



Southern Africa Association for the Advancement of Science

Rudolf Marloth Brochure 2010

Annual award ceremony: November 2009

The South Africa Medal (gold): Awarded to Professor Richard Mark Cowling

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 Cowling received this prestigious award in 2009 for his important contributions to South African botany and nature conservation.

Richard M. Cowling was born on 27 April 1955 in Eshowe, KwaZulu-Natal. He studied at the University of Cape Town, where he was awarded the degrees BSc (Hons) and PhD in botany. In 2000 he was appointed Professor in the Botany Department at Nelson Mandela Metropolitan University in Port Elizabeth, as well as Honorary Professor of Botany at the University of Cape Town. Since then he has been appointed in addition as Adjunct Professor at Curtin University, Australia (2001) and as a Research Associate at the CSIR: Natural Resources and Environment (2004).

Professor Cowling has served as a member of numerous national and international committees of specialists, for example, the Forest Advisory Group: World Wide Fund International (2000-2002); the Special Advisory Committee of the Succulent Karoo Ecosystem Planning (SKEP) Project (2001-2002); the Steering Committee and the Technical Committee of the Subtropical Thicket Ecosystem Planning (STEP) Project (2001-2004); the Roster of Experts: Scientific and Technical Advisory Panel (STAP) for the Global Environment Facility (GEF) (2003-); the Technical Working Group: Succulent Karoo Ecosystem Planning (SKEP) Project (2003-); the Scientific Advisory Committees of the Baviaanskloof Conservation Initiative (2004-), the Subtropical Thicket Ecosystem

Planning (STEP) Project (2004-), and the Subtropical Thicket Rehabilitation Pilot Project (2004-); the Klein Karoo Study Group (2005-); and the Southern African Plant Specialist Group of the Species Survival Commission: International Union for the Conservation of Nature and Natural Resources (2006-).

On the basis of his research Professor Cowling has published well over 200 scientific papers in peer reviewed journals, two scientific books, three popular books, and more than 50 popular articles, and delivered numerous papers at scientific meetings. The many awards and honours he has received include the following: The Cape Times Centenary Award: Conservation (1993); the prestigious international Pew Fellows Conservation Program Award (1994); the Gold Medal Award of the Wildlife and Environmental Society of South Africa (2003); the Silver Medal of the South African Association of Botanists (2003); the Flora Conservation Award of the Botanical Society of South Africa (2004); the distinguished Service Award of the (American) Society for Conservation Biology (2004); The Buchu Award Gold of the Cape St Francis Civic Association (2005); and the Researcher of the Year Award of Nelson Mandela Metropolitan University (2006). In 2008 he was awarded an AI rating by the NRF.



Professor Richard Mark Cowling

Summary of the 2009 Rudolf Marloth Lecture by Prof. Cowling: Exploring Levyns' Law: west-east plant diversity patterns in the Cape Region

Since 1908 S₂A₃ has awarded the South Africa Medal (gold) to several distinguished scholars for their contributions to our knowledge of South Africa's uniquely rich Cape flora, namely Harry Bolus (1909), Rudolph Marloth (1914), R.H. Compton (1954) and Margaret Levyns (1958). In her Presidential Address to the Royal Society of South Africa in 1964, Levyns emphasized a vegetation pattern she had pointed out in earlier papers, namely the concentration of species of large Cape plant genera in the western parts of the region. She attributed this phenomenon to more "intensive speciation in the west". I will call this pattern *Levyns' Law*, and will explore the processes responsible for producing it in this presentation.

Physiographically, there are substantive west-east gradients across the southern Cape. These gradients include a declining proportion of winter rain, declining reliability of winter rain, increasing proportion and reliability of autumn and summer rain, and increasing soil fertility on substrata of the same origin. Species-area analysis shows that, on average, regions in the west support slightly more than double the number of species as similar-sized regions in the east. After removal of this trend, the residual variability in species number is overwhelmingly explained by rainfall reliability. Unreliable rainfall may limit species numbers by restricting post-fire seedling establishment of non-sprouting species. Evidence from Proteaceae support this conclusion.

