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 2006

The South Africa Medal (gold):
Awarded to Professor R N Owen-Smith

Prof Norman Owen-Smith

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 Owen-Smith received this prestigious award in 2006 for his internationally recognised research in ecology and conservation biology.

R. Norman Owen-Smith was awarded an MSc degree in Inorganic Chemistry at the University of Natal, Pietermaritzburg, in 1965. In 1971 he proceeded to the University of Wisconsin at Madison, where he obtained the PhD degree in Zoology and Wildlife Ecology. His thesis dealt with the behavioural ecology of the white rhinoceros. The next two years he spent at the Mammal Research Institute of the University of Pretoria, conducting studies on the population dynamics, feeding ecology and social organisation of kudus in the Kruger National Park.

After three years as a lecturer at the University of Zimbabwe he joined the staff of the University of the Witwatersrand in 1979 and has remained there to date. Until 1986 he conducted research at the Centre for Research Ecology of the Department of Botany. For the next ten years he was a Senior Lecturer/ Reader in the Department of Zoology. In 1997 he was appointed to his present post, namely Research Professor in African Ecology in the university's School of Animal, Plant and Environmental Sciences. Many

PhD and MSc research students have completed their degrees under his supervision.

Professor Owen-Smith has conducted many years of research on the ecology of large herbivores and their interaction with the vegetation that supports them, the dynamics of savannah ecosystems, theoretical resource ecology, and quantitative conservation biology. His current research programme, funded by the National Research Foundation, is entitled *Adaptive resource ecology: Herbivore-vegetation systems in variable environments*. In addition to over a hundred published papers and chapters in books, including many articles in top international journals, he is the author of *Megaherbivores: The influence of very large body size on ecology* (1988) and *Adaptive herbivore ecology: From resources to populations in variable environments* (2002). His most recent book is *Introduction to modelling in wildlife and resource conservation.*

Professor Owen-Smith received the Distinguished Researcher Award of the University of the Witwatersrand in 1995, was A-rated as a researcher by the National Research Foundation in 1999 and 2004, was elected an Honorary Life Member of the Ecological Society of America in 2000, and was awarded the Gold Medal of the Zoological Society of South Africa in 2002. In 2003 he was elected a Fellow of the Royal Society of South Africa and in 2006 was awarded the Harry Oppenheimer Fellowship. As a leader in his field he established a Working Group at the National Centre for Ecological Analysis and Synthesis in California, where 18 of the world's top ecologists gathered several times during 2001-2003 to explore the dynamics of large mammalian herbivores in changing environments.

Summary of the Marloth Memorial Lecture by Prof Owen-Smith: The science of Ecology: Establishing the causes of population changes

Ecology entails a high level of complexity as a science, incorporating physics and chemistry as well as organismal biology. It also spans four levels of integration within biology, from individual organisms through populations and communities to ecosystems. Population ecology in particular is a numerical science and invokes mathematical models relating population change to underlying resources and the state of the environment. The theoretical foundations of population ecology draw on dynamical systems concepts, but in addition invoke adaptive responses to changes in time and space. The problems addressed concern processes regulating populations around mean abundance levels; how to deal with seemingly overabundant populations, especially those of very large animals like elephants and rhinos; and how to respond to declining populations, threatening species extinctions.

Professor Owen-smith receives the South Africa Medal (gold) from Dr Ian Raper, President of the Association

Of special concern currently are the causal factors that have led to substantial population declines by several of the rarer antelope species in the Kruger National Park. Potential influences include adverse rainfall, competition from other grazers, habitat deterioration as a result of aridification, increased predation pressure, and changes to the ecosystem following the provision of artificial water sources. The challenge is to separate out the relative contributions by these factors, which do not operate in isolation. This involves a combination of basic theory, statistical probes, and comparisons among alternative multi-factorial models. Rather than there being a single cause, the evidence supports an interaction between the provision of water points, an increase in the abundance of common herbivore species, a consequent rise in lion abundance that increases predation pressure on less common species, and adverse environmental conditions making these species more vulnerable to predation.

