

THE WATER WHEEL

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WRC CELEBRATES 40 YEARS



Cover illustration by Ralf Broemer

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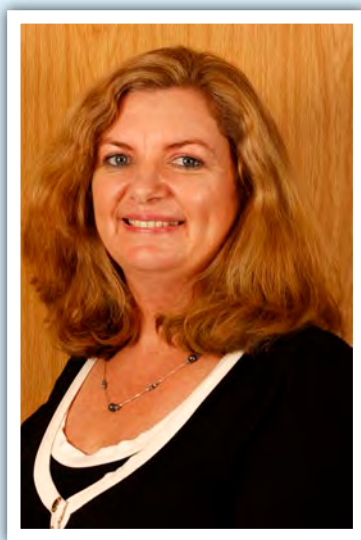
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**Prof
Janine
Adams**



REFLECTING ON THE PAST – COMMITTING TO THE FUTURE

Founded in 1971 at a time when debilitating droughts swept South Africa, and disjointed and fractured research left the nation unable to address many of its water challenges, the Water Research Commission (WRC) this year celebrates four decades of loyal service to the South African public.

Financed by the Water Research Levy, the WRC is a unique organisation that provides and funds applied knowledge and water-related innovation for the improvement of the lives of all citizens across the water

cycle. The WRC aspires to answer some of the most urgent questions around human health and societal well-being, the economy and the environment.

Turning 40 is always a time for celebration and so this commemorative supplement celebrates some of the history and achievements of the WRC. There comes a time in the existence of every organisation that it must stand still for a moment, look back and reflect on its mandate and how far it has come in fulfilling it.

There is no doubt that the Commission has had an immense impact on the South African water sector as well as society as a whole – from introducing better ways to manage our catchments and related water resources, to providing technologies to clean drinking water and remove impurities from wastewater, to improving rain-fed harvesting agricultural practices and sanitation innovations.

Water is not limited to science, technology and innovation. Water is about people – about the quality of what they eat and drink, what kind of environment they live in, about their health. This publication reflects the impact the WRC has had not only on the people of South Africa, but also on the researchers themselves whom the Commission has supported – many of them for 30 years or more. Interviews are featured with some of the passionate water researchers who have made a significant contribution to the advancement of water knowledge. Over the years research capacity has been built in numerous disciplines and in different areas of the country.

Promotion of a multi-disciplinary research approach by the WRC has



Prof Janine Adams (seated, third from left) with some of her students at the Nelson Mandela Metropolitan University in 2003.

facilitated unique and important partnerships (...and friendships too). Most of us in the water sector have been influenced by the WRC in one way or another.

As an ecologist focused on estuaries I myself have witnessed first-hand the impact of the WRC. I have been involved in Commission-funded research since my days as an MSc student and completed by PhD study on a WRC project focused on the freshwater requirements of estuarine plants. This was a very enriching experience having the best estuarine scientists in the country on a steering committee providing valuable input and advice on my research. The steering committee system of providing experts to guide research projects has played a key role in developing research capacity.

Since then I have participated in a number of programmes funded by the WRC which have contributed to the understanding of the environmental water requirements of estuaries. These projects were always multidisciplinary and multi-institutional, which contributed to capacity building and a progression of knowledge.

Among others, I have been involved in a Cape estuary group working closely together on both research and Department of Water Affairs (DWA) resource directed measures studies, which led to considerable progress in understanding and managing the environmental water requirements of estuaries. The effects of a dam release into the Kromme Estuary, the importance of the river estuary interface zone in the Gamtoos Estuary, and the environmental water requirements of the East Kleinemonde Estuary are some of the other projects I have participated in. Many post-graduate students also contributed to this research.

“There is no doubt that the Commission has had an immense impact on the South African water sector as well as society as a whole.”



Lani van Vuuren

Research funded by the WRC has greatly contributed to our improved understanding of the environmental water requirements of estuaries.

In another WRC project titled ‘Contributions to information requirements for the implementation of resource directed measures for estuaries’, capacity was extended to KwaZulu-Natal through joint research and specific resource directed measures studies on the Mdloti and Mhlanga estuaries (I coordinated this study). Nowadays there is a specific KwaZulu-Natal Ecological Reserve team that conducts these studies for the department indicating successful skills transfer.

Technical transfer and capacity building was also achieved through workshops around the country on the Ecological Reserve methods for estuaries. These were attended by government departments, local conservation authorities and academic institutions. Training workshops such as these have continued through the FETWater programme. At present, I am part of the project team addressing the revision of the methods for determining the

environmental water requirements of estuaries. I am also involved in investigations on water quality management in South Africa’s estuaries.

With 40 years of age comes maturity and wisdom, may we use this experience well into the future to address the country’s water research needs through co-ordination and co-operation. The need is greater than ever to ensure knowledge uptake, to communicate our research results and continue to produce the relevant research that changes the lives of all South Africans.

Thank you to everyone who has contributed to this landmark publication which marks this important occasion. Congratulations and best wishes!

Prof Janine Adams
Chairperson: WRC

WATER RESEARCH COMMISSION

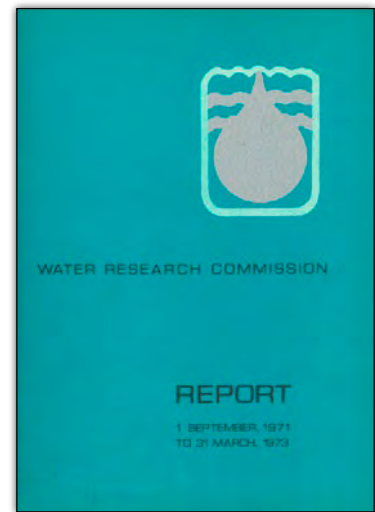
– Celebrating 40 years of research excellence

On 1 September, the Water Research Commission officially celebrated its 40th year of existence. This unique organisation has undoubtedly left its mark on the South African water sector, providing a valuable platform for scientists while serving the interests of all water users countrywide. Lani van Vuuren traces the history of the organisation.

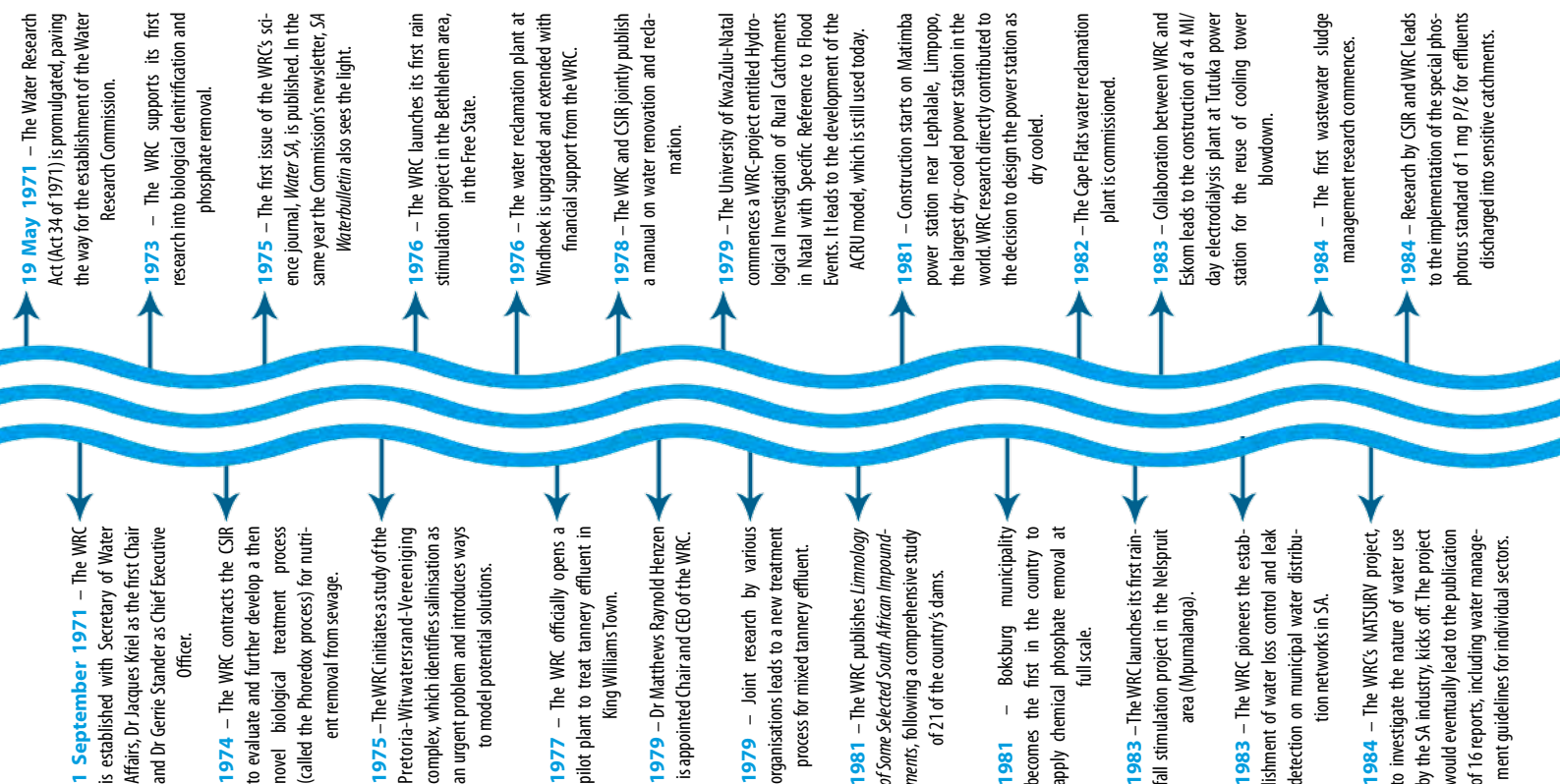
In the early 1960s South Africa experienced a tremendous countrywide drought, in some areas the worst seen in a century. The storage in many dams dropped

to less than a third of their total capacity. In many regions water restrictions were at the order of the day, the most dramatic being these applied to consumers dependent on the Vaal Dam which, at its lowest, was less than 27% full.

There was an increased realisation that the country had, in the past, been rather cavalier in the management of its water resources, and in 1966 a Commission of Enquiry into Water Matters was appointed under the leadership of Prof SP du Toit Viljoen to investigate the current situation and make recommendations regarding the



The cover of the first annual report of the Water Research Commission.



management of water resources across all sectors. The resultant report was published in 1970, and to this day remains one of the most important documents in the South African water sector.

When the Report of the Commission of Enquiry into Water Matters was submitted to Parliament, then Minister of Water Affairs Fanie Botha stressed the necessity of the efficient generation of new knowledge and the application thereof in the development and utilisation of water resources, and that it was of national importance that a statutory body with the necessary powers and funds be established to promote and expedite the country's water research purposefully.

Parliament subsequently passed the Water Research Act (Act 34 of 1971), and on 1 September, 1971 the Water Research Commission came into being with Secretary of Water Affairs, JP Kriel, as *ex officio* Chair and Dr Gerrie Stander as Chief Executive Officer. A further six members were appointed that first year:

VN Bolitho, Prof BJV Botha; NA Lever; Prof Meiring Naudé, Prof Des Midgley and Dr PW Vorster. The first meeting of the Commission followed on 15 September, 1971. Initially, the Commission operated out of offices in Pretorius Street, Pretoria.

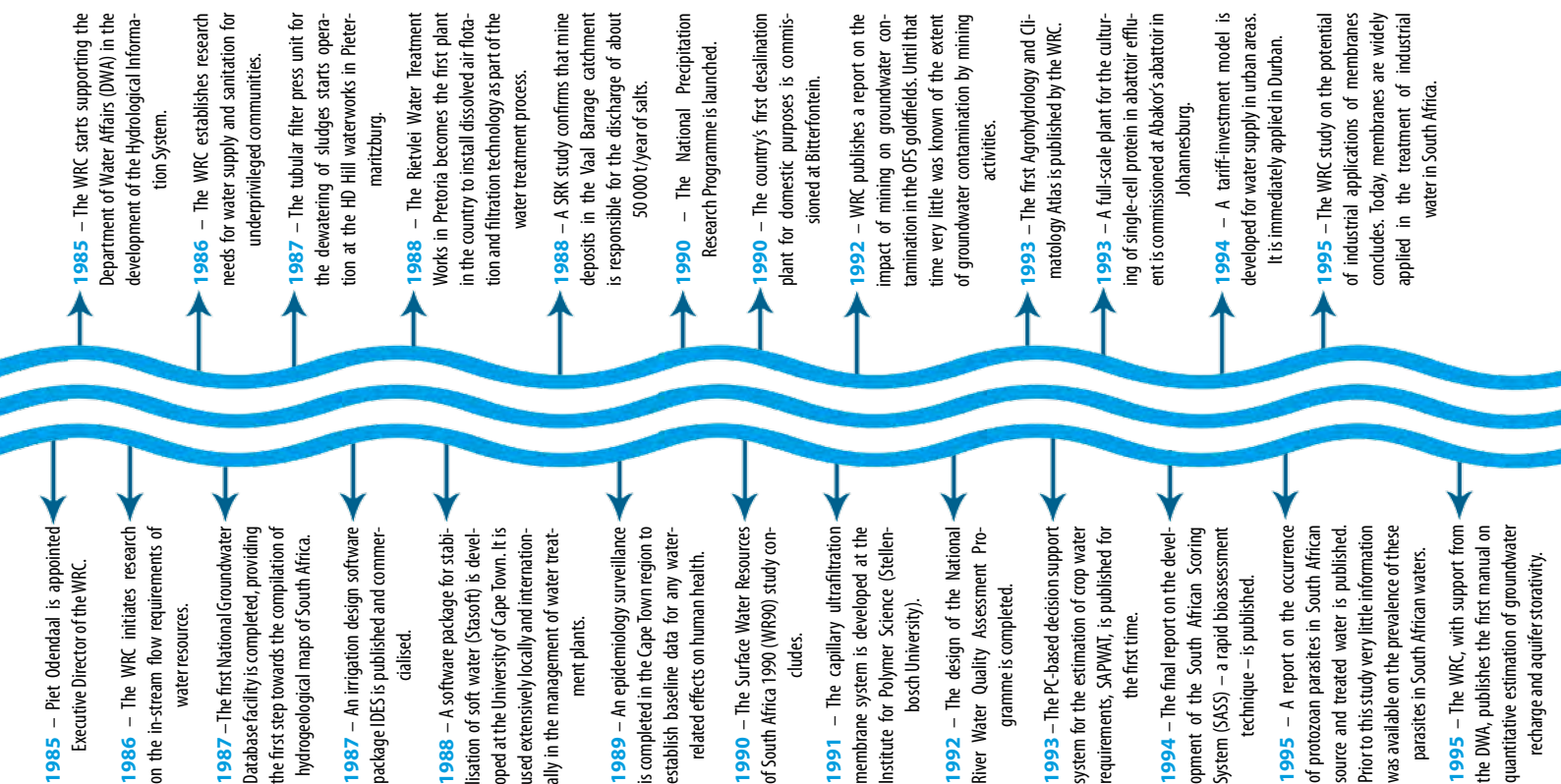
At that time water research was virtually confined to the CSIR and some government departments and various important research fields (including water in the environment) received little to no attention. There was also no research coordination or strategies for identifying national research needs and priorities.

The first task of the WRC was to identify the most important constraints in the present and future water economy of South Africa. They included, among others, the country's insufficient and intermittent rainfall; management and practices in catchment areas which influence runoff; high evaporation losses from dams, rivers and canals; uneconomic and inefficient

THE WRC MANDATE

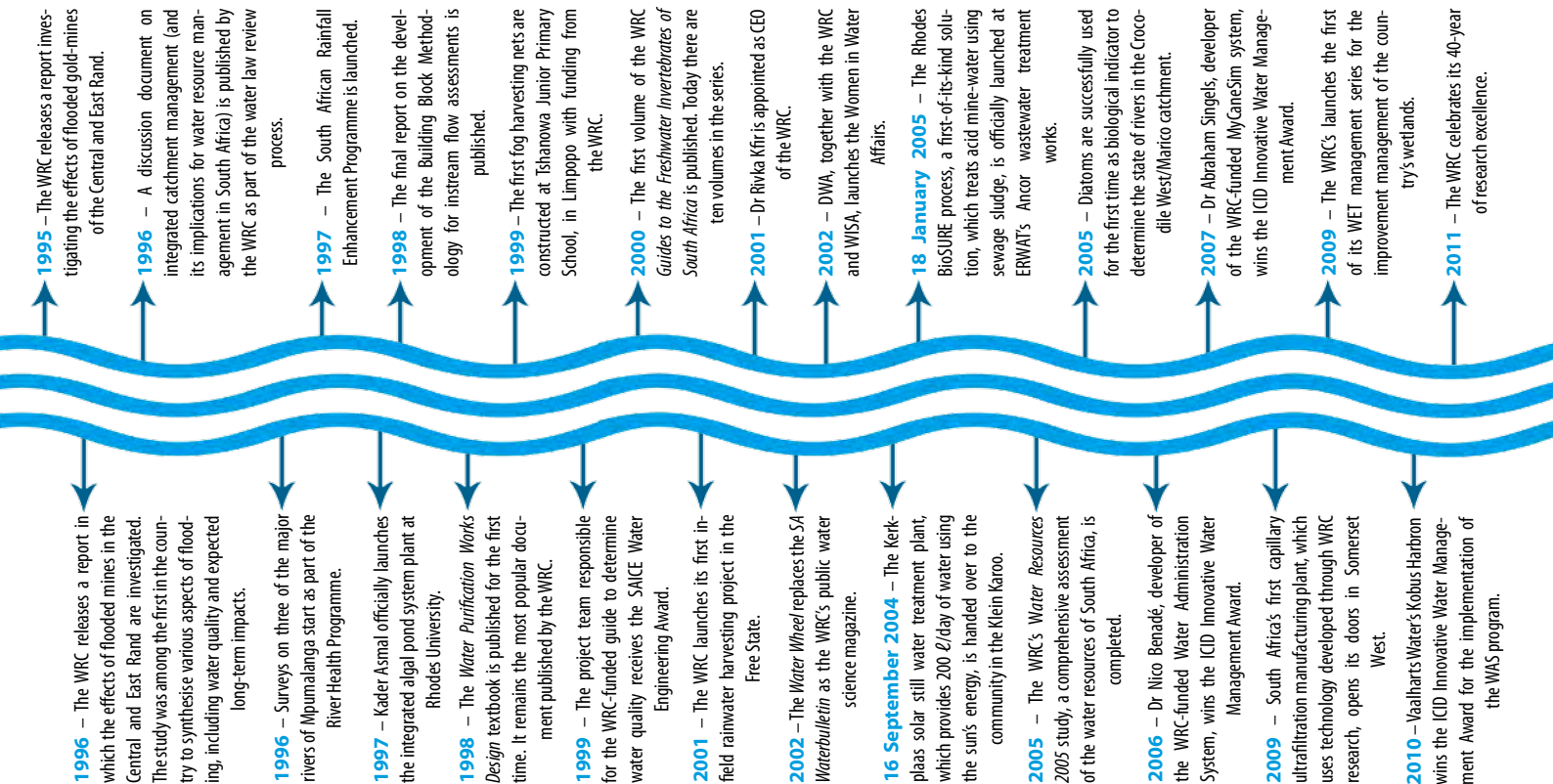
- To promote, coordinate, cooperate and communicate in the area of water research and development;
- To establish water research needs and priorities;
- To stimulate and fund water research according to priority;
- To promote effective transfer of information and technology;
- To enhance knowledge and capacity building within the water sector

use of water by various sectors; water pollution, insufficient management and overabstraction of groundwater; unsatisfactory coordination, publication and communication of water research and development work; and inadequate training of scientists, engineers and other experts required for water research and the development of the resources of the country. All of these constraints went on to receive attention from the WRC.





