

Claude Lorius (1932-2023)

As a young man in his twenties, Claude Lorius experienced the extremely difficult living conditions in Antarctica at the end of the 1950s. In July 1957, together with two French colleagues, he spent an entire year "voluntarily buried" at the Charcot Station. The year 1957 marks the beginning of an exceptional career, during which Lorius went on 22 expeditions, totaling six years in the field.

He was a pioneer in polar glaciology. Based on the isotopic approach originally developed by Willi Dansgaard, Claude Lorius and Liliane Merlivat adapted and applied the approach in Antarctica, and found a linear relationship between the isotopic composition of precipitation (heavy isotopes of hydrogen and oxygen) and the temperature of formation. These results formed the basis for the development of an "isotope thermometer" and the reconstruction of past temperature variations from deep ice cores.

In 1965, while contemplating the air bubbles released from melting ice cubes in his glass of whisky, he realized that ice could be the window into archives of the atmosphere.

His primary objective then became drilling at Dome C, in the heart of the Antarctic continent, to extract an ice core for analysis. Thanks to logistical support from the US National Science Foundation (NSF), and the perseverance of engineers and drillers, scientists were able to accurately obtain the first analyses of properties such as dust content, crystal size, ice chemistry and air-bubble composition that were trapped in the ice found at the Dome C site.

During the International Geophysical Year (1957-1958), the Soviet Union established a permanent station in East Antarctica, at the Vostok site. Due to his personal contacts, Claude Lorius managed to initiate a collaboration between the French and Soviet teams. Drilling depth reached 2083 meters on 11 April 1982. The oldest ice in this location was estimated to be 150,000 years old, meaning that coring would cover the whole of the previous warm period, the Last Interglacial, which peaked around 130,000 years ago, and entered the previous ice age. The link between major climatic cycles and variations in the Earth's orbitally forced insolation, as demonstrated in 1976 from deep-sea core records, was confirmed by the Vostok isotopic recording (Lorius and Merlivat 1977). More importantly, however, throughout the last 150,000 years covered by the core, the CO₂ concentration was found to be closely correlated with the temperature deduced from the isotopic analysis of this ice (Lorius et al. 1990).

At the end of the 1980s, Claude Lorius, together with other early visionary paleoclimate researchers at the time, such as Hans

Oeschger, was instrumental in the establishment of the PAGES initiative. As members of the International Geosphere-Biosphere Programme (IGBP) Working Group, they met for the first time in July 1988 in Bern, Switzerland, to discuss "Techniques for Extracting Environmental Data from the Past". This meeting lay the foundations for what one year later became the birth of PAGES: the IGBP Core Project on Past Global Changes. After the official launch of Past Global Changes (PAGES) as a registered organization in 1991, Claude Lorius served as one of the first PAGES Scientific Steering Committee members from 1991-1996.

The start of the 1990s proved a challenging time for the Soviet drillers who were confronted with the end of communism in the USSR. Despite this, operations at the Vostok site continued and American scientists joined the project. Claude Lorius, with the assistance of a colleague from Grenoble, Jean-Robert Petit, put all his energy into ensuring this collaboration continued. In January 1996, the depth of 3350 meters was reached, with this ice record covering 420,000 years (Petit et al. 1999). The record demonstrated that Antarctic climate and greenhouse gases go hand-in-hand throughout this period, characterized by four glacial-interglacial cycles. This confirmed that variations in insolation are at the origin of the major climatic cycles, and those of the greenhouse gases play an amplifying role. This extension of records also put the role of human activity into perspective; throughout the last 420,000 years, the quantities of carbon dioxide and methane present in the atmosphere have never been as high as they are today.

Very quickly, the drilling project took on a European dimension. It was the beginning of "EPICA" (European Project for Ice coring in Antarctica). Claude Lorius was determined for drilling to reach the bedrock in Antarctica at Dome C, and this was achieved in January 2005 when the bedrock was finally reached

at 3260 meters. This success owes a great deal to Claude Lorius' confidence and determination.

One of his primary aims was to show that data from the past can provide relevant information regarding the future evolution of our climate, and to raise the alarm about global warming linked to the increase in the greenhouse gases resulting from human activities. He devoted most of his time to this from the 2000s through activities on the Anthropocene and his messaging in the film "Antarctica: Ice and Sky" (French original: "La glace et le Ciel") by the Oscar-winning director Luc Jacquet.

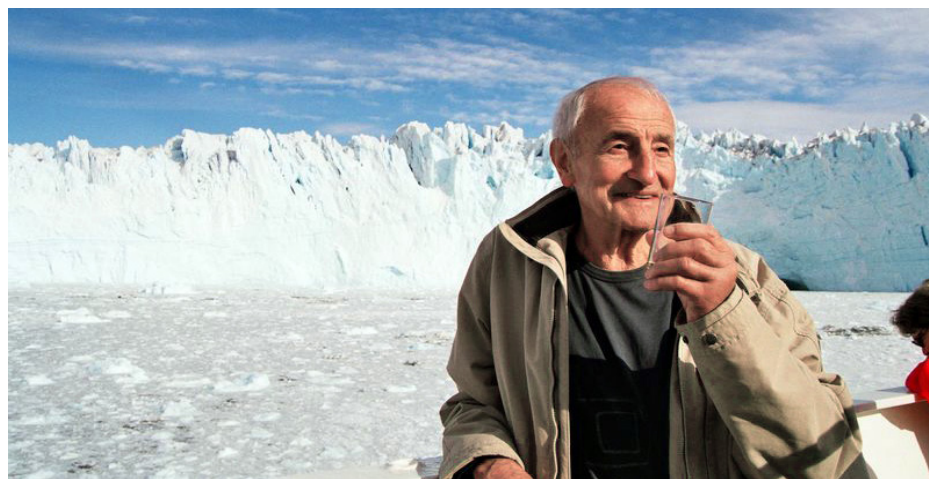
Claude Lorius had a concrete vision of how polar ice can contribute to knowledge of our climate and environment. He was a true leader, a tough scientist, and someone whose undeniable charisma inspired a whole generation of researchers. He was a member of the Academy of Sciences and received the CNRS Gold Medal in 2002. He also received numerous prestigious international accolades, including the Tyler, Balzan, Bower and Blue Planet prizes. In 2021 he was decorated "Grand Officier" in the French order of the Legion of Honor - the highest decoration in France.

Claude Lorius passed away on 22 March 2023.

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Claude Lorius in Antarctica, 2008 (commons.wikimedia.org/wiki/File:Claude.Lorius.jpg).