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Newsletter of the Water Research Commission

In This Edition

Microbiology from a Macro-Scientist – p1
 From the Chair – p2
 Minister Sonjica Addresses New WRC Board – p2
 Bev and Arjen Join WIN – p2
 Site Visit – Jatropha @ Empangeni, KwaZulu-Natal – p4
 Water Safety in Small Community Water Supply – p4
 The WRC at the IWA-WISA Conference – p4
 The WRC @ the SAIWA Career Faire – Kimberley – p4



Microbiology from a Macro-Scientist

When Professor Eugene Cloete experienced a series of disappointments regarding the publication of his research, this did not deter him. Instead it spurred him on to achieve greater heights. In 1981 he discovered a bacteria that could lyse algae and this was a world first. However, his publication was rejected along with a few others. When Prof Cloete's work on the role of *Acinetobacter* was published, it placed him on the world map. This eminent researcher today boasts many accolades: he is a Senior Fellow of the Water Institute of Southern Africa (WISA). He also serves as the Vice-President of the International Water association (IWA), serving also as Chairman of the IWA Strategic Council. He has also received awards from SAIWA and the Corrosion Institute.

Prof Cloete commenced his career at the Institute for Environmental studies at the University of the Free State as a researcher, during which time he completed his MSc (Botany). He then joined a chemical company as Technical Manager and enrolled for a DSc degree in microbiology at the University of Pretoria (UP). In 1986 he joined UP as a senior lecturer and was promoted to Associate Professor two years later and full professor during the following year. In 1995

he assumed the position of Head of Department of Microbiology and plant pathology at UP. In 1999 he was appointed Chairman of the School of Biological Science.

"My primary philosophy in life is to add value to the lives of other people. Bringing solutions to water problems has been an excellent vehicle to live this philosophy. My career as an academic has afforded me the opportunity to help shape the future for many under-graduate and especially post-graduate students who are today significant people. It was an honour for me to be part of their careers as friend and colleague. I also value quality and high standards in every endeavor and pursuit of excellence has been a major driving force throughout my career," says Cloete. During his career thus far Prof Cloete has 110 publications under his belt, has supervised more than 50 Masters and Doctoral students and has edited three books. Prof Cloete's focus on developing students is aligned with the WRC's capacity-building drive.

Says Prof Cloete: "I have been involved with the WRC for the past 15 years. The WRC has played a major role in my development as a scientist and has contributed to the training of 20 MSc and PhD students under my supervision and to more than 60 scientific papers in SCI journals out of a total of 110 over this time. The support by the WRC has also contributed to the establishment of the Centre for Water Biotechnology at UP under my leadership. Today the WRC continues to be an important resource for my research. For many years I have also participated in evaluating research proposals for the WRC as well as served on numerous steering committees or reference groups as they are now called. The WRC is not only an excellent catalyst in water research in South Africa, but also has one of the best systems to ensure that quality research is produced. There numerous research reports that have been published and the demand for these are testimony to this. The WRC is one of the premier knowledge hubs in the world. They have also contributed significantly to place SA researchers at the forefront, making them international players at the highest level. This, in turn, has led to the establishment of experts in the field that can be considered national assets."

Greatness is usually rooted in excellent mentors, role models and peers. In the case of Prof Cloete, his main catalysts were Dr DF Toerien and

Prof JH Pieterse from the University of the Free State. They were the promoters of his MSC who set high standards, a norm that forms the essential make-up of this learned academic. "Some of the colleagues and peers who have made an impact on my life are Prof George Ekama, Prof Mark Wentzel and Prof Peter Ashton, who are truly leaders in their field of expertise and internationally respected. I have also been inspired by scientists like Prof Bill Costerton, the father of biofilm research who I have had the pleasure of working with, Prof Z Lewandowski another world leader, Dr Bill McCoy a good friend of mine who chose to stay in industry and become the technical director of the largest water treatment company in the world. Prof Allan Hamilton, who did benchmark work on sulphate-reducing bacteria at the University of Aberdeen and there are many more, that I could mention. I am indebted to these individuals who have touched and enriched my life over the years," says Cloete.

"Water has been and will continue to be one of the major issues in the world. The world is in need of experts in every field of water research and management. A career in water is worthwhile in every possible respect and a great way in which we can contribute to make a difference in this world. I will continue to pursue my career in water research. The world is in dire need of expertise and new technologies to bring water and sanitation to millions of people around the world."

When the good professor is not engaged with microbiology, he enjoys restoring vintage cars. His latest project was a 1962 Jaguar MK II. He is generally a motor car enthusiast. He also enjoys good music and watching an absorbing movie.

