

New water institute aims to spearhead 'BLUE REVOLUTION'



UF membranes, pictured here, are among the focus areas of the SU Water Institute.

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The new Water Institute at Stellenbosch University (SU) is ready to lead South Africa's 'blue revolution' through the advancement of technology and innovation. This was the main message at the official launch of the institute during National Water Week in March.

The institute brings together a host of established water research groups across various disciplines and departments. The researchers now united under the banner of water include, among others, microbiologists, polymer scientists, soil scientists, geologists, invasion biologists, engineers, zoologists, food scientists, biochemists, agricultural economists and even a philosopher.

“At SU we have, over the years, built up excellent capability within the field of water research in various departments and faculties,” notes Prof Eugene Cloete, Dean of the SU Faculty of Science and Chair of the Advisory Board to the Water Institute. “By uniting our researchers in such a way I believe we have created a national asset that actively contributes towards solving South Africa’s and the continent’s water-related challenges.”

According to Prof Cloete, there is a clear need to develop innovative new technologies and materials to address the issues faced by the water sector, such as the improved supply of potable water. “Although new approaches are continually being examined, these need to be durable,

cost-effective, and more efficient than current options for the removal of contaminants from water. Innovation holds the key to the mitigations of all of these problems – ranging from unsophisticated technologies like rooftop rainwater harvesting and nanotechnology.”

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Current research undertaken at the water institute in collaboration with government and industry focuses on the themes of health, agriculture and food, a sustainable environment, nanotechnology and filtration, effluent treatment as well as social aspects around water. One of the early successes of the institute has been the development of the now famous nano-filtration ‘teabag’, which achieved world-wide status last year. SU has since signed a licensing agreement with the company Aquacure to produce, manufacture and market



Prof Russel Botman, Vice Chancellor of SU, Minister of Science & Technology Naledi Pandor and Chair of the SU Water Institute Advisory Committee Prof Eugene Cloete at the launch of the institute earlier this year.

Justin Aliberts/SU

the filters. Special equipment is also being imported to undertake the electrospinning of the filters at commercial scale.

The Water Research Commission (WRC) is a significant contributor to many of the research undertaken at the SU Water Institute. This includes studies into membrane technology led by Prof Ed Jacobs at the Department of Chemistry and Polymer Science. Present research aims to increase the water recovery ratio of ultrafiltration membranes to beyond the accepted 95% level. According to Prof Jacobs, key to the success of this research is the development of a floating media filtration process used both to condition feedwater for the UF process and to separate solids for discharge. Preliminary investigations are also underway to develop equipment and protocol to harvest kinetic energy from flowing water and to convert it to potential energy to drive a membrane filtration process.

The WRC is also contributing to research around endocrine disrupting contaminants (EDCs) at SU. The Department of Botany and Zoology under leadership of Prof Hannes van Wyk is currently developing several additional biomarkers for the screening of potential endocrine activity in our waters. Meanwhile the Department of Biochemistry, led by Prof Pieter Swart, is doing valuable work aimed at reducing the risk of EDCs through early detection. "Our approach is to fill the information gaps in developing and validating the testing and screening of substances with possible EDC effects in purified drinking water."

In the end it is all about making a difference where it matters. "We hope to see the Water Institute continue its groundbreaking work and truly put science and our expertise at the service of human need, to overcome some of the biggest water-related challenges facing our country, our continent and the globe," concluded Prof Russel Botman, SU Vice Chancellor. □

SOUTH AFRICA'S WATER CHALLENGES, ACCORDING TO SCIENTISTS AT THE SU WATER INSTITUTE RELATE TO:

- **The monetary value attached to water:** "We need more focus on issues about the efficient allocation of water, because water is such a scarce resource and of enormous economic importance, especially to the agricultural sector," notes Prof Theo Kleynhans of the SU Department of Agricultural Economics in the Faculty of AgriSciences. "Water must remain an important policy and business issue."
- **Low-cost housing, health and sanitation:** "It is admirable to want to provide housing for all South Africans, but if we do not also ensure the adequate upkeep of provided facilities such as toilets and taps, the sanitation problems associated with low-cost housing will continue to pose a health risk to humans and the environment," notes Dr Jo Barnes of the Division of Community Health in the SU Faculty of Health Sciences. She believes more serious thought must go into the design of low-cost housing to ensure better sanitation conditions.
- **The contamination of irrigation water and fresh food produce:** According to Dr Gunnar Sigge of the SU Department of Food Science in the Faculty of AgriSciences, South Africa's failing sanitation levels, combined with its below par water treatment services might be to blame for the potential contamination of rivers, irrigation water and raw food products with waterborne disease-causing pathogens. "There is a real risk that people who eat unwashed raw food could contract diarrhoea or other waterborne diseases when contaminated water is ingested or used to irrigate these crops."
- **The use of membrane technology to solve water shortages:** Faced with water shortages local authorities are increasingly turning to membrane technologies to help solve their water provision problems. "On the South Coast alone, seawater desalination plants are already running in Knysna, Sedgefield, Mossel Bay and Boesmans River," notes Prof André Burger of the SU Department of Process Engineering in the Faculty of Engineering. "Our challenge is to make it increasingly effective and cost-effective." Prof Burger also foresees that seawater desalination together with effluent recycling will become an integral part of water provision in the water-scarce Western Cape within five years.
- **The impact of invasive species on water quality and provision:** "Now more than ever we need research being done [on the impact of invasive species] to find its way into policy and into practical guidelines that can help individual landowners and other custodians of land to effectively manage our resources," notes Prof Dave Richardson, Deputy Director: Science Strategy of the DST-NRF Centre of Excellence for Invasion Biology based at SU. "In South Africa as the case worldwide, riparian zones are heavily invaded by alien plants that generally are massive consumers of water. In many areas, this destabilises stream banks and substantially reduces water quality and quantity due to the increased biomass." Alien fish species such as trout and bass, as well as water weeds such as hyacinth also impact local biodiversity.
- **The occurrence of EDCs in our water:** A whole host of endocrine disrupting contaminants (EDCs) are being released into our environment every day. The chemicals in these products have the ability to mimic or antagonise the functioning of the steroid hormones in our bodies. EDCs can disrupt the normal functioning of the endocrine system in humans, fish and reptiles. Research has shown that EDCs have had an impact on infertility levels in some communities, the occurrence of certain types of cancers as well as hormone-related bodily changes such as hermaphroditism. "It isn't possible to simply routinely test and detect EDCs, as they have no visible characteristics like smell or taste and they usually occur at extremely low concentrations," notes Prof Pieter Swart, chair of the SU Department of Biochemistry in the Faculty of Science. Therefore specialised analytical methods are required. "Thanks to solid support from, for instance, the WRC, South African researchers have been able to make valuable contributions to the field."



Drs Michèle de Kwaadsteniet and Marelize Botes with Prof Eugene Cloete all of SU at the seminar which preceded the launch of the Water Institute.

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