# Prologue

The ocean drilling ship *Glomar Challenger* left Fremantle on 20 December 1972. It was the start of Leg 28, the first of a number of 'legs' of the Deep Sea Drilling Project planned for high southern latitudes. In many respects it was a test of the feasibility of drilling operations in latitudes close to Antarctica, with severe weather and the ever-present danger of icebergs.

Our departure took place 100 years minus just one day after the first ocean cruise dedicated wholly to science, that of our namesake vessel, HMS *Challenger*, left England. She weighed anchor from Portsmouth on the 21 December 1872, at the start of what was to be a four-year, 130,000-kilometre voyage surveying, sampling and dredging the world's oceans. The Royal Society sponsored that expedition.

Its aims were to investigate the physical conditions of the deep seas as far south as the Great Ice Barrier; to investigate the chemical composition of seawater at various depths; to examine the physical and chemical character of deep sea deposits; and to investigate the distribution of organic life at different depths and on the deep sea floor. HMS *Challenger* was equipped with state of the art laboratories and equipment, including devices for sounding and dredging the deepest parts of the ocean. The expedition was also directed to establish the existence or otherwise of life in the deep oceans, to disprove the currently popular theory that none existed below depths of 1,800 feet (roughly 550 metres) and to examine Charles Darwin's view that a range of primitive life forms extinct on land might be found at great ocean depths.

The scientific aims of our own cruise were to explore the history of the polar icecap and the changing environments of the seas surrounding Antarctica. We also planned to investigate sea-floor spreading between Australia and Antarctica, and the development of the Antarctic Circumpolar Current and other features of the high latitude ocean circulation.

I had joined the expedition from Florida State University, where I had a postdoctoral fellowship. I am a palaeontologist, one who studies fossils. Within that broad category I study pollen, and have a long-term interest in the history of the land vegetation of Antarctica. The cruise provided me with a chance to research this aspect of the Antarctic's evolutionary story.

Florida State University, in its subtropical setting at Tallahassee, might seem a strange place for those interested in the history of life in Antarctica. But that university was home to an Antarctic marine research facility, which housed cores of marine sediments collected on cruises undertaken around the southern continent, and supported an active program of research centred on the core collections. Still, it always struck me as incongruous that palm trees framed the entrance to this polar research building.

For this cruise I was classified not as a palynologist (a pollen researcher) but as a sedimentologist, simply because these were scarce creatures, and because I could tell a diatom ooze—a clayey sediment rich in silica of the shells of marine algae—from a calcareous, or limy ooze where calcium carbonate dominates. It was important to be able to distinguish between these sediment types as they provide clues to the climatic conditions in the ocean where they formed. Before the cruise I had had to refresh my undergraduate training in looking at minerals and rock fragments under the microscope by taking a refresher course at my alma mater, the University of Western Australia in Perth. Nonetheless I certainly was not very confident in my new role, where I was to be a member of a small team deciphering the history of the oceans.

During the voyage, in the best tradition of Antarctic explorers, I kept a diary. I wrote it on a flimsy foolscap pad. These many years later it is tattered and in some parts barely legible. It records the daily activity associated with drilling, the anticipation of steaming to new sites—to unsignposted spots in a blank grey ocean—the nervous waiting for cores to come up, the frenzy of activity when they do, the late night discussions around the science, and always, the weather and the accompanying wildlife. Diary keeping was possible for most of the voyage, but when the vessel entered the Ross Sea, where shallow water meant that cores were landing rapidly on deck, the pressure of dealing with more and more drill core in a tight time frame meant that I abandoned the diary. Accounts of that part of the cruise are thus from recollection.

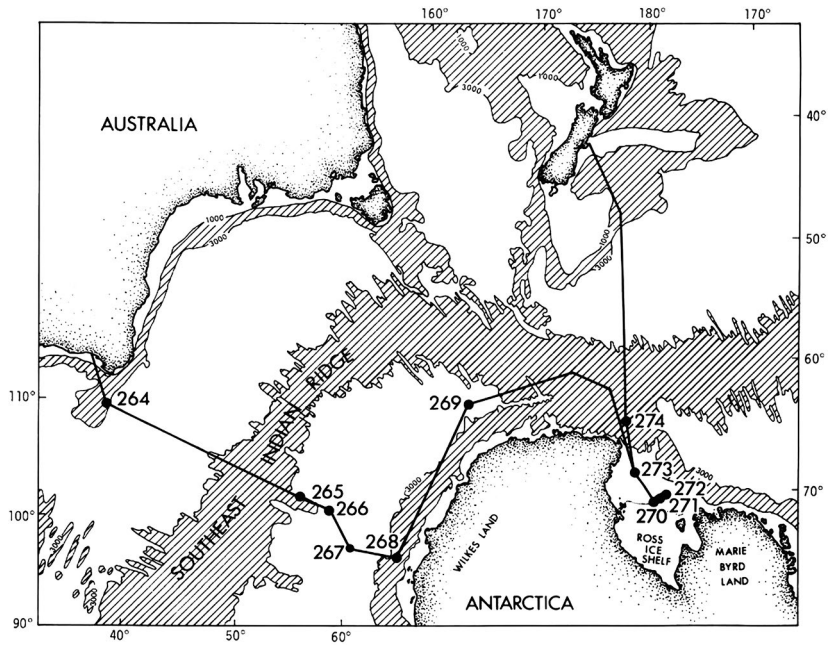


Figure 1. Route of the *Glomar Challenger* on Leg 28, with numbered drill sites shown; 1,000 m and 3,000 m contours shown.
Source: DSDP Leg 28, *Initial Reports, Volume 28*, 1975.

