faculty of
engineering
N E W S

UNIVERSITY OF KWAZULU-NATAL

November, 2009

Bioresources Engineering & Environmental Hydrology (BEEH)

BEEH hosts South African national hydrology symposium

Sustainable water quantity and quality management in South Africa were the focus of attention at the 14th South African National Committee of the International Association of Hydrological Sciences (SANCIAHS) Symposium hosted by the School of BEEH at UKZN's Pietermaritzburg campus.

The symposium brought together South Africa's leading experts on the wise and sustainable management of the country's freshwater resources. National and international delegates discussed the challenges facing the hydrological sciences around the following sub-themes: New tools for water resources planning and management; Present and future water quality challenges for South Africa; Innovative research in process-based hydrology and Hydrological impacts of land use change for food, fuel and fibre production.

In his opening address, Deputy Vice-Chancellor and Head of College, Professor Pete Zacharias, said the conference supported two of the University's main goals: applying African Scholarship in the environment in which we live – "Africans solving Africa's problems" – and transdisciplinary collaboration and partnerships – "water is becoming a unifying theme across a range of activities".

One of the features of the symposium was the launch of WR2005 by the Water Research Commission (WRC). It involved the handing over of an integrated modelling system to the Deputy Director General of Water and Environmental Affairs, Dr Sizwe Mkhize. The system, aimed at effectively managing South Africa's water resources, was developed by a consortium of experts managed and funded by the WRC.

The symposium, deemed a great success, provided an excellent opportunity for the University to interact with the real world and for hydrology scholars to discuss the future quality and quantity of South Africa's water resources.

A large number of BEEH alumni attended the symposium: (Back row from left) Lousie Dobinson, Mark Gush, Jason Hallowes, Phillip Hull, Simon Johnson, Mehari Frezghi. Second row: Kerry Grimmer, Sakhile Hlalukane, Ryan Gray, Percy Sithole, Peter Mpoko. Front: Gabriel Lekalakala, Kevin Bursey, Dylan Kime

Hydrology symposium coordinators, Professor Graham Jewitt (left) and Ms Michele Warburton (right) with the Chair of SANCIAHS, Professor Denis Hughes (centre, left) and guest speaker, Dr Chris Herold (centre, right)

BEEH Masters student conducts valuable research

Mr Ashiel Jumman, Masters Agricultural Engineering student and a researcher at the South African Sugarcane Research Institute (SASRI), recently conducted research that will help farmers determine how much water their crops need.

Together with another SASRI researcher, Mr Jumman measured the soil water potential levels in KwaZulu-Natal sugarcane fields. They used Watermark sensors in combination with H8 Hobo four channel data loggers which were calibrated in a pressure plate chamber by Professor Simon Lorenz and Mr Kobus Pretorius, both from the School of BEEH. Before the study, there was evidence to suggest the farmers were under-irrigating their crops. This was proved correct by the Watermark sensors.

The sensors provide strong advantages over volumetric soil water sensors (including capacitance sensors, neutron probes and time domain reflectors) which only indicate the amount of water in a given volume or depth of soil. They are capable of measuring the energy a crop deploys in order to suck up the water. This has huge potential for farmers looking for a more direct indicator of potential crop stress during critical growth periods, and whether or not the soil is too dry.

According to Mr Jumman, the sensors are compact and easy to operate, don't require specialised knowledge and are reasonably inexpensive. The only downside is that they are sensitive to soil temperature which must be monitored and factored into the calibration equation.

Chemical Engineering

Chemical Engineering delegation features prominently at conference

Professor Deresh Ramjugernath, as South African Research Chair in Fluorine Process Engineering and Separation Technology, recently led a large team of his chemical engineering postgraduate students to the South African Chemical Engineering Conference in Somerset West.

The UKZN Research Chair delegation, which consisted of 18 members, presented a total of 20 papers – by far the largest number of papers presented by any one delegation.

The UKZN Chemical Engineering delegation at the conference in Somerset West

"We made a massive contribution at the conference with almost 15% of all papers presented being by our group. I believe this is truly noteworthy and emphasises the contribution of my Chair in terms of chemical engineering in the country," said Professor Ramjugernath.

Professor Ramjugernath and his team of students actively contribute to the Government's Fluorine Research Expansion Initiative (FEI) by researching and developing South Africa's fluorinated products. Their activities are integral to the development of a fluorochemicals industry in the country and are directly linked with the Nuclear Energy Corporation of South Africa and SASOL.

Director of UKZN's Thermodynamics Research Unit and Professor of Chemical Engineering, Professor Ramjugernath has a publication record of over 180 journal and conference papers and has graduated nearly 50 Masters and PhD students.

Research day highlights Chemical Engineering expertise

The KwaZulu-Natal branch of the South African Institution for Chemical Engineers (SAIChE), in which UKZN plays a key role, held its annual Research Day at the University's Innovation Centre on 24 July. Showcasing students' projects as well as industrial research, the event provided a unique platform for interaction between students from various academic institutions and the companies involved in chemical engineering related work. Participants, including students and researchers from UKZN, Durban University of Technology and Umgeni Water, presented oral and poster presentations which were assessed by a panel of professional judges.

