cancer research, Prof Gerber – who completed his BSc at the then University of Port Elizabeth (now NMMU), his BSc Honours and Masters degrees at the University of the Free State, and his PhD through Unisa – is also exploring the early diagnosis of Alzheimer's.

Emerging Faculty Researcher of the Year

Investigating the Role of Radio-Active Metals in Medical Applications

After 16 years of working on rhenium – a radio-active metal which is the subject of revolutionary global research into cancer treatment – Dr Abubak'r Abrahams has shifted his focus to lanthanides, which has a similar medical application.

"It is similar to rhenium but, because there are 14 different lanthanides, its scope is much broader." Dr Abrahams has chosen to focus on gadolinium, the main lanthanide in the group, which

Faculty Research Themes

Themes	Drivers
1. Energy for the future	Prof Ernest van Dyk
2. Environmental and natural resource management	Dr Derek du Preez
3. Novel materials, products and processes	Prof Ben Zeelie
4. Science education for a changing world	Prof Werner Olivier
5. Next generation ICT solutions	Prof Janet Wesson



Dr Abubak'r Abrahams, Emerging Faculty Researcher of the Year

is used as a therapeutic agent in the treatment of cancer, as a contrast agent (used to enhance the contrast of structures or fluids within the body) in magnetic resonance imagery (MRI scans), and

in sensors (devices that measure a physical quantity and convert it into a readable signal). There are not many people in South Africa conducting research on lanthanides. "It is cutting-edge research – so very exciting. I would like to become the national authority in this field."

His work on rhenium, conducted in collaboration with Prof Tommy Gerber, saw him using coordination chemistry to combine the radio-active isotope to other atoms or chemical groups, including nitrogen, oxygen, sulphur and carbon – elements usually found in the human body. Injected intravenously, these special compounds start emitting radiation once they reach a targeted organ, destroying cancerous cells from inside the body.

Dr Abrahams obtained his BSc, Honours and Masters degrees at the then University of Port Elizabeth (now NMMU) before working as a lecturer at the then Vista University (now merged into NMMU) from 1997 to 2006, where he completed his PhD. He has presented his work at a number of national and international conferences – the latter taking him to Mexico, Saudi Arabia, Japan, Scotland and Germany.

Staff Doctorates

Dr Abubak'r Abrahams completed his PhD on The Coordination Chemistry of Rhenium (V) with *Multidentate NO-donor Ligands*. He is profiled above.



Chemical responses in biological systems frequently depend on a "hand and glove" type of interaction between a chemical in the form of a drug, and a receptor site in an organism. Therefore it is necessary for the drug to have the correct "handedness" in order to interact correctly with the receptor site. Consequently there is great interest in developing methods for synthesising compounds selectively with the correct "handedness". In her Doctoral thesis titled *Novel Camphor Derivatives as Potential Asymmetric Alkylation Auxiliaries*, Dr Neliswa Mama, a Lecturer in the Chemistry Department, has investigated the use of asymmetric camphor substituents to impose the correct "handedness" when reactions are carried out elsewhere in a molecule.

Chemical responses in biological systems frequently depend on a "hand and glove" type of interaction between a chemical in the form of a drug, and a receptor site in an organism. Therefore it is necessary for the drug to have the correct "handedness" in order to interact correctly with the receptor site. Consequently there is great interest in developing



Dr Marguerite Walton, a Lecturer in the Department of Mathematics and Applied Mathematics, graduated in 2009 with a PhD in Mathematics Education, in which she researched the mathematical requirements of first-year BCom students at NMMU. Her aim was to contribute towards clarifying mathematical requirements that

would enhance the chances of successful BCom studies at South African universities. "My study also draws the contours for starting to design an efficient support course for future 'at risk' students who enter higher education studies."



The digital age has seen people becoming increasingly reliant on high-tech products like cell phones, digital cameras, website and social networking software, which require a combination of computer software and hardware to work. To create these digital interactive products requires creative and careful design, an area which

Dr Lester Cowley, Senior Lecturer in the Department of Computing Sciences, chose to investigate for his PhD in Computing Sciences. His Doctoral thesis was titled *An investigation into the use of guidelines and patterns in the interaction design process*.

Research Highlights

Alien Vegetation Linked to Desertification and Climate Change

Could the invasion of alien Karoo vegetation into the once-fertile area of Ngqushwa (Peddie) in the Eastern Cape – resulting in a microcosm of desertification – be linked with climate change? Head of Geosciences, Professor Vincent Kakembo, has good reason to think it can. Prof Kakembo and his team of students, in collaboration with the University of Amsterdam, have been investigating this phenomenon through a three-year R600 000 South African Netherlands Research Programme on Alternative Development (Sanpad) project, which ends in 2010.

They have also been monitoring the implications of the alien invasion for hydrological (water run-off and absorption) and erosion response. A custom-built rainfall simulator has helped Prof Kakembo and his team determine water run-off, and the sediments contained within it.

The Ngqushwa district communal lands – once fertile fields used to cultivate crops, since abandoned – is one of several Eastern Cape areas severely affected by soil erosion. Land degradation, caused by soil erosion, deforestation and other factors, leads to disturbances of carbon sequestration on land. “What is the fate of soil carbon on eroded lands? This is one of the questions the team is trying to unravel,” said Prof Kakembo. Part of Prof Kakembo’s research is



Prof Vincent Kakembo, Head of Geosciences

quantifying just how much carbon is either lost to the atmosphere or stored in sediment sink zones – and how this impacts on environmental change. But he is also looking at ways to rehabilitate the degraded areas.