So have the WRC's research reports changed over the years.

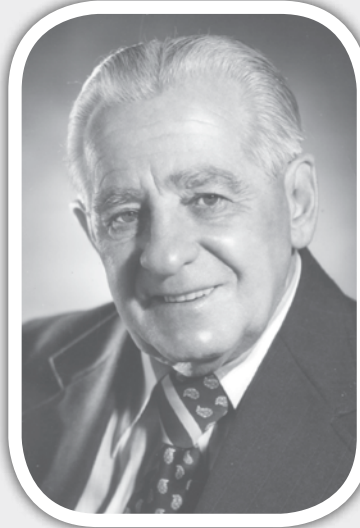


DR GJ STANDER: A WATER RESEARCH PIONEER

It was perhaps apt that Dr Gert Johannes Stander was born under the sign of Aquarius. Described as a man of great vision and creative ability, Dr Stander's name is coupled to a number of key water research institutions in South Africa, most notably the National Institute of Water Research or NIWR (today CSIR: National Resources & the Environment) and the Water Research Commission (WRC).

Born in the small Free State town of Philippolis in 1911, Gerrie Stander was educated at Middelburg in the Cape. He obtained an MSc degree in Chemistry (cum laude) and was later awarded a PhD from the University of the Witwatersrand. His thesis dealt with anaerobic digestion as a method of purification of effluents from fermentation industries. Subsequently he also registered with the South African Council for Professional Engineers.

Following his Masters degree, Dr Stander first joined the Pretoria Municipality as a chemist before becoming chief chemist of the Municipality of East London, a position he held until 1948. During that year he accepted an appointment with the CSIR. Under his leadership, the CSIR's water research programme developed to such an extent that the NIWR was established in 1957 and he became its first director. He also played a leading role in the establishment of the WRC, and became its first CEO in 1971 – a post he held until his retirement in 1979.



During his career he penned around 100 scientific articles. Known as the 'father of water reclamation' in South Africa, he led the team that established the Windhoek water reclamation plant (the first of its kind in the world) in 1968. He received various honorary memberships and awards from national and international bodies for his contribution to water science and technology. Three South African universities accorded him honorary doctorates, and in 1987 he was awarded with the prestigious Order of Meritorious Services, Class 1: Gold.

In 1976, Prof Bernie Berger of the International Association on Water Pollution Research (of which Dr Stander was President for many years), said the following: "An assessment of the nature and quality of Dr Stander's contributions in the field of water science and technology must inevitably employ such terms as innovator, catalyser and integrator.

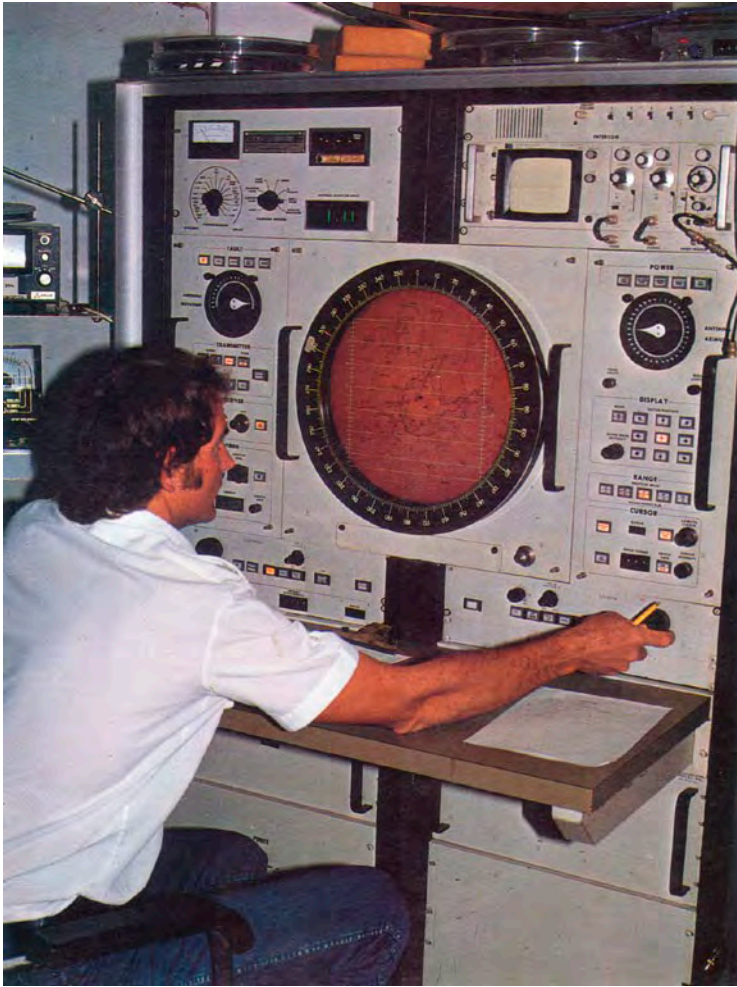
It must also use the description dedicated, courageous, persistent, responsible and responsive. His work is marked by a rare combination of vision, intellect and drive. One may single out many individual areas in which Dr Stander's personal impress is evident. Among them would be: advancement of wastewater treatment technology, reclamation of the water component of wastewater, development of a universally respected water resources research organisation, mobilisation and preparation of scientific manpower of the highest calibre, and accomplishment of an effective programme of international sharing of new knowledge in the water fields. His contributions made over a span of four decades should not be viewed as only past phases of an exceptionally productive professional career. In Dr Stander's case, the past is truly prologue. The programmes initiated by him continue to evolve and enlarge in apparent response to the needs of the nations, developed and developing."

Dr Stander passed away on 3 December, 1997, at the age of 86. At the time of his death, Piet Odendaal, then Executive Director of the WRC, paid tribute to this great legend of the South African water sector: "Gerrie Stander was indeed one of the greats that moved on the water scene. Perhaps his greatest gift was the ability to inspire others, and this legacy will carry his influence far into the future."

More specifically, the first projects to be funded by the WRC fell under the following themes:

- Desalination of brackish water;
- Prevention of eutrophication of rivers and dams;
- Technological development of water reclamation and pollution control;
- Improvement of the Windhoek water reclamation plant;
- Development work for the desalination of sea water; and
- Reclamation and re-use of water in the Cape Peninsula.

In time the WRC has developed into a dynamic hub for water-centred knowledge, innovation and intellectual capital. Today, there is not a single part of the water cycle that has not been investigated in one way or the other by the Commission. From national policy and legislation, to the



Top left: A radar operator studies cloud buildup over the Lowveld as part of a rain stimulation project by the WRC in 1983. The commission supported weather modification research for more than 20 years.

Bottom left: Reaching out to the scientists of tomorrow. Stellenbosch learners are shown how to use the miniSASS scoring system to review the quality of their town's main river.

years have illustrated just what an impact the Commission has had on the South African water research scene. In many areas, including wetland, estuary and membrane-related research, the WRC is the major funder of research in the country. Literally thousands of research reports, guidelines and documents have been published by the WRC over the years, and every year hundreds of post-graduate students receive valuable additional training and experience while working on Commission-funded research thereby contributing to the country's pool of expertise over a wide range of disciplines and organisations. Various technologies developed with funding by the WRC have gone on to be commercialised, while several centres of expertise have been developed, which are being consulted by operational agencies and serve as valuable conduits for transferring information and technology. □



To celebrate its 40th anniversary, the WRC has compiled a special hard cover publication to highlight its impact on various aspects of the water sector over the past four decades. Limited copies of this glossy, full colour book have been made available free to readers. To order a copy, contact Publications Tel: (012) 330-0340 or Email: orders@wrc.org.za (kindly note that orders are limited to three per person).



Hlangiwe Cele

potential impact of climate change on the country's water resources, to the development of improved technologies for more efficient use of water and the protection of natural

water resources to basic supply of water and sanitation to the country's most vulnerable people.

A number of impact studies conducted by the WRC in the last few

BUILDING KNOWLEDGE THROUGH PARTNERSHIPS

Throughout its 40-year history the Water Research Commission (WRC) has not only touched the lives of thousands of people in South Africa, but also contributed tremendously to building the skills base of the country's water sector. In this section some of the country's foremost water scientists share their experiences of working with the WRC. The testimonials are in no specific order.

Research for all seasons

Former Acting CEO and Deputy CEO, Dr George Green's name is synonymous with climate-related research at the WRC.

His association with the WRC began long before his appointment as Research Manager at the Commission in 1983. "My initial experience of the WRC was as an agrometeorologist employed by the then Soil and Irrigation Research Institute (SIRI) in Pretoria. I was first stationed in Nelspruit before moving to Pretoria in 1974."

This was during the early years of the WRC, when it was first attempting to come to grips with irrigation research. Dr Green was called upon to arrange a nationwide study tour for the WRC's Study Group on Irrigation Research. This tour turned out to be a rich learning experience for everyone involved. Dr Green then took the lead in drafting the Commission's first Master Plan for Irrigation Research. This was undertaken in consultation with the irrigation research community and stakeholders in the irrigation sector. "One of the key provisions in the Master Plan was to arrange and conduct a suite of separate, but related, WRC workshops dealing with the agronomic, soils, engineering, economic and social aspects of irrigation in order to refine the

future research agenda for irrigation research in South Africa," Dr Green explains.

Then, in 1977, as Assistant Director: Irrigation Research at SIRI, Dr Green led an investigation for the WRC into the movement of water through the soil-plant-atmosphere continuum in relation to the water requirements of agricultural crops. The study had two primary research sites, one at Roodeplaat Experimental Station northeast of Pretoria, and the other at Addo in the Sundays River Valley near Port Elizabeth.



Dr George Green

Both sites were equipped with state-of-the-art weighing lysimeters, with Roodeplaat dedicated to the study of agronomic crops (mainly wheat and soybeans) and Addo dedicated to the study of citrus trees. "The Addo lysimeters, in particular, were unique in the world in terms of their size and their ability to



Cloud seeding in process



Former Deputy CEO of the WRC, Dr George Green, hands over the MRL-5 weather radar in Bethlehem, in the Free State, to former CEO of the South African Weather Service, Jerry Lengoase, in 2003, following the conclusion of the Commission's weather modification project.

measure the hourly and daily water use of mature citrus trees,” notes Dr Green. “The project attracted international collaboration, and researchers from Australia and Israel joined the research team at various times during the course of the research.” The results of the study were fed directly into the guidelines for irrigation requirements of crops in South Africa that were being prepared at the time.

A particular highlight in Dr Green's career has been the rainfall enhancement research conducted by the WRC during the 1980s and 1990s. He played an important role in managing this research, which involved cloud seeding experiments encompassing large parts of south-western Mpumalanga, north-eastern Free State and Limpopo. In a period stretching nearly two decades, researchers studied and tested hypotheses to enhance rainfall with the assistance of aircraft, meteorological radars at various locations, data acquisition and handling facilities, special laboratories and special computational facilities, much of it funded by the WRC.

For Dr Green, this project stands out for several reasons. “Firstly,

the project succeeded in moulding rival research groups into a single, highly competent research team with a common purpose and goals. It also allowed the development of new observational techniques and approaches to statistical analysis, leading to a new understanding of rainfall formation processes in convective clouds.”

“The project succeeded in moulding rival research groups into a single, highly competent research team with a common purpose and goals.”

In addition to the development of new cloud seeding technology, tailor-made for clouds characteristic of South Africa's summer rainfall areas, the research also had other spin-offs in terms of knowledge relating to rainfall measurement with radar, stochastic modelling of rainfall, pollution impacts on rainfall, nowcasting of extreme rainfall events for disaster management applications, and so on. In 2005, the

research was awarded the United Arab Emirates International Prize of Weather Modification by the World Meteorological Organisation.

Dr Green notes that in the broad area concerned with issues of weather and climate in agriculture (including water requirements and irrigation) and hydrology, WRC-funded research has largely been responsible for effecting, within a few decades, the transformation from a situation in which knowledge and technology were rudimentary and incapable of adequately supporting water management practices needed by a water-stressed country, to one in which available knowledge and technology is equal to the best available internationally. “Much the same can be said for other areas of expertise, with the result that the water sector has been enabled to address challenges in a balanced manner, without being crippled by a lack of knowledge in any particular area.”

Dr Green's association with the WRC is continuing long after his retirement from the Commission in 2005. He still provides valuable guidance and advice as a member of several project steering committees.

The value of the WRC, which is dedicated to identifying and addressing critical water-related knowledge gaps on an ongoing basis, serving as a national hub for water-centred knowledge and building capacity within the water sector, is difficult to overestimate, according to Dr Green. “This has been confirmed time and again by high-profile international visitors and reviewers, who see the lack of a similar, single organisation with a mandate to address the entire water cycle as a definite handicap to addressing issues of integrated water management in their countries.”

He concludes with his birthday message: “Well done, WRC! With your support, the water sector will continue to meet all the new challenges it will face over the next 40 years.” □

The Reserve – Striving for a country built on balance between conservation and development

Considered one of the matriarchs of South African river ecology, Dr Jackie King has dedicated three decades of her life to inland water ecological research and management. She spent most of her career as a researcher in the Freshwater Research Unit of the University of Cape Town (UCT), and it was here that her paths first crossed those of the WRC.

“As a full-time researcher I had to create my own income and all the income for my research team. I first turned to the WRC for funding in 1989. Much to my surprise they agreed to fund my research into what was at that time still an obscure topic – the water needed for maintenance of river ecosystems that were being targeted for water resource development. I was tasked with researching what was happening globally in this field and then making recommendations as to what South Africa should do.”

So started an amazing career in which Dr King learnt her way across the multidisciplinary nature of what came to be called environmental flow assessments, helping to bring together specialists in hydrology, hydraulic modelling, sedimentology, fluvial geomorphology, water chemistry, riverine vegetation, aquatic invertebrates, fish, amphibian, reptiles, riverine mammals, sociology, anthropology, resource economics, water law, macro-economics, water management and politics. “In the early days we worked much in isolation from the rest of the world because of apartheid, and independently developed methods for

assessing environmental water needs that influenced our new post-apartheid National Water Act (particularly the policy of the Environmental Reserve). This Act led to our minister (Kader Asmal) being awarded the Stockholm Water Prize in 2000.

To date, Dr King has been involved in (and mostly led) close to 20 WRC projects. She has also served on more than 20 project steering committees. In the process, she has supervised or co-supervised 23 post-graduate projects to completion in the fields of engineering and freshwater ecology. While she has entered private practice, Dr King still teaches at the UCT Summer School – all about water issues learnt from her WRC research years.

Dr King is the main architect of the Building Block Methodology, which became an international



Dr Jackie King

benchmark for instream flow requirement assessment in the 1990s, and is still used and copied around the world today. Along with her colleagues, she has since also developed the DRIFT (Downstream Response to Imposed Flow Transformation) methodology to catalogue, analyse and assess the multi-variate effects of changing flow patterns in rivers. Dr King has been awarded with, among others, a Women in Water Award for her efforts. The WRC was (and remains) a significant funder of these developments.

According to Dr King, South Africa’s work in this field was – and still is – at the forefront of global practice and the country

Much of the methodology to determine the Environmental Reserve has its origins in WRC-funded research.



Lami van Vuuren

has developed a wide international reputation. “In my opinion, the funding and intellectual support, and just plain good and kind project management of the WRC has been the crucial factor in our success. From the initial foresight to fund this field of research, through the years of uncertainty of turning a ‘grey’ science into an internationally accepted one, to the growing international exposure of the last decade, the WRC has stood fast in support. Among the funding bodies I have worked with, the WRC stands heads and shoulders above the others in terms of good working relationships, trust, belief in what we are doing and pride in our results. Given that the WRC has equally good working relationships with our national

water ministry and has successfully brought together water scientists, water engineers and water managers, there is no doubt in my mind that the WRC is a great force for good in water management in South Africa.”

The relationship between the groups of water specialists is serendipitous, according to Dr King. Researchers can suggest topics that they think are essential for the country to address, but these will go nowhere unless funders understand the necessity for the research. Funders can fund the research, but this has no application unless managers see its use. In turn, managers can wish for more informed ways of doing things but this goes nowhere unless researchers and funders are receptive. “In South Africa we seem to have

got it right: across the country, water researchers, funders and managers work closely together. The WRC plays a vital role, not only in supplying the funding but also in ensuring a good balance of support for different research units and different research topics across the country.”

“It would be difficult to over-emphasise the vital role that the WRC has played in my career, in those of my colleagues and in water research and management generally in South Africa,” concludes Dr King. “Always with its finger on the national pulse of concerns and needs in the water field, it has been a strength that we have come to rely on and that other countries envy us. I could not have practised as a career researcher in water without it.” □

Prof Eugene Cloete



The WRC’s relationship with microbiologist Prof Eugene Cloete stretches back much further than his appointment as Dean of Science at Stellenbosch University (SU) in 2009. In fact, his association with the Commission started in the late-1980s when he received his first contract from the WRC while at the University of Pretoria (UP). His first project was on the microbial population dynamics in enhanced biological phosphorus removing activated sludge systems. The research indicated the role of

Hands up for innovation

bacteria and the extracellular polymers that they produce in phosphate removal.

Since then this award-winning former Vice President of the International Water Association (IWA) has gained international recognition for his innovations in the water sector, most notably the teabag water filter. Another innovation, developed with funding from the WRC, has been the Rotoscope, an online real-time biofilm monitoring system for industrial water systems. The system is designed to monitor and treat the formation of unwanted biofilm – the accumulation of bacteria, proteins, algal material and fungi that causes the deterioration in the microbiological quality of treated water. He also lists a number of other research outcomes as highlights, including indicating that not only bacteria per se, but the extracellular polymers that they produce play an important role in enhanced biological phosphate removal; the elucidation of a number of antimicrobial

resistance mechanisms, resulting in the development of new biocides; as well as research on dispersants as antifouling agents in industrial water systems, which led to this now being common practice in industry.

