JOHANN LUTJEHARMS

TOP THREE AWARDS

- Oceanology International's Lifetime Achievement Award, 2008
- European Geosciences Union's Fridtjof Nansen Medal, 2006
- National Order of Mapungubwe (Silver), 2000

DEFINING MOMENT

Dropping instruments into the waters west of Cape Town on an international research cruise in 1983 and discovering an eddy of Indian Ocean water that had 'leaked' into the Atlantic.

WHAT PEOPLE DO NOT KNOW

Lutjeharms published prolificly and loved to see his articles in print, particularly in high-ranking journals. He would update his CV every Friday, making sure to record any new citations his articles had received.

CHARTING THE AGULHAS CURRENT

On his first research cruise as a graduate student, Johann Lutjeharms swam in warm eddies off the east coast of South Africa. These mysterious gyrating patches of warm water were found far offshore, in water thousands of metres deep. He would not have known it at the time, but those swirls would later play a critical role in his career. By the time of his untimely death from cancer in 2011 he had become the leading authority in the world on the Agulhas Current that sweeps along the east coast of southern Africa.

During his career, Lutjeharms managed to revive global interest in the oceans and currents off southern Africa. By collaborating with key observational groups from all over the world, he was able to have a big impact despite having limited means. In total, he published eight books, 32 contributions to books, and 177 papers in peer-reviewed international journals. He was also a popular mentor and passionate communicator, sharing his insights with students and colleagues, as well as with communities living close by the ocean.

An adventurous spirit, he participated in a total of 17 research cruises. His work laid the foundation for understanding the role that the Agulhas Current plays in global climate and ocean dynamics. An iconic photograph depicts him on the deck of a ship surrounded by sea ice, peering at the horizon in his trademark beanie with a big grin on his face.

EARLY LIFE AND WORK

Paradoxically, for somebody whose life revolved around the ocean, Johann Lutjeharms grew up hundreds of kilometres from the sea. He was born in Bloemfontein in 1944 to an academic family. His father Wilhelm 'Willie' Lutjeharms had arrived in South Africa in 1937 from the Netherlands to become professor of botany at the University of the Orange Free State. As a boy, Lutjeharms attended the historic Grey College in Bloemfontein. In 1960, the family moved to Cape Town where Johann's father took up a Chair of Botany at the University of Cape Town (UCT). It was natural for the son to follow in his father's footsteps. Lutjeharms obtained his undergraduate degree in physics from UCT in the late 1960s.

As an Honours student, a visit to UCT's Oceanography Department sparked his interest in the subject, and he went on to obtain his Masters degree in oceanography in 1971. Thereafter, he received three bursaries – the Harry Crossley Bursary, the Fisheries Development Corporation postgraduate overseas bursary and the CSIR overseas bursary – to study abroad for a doctorate at the University of Washington in the USA.

Lutjeharms' PhD thesis described the dynamics of the Southern Ocean and was written under the supervision of James Baker, a famous American oceanographer. Baker later became Head of the US National Ocean and Atmosphere Administration (NOAA) during the Bill Clinton presidency.

After receiving his PhD in 1977, Lutjeharms returned to South Africa. He took up a position at the Council for Scientific and Industrial Research's (CSIR) National Research Institute of Oceanology, then newly established in Stellenbosch.

It was at this time that Lutjeharms began embarking on his famous cruises, often with the backing of international oceanographers and ocean modellers. He was particularly interested in the oceans around southern Africa, which were among the least studied in the world. Little was known about the Agulhas Current, more than that it flowed down the coast of Mozambique and South Africa. Nobody knew for sure what happened and at which point it intersected with the colder waters off the Cape of Good Hope, for instance.

Through his studies, Lutjeharms discovered that rather than moving like a conveyor belt along the southeast African coast, the Mozambique Current flowing through the Mozambique Channel was made up of swirls of water – the warm eddies he and his friends had swum in many years before – whirling south-and-west like waltzing couples before joining the Agulhas Current close to Richards Bay. This was a major discovery, which revolutionised the way the current was understood to behave and which has changed the face of all modern research in this area.