“Regeneration and restoration is a very long process, as much of the grass seed bank has been lost ... However, a number of trial plots (established in collaboration with the community) is proving successful.”

Polish Study Awards for Leading Conservationist and student

Prof Graham Kerley, Director of the Centre for African Conservation Ecology (ACE) and Head of Zoology, along with Zoology PhD student Ms Marietjie Landman, were respectively awarded a sabbatical opportunity and a summer school bursary to study at the Mammal Research Institute of the Polish Academy of Sciences.

Widely-respected conservationist Prof Kerley, who was awarded a prestigious Marie Curie Fellowship, took the opportunity to focus on the concept of animal refugee species (species being kept in inappropriate habitats), using the European bison as a model, during his six-month sabbatical. “I wanted to find out why a large grazer like the bison is being kept in forests (as is the current conservation strategy for this animal). I analysed its evolutionary (breeding) background and ecology, and found that it should be offered opportunities to move into open habitat ... Managing this species in a forest habitat is not the most effective approach to increasing bison numbers.” For the past 600 years, the European bison has been confined to forest areas. Those that wander into the neighbouring farmland are chased back into the forest.

Prof Kerley, who in 2009 was appointed to the board of the South African National Parks (SANParks), said the fundamental concept of a species being kept in an inappropriate habitat had



Prof Graham Kerley, Director of the Centre for African Conservation Ecology (ACE)



Marietjie Landman, Zoology PhD student

relevance for South Africa. “One just has to look at the forest-dwelling Knysna elephant. It is exactly comparable.” Based on the quality of her extensive postgraduate research, Ms Landman was one of a handful of students, selected worldwide, to receive a full bursary to attend the BIOSEB Summer School in Ecology and Biodiversity at the Mammal Research Institute. While there, Ms Landman, who is studying mega-herbivore (elephant and rhino) foraging and its impact over the last 30 years in the Addo Elephant National Park, was awarded the prize for the best student poster presentation.

Pushing Boundaries in Nanophotonics



Prof Reinhardt Botha, Chair in Nanophotonics

Physics Professor Reinhardt Botha, who holds a prestigious Research Chair in Nanophotonics, is conducting innovative research in photonic applications (devices that absorb or emit light) for the infra-red and ultra-violet wavelength ranges, which could be used in high-tech military applications. "We're working on devices in the infra-red range which could be used in missile-tracking devices. I believe our work is of an international standard – it is certainly cutting-edge in South Africa."

Prof Botha explained that nanophotonics was the study of semi-conducting structures of atomic dimensions (very tiny) to develop applications in the field of photonics (i.e. devices that absorb or emit light, such as light emitting diodes, lasers or detectors).

Prof Botha and his co-researchers Prof Magnus Wagener and Mr Andre Venter make use of a state-of-the-art metal-organic

chemical vapour deposition (MOCVD) system to deposit ultrathin films of zinc oxide and antimony-based semi-conductors (antimony is a metallic element), which are then used for research in developing ultra-violet detectors and other photonic applications. "Semi-conductors are materials that conduct electricity at normal temperatures, but are insulating near absolute zero temperature. These materials have a band gap, which determines the range of energies or wavelengths in which they will absorb or emit light. The band gap can be changed at will, based on the composition of the material or the size of the structure."

Prof Botha said: "One of our main interests is in devices operating in the mid-infrared (range). Such devices can be used in atmospheric pollution-monitoring or in military applications, like missile-tracking. We are also interested in ultra-violet materials. Here, most of our research focuses on establishing the ideal deposition parameters, which give optimised material in terms of its optical and electrical response. Changing the size of the structure or controlling its shape will influence its efficiency as a light emitter or absorber. Our work is to push the boundaries, and to engineer small structures that will surpass the limitations imposed by the properties of macroscopic materials."

Retired Geologist's Research Honoured



Prof Peter Booth, retired Geology Lecturer

Recently-retired Geology Professor Peter Booth – now a Research Associate – was honoured in a special session titled "The Cape Fold Belt" at Inkaba yeAfrica's 2009 annual scientific workshop New Horizons in Swaziland to celebrate his contributions to understanding this unique mountain range across southernmost Africa. In further recognition of his contributions

to the geology of South Africa, he was also made a Fellow of the Geological Society of South Africa (GSSA). Prof Booth, who delivered the keynote address (*A review of the structural geology of the Cape Fold Belt and challenges towards future research*) at the Inkaba yeAfrica workshop, started researching the Cape Fold Belt mountains in 1990. Prof Booth's deep interest in the little-explored area of "thrust faults" inspired his research in this area – winning him national and international recognition. Using satellite imagery, aerial photographs, field research, microscopes and, most recently, NMMU's newly-acquired scanning electron microscope, Prof Booth and his team endeavoured to determine the pre-fault appearance of the Earth's upper crustal rocks, and predict the changes deep below. "The whole story of the Cape Fold Belt is by no means sewn up. There are still many enigmas to solve."

