Prologue

An expedition to Antarctica is one of the most dangerous and adventurous journeys in the world. Although modern technology has made such expeditions more manageable and efficient, the spirit of adventure and the harsh realities of the environment remain unchanged. The present-day ability to explore Antarctica has come only after countless sacrifices, including the loss of many lives and numerous failed attempts. This leads to fundamental questions: why does humankind remain so deeply drawn to such perilous journeys? What has transformed the initial spirit of exploration into a scientific and strategic necessity to reach one of the planet's most remote, inhospitable, and icy continents? In this section, I will discuss the discovery of Antarctica and examine how growing global interest in the region led to the formation of the Antarctic Treaty, a milestone in international cooperation. This narrative traces the evolution of human engagement with Antarctica, from the Heroic Age of exploration to the present day, highlighting the collaborative efforts of both developed and developing nations to preserve and study this unique environment. Particular attention will be given to India's expanding role in scientific research and environmental stewardship in this frozen frontier.

Introduction

The basic nature of human beings is to explore the unknown, venturing into inaccessible and remote places on the Earth to expand existing knowledge and gain a deeper understanding of the present to secure a better future. Throughout history, humankind has undertaken numerous expeditions, overcoming immense challenges, and leaving footprints in the most inhospitable

regions of the planet. Humans have ascended the world's highest peak, Mount Everest, and descended to the deepest point on the Earth, the Mariana Trench in the western Pacific Ocean. Driven by curiosity and the desire to uncover what lies beyond the visible horizon, humans set sail into the unknown, pursuing new lands and knowledge through adventures. This quest to explore and push the limits of human experience reflects an innate desire to understand the world in its entirety, no matter how remote or unreachable it may seem. The benefits of such explorations were trans-continental trade to acquire wealth and the conquer of new lands.

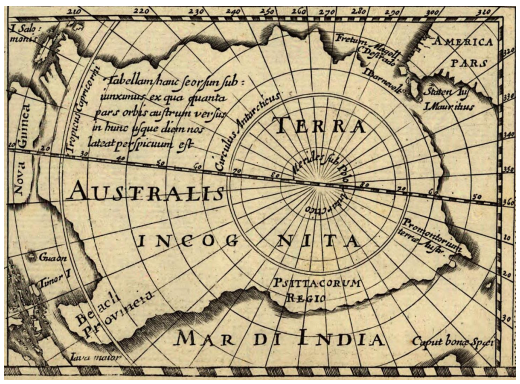

Figure 1: The Mysterious Land That Kept the World From Tipping Over [1].

Evidence suggests that ancient people during the Indus Valley civilization were engaged in maritime trade with Mesopotamia in 3300 BCE. Many documents show that Egyptians were experts in making large cargo ships. It was a conceptual awareness among the ancient Greek sailors that a southern landmass, given the name *Terra Australis* in the southern hemisphere, was present to balance the landmasses of the northern hemisphere. The existence of *Terra Australis* was a myth throughout the Middle Ages and the Renaissance; however, there was not much evidence of its existence [2].

Later in Europe, a race had begun to explore the oceans and discover the unknown lands. Many Europeans accepted the challenges to sail across the seas, and in this process, many marine routes were discovered that established transcontinental connections. European sailors put serious efforts into venturing further south into the Southern Ocean, as crossing it was not only highly

challenging but also a perilous journey from the *roaring forties* to *furious fifties* to *shrinking sixties* (called so due to the intense westerly winds at those southern latitudes) [3].

Figure 2: Roaring Forties[4].

Many ships have mysteriously vanished while crossing the dangerous ocean and are lost to history. The Dutch navigators Dirck Gerrits (1599) and Abel Tasman (1642–1644) explored but could not cross the Southern Ocean. Their expeditions were well documented. European sailors began venturing further south into the Southern Ocean, and there were several accounts of possible sightings of land beyond this deadly ocean. Later, the land was confirmed and named as **Antarctica**, which means *opposite to north*. While Antarctica itself remained uncharted, exploration of the surrounding Southern Ocean by early seafarers laid the groundwork for the eventual discovery of the continent. Tasman, for example, discovered parts of what are now the islands of Tasmania and New Zealand, but he did not reach the Antarctic mainland [5].

British explorer Captain James Cook is often credited with the first clear and scientific exploration of the Southern Ocean.

In 1773 and 1774, Cook led an expedition around the Antarctic Circle, proving that Antarctica was not a large landmass extending northward but a vast and frigid oceanic region [7], [8].

Figure 3: Captain James Cook [6].

The discovery of Antarctica is a fascinating story that involves exploration,

scientific curiosity, and the gradual
unveiling of one of the most isolated and inhospitable places on Earth. Unlike many other continents, Antarctica was not discovered during a single event or by a single explorer. Instead, it was a process of gradual exploration, scientific research, and mapping that spanned centuries.

