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Newsletter of the Water Research Commission



In This Edition

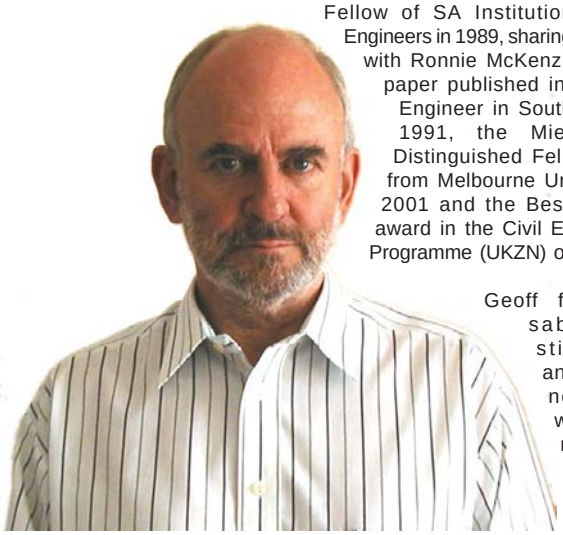
Carpe Diem!

On 19 November 2004 Prof Geoff Pegram gave his last undergraduate lecture after 38 years of developing and shaping young minds to meet the engineering challenges of the future. This eminent professor attained full Professor status in 1980 and has held the chair of Hydraulic Engineering for 25 years. As a colleague wrote in a recent tribute: "he enjoys working with young minds, developing their strengths and perhaps enthusing them in the things that excite him".

Geoff graduated from the then University of Natal, Durban (UND) in 1961 as a BScEng (Civil) Engineer and worked off his scholarship with the Rhodesia Railways in Zambia for 4 years. He then worked for a year with Cementation on the Orange-Fish scheme and was persuaded to turn to Water Resources engineering by Franz van der Wielen. After attending the Hydrology course given by Midgley, Pullen, Pitman and Schwartz and completing his MSc, he was persuaded to apply for lectureship by the Head of Department, Ken Knight. Geoff's initial trepidation was transformed to passion when he realized that he enjoyed this experience tremendously - this was his obvious calling! It comes as no surprise that Geoff supervised 12 successful MScEng candidates, two having attained distinctions; and co-supervised and supervised 4 successful PhD candidates.

He is grateful to his first wife, Gill, for supporting him in his career development as he "hauled his family to Lancaster (UK)" and completed his PhD in Stochastic Reservoir Theory under the supervision of Emlyn Lloyd in the Mathematics Department. Geoff returned to UND as a Senior Lecturer in 1972. During this time he worked with the likes of Lourens Hiemstra, Jim Windsor and Walter Zucchini together with a "trickle of good grad students: Mike Dixon, Ian Pearson, Alan Hulley and Derek Stretch."

The turning point in Geoff's career was his doctorate which gave him "analytical skills to follow (his) my intuition." This successful Academic has enjoyed many accolades spanning his brilliant career, among them the Ernest Oppenheimer Trust University Fellowship in 1977, being elected Fellow of SA Institution of Civil Engineers in 1989, sharing the award with Ronnie McKenzie for best paper published in The Civil Engineer in South Africa in 1991, the Mieyegunyah Distinguished Fellow Award from Melbourne University in 2001 and the Best Lecturer award in the Civil Engineering Programme (UKZN) of 2004.



Geoff found his sabbaticals stimulating and enjoyed networking with great minds, "contributing energy to their projects." Opportunities to visit abroad have become more frequent with the passage of years. In the last 8 years he has been overseas on over 20 occasions, working with field leaders such as O'Connell, Todini, McMahon, Bardossy and Sempere-Torres, respectively in England, Italy, Australia, Germany and Spain.

"My collaborative research literally blossomed with the support of the Water Research Commission (WRC), particularly Dr George Green, opening up new avenues of access to the hydrometeorogical community, both nationally and, more importantly after isolation, internationally. This support enabled networking with the world's best and led to interesting projects with my grad students (supported by the WRC): Mark Pennington (bored tunnel roughness), Tony Clothier ("String of Beads" rainfield model), Scott Sinclair (flood forecasting with radar) and Phums Mkwananzi (catchment modelling under uncertainty)."