He is an IWA Fellow and serves on the IWA Biofilm Specialist Group, among others. He is also a member of the Coca-Cola World Water expert panel and is chairperson of the South African Academy of Science committee on poverty and technology. In addition, Prof Cloete has been the driving force of two water institutes – one at UP and one at SU. Enjoying international acclaim, Prof Cloete has nine patents to his name. He serves on the editorial boards of several scientific journals and is the editor or co-author of five books in the field of microbiology, water treatment and nanotechnology.

He credits the WRC as playing a major role in shaping his career in water research. “Not only through the research that they funded, leading to more than 130 scientific

papers, but also through involving me in numerous project steering committee activities over the years. This has broadened my knowledge and provided me with excellent networking opportunities with colleagues in the field.” In future he would like the Commission to pay more attention to innovation.

But Prof Cloete is not only an innovator, he is also a mentor. He names the more than 40 Masters and Doctoral students supported by the WRC under his supervision as a highlight of his working relationship with the Commission. “Of these, four are currently professors across the world, still doing water research and another four senior lecturers at South African universities. Many of these students have also received awards for their research contributions.”

Prof Cloete has been inspired by a number of people at the WRC over the years, among others former

CEO Piet Odendaal for his excellent visionary leadership (both nationally and internationally) and current CEO Dr Rivka Kfir for her openness to new ideas and innovation and broad knowledge of the water sector and identification of gaps that needed to be researched. “Her leadership in general has been impressive,” he says. He also singles out former Director: Water-linked Ecosystems, Dr Steve Mitchell, for his insight into the scientific process and thoroughness when it came to the final production of reports; Director: Water-centred Knowledge, Dr Heidi Snyman, and Research Manager, Dr Jo Burgess, both for their enthusiasm and passion for young scientists and water; former Research Manager Meiring du Plessis for his dedication to making a difference with the research he directed; and *Water Wheel* Editor Lani van Vuuren for her “excellent professional scientific

and general reporting on behalf of the South African research community and other role-players in the sector.”

Commenting on the value of the WRC to South Africans Prof Cloete says: “the fact that South African scientists involved in water research are at the forefront in the world is undoubtedly a direct consequence of the Commission’s commitment to South African scientists. The support for post-graduate students over many years has furthermore created human capacity that is desperately required in the country.” He concludes with a special birthday message for the WRC: “They say life starts at 40 and I hope this will also be true for the WRC. I wish to express my thanks for the professional and friendly way that the Commission has treated me, and for all the support over the past 20 years.” □

Changing the world from the waste up

For 35 years Prof Chris Buckley has been involved in research funded by the WRC, in the process changing the way we view and manage sanitation and wastewater.

Now the head of the Pollution Research Group (PRG) at the University of KwaZulu-Natal, Prof Buckley’s journey with the WRC started in 1976, only five years after the establishment of the Commission, when as a new graduate, he joined a project investigating water and effluent management in the textile industry. Within weeks of starting work as a salaried researcher Prof Buckley was touring textile factories in the Eastern Cape.

The PRG was established in 1972 under the Department of Chemical Engineering at the University of KwaZulu-Natal by Profs Ted

Woodburn and Ferdie de Wilde with the support of AECI and the WRC to research the recycling of water and recovery of chemicals in the textile sector. Initial investigations focused on identifying the four major point sources of pollution in the textile industry – these were effluents from dyeing and printing, scouring, sizing/desizing and wool scouring.

The PRG was then contracted by the WRC to develop closed-loop water and effluent treatment/recycle systems for these sections of the industry. The projects that followed would change the textile industry for ever. In the late 1970s/early 1980s the textile sector in South Africa was quite sizeable, with more than 600 factories nationwide supporting about a quarter of a million people (including those in the clothing manufacturing side),

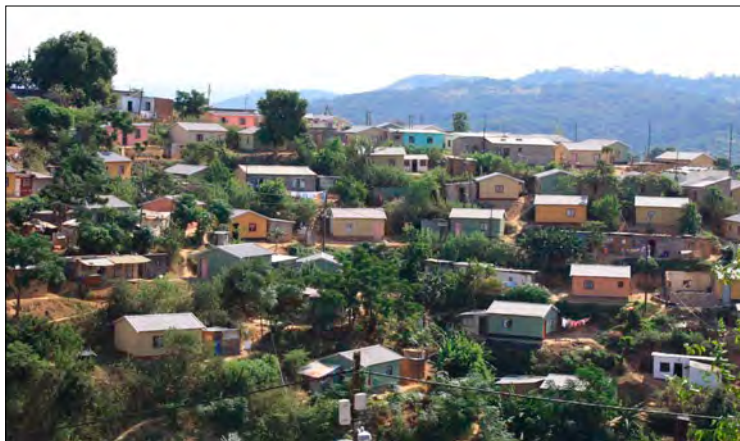


Prof Chris Buckley

and producing much effluent, which was difficult to treat. The research done by PRG over several years eventually culminated in design guides for textile wastewater treatment plants in 1991.

Much of the research was undertaken in close association with the textile sector, and the PRG soon became recognised in South Africa and abroad for its major contribution to the research and application

The PRG works closely with the eThekweni metro and the WRC to improve water and sanitation supply to Durban citizens.



of advanced industrial effluent treatment and reuse. Today, cleaner production principles have been implemented at many textile companies around the country thanks to the work of the PRG. The group also started the initiative of waste minimisation clubs in the sector.

Thank goodness the water sector did not lose Prof Buckley to his other career choice – accounting. Today, largely as a result of his inspirational leadership and the dedication of his

team, the PRG's expertise has widened intensely to a wide range of water-related areas. The group's current focus is on urban and industrial water management, with the range of sanitation-related research ranging from biotransformation mechanisms in ventilated pit latrines (VIPs), through urine diversion toilets, community ablution blocks, anaerobic baffled reactors, to modelling conventional wastewater treatment works processes. The PRG works closely with eThekweni Municipality, among others, searching for ways to reduce the filling rate of pit toilets and investigating safe and sustainable ways of managing the waste from VIPs and urine diversion toilets.

Prof Buckley highlights the suite of WRC projects which centred around membrane processes as exceptional due to the interaction by the different teams in the country. "The range of approaches and applications were very supportive of each other and interactive." He sees the reduction of the water intensity of all activities as remaining a major challenge which still requires attention, from waterless sanitation through to irrigation and the manufacturing sector.

The group is currently leading a number of WRC research projects in addition to being sub-contractor to others. These include an evaluation of forward osmosis technology for the treatment of concentrated brines; a project on the co-digestion of sewage sludge and industrial concentrates and another on the

Dewats process for decentralised wastewater. The group is also investigating a protocol for the quantitative assessment of industrial effluents for discharge permitting. The WRC is not the group's only funder. This year, the PRG achieved international status after receiving a US\$400 000 grant from the Bill & Melinda Gates Foundation to explore the design and implementation of an innovative toilet system that will lead to the safe disposal and recovery of valuable material from excreta from community ablution blocks.

Prof Buckley sees the greatest impact of the WRC as the consistent and continual funding for water research, which has enabled the country to produce a stream of well-trained people from a range of disciplines with a deep understanding and appreciation of water-related issues. For him, the continuing of the organisation and staff have enabled the retention of knowledge and the opportunity to have a long-term vision for knowledge generation about water – the critical resources for the country. He notes five people associated with the WRC of its projects whom he admires most. They are Dr Gerrie Stander for his wisdom and insight; Dr Ferdie de-Wilde for his vision and leadership in water research, and for mentoring so many researchers; Mr Piet Odendaal for his dedication to water research and his networking skills; Dr Oliver Hart for providing support and encouragement to researchers when times were difficult and then arranging open days and functions to celebrate successes; and finally Prof Marais for his commitment, supervision and assistance to young researchers.

The WRC has, in a quiet way, had a major influence in the development of the country, notes Prof Buckley. He concludes with the following birthday message for the Commission: "You are only 40 years young, and are just starting out. Build on the achievements of the past and continue to an even greater future." □

A younger Chris Buckley sampling the permeate from a pilot plant to treat cotton/synthetic fibre dyehouse effluent in 1983. He has been involved with WRC-funded research since 1976.



Lani van Vuuren

Dedicated to a lifetime of policy-changing research

The name Charles Breen is synonymous with aquatic science in South Africa. He has dedicated nearly four decades of his life to improving the state of the country's water resources, much of it with the assistance of the WRC.

After completing his studies at Rhodes University, Prof Breen worked as a Research Fellow at the Indiana State University, in the USA. In 1972 he returned to South Africa and was appointed Senior Lecturer in plant ecology at the University of Kwa-Zulu-Natal. Almost immediately he joined Prof Jan Heeg in research on the Pongolo River Floodplain. The CSIR, with the Department of Water Affairs (DWA), had established the National Programme for Environmental Sciences, within which was a focus on inland water ecosystems. Research in this programme was given strategic direction through the Committee for Inland Water Ecosystems, with membership drawn from the CSIR, DWA, researchers, and later the WRC. The first chair was Dr Paul Roberts (formerly of DWA).

Growing awareness of eutrophication led the Committee and the research programmes that it spawned to focus on impoundments, particularly Hartbeespoort Dam (which was already highly eutrophic), Midmar Dam (unpolluted), Wuras (highly turbid) and later Vanderkloof Dam. "The Pongolo River Floodplain was an exception because it was a response to concern that impounding the river would have adverse consequences for the downstream floodplain," notes Prof Breen. "The Committee created a wonderful learning environment for all who were interested in inland water ecosystems. It supported the researchers and their

professional development nationally and internationally, encouraging and facilitating participation in national and international scientific institutions."

There was a strong focus on profiling aquatic science in South Africa. "Although we did not know the term then, what emerged was a strong community of practice characterised by friendship and professionalism," says Prof Breen. "We competed professionally, but were friends able to engage each other without rancour. I recall that the year-end meetings were robust, particularly when budgets were being considered. On one occasion we had been encouraged to prepare 'honest' budgets. When my budget came up for consideration (which meant to be cut!) at one point I ventured that as instructed I had prepared an 'honest budget' to which Prof Daan Toerien asked: Yes, but how honest?!" Professionalism was encouraged and supported. The WRC, DWA and the CSIR supported researchers and their research institutions.

THE PONGOLO RIVER FLOODPLAIN

The Pongolo River Floodplain study, in which WRC was but one funder, was a defining moment in the history of aquatic science in South Africa. The first study was launched in 1970 following concern expressed over the impending closure of the Pongolapoort Dam and the potential impacts this



Prof Charles Breen

"The WRC has funded and supported researchers, encouraging and enabling them to excel. The knowledge, understanding and competence that informs water resource management in South Africa, and in the region, reflects the investment made by the Commission."

The Letaba River in the Kruger National Park. Much of the methods used to determine river health was developed during the ten-year Kruger National Park Rivers Research Programme, spearheaded by the WRC.



Lani van Vuuren

would have on the downstream floodplain and Ndumu Game Reserve. Following preliminary surveys by the Natal Parks Board and the University of KwaZulu-Natal, Profs Breen and Heeg conceptualised a research programme around the concept of ecosystem trophic dynamics in 1973. It sought to understand how the floodplain ecosystem responded to variation in river flow.

“It is inconceivable that we can make informed decisions in South Africa, and play the regional role that the country must do without an organisation such as the WRC.”

Working in such a far-flung area had its challenges, as Prof Breen explains: “Although a research station was established at Jozini, by today’s standards working conditions were primitive. The only communication with the rest of the country was via a manually operated, shared telephone service (no computers, emails, mobile phones, or air conditioners). Much of the work was conducted from tents set up adjacent to the pans. On moonlit nights we would listen to hippo, pelicans herding fish and the whistling white-faced duck. The isolation was reflected in the lifestyles of the people: we would listen to the drums at night and see young girls with traditional hairstyles come down to the river to fetch water.”

Several researchers cut their teeth on this project, including Hilton Furness, Hennie Kok, Kevin Rogers, Charles Walley and Alistair Buchan, Fiona Rogers, Terry Everson, Jill Slinger and Annelise Drewes. Together, they elucidated system composition, structure and functioning and how these responded to flow. The study also established the essential role of the

floodplain in the lives of the local people.

The finding of a comparative analysis of costs and benefits of allocating water for sustaining floodplain processes, and for allocating the same amount of water for irrigation suggested greater benefit when water was allocated to sustain the floodplain processes. This provided for the basis of recommendations for managing flow below the dam. “I clearly remember Will Alexander (then of DWA) saying to me that the findings had convinced him of the importance of flow releases to sustain the floodplain and similar systems,” notes Prof Breen.

Unfortunately, none of the recommendations from the study were taken up and structured into policy and operating rules for the Pongolapoort Dam. Later, so-called ‘water committees’ were established on the floodplain to negotiate releases, but 30 years later the requirements for the environmental flows (the Environmental Reserve) have yet to become incorporated into the operating rules for the Pongolapoort Dam. Nevertheless, it set the platform for DWA to begin to appreciate the importance of environmental flows and to collaborate with aquatic ecologists. It also introduced people as integral parts of river ecosystems – a concept that would later be formulated as ‘socio-ecological systems’ and find expression in further WRC-funded research.

THE KRUGER NATIONAL PARK RIVERS RESEARCH PROGRAMME

In the 1990s, Prof Breen led the Interdisciplinary Estuarine and Kruger National Park Rivers Research Programme, a forerunner to the national River Health Programme. This was his first project where the WRC played the anchor role.

The international committee that evaluated the programme

concluded that the programme produced management strategies and information that had the potential for uptake beyond the immediate confines of the Kruger National Park. “In particular, the strategic adaptive management approach, which has been applied effectively within the Park, could be adopted more widely in planning research programmes and to support a wide range of environmental management needs,” it noted. “We believe that it could be very helpful in the catchment management planning processes that are now being developed in preparation for the catchment management areas.”

From the WRC, Prof Breen singles out (former Deputy CEO) Dawid van der Merwe and (former CEO) Piet Odendaal for playing important roles in the programme. “The programme had a difficult first phase, and I think it was possible only because of Piet’s vision that a second phase was considered, and that allowed me to become involved. He also foresaw the need for research to inform estuary management and promoted what was to become the Eastern Cape Estuaries Research Programme for which (former Director) Dr Steve Mitchell’s insight and support were invaluable.

He also notes the pivotal role of Dr Graham Noble in the establishment and success of the National Programme for Environmental Sciences. “His vision for cooperative research and his understanding of the central importance of profiling research and researchers were key ingredients for success. Once the vision for cooperative programmes was lost, systems research received little support. The WRC consequently became the principal vehicle for aquatic research.” Prof Kevin Rogers’ research on the Pongolo and in the Kruger National Park Rivers Research Programme (collaborating with Harry Biggs) has also been very influential both academically, and in management.

The uptake by researchers and managers and enhancement of adaptive management that was the central thrust of the Kruger National Park Rivers Research Programme has been satisfying. A specific highlight for Prof Breen has been the way it has helped scientists and managers understand and manage for socio-ecological complexity and the spread beyond the original confines of the Kruger National Park to find expression in estuary management, among others.

According to Prof Breen, it has been rewarding to follow the uptake of research conducted with the support of the WRC. "The social-ecological approach we conceptualised in the 1970s in the Pongolo research has gained recognition, and there is growing appreciation for the complex nature of socio-ecological systems and the influence this research had on receptiveness in government to the concept of environmental flows. Importantly, this has softened the boundaries between disciplines, making inter-disciplinary research and learning an exciting challenge rather than a threat."

Prof Breen is still involved in WRC-funded research projects. At the time of writing he was contributing to a project involving extracting evidence for the development of ecosystem services production functions for the Resource Directed Measures. He had also just started on a project looking at the contribution of property rights to cooperative approaches in water resource management in South Africa. "This project seeks an understanding of the relationships between property and the sharing of benefits in common property resource systems, such as water. The intention is to inform policy and governance."

Regarding the impact and value of WRC-funded research, Prof Breen says: "South African aquatic science is recognised by peers around the world for originality and relevance to management.

Our contribution has been far more than might be expected from such a small group. The WRC has funded and supported researchers, encouraging and enabling them to excel. The knowledge, understanding and competence that informs water resource management in South Africa, and in the region, reflects the investment made by the Commission."

Regarding the management of estuaries, Prof Breen praises the WRC for providing strategic direction and its role as the principal funder of estuaries research for the last two decades. "The WRC must be largely credited with the credible scientific understanding and competence that has emerged in South Africa." Estuaries research supported by funding from the Commission has had a significant and positive effect nationally and locally on the management of estuaries. "The WRC approach to support for research is singular in that it has encouraged and provided opportunity for innovation while, at the same time, facilitated alignment with reality through feedback from managers," notes Prof Breen.

He points out that the benefits that can be derived from how we use water resources have to be shared. The trade-offs will become more complex and challenging. "It is inconceivable that we can make informed decisions in South Africa, and play the regional role that the country must do without an organisation such as the WRC."

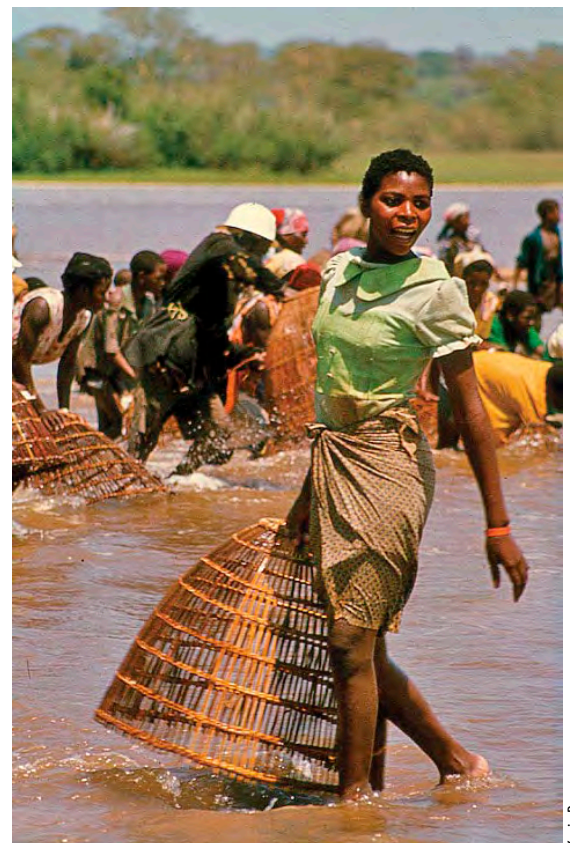
Rivers and the water they transfer connect our people and economies across local and international boundaries, Prof Breen continues. "We cannot pretend that South Africa can somehow isolate itself from the rest of the region. Because of our economy, experience and competencies we have a regional responsibility to develop the regional understanding and competencies that are required to make the inevitable trade-offs in ways

that are equitable and sustainable." Looking at future research possibilities, Prof Breen would like the WRC to develop the partnerships that are required to enable research to take a regional, social-ecological systems perspective of the management of water resources.