Habitat heterogeneity is widely invoked for explaining gradients in diversity. However, there are no differences in topographic heterogeneity between the western and eastern parts of the southern Cape, although scenery in the two regions is the product of different geomorphic processes. In addition, plant community diversity – a biologically

integrated measure of habitat heterogeneity – shows no difference across the Cape. Turning to biological correlates of diversity, several studies have shown a strong positive relationship between diversity and rarity: areas rich in species are also rich in those species with small and range-restricted global populations. Moreover, molecular data show higher phylogenetic diversity among western than among eastern clades. These findings suggest that diversification rates have been higher, and extinction rates lower in the west than in the east, consistent with Levyns' prediction.

Recent evidence suggests that speciation rates are similar in Cape clades concentrated in winter and summer rainfall environments. This implies that, in terms of diversification rates, differential extinction rates have contributed to the west-east diversity gradient in the Cape. Palaeodata are consistent with this hypothesis: the western parts of the Cape enjoyed moisture conditions that were more stable during the Pleistocene than those in the east. Greater climatic stability historically is the most likely candidate for producing the patterns that I have formalized as Levyns' Law.



Professor Cowling and guests at the award ceremony

The British Association Medal (silver): Awarded to Dr. Lizette Leonie Koekemoer

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. In 2009 the medal was awarded to Dr Koekemoer in recognition of her important research in medical entomology.

Lizette Koekemoer matriculated in 1989 at Pietersburg High School. She obtained her BSc (Agric) degree (in Biochemistry and Genetics) from the University of Pretoria in 1993 and did her Honours in Genetics in 1994. That same year she started her work as a junior scientist at the South African Institute for Medical Research (SAIMR) in the Department of Medical Entomology (currently called the Vector Control Reference Unit (VCRU) in



Dr Lizette Koekemoer

the National Institute for Communicable Diseases, a division of the National Health Laboratory Service). Here she worked closely with Professors Maureen Coetzee and Richard Hunt. Lizette obtained her PhD in 1999, working on the molecular systematics of African malaria mosquitoes and specifically the

Anopheles funestus group. She received the Watkins-Pitchford prize for her first publication in 1998. In 2008 she was appointed as Head of the VCRU and holds a joint appointment with the University of the Witwatersrand as Senior Researcher.

Lizette has supervised and co-supervised 20 post graduate students at Hons, MSc, PhD and post-doctoral levels. She has authored or co-authored 47 scientific papers and has acted as reviewer for several scientific journals and granting agencies. She has presented her research findings at various local and international conferences and has successfully obtained research funding from local as well as international granting agencies.

Based on her research output, Lizette was elected a Fellow of the Royal Entomological Society (London) in 2007. She has served as temporary adviser to WHO/TDR in the area of research capability strengthening on several occasions and collaborated with scientists in institutions across Africa. She is currently a member of the WHO/TDR/Empowerment Research Strengthening Group (RSG) steering committee.

Lizette has been married to Jan Koekemoer for 14 years and they have two children, aged 9 and 7.

Summary of Dr Koekemoer's lecture: The beasts that I love

Towards the end of the 19th century malaria research, and specifically malaria vector research, took a huge leap. A British scientist, Ronald Ross, received the Nobel prize for showing that a grey dappled winged mosquito transmits the malaria parasite to humans through an infected bite. Ross was under the impression that it was a "Culex" species that was the vector, however, shortly after the publication of his paper an Italian team lead by Giovanni Battista Grassi also identified the role of "Anopheles" mosquitoes in malaria transmission.

During the late 1920s, South Africans made international news when Drs Botha De Meillon and Alexander Ingram, of the South African Institute for Medical Research, showed that a liquid pyrethrum and kerosene solution could kill mosquitoes in houses. De Meillon was the first person to show that *Anopheles funestus*, a major vector in South Africa, rests indoors and exits houses about two days later when they are ready to lay eggs or oviposition. This information led to the development of a vector control strategy based on treating the inside of houses with insecticides, thus killing any mosquitoes resting there after they had fed on their host.