"The WRC continues its support of the new programmes I am working on which can be summarized as 'Hydrometeorological modelling with Remote Sensing'. Through their support I have worked closely on radar-rainfield modelling with Alan Seed of the Bureau of Meteorology in Melbourne, then the research team of SAWS at Bethlehem: Deon Terblanche, Nico Kroese and Pieter Visser. This collaboration (besides building post-graduates) has blossomed into a joint contract (with DWAF, CSIR-SAC & ARC-ISCW) to receive METEOSAT-8 data directly from EUMETSAT. Much of the 'push' I have recently experienced to direct my research has been from George and Deon; whenever I say 'What next?' they always have an apposite answer. This comes from the base of understanding and the central role the WRC has in keeping its finger on the pulse of what is needed to solve the water problems in RSA. An academic in isolation can only dream up problems; for the research to be appropriate (after all I'm an engineer!) there has to be a hot line to where the important (not necessarily fashionable) problems are welling up."

Geoff is on the verge of embarking upon a new research project that deals with soil moisture measurement from space. He is grateful to the WRC for supporting his work and he looks forward to a close association with the WRC in the future.

The adage "behind every successful man is a woman" rings true in Geoff's case. He is indebted to his wife, Joan, for being supportive and enabling him to "re-invent" himself and "realize that there is a fruitful life of research after retirement. In my maturity I have learned, through Joan, to recognize my strengths and manage my weaknesses."

The "fruitful life of research" is evident when Prof Pegram was appointed by the University of KwaZulu-Natal as Honorary Research Associate in the Engineering Faculty- a position that he will hold until 2007, possibly thereafter. "This means that I can continue doing what I love as long as I can do meaningful research, publish and grow post-graduate students," says Prof Pegram. The irony is that this outstanding Professor's formula for success is simple: "I live my passion; seize the day; pour myself into the task at hand; don't pick up the hurdles I've knocked down - jump a little higher at the next one; do not betray trust; love life!"

Dr George Green of the WRC says, "There came a time about a dozen years ago when the WRC had completed some very successful projects on the stochastic modelling of rainfall at a point. This made it possible to simulate daily rainfall as measured by a single raingauge over time. But,

(continued on p 2)

what was really needed was to be able to model rainfall simultaneously over space and time, which would enable areal rainfall to be simulated – a process of far greater hydrological significance. Geoff Pegram was the only researcher we could find who dared to accept the formidable challenge. He threw his heart and soul into working on one innovative approach after another. Before long he was successful in numerically simulating rainfields thousands of km^2 in extent, as observed by radar. This ability opened up a host of hydrological applications and gained Geoff and his graduate students international recognition, all of great benefit to the WRC and South Africa. With this level of momentum, there is now no stopping Geoff – not that we would ever wish to!"

Prof Pegram, the WRC looks forward to interacting with you for many years to come, especially after your re-invention and the renewed vigour with which you grapple with the "what next?" challenges which will be thrown at you. We look forward to seeing you "jump a little higher" each time a hurdle is placed in front of you!

The WRC @ the Global WASH Forum, Dakar, Senegal

On 28 November – 2 December the WRC formed an integral part of the Global WASH Forum (attended by at least 500 people) held in Dakar, Senegal. The WRC took the initiative to coordinate a South African water sector exhibition. Organizations that participated were DWAF, Rand Water, Umgeni Water, Mvula Trust, Masibambane, SALGA, DPLG, WIN and the WRC. Jay Bhagwan, the local WASH Coordinator and Dr Rivka Kfir, CEO of the WRC, attended.

Dr Kfir acted as the chief reporter during the entire conference. The WRC also sponsored a journalist, Ms Lani Holtzhauzen from *Water, Sewage & Effluent*, allowing her to attend the media workshop aimed at enlightening journalists about water and sanitation issues. Lani also attended the conference.

According to the Dakar Statement the Forum was held to implement practical actions to achieve the Millenium Development Goals (MDG) on water, sanitation and human settlements as discussed at the World Summit on Sustainable development. The focus areas were:

- A commitment to water, sanitation and hygiene as human rights and as vital components of sustainable human development
- The MDG targets for water and sanitation are achievable through special efforts on sanitation and in Africa
- Reaffirm the need to create genuine political will at the national and local levels to translate rhetoric into action
- Assert that the MDGs must form the basis both for national Poverty Reduction Strategy Paper (PRSP) processes and WASH roadmaps and for international support through aid, trade reform and cancellation of the unpayable debts of the world's poorest countries
- Endorse the celebration of a Sanitation and Hygiene Week from March 15 through March 21 as an action-oriented programme, leading into the World Water Day
- Draw attention to practical actions effected at household, local and national levels to attain global targets.