Prof Breen's birthday wish for the WRC: "I would like to take this opportunity to thank the WRC for the pivotal role it has played in my personal development, that of the students and colleagues with whom I have worked, and in the development of my career. I hope future generations of South Africans will be fortunate enough to have the WRC to support their growth and development.

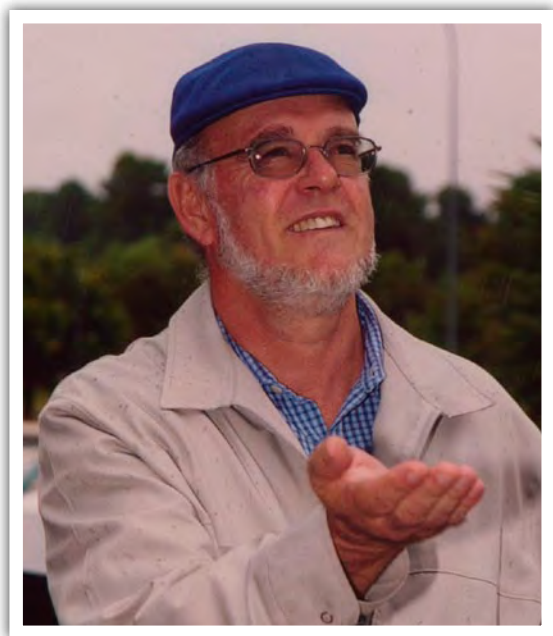
"I wish the WRC success for the next 40 years. May it be given the recognition it deserves for the signal contribution it has made to developing the understanding and competencies that guide management of water resources in South Africa." □

Traditional fishing in the Pongolo River floodplain. The floodplain study for the first time introduced the concept of environmental flow releases for people and the environment to South Africa.



Kevin Rogers

Measuring Rands and cents in times of disaster



Prof Giel Viljoen

For nearly 40 years agricultural economist, Prof Giel Viljoen, has been involved in WRC-funded research in the field of agriculture.

Prof Viljoen first started working with the WRC in 1975 when he was a new researcher at the Institute for Social and Economic Research (ISER) of the University of the Free State (UFS). After extensive flooding over large parts of South Africa, the Department of Water Affairs requested the WRC to fund an investigation into the nature and extent of the damage caused by the floods. The research was led by two organisations, namely ISER and the Bureau for Economic Investigation at Stellenbosch University. Prof Dirk Smith led the UFS research team.

The specific aims of this research were, among others, to develop a methodology for identification and assessment of all types of flood damages; to apply the methodology in different river reaches in order to determine flood damages; to describe the circumstances of each damage so that a logical relationship between physical damage and flood

circumstances could be established for the development of a paradigm; and to formulate the paradigm to supply guidelines for application in other rivers.

Among others, the study found that the floods, which occurred in the Orange, Vaal, Riet, Seekoei and Hartbees rivers during 1974, caused damage accounting to R42-million (1979 figures). The research eventually culminated in guidelines for assessing flood damage in SA.

The project was completed during the early 1980s, and proved a necessary point of departure for follow up research conducted a decade later.

According to Prof Viljoen, this first experience working with the Commission was very educational. "I gained good experience and learned a lot working in a multidisciplinary research team, with the WRC providing the needed research funding, exercising efficient project control and rendering proper guidance to assure that the research was conducted scientifically so that good quality research products resulted." This opportunity also gave him the

perfect start to his doctoral thesis, which he completed in 1979.

Since then Prof Viljoen has been involved in a myriad of projects for the WRC. He is currently leading a multi-institutional, multidisciplinary project aimed at evaluating the social, economic and institutional determinants of sustainable rain-water harvesting and conservation techniques and practices. The project is being undertaken at Thaba 'Nchu, in the Free State as well as the Amatole district, in the Eastern Cape, and will be completed this year.

"The various projects undertaken on behalf of the WRC have had a common denominator: assessing the economic impact of the water quantity and/or quality dimension. The main focus has been on determining and managing the impacts of floods (too much water), although I have also assessed the impact of water restrictions (too little water). Over the years Prof Viljoen has also been involved in project pertaining to irrigation with water of different salinity levels; capacity sharing among users of stored irrigation water; and evaluations of different rainwater



Prof Giel Viljoen (right) with Dr Gerhard Backeberg, WRC Director: Water Utilisation in Agriculture.

harvesting and conservation techniques and practices. In future, he would like to see the WRC becoming more involved in research related to the impact of climate change on effective flood control planning and management.

“The expertise thus obtained has enabled me to have a well-rounded academic career, lead a meaningful number of students to post-graduate qualifications, and develop research products that have practical use value. I have also been fortunate to conduct research in collaboration with researchers in Australia and have represented South Africa on various international forums, including the flood research working group of the International Commission on Irrigation and Drainage and the editorial team of the *Irrigation and Drainage* journal.”

Still, his first WRC project remains a stand out. “The research conducted on floods where a full cycle of research was completed

must be highlighted. The research conducted during the 1970s was followed up in the 1990s with additional research which resulted in several computer models (TEWA, FLODSIM and FLODCAL) that can be applied in different floodplains to assess the impacts of flooding with or without the occurrence of an actual flood events and to undertake flood damage control planning.”

Various WRC staff members have made an impression on Prof Viljoen over the years. “When I was still a new researcher, Piet Odendaal and Dawid van der Merwe were impressive with their disciplinary and research knowledge and the professional way in which they rendered assistance and guidance. Working with Dr Gerhard Backeberg as a research manager is likewise impressive with his particular knowledge, expertise and meticulous way of guiding and managing research projects. I want to thank all of them for their guidance, assistance and

patience working with me.”

The importance to South Africa of having a high-quality water research institution such as the WRC cannot be overemphasised, notes Prof Viljoen. With problems and challenges around water quantity and quality management increasing all the time it is absolutely necessary to pro-actively create new knowledge through high-quality scientific research, he says. “It is also important that the research budget is effectively managed so that all water-related challenges receive the required attention. To effectively do this, an organisation such as the WRC is an absolute necessity.”

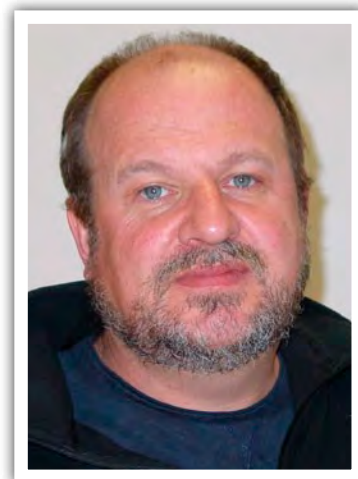
He has the following birthday message for the WRC: “The WRC has developed into a formidable research organisation with an impressive track record. I want to congratulate the WRC with its excellent achievements. The organisation is well geared to address new research challenges.” □

Development from the ground up

Belgian-born Prof Wim van Averbeke first met up with the WRC in 1995 while working at the Agricultural and Rural Development Research Institute (ARDRI) at the University of Fort Hare. He describes how this initial meeting came to be, which was to be the start of a long working relationship with the Commission: “The new political landscape had made it necessary for the WRC to generate knowledge that could assist smallholder farmer development, a domain that up to that time had not received much research attention. The Commission sent a high-level delegation to visit potential research partners with

experience in the domain of smallholder agriculture to encourage them to submit research proposals on water-related topics which had a smallholder focus. ARDRI was one of the organisations that had such experience.”

Prof van Averbeke’s first project with the WRC commenced shortly thereafter, in which he investigated irrigated food plot production on smallholder irrigation schemes in the central Eastern Cape. The project explored the circumstances in which irrigated food plot production occurred on a selection of irrigation schemes using a factor approach. The study also quantified the benefits participants derived



**Prof
Wim van
Averbeke**

from irrigated food plot production. Subsequent to that project, irrigated smallholder farming has increasingly featured in the WRC research portfolio.

From 2003 to 2007, he also led a very important project titled ‘Best management practices for small-scale subsistence farming on selected irrigation schemes and



Much work has been done to improve the plight of smallholder farmers in South Africa.

surrounding areas through participatory adaptive research in Limpopo Province'. The project centred mainly around Dzindi, Rabali and Khumbe irrigation schemes.

Currently a Research Professor at the Tshwane University of Technology, Prof van Averbeke is one of the researchers on a WRC-funded project exploring the agronomic and water requirements of a selection of popular African leafy vegetables, as well as their potential contribution to address nutrient deficiencies in the diets of rural people, with particular emphasis on vitamin A and iron. Laboratory, on-station and participative action research is being undertaken to develop best practices in order to improve food security and the well-being of households.

He also serves as project leader on another WRC research project aimed at identifying practical ways to improve the performance of smallholder canal irrigation schemes in the Vhembe district of Limpopo at both scheme and plot level. The final output of this project will be a comprehensive

report that documents the holistic approach followed in addressing the challenges facing smallholder irrigation farmers and lessons learnt as well as practical crop and animal production manuals for smallholder farmers and their advisers. These outputs will undoubtedly contribute to national programmes of high priority that address issues of poverty alleviation and food security.

"I expect the findings of this project to bring us a step closer to full understanding of how farmer-managed smallholder irrigation schemes function, what their impact on livelihoods of rural people is, and how this impact can be further enhanced. I hope to demonstrate that in areas where farming is still important to people, smallholder irrigation schemes constitute a viable rural development option."

"The WRC has ensured that there has been a systematic approach to answering important water-related questions and to the identification of best practice in dealing with the various challenges that face agriculture as far as the water factor is concerned."

Commenting on the impact and value of WRC-funded research, Prof van Averbeke believes that, from an agricultural perspective, without the WRC the body of knowledge on agricultural water would have been a fraction of what it is now and would have been highly fragmented. "The WRC has ensured that there has been a systematic approach to answering important water-related questions and to the identification of

best practice in dealing with the various challenges that face agriculture as far as the water factor is concerned."

He does express concern that this knowledge is now always tapped into by decision makers, although it has often been presented in reasonably accessible ways. "In my view, the lack of uptake of knowledge has resulted in the waste of scarce resources." According to Prof van Averbeke, the knowledge generated by the WRC will become increasingly more valuable in future as the country's water resources increasingly come under pressure.

Prof van Averbeke expresses his appreciation of the professional approach of the WRC's research managers responsible for agricultural water and their willingness to engage researchers in the planning of new projects. "The support staff are also excellent. Overall, it has been a pleasure to work with the WRC."

While his work over the last 15 years has been focused on smallholder irrigation, Prof van Averbeke is increasingly becoming interested in large-scale irrigation. This interest has been triggered by the site visits to various irrigation schemes in South Africa through the Network for Irrigation Research and Extension in Smallholder Agriculture – an initiative coordinated and funded by the WRC. "I believe there is a lot that can be learnt from the way large-scale irrigated agriculture is organised."

In conclusion, Prof van Averbeke shares his birthday wish for the WRC: "For people, turning 40 tends to mark the end of youth, as their bodies start showing the first signs of wear and tear. I am not sure whether organisations experience similar symptoms but if they do, it should be a relief to the WRC that many researchers do their best work after turning 40. Happy birthday WRC!" □

Forty years of providing a balanced view on water issues

Aquatic ecologist Dr Peter Ashton from the CSIR: National Resources & the Environment (NRE) has 40 years of experience of limnological studies, water research and environmental assessment projects in southern and central Africa.

Shortly after graduating from Rhodes University in the early 1970s, Dr Ashton joined the National Water Research Institute (NIWR) a predecessor of today's NRE. The institute enjoyed a close relationship with the WRC from its founding days. Dr Ashton describes some of his memories: "The four CEOs of the WRC (Dr Gerrie Stander, Dr Mac Henzen, Piet Odendaal and Dr Rivka Kfir) were all drawn from the CSIR and, more specifically NIWR. When I started working at NIWR in January 1974, Dr Stander – a previous director of the institute – was the first CEO of the Commission."

The water purification technology that had been developed at NIWR during the 1960s was implemented full-scale in the City of Windhoek in 1968 – a world first. The Daspoort pilot plant in Pretoria (where the technology had first been tested) attracted a considerable number of overseas visitors. Later – after the formation of the WRC and the initiation of its research funding mandate – both NIWR and WRC supported further water purification research at this facility – all carried out by research engineers at NIWR. "Our aquatic ecology projects within NIWR were always aware of the importance attached to water purification, and our results were used as inputs in the development of design criteria and specifications for

particular purification processes, e.g. to remove toxic algae, to minimise filter clogging, and to reduce the need for chemical dosing to remove algae," notes Dr Ashton.

This internationally renowned water specialist did not have to wait long to become involved in his first WRC-funded project. "My first experience of working with the WRC was on a project to evaluate the aquatic ecology implications of chemical control of water hyacinth on Hartbeespoort Dam in 1978/79. The project was funded jointly by the then NIWR and the WRC, and our team (Willem Scott, Dewald Steyn and Peter Ashton – all from the NIWR) studied the effects of the chemical spray and the dying/decanting water hyacinth on water quality in the reservoir."

The final results of this project were published in a special report produced by the WRC, *The Chemical Control of Water Hyacinth on Hartbeespoort Dam*. The publication aroused considerable interest across the world and a second print run of the report had to be organised to meet the demand for copies.

Dr Ashton has been involved in WRC projects in one way or another ever since. At present, he is part of two studies, one being an investigation into the causes of poor water quality in the Olifants River catchment. Another project, which was being finalised at the time of writing, involved capturing the chronology of aquatic science in South Africa from 1900 to 2010.

He does highlight one project in particular, namely the Hartbeespoort Project, which ran from 1980 to 1986. "This was an excellent example of a project that produced a large



Dr Peter Ashton

number of technical outputs (reports and scientific papers) as well as enabling several individuals to obtain their Masters or Doctoral degrees." The project was co-funded by several organisations, including the WRC and the NIWR and produced a number of outstanding scientific findings for the hypertrophic reservoir that were considered to be world firsts. "Overall the project provided the research team with an excellent opportunity to conduct longer-term research on the physical, chemical

Through the decades the WRC has funded valuable research on the Hartbeespoort Dam and its catchment.



Lani van Vuuren

and biological processes that control nutrient flows within the reservoir and their implications for the supply of potable water to society,” Dr Ashton tells *the Water Wheel*.

Another important project, according to Dr Ashton, was the co-funded Kruger National Park Rivers Research Programme, which produced a number of exceptional graduate students and also provided a firm scientific basis for managing these important rivers.

For him, the impact and value of WRC-funded research on water quality issues have enabled researchers to more precisely define many of the causes of particular problems and to use this information to design specific remedial measures. “I also think that a lot of the potential value of the findings from many WRC-funded research projects has not been fully realised – apparently, because of apathy on the part of the responsible government departments (water, health, agriculture and minerals).” He continues: “While I appreciate fully that researchers need to work closely with implementers of their research findings to ensure that their results are transformed into real-time solutions, this seems to be increasingly

difficult to achieve because of capacity constraints in the target organisations and departments.”

Dr Ashton singles out Hugo Maaren, Dr George Green and Dr Steve Mitchell as outstanding research managers at the WRC. “The ways that these individuals handled their project portfolios enabled participating scientists and engineers to develop a wide range of new insights and built up a lot of respect and appreciation for transdisciplinary project teams.” Outside the Commission he has also worked with outstanding project leaders on WRC-funded projects, including Dr Mark Chutter, Prof Brian Allanson and Prof Charles Breen. “They have provided considerable leadership in the water research community through the projects that they handled. In all cases, these individuals worked on co-funded projects that continued for several years and enabled high-quality research to be carried out.”

So what is the value to South Africa in having an organisation such as the WRC? “To me, the real value of the WRC to South Africa lies in its focus on the scarcest natural resources in the country – water. In addition, there is an additional

benefit in the fact that the WRC is not driven by a government department to act as the equivalent of its ‘research arm’. In this way, the Commission is able to provide a far more balanced overview of the research priorities in our country, take cognisance of international developments, and is able to link researchers from a variety of different institutions into coherent research teams. It is also important to ensure that longer-term research projects are undertaken.”

As such, Dr Ashton believes that far more attention needs to be paid to the issue of water quality and the ways in which water quality in effluent streams and in water storage reservoirs and natural rivers, can be improved and the adverse effects eliminated. “It is hard enough for our water resource managers to deal with a steady decline in the volume of water available per person – having to deal with appallingly poor water quality as well is a truly unwelcome burden.”

He ends off with a birthday wish for the WRC: “Let us hope the next 40 years will be at least as productive, beneficial and informative as the first 40 were!” □

Prof Hannes Rautenbach



It was WRC funding that first got Prof Hannes Rautenbach appointed at the University of Pretoria (UP) 20 years ago.

The appointment as a ‘temporary research assistant’ in 1991, led to his

Dedicated to climate research no matter the weather

later permanent appointment at the university and kick-started a long and successful career. Today, this nationally-acclaimed meteorologist heads UP’s Department of Geography, Geoinformatics and Meteorology. He is also Acting Director of the UP Water Institute.

His department is still the only one in South Africa which offers BSc and post-graduate degrees in Meteorology, and it therefore has

strong links with the South African Weather Service (SAWS) in training meteorologists for South Africa.

Prof Rautenbach’s first WRC-funded research project, undertaken in the 1990s, focused on the seasonal forecasting of rainfall. “At that point in time the influence of the El Niño on the rainfall of South Africa was relatively new,” he explains. “This has led to many, more complex, projects on this topic, but despite of this,

the El Niño cycle is still regarded as the major driving force behind our rainfall.”

Among others, he has also been involved in WRC-funded projects related to numerical weather prediction. This involved constructing computer simulations of air current and their interaction with land mass.

“The joy on people’s faces when we first managed to successfully harvest water from the fog nest was priceless.”

These simulations can be sped up so that Monday’s weather will have been predicted on computer by Sunday. (The daily weather forecasts presented by the SAWS are the results of predictions based on such a model.) Through this project the UP Meteorology Group became the first institute outside the SAWS to issue routine numerical weather predictions. The routine numerical weather prediction system which emanated from the WRC project has since been used in other countries, such as Uganda.

The work closest to Prof Rautenbach’s heart, however, has been his involvement in establishing fog harvesting as a viable water source in South Africa. “These projects have been very special to me as they have taken me out of the office into rural communities where I have witnessed first-hand the challenges we face regarding clean water supply.”

The WRC first funded research into the feasibility of fog collection to supplement water supplies in the rural areas of South Africa in 1995. In 1999, a prototype system under leadership of Prof Jana Olivier was set up at Tshanowa Junior Primary School, on the Soutpansberg in Limpopo. The only water source the children had before the erection of the fog nets were a non-perennial spring 2 km away and a dam 5 km

away and they had to rely on what they could carry with them to school each day.