South Africa is currently using indoor residual spraying to control malaria mosquitoes very efficiently. Historically, up to the 1930s, malaria risk areas included localities such as Pretoria and Durban. With the use of pyrethroids and later DDT, the malaria risk area was confined to South Africa's border regions.

Hugh Paterson, another South African, played a major role in resolving the species complexes of African malaria vectors. During 1962 he applied the "biological species concept" and showed that the *Anopheles gambiae* complex comprises different species. Understanding and differentiating between species is vital in the field of medical and veterinary entomology and is of major importance in vector disease control.

During 1996 South Africa replaced DDT with a more environmentally friendly insecticide, pyrethroid. However, within three years KwaZulu-Natal experienced a seven-fold increase of malaria cases. At this time I was involved in the development of a multiplex molecular assay to identify the members of the *Anopheles funestus* group. Mosquitoes

from KwaZulu-Natal could be identified to species level using this new technology and it was quickly shown that *Anopheles funestus* was the vector involved in this epidemic, and that it was resistant to the pyrethroids. Our work contributed to a policy decision to change our control strategies. This resulted in an immediate reduction in malaria transmission. I was intrigued by the molecular mechanism of pyrethroid resistance in this species. Using various molecular techniques, we have now identified four potential genes that are probably involved in their insecticide resistance.

To circumvent the effects of insecticide resistance, the use of novel compounds such as entomopathogenic fungi are being investigated as an additional control strategy that can be used in combination with current methods. Research has already shown that *Anopheles funestus* is susceptible to the fungi. The major advantage of this technology is that the fungi will kill the mosquito before it is able to transmit the parasite to humans.

The molecular species-specific assay to identify species of the *Anopheles funestus* group resulted in

producing yet another pleasant surprise in 2008. The assay seemed to fail to identify *Anopheles funestus* group mosquitoes from Koronga, Malawi. After Prof Hunt had collected additional mosquitoes there, it became evident that a new species in this group had been found. This resulted in hours of pleasure to try and elucidate the relationship between these mosquitoes and the other members of the species group.



Dr Koekemoer and family at the awards ceremony

***S₂A₃* Medals for Original Research at the Masters Level, awarded during 2009**

The Association's Masters Medals (bronze) are awarded annually to the most outstanding research student in a scientific subject, graduating at the Masters level, at each South African university. During 2009 medals were awarded to the following students:

University of Stellenbosch (2008 medal)

Ethel Emmarantia Phiri, MSc (Zoology): "Species occupancy, distribution and abundance: indigenous and alien invasive vascular plants on sub-Antarctic Marion Island."

University of Stellenbosch (2009 medal)

Margaretha Bester, MedSci (Medical Biochemistry): "Defining mechanisms that determine the levels of drug resistance in *Mycobacterium tuberculosis*."

Central University of Technology, Free State

Rudolph Johannes Pretorius, MTech (Agriculture): "A plant health management system for *Aphididae* on lettuce under variable shadehouse conditions in the central Free State, South Africa."

University of Limpopo (Medunsa Campus)

Lisbeth Ramokone Lebelo, MSc Med (Medical Virology): "Pre-vaccination exposure to hepatitis B virus infection and protective efficacy of the hepatitis B vaccine in infants from Pretoria region, South Africa"

Rhodes University

Justin Oliver Gordon Kemp, MSc (Fisheries Science): "Mariculture as a means to add value to the east coast rock lobster, *Panulirus homarus rubellus*, subsistence fishery: a physiological approach to define transport and growout protocols for wild caught juveniles."

University of Cape Town (2008 medal)

Dorit Hockman, MSc (Molecular and Cellular Biology): "Limbs gone batty: the role of the anterior

posterior patterning signal, Sonic Hedgehog, in the development of the unique bat limb.”

University of Cape Town (2009 medal)

Renée Hlozek, MSc (Applied Mathematics): “Challenges in the hunt for dark energy dynamics.”

University of the Free State

Marietjie Schutte, MSc (Chemistry): “A mechanistic study of substitution reactions on tricarbonyl complexes of rhenium(I).”

University of Johannesburg

Tarryn Susan Pentz, MSc (Chemistry): “Chemical characterisation of sediments and its correlation with the bioavailability of selected heavy metals.”