NRF-Rated Researchers

Adams, JB, Prof	C1
Baird, D, Prof	B3
Booth, GL, Prof	C2
Booth, PWK, Prof	C3
Botha, JR, Prof	C2
Christopher, AJ, Prof	B2
Cowling, RM, Prof	A1
Downing, TG, Dr	Y2
Engelbrecht, JAA, Prof	C2
Ferg, EE, Dr	C3
France-Jackson, H, Prof	C1
Frost, CL, Prof	C3
Gerber, TIA, Prof	C2
Groenewald, NJ, Prof	C1
Kakembo, V, Prof	L
Kerley, GIH, Prof	C1
Leitch, AWR, Prof	B3
Lombard, AT, Dr	C2
McClelland, CW, Prof	C3
Mzilikazi, N, Dr	Y2
Neethling, JH, Prof	C3
Somai, BM, Dr	L
Strydom, NA, Dr	Y2
Van de Venter, M, Dr	L
Van Dyk, EE, Prof	C2
Wagener, MC, Prof	C1
Wesson, JL, Prof	C3
Whittington, PA, Dr	C3
Wooldridge, TH, Prof	C1
Zeelie, B, Prof	C2

Research Entities

Research entities in the Faculty of Science include one research institute and three research centres as profiled below:

InnoVenton: NMMU Institute for Chemical Technology and Downstream Chemicals Technology Station (InnoVenton/DCTS)



Prof Ben Zeelie, Director of InnoVenton

InnoVenton/DCTS has a specific focus on two areas of research: downstream chemical product discovery and process development. As an institute of technology, InnoVenton/DCTS also provides a wide range of services to its stakeholder community, based on what it has (knowledge, expertise and infrastructural capabilities) and what it does (teaching and research). As a result, its primary outputs are: trained students, analytical and testing services, new knowledge, technology solutions, and new business.

InnoVenton/DCTS's highlights for 2009 included:

- The signing of a commercialisation agreement for a flower preservation process;
- The initiation of an algal biomass production project;
- The formation of a spin-off company, Zalgen (Pty) Ltd, as the commercialisation vehicle for the algae project;
- The first intake of full-time (one-year) students in the new degree programme, BSc (Hons) Formulation Science;
- The initiation of phase one of the National Fuels Chemical Centre (NFCC) project) and;
- Several major technology support projects undertaken in support of Small and Medium Enterprises.

Telkom Centre of Excellence and its Sub-Entities (COE)

NMMU's Centre of Excellence (CoE) programme was developed by Telkom SA to research various aspects of telecommunications.

The NMMU CoE consists of three units:

- The Distributed Multimedia Applications (DMA) Unit in the Department of Computer Science and Information Systems,
- The Optical Fibre Research (OFR) Unit in the Department of Physics,
- The Photovoltaics (PV) Unit in the Department of Physics.

The three units are sponsored by Telkom, Hezeki Contracting, MCT Telecommunications, Ingoma Communication Services, Dimension Data, Total Facilities Management Company, and the Technology and Human Resources for Industry Programme (THRIP), allowing for the purchasing of high tech equipment to be used for postgraduate research. The South African Telecommunications Networks and Applications Conference (Satnac) is the flagship event of the Telkom CoE programme. In all three units, research highlights included journal articles in accredited journals and papers presented at national and international conferences.

In the DMA unit, three CoE Masters students graduated in 2009. In the OFR unit, Dr Vitalis Musara, who completed his PhD in Physics at the end of 2009, was one of the three chosen finalists for the student award section of the annual Thrip awards. From his project a provisional patent has been lodged. The OFR unit published three papers in accredited scientific journals. In the PV unit two PhD students graduated in 2009 and the unit published seven papers in accredited scientific journals.



Prof Janet Wesson, Director of the Telkom Centre of Excellence

Centre for African Conservation Ecology (ACE)

The Centre for African Conservation Ecology (ACE) comprises staff and postgraduate students of the Zoology, Botany and Geography departments, with an advisory board comprising representatives of the state, NGO and private conservation and environmental management interests. ACE's vision is to build its national and international recognition as a centre of excellence in the fields of ecological and conservation research, as well as postgraduate training, and to expand this role in Africa.

ACE's 2009 outputs included 23 refereed scientific publications, six technical reports and 12 conference proceedings. One PhD and nine MSc students graduated, while 11 PhD students and six MSc students were busy with their degrees. A number of students

received top awards, in recognition of their research.

In 2009, ACE's research activities were grouped under the following themes: conservation biology, animal-plant interactions, resource ecology, predator-prey interactions, transformation and restoration ecology, biodiversity and fundamental research (research on any intellectually interesting ecological or evolutionary question). A unifying feature, cutting across all themes, was the issue of global change.

Major contracts for 2009 included an assessment of the impacts of carnivores (lion and spotted hyena) on buffalo, and another of elephant on biodiversity, both in the Addo Elephant National Park.



Prof Ernest van Dyk, Director of the Centre for Energy Research

Centre for Energy Research (CER)

The Centre for Energy Research (CER) has two main objectives. The first is to provide postgraduate training in the following fields: photovoltaic systems design, installation and integration; solar thermal device and systems characterisation; wind energy; and energy storage. The second objective is to conduct applied research on renewable energy materials, devices and systems.

2009 saw continued growth in the CER's activities, along with an increased involvement from the faculties of Science, Engineering and Economics. Furthermore, the Faculty of Engineering, the Built Environment and Information Technology (EBEIT) is now actively promoting and encouraging renewable energy research through the School of Engineering.

The CER's current research activities include: photovoltaic cell, module and systems characterisation; device parameter extraction; Light Beam Induced Current (LBIC) measurements (laser and solar radiation as probe beam); Concentrator Photovoltaic (CPV) development; photovoltaic systems research; solar thermal system design and optimisation; wind energy converter characterisation; vertical axis wind turbine development; and energy storage.