Within four days of completion, school children and members of the local community were drinking water collected by the fog screen. The water was rated at Class 0 – ideal quality, and a far cry from the contaminated sources people were exposed to previously. “The joy on people’s faces when we first managed to successfully harvest water from the fog nest was priceless. One gets tremendous satisfaction from helping especially children gain access to water,” notes Prof Rautenbach. The same system was later also set up at Lepelfontein, a small missionary station about 400 km from Cape Town.

As a direct result of these projects, the UP Meteorology Group has introduced a ‘community project’ module that forms part of its BSc Meteorology curriculum where students go to rural schools on an annual basis to teach and perform maintenance on fog harvesting structures. Last year, the WRC approved a new project worth R2,4-million under leadership of Prof Olivier to expand fog harvesting in areas where applicable. Prof Rautenbach is a member of the project team.

“The WRC did not only play an important role in establishing my career; my work around WRC projects also contributed to the decision of the UP to appoint me as Acting



Director of the Water Institute,” says Prof Rautenbach. “On a more focused level, WRC projects have contributed significantly to building capacity in my department around atmospheric modelling (forecasting on different time scales).”

He has been particularly inspired by former Deputy CEO Dr George Green, who played a very important role in his career development. “I have always seen him as a role model, and was especially impressed

Prof Hannes Rautenbach at the fog harvesting project in Limpopo.



Lani van Vuuren

Fog harvesting screens on the West Coast. The process is rather simple: fine mesh netting is stretched between two posts perpendicular to the direction of the wind, so as to trap and coalesce the water droplets in the fog. The water runs down into a trough or gutter at the bottom of the panel and is then collected and stored.

Prof Hannes Rautenbach (right) with Regent Mpapatla Bakhoma Modjadji of the Rain Queen Dynasty during his WRC research on fog harvesting in Limpopo.



by the professional way he managed research projects. This did not only inspire me to increasingly produce better output from our WRC-funded projects, but also played an important role in the establishment of my international networks and general high-quality research.”

According to Prof Rautenbach, the value of the WRC to South

Africa lies in the fact that research is aimed at making a difference to the value of life of ordinary South African citizens, rather than being academically orientated. His birthday message to the WRC: “Please continue with the good work of the past – we need an organisation like the WRC to create better living conditions for all in South Africa.” □

Dr Kevin Pietersen



Shining the spotlight on groundwater

groundwater mapping, artificial recharge, rural water supply and sanitation, community education and groundwater management. In November 1998, he was appointed Research Manager: Geohydrology at the WRC. He had some mixed emotions regarding the appointment:

“I have been blessed with working with people at the WRC who have been instrumental in my career.”

“The appointment was quite exciting as it meant moving my family from Cape Town. It was also a difficult time because I replaced Tony Reynders who recently passed away.”

There have been many project highlights over the years. Dr Pietersen singles out the programme that focused on developing the fractured rock aquifer understanding in South Africa and the programme that focused on organics in groundwater as stand out WRC projects.

Dr Pietersen’s career path later led him to become Director: Water Resource Management and later Director: Water Centred Knowledge at the WRC. He then

left the organisation to open his own groundwater consultancy. He has also served as President of the Water Institute of South Africa. “I have been blessed with working with people at the WRC who have been instrumental in my career. Dr George Green played a significant role in my early days at the WRC. Later Dr Rivka Kfir helped me to develop my skills set further.”

Although he is not involved in any WRC projects at present, Dr Pietersen did recently participate in a consultancy funded by the World Bank focusing on assessing groundwater governance in South Africa. He maintains that WRC has had a significant impact on the South African hydrogeology sector. “Without the WRC, the knowledge base in the groundwater field would not have grown to its current understanding. A significant proportion of hydrogeologists in the country cut their teeth on WRC-funded research projects. Also, the value of the WRC to South Africa is remarkable. The water knowledge base would have been much poorer was it not for the research funding available to researchers.”

“I would like to wish the WRC well in achieving 40 years of outstanding work. I have been privileged to have been part of this journey.” □

Born and bred in Cape Town, Dr Kevin Pietersen completed his first degree - BSc Hons (Geology) - at the University of the Western Cape in 1991. He then went on to work at the CSIR in Stellenbosch as a hydrogeologist.

It was during his time with the CSIR that he first crossed paths with the WRC. In fact, he completed his Masters degree as part of a Commission-funded project. The project focused on the Table Mountain Group aquifer. Dr Pietersen’s role was to conduct drilling supervision and data analyses. The study was directed at using chemistry and isotopes to understand the groundwater flow regime. “This was followed by a large-scale project in partnership with the University of the Western Cape, which formed the basis of my PhD,” he explains.

Dr Pietersen went on to become involved in a number of different aspects of groundwater, including groundwater evaluation projects,

Recharging groundwater again and again and again...

Hydrogeologist Dr Ricky Murray brings over 20 years of experience to the groundwater sector, much of it gained through WRC-funded projects.

Today perhaps best known for his work on artificial groundwater recharge, Dr Murray explains how he initially got involved in WRC research: “After completing my undergraduate degree at Rhodes in the 1970s, I did a number of things before getting into groundwater. It was only in the early 1990s that I really returned to the sector. I had worked for Martinelli & Associates and SRK doing borehole siting work and so on. One thing that puzzled me was how one went about establishing a borehole’s sustainable yield. So I asked around, and no one could tell me. At least, no one could give me a scientific, systematic answer.” As a result, Dr Murray, through Rhodes University, proposed a project to look at this and come up with a defensible answer. He ended up doing his MSc degree on the subject, which was published in his first WRC report. This method is still considered one of the best to determine sustainable borehole yield.

The WRC Research Manager who oversaw this project was Dr Murray’s old varsity mate, Tony Reynders. “He was a special man,” says Dr Murray. “He was a superb project manager, but most of all a gem of a person – I still miss his infectious smile.” (Tony passed away in 1998 after a battle with leukemia – a trust fund was later established in his name by the South African groundwater community).

Along with other groundwater specialists, such as Dr Gideon

Tredoux, Dr Murray then undertook valuable work on behalf of the WRC into artificial groundwater recharge. Artificial recharge is the process whereby surface water is transferred underground to be stored in an aquifer. This was the first work of its kind to be undertaken in South Africa. The research later led to four pilot projects being implemented at Windhoek, Namibia; Calvinia and Karkams, in the Northern Cape; and Polokwane, Limpopo. All the pilot projects were focused on artificial recharge to hard-rock aquifers, which make up 90% of South Africa’s aquifers.

The Department of Water Affairs (DWA) then followed up on this research, leading to the first ever major scheme in fractured rocks being implemented at Windhoek. “Its success was huge – an international first in fractured rock conditions,” notes Dr Murray. Small schemes at Karkams and Williston followed. A few years ago Dr Murray, along with Dr Tredoux and Phillip Ravenscroft were approached by DWA to write and then implement a national artificial recharge strategy. “This has led to widespread awareness and more feasibility studies. I have no doubt that this form of water storage and conservation will play a significant role in future,” notes Dr Murray.

Dr Murray also points out the significance of the research funded by the WRC in developing South Africa’s understanding of Karoo aquifers, which will have unexpected benefits if shale gas exploration is approved. At present, he is finalising a four-year project on identifying and quantifying Karoo aquifers. In identifying groundwater targets, the



Ricky Murray

project team has produced a detailed transmissivity map of the Karoo Basin. They have also developed a way of quantifying groundwater in a similar way to the surface people do – by providing firm yields. “The aim is to make groundwater yields more accessible to surface water engineers, hydrologists and planners,” notes Murray.

The WRC has done superbly in supporting the water sector, notes Dr Murray. “The value to South Africa of having an organisation such as the WRC is huge. In the four major projects I have worked on the impacts have been significant, cost savings have been huge and the potential water conservation on storage by implementing artificial recharge are major.”

He has some further suggestions to elevate groundwater to the status it deserves. “I would like to see proper cost comparisons being established between the different supply options, including operation and maintenance costs. Also groundwater must be included properly in

A borehole in the Karoo Basin near Calvinia sited by Dr Ricky Murray with yields over 50 l/s. The site was linked to a WRC research project.

The city of Windhoek were artificial recharge has been implemented on a large scale following research funded by the WRC.



school text books and groundwater management must become enforceable. Lastly it must become a crime for unqualified people (especially pump and drilling contractors) to recommend borehole yields – they give groundwater a bad name!”

Dr Murray shares a final idea: “How about a small fund for experienced researchers, e.g. retired or semi-retired researchers to investigate a water-related interest that they have an interest in? No reference groups, no progress reports – just one paper in say *Water Wheel* or *Water SA*, in other words, the freedom to do what they want, but the end result must be shared. How about it?” □



Dr Caren Jarmain

Dr Caren Jarmain of the University of KwaZulu-Natal is a very busy woman. As one of the country’s few agrometeorologists she is currently involved in no less than three WRC-funded projects – one as project leader.

This is a far cry from her days as a young student under Prof Jimmy de Jager at the University of the Free State when a delegation from the WRC visiting the department saw her being summoned to Prof De Jager’s office and being asked about her future in agrometeorology. “I remember many men in dark suits and not much more!” she says.

It was a few years after this experience, as a researcher at CSIR that she participated, and managed,

Eyeing water management from space

her first WRC study. The aim of the project was to improve the basis for predicting total evaporation from natural veld types in South Africa. Running from 2002 to 2004, the project investigated the use of various models for plant growth and total evaporation estimation. “We subsequently worked on improving simulations of total evaporation of natural veld types, specifically in the context of streamflow reduction activities,” Dr Jarmain explains.

The project was set in the background of the newly-proclaimed National Water Act and specifically focused on streamflow reduction activities. (A streamflow reduction activity is any land use change that has the likelihood of changing the quantity and temporal availability of water to downstream users). “The impact of a streamflow reduction activity is generally assessed against the natural vegetation it would replace,” notes Dr Jarmain. “At the time of project initiation, very

limited information was available on total evaporation from natural vegetation such as valley thicket and coastal bushveld/grassland that the forestry species often replace in KwaZulu-Natal.”

Since then Dr Jarmain has gone on to participate in many more studies funded by the WRC. She notes three projects that specifically stand out as highlights for different reasons, the first being a project on refining tools for evaporation monitoring in support of water resources management. “The study, for which I was project leader, assessed the use of different field-based methods for evaporation estimation of a range of land uses (agricultural crops, water, and natural veld).

“It involved eight field campaigns across the country, and many students. The idea was to expose students to the different techniques during the field campaigns. This meant a lot of hard work, but it was really interesting to test the technologies in so many environments

and seeing students get excited about working in the field.”

The second project close to Dr Jarmain’s heart involved studying total evaporation from a range of wetlands in the Isimangaliso wetland park, specifically the Nkazama swamp forest and the Mfabeni mire, two very unusual and unique systems in South Africa. “I can still recall what it felt like to walk on and through the swamp forest, recall the sense of space in the sedges wetland and also the feel of the dune forest. What a privilege to have worked there!”

The third project stands out specifically from a technical point of view. “This project, titled ‘A methodology for near-real time spatial estimation of evaporation’ brought me into contact with a number of internationally acclaimed scientists using remote sensing technology to estimate evaporation, and has opened up many opportunities for illustrating the use of this type of technology in South Africa.”

Recalling all the people she has worked with, Dr Jarmain singles out Prof Colin Everson of the University of KwaZulu-Natal as the person that has made the most impact on her over the years. “He has been my mentor since the day I started working at CSIR in 1997 and remains someone I look up to. He taught me the ins and outs of research – applying micrometeorological methods in the field, balance in life, endurance to start and finish projects, professional relationships, to have a sense of humour at all times, and most of all to enjoy all one does in life.”

At present, her main project for the WRC is a study titled ‘Water use efficiency of irrigated agricultural crops determined with satellite imagery’. The project is building on research conducted in South Africa in the last few years where the accuracy of models that use remote sensing data to estimate evaporation has been evaluated as well as evaluation of the use of spatially explicit data products generated with the Surface

Energy Balance Algorithm for Land (SEBAL) model.

“In this latest project we will illustrate how spatially explicit information provided at frequent intervals can be used to assess and potentially improve water use efficiency within irrigated agriculture. The first phase of the project will focus on irrigated sugarcane produced in parts of the Inkomati Basin while the second will look at grain crops produced in parts of the Vaal and Orange River basins.”

The project is exclusively aimed at confirming the degree of accuracy of the SEBAL model for estimating evaporation (crop water use) and water use efficiency of the selected agricultural crops. It is hoped that the study will pave the way forward for future operational near-real time application of remote sensing data in agricultural water management.

The other two projects where Dr Jarmain is involved are aimed at validating forcing variables (evaporation and soil moisture) in hydrometeorological models and rehabilitation of alien-invaded riparian zones and catchments using indigenous trees.

The WRC has been pivotal in creating the opportunities (through funding) for South African researchers to stay up to date with international developments in the field of evaporation estimation, notes Dr Jarmain. “WRC funding allowed us, among others to assess new field-based methods such as scintillometry and the surface renewal method in South Africa. It also allowed us to make great contributions in terms of determining total evaporation from veld types for which there had been little information available in the past.”

For Dr Jarmain, there is definite value for South Africa in having an organisation such as the WRC. “When I started my career I was mainly involved in projects funded by mines and the Department of Water Affairs. I often wondered where certain research funding emanated from. I think the value of an institution specifically aimed at supporting research in



Who's afraid of heights? Dr Caren Jarmain (in the middle) with fellow researchers Prof Colin Everson and Peter Dye setting of evaporation measuring equipment.

aspects related to water cannot be overstated. South Africa will have to address the increasing challenges related to water availability and quality. Informed decisions will have to be taken and this will require relevant information. This might also require adopting new and improved technologies.

The WRC can be proud of the research it has facilitated over the past 40 years, maintains Dr Jarmain. “The Commission has played and I believe will continue to play a significant role in generating this information and being open to investigating the latest technologies.” □

Working in the field has its advantages and also its drawbacks. Dr Caren Jarmain's work has brought her close encounters with snakes, spiders, buffaloes and rhino.



CSIR

Dr Nico Benadé



In 1984, Dr Nico Benadé was a young Water Affairs employee with a vision and a personal computer working at Loskop Irrigation Scheme near Groblersdal, in Mpumalanga.

It was that personal computer (a rarity at the time) that gave him the edge and opened the door to him receiving research funding from the WRC. Today, his internationally acclaimed Water Administration System (WAS) is implemented on most of the country's major irrigation schemes, covering a third of the total irrigated area served by water user associations.

All innovations have to start somewhere. Dr Benadé describes how he got involved in water research: "While a junior civil engineer at Loskop I was approached by Johan van Aswegen who was

A younger Nico Benadé at the sluice of the left bank main canal at the Loskop irrigation scheme shortly after the publication of his first WRC report in 1991.



Saving water one irrigation scheme at a time

the scheme manager. He told me to go home and talk to my wife about being seconded by the Department of Water Affairs to the Rand Afrikaans University (today the University of Johannesburg) to work as a full-time researcher on a WRC project. The research project involved the development of a computer model to simulate water flow in irrigation canals. This is where my career as a water researcher started, and I have been involved in water research ever since."

For this first project Dr Benadé had to develop a simulation model to simulate the flow of water in irrigation canals. The idea was to use this model to minimise distribution losses in irrigation canals. "We had great success with this model which received international recognition, and I received my Master's degree in Civil Engineering as a result of this research," he explains. "The only problem was that it was not the solution to the problem of saving water. It did, however, trigger an array of research projects which led to the development and successful implementation of the WAS."

WAS is a decision-support program for use by water user associations on irrigation schemes in managing water accounts and their water supply to clients through rivers, canal networks and pipelines. The system can be implemented at various levels from a small water office that manages a few abstractions and measuring stations up to a catchment management level with thousands of abstraction points and measuring stations. Among its capabilities, WAS calculates water releases from rivers and canal networks, taking lag times and various water losses into account.

Largely as a result of Dr Benadé's

efforts, and with assistance from the WRC, irrigation schemes which have implemented WAS have reduced their water losses up to 20% through improved water releases in canals and rivers. WRC Director: Water Utilisation in Agriculture Dr Gerhard Backeberg has described this water management system as a prime example of taking the innovation process through the full cycle – from research to practical application to exploitation of its commercial potential.

In 2007, Dr Benadé scooped the International Commission on Irrigation and Drainage's (ICID's) Innovative Water Management Award, a significant recognition for two decades of hard work and dedication. Three years later, Vaalharts Water Head Water Control Officer, Kobus Harbron, again won the ICID Award for South Africa for the use of WAS at the Vaalharts scheme.

"In the first year of implementing the water management system, the scheme managed to reduce water losses by 5%."

The largest irrigation scheme in the country, Vaalharts covers a total scheduled area of around 29 181 ha with 1 900 abstraction points. In the first year of implementing the water management system, the scheme managed to reduce water losses by 5% or 17,5 million m³, a significant volume when considering the age of the scheme and the general state of canal infrastructure. Dr Benadé was delighted with this win. "The main aim of my first WRC project 25 years ago was to save water specifically at Vaalharts. The award was like a

stamp of approval of my work as a WRC researcher.”

Dr Benadé is very much involved in further research, development, training, support and implementation of WAS. He has turned the outcome of the research into a sustainable business. When asked about the impact and value of the WRC, he says: “In my case the impact is enormous and really difficult to quantify. The WAS program makes a huge difference on all our major irrigation schemes in terms of water savings and productivity. If you ask any of the big irrigation schemes whether they can do without WAS, the answer is a definite no.” He would like to see the WRC continue to support young researchers to generate further innovations for the country.

There are a few people who have made an impact on him over the years. “I specifically remember Dawid van der Merwe and Peter Reid, who had different styles as project leaders. The one person I have the utmost respect for is Dr Gerhard



Backeberg. He is a ‘no-nonsense’ kind of guy with a passion for his work, and I can relate to that.”

“I think the whole WRC concept is brilliant,” he adds. “It gives water researchers opportunities to tackle water-related problems which won’t be possible without the necessary funding. The WAS program would never have been the success that it is without the financial support from



the WRC. Strong water research teams can only exist with funding from organisations like the Commission, and without research we will certainly not be able to solve our ever growing water-related problems.”

Dr Benadé has the following birthday wish for the WRC: “I wish that they get the recognition that they deserve and that they get excellent research teams that focus on the research and development of sustainable solutions for all our water-related problems.” □

Top left: Dr Nico Benadé with WRC Director: Water Utilisation in Agriculture Dr Gerhard Backeberg and the WatSave Award for the Water Administration System.