Minister Sonjica at the Global Wash Forum

Pat Twala (ERWAT) and Rivka Kfir (WRC) concluding the BioSURE Licence agreement

Launch of the Rhodes BioSURE Process

History was made in South Africa on 18 January 2005 with the launch of a locally-developed, first of its kind solution to treat acid mine water drainage. The Rhodes BioSURE Process, a very cost-effective biological treatment option presently known in the world aimed at reducing sulphates in acid-rich mine water without the external addition of chemicals, was launched by Professor Dennis Goldberg, Special Advisor to the Minister of Water Affairs and Forestry, Ms Buyelwa Patience Sonjica, near Springs.

Developed by Rhodes University's Environmental Biotechnology Group over the past eight years with the support of the WRC, ERWAT and BioPAD, the Rhodes BioSURE Process removes sulphate from acid-rich mine water. Instead of expensive carbon and electron donor sources, primary sewage sludge, a by-product from ERWAT, is being used. Together, the two waste products ensure improved water quality before being discharged into the Blesbokspruit Ramsar site. At the same time, safe and stable biosolids are produced.

The WRC CEO, Dr Kfir, was one of the speakers at this event. The technical presentation was done by Prof Peter Rose of Rhodes University. Prof Rose was the project leader. Guests were entertained by the TWC theatre group.

The WRC is the patent holder of patents covering the BioSURE technology. The WRC and ERWAT signed a licence agreement, enabling ERWAT to exploit the BioSURE technology.

What's New

Report No TT 230/04 (Contractor: University of Pretoria)
Building capacity in irrigation management with wetting front detectors
This project introduced a Wetting Front Detector (WFD) to farmers with the purpose of stimulating a re-think about irrigation management on their farms. The WFD was designed to be the simplest tool that could assist farmers to improve their understanding of irrigation. Apart from introducing farmers to the WFD concept of irrigation management, the project also sought to evaluate the acceptability by subsistence and commercial farmers; to determine from users their perceived benefits from using WFDs; to research the best methods for using the WFDs and to develop guidelines for different crops, soil and irrigation systems.

Report No TT 232/04 (Contractor: Wits University)
An assessment of the water policy process in South Africa (1994 to 2003)
This report documents the interpretation of the policy process followed by Government in developing the White paper on a National Water Policy for South Africa between 1994 and 2003. An attempt is made to solicit lessons of experience and to suggest findings regarding future options for policy development and implementation. Valuable experiences exist which are relevant to present and future policy and strategy initiatives of the Ministry and Department of Water Affairs & Forestry, as well as comparative experiences of other departments and sectors which are relevant to policy process development in a regional and global context. This review of the water policy process is an attempt to record case material of the water policy process and to apply a selected policy process model to this initiative in order to attempt a systematic analysis of the water policy process. This is done by providing a short overview of available theoretical models, by developing a recorded case and by selecting specific tools in the area of policy processes. Specific findings were made regarding policy and strategy processes, institutional capacity and policy research in the water sector. The findings of the study included a confirmation of the technical quality of the policy and identified several opportunities and priorities in the implementation of water policy.

Report No TT 212/04 (Contractor: Pulles Howard, Rand Water, CSIR & RAU)
Freshwater fish and human health overview guide
This guide is amied at a wide variety of potential users: Regulators (Government, conservation organizations and health authorities), practitioners (consultants and researchers), water resource managers, polluters (agriculture, mines and industry) and educational institutions. The guide enables potential practitioners to have a standardized, scientifically repeatable, process that can be used to determine the health risks associated with consuming fish, what levels of contaminants occur in the fish and if the fish can be eaten with minimal risks to humans. The South African protocol developed has several outputs which include levels of contamination in fish, human health risk assessment associated with eating these contaminated fish and a fish health index. A second document, a definitive reference document (TT 213/04), which is a that is to be used by all practitioners to ensure that the methodology is standardized and the results have a high level of confidence.

Report No TT 213/04 (Contractor: Pulles Howard, Rand Water, CSIR & RAU)
Freshwater fish and human health reference guide
The health risks to humans when consuming contaminated fish are seldom addressed. A generic protocol has been developed that gives guidance in the undertaking of fish contaminant surveys to provide information regarding the possible health risk if the fish are consumed by recreational and subsistence fishermen. The fundamentals of the protocol are based on catchment information, socio-demographic information of consumers of freshwater fish in the actchment, bioaccumulation potential and health risks of analytes, sound sampling design, risk assessment procedures and performing monitoring at different scales of depth. By applying the proposed protocol, sound comparable assessments, based on risk assessment methodology, can be made regarding the human health risk associated with the consumption of freshwater fish in South Africa.