The CER is working towards the establishment of a Postgraduate Programme in Renewable Energy, in collaboration with the University of Oldenburg, Germany.

Faculty Highlights and Achievements

National and International Research Collaboration

Several activities to grow the faculty's partnership with three specific universities took place during 2009:

Oldenburg University, Germany:

A research proposal prepared with colleagues from Oldenburg University during 2009 was accepted for funding by the German funding agency, DAAD. The collaboration, which will include student and staff exchange as well as joint research between the two institutions, will run for four years.

Makerere University, Uganda:

A successful research visit by five members of the faculty to Makerere University took place in March 2009. The purpose was to grow research collaboration between the faculty and its Ugandan counterparts. The visit led to research collaboration as well as staff exchanges in the disciplines of Zoology, Physics, Maths and Applied Maths, and Computing Sciences.

University of Washington, Seattle, United States:

The Department of Zoology developed strong ties with colleagues at the University of Washington in 2009. This included staff exchanges from both sides, with a special focus on genetics.

Visiting scholar

Dr David Bell from Arizona State University, United States, spent some time in the Department of Geosciences in January 2009. As a South African geologist now resident in the US, he gave input into strategic planning for future research directions for the geology section of the Department of Geosciences.

Conference Facilitation

The Department of Mathematics and Applied Mathematics hosted a very successful workshop on algebra. Attended by algebraists from across South Africa, the workshop reaffirmed the leading national role played by NMMU mathematicians in the highly specialised area of algebra.

Research Capacity Development

Several Science Faculty staff obtained NRF ratings (or re-ratings) during 2009. In addition, four staff members completed their doctorates.

Awards

- Prof Richard Cowling was awarded the prestigious Gold Medal of the Southern Africa Association for the Advancement of Science (S2A3) for exceptional contributions to the advancement of Science. He also received the exciting news that he had been re-rated by the NRF – this time with an A1 rating. He is NMMU's top-rated researcher (see page 21).
- Prof Graham Kerley, Director of the Centre for African Conservation Ecology (ACE), was appointed to the board of South African National Parks. He was also awarded a prestigious Marie Curie Fellowship, enabling him to spend a six-month sabbatical at the Polish Academy of Sciences during 2009.
- Prof Janine Adams was appointed as Chairperson of the Water Research Commission (WRC) by the Minister of Water Affairs and Forestry (now the Minister of Water and Environmental Affairs) for a three-year term of office from August 2008 to 2011.
- At the 2009 Microscopy Society of Southern Africa (MSSA) conference, Prof Jan Neethling was re-elected as president of the MSSA.

Campus Principal's Overview



Prof Christo Fabricius, Campus Principal, George Campus

Putting our Long-Term Research Plan into Action

Research lies at the heart of academia. It exposes our ignorance, challenges our wisdom, and leads us to explore unanswered questions or discover vast new vistas. Research is the ultimate platform for learning and change to transpire. It demands honest introspection, challenges age-old assumptions and uncovers new possibilities. Research reminds us that “knowing for certain” is as elusive as world peace and the unicorn.

George Campus’s research theme, “Sustainable Resource Use and Management”, is gradually taking shape. Our focus in 2009 was on building a solid foundation for research to flourish. This was achieved by strengthening our staff’s research skills through a number of capacity development workshops, investing seed funds and facilitating monthly research club activities. The campus also recruited postgraduate students and encouraged staff and students’ participation in local and international conferences. During 2009, 17 students and staff members presented at conferences and eight staff members registered for Masters or Doctoral degrees.

This is a long-term plan and our current efforts will only pay off in the next three to four years, but short-term gains are already evident: the number of peer-reviewed papers is steadily increasing, conference presentations are leading to manuscripts,

and staff members are discussing research projects and actively participating in research administration.

We have a long waiting list for sabbaticals and research leave, and at least six staff members are looking forward to taking either research leave or sabbaticals in 2010. We are also looking forward to recruiting a number of established and enthusiastic young academics to further boost our capacity to supervise postgraduates, and are registering new qualifications leading to exciting postgraduate opportunities.

The campus’s first entity, the Sustainability Research Unit, will give further impetus to our research plan by acting as a catalyst for research funds, and enabling alliances to promote high quality, applied research in the field of sustainability science focusing on the Southern Cape. George Campus’s research train is slowly but surely building momentum and is truly on track.

Yours sincerely,

A handwritten signature in black ink, appearing to be 'C. Fabricius'.

Prof Christo Fabricius
Campus Principal: George Campus

Faculty Researcher of the Year



Dr Glen Taylor, Faculty Researcher of the Year

Researching how bulls adapt to hot conditions

For his research on the adaptability of cattle under tropical or sub-tropical conditions in southern Africa, Dr Glen Taylor, former Head of the Department of Agricultural Management, was named George Campus's 2009 Faculty Researcher of the Year.

Dr Taylor, who has since moved to the University of the Free State, had three articles relating to his research published in the *Australian Journal of Animal Science*. The first addressed the fertility of bulls, as affected by nutrition. Due to the generally low nutritional value of grass found in the tropics and subtropics, as a result of the climate in these areas, cattle producers tend to supplement the animals' nutrition with grain. This often leads to over conditioning (over-fattening), which affects the fertility of young bulls. "I found that when farmers feed young bulls at too high an energy level, the results were over-fattening, decreased fertility and sometimes permanent sterility. The implication is that farmers often supply sub-fertile animals to the market." His study was backed up by histological data, based on the dissection of the tissues of the sexual organs. In his second article, he compared the reproductive performance of over-conditioned

bulls of different age groups. He found that not only was their fertility compromised, but their reproductive performance was also lower, compared to bulls of lower body condition. He also found that the older bulls tended to return to normal fertility when in normal condition, while many of the younger bulls had permanent fertility problems. "Sub-fertile bulls could contribute to the low national calving average of 50 per cent."