Greg Steenveld, Research Manager at the WRC says, "Prof Cloete and the WRC have had a productive research relationship going back a long time. I personally have had the pleasure of working with him on a number of projects where he has always delivered quality outputs (and on time!). He has also served on a number of steering committees for other projects I have managed – the latter is a testament to his wide-ranging knowledge in microbiology in general and biological wastewater treatment systems in particular. One aspect that deserves special mention is his dedicated mentoring of students, all of whom (that I know of!) later continue to hold him in high esteem, a mark of the value that he has contributed to their development".

Prof Cloete, the WRC admires your contribution to water research and to improving the lives of South Africans in particular. Your valued expertise in the water sector is gratefully acknowledged.



F From the Chair

Yuven Gounden of the WRC interviewed Dr Snowy Khoza, the new Chairperson of the WRC Board



that can take the WRC to greater heights and, consequently, provide support to the Minister of Water Affairs and Forestry, Ms Buyelwa Sonjica.

Where do you see the WRC in the next ten years?

I see the WRC as the Africa's Centre of Excellence in the Water sector. I see a WRC that leads and is proactive in providing water knowledge solutions in South Africa and the continent and commands respect as a leader in the water sector internationally. I believe that the WRC already commands this respect and we need to ensure that we sustain and grow this respect. I also believe that the WRC has the knowledge workers in critical areas that can make this vision a reality. I will be one of those that will look back at the WRC and say I knew it!!

How do you intend supporting the WRC as Chairperson of the Board?

The Board consists of highly qualified professionals, people who have broad experience and competencies especially in the research field and the water sector. I believe that as the Chairperson of this highly qualified Board, having served in the previous Board myself, my job is made easy by that.

How do I intend supporting the WRC? I will support the WRC through the available knowledge base we have in the Board and the WRC. My job is to ensure that the "Board-team" strategically facilitates the vision and mission of the WRC. The Act, the Core Strategy and Business Plan as well as Policies of the WRC are very clear in terms of what we as a team (Board and the WRC as an organization) need to do to deliver our mandate - of creating a globally recognized water-centered knowledge hub that provides innovative water solutions to meet the changing needs of society and the environment not only in South Africa but globally.

Is there common ground in your role as Executive Manager: Knowledge Management (DBSA) and as Chairperson of the WRC, given the fact that the WRC is South Africa's water knowledge hub?

Yes, there is common ground in what I am doing

at the DBSA and currently on the WRC Board. Knowledge Management is the same in all knowledge-based or learning organizations. My job at the DBSA is to facilitate the positioning of the DBSA as a knowledge-bank and as a centre of development knowledge. Thus, my job spans further than applied research but stretches to monitoring and evaluation of DBSA projects for development impact measurement, to developing sector strategies, policies and perspectives. I also manage an Academy to build capacity of DBSA staff as well as DBSA clients and stakeholders. All of these are geared towards ensuring that knowledge is generated, applied, disseminated and shared inside and outside the DBSA. All that is done by the WRC, we do also at the DBSA. So yes, there are synergies between the two organizations.

What innovations are you planning on introducing to the WRC?

As a Board member I have no individualistic innovative ideas. What I bring must be in line with the mandate of the Board and the WRC. Personally I have no new ideas to bring except consolidating what is in the core strategy of the WRC. Having said this I believe that we can create an "unpenetrable, uninterrupted and uncorruptable" team from Board down to staff. I believe that we can create a visionary team

Minister Sonjica Addresses New WRC Board

On 18 July 2005 the Minister of Water Affairs and Forestry, Ms Buyelwa Patience Sonjica, met the new WRC Board at the WRC offices in Pretoria. She formally welcomed Board members and outlined her expectations during their term of office. Read Minister Sonjica's speech on the WRC website www.wrc.org.za.

The new WRC Board met WRC staff members on 19 July. The Chairperson, Dr Snowy Khoza, addressed staff. Thereafter, Board members interacted informally with WRC staff.

*Jay Bhagwan chatting to Richard Holden and Martin Rall (top right)
Dr Khoza addressing WRC staff members (bottom right)*



Bev and Arjen Join WIN

Bev Pretorius joined the WIN-SA team in April 2005, as a Programme Support Specialist. When Bev joined the water services sector in 1997, she did not realize that she would make such a valuable contribution to the sector. She worked in the Department of Water Affairs and Forestry, and was mainly responsible for Institutional and Social Development (ISD), and Water Services Development Plans (WSDP). Prior to joining the WIN team, Bev was responsible for the establishment of the first Water Services Directorate at the South African Local Government Association (SALGA). Her focus areas in WIN are, Building a strong network of partners, and strengthening the products and services.