Top right: At Vaalharts, the largest irrigation scheme in the country, the use of the WAS system brought about water savings of 5% in the first year of application – enough to irrigate 74 additional farms.

Improving the plight of poor communities

Growing up in an under-developed, rural area has given Dr Nozi Mjoli first-hand knowledge of the challenges associated with lack of access to basic services. She has dedicated her life to the improvement of the lives of those less fortunate in South Africa.

When Dr Mjoli completed her B.Sc. degree and a University Education Diploma at the University of Fort Hare in 1977, she opted to teach Biology at high school level. But, she found that she was stagnating and teaching was not her proverbial cup of tea. She decided to return to university where she completed a B.Sc. (Hons) in Zoology with the support

of a CSIR bursary. After serving a short stint at the newly-established University of Bophuthatswana, Dr Mjoli studied towards her M.Sc. (Microbiology) at the University of Notre Dame, USA, which was funded by a Fullbright Scholarship. After completion of her Masters degree the university offered to fund her PhD studies, which she completed in 1987.

Upon her return to South Africa she worked as a researcher at the University of Cape Town and the CSIR. The latter offered her the opportunity to work in the water and health programme under leadership of Dr Rivka Kfir. She was also



Dr Nozi Mjoli

a senior lecturer in Microbiology at the University of Durban Westville. Here she introduced a Seminar programme for final-year Microbiology students, which motivated many students to obtain their PhD degrees in Microbiology.

Her first experience of the WRC was when she joined the Commission



Dr Nozi Mjoli's research has already resulted in much needed improvements in the National Sanitation Policy.

as Research Manager in 1995. She was the first black woman to be appointed in a managerial position at the WRC. Unfortunately, she found it to be a racist and sexist organisation. "I joined one white female and one male who were appointed post-1994 and they were also struggling to be accepted into the 'boys club.'"

Although the environment was not enabling, Dr Mjoli took the decision that she was going to make a success of her career in the water sector. As the research manager responsible for research projects relating to the provision of water and sanitation for unserved communities she was committed to improving the lives of all those millions of South Africans who lacked access to water and sanitation services prior to the country's democratisation. Among others, she introduced a theme on gender and water and sanitation as she believes that women have an important role to play in sustainable water management as mothers, managers of their households and citizens.

Thankfully she met up with the late Hugo Maaren, then also a Research Manager at the WRC. "Hugo made it his business to mentor me and exposed me to opportunities to participate in sector conferences and workshops. In recognition of my interest in gender and water issues, he nominated me to be the organiser of a UNESCO gender workshop for eastern and southern Africa, which was held in Pretoria in 1997. I consider this to be one of my career highlights in the water sector."

The international recognition of Dr Mjoli's contribution to the water sector has seen her represent women – and the country – on a number of bodies and fora, such as the Water Supply and Sanitation Collaborative Council, the United National Development Programme, and the Global Water Partnership.

She was instrumental in incubating and catalysing research and development in the subject area of water supply and sanitation for marginalised and poor communities. This was achieved in a very difficult environment dominated by years of First World science. Her research output resulted in policy change in this area. Dr Mjoli was later appointed Director of Water Resource Management at the WRC and she was responsible for the development of the first strategic plan for this key strategic area. Few changes have been made to her first version drawn up in 2002. The WRC has also implemented some of her recommendations on water research capacity building, namely the introduction of annual research proposal workshops for new project leaders.

In 1999, Dr Njoli was appointed by former Minister of Water Affairs & Forestry, Kader Asmal, as chairperson of the National Water Advisory Council. In 2003, she formed her own consultancy, Hlathi Development Services. As a consultant she has developed several research strategies for the WRC, for example, the sanitation research strategy, water services research strategy and

Strategic Framework for Water and Health Research.

She recently completed two sanitation-related projects on behalf of the WRC. The first examined the understanding and interpretation of the sanitation policy and practice in South Africa from 2001 to 2008. Among others, the study identified several gaps in the national policy, including lack of sanitation policy guidelines for basic sanitation service delivery to dense urban informal settlements as well as for the provision of basic sanitation to severely marginalised groups, such as people with physical disabilities, elderly and HIV/AIDS infected individuals. Several recommendations were made, which have influenced the National Department of Human Settlements to review the national sanitation policy to align it with realities experienced by those responsible for sanitation service delivery.

"In a water scarce country such as South Africa, an organisation such as the WRC is mandatory for ensuring that innovative research is funded and coordinated to achieve national social and economic development goals without compromising environmental sustainability."

The second recently completed project involved an evaluation of the implementation of the Free Basic Sanitation policy. Among others, this study sought to evaluate subsidy arrangements and approaches for their appropriateness within the context of accelerated service delivery; assess the costing of sanitation schemes and the Municipal Infrastructure Grant budget ceilings for the capital cost of sanitation for the poor; and assess the ongoing operation and

maintenance costs for sanitation schemes.

While free basic sanitation was found to be plausible in larger metropolitan municipalities, smaller municipalities expressed a need for greater guidance and assistance in dealing with the challenge of providing free sanitation to poor households. With the focus on providing infrastructure only, ongoing hygiene education and awareness appeared to be falling between the cracks. The final report makes several recommendations to enable decision makers to improve the situation.

At present, Dr Mjoli is leading a project on the evaluation of the bucket eradication programme. The main objective of the study is to evaluate the extent of bucket eradication compliance with sanitation policy principles of the National Sanitation Policy. "The bucket eradication programme presents an interesting case because it was a politically driven programme with too much focus on numbers of toilets built and limited consideration of the soft issues such as community involvement, hygiene education, affordability and long-term sustainability," notes Dr Mjoli. "The study has used the case study

methodology to conduct in-depth analysis of the bucket eradication programme implementation approaches in selected municipalities." The preliminary findings of the study are already being incorporated into Phase II of the bucket eradication programme.

Sanitation service delivery continues to be a huge challenge for municipalities, therefore the research funded by the WRC in this field provides municipalities with documented evidence of what works and what does not work. "However, there is still a huge gap in the adoption of good practice by municipalities," notes Dr Mjoli.

Thankfully, the WRC has come a long way from being a white male-dominated organisation to a transformed racial and gender representative organisation, says Dr Njoli. She believes that, in a water scarce country such as South Africa, an organisation such as the WRC is mandatory for ensuring that innovative research is funded and coordinated to achieve national social and economic development goals without compromising environmental sustainability. "The WRC needs to continue drawing on the



diverse knowledge and wisdom of its managers, the research community and stakeholders to find innovative solutions to current and future water challenges in South Africa. The Commission has a critical role to play in building the capacity required to manage water resources for a sustainable water future for current and future generations. This will require strong partnerships with the relevant roleplayers." □

Empowering women in the water sector remains close to Dr Nozi Mjoli's heart.

Caring for SA's wetlands

As Director of the Freshwater Programme of the South African National Biodiversity Institute (SANBI), John Dini is responsible for the national Working for Wetlands programme, which uses wetland rehabilitation as a vehicle for job creation, skills development, and the wise use of wetlands.

Prior to joining SANBI in 2004, Dini worked at the Department of Environmental Affairs & Tourism (DEAT), focusing on wetland conservation and policy development and implementation, among others. It is here where his relationship with

the WRC began. "My first encounter with the WRC was through its involvement in the development of methods for the River Health Programme [in the late 1990s]. I had just joined DEAT which, together with the Department of Water Affairs and the WRC, made up the custodians of the programme."

With its statutory mandate for research, development and capacity building within the water sector, the WRC played a key role in supporting the development of scientific tools and methods necessary to operationalise the River Health Programme.



SANBI Director: Freshwater Programme, John Dini, explaining the benefits of peat during World Wetlands Day celebrations in 2010.

John Dini



The WET-Management Series, published by the WRC in 2009, has been a significant highlight for the wetland research and management fraternity.

“One of the Commission’s key interventions was thus to fund a research project to develop and pilot procedures for translating the programme’s conceptual design into operational protocols,” explains Dini.

Dini currently sits on the steering committees of four WRC-funded projects. He also provides valuable input in reviewing project proposals submitted for Commission funding. This interaction is extremely important, as his main interest is as a user of research outputs and bridging the science-policy divide.

A recent project highlight has been the *WET-Management Series*, a set of 11 volumes published by the WRC in 2009. This set of integrated tools guides well-informed and effective wetland management and rehabilitation. They are designed primarily for guiding wetland rehabilitation work in South Africa, but can be applied to a wide range of other purposes, such as assessing wetland health and ecosystem services, fostering wise wetland management and developing understanding of the driving forces behind the formation and degradation of wetlands. The

series is also of enormous value for education and training.

Dini explains how the series came to be: “Recognising the need to put in place strong scientific and technical foundations for the wetland rehabilitation work undertaken by the Working for Wetlands programme, the WRC together with SANBI formed a co-funded research partnership in 2004. Over four years a multidisciplinary research team under the leadership of Prof Fred Ellery at the University of KwaZulu-Natal produced this 11-volume series on wetland rehabilitation.”

Overall, the impact of the WRC especially in the field of wetland research and management has been quite significant, notes Dini. “I am fortunate to base this statement not only on my personal experience, but also on a recent assessment commissioned by the WRC on the impact of its wetland-related research. The study confirmed the pivotal role played by the WRC as one of the principal funders and advocates of wetland-related research in South Africa.”

According to the assessment, captured in the report *An Impact Assessment of the Research Funded by WRC on Wetland Management in South Africa* (Report No: **KV 253/10**), the WRC has invested nearly R50-million in 67 research studies with a wetland objective in the last eight years, thereby making a valuable social and institutional contribution to the sector. The Commission’s strategic networking initiatives, multi-stakeholder project steering committees, multi-disciplinary research consortia and the participatory approach adopted by many researchers, have helped strengthen the institutional arrangements underlying wetland management, protection, rehabilitation and sustainable use, the assessment found. In addition, a community of practice has developed around wetland research, with on average 12 organisations per project acknowledged

for their engagement in the research process.

According to Dini, WRC-supported research has also contributed immensely to raising public awareness of wetlands, while building stakeholder capacity. “The WRC has become a common feature in wetlands activities around the country, such as the National Wetlands Indaba and World Wetlands Day celebrations.”

He singles out former WRC Director, Dr Steve Mitchell, as having made an impression. “Dr Mitchell was my first human contact with the WRC and, as a junior official in DEAT, I came very quickly to respect his experience, guidance and approach to his work and his passion for contributing to the sector. His humility and ability to extract maximum value from the resources at his disposal greatly influenced my professional development. Even after retiring from the WRC, he remains involved in the sector and continues to contribute his extensive knowledge willingly.”

Dini is often reminded of the value of an organisation such as the WRC when listening to his colleagues in the biodiversity sector lamenting the lack of dedicated and easily accessible funding sources for biodiversity-related research. “It is easy to take the WRC for granted, but I believe that we in the water sector have a tremendous asset that many other sectors do not. Over the years I have seen this value made tangible repeatedly, through the willingness of WRC managers to engage with our research needs, form partnerships and integrate themselves into the community of practice.”

He ends off with a special birthday message for the WRC: “The WRC really knows how to celebrate an important anniversary! So often we are so focused on the future that we do not stop to reflect on where we have come from. Best wishes for another 40 successful years leading research in the water sector.” □

Hooked on water research for life

The name Prof Ed Jacobs is synonymous with membrane-related research in South Africa. Realising the potential of membrane technology in the purification of water and wastewater, the WRC has given sustained support to membrane research since the middle seventies.

As Associate Professor at the Department of Chemistry and Polymer Science at Stellenbosch University (SU) Prof Jacobs's relationship with the WRC dates back 36 years. He recalls his first contact with WRC personnel: "I was a final-year chemical engineering student and worked as a part-time laboratory assistant for Prof Ron Sanderson at SU. The research was conducted on behalf of the National Institute of Water Research (CSIR) and the membrane project was sponsored by the WRC. The energy, enthusiasm, passion and knowledge that the staff of the Commission radiated was inspiring and hooked me on water research for life."

In 1976 Prof Jacobs became involved in his first WRC-funded project when he became the project engineer on the study towards the development of membrane production technology. One of the achievements was the successful development of a technology to produce tubular cellulose acetate reverse osmosis membranes.

The results from this early research by SU led to the establishment of a tubular membrane production company called Membrattek (Pty) Ltd in the early 1980s. The company commercialised tubular reverse osmosis technology in 1983. In 1996, Membrattek and its sister company, Debex Desalination, joined forces to form a new company called Envig (Pty) Ltd, to consolidate and rationalise all their activities

in the membrane development and application fields.

The establishment of this first company in South Africa to produce the membranes his department developed in their laboratories still remains a career highlight for Prof Jacobs. "Also special was when a membrane, which saw the light after a challenge, became an export product – the membrane was used in a membrane bioreactor application."

"The energy, enthusiasm, passion and knowledge the staff of the Commission radiated was inspiring and hooked me on water research for life."

More recently Prof Jacobs collaborated with Prof Lingam Pillay of the Durban Institute of Technology to develop the South African capillary ultrafiltration water treatment system. These capillary membranes are narrow-bore polymeric filters, capable of filtering out suspended solids, dissolved macromolecules



Prof Ed Jacobs

and bacteria. These ultrafiltration membranes can also remove colour from water and are therefore ideally suited to treat surface water to high-quality drinking water standards.

The capillary ultrafiltration membranes have been commercialised through the company Ikusasa Water, and a manufacturing facility has opened in Somerset West. In 2010, Profs Jacobs and Pillay were presented with the WRC Technical Excellence Award for this innovation.

Prof Jacobs singles out former Research Manager Dr Oliver Hart for making an impression and for his



WRC Director: Water Use & Waste Management Jay Bhagwan and Western Cape Regional Head of the Department of Water Affairs Rashid Khan at Ikusasa Water's capillary membrane manufacturing plant.



Above: Prof Lingam Pillay of the Durban Institute of Technology with whom Prof Ed Jacobs collaborated to develop the South Africa capillary ultrafiltration water treatment system.

Right: A module containing capillary membranes. Each module contains about 5 000 such membranes.



fundamental belief and trust in people's ability to manage and deliver. For him an institution such as the WRC in a country such as South Africa with its

limited water supplies is invaluable.

Current research at the Department of Chemistry and Polymer Science funded by the WRC aims to increase the water recovery ratio to beyond the accepted 95% level. Key to the success of this research is the development of a floating media filtration process used both to condition feed water for the ultrafiltration process and to separate solids for discharge. The key to the successful operation of the media filter is the media itself, and more specifically the grain size and shape of the synthetic media used.

A pretreatment system that has proved successful for ultrafiltration was at the time of writing undergoing extended field trials at Duivenhoks River near Heidelberg, in the Western Cape. "We endeavour to operate the combi-system at water recovery ratios very close to 98%," says Prof Jacobs.

Preliminary investigations are also underway at SU to develop equipment and protocol to harvest kinetic energy from flowing water and to convert it into potential energy to drive a membrane filtration process. The flow rate of water

in irrigation canals, for example, is ideal to power manometric pumps that will allow water to be raised to heights sufficient to drive a membrane filtration process.

It was already demonstrated successfully that an ultrafiltration plant can be operated by difference in hydrostatic head, without the use of pumps. By strategically positioning the feed and product tank relative to the membrane plant, filtration and backwash can be achieved through simple switching of valves, which requires very little energy.

According to Prof Jacobs, the WRC's impact in the area of membrane research has been incredible. "The WRC had the vision to support research into membrane technology at a stage when the technology was still in its infancy. The research allowed the establishment of a knowledge base that could be shared with users in the field. In the years to follow the Commission also played a major role in the success the Water Institute of Southern Africa's Membrane Technology Division had in transferring know-how through regular workshops and conferences." □

Dr Kevin Wall



CSIR

The CSIR's Dr Kevin Wall has been involved in WRC-related projects for about 20 years, but it is his latest endeavour with the Commission that he

Going with the franchising flow

highlights as an achievement.

Dr Wall has been investigating the potential application of the franchising business model in the water services sector. His studies have found that the franchising concept and its success in the commercial sector show many characteristics which could alleviate problems encountered in municipal water and sanitation services delivery. At the same time, franchising has the added benefit of stimulating and supporting small business and black economic empowerment opportunities. More than 400 franchised systems

currently operate in South Africa through more than 26 000 outlets in the country, providing services ranging from petrol and plumbing to food and retail outlets.

Investigations into the potential of applying franchising principles in the water services industry was first initiated by the WRC and CSIR in 2005. This led to a follow-up project by the two organisations aimed at identifying those elements in the water services delivery chain that offered the greatest scope for franchising, and developing franchising models.

The initiative has progressed so much that at present, a pilot project involving the creation and nurturing of franchise micro-entrepreneurs is being undertaken at Butterworth, in the Eastern Cape. The project is being funded by Irish Aid, with Amanzabantu Services acting as the franchisor. Under the guidance of this experienced service provider trainee franchisees are being equipped to start cleaning and maintenance of sanitation facilities at schools.

The project establishes and supports local franchisee micro-businesses, thus creating entrepreneur

and employment opportunities – mostly for women. The cleaning and maintenance services provided by the franchisees at the schools are being paid for by the schools themselves from their budgets annually allocated for operation and maintenance of infrastructure. It is planned to run the pilot for three years.

According to Dr Wall, the WRC offers amazing value in terms of the research work done and reports produced, although he would like to see the knowledge generated being disseminated to an even wider audience. In terms of WRC personnel that

have made an impression, he singles out Director: Water Use & Waste Management Jay Bhagwan for his 'dedication, his wide and deep knowledge of the field, and for his proactive helpfulness.' "On the other hand," he adds "as a client Jay demands his pound of flesh – and more!"

Dr Wall points out that in the water sector, the problem is often not the technology or the science, but institutional, skills and financial matters, and he would like to see the WRC pay more attention to this in future. His birthday message to the WRC: "Keep up the good work!" □

Innovation for the sake of the environment

His love for the environment has led to Dr Ralph Heath's involvement in a host of projects for the WRC over the years – from studying the environmental flow requirements of rivers to developing optimal fishways and creating innovations in passive mine-water treatment.

Currently Business Unit Leader of Environmental Technology at Golder Associates Africa, Dr Heath's first experience with the WRC was as a researcher for the CSIR in the mid-1980s. "I was working in the former National Institute of Water Research which, through Dr Gerrie Stander and his fellow researchers, has left a legacy in the international water industry. The WRC was seen as a collaborating organisation with a similar vision – improving our understanding of South Africa's water resources."

His first WRC-funded project saw him developing environmental flows for the Letaba River with Dr Mark Chutter. The study, which was published in 1993, was initiated following a drought period which saw the flow of the Letaba River

ceasing before it reached the western boundary of the Kruger National Park. Among others, the project sought to identify the combinations of minimal flow, depth and current speed in the river which allow the occurrence of a natural river fauna; and to compare the conditions as identified to estimates of the natural flow and cross section of the river, in order to give a first estimate of minimal low flow requirements for habitat diversity and ecosystem maintenance. "This study sparked a huge local research programme on environmental flows, which eventually culminated in the use of term 'Ecological Reserve' in the National Water Act," notes Dr Heath.

