

Guest Editorial

Life, diatoms and everything: a tribute to Leanne Armand

I met Leanne Armand for the first time about 10 years ago at the 4th Polar Diatom Taxonomy Workshop, hosted at Cardiff University, and I'll never forget enthusing with her about life, diatoms and everything.

Diatoms are a major group of algae that form the basis of most Antarctic marine ecosystems. They make their microscopic but beautifully ornate shells or frustules out of silica, and so they have an absolute requirement for dissolved silicon in their environment. As the diatom cells die, they sink, and a portion becomes buried in marine sediments. This burial helps to sequester organic matter away from the atmosphere but, in addition, produces a unique archive of ecology and oceanographic conditions going back through time. Different species of diatoms prefer living under different conditions, such as in sea ice rather than the open ocean or in cold *versus* warm waters. Conveniently, the different shell morphologies are genetically controlled, so different species can easily be distinguished - by the trained eye! This means that it's possible to examine the changes in species through time, reading the pages of this book to reconstruct changes in the extent of sea ice or water temperatures. Such palaeoceanographic information is vital for quantifying climate sensitivity and for improving climate models and future projections, especially in a place so central to the global climate as the Southern Ocean.

This was where Leanne found her academic home. Shells had been a fascination of hers for years, and she spoke about how she spent her childhood combing beaches near her home city of Adelaide for mementos (Heard 2001). Her interest thoroughly sparked, she excelled at biology at school and decided to read the subject at Flinders University. It was as an undergraduate that she gained an interest in fossils, carrying out her undergraduate research thesis in vertebrate palaeontology (e.g. Armand *et al.* 2000) after transferring to the Australian National University (ANU). For her PhD, she stayed at ANU, but she shifted her attention to the study of diatom fossils from the Southern Ocean and how they can be used to reconstruct past changes in sea-surface temperature and sea-ice extent (e.g. Armand 1997, 2000, Armand *et al.* 2005). Her career boomed from there on, including a prestigious European postdoctoral fellowship hosted by Université d'Aix-Marseille. It was there that Leanne worked on modern diatom ecology in the Southern Ocean, including taking part in the Kerguelen: Compared Study of Ocean and Plateau in Surface Water (KEOPS) project, a natural iron fertilization experiment carried out near the Kerguelen Plateau (Blain *et al.* 2007, Armand *et al.* 2008a). She then moved back to Australia, taking up positions in Tasmania and Macquarie University, before returning to ANU. She was appointed the Director of the Australian and New Zealand International Ocean Discovery Program Consortium (ANZIC), becoming a leader in the international scientific ocean drilling efforts required for deep-time palaeoceanographic reconstructions. She remained heavily involved in hands-on research, including being the first chief scientist on the *RV Investigator* on an expedition to Totten Glacier 5 years ago.

As a diatomist and a micropalaeontologist, her papers will be the 'go to' texts for years to come, ranging from Southern Ocean diatom taxonomy and the complexities of applying species data to interpretations of past environmental conditions (e.g. Armand *et al.* 2008b), to Southern Ocean dynamics and climate change (e.g. Shulmeister *et al.* 2004). The number of medals and awards she received is testament to her achievements throughout her career. However, her other - perhaps more important - legacy will be in the inspiration of the next generation of marine researchers and in the promotion of women in science. She was an exceptional educator, from being an enthusiastic role model for high school and undergraduate students to designing and running Masters-level marine science training courses.

So, thank you, Leanne, for the motivation and your enthusiasm, and, most of all, thanks for all the diatoms.

Leanne Armand sadly passed away on 4 January 2022, aged 53. This tribute is dedicated to her and her family - her husband, Stéphane, and sons, Maxime and Gaston - and all the people who she inspired.

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