The third article highlighted the "tick burden" on animals in the tropics. The results showed that the body surface temperature of an animal had a significant effect on external parasite load, hence the fact that animals not adapted to the tropics have raised skin surface temperatures and often suffer from tropical degeneration syndrome.

Dr Taylor began his studies with a Diploma in Veterinary Technology and ultimately graduated with a PhD in Physiology.

Emerging Faculty Researcher of the Year



Dr Darlington Onojaefe, Emerging Faculty Researcher of the Year

Former Marketing lecturer Dr Darlington Onojaefe, now an Assistant Professor in Marketing at Saudi Arabia's Al-Faisal University, won recognition in 2009 as George Campus's Emerging Faculty Researcher for examining how marketing management should respond to new technology opportunities.

"I specifically identified the ways in which brand management could maximise the benefits of e-commerce (the promotion and marketing of goods and services over the Internet)."

His research outlined good management practice for the combined management of both marketing and information technology (IT), and the role customer relationship management can play in doing this successfully.

Faculty Research Theme

Theme	Drivers
Sustainable resource management	Prof Christo Fabricius and Dr Laurence Watson

Research Highlights

Embracing Sustainability in the Southern Cape

The Sustainability Research Unit's (SRU) first year of existence in 2009 focused on raising its profile through the hosting and facilitation of conferences and workshops. These workshops served as platforms for dialogue, networking and knowledge exchange, in order to raise awareness about sustainability in the southern Cape.

The SRU gradually recruited members and associates and expanded its influence by linking with national and international institutions such as South African National Biodiversity Institute (SANBI), Cape Nature, South African National Park (SANParks), the National Research Foundation (NRF), the Resilience Alliance, as well as local farmers and municipalities.

A Sustainable Dairy Farming Workshop focused on the impacts of climate change on the natural resources (soil and water in particular) in the Eden district. The aim of the workshop was to encourage the development of policies and knowledge integration for sustainable dairy management. The end product was a discussion document which farmers presented to senior government policy makers.

The AKILI Complexity and Integration Initiative (ACII) NRF Colloquium attracted local and international academics from a variety of disciplines, with a focus on promoting applied research in the service of society. The seed concepts were trans-disciplinarity, complexity in social-ecological systems, integration and implementation science, and ecosystem services. The SRU took responsibility for organising a stimulating field trip to the Duiwenhoks wetlands near Heidelberg, where a network of complexity researchers was initiated.

The Biodiversity Conservation Curriculum Innovations in Higher Education Institutions in the Cape Floristic Region, facilitated by SANBI, aimed to strengthen and share examples of innovative approaches to enhancing capacity, career options and the quality of learning in conservation education.

Key SRU researchers and their work in 2009 include:

- Nature Conservation / Game Ranch Management Lecturer Mr Anton Schmidt focused on developing a resilience-based State and Transition Model for Arid Mosaic Thicket, which will enable land users to recognise functional and dysfunctional vegetation states, and identify plant communities that are at risk of crossing a functional threshold. It will also provide land users with guidelines on how to manage their land in order to maintain or enhance its resilience.



Anton Schmidt, Nature Conservation / Game Ranch Management Lecturer



Bianca Currie, Nature Conservation / Game Ranch Management Lecturer

- Campus Principal Professor Christo Fabricius co-authored a research report for the Aga Khan Foundation titled *Challenges and opportunities for resilience assessment in Tajikistan*, which he presented at the Resilience Alliance Science Meeting in Vancouver 2009. This work emanated from two visits by a research team, lead by Prof Fabricius, to the Vaksh River Basin to conduct participatory research with rural farmers and government officials, aimed at developing strategies for coping with climate change. He also co-authored a book chapter with Georgina Cundill titled *Adaptive co-management under resource-poor conditions – lessons from South Africa* and posted an article titled *Pushing the boundaries; have we crossed the boundaries of sustainability in the Garden Route?* on the SRU website.
- Nature Conservation / Game Ranch Management Lecturer Ms Bianca Currie secured US\$40 000 from a funding agency for an action research project aimed at positioning George Campus as an example of sustainable living. She is also facilitating a short learning programme on conservation stewardship and extension. Furthermore, she initiated a research project aimed at applying resilience theory in social-ecological wetland systems.
- Further products of the SRU during 2009 included a synthesis report titled *Challenges to sustainability in the Garden Route: Water, Land and Economy* by statistician and part-time lecturer Dr Jeanette Pauw and a presentation by Research Associate Dr Wietsche Roets, of Cape Nature, titled *Water sustainability in the Garden Route*. The SRU also took the lead in a multi-authored paper on *Sustainability in the wildlife industry*, which Prof Christo Fabricius presented as a keynote address at the 2009 Southern African Wildlife Management Association Symposium.



Faculty Highlights and Achievements

National and International Research Collaboration

Apart from the collaborative research under way within the Sustainability Research Unit (SRU), other research collaboration activities included the following:

- Agricultural Management Lecturer Mr Johan Jordaan, in collaboration with the Western Cape Department of Agriculture, is conducting an economic analysis of land reform farms in the Central Karoo.
- Forestry Lecturer Mr Andrew McEwan, with Forest Engineering South Africa, is researching pine saw timber optimisation and the mechanised harvesting of plantation timber.
- Nature Conservation / Game Ranch Management Lecturer Dr Laurence Watson, in collaboration with South African National Parks (SANParks), is researching the management of the rare bontebok and Cape mountain zebra in Bontebok National Park.