Marine Expeditions and the Discovery of Antarctica

On his circumnavigation of the globe, Ferdinand Magellan (1519–1522) sailed around the southern tip of South America and entered the Strait of Magellan, which became a vital route for later expeditions into the Southern Ocean. A Dutch explorer, Abel Tasman (1642–1644), became the first recorded European to approach the southernmost parts of the Southern Ocean. Though he did not discover Antarctica, his voyages around the southern coasts of Australia and New Zealand contributed to knowledge about the southern latitudes. The British explorer James Cook (1772–1775) is often credited with being the first to systematically map and explore the high southern latitudes [9].

Cook's famous second voyage (1772–1775) took him far into the Southern Ocean, where he crossed the Antarctic Circle and *became the first to definitively claim that there was no land* at the South Pole. While he didn't discover the continent, his voyages demonstrated the extreme isolation of the region and showed that the idea of a vast southern landmass might not be accurate.

Fabian Gottlieb von Bellingshausen and Mikhail Lazarev, Russian explorers, were the first to make a confirmed sighting of the

Antarctic coastline in January 1820.

Figure 4: Left:Fabian Gottlieb & Right: Mikhail Lazarev [10]

Bellingshausen's expedition, aboard the ships Vostok and Mirny, circumnavigated Antarctica and encountered land near the Antarctic Peninsula. Edward Bransfield, a British naval officer, also sighted the Antarctic Peninsula in January 1820, shortly after Bellingshausen's sighting [11]. While his mission was not to claim the continent, it marked an important milestone in the discovery of Antarctica. Nathaniel Palmer, an American explorer, is often credited with being one of the first Americans to see the Antarctic Peninsula, also in 1820, though his discovery was less widely publicized at the time. The American explorer John Davis is credited as the first person to set foot on the Antarctic mainland, doing so in February 1821 during an expedition to the Antarctic Peninsula

He was part of an American whaling expedition and is regarded as one of the earliest explorers to venture onto the continent. In the early 19th century, whalers were among the first to regularly visit the waters surrounding Antarctica, hunting for seals and whales. These expeditions were critical for charting the region's waters, though they did not venture far in-

Figure 5: John Davis [12].

land. After the continent was discovered, several nations began to mount scientific and exploratory expeditions to study Antarctica's geography, climate, and wildlife.

> The most famous of these expeditions was the *Heroic Age of Antarctic Exploration* expeditions, which took place in the early 20th century.

Ernest Shackleton's Imperial Trans-Antarctic Expedition (1914–1917) was a famous expedition to cross Antarctica and is one of the most dramatic and legendary in the history of exploration. Although Shackleton's team never reached the South Pole, their survival after being stranded in the ice demonstrated the resilience and bravery required for Antarctic exploration. Robert Falcon Scott led two major British expeditions to Antarctica. His first expedition (1901–1904) helped chart much of the coast, and his second expedition (1910–1913) aimed to reach the South Pole. Tragically, Scott and his team reached the South Pole in January 1912, only to find that Roald Amundsen's Norwegian team had beaten them there by a few weeks. Scott and his men perished on the return journey.

Roald Amundsen (1911) is famous for his Norwegian Expedition and is credited with being the first to successfully reach the South Pole.

Figure 6: Roald Amundsen [13]

His team arrived at the pole on December 14, 1911, and returned safely, marking a major achievement in polar exploration.

The Antarctic Treaty

By the mid-20th century, Antarctica was recognized as an important scientific resource, and global tensions during the Cold War led to international cooperation. Various nations, including the United Kingdom, Norway, and Australia, began exploring the continent. Notably, in 1911, Norwegian explorer Roald Amundsen reached the South Pole, and British explorer Robert Scott followed a few weeks later. This sparked further interest in scientific research and territorial claims. In the post-World War II period, there was a renewed interest in Antarctica [14].

One of the key milestones that led to the creation of the Treaty was the International Geophysical Year (IGY), which took place from 1957 to 1958.