University of KwaZulu-Natal

Ayoub Basheer Mohammed Basheer, MSc (Chemistry): “Character tables of the general linear group and some of its subgroups.”

University of Pretoria (2008)

Jacomine Grobler, MEng (Industrial Engineering): “Particle swarm optimization and differential evolution for multi-objective multiple machine scheduling.”

University of Pretoria (2009)

Claudia Zander, MSc (Physics): “Information measures, entanglement and quantum evolution.”

University of the Witwatersrand

Philip Charles Haycock, MSc (Med): “Exposure of mouse embryos to ethanol during preimplantation development: effect on DNA-methylation in the *H19* imprinting control region.”

Nelson Mandela Metropolitan University

Brian Reeves, MSc (Botany): “A resource allocation system for invasive alien plant control on the St Francis conservancy.”

Tshwane University of Technology

Monika Brigitte Ogden (née Lehmann), MTech (Nature Conservation): “The behavioural ecology of a solitary lion pride in Karongwe Game Reserve.”

North-West University

Mmamontsho Charlotte Senosi, MSc (Mathematics): “Discrete dynamics of bank credit and capital and their cyclicity.”



The Nelson Mandela Metropolitan University awarded the S_2A_3 Masters Medal for 2009 to Mr Brian Reeves. His supervisor was the recipient of the South Africa Medal for 2009, Prof Richard Cowling. From left to right: Prof Cowling, Mr Reeves, Ms Jaci Barnett (S_2A_3 Vice-President for the Eastern Cape), and Prof Andrew Leitch (Dean, Faculty of Science).

Report of the President, Dr Ian Raper, for 2009

At the close of each year we reflect on the achievements of our scientists in various fields and their contributions both to the global corpus of scientific knowledge and to increased expertise with particular applications.

It often becomes clear why science associations need to be ultimately independent, unaligned. For example, an honest association of scientists at times has to speak out against state or other institutional suppression of research findings.

Particularly since our centenary in 2002, we have evinced environmental concern based on scientific knowledge, recognising contributions made by wildlife societies, a conservation television programme, and a courageous cabinet minister. At its annual general meeting the Association has resoundingly elected to affiliate with The Earth Organization. S_2A_3 will no doubt increasingly question matters such as disproportionate spending on space exploration as opposed to anti-desertification and desalinating measures to make our own planet more habitable in times of great poverty and climate change.

As we jealously guard our integrity and the unfettered pursuit of science for the benefit of humanity and the living environment, we have also reconfirmed the rigorous S_2A_3 policy that each university will be permitted to award only one S_2A_3 Masters Medal per year, and only for original masters research, excluding any component of course work.

We are proud to note that during 2009 thirteen universities awarded the Association's Masters Medal. The candidates for these medals are selected by the institutions themselves, rather than by S_2A_3 . The names of the recipients are listed elsewhere in this brochure.

We warmly and heartily congratulate the scientists who were honoured by means of the South Africa Medal (gold) and British Association Medal (silver) at our award ceremony in November, and also the following recipients of the S_2A_3 Merit Award for outstanding service to the Association's Council and the Pretoria Branch: Dr Walter Meyer, Mr Michael Ortner, Prof. Cornelis Plug, Prof. Casper Schutte, Mrs Engela van Dyk, Mrs Rejaene van Dyk, and Dr Elise Venter.

The paid-up membership tally of S_2A_3 as at 22 October 2009 was as follows: Ordinary members 65; student members 1; life members 5; honorary members 4. Dr Shaleen Els resigned as Vice President in the Eastern Cape. She is succeeded by Ms Jacqueline Barnett. Mr Lawrence Anthony was co-opted to serve on the S_2A_3 Council during May 2009.