Visiting Scholar

Research Associate Dr Wietsche Roets, of Cape Nature, delivered a paper titled *Water sustainability in the Garden Route* at the Sustainability Research Unit.

Research Capacity Development

One of our strategic priorities is to develop the future research capacity of our BTech students. In 2009, this involved the following:

- The BTech Natural Research Management Symposium: The 2009 theme of the symposium, held annually at George Campus, was *Challenges to Sustainability in Natural Resource Management*.
- Nineteen BTech students from the Nature Conservation programme attended the South African Wildlife Management Association Symposium.

Awards

- Nature Conservation / Game Ranch Management Lecturer Mr Anton Schmidt won best poster at the South African Wildlife Management Association Symposium. (His poster detailed an approach to assessing herbivory-induced thresholds in arid mosaic thicket.)
- BTech students Ms Zurita Bouwer, Ms Sunel Esbach, Ms Lorain le Roux, Ms Monique Nunes, Ms Rabia Ryklief and Ms Lizelle van Heerden won second best poster at the International Association for Impact Assessments in South Africa symposium, for their poster *Desert in the Garden Route: the Sedgefield water crisis*.

Entities reporting directly to the DVC: Research and Engagement

HIV/Aids Unit

NMMU's HIV/AIDS Unit aims to promote and sustain a collaborative response to the HIV/Aids pandemic through governance, teaching and learning, research, community engagement and service provision. In 2009, the unit completed two skills audit surveys among nursing staff in the Ukhahlamba and Chris Hani district municipalities, respectively. These studies were conducted on behalf of the Eastern Cape Provincial Department of Social Development, with funding received from the United Nations Population Fund (UNFPA). The studies showed that numerous skills gaps and training needs exist among all nursing categories and that this may hamper delivery of health services to communities. The unit also delivered a research paper, titled *HIV/AIDS Workplace Programmes in Higher Education*, at the Third International Business Conference in Zanzibar from 15 to 17 September 2009. Finally, two research contracts were awarded to the unit by the Eastern Cape Department of Social Development to respectively evaluate foster care services and substance abuse among the youth in the Eastern Cape. Preliminary reports have been submitted to the Eastern Cape Department of Social Development. Articles for publication are pending.



The HIV and AIDS Unit are (back from left) Anri van der Merwe, Francois Potgieter and Yolande August (front from left) Jill von der Marwitz and Minty Nopote.

Centre for the Advancement of Non-Racialism and Democracy (CANRAD)



The CANRAD team (from left) Buyiswa Scott, Prof Itumeleng Meko, Dr Jay Govender and Mr Allan Zinn

The Centre for the Advancement of Non-Racialism and Democracy (CANRAD) has been established at NMMU to provide an intellectual and social platform for debate on the complexities of post-apartheid South Africa, with a view towards promoting a social and economic order that is both non-racial and democratic. As a result, NMMU will be offering an initiative that meets with urgent regional, national and global priorities and hopes to become a centre of excellence in critical scholarship on racism,

non-racialism and democracy. As a public institution – and one that derives its very name from the iconic former state president – NMMU believes it is socially-obliged to be pro-active in this endeavour. As such, the new centre (launched in March 2010) is intent on transforming academic research into practical initiatives. Furthermore, such research will also be aimed at raising public understanding and policy support for the pursuit of a non-racial, democratic South Africa.

Leadership and Management

Office of the Deputy-Vice Chancellor: Research and Engagement

The Research, Technology and Innovation (RTI) division is headed by the Deputy Vice-Chancellor: Research and Engagement.

The project team includes:

- Prof Thoko Mayekiso (Deputy Vice-Chancellor: Research and Engagement)
- Dr Pieter van Breda (Director: Research Management)
- Dr Blanche Pretorius (Director: Research Capacity Development)
- Ms Jacqueline Barnett (Director: Innovation Support and Technology Transfer)

Research, Technology and Innovation (RTI) activities are managed at two levels, i.e. at faculty level and at Senate level. Senate is the custodian of all RTI matters. At faculty level, RTI activities are managed by faculty RTI committees, while at Senate level, RTI activities are managed by the NMMU RTI Committee, a sub-committee of Senate. The Deputy Vice-Chancellor: Research and Engagement is the Chair of the NMMU RTI Committee and



Prof Thoko Mayekiso, Deputy Vice-Chancellor: Research and Engagement (centre) with research assistant Sisanda Nkoso (left) and executive secretary Nozuko Ngcukana.

reports to Senate on the overall management of RTI activities at NMMU. The Dean of each faculty is responsible overall for RTI activities within the faculty. S/he can delegate the day-to-day management of RTI activities to a senior academic, who would chair Faculty RTI Committee meetings and report to the Faculty Board on RTI.