Bev's passion never ceases to explore innovative ways to assist municipalities in lesson learning and sharing, in order to accelerate the delivery of quality water and sanitation services to households. She believes that WIN has a significant contribution to make towards assisting the sector to achieve the targets articulated in the Strategic Framework for Water Services.

Arjen van Zwieten joined WIN as the Portal Administrator in July 2005. Arjen gained experience in web and portal development and administration through several similar large-scale project. Most recently he was involved in the development and implementation of the HRD Data Warehouse at the HSRC. Prior to that he worked as the Data Unit Manager at the Trade & Industrial Policy Strategies. His areas of responsibility at WIN lie in the development and administration of the WIN portal as well as content management and development for the portal.



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What's New

Report No 606/2/05 (Contractor: Cape Metro Council)

Practical application of hazardous waste co-disposal with municipal refuse at the Coastal Park landfill bioreactor

This project was negotiated between the Cape Metropolitan Council and the Water Research Commission with the objective of developing practical operational criteria for the landfill co-disposal of selected hazardous wastes with general wastes. This could assist smaller landfill operators where only general waste landfills occur and where small volumes of special wastes must be disposed of. The most striking finding of these studies was the small amount of leachate that found its way to the base of the cells. It would appear that rain water was absorbed and mostly held by the landfilled-general wastes, subsequently being drawn back to surface by capillary action, where it evaporated during the course of each year. Seasonal variations in leachate flow rate were evident to varying degrees in all cells. There was no evidence of breakthrough of any of the applied hazardous waste chemicals or soluble tracer salts over a period of 7 years. The total masses of chemicals found in the leachates were a very small percentage of the applied amounts and sampling of the wastes underlying the cells showed that most of the co-disposed substances had remained within the waste.

Report No 1255/1/05 (Contractor: Nelson Mandela Metropolitan University)

Phytoplankton Chlorophyll *a* concentration and community structure of two temporarily open/closed estuaries

The objectives of the study were to determine variations in phytoplankton chlorophyll *a* concentration in relation to changes in nutrient input following increased river inflow; to determine spatio-temporal distribution of the phytoplankton chlorophyll *a* concentration and relate this to water level fluctuations; to examine the influence of fluctuating water level on phytoplankton community structure particularly during periods of mouth closure; to determine shifts in phytoplankton community structure following changes in nutrient loading brought about by increased water flow, and to link the information from this study to ongoing regional research on estuarine reserve determinations and other regional, national, and international related research on temporarily closed/open estuaries. The two estuaries selected for study were the Maitlands and the Van Stadens. Results indicate that both estuaries are oligotrophic, and that the rivers are the sources of nutrients for the systems. The phytoplankton communities reflect this difference. A flow of $\geq 3 \text{ m}^3 \text{ sec}^{-1}$ was sufficient to breach the berm across the mouth of the Van Stadens estuary, and a flow of $0.8 \text{ m}^3 \text{ sec}^{-1}$ was the minimum sufficient to keep the mouth open. The study showed that the nanophytoplankton size-fraction was responsible for driving water column production, and the contribution of groundwater to the nutrient budget varied. The results of the research have already been applied in principal in the DWAF reserve process on other estuaries.

Report No 1137/1/05 (Contractor: University of Pretoria)

The range, distribution and implementation of irrigation scheduling models and methods in South Africa

The adoption of irrigation scheduling amongst commercial and small-scale farmers was investigated with the purpose of identifying the possible human and socio-economic factors that may influence the adoption thereof. This investigation was done on macro (scheme) level as well as micro (on-farm) level. The study found that commercial irrigation farmers rely mainly on information from the local co-operative, private consultants, industry experts and fellow farmers, while the majority of the small-scale irrigators depend more on information from the departmental extensionists. One of the most valuable insights derived from this project was the identification of the vast difference in perception regarding irrigation scheduling and what it involves. It is inevitable that farmers will differ in their selection of the most appropriate scheduling method and technique, as their needs will be based on the relative technology level of operation required on the farm.

