

| DUNCAN MITCHELL |



TOP THREE AWARDS

- Harry Oppenheimer Fellowship from the Oppenheimer Memorial Trust, 2010
- Receiving an NRF A1-rating in 2007 and again in 2012
- One of four winners of the Outstanding Young South Africans Award, 1980

DEFINING MOMENT

Starting to work with Prof Cyril Wyndham, who led the Human Sciences Laboratory of the Research Organisation of the Chamber of Mines of South Africa.

WHAT PEOPLE DO NOT KNOW

"I started school life in a girl's school" – St Mary's in Johannesburg, which at the time took in a few boys in the entry year.

DELVING IN WHEN THE HEAT IS ON

“Serendipity” and “luck” are mentioned frequently when heat and pain expert, Prof Duncan Mitchell, looks back on defining moments of his life as an A-rated scientist and a conservation physiologist. His spirits are only dampened when the inevitability of climate change becomes the subject. But even then, he has a Plan B in mind.

He was Director of the Brain Function Research Group at the University of Witwatersrand (Wits) between 1988 and 2006 – a research entity whose staff works on matters related to pain, fever, sleep and the influence of heat on humans and wildlife. The career of this Founder Member of the Academy of Science of South Africa (ASSAf) and former President of the Royal Society of South Africa has taken him to 26 countries to lecture on anything from the pain associated with HIV or women’s menstrual cycles to how apes, antelopes and elephants handle heat. He is also regarded as a sage when it comes to thoughts around training medical students and academic administration.

It all started because of his inauspicious studies in physics, and his subsequent unplanned yet very lucky meeting with mining expert and physiologist, Prof Cyril Wyndham.

EARLY YEARS

Mitchell was born on 10 May 1941 in Germiston. At the time, his family was living in Durban, but with his father away in East Africa during World War II, his mother went to stay with her sister. A few years later, his family moved north to Johannesburg, where Mitchell has lived ever since for all but four years.

Studying towards a BSc degree with physics and mathematics at Wits was “purely serendipitous”.

“It wasn’t as if I had an ambition or a career in mind; I was simply good in maths and science and went to do that at the university,” this St John’s College old boy describes how his study choice came about.

By his Honours year in 1964 he had developed a particular interest in biology. It was influenced in part by a certain zoology student, Lily May Austin, who would later become a business coach – and his wife. The couple celebrated 50 years of marriage in 2016.

Then there was also the head of his department, Prof Frank Nabarro, a hugely formative influence. He believed Mitchell would “be useful but never good in physics”.

It was indeed good advice to leave physics behind. Mitchell now counts Africa’s most prestigious research prize, the Oppenheimer Fellowship (2010), among the honours he has received. Already in 1984 he received an A-rating from the Foundation for Research Development, followed by an A1 evaluation by the National Research Foundation in 2007 and 2012.

Back in 1964, however, Mitchell found himself in an administrative quandary. Even though he had a higher degree in biology in mind, it wasn’t easy to switch over to a discipline other than that of his undergraduate degree. Nabarro perhaps unknowingly set Mitchell on his life’s course. “He said I could study postgraduate biology, on condition that I work with the one local biologist he admired: Cyril Wyndham.”

“It was a wonderful, wonderful piece of luck for me; I couldn’t have wished for a better mentor,” underlines Mitchell, who has mentored more than 40 PhD and MSc students and in 2012 received his DSc (honoris causa) from Wits.

Wyndham led the Human Sciences Laboratory of the Research Organisation of the Chamber of Mines of South Africa at Wits. It was mandated by the mining industry to resolve issues surrounding heat-related deaths in South African mines. “We had to keep miners alive,” is the two-second summary of the life-enhancing work Wyndham’s team did.

Many of their recommendations are still followed. They, for instance, found that better cooling is achieved when miners do not have to work in totally stagnant air, and the wind speed over them is increased.

For the next nine years Mitchell delved into the subject with zeal and published the first of his more than 260 scientific papers in 1965.

"I still work on how to keep things alive in the heat, but it's now big mammals, and the heat comes from climate change," explains this Fellow of the Royal Society of South Africa, Honorary Fellow of the Physiology Society of Southern Africa and member of many international scientific bodies and national academic administrative committees and endeavours.

In 1973, the Mitchells and their two young children settled in Harpenden near London so that he could further a new interest in neurophysiology. He had a five-year contract with the UK Medical Research Council at its National Institute for Medical Research.

When budget cuts were making life in England quite difficult, Mitchell seized the opportunity of a lectureship at his *alma mater* in 1975. He became a Professor in physiology a year later. Ever since, Wits has been Mitchell's academic home, well beyond his official retirement in 2006.

