



College of Agriculture, Engineering and Science | Annual Report 2018

by Professor Albert Modi



Professor Albert Modi
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(Acting)

2018 saw the College of Agriculture, Engineering and Science contribute significantly to the fulfilment of UKZN's vision to be the Premier University of African Scholarship, and to meeting its strategic imperatives of excellence in teaching and learning, research, community engagement and targeted internationalisation.

Awards and Achievements

In 2018 the College celebrated individual and group achievements, as well as national and worldwide recognition of a number of its students and staff for their excellence in a variety of activities.

Altogether 12 academic and 9 professional services staff received promotion, either through the academic promotion process or via means of recruitment.

Dr Konstantina Velkushanova, a Senior Research Associate in the Pollution Research Group (PRG) at UKZN, was appointed Deputy Chair of the International Water Association (IWA) Non-Sewered Sanitation (NSS) Specialist Group (SG) at the group's official launch during the IWA World Water Congress and Exhibition in Tokyo, September 2018.

Professor Roland Schulze received a Lifetime Achievement Award at the African Utility Week Industry Awards, which recognise energy and water influencers in Africa.

Dr Sudan Hansraj, Mathematics senior lecturer was appointed to serve for the third term on the Assessment Standards Committee of the Umalusi Council for Quality Assurance in General and Further Education and Training.

Dr Mzamo Shoji from the School of Chemistry and Physics was awarded a Fulbright Scholarship, as was Dr Anathi Magadla from the School of Life Sciences and Professor Andrew Green of Geological Sciences, for a six month research visit to the USA.

In the School of Chemistry and Physics, Professor Bice Martincigh was elected as a Fellow of the South African Chemical Institute (SACI); whilst her colleague Professor Patrick Ndungu, as the corresponding author, was awarded the MERCK Medal by SACI for the paper authored by Edwin T. Mombeshora, Reuben H. Simoyi, Vincent O. Nyamori and Patrick G. Ndungu entitled "Multiwalled Carbon Nanotube-titania Nanocomposites: Understanding Nano-Structural Parameters and Functionality in Dye-sensitized Solar Cells", which was judged the most cited (without self-citation) South African authored paper in the field of Chemistry, published in the South African Journal of Chemistry between 2012-2017.

The College's annual "Wonder Women in Science" awards for 2018 were presented to Dr Nomfundo Mahlangeni (School of Chemistry and Physics), Dr Joyce Chitja (School of Agricultural, Earth and Environmental Sciences), Professor Anne Stark (School of Engineering), Ms Seipati Mokhosi (School of Life Sciences) and Ms Zahra Kader (School of Mathematics, Statistics and Computer Science).

Several of our students received significant and noteworthy awards. School of Life Science doctoral candidates Ms Refilwe Mofokeng and Mr Trishan Naidoo were awarded the Association of Commonwealth Universities Blue Charter Fellowship for research visits to the University of Birmingham & Plymouth University, UK, respectively; whilst fellow MSc student Ms Tshepis



Mafole received the prestigious Southern Africa Association for the Advancement of Science (S2A3) prize for the best MSc thesis for 2018.

Environmental Sciences Masters graduate, Ms Ntombifuthi Nzimande, received a Stipendium Hungaricum Scholarship through the Department of Higher Education and Training, enabling her to conduct her PhD studies at a Hungarian public university. And in recognition of his impressive academic achievements, Mr Stuart Demmer, an MSc candidate in Grassland Science, was awarded a Mandela Rhodes Scholarship towards his postgraduate studies.

On a lighter note, Microbiology postgraduate students from the Pietermaritzburg campus were awarded first prize for their “Hawaiian Death Punch” fruit beer at the 11th Annual South African Breweries Intervarsity Brewing Competition.

Research

CAES continued to maintain its longstanding position as the leading College in research production in the University. The College spent R 953 600 providing support to 32 postgraduate students and postdoctoral scholars, as well as 12 academic staff, to attend both local and international conferences. The total amount spent to support postdoctoral scholars was R 6 369 120.

Schools within the College brought in a total of R 42,675,134 of research funding in 2018. Just one such grant was for Professor Indresan Govender’s Particle Technology Group. The International Fine Particle Research Institute (IFPRI), which provides funding by invitation only, awarded the group R3.1 million to conduct research on the development of fundamentally based mixing rules for industrial granular flow systems – the first group in Africa to receive such funding from IFPRI.

2018 witnessed an even bigger and better Postgraduate Research Day, with 60 oral and 156 poster presentations being submitted for review by Masters and PhD students from the College’s five Schools. A diverse number of external partners supported the event, including 40 sponsoring companies and 33 exhibitors; as well as 61 internal research groups and academics. 58 members of staff and 14 external partners were involved as judges; and an innovation and entrepreneurship stream was added to the proceedings.

CAES featured prominently in the Annual Research Office awards. Among the top 30 UKZN researchers for 2017, 20 came from the College with nine of the top ten positions going to Agriculture, Engineering and Science. Half of the top ten young researchers were from CAES. Professor Cynthia Chiang – an astrophysicist specialising in observational cosmology – was awarded the Vice-Chancellor’s Research Award; Professor Chris Buckley received the Research Award for the Highest Grant Holder for 2017 in the College; whilst Professor Amir Mohammadi was amongst the top five cited researchers. Professor Colleen Downs from the School of Life Sciences remained the top published female researcher at UKZN.