Report No TT 243/04 (Contractor: Institute of Natural Resources)

Managing estuaries in South Africa: A step-by-step guide

Since democracy was established in South Africa, there has been a strong emphasis on promoting the participation of civil society in governance and in managing the use of natural resources. The legal foundation for this is reflected in the South African Constitution and Acts that have followed. This has brought new challenges for government, civil society and for researchers whose contribution is increasingly measured as growth in understanding leading to social benefits that can be sustained in the longer term. Acknowledging this context, the challenges posed to researchers in this programme were to better understand the needs of society, to develop the scientific basis for management and to promote informed co-operative governance and management of the use of estuary resources. The purpose of this guide is to assist in managing the activities associated with estuaries so as to improve co-operative use and reduce the conflict that results from competing uses.

Report No TT 180/05 & TT 240/05 (Contractor: Tshwane University of Technology)

NATSURV: Water and wastewater management in the oil refining and re-refining industry & the power generation industry

Two further issues in the NATSURV series of "Guides to Water and Wastewater Management" in various industries have been published, bringing the total number of publications in this series now to sixteen. The latest issues cover the Oil Refining and Re-Refining Industry (NATSURV no. 15) and the Power Generating Industry (NATSURV no. 16). In each, the Specific Water Intake (SWI) and Specific Pollutant Load (SPL) values for the respective industries were established from national surveys of all or most of the plants in the RSA. These values allow operators in these industries to

assess their relative water efficiency and environmental impact. Recommendations for improving performance in these areas are also given. The NATSURV series has been amongst the most widely-sought publications by the WRC. Previous issues have dealt with water and wastewater management in malt brewing, metal finishing, soft drinks, dairy products, sorghum malt, laundry operations, poultry abattoirs, red meat abattoirs, sugar production, pulp-and-paper, textiles, wine-making, leather tanning, fruit-and-vegetable processing, and pelagic fishing. The NATSURV series will shortly be downloadable from the WRC website.

Report No 1377/1/05 (Contractor: CSIR)

An evaluation of different commercial microbial or microbially-derived products for the treatment of organic waste in pit latrines

Laboratory tests and on-site trials have confirmed that microbially-derived products can potentially be used to successfully treat organic waste in pit latrines. Because the process of anaerobic decomposition is very slow, such wastes normally accumulate, leading to odour production and posing health and environmental risks. Most of the commercially available biological products have multiple purposes, with relatively few currently in use for pit latrine treatment. The efficacy of twelve commercial products was tested in small-scale laboratory trials. Two of the most promising of these were field tested with promising results such as the disappearance of flies and odours. Although the digestion of organic waste was also improved, the large variability in measured effects, resulted in the improvement to be statistically not significant.

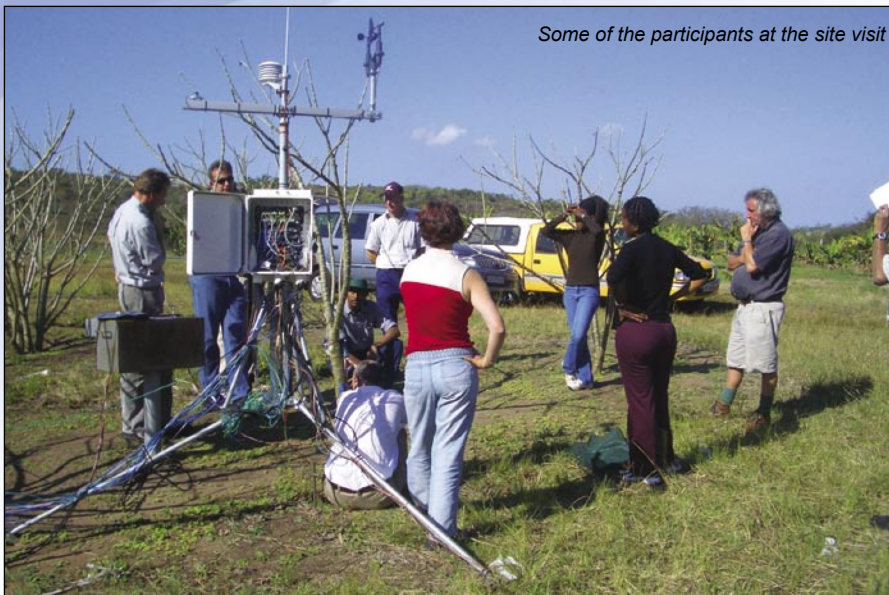
Other new reports available:

1467/1/05 & 1467/2/05 – Knowledge review of modelling non-point source pollution in agriculture from field to catchment scale & First order estimate of the contribution of agriculture to non-point source pollution: Salinity, nitrogen and phosphorous
1229/1/05 – Removal of organic foulants from membranes by use of ultrasound
1388/1/05 – Application and conceptual development of genetic algorithms for optimization in the water industry
1323/1/05 – Analysis of groundwater level time series and the relation to rainfall and recharge
1200/1/05 – IL-6 as biomarker for the immunomodulatory effects on microcystins
1017/1/05 – Development of a biomonitoring method using protozoans for assessment of water quality in rivers and ground waters and seasonal/ephemeral waters
1257/1/04 – Hydraulics of estuarine sediment dynamics in South Africa
KV 163/05 – Measurement of heterotrophic active biomass in activated sludge systems
TT 248/05 – Guidelines for irrigation water measurement in practice
TT 246/05 – Ecological sanitation – Literature review
TT 249/05 – Guidelines for ensuring sustainable effective disinfection in small water supply systems

Reports can be ordered at
orders@wrc.org.za



Site Visit – *Jatropha* (Biodiesel Tree) @ Empangeni, KwaZulu-Natal



Some of the participants at the site visit

The WRC was part of a site visit to Owen Sithole Agricultural College in Empangeni on 21 July. This three-year project, which is funded by the WRC, deals with the cultivation of *Jatropha curcas* trees. The seeds of the tree have a 35% oil content and they can be used for diesel production. The husks of the seeds can be used for cattle feed and as a fertilizer.

Representatives from the Department of Agriculture, the CSIR, DWAF and the WRC were present. Mark Gush outlined how data such as weather conditions, sap flow and heat pulse measurements were recorded.

The three major components of the project were discussed at the site:

- Water use monitoring in *Jatropha* trees supported by remote automated loggers, cell phone links and timed computer download connections.
- A national GIS assessment of areas that are suitable for economically beneficial *Jatropha* plantations.
- Simulation of large scale hydrological impacts of *Jatropha* plantations.

WRC to Play a Leading Role in an International Drive to Improve Water Safety in Small Community Water Supply

The WRC will be playing a leading role in an international effort to promote and improve the safety of drinking water in small communities. This initiative will attempt to meet the Millennium Development Goals (MDG), initiated under the auspices of the World Health Organisation (WHO). Dr Gerhard Offringa (WRC) will represent South Africa as part of this international task group. He has attended a workshop, held from 19-22 July 2005 in the outback of Australia (Alice Springs), where some action plans were drafted.

This drive will encompass a two-pronged approach to improve small community water safety: A small task team has been selected (which includes South Africa) to coordinate international sharing of knowledge and tools in water safety. This also involves the setting up of a dedicated website. All internationally available management tools and knowledge will be utilised to assist small communities to improve their water safety. One of the first actions to be taken involves the compilation of an internationally applicable Water Safety Plan (WSP) for small community water supply. Draft WSP's from New Zealand, Australia, Bangladesh and Iceland will be used as a starting point. The WRC has already commissioned a research team, under the leadership of Umgeni Water, to draft a WSP which will be applicable to the South African situation in particular, and to the African situation in general. This work will be executed in close collaboration with the international task team.

The WRC at the IWA-WISA Conference

The WRC was one of the sponsors of the following IWA-WISA Conferences:

- Diffuse Pollution Specialist Conference
- Management of Residues Emanating from Water and Wastewater Treatment.

Both these conferences were parallel events which took place at the Sandton International Conference Centre on 10-12 August. The WRC exhibited at this event. As part of its capacity-building drive, the WRC sponsored the conference registration fees of seven students.

Dr Stanley Liphadzi presented a paper at this conference. His paper is titled:

Heavy Metal Displacement in EDTA-Assisted Phytoremediation of Biosolids Soil.

A copy of the presentation is available on the WRC website.

The WRC @ the SABC Career Faire – Kimberley

The WRC joined DWAF at the SABC Career Faire in Kimberley on 2-4 August. Learners were enlightened about careers in the water sector. DWAF's Forestry section (Upington Division)

gave learners a presentation on planting trees in arid regions. This proved to be a popular attraction at this event. Yuven Gounden represented the WRC at the Kimberley event.



Enthusiastic learners at the SABC career faire – Kimberley



Jacqui (Upington office) and Tebogo (Forestry, Pretoria office) assist learners at the career faire

New Chairperson for National Water Advisory Council

The Minister of Water Affairs and Forestry, Ms Buyelwa Sonjica, has appointed Mr Jay Bhagwan, a Director at the WRC, Chairperson of the National Water Advisory Council for a period of three years. The Council's task is to advise the Minister on various matters relating to water in terms of policy, conservation measures, recreational matters, structures, procedures and related matters.