



Southern Africa Association for the Advancement of Science  
Suider-Afrika Genootskap vir die Bevordering van die Wetenskap

# Rudolf Marloth

## Brochure - Brosjure

**Annual award ceremony: November 2007**

### ***The South Africa Medal (gold): Awarded to Professor Wieland Gevers***

The South Africa Medal (gold) has been awarded annually since 1908 to recognise exceptional contributions to the advancement of science on a broad front or in a specific field, by an eminent South African scientist. Professor Gevers received this prestigious award in 2007 for his important contributions to medical research and his leadership role in organised science in South Africa.

Wieland Gevers qualified in Medicine (MB ChB) with First Class Honours at the University of Cape Town in 1960, and proceeded as a Rhodes Scholar to Oxford University. There he obtained the DPhil degree in 1966 under Sir Hans Krebs, for his research on the regulation of liver metabolism. He subsequently spent four postdoctoral years at the Rockefeller University in New York, where he worked on the biosynthesis of peptide antibiotics, before returning to South Africa in 1970.

Professor Gevers directed research units of the Medical Research Council at the University of Stellenbosch (1970-1977) and the University of Cape Town (1979-1994), using biochemical, cell-biological and molecular genetic approaches to the study of heart contractility, intracellular protein turnover and cholesterol metabolism. In 1978 he was appointed Professor of Medical Biochemistry at the University of Cape Town and from 1992 until the end of 2002 was Senior Deputy Vice-Chancellor responsible for planning and academic process. He was President of the South African Biochemical Society (1975-1976), the Royal Society of South Africa (1987-1989), and the Academy of Science of South Africa (1998-2005). He holds a Distinguished Teacher's Award from the University of Cape Town.

Professor Gevers was awarded the Wellcome Gold Medal for Medical Research and the Gold Medals of both the South African Society for Biochemistry and Molecular Biology, and the South African Medical Research Council. In 2004 he received the NSTF's "Achievements as an Individual over a Lifetime" Award, and in 2006 the M T Steyn Medal of the Suid-Afrikaanse Akademie vir Wetenskap en Kuns. He was awarded honorary DSc degrees by the Universities of Cape Town and Port Elizabeth. He is now the Executive Officer of the Academy of Science of South Africa.



*Prof Wieland Gevers*

## Summary of the Marloth Memorial Lecture by Professor Gevers:

### The complementary role of hedgehogs and foxes in the progress of science

Science is perhaps the largest inclusively communal undertaking of humankind, and the one with the least internal conflict. The scholarly literature is the vast storehouse of evidence-based knowledge, continuously revised and re-formulated as improved conceptual frameworks and techniques evolve. Progress in science is brought about by the efforts of many individual scholars and collaborating teams. The observation is not new that the general styles of most scholars can be categorised fairly simply into two basic types, the fabled “hedgehogs” and “foxes”. Sir Isaiah Berlin first elaborated extensively on this theme many years ago, and Clem Sunter has made quite a meal of it locally over the last decade. What is perhaps new is the idea that progress in science can be accelerated by ensuring that the likelihood of productive complementarity between the work done by both types of scientists is maximised.

“Hedgehog-type” scientists are pre-occupied with a single problem or area of investigation, and continue to gnaw at it until the best and most persistent ones become “world authorities” on the subject in question. “Fox-type” scientists tend to have careers that involve voluntary re-starts on different topics several times in their working lives. They carry experiential baggage from one phase to another, often making unexpectedly rapid progress because of the “bags of tricks” they acquired, which make them unique in their new area of activity.

“Hedgehog-type” scientists read papers and attend seminars only in their fields of interest; “fox-type” scientists read much more widely, looking for tips and models for creative application in their current areas of interest. For example, the physicists who opened up twentieth-century molecular biology were “foxes” in their own discipline. In my own experience a move from deep involvement in muscle biology led to a new pre-occupation with the cell-surface receptors which control cholesterol in the blood, and saw my group overturning conventional notions and quickly establishing itself as the world authority on the turnover of LDL receptors, amongst other novel contributions we were able to make.

Progress in science thus needs complementary interventions by “hedgehog-type” and “fox-type” scholars. Journals need to remain as well-edited organs of disciplinary progress and cohesiveness, permitting readers regularly to make lateral excursions and to be excited by authoritative, synthetic reviews that create new interpretations of known phenomena. The current trend towards electronic publishing may lead to an indexed, searchable universe of bits of knowledge that may be well-suited to the working style of “hedgehogs” but not to that of “foxes”. Funding bodies need to understand the typology of the people who seek their support; they cannot be evaluated using criteria that are designed for only one type, as is the case in the NRF’s current rating system.