He has also been involved in the development of the Integrated Managed Passive Treatment Process (IMPT) technology in response to the need for low-cost, self-sustaining, low-maintenance passive treatment systems to treat acid mine drainage at closed and defunct mines. The technology was later successfully implemented at the Vryheid Corona Colliery. "In the area of passive



Dr Ralph Heath

mine-water treatment research and development the WRC has enabled the South African mining industry to be the world leaders," says Dr Heath. "The use of this technology for mine closure will greatly reduce the costs of mine closure for both the mining industry and the country."

Dr Ralph Heath (second from left), with Dr Peter Reid, Dr Mark Chutter and DS Joubert during a surveillance field trip of the Letaba River in the early 1990s.



Top right: Dr Ralph Heath with WRC CEO Dr Rivka Kfir at the Biennial Conference of the Water Institute of Southern Africa in 2008.

Bottom right: The natural-bypass fishway at the lower Sabie River. WRC-funded research led to the development of an appropriate process and design for South African fishways.



Another career highlight has been the development of an appropriate process and design for South African fishways. The WRC launched a multidisciplinary effort in 2000 into developing guidelines to establishing fishways designed to meet the requirement of indigenous species and to suit South Africa's environmental conditions. This collaborative effort included input from hydraulic and design engineers, hydrologists and fish biologists.

"This project was a successful collaboration between the Department of Water Affairs, national and provincial conservation organisations, industry, fisheries biologists and hydraulic engineers," notes Dr Heath. "The procedure has been successfully implemented in fishway design in our rivers." Importantly, the project also led to the development of the twin-channel, vertical slot fishway specifically to meet South African requirements.

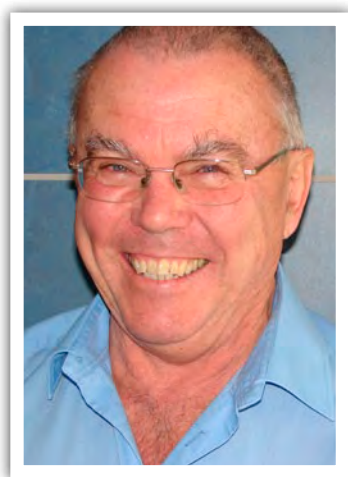
To name just a few people that have made an impression over the years would be an injustice to the calibre of research leaders with the

WRC, notes Dr Heath. However, the three people that he has gained most from (and ultimately the South African water industry) are Dr Steve Mitchell, who through his passion for freshwater (and fishing) kept the freshwater discipline high on the funding agenda; Meiring du Plessis, who stoically supported passive mine-water treatment through the years; and Dr Jo Burgess, who has recently brought a new drive and intellect to the water treatment discipline.

The biggest challenges to our sustainable freshwater resources in South Africa relates to our inability to control eutrophication and salinity. We know what the solutions are, but seem powerless to implement appropriate regulations to enforce these solutions, and this is what we need to focus on now, maintains Dr Heath.

"The role of the WRC is invaluable for taking water-related issues and, through focused research, coming up with appropriate solutions. I hope the next 40 years will be filled with passionate and applied research that will keep South Africa in the world water arena as a leader." □

Dr Steve Mitchell



A name readers will see regularly in these pages as someone who has made a real impact in management and protection of South Africa's water resources is that of former WRC Director: Water-Linked Ecosystems, Dr Steve Mitchell.

A strong voice for our aquatic environment

Born and schooled in Zimbabwe, Dr Mitchell graduated from the University College of Rhodesia after which he was awarded a scholarship for postgraduate research leading to an M Phil (London). In 1971, he joined the Department of National Parks and Wildlife Management of the then Rhodesia as an ecologist. Initially he was stationed at Lake Kariba Fisheries Research Institute investigating the role of *Salvinia* (Kariba weed) on the distribution and survival of juveniles of some commercially important fish species.

As senior ecologist he was in charge of the Inyanga Trout Research

Centre from 1977 to 1981. After a short period of research with the Directorate of Nature Conservation of the Orange Free State, Dr Mitchell joined the University of the Orange Free State as lecturer and researcher. It was here that he first crossed paths with the WRC when he applied for a small project to complete the work for his PhD research.

"In response to my request for funding, former Executive Director, Piet Odendaal, and former Research Manager, Herman Wiechers, visited the university to find out more about what I was doing. I was awarded the funding, and the work was published

as a WRC report in 1989,” Dr Mitchell tells *the Water Wheel*. This study focused on aquaculture, specifically the culture of *Spirulina* and invertebrates on wastewater as a means of recovering the nutrients from wastewater and converting these to a form that could be used as a component in stock feed.

In 1990, Dr Mitchell joined the WRC as Research Manager: Urban Wastewater & Aquaculture. He was later appointed Director: Water-Linked Ecosystems, and retired from the WRC in 2009. During his term of employment he came across many dedicated and passionate researchers who have gone the extra mile to develop successful innovations and to mentor students in a way that allows them to become strong researchers in their own right. “To name these people would be difficult – where would I draw the line? I would not only include project leaders, but established researchers and students in the list. I have always derived great pleasure in seeing people get recognition for their work, and there have been a number that I have been involved with over the years.”

This former President of the Water Institute of Southern Africa (WISA) and WISA Senior Fellow is still involved in many WRC activities – one might argue that he works harder for the Commission now than he did when he was an employee! Among others, he is tasked with taking to completion some of the projects that he was managing when he retired from the WRC. Other projects work into the relationship between various aspects of resource economics and resource rehabilitation and management. In particular, he is participating in the development of methods for extracting evidence to support management and policy decisions in a data-poor environment, the renewal of natural capital, the economic implications of the poor performance of wastewater treatment works as illustrated by the Green Drop report and remote sensing of wastewater effluent quality.

Dr Mitchell sees some key factors of the WRC that have contributed to the strength of South Africa in the water field. One of these has been the consistent availability of research funding, which has allowed researchers to develop their careers in their chosen fields of research. “The unique funding model, which is the envy of many researchers internationally, has enabled this.” Another has been the flexibility of being able to take on new areas of research as the need arose and to drop those where there was no longer a pressing need.

Dr Mitchell notes another strength of the WRC as being the number of students that are involved in WRC research. In addition to their degree, these students gain wide experience in a range of skills, including interacting and communicating with stakeholders, project management and other skills that are useful to people who are researching, consulting or otherwise involved in management.

The WRC’s steering committees serve various functions. They provide constructive peer review of research that is ongoing, while also providing the opportunity for people to develop active and productive networks through the less formal moments (tea time, lunch etc). “The selection of people to serve on these committees has been carefully considered to provide not only a mix of research, management and implementation, but also more recently to mix disciplines and so provide additional stimulation to the flow of ideas,” notes Dr Mitchell. “This has also fostered the ongoing liaison between engineers, scientists and managers. These committees have also served to keep many of the people in any one field of interest informed of the current state of research and so, by and large, exclusive cliques have not developed.”

There have been many WRC-funded projects over the years that Dr Mitchell has been proud of. He was a driving force behind the Kruger National Park River Research Programme, and took the

initiative to involve the WRC in a now thriving estuarine research programme. “The longer-term initiatives (such as the research in environmental, water requirements, estuaries, wetlands and blackfly control) have been rewarding and have delivered sound products. The Consortium for Estuarine Research and Management is one widely supported network that arose from a joint interest of researchers and the WRC, and has sustained a high level of research and management expertise for estuaries.”

As part of the South African water law revision, Dr Mitchell collaborated actively with the Water Law Review and Steering Committee and was also responsible for the sourcing of resources for research results to be made available to the Water Law Policy and Drafting teams. This resulted in a rapid and effective transfer of scientific knowledge into policy and law. The resultant National Water Act, promulgated in 1998, is firmly based on the principles of equity and sustainability, with recognition of the dependence of long-term water use on resource protection.

“The capability of the water industry in the country is outstanding,” notes Dr Mitchell. “For such a small country a disproportionate number of people have served in leadership positions in international professional bodies over the years; South Africans have been among the world leaders in wastewater reclamation, biological nutrient removal, environmental water requirements, strategic adaptive

Being an Executive Member of the WRC still means getting your hands dirty from time to time. Dr Steve Mitchell (right) partakes in fish sampling.





Former WRC Director Dr Steve Mitchell's passion for the aquatic environment has earned him praise from fellow peers and colleagues.

management, relations between scientists, managers and engineers, and in many other fields. This is a result of the consistent and reliable funding mechanism combined with the style of managing research.”

In the early days of the WRC it was sufficient to address problems

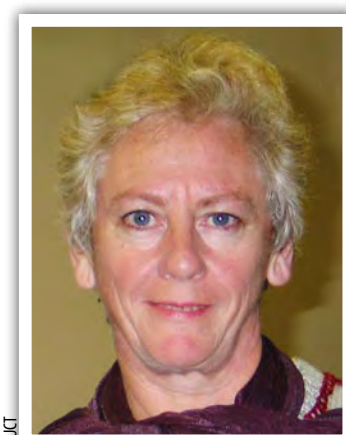
from within their discipline only. However, the increasing pressure on the country's water resources means that a development in one field will have an influence on the water resource available to other fields, and this means that other stakeholders' interests need to be considered. Therefore, Dr Mitchell sees it as essential that the WRC adopts the approach of supporting and soliciting multi- and trans-disciplinary research programmes that will integrate the complex array of interests involved in integrated water resource management (IWRM).

“While IWRM is primarily water resource management, it is actually much broader than just that. The mandate of the Department of Water Affairs is not wide enough to encompass the entire breadth of IWRM,

making cooperative governance essential. But fundamentally, IWRM is the management of the flow of benefits from ecosystem services to support the social and economic systems on which we depend. This makes the management and maintenance of ecosystem health a priority if we are to sustain the social and economic systems at a level at which they can support the growth and development that is required to achieve the projections planned by the government.”

There are examples of various funding models in South Africa, and that of the WRC has proven successful in both developing technologies that have been implemented in practice as well as developing well-rounded human resource capacity that is able to contribute to the social and economic development of the country. □

Prof Jenny Day



In 1984, Prof Jenny Day – along with Dr Jackie King and Prof Bryan Davies – co-founded the Freshwater Research Unit (FRU) at the University of Cape Town – one of the most important centres of excellence for ecological research in South Africa.

She has been Director of the unit since 1993, and also serves as an Associate Professor in the university's Zoology Department. Prof Day has taught in the department since 1971, and was awarded her PhD in 1978 for her work on the systematic of *Cumacea*, a group of marine crustaceans. Subsequently, her research interests have focused on the ecology

Taking SA to the forefront of freshwater research

and water chemistry of temporary waters, and the biology of freshwater crustaceans.

She recalls her first experience of the WRC as a couple of steering committee meetings on the very first environmentally-orientated projects funded by the Commission. “We found the meetings useful and stimulating but we did give the research manager a few grey hairs when members of the committee and the project team had some good vigorous arguments about the approach to take with the project. We did not realise that it was not ‘done’ to be too argumentative in these discussions, and he did not realise that this was normal academic give-and-take with no malice involved. He was even more surprised when later we all went to the pub together for a friendly evening!”

On a more serious note, says Prof Day, the unit did appreciate the opportunity these meetings offered for discussion and debate in small

groups. She first became involved in a WRC-funded project in 1991. The three-year project titled ‘Effect of water quality variables on riverine biotas’, was one of the first environmental projects undertaken by the WRC and fell under Research Manager, Dr Peter Reid. “This project began a long and fruitful partnership between the FRU and the WRC looking at water quality from the point of view of rivers and wetlands.”

Since then Prof Day has helped develop and evaluate regional water quality guidelines. She has also investigated the relationship between river flow, water quality and biotic response, and made recommendations for setting the water quality component of the Ecological Reserve in both rivers and wetlands. More recently, she acted as programme leader for the Wetland Health and Integrity Research Programme, which she credits for its development of a series of socio-economic and

biophysical tools for wetland assessment. In addition, Prof Day was the lead editor for most of the volumes in the identification guide series, *Guides to the Freshwater Invertebrates of Southern Africa*.

According to Prof Day, the impact of the WRC in her area of expertise has been immense. "Without the WRC there would have been almost no opportunity to develop the

capacity, experience and knowledge that we have managed to produce." In terms of people who have made an impression she singles out former WRC Director Dr Steve Mitchell. "Steve has been a wonder. He has the depth of knowledge and breadth of experience to be able to be involved intellectually in each project, and the foresight to see where new research is needed." □



Cecile Reed

Students of the Freshwater Research Unit at the University of Cape Town receiving valuable field experience.

Improving the management of the nation's natural resources

An honorary Professor at the University of KwaZulu-Natal, Colin Everson's main interests are in terrestrial plant ecology, particularly plant community dynamics in response to fire, the investigation of plant-water relations through an understanding of the soil-plant-atmosphere continuum, land-use hydrology, conservation biology and atmospheric pollution.

In South Africa, agriculture and forestry face increased competition for water by industries, municipalities and other groups. This ever-growing demand for water makes it imperative that water resource management procedures and policies be wisely implemented and improved. The accurate assessment of total evaporation from land surfaces is essential if this is to be done.

The importance of this field of research was recognised by the WRC and supported by projects designed to investigate the different techniques of measuring evaporation. In the early 1990s there was a focus in South Africa in measuring hydrological processes (especially evapotranspiration), driven largely by the development and increasing availability of

sophisticated electronic equipment and sensors.

"My first experience working with the WRC was being able to work with state-of-the-art equipment, for example Bowen ration and Eddy correlation, on my first Commission-funded project, which was managed by both the late Hugo Maaren and Dr George Green, who were both wonderful mentors to have for my first project," notes Prof Everson.

This first project was titled 'Monitoring and modelling components of the water balance in a grassland catchment in the summer rainfall area of South Africa', and was published in 1998. "Traditionally, estimates of water use of vegetation in gauged catchments were made by determining the difference between precipitation and streamflow," explains Prof Everson. "However, these estimates were not considered precise enough to enable accurate predictions of water yield from hydrological models. Since the water use of natural grassland largely depends on available energy, accurate estimates of evaporation from the vegetation could only be made by quantifying the catchment energy budget."

This study pioneered the use of the Bowen ratio energy balance



CSIR

Prof Colin Everson with fellow researcher Mark Gush inspecting a *Jatropha curcas* plant.

Prof Colin Everson

technique to measure the water use of a grassland catchment. It was also the first long-term study in the country in which all the components of the catchment water balance were measured simultaneously.

Since then Prof Everson has been involved in a dozen other WRC projects, ranging from investigating the effect of the introduction of agroforestry species on the soil moisture regime of traditional cropping systems; developing guidelines for irrigation management in pasture production; to studying evapotranspiration from the Nkazana swamp forest and the Mfabeni Mire in the iSimangaliso Wetland Park; improving the livestock-carrying capacity with rainwater harvesting and conservation on grasslands; and the long-term impact of *Acacia mearnsii* trees on evaporation, streamflow, low flows and groundwater resources.

In fact, the WRC has been the primary funder of most of his

research, and has had a major impact on all aspects of the development of his career in forest hydrology. “The mentorship role played by the various project managers and the valuable interactions in the reference group meetings have also had a big impact on the development of my career in the field of water research,” he notes. Without exception, he has developed good working relationships with all of the WRC research managers he has worked with.

Having been involved in so many different projects, it must be difficult to single out just one as being a highlight? “I have enjoyed all the water research projects that I have managed, but the first project at

Cathedral Peak where we developed baseline values for evapotranspiration of montane grassland definitely was my favourite. Besides working in a spectacular part of the country, the project provided many new challenges for a grassland scientist converting to hydrology.”

Prof Everson believes that, as an organisation, the WRC is playing a crucial role in defining research thrusts within the water sector, and is making a significant contribution to the knowledge base for policy, management and sustainable livelihoods. “Their emphasis on capacity building is also a key component in paving the future for developing young scientists within the water sector.”

He sees the role of remote sensing in water resources management as becoming increasingly important and requiring more support. “There is also a need to recognise the role of blue-sky science (i.e. scientific research were real-world applications are not immediately apparent) where researchers are given the freedom to follow new innovative ideas.”

Prof Everson concludes with his birthday message for the WRC: “This is your Ruby celebration of 40 years of promoting high-quality research. This is a significant milestone as rubies are valuable gemstones that possess outstanding qualities. Please keep the passion for research alive in your organisation! I hope to be around for your 50-year celebration.” □

Felix Reinders



Water has always been precious to Felix Reinders, Programme Manager: Agricultural Water Resources & Conservation at the ARC-Institute for Agricultural Engineering (IAE).

“It was in May 1970, when South Africa celebrated its ‘Water Year’ that I was made fully aware of the meaning and value of water in South Africa. It is as stated in the National Water Act: ‘Water gives life. It waters the fields of farmers; it nurtures the crops and stock of rural communities; it provides recreation for our children; our friends, our families, it support our power generation, our mines, our industry, and the plants and animals that make up ecosystems.’”

Engineering for improved efficiency in agriculture

Reinders’ first interaction with the WRC was in 1980 when he attended meetings of the steering committees on different projects. In October, 1983, the WRC hosted a workshop regarding the ‘Research on the engineering aspects of irrigation applications and drainage systems’. “The objective was to identify research needs and allocate priorities,” explains Reinders. A number of presentations were made and he presented a paper on future possible drainage techniques and materials. After the presentations different subjects were debated and recommendations were made which served as a guideline for research needs in the agricultural engineering field.

“Due to the fact that I was employed by the Department of Agriculture, projects were funded internally and my first WRC-prioritised project was to develop a technical manual on subsurface drainage,” says Reinders. “This manual was published in January 1984. Another WRC-prioritised project was to

research and develop an apparatus to determine the infiltration ability of a soil to use as an input to size centre pivots.” Research was concluded and a report, *Infiltration: Measurement and Use*, was published in 1984.

When the Agricultural Engineering section was transferred to the Agricultural Research Council in 1995 the Institute’s budget was complemented by external funding and the first WRC-funded project was in 1999 when the IAE team conducted research on the performance of two types of irrigation sprinklers.

After that the Commission contracted the institute to perform research on several projects, including investigating performance and drip irrigation systems under field conditions; studying sub-surface drip irrigation, particularly the factors affecting the efficiency and maintenance; developing guidelines for the selection and use of various micro-irrigation filters with regards to filtering and backwashing efficiency; and undertaking technology

transfer on the technical aspects and cost estimating procedures of surface and subsurface drip irrigation systems, among others.