Department of Research Management

The Department of Research Management (RM) is headed by a Director, Dr Pieter van Breda, and comprises of six permanent full-time staff members and one contract staff member. RM focuses mainly on the needs of established researchers. It manages such matters as:

- All NRF grants, excluding Thuthuka and student bursaries.
- The Technology and Human Resources for Industry Programme (THRIP).
- The development of an in-house research information system (RIMS) and the roll-out of the national DST/NRF supported InfoEd RIMS.
- The submission of applications for NRF rating.
- The registration and activity reporting of research institutes, centres and units.
- The submission of publication research output subsidy claims to the Department of Higher Education and Training (DoHET).
- The development and implementation of various categories of research incentives.
- Applications for research leave and research sabbaticals via the NMMU Research Committee, which is chaired by the Director of RM.
- All external and internal research grants aimed at established researchers.
- The Unit for Statistical Consultation (USC).
- The identification and nomination of staff for external research awards.



Department of Research Management staff (from left) Carmen van Leeve, Nicola Taylor, Visha Coopasamy, Kevan Johnson, Dr Pieter van Breda (Director) and Marisa Kolver.

- The DST/NRF Research Chairs.
- The Researcher of the Year Awards.
- Internal and external research surveys.

Recently research partnerships and the monitoring of various research activities have been added as additional responsibilities. RM advises the Capital Resource Allocation Committee (CRAC) on the allocation of research equipment. It also plays an active role in the management of individual research accounts in close co-operation with NMMU's Finance Department.

Department of Research Capacity Development



Department of Research Capacity Development staff (back, from left) Annette Denakie, Kirsten Longe, Delene Gerber and (front) Dr Blanche Pretorius and Belinda du Plooy.

The Department of Research Capacity Development is managed by its Director Blanche Pretorius and five permanent staff members with its core functions of:

- Managing institutional and external funding support for post-graduate students.
- Expanding the levels of accredited research outputs by emerging researchers.
- Improving the academic staff qualification profile.
- Assuming responsibility for institutional research capacity development programmes / interventions.
- Training sufficient and adequately skilled researchers who are able to supervise postgraduate student research.
- Providing mentorship to developing research staff and post-graduate students.
- Harnessing the research contribution of research associates.
- Managing the NMMU Research Ethics Committees (Animal and Human).

Department of Innovation Support and Technology Transfer

The Department of Innovation Support and Technology Transfer (IS&TT) had two permanent staff members in 2009, the Director, Ms Jacqueline Barnett, and a secretary, Ms Elsa van Wyk. IS&TT undertakes the following broad activities:

- Technology transfer activities which encompass the management and commercialisation of NMMU's Intellectual Property (IP);
- Innovation Support for external research-related activities such as facilitating collaborations, proposal writing, access to funding; and
- Other innovation activities at local, provincial and national level.

Technology transfer activities typically start at disclosure of an invention or creation by a staff member or student, discussion of further research needed and possible commercialisation routes, protection of the IP, and driving of the commercialisation strategy. Typical commercialisation strategies are licensing of the IP, or creation of a spin-off company to commercialise the IP. As a number of spin-off companies have been created, IS&TT remain involved with the company on NMMU's behalf.

Innovation support activities focus on facilitation of externally funded research-related grants and contracts. IS&TT has arranged and funded access for all staff and students to a research funding search service called Research Africa, and advice and assistance is given on proposals submitted for funding, mainly in the science, engineering and technology fields. Other assistance is given as required on an *ad hoc* basis, such as providing contract templates, assisting academic staff with publishing permission and assisting with resolving payments. The Director also sits on some of the advisory boards and management committees of research entities at NMMU, to provide guidance on IP management and general research issues.

Other innovation activities undertaken by IS&TT are numerous and varied, such as:

- Running the National Innovation Competition at NMMU;
- Being part of a team entering the SA Bio Plan Competition;
- Proposing the concept of a Regional Technology Transfer Office anchored at NMMU;
- Driving the creation of a regional innovation forum;
- Working with national government to showcase the contribution of the Eastern Cape universities towards an Eastern Cape Regional Innovation System;
- Motivating the creation of a Research Park at NMMU and working towards a business plan for the park;
- Being a founder member of Tektique, a website for marketing of SA university technologies;
- Being involved in the Executive Committee of the Southern African Research and Innovation Management Association.



Department of Innovation Support and Technology Transfer staff, Elsa van Wyk (left) and Jacqueline Barnett.

Research Support

Finance Department

In August 2007, the Department of Finance created a section (comprising three staff members) to focus on research-related financial matters.

Research Information Management System (RIMS)

With the introduction in 2007 of InfoEd as a national Research Information Management System (RIMS) and the signing of a contract between the NRF and DST for the NRF to manage the system, NMMU became a member of a consortium of South African universities and science councils implementing InfoEd. RIMS allows the research office to capture a wide range of research data that can easily be extracted, which allows for trends to be identified and strategies developed to further enhance research capacity and quality. For example, it allows individual research profiles to be extracted, along with CVs of researchers and specific faculty or department outputs. Other capabilities include tracking and developing proposals, assisting with research ethics approval and identifying research funding opportunities via Sponsored Programs Information Network (Spin).

An in-house information system has also been developed. This system compiles various valuable pieces of data into an informative view of research activity by the researcher, in terms of research output that can be subsidised and main streams of funding. This archive of pertinent research data can provide valuable assistance to stakeholders of various levels to evaluate performance and for other strategic exercises.

Research websites

The departments of Research Management (RM), Research Capacity Development (RCD) and Innovation Support & Technology Transfer (IS & TT) have designed their own websites aimed at providing online access to information and services offered. These can be accessed at: www.nmmu.ac.za

Unit for Statistical Consultation (USC)

The Unit for Statistical Consultation (USC) renders a free statistical consultation service to staff as well as Masters and Doctoral students engaged in academic research. In 2009, consultation services were provided to a total of 105 projects across all faculties.