The overall winner of the Research Day was UKZN Chemical Engineering PhD student, Mr David Lockhat. His project was entitled "Gas-phase Metathesis of 1-hexene over a WO3/SiO2 catalyst: Search for Optimal Reaction Conditions". Mr Lockhat and the other prize-winners received their awards at the SAIChE AGM and Dinner held in the evening at the Hilton Hotel.

The Research day will continue to be held annually and will hopefully feature prominently in the calendars of the KwaZulu-Natal chemical industry and the province's tertiary institutions.

Civil Engineering, Surveying and Construction

Some of the new staff in the School: (left-right) Prof Sekhar Chakrabarti, Prof Sarvesh Chandra, Ms Pria Bhagwandin, Ms Robynne Lawrie, Dr Muthukrishnavellaisamy Kumarasamy, and Mr Malcolm Jaros

New members of staff:

- **Dr Mulemwa Akombelwa**
  Lecturer in Geomatics
- **Mrs Bilkis Alladeen**
  Assistant Administrative Officer: Land Surveying & Property Development
- **Ms Pria Bhagwandin**
  School Administrator
- **Professor Sekhar Chakrabarti**
  Professor in Structural Engineering
- **Professor Sarvesh Chandra**
  Professor in Geotechnical Engineering
- **Mr Logan Govender**
  Technical Manager
- **Mr Malcolm Jaros**
  Senior Lecturer in Geotechnical Engineering
- **Dr Muthukrishnavellaisamy Kumarasamy**
  Lecturer in Hydraulics
- **Ms Robynne Lawrie**
  LEAP Lecturer in Civil Engineering
- **Mr Ntlibi Matete**
  Lecturer in Environmental Engineering

Civil Engineers benefit from course on Problem Soils in Southern Africa

UKZN Civil Engineering students and practicing geotechnical engineers in the Durban area were recently treated to a highly valuable course that looked at some of the challenging geotechnical conditions in southern Africa.

Hosted on the Howard College campus and organised by the South African Institution of Civil Engineers, the course was presented by five high profile specialists from Gauteng, four of whom received their degrees from UKZN.

Participants discussed some of the unique problems in South Africa that are rarely encountered or understood in the developed world, e.g. sinkholes large enough to swallow a house and expansive clays that start out desiccated and heave when infiltrated. Other local problem soils such as dispersive clays (breaching of earth dams) and silty sands with collapsible grain structure (cracking houses on the Berea and Bluff) also formed part of the discussion.

According to Senior Civil Engineering Lecturer, Mr Malcolm Jaros, the event "presented valuable knowledge not available in textbooks and also served to strengthen bonds between the academic and professional communities."

Professor Stanley Mneney shakes hands with Mr Eddie McAlone from Movius with Dr Rob Smorfitt (front left) and staff from the School of Electrical, Electronic and Computer Engineering

Textbook donation benefits Electronic Engineering Students

Global leader in the telecommunications industry, Movius, recently donated R50 000 worth of textbooks to the School of Electrical, Electronic and Computer Engineering.

Brainwave of local entrepreneur and part-time UKZN lecturer, Dr Rob Smorfitt, the books relate specifically to the telecommunications field. They will enrich the learning experiences of students in Electronic Engineering, many of whom struggle to afford the requisite textbooks for their classes.

Originally intent on sponsoring a telecommunications student, Movius was persuaded by Dr Smorfitt to put their funding into textbooks which is a more sustainable way for a small company to make an impact. Managing Director of Movius Africa, Mr Eddie McAlone, said: "we could touch one student but this way we can touch many more". He emphasised the importance of increasing the pool of skilled engineers in South Africa. He assured the School that it should not view this as a one-off contribution, but that as long as his company continues to grow, it will explore other ways of supporting students.

Head of Electrical, Electronic and Computer Engineering, Professor Stanley Mneney views the textbooks as a valuable contribution to his School. He said some students depend solely on notes as many of them support families back home and textbooks are often the last things on their list of priorities.

Professor Mneney said the textbooks will be treated like other equipment within the School which students can sign out and keep for a set period of time. This will give the School greater control of the resources and they can be recycled year after year.

Centre collaborates with Aalborg University

UKZN became the first South African university to sign a Memorandum of Understanding with Aalborg University when its Radio Access and Rural Technologies Centre (CRART) and the Centre for TeleinFrastruktur (CTIF), located in Denmark, agreed to collaborate.

The objectives of the collaboration include the initiation of study courses and joint research programmes in wireless communications and multimedia technology that may include European Union-commissioned projects. Research activities will include the exchange of staff members as well as collaboration between students on specific projects or theses.

CRART, located in the School of Electrical, Electronic and Computer Engineering, was established in 1997 to find solutions to South Africa's telecommunications challenges and to train engineers in advanced communication techniques. It is supported by Telkom, Alcatel-Lucent and THRIP.