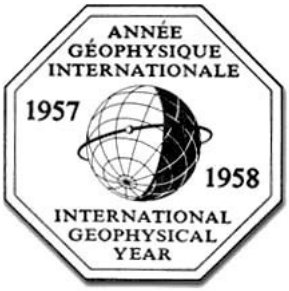

Figure 7: International Geophysical Year [15]

The IGY was a global scientific project that included scientific research in Antarctica. During this period, 12 countries established research stations on the continent, marking the first real international cooperation in the region. This collaboration among countries during the IGY laid the groundwork for the idea of managing Antarctica as a scientific and peaceful zone rather than as

a territory for individual nations to claim. There was a cold war situation that arose between the United States and the Soviet Union during the following years of World War II. Tensions between the two superpowers were high, and there was concern that the growing scientific and territorial interests in Antarctica could escalate into political or military conflicts. Additionally, countries with territorial claims in Antarctica, such as Argentina, Chile, and the United Kingdom, had conflicting claims, and there were worries that exploitation of the continent's resources, like minerals, could create further disputes. In response to these concerns, 12 countries that had been active in IGY (the United States, the Soviet Union, the United Kingdom, Argentina, Chile, Australia, New Zealand, France, Norway, Belgium, Japan, and South Africa) began negotiations for an international treaty to regulate activities in Antarctica. The talks were focused on preventing military activity, promoting peaceful scientific research, protecting the environment, and preventing territorial disputes. The negotiators recognized the unique status of Antarctica and the need for international cooperation to preserve the continent for future generations. After extensive discussions, conferences, and drafting, the Antarctic Treaty was signed in Washington, D.C. on December 1, 1959, by 12 countries.

This day is presently celebrated as *Antarctica Day*, establishing Antarctica as a scientific preserve and banning military activity and nuclear testing on the continent.

The Treaty officially entered into force on June 23, 1961, after ratification by the required number of countries. The treaty was a major milestone in the governance of Antarctica, ensuring its protection for future generations and promoting peaceful research. The Antarctic Treaty is rooted in the growing interest in Antarctica during the mid-20th century, combined with the need for an

international agreement to manage the continent's use and protect its unique environment. Over time, more countries joined the Treaty, expanding its influence and coverage. The number of signatory countries grew, and as of now, 54 countries are parties to the Treaty. In 1991, the Protocol on Environmental Protection to the Antarctic Treaty was adopted, further strengthening the environmental protection provisions of the Treaty. This protocol prohibited commercial mineral extraction and laid out strict guidelines for waste management and conservation efforts. The Antarctic Treaty remains one of the most successful examples of international cooperation, with its emphasis on peaceful use, scientific research, and environmental protection. The Treaty is regularly reviewed and updated by the Antarctic Treaty Consultative Meeting (ATCM), where the parties meet to discuss issues relating to the governance of Antarctica. The Antarctic Treaty has proven to be a unique and effective model for international cooperation, successfully preserving the continent for scientific research, protecting its environment, and maintaining peace and stability in the region.

India and the Antarctic Treaty

India became a part of the Antarctic Treaty in 1983, making it the 46th country to accede to the Treaty. Here's how India came to be involved in the Antarctic Treaty and its growing engagement with Antarctica. India's interest in Antarctica began to grow in the early 20th century, as the country looked to explore scientific opportunities in the region. However, it was only after India gained independence in 1947 that the country took concrete steps to participate in Antarctic research and exploration. India formally acceded to the Antarctic Treaty on August 1, 1983. The decision was driven by India's growing interest in scientific

research, particularly in fields like glaciology, climatology, and environmental science. By joining the Treaty, India committed to using Antarctica for peaceful purposes, supporting scientific cooperation, and protecting the region's environment. Even before joining the Antarctic Treaty, India had been exploring the potential of conducting scientific research in Antarctica. In 1981, just two years before India became a Treaty party, India launched its Antarctic Program under the Department of Ocean Development (now the Ministry of Earth Sciences). The goal was to establish India as a participant in global Antarctic scientific efforts. India sent its first scientific expedition to Antarctica in 1981. This expedition laid the groundwork for India's active involvement in Antarctic research. The Indian National Antarctic Expedition (INAE) was launched, and India began to develop its capacity for polar research. India's participation in Antarctic research deepened with the establishment of its research stations [16].

Dakshin Gangotri was India's first research station in Antarctica, marking the beginning of India's scientific endeavours on the continent.

Figure 8: Dakshin Gangotri [17]

Dakshin Gangotri was established in 1984 during the Indian Scientific Expedition to Antarctica (ISEA). The station was named Dakshin Gangotri, meaning "Southern Gangotri" in Sanskrit, drawing a symbolic connection to the Ganges River (Gangotri is the place where the Ganges originates) and the name reflects India's