An important implication of these findings, and of other recent developments in ecology, is that the hypothesis-refuting approach commonly followed

in many of the natural and social sciences is not necessarily appropriate in the study of ecology. It needs to be replaced by a more integrative approach, in order to establish the relative weight of evidence in favour of multiple contributory causes, in the spirit of ecological detective-work. In this respect ecology has much in common with other integrative sciences, such as climatology, economics and socio-biology. Research in these sciences involves drawing on concepts of sustainable trajectories through shifting state space, rather than identifying static optimality. Making the science of complex adaptive systems more rigorous and reliable is a special challenge facing us in our current global circumstances.

The British Association Medal (silver):

Awarded to Dr Peter Dunsby

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. Dr Dunsby received the award in recognition of his outstanding research on theoretical cosmology.

Peter Dunsby started his academic career as a postdoctoral fellow at the University of Cape Town (1993-1995) and at Dalhousie University in Halifax, Canada (1996), before joining the teaching staff of the University of Cape Town in 1997. He is currently associate professor and deputy head for research and innovation in the Department of Mathematics and Applied Mathematics at the University of Cape Town.

Undergraduate teaching forms an important and challenging part of Dr Dunsby's activities and has provided him with an opportunity to experiment with the use of technology in the classroom. His on-line course on general relativity is used widely as reference material around the world. Over the last few years he has successfully developed an integrated research programme involving graduate students, postdoctoral researchers and international collaborators, many of whom are involved in research projects linked to bilateral agreements between South Africa and Sweden, Italy or the United Kingdom.

Much of Dr Dunsby's research during the last five years has focused on theoretical cosmology and particularly on the new theoretical challenges that have resulted from detailed studies of the anisotropy of the cosmic microwave background radiation and the more accurate determination of the Hubble parameter from the study of Type Ia supernovas. His research in this area contributed mainly to the analysis of braneworld cosmologies. In collaboration with Swedish researchers he has also explored problems at the interface of plasma physics and general relativity, for example the non-linear interaction between gravitational waves and magnetic fields. Currently he devotes much time to theoretical studies of dark energy and dark matter, particularly to theories that appear to be a good alternative to

Dr Peter Dunsby

the standard dark energy models. He has published extensively on these topics, including 40 peer reviewed papers in international journals, usually in collaboration with experts in other countries.

Dr Dunsby is regularly invited to lecture at local and international summer schools and has a proven track record in fund raising and in the management of large research grants. He currently serves, or has served, on the National Astrophysics and Space Science Steering Committee, the African Institute for Mathematical Sciences Advisory Board, the Council of the South African Relativity Society, and the South African National Committee for the International Astronomical Union. In 2003 he secured a bid to host the National Astrophysics and Space Science Programme at the University of Cape Town and was subsequently appointed coordinator of this programme, which over the past four years has made a major contribution to human resource development in Astronomy and the Space Sciences. He is co-leader (with Professor Kraan-Korteweg) of the NRF Niche Area in Extragalactic Astronomy and Cosmology at UCT.

Summary of Dr Dunsby's lecture: In search of the dark side of the universe

Professor Dunsby, recipient of the British Association Medal, with his family and Dr Raper at the awards ceremony

New observational evidence relating to the origin and history of the universe poses exciting challenges to theorists. Recent observations have yielded a detailed map of tiny differences in the intensity of the microwave background radiation over the celestial sphere. The distribution of these intensity differences reflects the distribution of mass in the universe when it was 300 000 years old. The characteristics of the radiation show that space-time is Euclidean, rather than curved.

The fact that all the galaxies recede from us at a speed that increases with their distance provides observational evidence for the continuous expansion of the universe. Recently two teams of astronomers, one in Australia and one in Europe, completed a detailed study of the recession of the most distant observable galaxies. Distances were based on the observed brightness of Type Ia supernovas, which all have the same maximum intrinsic brightness and can therefore be used as a "standard candle". Recession speeds were determined by measuring the red-shift of the galaxies. Contrary to expectations both teams found that the expansion of the universe is accelerating.