Report No 990/1/03 (Contractor: Greengrowth Strategies CC)
The value of water as an economic resource in the Vaal River catchment
There is a growing need to understand the economic features of water demand in South Africa. The objectives of this research initiative were to determine the water balance and prevailing competition for water resources in the catchment; to derive a demand schedule/curve for water for important water use sectors; to quantify the value of water resources at current levels of water use; to compare the economic value with full economic costs as well as current water tariffs, and assess the incidence and nature of temporary or permanent transfers of water rights already occurring and to explore a variety of scenarios and estimate the changes in the value and price of water resources through appropriate modelling, when negotiated and lawful transfers of rights to available water resources take place within or between existing uses. For modelling purposes, a system dynamics model of the Vaal River system was developed. STELLA, a software package for developing system dynamics computer models, was used to model a variety of complex systems by attempting to understand the underlying relationships between the different parts of the system. For the purpose of this study, the total system has been consolidated into two "dummy dams" represented in the Upper and Middle Vaal systems by the Vaal and Bloemhof dams respectively. The economic value of water for the various users is calculated by estimating their demand schedules. By applying the demand schedules above, the economic value of water for the total Vaal River system was calculated to be R13,3 billion for 1998. Of this total the contribution of the Upper Vaal is R11,6 billion (87%) and that of the Middle Vaal R1,7 billion (13%). It is important to note that this is a flow variable, i.e. it is a recurrent value. The reliability of the model was tested by generating illustrative water management scenarios.

Report No 950/1/04 (Contractor: Stewart Scott (Pty) Ltd)
WQ2000: Development of an interactive surface water quality information and evaluation system for South Africa
Increasing development and a general aridity of South Africa makes it susceptible to increasing salinisation and other water quality problems. This raises the need for a tool that will enable planners to make rapid low cost initial assessments of water quality impacts at the earliest planning stage. This project was undertaken to provide such a planning tool by developing an interactive water quality information and evaluation system, demonstrating its applicability for a data poor catchment and to prepare the first segment of the system for the Vaal River catchment. The WQ2000 model that was developed as this planning tool, provides an interface between the user, a database containing a large amount of data for each quaternary catchment, the monthly-time step WQT hydro-salinity model and DWAF's GIS Viewer. This enables the user to run the WQT model for a selected quaternary catchment and view the results. WQ2000 is intended primarily to provide a rapid assessment of the expected salinity implications of a planned development, or to prepare an overview of the regional salinity status. This is a powerful and flexible tool. However, it does have limitations that need to be observed. It is not a large system simulation model and thus not intended to simulate month by month variations in water release between dams in highly regulated river reaches involving more than two major dams and it does not cater for feedback loops. While the standard WQ2000 system layout will be sufficiently accurate to yield the final results required to support the investigations, more detailed evaluation of some development options may require a custom made system layout to describe more accurately the catchment features.

Report No 1150/1/04 (Contractor: Pulles, Howard & de Lange)
Water related impacts of small scale mining
This study was undertaken to identify and characterise the critical aspects relating to water-related impacts of small-scale mining and to develop and recommend appropriate tools to assist in environmental management for small-scale miners. The project team identified the mining types that have the greatest impact on the water environment through consultation with national representatives of DME and DWAF. The types of mining identified include diamond diggings, sand-winning (dry-pit mining, wet pit mining, bar skimming and mining of pits on adjacent floodplains or river terraces), coal mining, gold mining/panning and alluvial gold deposits, clay mining and peat extraction. Interested and affected parties assisted the project team with the design, planning and implementation of a handbook to assist small-scale miners in responsible mining. The content of the Handbook takes into account the needs, interests, and values of the community, mining sector, regulators, etc. A stakeholder workshop with wide representation was convened with the aim to discuss possible education, implementation strategies and to engage in an understanding of the water-related issues of small-scale mining. This Handbook is expected to play a significant role in assisting the regulating authorities to sensitise small-scale miners about their environmental impact and assist them with devising environmentally responsible mining options.