Deputy Vice-Chancellor and Head of the College of Agriculture, Engineering and Science, Professor Pete Zacharias, highlighted the College's drive to develop working partnerships. "As communication is so critical to the effective development of any country's potential, we look forward to strengthening our relations with Aalborg and hope these expand to the other areas where we have complementary expertise," said Professor Zacharias.

Mechanical Engineering

Mr Haydn Osborn of ISS hands over the fuse to the wind turbine to Professor Glen Bright, Head of Mechanical Engineering

Pictured at the handover ceremony are the Mechanical Engineering students responsible for designing, manufacturing and installing the School's small wind turbine test facility (left-right): Bernard Genevieve, Jean Pitot, Ramona Chinappan, Glen Bright, Fambirai Takawira, Anthony Govender, Haydn Osborn and William Hove

Mechanical Engineering installs state-of-the-art wind turbine

In its quest to focus on renewable energy research, UKZN's School of Mechanical Engineering recently celebrated the handover and installation of a wind turbine on the Howard College campus. The R30 000 state-of-the-art wind turbine was donated by Inkanyiso Sustainable Systems Pty (Ltd) (ISS), a leading Durban-based consortium committed to addressing some of the key energy and environmental problems facing our country.

The wind turbine will complement the School's newly established small wind turbine test facility which was designed, manufactured and installed by Masters student, Mr Jean Pitot, and his team of highly committed fourth year mechanical engineering students.

As part of a final year student project, Mechanical Engineering's Renewable Energy Research Group will conduct a rigorous practical assessment of the turbine's durability and performance across a range of conditions. Their research will also investigate the effect of advanced blade design on the turbine's performance.

A formal agreement between the School of Mechanical Engineering and ISS to share the research findings will acquaint today's engineering students with the intricacies of wind turbine technology and will assist the company to further develop its products. Managing Director of ISS, Mr Haydn Osborn, expressed his pleasure at being able to forge new relationships between the private and educational sectors. "It is through this type of inter-sector cooperation that we will be better able to address the economic, social and environmental challenges which face us as a nation and a planet."

Recent activities in Mechanical Engineering

The School's Open Day was held on 23 October and showcased the final-year students' design and research projects. Some of these included wind turbinews, rocket motors, reconfigurable search-and-rescue robots, novel car engines and industrial chipboard recyclers.First prize was awarded to one of Professor Glen Bright's project teams which devised a modular tool changing unit for reconfigurable machines. Second and third place prizes went to a high voltage powerline tensioning device and a solar drier system for drying agricultural and marine products. Substantial funding was received for many of these projects, often running into hundreds of thousands of rands. The School believes that such funding highlights the relevance of its projects to industry and to international research efforts. It also emphasises the high quality and dedication of its staff and students.

Several lecturers and postgraduate students attended conferences around the world (primarily in North America) during the last two months: Mike Brooks, Jean Pitot, Riaan Stopforth and Glen Bright.

The Metallurgy discipline was proud to host the Struers / IMP Materials Preparation Workshop from 5-7 August. Much of the Metallurgy laboratory's new equipment was obtained at substantially discounted rates from these companies, and very generous donations were also received for hosting the workshop. Participants gained valuable knowledge and benefited from the networking opportunities and contacts they made in the niche area of materials science.

Mechatronics and Robotics

The Robotics discipline founded the Smart Technology Applications Research Team (START) which aims to broaden the practical knowledge of undergraduate students in the new and exciting world of mechatronics and robotics.

This research team exploits the idea of systems' integration by combining the disciplines of mechanical, electronic and software engineering.

Through research and the application of current mechatronic systems, a practical understanding will be gained outside the confines of the classroom. This understanding will be refined and applied to the construction of "Smart Technology" - hybrid systems that are able to operate autonomously. START hopes to be at the forefront of autonomous vehicle research by developing concepts on scale projects and adapting these concepts for practical scale applications.

UNITE Access Programme

Annual 3D paper plane competition is a hit

The UNITE Programme, which is dedicated to enhancing the success of Black engineering students, recently held its annual 3D paper plane competition. Forty students, divided into ten teams of their choice, had to design a paper airplane using one A3 piece of paper.

The judging criteria were the 3D's, namely Design, Distance and Direction. All teams were given the opportunity to test their design and to perform pre-flight checks.

For the Distance category, all planes were launched from the balcony in the Rick Turner Hall. Direction was tested by strategically placing a hula-hoop on the floor and recording the planes' proximity to this target. Three 'distance' attempts and three 'target' attempts were allowed per team. In the final round of the competition all planes were scored for Design.

The team with the highest total score was declared the winner and was treated to a generous prize – a flight in a private jet owned by a friend of UNITE from Container World who also addressed the class on various flight aspects and some basic technologies on how jet engines work.

The winners of the 3D paper plane competition: (left-right) Noel Powell (Head of UNITE), Innocent Khumalo, Nokubonga Mbili, Sandile Mthembu, Wonder Kunene, Rudi Kimmie (Deputy Head of UNITE)

The winning team prepare for their flight in a private jet

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