RESEARCH ON PAIN

His move to Wits did however transform Mitchell into something of a scientific juggler – all because his keen awareness of the interests of others. His heart was in studies on temperature-related matters and climate change, yet he continued to pursue the pain-related research that he had started in the UK. The nervous pathways detecting pain and temperature are very similar. Mitchell realised it would typically be more interesting to the many students with a health sciences background with whom he often worked. Over the course of the next ten years his research team became world experts in the then poorly researched field of dysmenorrhoea (period pain). They studied how it influenced women's performance during exercise, how it affected their sleep quality and the reasons behind it. Studies into aspects of sleep and exercise subsequently followed.

"The pain research allowed me to respond to South African human needs," he reflects on how his team began switching gear when the AIDS epidemic evolved.

"Almost 60% of people who are HIV positive experience really bad pain," he summarises the situation. Antiretrovirals can in fact make it worse.

One of Mitchell's former PhD students, Prof Peter Kamerman, now leads this work. In 2015, Mitchell published the last of his co-authored papers on the topic. Another PhD student, Prof Andrea Fuller, now heads the Wildlife Conservation Physiology Laboratory.

"The thing I am most proud of in my career is how well the people have done who have been through my hands," says Mitchell. Opportunities such as the Mellon Foundation Retiree Mentor programme have enabled him to be involved with students even after his retirement.

TEMPERATURE-RELATED RESEARCH

Mitchell is passionate about his ongoing work and those who work alongside him. He is a man with a keen ear, an interest in the world around him and in how it works. Birding, badminton and watching ballet count among his many interests, and there's nothing better for him than to wake up on the family reserve to the sound of a bulbul.

His successes with his protégés notwithstanding, Mitchell believes his biggest contribution to science has been finding ways to take physiological measurements of free-ranging animals. These include the use of implanted data loggers and radio telemetry to monitor the vital statistics of animals living in extreme temperatures and aridity, while still allowing them to lead their natural lives without humans being near.

This work has allowed him to apply everything he's learnt about physiology over the years in a climate change context.

In the process he has done much to advance the field of conservation physiology – one which notes how animals and plants are adapting to climate change, and considers how people should deal with it. He was among others, part of the very first team to measure the body temperatures of free-ranging non-human primates – that of baboons and vervet monkeys.

ONTO DATA LOGGING

Mitchell's wildlife research career started in the late 1970s with studies about the heat response of rabbits and giraffe, and how insects and reptiles in the Namib Desert coped. In the process he developed an overarching and very productive interest in comparative or conservation physiology.

Again, the word "luck" is used to describe how his numerous desert encounters with American Dr Mary Seely of the Gobabeb Research and Training Centre in Namibia came about.

In the early 1980s he and the late Prof Helen Laburn studied animals' reaction to fever, and wanted to look at local lizards with very high body temperatures. A referral to Seely set about a productive working relationship of three decades.

Encouraged by the late and legendary physiologist Prof Gideon Louw of the University of Cape Town, they first used small radiotelemetric methods to monitor Namib lizards. Since the research was transferred to large mammals, implanted data loggers have been used to record the vital statistics of armadillo, pangolin, cheetah or zebra for up to a year before being removed for analysis.

The idea that one could use commercial data loggers came from Prof Rudi van Aarde of the University of Pretoria, who measured forest floor temperatures with reasonably inexpensive equipment from the USA. In the States, the technology was used to track the temperature of fruit being trucked cross-country, and its manufacturers actually strongly discouraged their use in animals. Thanks partly to the efforts of the Wits team, since the 1990s these devices have shrunk to the size of a Myprodol capsule.

The team had been measuring body temperatures of free-ranging mammals for ten years before they realised how important the data could be to conservation biology. An important influence was a definitive paper authored, amongst others, by Prof Barend Erasmus, now Director of Wits' Global Change and Sustainability Research Institute. It predicted that because of climate change, the Kruger Park could lose 60% of its mammal species.

"There was growing evidence that climate change would be a really big problem for big mammals, because they live too long to adapt genetically," Mitchell summarises the paper.

Part of his Oppenheimer Fellowship has since gone into developing further data logging techniques appropriate for big mammals such as elephants, antelope, primates and camels. Because Mitchell is also concerned with the future of livestock, he works in the Karoo with Prof Graham Kerley of Nelson Mandela Metropolitan University on how Angora goats cope with heat and cold.

"Climate change is happening and there's nothing we can do about it, even if all the governments in the world do everything they promise to do," he states emphatically. "We might as well stop worrying about measures to alleviate it within the next 30 years, and rather concentrate more on how to adapt to it. What we have to do to make sure that animals survive, and that we survive in what is now inevitable."

With luck – and through the people who are following in Mitchell's footsteps – science might just be able to find the answers.

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Academy of Science of South Africa (ASSAf), (2017). Legends of South African Science.

[Online] Available at: DOI <http://dx.doi.org/10.17159/assaf.2016/0012>

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