Lutjeharms also found that the Agulhas Current, after arriving near South Africa's southern tip, deflects back south and east in what is known as 'ret-

roflection', arriving back to its starting point in the Indian Ocean. In 1988 he coined the term 'the Natal pulse' to describe the large 'meander' in the Agulhas Current originating near Durban, which travels down the South African coast before turning away from the coast and returning up again.

THE 1983 CRUISE

His biggest discovery arguably came during a 1983 research cruise aboard the US Navy's research ship *Knorr*. The cruise surveyed the 'choke point' between Africa and the Antarctic, where the Agulhas Current meets the cold waters of the Southern and Atlantic Oceans.

The cruise was planned and executed with Arnold Gordon from Columbia University in New York City and Dutch ocean scientist Will de Ruijter. They knew that most of the water in the Agulhas Current deflects against the colder water and starts moving south and east back towards the Indian Ocean. But there was speculation that a small part of the current escaped round the Cape of Good Hope and joined the Atlantic currents heading north.

Gordon, who was chief scientist of the cruise, recalls the first moment the instruments were lowered into the sea west of Cape Town. The data revealed an ocean stratification not characteristic of the South Atlantic. It was an eddy of subtropical Indian Ocean water – but how did it get there?. This was proof, the scientists realised, that the Agulhas was leaking into the Atlantic. Measurements from the cruise estimated that 10 – 15 million tonnes of water travels past the Cape of Good Hope into the Atlantic every second. This is approximately equivalent to 10% of the total Agulhas Current.

The cruise team also established that this leakage was part of the global circulation associated with ocean overturning in the North Atlantic, commonly referred to as the Great Ocean Conveyor Belt. The observations ignited international interest in the Agulhas and its role in the larger-scale ocean and climate system.

Not content to rely on ship-based measurements only, Lutjeharms became a pioneer in the use of satellite data to model ocean systems. He published papers in the 1980s that used thermal infrared data from satellites that he accessed through his contacts in the USA, as well as the CSIR's own Satellite Remote Sensing Centre.

He experienced first-hand the huge impact that advances in satellite technology had on oceanography – not least on navigation. On his first cruise as a graduate student, the crew still navigated by sextant, much the same as in the 17th century, and after a few cloudy days the ship would find itself hundreds of kilometres off course. Towards the end of his career, satellites were used to measure, to ever-smaller resolution, anything from plankton density to small variations in sea surface height.

KEY ACHIEVEMENTS

In 1990, Lutjeharms took up a Chair in Ocean Climatology at UCT, at the invitation of the then Head of Ocean Climatology, Geoff Brundrit. It was a post he held until his retirement in 2009.

In 1993, he also became the founding Director for UCT's Centre for Marine Studies, where he came to be known as a much-loved teacher and mentor. "He was a real father-figure to all of us," says Isabelle Ansorge, who worked with Lutjeharms at UCT from 1993. She says that he used his international standing and connections to create opportunities for his students to travel overseas, join research cruises and attend large international committees or workshops.

The book *The Agulhas Current* (Springer 2006) became his crowning glory; a definitive work on the subject informed by decades of study. The chapters of the book follow the current from upstream to downstream, charting the scientific understanding of the current but also detailing the explorers, ships and expeditions that contributed to the knowledge.

In the book, Lutjeharms describes how, as late as 1977, key textbooks in oceanography would describe the Gulf Stream in seven pages, while the Agulhas Current would receive two, brief paragraphs. He describes how the current connects major ocean basins, and how that makes it a

key area of study to understand the global weather patterns and climate change.

The book was widely praised as a seminal work, and in his review Lutjeharms' long-time friend, Will de Ruijter, called it "a must for everyone working in or on the greater Agulhas Current system".