Ethics Committees

The protection of both research subjects / participants and researchers lies at the heart of the practice of research. NMMU's Research Ethics Committee-Human (REC-H) and Research Ethics Committee-Animal (REC-A) are tasked with ensuring that research conducted at NMMU reflects nationally and internationally accepted principles of research ethics. In fulfilling this mandate, these committees work closely with the faculty's Research Technology and Innovation committees.

Research Funding Database

NMMU subscribes to Research Africa, a funding database which is available to all staff and postgraduate students. Research Africa allows researchers to search for funding opportunities in specific areas of interest and to set up e-mail alerts when calls for proposals are made.

Directory of Experts

The NMMU online Directory of Experts, a combined project between the departments of Marketing and Corporate Relations and Research Management was updated in 2009 and can be viewed on the NMMU website: <http://www.nmmu.ac.za> under "community".

Research Entities

There are 23 registered research entities at NMMU. The three institutes and five centres are profiled under the relevant faculties.

Name	Acronym	Leader	Faculty
INSTITUTES (3)			
Friction Processing Research Institute	FPRI	Dr Annelize Els-Botes	EBEIT
Institute for Information and Communication Technology Advancement	IICTA	Prof Rossouw von Solms	EBEIT
InnoVenton: Institute for Chemical Technology and Downstream Chemical Technology Station	InnoVenton/ DCTS	Dr Gary Dugmore	Science
CENTRES (5)			
Telkom Centre of Excellence and its sub-entities	COE	Prof Janet Wesson	Science
Centre for African Conservation Ecology	ACE	Prof Graham Kerley	Science
Centre for Energy Research	CER	Prof Ernest van Dyk	Science
Centre for Educational Research, Technology and Innovation	CERTI	Prof Paul Webb	Education
Centre for Mechatronics and Manufacturing	CMM	Prof Khaled Abou-El-Houssein	EBEIT
UNITS (13)			
Raymond Mhlaba Research Unit for Public Administration and Leadership	RMRUPAL	Dr Mzikayise Shakespeare Binza	Arts
Unit for the Study and Resolution of Conflict	USRC	Dr Gavin Bradshaw	Arts
Cyclic Peptide Research Unit	CPRU	Prof Pieter Milne	Health Sciences
Drug Utilisation Research Unit	DURU	Prof Ilse Truter	Health Sciences
Labour and Social Security Law Unit	LSSLU	Prof Adriaan van der Walt	Law
Labour Relations and Human Resources Unit	LRHRU	Prof Dave Berry	Business & Economic Sciences
Tourism Research Unit	TRU	Mr Hugh Bartis	Business & Economic Sciences
Unit for Applied Management Sciences	UAMS	Dr Suzette Viviers	Business & Economic Sciences
Unit for Professional Ethics	UPE	Prof Piet Naudé	Business & Economic Sciences
Integrated Environmental and Coastal Management Unit	IECM	Dr Derek du Preez	Science
Unit for the Study of Construction Processes	USCP	Prof John Smallwood	EBEIT
Sustainability Research Unit	SRU	Prof Christo Fabricius	George Campus

Entities reporting to the DVC: Research and Engagement

Name	Acronym	Director
HIV & AIDS Unit	HAU	Dr Jill von der Marwitz
Centre for the Advancement of Non-Racialism and Democracy	CANRAD	Mr Allan Zinn

Technology Stations

NMMU has two DST Technology Stations:

- Automotive Components Technology Station (ACTS), headed by Prof Danie Hattingh.
- Downstream Chemical Technology Station (DCTS), headed by Mr Geoff Ritson.

These two stations were identified by the Tshumisano Trust as the best of the 14 stations in South Africa.

Top 20 Researchers

This information is based on the number of Department of Higher Education and Training (DoHET) research output subsidy units generated from journal articles and graduated research Masters and Doctoral students (from 2006 to 2009).

Surname	Initial	Title	Faculty	Department	NRF Rating	DoE Units
Kerley	GIH	Prof	Science	Zoology	C1	29.97
Gerber	TIA	Prof	Science	Chemistry	C2	28.64
Olivier	G	Prof	Arts	Journalism, Media & Philosophy	C1	28
Smallwood	JJ	Prof	EBEIT	Construction Management	C3	24.16
Janse van Vuuren	HE	Prof	Arts	Language & Literature	C2	24
Cowling	RM	Prof	Science	Botany	A1	23.71
Von Solms	R	Prof	EBEIT	Information Technology	B3	23.5
Van Dyk	EE	Prof	Science	Physics	C2	21.96
Zeelie	B	Prof	Science	Chemistry	C2	20.25
Botha	JR	Prof	Science	Physics	C2	19.53
Naude	PJ	Prof	Business & Econ Sciences	MBA Unit	C3	19.5
Olivier	MAJ	Prof	Education	Foundation Phase	C3	19.50
Du Preez	JGH	Prof	Science	Chemistry		19
Adams	JB	Dr	Science	Botany	C1	18.54
Leitch	AWR	Prof	Science	Physics	B3	17.31
Foxcroft	CD	Prof	High Educ Access & Dev (Heads)	Heads Management	C2	17.05
Van Niekerk	TI	Prof	EBEIT	Mechatronics		14.50
Hattingh	DG	Prof	EBEIT	Mechanical Engineering	C1	14.35
Van Rooyen	RM	Prof	Health Sciences	Nursing Science		13.91
Neethling	JH	Prof	Science	Physics	C3	13.84

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