During 2018, two academics from the College were appointed as Pro Vice-Chancellors to lead UKZN’s strategic research focus areas: Professor Francesco Petruccione to lead “Big Data and Informatics”, and Professor Rob Slotow to head up the “African Cities of the Future” research flagship. Professor Slotow was also appointed as the Co-Chair of the African Elephant Specialist Group of the Species Survival Commission of the International Union for Conservation of Nature (IUCN). This committee advises on several conservation issues around elephants, including the CITES convention and the trade in ivory.

The College acquired three new South African Research (SARChI) Chairs. Professor Onesimo Mutanga took up the existing Chair in Land Use Planning and Development; Professor Cristina Trois was appointed as Chair for Waste and Climate Change, and Professor Annegret Stark as Chair in Sugarcane Biorefining. This brings the total number of SARChI Chairs hosted by the College

to eleven. The College also added another A rated researcher to its tally, with Emeritus Professor Barry Lovegrove receiving this accolade for the period 2018-2023, and joining Professors Steve Johnson, Fernando Albericio, Robert Gous and Craig Packer.

Four academics were inaugurated into the professoriate during 2018 and presented their inaugural lectures, where they articulated their research focus areas. These included Professors John Carranza and Tesfaye Kidane Birke from the discipline of Geological Sciences, and Professors Bice Martincigh and Peter Ajibade from Chemistry.

A number of book projects were successfully completed during 2018. Amongst others, the African Centre for Crop Improvement (ACCI) launched a book celebrating its 15 year milestone entitled *The New Breed: training the next generation of African plant breeders, in Africa*; and the *Handbook on Adaptation to Climate Change for Farmers, Officials and Others in the Agricultural Sector of South Africa*, was compiled by Professor Roland Schulze and released by DAFF. Dr Konstantina Velkushanova and Professor Chris Buckley from the Pollution Research Group are also two out of six editors involved in an international venture: *Methods for Faecal Sludge Analysis*.

In August 2018 the Astrophysics and Cosmology Research Unit (ACRU), led by Professor Kavilan Moodley and his team, launched the Hydrogen Intensity and Real Time Analysis eXperiment (HIRAX) telescope project.

In another development, UKZN researchers published details of a new malaria diagnostic test which detects a new form of malaria - *Plasmodium knowlesi*. Professor Dean Goldring conducted the research with Dr Robert Krause, who did the investigations as part of his PhD thesis. This is the first test that can detect a unique protein from the parasite using an antibody, as existing tests do not identify *P. knowlesi* malaria or distinguish this malaria from other malaria species.

Amongst the numerous conferences hosted by the College, was the 7th International Conference on Nanoscience and Nanotechnology, NanoAfrica2018. This was organised by the UKZN Nanotechnology Platform under the auspices of the South African National Nanotechnology Initiative (SANi). Also, later during the year, the 4th UKZN Nanotechnology Platform Symposium was successfully held at UKZN.

Teaching and Learning

Teaching and learning continued to take centre stage in the daily activities of the College. In 2018 the College exceeded its overall enrolment target, both in undergraduate and postgraduate numbers. The total number was 7 757 for undergraduate and 2 447 for postgraduates, against targets of 7503 and 2272 respectively. The biggest increase was the PhD enrolment of 968 against the expected figure of 754. The total number of Postdoctoral Scholars was 117.

The College held five graduation ceremonies, three in Westville and two in Pietermaritzburg, graduating a total of 2 042 students. This comprised 183 PhDs, 269 Masters, 342 Honours and 1218 Bachelors' degrees, as well as 30 Postgraduate diplomas. Of the 183 PhD graduates, eight were students from the African Centre for Crop Improvement (ACCI), whose mission is to train plant breeders for Africa.

During the 2018 graduation ceremonies Professor Guegium Kana and Professor Naven Chetty received the University's Distinguished Teachers' Awards for 2017 in recognition of their innovative teaching methods and commitment to their students.



In line with the strategic goal of the University, the College continued to strengthen its international, regional and local partnerships and collaborative teaching and learning endeavours. In particular, the partnership between UKZN and the Jiangsu Academy of Agricultural Sciences (JAAS), China under the MoU signed in 2014 has been of mutual benefit to both institutions over the years, resulting in joint research publications and supervision of students. Six students under the joint doctoral programme graduated with their PhD degree in September 2018. The ongoing joint doctoral programme is currently being strengthened by the implementation of a joint Postdoctoral programme.

In order to further enhance industry relevance of UKZN degrees within the discipline of Statistics, the process to establish a SAS-based Industry Unit was initiated within the School of Mathematics, Statistics and Computer Science. SAS (Statistical Analysis System) is the world leading software system for data analysis and report writing. This newly established Data Science Centre aims at delivering industry-infused Data Analytics training fit for the 4th Industrial Revolution, through a suite of BSc Data Science, Honours and Masters degrees. Students will learn to manage, analyse, predict and classify large and unstructured data emanating from business and industry. The Honours cohort of 2018 who passed a particular listing of modules defined, will receive an international SAS accreditation certificate along with their Honours degree in Statistics at the 2019 graduation ceremony.