Report No 1120/1/04 (Contractor: University of Cape Town)
Cost effective methods for monitoring pesticide pollution in water systems
This project was undertaken to evaluate cost-effective methods for monitoring pesticide pollution in rural water. The utility of solid-phase micro-extraction (SPME) fibres was tested to eliminate the problems associated with Solid Phase Extraction (SPE) of pesticides. A sampling method that yields a Time Weighted Average (TWA) concentration over a comparatively extended period (24 hours or longer), using a single sample, would give a more accurate picture of prevailing contaminant levels. Experimental results confirmed that in principle the SPME device could be adapted to obtain a TWA sample of the pesticides of interest, over a sampling period of up to 3 hours. Field tests over 24 hours showed that a TWA sample could be obtained with minimal effort. However, the TWA sample result significantly underestimated the average concentrations of 24-hourly samples. Enzyme-linked Immunoassays (ELISAs) are capable of detecting low levels of pollutants with high specificity. A cost appraisal of the three analytical methods, found SPME to have the lowest cost per sample (R253.86), followed by SPE (R329.86), while ELISA had the highest cost per sample, appreciably higher than SPME. It is important to provide rural communities and/or rural local authorities with guidance concerning relevant aspects for conducting pesticide water monitoring. This project has limited its contribution in this regard to recommendations on how a guideline document may be developed. It is based on the results of analyses of screening methods developed and the costs associated with these methods. The guidelines also reflect on the findings of the capacity within rural communities to conduct water monitoring. Costs are the chief barrier, and future work to reduce such costs will be the rate-limiting step for any widespread adoption of monitoring.

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



The WRC @ the IWMI World Bank Africa Training Hub

On 30 November - 4 December the WRC (KSA 4) played a significant role at the IWMI World Bank Africa Training Hub which was held in Blydepoort, Mpumalanga. The objectives of this event were to:

- Enhance the operational understanding of bank staff on water, soil and natural resource management issues, especially in the Africa region, by sharing knowledge on best policy and practices and updating on cutting edge research results.
- Generate issue-based and operation-oriented guidance for current/future research agenda for IWMI, other CG Centres, and partners, especially in the Africa region
- Explore options for organizational synergies to link research, policy and operation.

The event included a mix of site visits, indoor sessions, poster displays and videos. The WRC boasted an impressive poster display featuring projects funded by KSA 4. The WRC also featured videos on WRC-funded projects.

Delegates at the IWMI World Bank Africa Training Hub

The WRC & Capacity-Building

Mr Mompati Baiphethi has been awarded the prize for the best Masters student in 2004 at the Department of Agricultural Economics, University of the Free State. This recognition was achieved through his Master dissertation, under the supervision of Prof. MF Viljoen and Dr G Kundhlande, as well as papers presented and articles published on his research work. Mr Baiphethi was a member of the research team involved in a WRC-funded project of the socio-economics of water conservation techniques in semi-arid areas (WRC Report No 1267/1/04). The WRC also provided additional support for his Masters studies through a consultancy for capacity-building. The title of the dissertation is "An economic evaluation of water conservation systems for dryland crop production for small scale resource poor farmers: A case study of Thaba Nchu, Free State Province."

IWA Conference

The 3rd IWA Leading-Edge Conference and Exhibition on Water and Wastewater Treatment Technologies will he held in Sapporo, Japan on 6-8 June 2005. For more information contact:
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Best Agrekon Article

A total of 165 articles have been submitted to *Agrekon* since September 2001. Of these 84 were accepted for publication. In 2004 the winners of the Best *Agrekon* Article were Prof WL Nieuwoudt (UKZN), Dr GR Backeberg (WRC) and Mr HM du Plessis (WRC).

The WRC @ Okhombe

On 11 January 2005 the WRC attended a site visit to the Okhombe catchment area in the Drakensberg. The WRC is currently funding the project to assist the communities of Mnweni and Okhombe to manage their water resources sustainably and to build capacity in these communities to monitor the effects of different rehabilitation techniques.

The community have implemented various erosion control techniques such as stone packs, stone lines, swales, cattle steps (physical structures) and vegetative structures such as vetiver grass planted on contour lines, trees planted in micro-catchments and indigenous and exotic grasses planted on eroded slopes. Community members have been trained how to monitor the effect of these techniques on reducing soil erosion and improving water quality.

Members of the Okhombe Monitoring Group enthusiastically demonstrated various monitoring techniques. Among some of the methods demonstrated were the use of a Morgan Splash Cup, splash boards, rain gauges, basal cover quadrats run-off plots and portable gauging weirs to measure water quality and quantity.

The results are astounding: in some previously degraded areas 40-60% of the area is stabilizing and there is 25% less run-off. The community is currently implementing a grazing management plan to reduce soil erosion.

A demonstration at the Okhombe site visit