In this book, I have used my diary to tell the story of a pioneering expedition in drilling the sea floor around Antarctica. As a test of the feasibility of drilling at very high southern latitudes, with the probability of being hampered by weather and ice conditions, the cruise proved to be a success, both in the scientific results achieved, and in the test of drilling and navigational technology. We drilled 11 sites, some at latitudes that had never been drilled before, and have not been drilled since. For example, Site 270, at 77°26′S, in the Ross Sea, remains further south than any site drilled by scientific ocean drilling.

The achievements of this voyage have been documented in the scientific literature, but there is no account of the shipboard excitement that accompanied these. During the cruise we pushed back the age of glaciation in Antarctica from the approximately 3 million years that was widely believed when we left port, to at least 25 million years—a dramatic change. Changes in the circulation of the Southern Ocean that accompanied this rapid cooling first became evident in paper strips of drilling logs that I had

taped to my cabin wall. The antiquity of the glaciation became apparent through what was the first drilling of the Antarctic continental shelf in the Ross Sea, within 50 miles, or about 80 kilometres, of the Ross Ice Shelf—the 'Great Ice Barrier' of early explorers, a region which presented its own difficulties and dramas. Not the least of these was the encounter with gas in the Ross Sea sediments. This caused drilling to be abruptly terminated at some sites as a safety measure, but created excitement in the global press at the time of the oil crisis of 1973.

A sense of human history pervades scientific work in Antarctica.

The 'heroic era' stories of human endeavour, epitomised by Scott's fatal journey to the South Pole, have left an enduring cultural legacy. On Leg 28 our own encounters with human history began with our embarkation a century after that of HMS *Challenger*. Further south, between two drill sites on the Southeast Indian Ridge, we crossed the track of James Cook's vessel, HMS *Resolution*. In January 1773, just a little over 200 years before our venture, *Resolution* was sailing east on what was to become the first circumnavigation of the Antarctic continent, reaching southern latitudes never attained before.

Closer to Antarctica, the plethora of geographic names we encountered reflected other early explorers; we drilled off the coast of Wilkes Land, named for Charles Wilkes, commander of the US Exploring Expedition of 1838–42. Later, we sailed and drilled at sites in the Ross Sea where Captain James Clark Ross, commanding the expedition's vessels *Erebus* and *Terror*, charted much of the coastline, claiming it in the name of Queen Victoria, and discovered the Great Ice Barrier, now the Ross Ice Shelf, the peaks of the Transantarctic Mountains and the active volcanoes Mounts Erebus and Terror, which he named after his ships. The young botanist Joseph Dalton Hooker was initially appointed assistant surgeon to Ross's expedition, but his personal mission was the search for the flora of the wider Antarctic region. In this aspect of his life I have always felt some kind of kinship with him. While Hooker was not able to collect higher plants from the continent itself, he was convinced that Antarctica had once borne a rich vegetation, and this was the source of many of the related plants he observed on the continents and islands of cool temperate latitudes.

Figure 2. Frozen bollard on the *Glomar Challenger*.
Source: Elizabeth Truswell.

The role of recording the achievements of the early expeditions into high southern latitudes fell largely to the artists who supported the early scientists and navigators. These were mostly young but professionally trained, usually in the classical artistic traditions of Europe. Their role as artists in support of scientists often meant that they had to struggle to break free of the shackles of the classical traditions of their training, but echoes of the classical are often discernible in their illustrations. In the case of the British navy, an ability to draw was considered essential, and a more pragmatic training in this skill was provided to ship's officers; the journals and logs of officers are often enlivened with their artistry.

The book gives my personal story—that of a young scientist feeling largely unprepared—thrown into the excitement and absorbing interest of field work in one of the most remote regions of the globe. Then, because I have continued to research issues of Antarctic marine science and to contribute to the story of the ancient vegetation of that continent, I have given an account of some of the science underpinning the voyage. This I have written for a general audience, for whom I have included a glossary of those terms that geologists tend to use in everyday parlance. Lastly, the

book sets our venture in its historic context in homage to those who have sailed before and explored the oceans of these high southern latitudes in the name of science and navigation.

This is a world full of stories. Many have been told before, but fresh details continue to emerge. There are stories of human endurance in encounters with the elements, of competing national and individual ambitions, of dealing with the novel and unexpected in nature and of persistence in the everyday tasks of mapping and recording. It has often proved difficult to separate these different threads that are interwoven with the story of Leg 28.

This text is taken from *A Memory of Ice: The Antarctic Voyage of the Glomar Challenger*, by Elizabeth Truswell, published 2019 by ANU Press, The Australian National University, Canberra, Australia.