In terms of accreditation, the School of Engineering's degree offerings remained fully accredited by the Engineering Council of South Africa (ECSA); whilst the UKZN Bachelor of Science in Dietetics and Human Nutrition received accreditation from the Higher Education Quality Committee (HEQC) of the Council on Higher Education (CHE).

Community Outreach

The College of Agriculture, Engineering and Science was involved in an array of community outreach projects during 2018. Whilst staff and students affiliated with Professor Colleen Downs participated in the annual survey of endangered Cape Parrots in KwaZulu-Natal, horticulturist Alison Young coordinated the Midlands group of the Custodians of Rare & Endangered Wildflowers (CREW), who met several times during the year to look for rare plants. School staff, students, SANBI staff and volunteers from the public were involved.

Marine biology doctoral candidate and environmental activist, Ms Refilwe Mofokeng, organised regular clean-ups at the Durban Harbour with the support of the School of Life Sciences and African Marine Solutions (AMSOL). Mofokeng has established a non-profit organisation known as Refilwe Matlotlo #GetInvolved to help educate people about environmental conservation and litter reduction and to measure the effects of pollution on marine life.

A series of rapid biodiversity surveys ("bioblitzes") were conducted by School of Life Sciences academics and postgraduate students in collaboration with independent biodiversity specialists and employees from various government institutions such as eThekweni Municipality, Ezemvelo KZN Wildlife, the KZN Museum, the Durban Museum of Natural History and SANBI. Coordinated by Dr Adam Shuttleworth, with help from Ms Preshnee Singh and Ms Simangele Msweli, these represent part of a new "community of practice" (CoP) in KwaZulu-Natal, through a DST-NRF funded project led by Professor Steve Johnson. The CoP aims to foster relationships between government agencies and UKZN to develop an interactive community of biodiversity practitioners in the province.

The College Public Relations team continued with its outreach programmes to local schools, running a number of STEM educational projects such as "Be A Scientist for a Week", Engineering Winter School, a Grade 9 career expo in conjunction with eThekweni Municipality that reached 4000 learners; and the Umjikelezo We-Science Project which was run by the UKZN Science



and Technology Centre in conjunction with CASME, Durban Natural Science Museum, Kitchen Chemistry (University of East Anglia, UK), KZN Science Centre and Unizulu Science Centre, and which reached out to disadvantaged schools through the use of mobile science labs. The PR Team also won the Royal Industrial Floating Trophy at the annual Royal Show for the third year running. The stand was run in conjunction with the third Ukulinga Howard Davis Memorial Symposium and highlighted research related to sustainable agriculture value chains.

The uMngeni Resilience Project hosted a Farmers' Day at the Ukulinga Research Farm for more than 200 guests, including international researchers, small-scale farmers, extension officers and government officials. In conjunction with Agrometeorology staff they also installed an early lightning warning system at Swayimane School.

UKZN's Famer Support Group hosted its Eighth Annual Food and Nutrition Fair, celebrated in conjunction with World Food Day, at KwaNocomboshe, Msinga Top in KwaZulu-Natal. The theme of the day was: Azibuyele Emasisweni, meaning, "let's bring it back to our roots".

And as part of their final year assignment, Property Development students in the School of Engineering embarked on a visit to the Celamandla Crèche in Molweni with a bus full of necessities to improve the children's living conditions. The intention behind this endeavour, organised by Dr Nishani Harinarain, was to inspire the students and help elicit a better sense and understanding of personal and professional skills that would help them create a valuable connection with the people within the community, not just as professionals, but as passionate, empathetic leaders of tomorrow.

Campus Development

Within the School of Chemistry and Physics, 2018 marked the official opening of the Peptide Sciences Laboratory and the Laser Chemical Vapour Deposition and Thin Films Laboratory on the Westville Campus, and the Postgraduate Research Facility on the Pietermaritzburg Campus. These occasions allowed for valuable networking and interaction with external stakeholders and industrial partners.

A new electrophysiology lab was established by Professor Steve Johnson's research group in Pietermaritzburg. Overseen by Dr Adam Shuttleworth and Prof Johnson, the lab uses gas chromatography and electro-antennographic detection (EAD) methods to explore the physiological (antennal) responses of insects to plant volatiles.

On the Howard College Campus, funding from the Bill and Melinda Gates Foundation allowed the significant expansion of the research facilities for the Pollution Research Group. This forms part of the ongoing refurbishment of the Chemical Engineering building.

On the Westville Campus the Oliver Tambo Building underwent substantial renovation in order to house, along with College Professional Services staff, the new SAS Industry Unit and staff from the School of Mathematics, Statistics and Computer Science.

Finally, in an effort to promote campus efficiency, maintenance and growth, DVC for the College of Agriculture, Engineering and Science, Professor Albert Modi, was appointed as Campus Director for UKZN's Pietermaritzburg campuses.

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