cultural heritage and its spiritual connection to nature. It holds historical significance as the starting point for India's growing involvement in Antarctic exploration and research, especially the initiation of such a kind of polar research, placing India in front of the global scientific community's research efforts in Antarctica. Dakshin Gangotri was initially located in Queen Maud Land, in East Antarctica. The station was set up at a site where access was relatively easier for the scientists, although still challenging due to the extreme weather conditions of Antarctica. The primary purpose of Dakshin Gangotri was to conduct scientific research on Antarctica's environment, glaciology, meteorology, marine biology, and climatology, and it became a base for Indian scientists to collect data on Antarctic weather patterns, ice sheets, and biodiversity. The station was built with basic infrastructure, but over time, it became vulnerable to the extreme cold and ice buildup. It was eventually abandoned in the early 2000s due to structural damage caused by the movement of the ice shelf underneath the station. India's second Antarctic station, *Maitri*, was set up in 1989 in the King George Island area. This made India one of the countries with a permanent research presence in Antarctica. The name "Maitri" means "friendship" in Sanskrit, reflecting India's diplomatic and peaceful intentions in Antarctica. The station's name signifies India's commitment to international cooperation and peaceful scientific research, aligning with the principles of the Antarctic Treaty. Maitri, as a research station, faces one of the most extreme environments on Earth, requiring significant technological innovations to ensure its success. Initially, there were many challenges. The station is now equipped with technology that allows it to operate throughout the year. As Antarctica experiences harsh winters, the station is designed to withstand extreme cold, high wind, and snow, and is well-equipped for long-duration habitation by scientists during the harsh winter months. Maitri uses solar energy, wind power, and diesel gener-

ators to ensure a reliable power supply. The station is designed with energy efficiency in mind. The station has specialized labs and equipment for various research disciplines, including meteorological stations, ice core drilling facilities, and environmental monitoring systems. Prof. Sayed Zahoor Qasim was a crucial member of India's early Antarctic expeditions and contributed significantly to scientific research in the region. He was part of the team involved in setting up the Maitri Research Station in 1989. After Dakshin Gangotri was decommissioned, India's second research station, Maitri, has been operated regularly since 1989 to continue the research efforts and offer a more permanent base for scientific work in Antarctica. Maitri became a more advanced station, with better infrastructure and more durable facilities. Even though Dakshin Gangotri was no longer in operation, its establishment set the foundation for India's growing presence in Antarctica, including the establishment of Maitri and Bharati, the third station, and it helped India gain international recognition for its scientific contributions in understanding the Antarctic environment.

Bharati is India's third research station in Antarctica, established as part of India's ongoing commitment to scientific research and environmental protection on the continent.

Figure 9: The author is at Bharati Research Station.

It represents a significant step forward in the country's Antarctic program, following the earlier stations Dakshin Gangotri and

Maitri. Bharati was inaugurated in 2012 and is located in East Antarctica, specifically at the Larsemann Hills, which is a more remote and scientifically significant location compared to the previous stations. The station is named Bharati, after Bharati, the goddess of knowledge and learning in Indian mythology. The name symbolizes India's dedication to scientific exploration and knowledge.

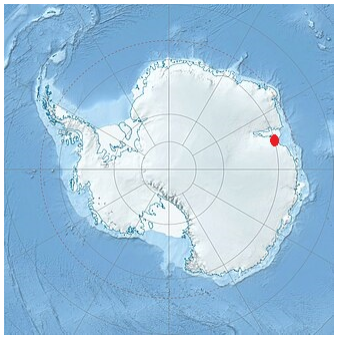

Figure 10: Location of Bharati Station in Antarctica

The station was built to be a more modern, permanent facility, equipped with better infrastructure and technology to support long-term research operations in the challenging Antarctic environment. The station has been designed with an emphasis on using renewable sources like solar energy to minimize its environmental footprint to support the researchers who stay for extended periods, especially during the harsh Antarctic winters, for conducting scientific experiments in various fields, such as biology, geology, and meteorology. Bharati has access to icebreakers, helicopters, and overland vehicles to facilitate transportation to and from the station. Since its establishment, Bharati has contributed to various scientific projects, including research on climate change, the Antarctic ice sheet, global warming, and marine biodiversity. The station also serves as a platform for international collaboration, as scientists from India and other countries often work together on joint research projects. As with all Indian Antarctic stations, Bharati adheres to strict environmental guidelines outlined in the Antarctic Treaty and its Proto-

col on Environmental Protection. The station operates with an emphasis on minimizing environmental impact, managing waste responsibly, and ensuring that scientific activities do not harm the delicate Antarctic ecosystem. Bharati Station represents the country's ongoing commitment to contributing to scientific research and environmental preservation in Antarctica. With its modern infrastructure and focus on sustainability, Bharati is expected to continue to play a crucial role in global efforts to understand the impact of climate change, the behaviour of the Antarctic ice sheets, and the ecosystems of the Southern Ocean. Alongside Maitri, Bharati strengthens India's presence as a responsible member of the international community engaged in peaceful and collaborative research in Antarctica.

In the next issue, I shall share my experiences in preparing for our Antarctica expedition from the demanding acclimatization training in the high-altitude Himalayan regions to the challenging voyage journey across the Atlantic and Indian Ocean, marked by intense rolling, pitching conditions, encounters with floating icebergs, and the dramatic navigation through polar ice sheets on our approach to Antarctica.

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