We welcome the following persons as new members of S_2A_3 : Ms Jacqueline Barnett, Vice President in the Eastern Cape; Prof Pat Eriksson, Gold Medal winner in 2008; Prof Thokozani Majozi, Silver Medal winner in 2008; Mr Johan de Beer; Ms Retha Bezuidenhout; Mr Ubbo Smith; Dr SJ van der Walt; Mr Gopolang Mohlabeng; and four new members from Department of Geology, University of Pretoria: Mr Victor Tibane, Mr Philani Mavimbela, Prof Wlady Altermann, and Mrs Beate Hölscher. One of our most senior members, Mr G.E. Burgess, passed away in October 2009 at the age of 92. He joined the Association in or before 1960. Dr Jan J. Taljaard, who received one of the Association's merit certificates in 2001, died in July 2009. Early in 2010 we lost a prominent scientist in the person of Prof. Ralph Kirsch, winner of the South Africa Medal in 2005.

I would like, on behalf of the Council, to invite any interested paid-up member to offer his or her services and volunteer to be co-opted onto the S_2A_3 Council or the Pretoria Branch Committee. Additional help is always welcome.

Our thanks to the following S_2A_3 members for their voluntary work during 2009:

- The S_2A_3 Council members and the Pretoria Branch Committee members for their dedication and hard work throughout 2009. We should remember that without their willingness S_2A_3 would not be in a position to function;
- All the helpers for organising a splendid awards ceremony;
- The Marloth Trust for financing the 2009 annual awards ceremony and the 2008 Marloth Brochure;
- Professor Cornelis Plug for once again compiling the Marloth Brochure.

We look forward to 2010, despite our awareness of many challenges.



At a function held in Pretoria on 26 September 2009 merit certificates were awarded to (from left to right) Prof Casper Schutte, Mrs Engela van Dyk, Mrs Rejaene van Dyk, Mr Michael Ortner, and Prof Cornelis Plug

Fifty years ago



Delegates attending the annual congress of the Southern Africa Association for the Advancement of Science held in Pietermaritzburg in 1959. The president of the Association for that year was Dr Ronald Elsdon-Dew (1909-1984), medical researcher and medical practitioner. The South Africa Medal (gold) was awarded to Dr Albert John Hesse (1895-1987), entomologist and expert on bee flies (Fam. Bombyliidae). No British Association Medal (silver) was awarded in 1959.

Lectures arranged by the Pretoria Branch

Owing to unforeseen circumstances only three lectures could be arranged by the Pretoria Branch Committee during 2009. We thank the committee for organising the following interesting and well-attended public lectures, held at the Sci-Enza Centre, University of Pretoria:

“1000 Years of Islamic knowledge rediscovered” (4 March 2009), by Professor Mike Bruton. This fascinating lecture on Islamic science, technology and culture during the European medieval period was arranged by the Royal Society of South Africa at the S₂A₃ venue, and was open to our members. Contributions of Islamic scholars to medicine, engineering, zoology, mathematics, astronomy, physics, navigation, geography and optics were reviewed, as well as Islamic learning institutions such as the madrasas, teaching hospitals, astronomical observatories, Houses of Wisdom, and early universities. Discoveries and inventions as varied as Arabic numerals, the automatic valve, camshaft, crankshaft, cheque, chemistry as a science, cryptography, coffee, conic geography, fountain pen, glass lenses, pinhole camera, spectrum of light, navigational compass, reciprocating pump, segmental gears, smallpox vaccination, sulphuric acid, toothpaste, and trigonometry, can be attributed to Islamic scientists and technologists.

“The physics of music” (20 May 2009), by Professor Ado Janse van Rensburg, Steve Biko Hospital, University of Pretoria. In this talk the fascinating interplay between the physics of sound, working of the ear, and the cultural aspects of music were explored. For example, there is a clear link between the functioning of the ear, musical instruments, and musical scales. The speaker explained the modes in which sound waves are generated by the French horn and other instruments, and linked this knowledge to the detection and interpretation of sound by an observer. When the composition of sound waves, the anatomy of the ear, the transmission of nerve impulses through the synapses, pattern recognition in the brain, and cultural influences all come together in perfect harmony, we have MUSIC!

“The H1N1 influenza pandemic – its emergence and the implications for society” (7 October 2009), by Professor Lynne Webber, Head of the Department of Medical Virology, University of Pretoria.

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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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Consult the S₂A₃ biographical database of southern African science at
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