This finding has important implications for our views of what the universe is made of. It has been shown that all the observable mass in the universe amounts to only about 5% of its content. Studies of the rotation curves of galaxies and of gravitational lensing show that galaxies contain much more mass than the stars and gas that we can observe in them. This extra mass has been termed "dark matter", as it is not directly observable. Although the nature of dark matter is as yet unclear, it may well be identified in the near future. Estimates of the amount of dark matter indicate that it represents some 25% of the total content of the universe. Hence 70% of the content is unaccounted for. The unknown content has been named "dark energy". Its nature remains obscure.

The new observational evidence has allowed cosmologists to eliminate several popular models of the universe, such as a high-density universe that is slowing down and will eventually re-collapse, as well as a nearly empty universe with no dark energy and low mass. In fact, there is now a model that appears to fit almost all available data - the concordance model. While the evidence from galactic clusters shows that mass density is low, the evidence for accelerated expansion shows that dark energy must dominate the density today. This is a description of the universe we would never have predicted 20 years ago and might require new physics to explain what we observe.

Several new observational initiatives are likely to throw further light on the history and nature of the universe within the next ten years or so and South Africa can play a significant role in the development of this exiting branch of science. Our Southern African Large Telescope (SALT) is eminently suitable for cosmological work; the High Energy Stereoscopic System (HESS) in Namibia is also an important instrument. Furthermore, South Africa has put in a bid to house a huge new radio telescope, the Square Kilometer Array. Meanwhile suitable students are being trained and encouraged to take up research in cosmology.

Certificate of Merit: Dr Ian Raper

The Association's merit certificates are awarded to persons or institutions who have contributed, each in their own way, to either the advancement of science or the Association's activities. In 2006 an award was made to Dr Ian Raper, President of S_2A_3 since 1996, for his outstanding leadership during the past ten years.

Dr Ian Raper receives the Certificate of Merit from Dr Frans Korb, member of Council

Bronze Medals awarded during 2006

The Association's Bronze Medals serve to commend outstanding South African science students graduating at the Masters level. During 2006 medals were awarded to the following students.

North-West University

Fimmie Reinecke, MSc (Biochemistry): "Functional properties of metallothionein over-expression in mitochondrial NADH: Ubiquinone oxidoreductase deficient cell cultures."

University of Johannesburg

R.M. Bell, M Ing: "The use of correlation coefficients for load identifiers and a fundamental approach towards power definitions in non-sinusoidal conditions."

Rhodes University

Amber-Bobyn Childs, MSc (Chemistry): "Movement patterns of spotted grunter, *Pomadasys commersonnii* (Haemulidae), in the Great Fish Estuary, South Africa."

University of the Free State

Olubukola Ayodeji Oyewumi, MSc (Agriculture): "Modeling tariff rate quotas in the South African livestock industry."

Central University of Technology, Free State

Dawid Schalk van der Merwe, M Tech (Mechanical Engineering): "The use of stereolithography and related technologies to produce short run tooling."

Tshwane University of Technology

Biljana Marjanovic, M Tech (Chemistry): "Determination of metals in avocado oil by supercritical fluid extractions and ICP-MS."

Vaal University of Technology

Johannes Paulus du Toit, M Tech (Electrical Engineering): "Design and development of a 100 W proton exchange membrane fuel cell uninterruptible power supply."

University of KwaZulu-Natal, Howard College Campus

Stephen Wesson, M Sc (Engineering): "Radar reflectivity infilling techniques."

University of KwaZulu-Natal, Pietermaritzburg Campus

Tinashe Mushayanyama, MSc (Agricultural Economics): "Improving access by smallholder farmers to organic crop supply chains: Evidence from the Ezemvelo Farmer's Organization, KwaZulu-Natal, South Africa."