At present, Reinders and his team are contracted by the WRC to undertake research on the development of technical and functional norms and standards for drainage and irrigated lands. "All these WRC-funded projects in the engineering field together with projects by other researchers and organisations serve a vital purpose in the advancement of technology and practices not only in South Africa but also internationally," he says. "A research highlight for me is definitely the new framework on irrigation efficiencies that was funded by the WRC as 'standards and guidelines for improved efficiency on irrigation water use from dam wall release to root zone application,' that we as a multidisciplinary team

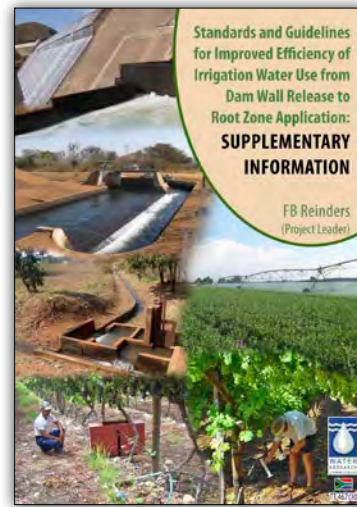
developed for South Africa."

Over the years, Reinders has managed to build up a very good relationship with personnel of the WRC.

"They are all people of integrity and stature and provide good leadership in the water sector as a whole. Just to name a few, the people who have made a difference in the field that I am working in are Piet Odendaal, Dawid van der Merwe, Dr George Green, Dr Rivka Kfir, Dr Gerhard Backeberg and Dr Andrew Sanewe."

The WRC can be proud of what it has achieved over its 40 years of excellence, maintains Reinders. "The publications are in great demand and provide an excellent reference with a practical application for modern day agricultural water use in South Africa.

"I would like to congratulate the WRC on its 40 years of water research excellence. May it continue to provide research leadership in



The new standards and guidelines developed to improve irrigation water use.

the water field and to bring practical information technologies and models through WRC-funded research projects to every user to assist in building the water knowledge base and creating a prosperous South Africa." □

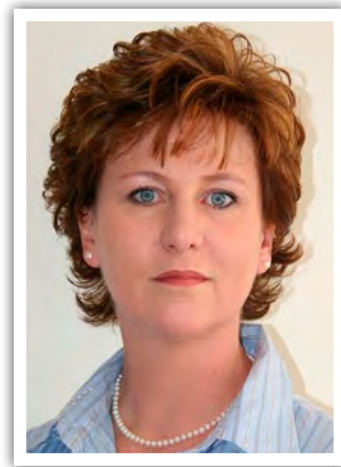
Being part of a team of integrity

Like many other natural scientists in South Africa WRC Director: Water-Centred Knowledge, Dr Heidi Snyman, is essentially a 'product' of Commission-funded research.

This former President of the Water Institute of Southern Africa started her working career at the CSIR in 1994, and it is here that her relationship with the WRC began. "As a young researcher with Watertek I was part of the team planning research proposal submissions for the WRC's Call for Proposals starting in April 1995. We had made a list of about five potential projects and had written abstracts for each of them. Then we set up a meeting with the imposing [former Director: Water-Linked Ecosystems] Dr Steve Mitchell.

"Luckily, a more experienced colleague, Karen Pearce, was also

there for the meeting. I was so nervous travelling to the WRC building. As we waited in the Reception area to meet this eminent person, of whom I had heard so much, I kept thinking that we would probably be collected by a secretary and then kept waiting in another room. To my surprise this friendly man walked in the door with a smile that went all the way up to his eyes. He greeted us all with a firm handshake and introduced himself as Dr Mitchell. At the meeting he had so much advice on which of our project proposals fit into the strategy and who to collaborate with. I know this sounds trivial, but that discussion made a huge impression on me. I was introduced to an organisation with integrity, knowledge filled with well known figures in the water sector that actually care and are willing to help where they can."



Dr Heidi Snyman

Not long after this eventful meeting, Dr Snyman became involved in a project on the development of bioremediation technology for the treatment of contaminated soil. This report was published in 1995.

Dr Snyman has worked with many people whom have left an impression on her, however, there are a few who stand out. "From the WRC there are people such as Greg Steinfeldt, Meiring du Plessis and Gerhard Backeberg, from whom I have really learnt a lot. In terms of project leaders I have to single



The establishment of the BioSure plant to treat acid mine-water using primary sewage sludge at ERWAT's Ancor works is a definite highlight in the WRC's history.

out Elize Herselman, who is both patient and a 'completer' – always make sure you have one of those on your team.”

Dr Snyman calls herself a product of the WRC, and says that she would not have achieved half of what she did had it not been for the Commission. “Had it not been for

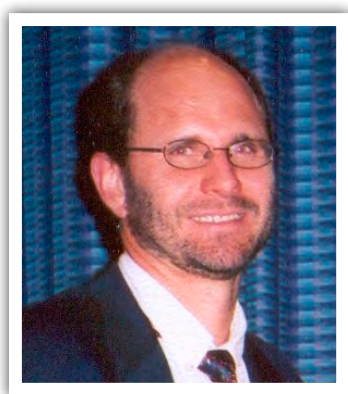
Commission funding and the CSIR giving me the opportunity, I would not have been able to completed my PhD in 1997. When I left the CSIR to join the East Rand Water Care Company (ERWAT), the WRC was a partner in the Research and Development Department of ERWAT. It was also the WRC which brought ERWAT and Rhodes University together to build a demonstration plant for the Rhodes BioSure process. It was a hard learning curve, but well worth it in the end.”

After leaving ERWAT, Dr Snyman also worked for international consulting firm Golder Associates as a waste specialist executing projects locally and abroad. She joined the WRC in 2006. She is perhaps best known, however, for leading the Sludge Guidelines process, an impressive programme which saw the publication of five guidelines

on the sustainable management of sewage sludge. This programme this remains a highlight. “The WRC, through Meiring du Plessis, shared our vision to develop more sustainable guidelines for the management of residues emanating from wastewater treatment,” Dr Snyman explains. “This is a wonderful example of the water sector expressing a need, followed by a comprehensive research programme that leads the user to friendly guidelines that are now being implemented throughout the country.”

Much of research work also informed the guidelines. “This is where I really learned about transdisciplinarity, the dynamics of a multidisciplinary team as well as the importance of stakeholder consultation. This phase of my career was very enriching and I often look back nostalgically at that time.” □

Prof Graham Jewitt



Currently a Professor of Hydrology at the School of Bioresources Engineering and Environmental Hydrology (BEEH) at the University of KwaZulu-Natal, Graham Jewitt first cut his teeth on a WRC-funded research project during the decade-long Kruger National Park Rivers Research Programme under leadership of Prof Charles Breen.

The programme, where he worked as a PhD student, remains a career highlight. “The big strength of that initiative was the way it was structured to allow high levels of interaction between junior, senior

Providing the tools for better water management

and emerging scientists, and the way it operated across disciplines. It was a wonderful interdisciplinary platform for a career in water research.”

Today, Prof Jewitt leads a strong team of scientists and students covering a broad range of research interests, including the assessment of impacts of land use (e.g. bioenergy production, afforestation and deforestation) and climate change on water resources and the generation of goods and services, the development of various tools to consider these and the management systems in which these can be applied.

In the last few years he has been involved in at least ten WRC projects, varying from analysing catchment attributes and hydrological response characteristics in a range of small catchments; estimating streamflow reductions resulting from commercial afforestation in South Africa; to

modelling the impacts of land cover and land management practices in stream flow reduction and investigating methods for near real-time spatial estimation of evaporation.

His latest published project involved a scoping study on water use of crops and trees for biofuels in South Africa. While the production of ethanol and diesel from vegetable biomass and oils (i.e. biofuels) has been promoted as an environmentally-friendly alternative to oil-based fuels, impacts on water resources are a major concern in the production of these fuels.

A study was instigated by the WRC (and led by Prof Jewitt) in 2007 to assess both the potential growing areas and water use of potential biofuel feedstocks in South Africa. Among others, the project sought to identify all crops and trees grown in South Africa that can be

used as a biofuel feedstock; assess the available knowledge on water use of these crops and trees; and estimate the water requirements of selected crops and trees where information on water use was lacking.

In all, the project identified 20 crops with the potential to produce biofuel in South Africa. Information regarding their growing requirements and potential water use, particularly the extent to which this information could be used to derived model parameters, was summarised. At present, Prof Jewitt is involved in another five research projects for the WRC – two of them as project leader.

According to Prof Jewitt, WRC research funding has contributed substantially to the operations at BEEH and the University of KwaZulu-Natal as a whole. “Student support is an obvious area where there has been a big impact. WRC support has also sustained some very important products. These include the South African Agrohydrological Atlas, the SCS-SA modelling system, and the ACRU agrohydrological system. We have staff whose research has been

supported through WRC contracts for many years. Their publication records, student support – effectively their careers – would not have advanced without WRC funding.”

One of the unique aspects of the WRC, according to Prof Jewitt, is the relationship between project managers and researchers. “I have really valued my relationships with David van der Merwe (though as a student I was quite scared of him), Hugo Maaren, Dr George Green, Dr Steve Mitchell and, more recently, Dr Andrew Sanewe, Dr Gerhard Backeberg, Eiman Karar, Wandile Nomquphu and Chris Moseki. He does express concern, however, about the existing projects within the Commission’s key strategic areas being very focused with limited interaction.

What is the value to South Africa in having an organisation such as the WRC? “When you speak to water researchers outside South Africa, the value of the WRC becomes immediately apparent. The model, where funding dedicated to water research is available for both targeted and blue sky-type projects, is truly unique. The

benefits are immense. The National Water Act itself has many aspects that have drawn on WRC supported research, the streamflow reduction activity and environmental flows work being the most obvious. Many researchers and research aspects have strong international profiles because of the sustained support offered through WRC projects.” The benefit of the WRC’s accredited journal, *Water SA*, should also not be ignored.

There is a very high proportion of post-graduate students in the South African water sector (and beyond) who have graduated through research within WRC projects, notes Prof Jewitt. “It would be interesting to do some sort of survey on this, but I estimate that over 70% of ‘water’ graduates over the past 40 years would have been involved with WRC projects at least as students.”

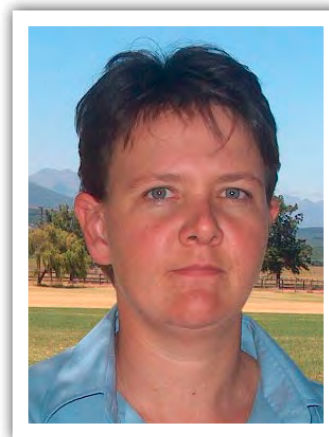
“I have really appreciated the opportunities provided and the support of the WRC throughout my career – from being a student on WRC projects to now being a supervisor of students on them” concludes Prof Jewitt. □

Irrigation water made to measure

Technical Executive Officer of the South African Irrigation Institute, Isobel van der Stoep, has come a long way since her first exposure to the WRC 15 years ago.

Van der Stoep describes her first experience of the WRC: “I joined MBB Consulting Engineers on 2 December, 1996, having completed my undergraduate studies a month earlier. Scarcely three days later, I was hauled off to a steering committee meeting, in my Sunday best to face a room full of what the rest of the (older and more experienced) team obviously perceived to be close to a firing squad. The meeting was long and very serious, but we all survived.”

Her first project for the WRC soon followed, where she participated on a review of planning and design procedures applicable to small-scale farmer irrigation projects with Charles Crosby, Marna de Lange and Chris Stimie. Since then she has worked continuously on WRC-funded studies and, at present, is project leader for a project entitled ‘Awareness creation, implementation plans and guidelines for management of sustainable on-farm and on-scheme water measurement’ with WRC Director: Water Utilisation in Agriculture, Dr Gerhard Backeberg, as research manager. “It is a technology transfer project following on a research project undertaken



Isobel van der Stoep

between 2001 to 2005,” explains Van der Stoep.

Most of her work for the WRC has focused on measurement of irrigation water and other irrigation-related parameters that are indicative of water use efficiency. One cannot manage that which one does not measure, and it is on the topic of irrigation water measurement that the real value of

the WRC can be seen, according to Van der Stoep. “The Commission has made an important contribution to the knowledge base on measuring methods and equipment in the irrigation sector by initiating projects well in advance and with particular foresight of the needs that arise in the field. The funding has made it possible to compile information that is useful to the whole industry and to create a network of knowledgeable persons across the country.”

She is no longer anxious at steering committee meetings – in fact, she now embraces them. “The research project I was involved in on irrigation water measurement while working at the University of Pretoria not only lay the foundation for the field I came to specialise in, it also changed my perception of the steering committee as the ‘firing squad’ to a supporting circle of colleagues.” The project also provided her with

wonderful opportunities to work at various irrigation schemes and with equipment suppliers, as well as to complete her Masters Degree.

The study, published in 2005, showed that there were not only legal reasons for irrigators to install water measuring devices, but that there were also other benefits related to practical water management, including accurate accounting and good records which helps to allocate equitable shares of water between competitive uses. Moreover, it provides farmers with the information needed to achieve the best of irrigation water while reducing negative environmental impacts.

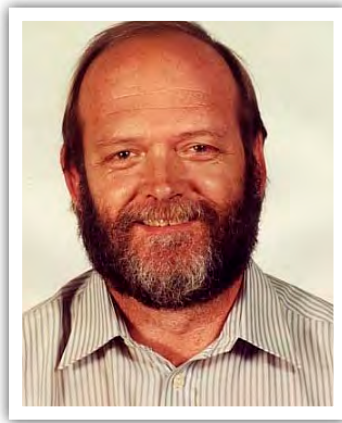
She holds Dr Backeberg in high esteem. “He has been the responsible person at the WRC for most of the projects I have worked on. I find him an exceptional chairperson at meetings, and he works just as hard as his project teams. I have also found him

to be technically knowledgeable due to the wide range of projects he manages, and he has really been instrumental in guiding irrigation research in South Africa over the last 15 years.”

The WRC provides a dependable source of funding for research in South Africa and, as economical and political pressures increase, it can be tempting to look for short cuts to find solutions to water problems. “By providing funding and employing technical specialists to manage the funds, the WRC provides opportunities for researchers to look for sustainable and not necessarily commercially-driven solutions,” notes Van der Stoep.

She does see an urgent need for focused research on energy efficiency and the use of electricity in the irrigation sector. Her birthday message for the WRC: “Keep up the good work and don’t succumb to political pressure.” □

Prof
Kevin
Rogers



Another prominent ecologist who has spent much of their careers working on WRC-funded research is Prof Kevin Rogers, Director of the Centre for Water in the Environment (CWE) at Witwatersrand University.

He first became involved in a riparian vegetation ecology project for the WRC in 1992. Among others, he was also a member of the team who participated in the Kruger Park Rivers Research Programme which the Commission co-funded. “The latter still stands out as an amazing,

Managing our rivers for people, plants and fish

internationally recognised success, especially with regards to fostering interaction between scientists and users.”

At present, he is involved in a project looking at advancing strategic adaptive management as a framework for implementation of integrated water resource management by catchment management agencies.

According to Prof Rogers, the WRC has had a very significant impact on his area of expertise, especially as the budgets have been realistic for the job that needs to be done and can provide students with a decent bursary or income. “The WRC has also been very supportive of both interdisciplinary and management-orientated research, neither of which are central to other funding agencies. I believe that the CWE has

been able to push the frontiers of river ecology and river/catchment management because the WRC has been so forward thinking and brave.

“Other national sources of funding would not have been brave enough or unfettered enough to do so,” Prof Rogers continues. “They actually limit progress by encouraging scientists to do more of the same so they can maximise publications and student production. The WRC’s approach allows for a much more balanced approach to research, student training, publications and applied work. In fact, I think the WRC has a much better ‘social contract’ than the others as a consequence of their approach.”

The fact that the WRC does not consider applied research to be something inferior has allowed the CWE to pursue its objective of

ensuring that research outcomes are used and not just useful. “My current research is very much action research which no other South

African organisation funds.”

He would like to see the WRC going back to cooperative programmes such as the Kruger National

Park Rivers Research Programme.

“There is more work involved but the reward per unit effort is much greater in the long run.” □

Lending municipalities a helping hand



Chris Swartz has assisted the WRC in developing numerous drinking water and wastewater guidelines for municipalities.

A few years ago, sensing the challenges that municipalities faced in terms of their drinking water and wastewater treatment operations, the WRC started producing a series of guide documents to assist in this regard, from the selection of optimal technologies to the correct operation and maintenance procedures. Independent consultant Chris Swartz has been involved in most of these initiatives.

His first project for the WRC started in 1988 and involved studying the occurrence of trihalomethane precursors in the drinking water supply from Hartbeespoort Dam water. “Back then I was working for the Division of Water Technology of the CSIR in Pretoria. The project leader was Prof Ronnie Gehr, a visiting researcher from the McGill University in Montreal, Canada. It was my first experience with dedicated field work for research projects, and I spent a lot of time doing pilot-scale studies at the Schoemansville water treatment plant at the dam.”

At present, Swartz is involved in three research projects for the WRC, two of them as project leaders. The

first involves the compilation of a compendium of case studies and best practices in energy efficiency in the South African water industry; while another comprises the development of a costing model to determine the cost-efficiency and energy efficiency of water treatment technologies and supply options. He is also working with Prof Maggie Momba of the Tshwane University of Technology on guidelines for the assessment of compliance of South Africa water supply with accepted drinking water quality standards and management norms.

For Swartz, the guideline documents developed by the WRC on operation, maintenance and management of water treatment plants have been most valuable for municipalities to assist them with planning day-to-day operation and maintenance of their water treatment systems. “Importantly, it is also assisting them with the monitoring of water quality. This has largely assisted municipalities to position themselves to comply with the requirements of the Department of Water Affairs’ Blue Drop certification programme.”

He singles out Dr Rivka Kfir, for her support over the many years that he has known her (they were once colleagues at the CSIR), as well as Drs Gerhard Offringa, Jo Burgess and Valerie Naidoo for their guidance, support and friendship in carrying out projects under their leadership as research managers for the WRC.

According to Swartz, it is invaluable to ensure that the South African water sector addresses the challenges in the water and wastewater treatment field, and the WRC has been instrumental in ensuring that these actions are done as Commission-funded projects. “It is also crucial that South African scientists remain among the best in the world through the opportunity and funding to undertake basic as well as innovative research.”

His birthday wish for the WRC: “To all the staff of the WRC, former and present, a big birthday wish for the excellent work that you have done for South Africa. I wish you all the best for the future and all the challenges that it holds!” □

Water Research Commission



The Water Research Commission (WRC) is South Africa's dynamic hub for water-centred knowledge, innovation and intellectual capital. The WRC provides leadership for water research development in:

- Water Resource Management
- Water-Linked Ecosystems
- Water Use and Waste Management
- Water Utilisation in Agriculture
- Water-Centred Knowledge

Impact areas address the following key issues:

- Water and Society
- Water and Economy
- Water and the Environment
- Water and Health

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