A long career in science leads naturally to reflection, not only on the interesting problems that have yielded answers to one’s many hypotheses, but also on the factors such as complementary working styles within teams that have made significant progress possible. That two prominent and contrasting styles might have been captured by a Greek fable-teller more than two millennia ago adds just a little spice to the notion.

*Professor Gevers (left) receives the South Africa Medal (gold) from Dr Ian Raper, President of the Association*

## The British Association Medal (silver): Awarded to Professor Alexander Myburg



Professor Zander Myburg

The British Association Medal (silver) was instituted in 1932 and is awarded annually to a scientist under the age of 40 who is actively engaged in research and has, by way of international participation and publications, shown outstanding capability and achievements. Professor Myburg received the award in recognition of his outstanding research in plant molecular genetics and genomics.

Alexander (Zander) Myburg was born in Bloemfontein in 1969 and obtained the degrees BSc (1993) and MSc (1997) in Botany and Genetics at the University of the Free State. He received the Fulbright Scholarship to pursue his doctoral studies in the United States and completed a PhD degree programme in Genetics and Forestry at North Carolina State University in 2001. Upon his return to South Africa he was appointed Lecturer, and in 2007 Associate Professor, in the Department of Genetics at the University of Pretoria. Soon after his return he established the Wood and Fibre Molecular Genetics Programme in collaboration with Sappi and Mondi, the two largest pulp and paper companies in South Africa.

During 2005-2007 Professor Myburg was Chairman of the Working Party on Molecular Biology of Forest Trees of the International Union of Forest Research Organisations (IUFRO) and in 2005 was co-host and scientific programme coordinator of IUFRO's Tree Biotechnology Meeting. During 2007 he received the Outstanding Young Researcher Award of the University of Pretoria and the President's Award (P-rating) of the National Research Foundation. That same year he was elected an Honorary Principal Fellow of the School of Forest and Ecosystem Science of the University of Melbourne.

Professor Myburg is currently Vice-President of the South African Genetics Society. He is the international coordinator of the International *Eucalyptus* Genome Network (EUCAGEN) and the lead investigator of the recently announced US Department of Energy (DOE) - Joint Genome Institute (JGI) project to sequence the *Eucalyptus* tree genome. His research has been published in 26 peer-reviewed research articles and book chapters on plant molecular genetics and genomics, and he has made numerous contributions to local and international conferences.

### Summary of Professor Myburg's lecture: Forest tree genomics - The future of fibre and energy production in trees

Our world is facing a double-edged threat from increased fossil fuel consumption and global carbon emissions and our generation will have to find solutions to these problems to avoid severe energy shortages, rapid climate change and environmental decay. Potential solutions include the development of alternative energy sources and the mitigation of greenhouse gas emissions. Forest trees may be an essential part of both solutions. They produce large quantities of cellulose-rich wood that can be used as a renewable energy source and they sequester carbon from the atmosphere, thereby reducing greenhouse gases.

Lignocellulosic raw materials such as wood are important targets for biotechnology research owing to their potential use in bioenergy production. The cellulosic component of wood can be converted to sugar and used as an energy source for bioethanol fermentation. Purified cellulosic materials have twofold higher energy conversion rates than starch-based materials such as maize, and can lead to threefold greater net reduction in greenhouse gas



Professor Myburg receives the British Association Medal (silver) from Dr Raper

emissions. Extensive processing expertise has already been developed for wood fibre materials in the pulp and paper industry and this expertise can be adapted for the processing of woody biomass in bioenergy production

A major challenge for the sustainable production of bioenergy from woody biomass is our understanding of the molecular basis of superior growth and adaptation in trees. *Eucalyptus* tree species are among the fastest growing woody plants in the world and the most widely planted plantation forest trees worldwide. However, to serve as future energy and fibre crops they need extensive genetic improvement to achieve substantially increased growth rates, optimised fibre chemistry and reduced environmental impact. This requires a fundamental understanding of the genetic regulation of wood fibre development and the deposition of cellulose-rich fibre cell walls, and the molecular basis of the interactions of trees with

the environment. Factors such as disease resistance and water-use efficiency will be of particular concern for intensely cultivated bioenergy and fibre crops.

In June 2007, the US-DOE announced that it will sequence the genome of a *Eucalyptus grandis* tree. This will be only the second forest tree genome (after poplar) to be sequenced and the first of a tree with a global industrial footprint. The *E. grandis* genome comprises 640 million nucleotides in 11 chromosomes. It will take just two years to determine the primary sequence (2007 to 2009) and another year (2010) to annotate all of the genes and other regulatory regions in the genome. The DNA sequencing work will be performed at the DOE's Joint Genome Institute (JGI) in Walnut Creek, California. Prof. Myburg is the lead investigator of the project, with co-leads from Brazil and the US.