OTHER INTERESTS AND LATER LIFE

Passionate about his Afrikaans heritage, Lutjeharms compiled a list of oceanographic terms for the leading Afrikaans dictionary, the *Woordeboek van die Afrikaanse Taal*. In addition to his other duties he was also a Fellow of the Royal Society of South Africa, a Full Member of the *Suid-Afrikaanse Akademie vir Wetenskap en Kuns* and also a Member of the Academy of Science of South Africa.

A prolific author, Lutjeharms often bragged that he had never submitted a paper to an academic journal that wasn't eventually published. To his close colleague Frank Shillington he confessed that he had studied at which time of year there was a drop in submissions to the journal *Science* – usually at Christmas time or during Europe's summer holidays! That's when he would submit his own manuscripts, to maximise his chances of publication.

Over his career he published two articles in *Science*, and five in *Nature*. In 2005, the *South African Journal of Science (SAJS)* lauded him as their most prolific author in the 25-year-period leading up to its centenary that year. He was also the author with the most *SAJS* journal covers in that period.

But Lutjeharms also cared deeply about communicating science with communities living in coastal areas, seeing them as a key part of the system he was studying. He was one of the brains behind the Agulhas and Somali Current Large Marine Ecosystems (ASCLME) project, which ran from 2008 to 2013. The project aimed to provide new information on ocean currents and how they influence climate, biodiversity and the economies of the Western Indian Ocean. It developed a strategic action plan for the region to deal with trans-boundary threats, including unsustainable fishing practices and climate change. Nine countries bordering the Indian Ocean endorsed the plan on 23 June 2015.

Lutjeharms was diagnosed with cancer in late 2001. He fought the disease bravely, and managed to sustain an astonishing rate of scientific publications until his death.

Lutjeharms passed away on World Oceans Day, 8 June 2011 in his hometown of Stellenbosch. He was only 67 years old, but the disease had left him feeling old and tired before his time. His students travelled from near and far to pay their respects at the funeral service.

In the last two years of his life, despite being weak from surgery and chemotherapy, Lutjeharms undertook study trips to Europe and the USA. His final publication *Decay of Eddies at the South-West Indian Ridge*, written with students at UCT and the University of Southampton in the UK, was published posthumously on 3 November 2011 in the *South African Journal of Science*.

SOURCES

John G Field & Isabella Ansorge (2011) Johann RE Lutjeharms FRSSAfr, *Transactions of the Royal Society of South Africa*, 66:2, 152-153. DOI: 10.1080/0035919X.2011.605916.
Shillington F. Johann Lutjeharms: Oceanographer (1944–2011). S Afr J Sci. 2011;107(9/10), Art. #889, 2 pages. http:// dx.doi.org/10.4102/sajs. v107i9/10.889.
http://www.dlist-asclme.org/group-discussion/general-discussion/memoriam-johann-reinder-erlers-lutjeharms.
http://www.ru.ac.za/latestnews/2011/2011-06-220755.html.
http://www.springer.com/gp/book/9783540423928.
http://www.nstfawards.org.za/ShowProperty?nodePath=/NSTF%20Repository/NSTF%20Awards/files/Winners2007/lutjeharms.pdf (PDF).
http://www.rsmas.miami.edu/g/aplysia/contact-information/act/science/satellite-technology/.
http://reference.sabinet.co.za/webx/access/electronic_journals/quest/quest_v2_n2_a22.pdf.
Willie Lutjeharms http://www.tandfonline.com/doi/abs/10.1080/00359198309520098?journalCode=ttrs20
https://books.google.co.za/books?id=-yshCgAAQBAJ&pg=PA177&lpg=PA177&dq=Lutjeharms+botany+UCT&source=bl&ots=rJriamnFgB&sig=b-FrWasK8a5R4atlqXVHhr01N6Y&hl=en&sa=X&redir_esc=y#v=onepage&q=Lutjeharms%20botany%20UCT&f=false.