

The Greatest Polar Expedition of All Time: the Arctic Mission to the Epicenter of Climate Change

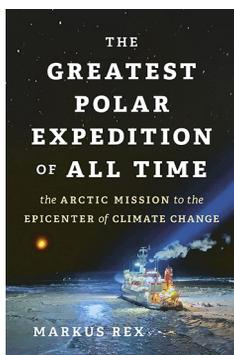
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The Arctic is warming at twice the rate of the global average and has been described as the epicentre of global climate change. The multi-year sea ice that once covered the Arctic Ocean throughout the year has nearly all melted. It's been replaced by ice that, each year, forms in the autumn and winter and melts in the spring and summer.

Current climate modelling forecasts that by 2050 the Arctic Ocean will be entirely free of sea ice during the summer months. These changes have far-reaching implications, because ice at the planet's poles moderates climate across the globe. Despite the clear importance of Arctic sea ice to global climate, obtaining *in situ* measurements in the Arctic to validate models is quite difficult and expensive due to its remoteness and harsh climate.

The MOSAiC (Multidisciplinary drifting Observatory for the Study of Arctic Climate) expedition set out to bring together a large team of scientists to study one full year of the Arctic sea ice cycle. This included experts on the atmosphere, sea ice, oceanography, and ecosystem. *The Greatest Polar Expedition of All Time* is written by the chief scientist of MOSAiC, Markus Rex, and provides a detailed account of the expedition. In autumn 2019, the MOSAiC team sailed the icebreaking German research vessel (RV) *Polarstern* close to the North Pole, where they allowed it to get stuck in an ice floe. It remained locked in the ice until the spring. During this time, researchers made an unprecedented number of scientific measurements of the atmosphere, sea ice, ocean, and ecosystem around that ice floe. After breaking free of the ice in the spring, the *Polarstern* continued to the North Pole during the summer of 2020, where researchers finished obtaining measurements and completed their observations of the annual cycle of Arctic sea ice.

The MOSAiC expedition was a largely successful mission, but it also had many logistical hurdles to overcome. First and foremost, keeping a ship frozen in an ice floe in the middle of the Arctic Ocean throughout the winter required support from multiple organizations, people, and vessels. The team of researchers and support staff on the *Polarstern* rotated



every few months, which required other icebreakers to break through the ice to reach the *Polarstern*. Being surrounded by sea ice and dealing with some of the coldest temperatures on Earth were significant challenges. The team also had to worry about Polar Bear encounters. To keep scientists and crew safe, there were systems in place around the ship for detecting the bears, as well as dedicated Polar Bear guards. Last, but certainly not least, the COVID-19 pandemic started in the middle of the MOSAiC expedition. The *Polarstern* was already locked into the ice when the pandemic was announced, which complicated all subsequent operations. Some countries that had previously promised support completely withdrew support, and all procedures for resupplying the expedition and changing out crew became far more complicated. Despite these significant challenges, MOSAiC was still successful in its mission.

The Greatest Polar Expedition of All Time was a really interesting book. I am biased, of course, because I read it while in the Canadian Arctic during the winter conducting my own fieldwork. However, for any field scientist, particularly an Arctic scientist, this book will not disappoint. It is written like a journal or diary, with entries for different days of the expedition. It starts off with near-daily entries that take place during the early phases of the expedition when the *Polarstern* was making its initial voyage into the Arctic Ocean to find the perfect ice floe to get stuck in. The ice floe needed to be large enough to support the ship and all of its research operations, and also needed to be older, thick ice that could hold the ship in place. The entries then get a bit farther apart, especially those written after the start of 2020 when Rex was no longer on board the *Polarstern* and was instead managing logistics remotely from Germany. Journal entries become more regular again after Rex comes back on board the *Polarstern* for the last two legs of the expedition. The book is also filled with other information about climate science and the importance of the mission, which should make it an interesting read for a general science audience who may not be familiar with Arctic fieldwork or climate science. Overall, I highly recommend this book.

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