New genome sequencing technology, launched in the past two years, will allow the sequencing of additional eucalypt genomes even before the first template is completed. These next-generation sequencing technologies allow individual researchers to sequence genomes at a throughput of 2 to 4 billion bases per week. The general approach is to use the first genome sequence as a reference for comparison of many additional genome sequences from the same species, with the aim of identifying genetic differences that may be linked to disease resistance, adaptability and quality traits. In the next two decades this approach will produce the first full description of genome diversity in species, which will enable scientists to study biological processes such as wood formation using a systems biology approach. In South Africa, a recent investment by the National Research Foundation (NRF) in a next-generation sequencing platform will contribute to our understanding of genome diversity and function in *Eucalyptus* trees and so enhance their ability to produce fibre and energy for future generations.

## **$S_2A_3$ Medals for Original Research at the Masters Level awarded during 2007**

The Association's Masters Medals (bronze) serve to commend outstanding South African science students graduating at the Masters level. During 2007 medals were awarded to the following students.

### **University of the Free State**

Ané van Heerden, MSc (Microbiology): "Oxylipin production and novel ascospore release mechanisms in the yeast *Dipodascus*."

### **University of Johannesburg**

Anthony Richard Magee, MSc (Botany): "A taxonomic study of the Cape species of *Peucedanum* (Apiaceae)".

### **Vaal University of Technology**

Antoinette Lombard, MTech (Information Technology): "A conceptual comparison of warthog and conventional application development tools".

### **University of the Witwatersrand**

Nevena Selic, MSc (Computational and Applied Mathematics): "The LIBOR market model".

### **Rhodes University**

Oliver Gray King, MSc (Physics and Electronics): "The C-Band: continuum mapping and measuring the radio environment".

### **North-West University**

Renée Greyvenstein, MEng (Mechanical): "Techno-economic comparison of power conversion units for the next generation nuclear power plant".

### **Nelson Mandela Metropolitan University**

Mari Terblanche, MSc (Computer Science & Information Systems): "An extensible framework for data mining".

### **Tshwane University of Technology**

Victor Harley, MTech (Nature Conservation): "An optimised monitoring programme for ungulate numbers in the North West Parks, South Africa".

### **Central University of Technology, Free State**

Gerrie Jacobus Booysen, MTech (Mechanical Engineering): "Bridge tooling through layered sintering of powder".

### **University of Pretoria**

Li-Chang Johnny Lo, MSc (Computer Science): "A framework for cryptography algorithms on mobile devices".

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## **Report of the President, Dr Ian Raper, for 2007**

Five years have passed since this Association celebrated its centenary. We have soldiered on consistently and continued to recognise scientific achievement and endeavour. In our country the pandemic endures, with all its devastation on families and communities. We have also felt the ravages of pollution, desertification and accelerated climate change. We seem to know more and more about the past, thanks to archeological discoveries, and less and less about the future of the planet!

S<sub>2</sub>A<sub>3</sub> remains optimistic. We are grateful for the research that is being done, and the constant flow of new entrants to the world of science. Children are undoubtedly being made more aware than previously of the need for conservation and the protection of the living environment at all levels. Industry is showing increasing signs of concern for the control of noxious emissions. This includes aeronautical engineering and motor vehicle designers. We have been in contact with the Earth Organization on conservation matters, and with the Humane Society of the United States (HSUS) and the NSPCA on animal protection. Avenues for collaboration with the Royal Society of South Africa are being explored.

Our website is at present being upgraded. It holds great promise for bridging distances and informing an ever greater public of the achievements of science. As President I can now report in more detail as follows:

### **Membership**

Current paid-up membership of the Association stands at 78, including 9 honorary members. Unfortunately 11 persons failed to renew their 2007 membership and have been removed from the membership list.

At the last Council meeting in 2007 two former Presidents of the Association, Professor P.J. Smit and Professor J.A. Wolfaardt, were elected honorary members. Professors M.A. Loos and H.J. Oosthuizen have both retired and resigned from S<sub>2</sub>A<sub>3</sub>. We congratulate one of our life members, Dr Basil Cooke in Canada, who celebrated his 92nd birthday in mid-October.

The Council invites interested paid-up members to offer their services and volunteer to be co-opted onto the S<sub>2</sub>A<sub>3</sub> Council or the Pretoria Branch Committee.