University of KwaZulu-Natal, Westville Campus

Poobalan Naidoo, M Med Sc (Pharmacology): "The determination of the effects of gliclazide in regulating postprandial hyperglycaemia in Type 2 diabetic patients."

University of Pretoria

Leanne Hart, MSc (Zoology): "Reproductive biology of the Cape dune mole-rat, *Bathyergus suillus* (Schreber, 1782)."

University of Cape Town

Lucy Valeska Kemp, MSc (Zoology - Applied Marine Science): "Ancient stonewall fish traps on the south coast of South Africa: Documentation, current use, ecological effects and management implications."

University of the Witwatersrand

Lisa Desiree Majmin, MSc (Advanced Mathematics of Finance): "Local and stochastic volatility models: An investigation into the pricing and hedging of exotic options."

Nelson Mandela Metropolitan University

Yatish Jaganath, MSc (Chemistry): "Non-classical platinum anticancer complexes."

University of Stellenbosch

Gareth Lloyd, MSc (Chemistry): "Crystal engineering of porosity."

Irene Hitchcock, aged 89, is currently the oldest member of S_2A_3. She was elected an honorary member of the Association in 2006.

Report of the President, Dr Ian Raper, for 2006

I am honoured once again to be reporting, on behalf of the National Council, to members on the activities of S_2A_3 during 2006. It will be apparent that we are dedicated to ensuring that the Association remains important in its own right, as truly a national asset, and that we are all aware of work to be done in the coming years.

We have encouraged and paid tribute to endeavours and achievements in scientific fields at various levels and ranges of expertise. Since 1981 the Bronze Medal has been awarded annually to the best student at masters level in the sciences at each of the South African universities, and in 1998 this was extended to include technikon students at masters level. The mergers of institutions for higher learning have caused us to restructure the Bronze Medal Awards. During 2006 Bronze medals were awarded to senior research students at 15 tertiary institutions. Details appear elsewhere in this brochure. The medals to be awarded this evening indicate once again the importance of excellence in science as recognised by this association. We are proud to be associated with these scientists, and thank Dr von Gruenewald once again for advising Council. We recently thanked him by way of a dinner in his honour. My congratulations to this year's winners of the Gold and Silver medals.

Council of S_2A_3 and the office bearers of the Earth Organization have proposed a Memorandum of Understanding for the affiliation of these two bodies. Since 2002, S_2A_3 has recognised achievement in environmental matters, presenting awards to the then Minister of the Environment and tourism, the TV programme 50/50, and WESSA. Lectures have increasingly focused on topics concerning the environment. The President has personally been involved in coordinating scientific expertise for submission to decision makers, and has been most fortunate to have collaborated with scientists such as John Skinner, Rudi van Aarde and others in this process.

The proposed affiliation, which was submitted to Council in May, indicates S_2A_3's determination to remain relevant and to be a significant agent for change in the country. It is believed that much needed involvement by especially young members, students and active researchers will follow, to the benefit of science, this association and the country. The Earth Organization is an independent non-profit body with international office bearers, based in South Africa. Its signal achievements have been rescuing zoo animals in Baghdad, opposing the cull of elephants in the Kruger Park, and addressing the plight of the few remaining northern white rhino in the DRC. It is also clear that collaboration with other scientific societies should be sought, as confirmed by a members' motion to that effect.

Lectures arranged by the Pretoria Branch

I would like to thank the Pretoria Branch Committee for organising the following extremely interesting and well received lectures during 2006, most of which were delivered at the Discovery Centre, University of Pretoria. We intend developing our website to provide a repository of these lectures, and as an interactive platform for debate.

"Influenza – no time for complacency for South Africa" (5 April), by Dr Lynne Webber, Clinical Virologist at Lancet Laboratories and part-time lecturer in the Department of Medical Virology, University of Pretoria. Dr Webber discussed the potential impact of the bird flu pandemic and outlined strategies for preventing the interaction of bird flu with human flu, which might lead to a totally new human flu strain.

"Vredefort Dome World Heritage Site" (3 May), by Prof Frans Waanders, Director, School of Chemical and Minerals Engineering, North-West University. An estimated 2023 million years ago a gigantic meteorite hit the earth near present Vredefort in the Free State. The resulting crater structure is probably the oldest and largest meteorite impact site in the world and was declared a World Heritage Site in July 2005. Detailed field studies have enabled geologists to reconstruct this cataclysmic event, even though most of the original structure has been destroyed by erosion.

"Antarctic-Southern African geological relationships" (7 June), by Dr Geoff Grantham, Council for Geoscience. This lecture focussed on certain similarities between the geological evolution of western Dronning Maud Land in Antarctica and that of southern Africa, particularly during the Grenvillian (c.1200-1000 Ma) and Pan African (650-450 Ma) periods.

"Conservation of southern Africa's elephants: Dealing with causes rather than symptoms" (2 August), by Prof Rudi J van Aarde, Conservation Ecology Research Unit, University of Pretoria. Africa has some 350 000 elephants, most of them in seven conservation areas in southern Africa. Management of their increasing numbers may require enabling the animals to disperse via linkages between existing populations, to stabilise their numbers and reduce their impact on vegetation and on people.

"Dinosaurs: How we know what we know" (14 September), by Prof Anusuya Chinsamy-Turan, Zoology Department, University of Cape Town. Most of what is known about dinosaurs has been reconstructed from

clues left in the fossil record. Preserved bones and teeth allow insight into their biology; more particularly, the microstructure of dinosaur bone provides a record of their growth processes and clues to factors that may have influenced these.

"Evolution on a restless planet: Did climate change and climate variation drive human evolution?" (10 October), by Prof Peter Richerson, Department of Environmental Science and Policy, University of California Davis.

Congratulations to a former medal winner

Professor Okkie de Jager, winner of the British Association Medal in 1988 and now an astronomer at North West University, is once again in the limelight. He and four colleagues (Professor Christo Raubenheimer, Christo Venter, Matthew Holleran and Isak Davids) are part of an international team of a hundred scientists from eight countries, financed by the European Union to manage the High Energy Stereoscopic System (HESS). This system of four telescopes, situated in Namibia, is used to study gamma rays from astronomical objects such as burnt out stars, by observing the blue Cerenkov radiation emitted when these rays strike our atmosphere. Their work has greatly extended our knowledge of celestial gamma ray sources. In March 2007 the team was awarded the prestigious Descartes prize for 2006, in competition with 65 entries submitted by 20 countries. Well done Professor de Jager!

The Association remembers

Our condolences are expressed to the families and friends of the late Dr N Stutterheim, Honorary Member, and Dr Elzabe Coetzee, Ordinary Member.

We note the resignation of members Professor Jan Geertsema, Mr Case Rijsdijk, Professor H J. Oosthuizen and Professor M A Loots. Our thanks to them for their support and service to the association over many years.

A word of thanks to the following:

- S_2A_3 Council Members and Pretoria Branch Committee members for their dedication and hard work
- Mrs Esme den Dulk, Mr Hermann Ortner, Mr Michael Ortner, Dr Elise Venter and Mr Walter Meyer for all the arrangements for this evening, and all the helpers concerned with the smooth running of the awards function
- The Marloth Trust for financing the Annual Awards Ceremony and 2006 Marloth Brochure
- Professor Cornelis Plug for producing an excellent 2005 Marloth Brochure and for his stimulating contributions to the Pretoria Branch Newsletter during 2006
- The Editor of the magazine *Undercover farming*, Johan Swiegers, for publishing an advertisement of the Association free of charge during 2006.

One hundred years ago. Delegates attending the fourth Annual Congress of the South African Association for the Advancement of Science, held in Kimberley in 1906. The President of the Association that year was Mr Gardner F Williams (1842-1922), mining engineer and General Manager of De Beers Consolidated Mines, Ltd. (front row, fifth from the left). We thank Mr Dirk Vermeulen for an electronic copy of this rare photograph.

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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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