### **The S<sub>2</sub>A<sub>3</sub> Masters Medal (bronze)**

For many years now the Association has annually awarded bronze medals to one outstanding Masters student in science at each of South Africa's universities and former technikons. The candidates for these medals are selected by the institutions themselves and the purpose of the awards is to recognise outstanding research for the Masters degree. As a result of changing circumstances Council



*The President of the Association, Dr Ian Raper, delivers his address*

had to reconsider these awards.

Following the amalgamation of several of our tertiary institutions Council reconfirmed the Association's policy that each institution would be permitted to award only one medal each year, even though the institution may be divided over more than one campus. As a result of amalgamations the number of institutions, and hence the number of medals, has declined.

Secondly, Council confirmed its policy that the medals should be awarded to candidates selected according to the quality of their original research only, without taking their performance in course work into account. To emphasize this policy the medal will in future be known as the  $S_2A_3$  Medal for Original Research at the Masters Level. The recipients of medals awarded during 2007 are listed elsewhere in this brochure.

## **Lectures arranged by the Pretoria Branch**

I would like to thank the Pretoria Branch Committee for organising the following public lectures of a very high standard during 2007. The lectures were delivered at the Discovery Centre, University of Pretoria, and were well received. Unfortunately the June lecture had to be postponed because the electricity supply was cut off.

"KAT and the SKA: The future home of radio astronomy in South Africa" (7 March), by Dr Adrian Tiplady, University of Cape Town. In 2009 South

Africa plans to complete the Karoo Array (Radio) Telescope (KAT) in a radio quiet reserve in the Karoo, with a high-speed fibre-optic link to the Centre for High-Performance Computing in Cape Town. The KAT will be a world-class research instrument in its own right, but is also intended to prove South Africa's readiness to host the Square Kilometer Array (SKA), a huge radio telescope currently being planned.

"Building the most powerful supercomputer in Africa" (9 May), by Albert Gazendam, Meraka Institute, CSIR. The South African National Centre for High Performance Computing is responsible for providing services, support and coordination to the local scientific computing community. A key aspect is the establishment of high performance computing resources. The first iteration of these resources, believed to be the most sophisticated in Africa, are now in place.

"Elephant seals and the International Polar Year" (1 August), by Marthán N Bester, Mammal Research Institute, University of Pretoria. This well-illustrated talk described a study of the elephant seals that breed on Marion Island. The study includes the use



*One of the guests at the award ceremony in conversation with Dr Frans Korb, a member of the  $S_2A_3$  Council*

## *Fifty years ago*



*Delegates attending the annual congress of the South African Association for the Advancement of Science held in Pretoria in 1957. The President of the Association for that year was Professor Robert H. Compton (1886-1979), botanist.*

of sophisticated satellite-linked recorders that are attached to selected individuals. The project, which is related to the International Polar Year, provides insight into the physical characteristics of the animals' foraging areas and other important oceanographic data.

"Chemical complexities in a crime novel" (5 September), by Professor Keith Manchester, School of Molecular and Cell Biology, University of the Witwatersrand. In this entertaining talk Professor Manchester discussed the subtle chemistry involved in one of Dorothy Sayers' crime stories, *The documents in the case*, and how she used this arcane knowledge to solve the otherwise seemingly perfect and unprovable murder.

"Peregrinations about  $\pi$  and mathematics with a computer" (3 October), by Professor John F. Ogilvie, Visiting professor of chemistry, University of Pretoria and Associate, Centre for Experimental and Constructive Mathematics, Simon Fraser University. The ratio of the circumference to the diameter of a circle,  $\pi$ , is a fundamental mathematical constant that has been calculated with increasing accuracy from ancient times to the present. Prof. Manchester reviewed the progress towards our present knowledge of its value. He also explained how computers can be used to perform mathematical (not merely arithmetical) operations that have radically altered our approach to the teaching and learning of mathematics.

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## **The S<sub>2</sub>A<sub>3</sub> National Council**

### **President**

Dr Ian Raper

### **Vice-Presidents**

Prof Fred Ellery (Kwazulu-Natal)

Dr Frans Korb (Gauteng)

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Mr Braam Smit, Prof Michael Wingfield

### **Past Presidents serving on Council**

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### **The Pretoria Branch Committee**

Prof Casper Schutte (Chairman), Dr Elise Venter  
(Secretary/Treasurer)

Mrs Rejaene van Dyk, Dr Walter Meyer, Mr Quintin Odendaal

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## **Contact us**

Persons who support the advancement of science are invited to become members of S2A3. Please contact the Secretary, Mrs SA Korsman, for details of current membership fees and an application for membership form:

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