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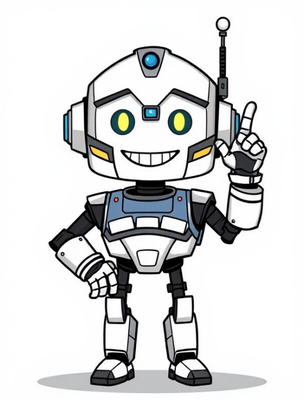

Antarctica is the coldest continent on Earth, but much of it is warming at one of the fastest rates second only to parts of the Arctic. At nearly twice the size of Australia, Antarctica is the fifth-largest continent on Earth. It surrounds the South Pole and is surrounded by the Southern Ocean. Almost all of Antarctica is covered in a thick layer of ice, averaging around 2 kilometres deep. The thickest ice in Antarctica is thought to be nearly 5,000 metres deep. This icy continent plays a big part in our global climate and, in turn, is directly affected by changes to the global climate making Antarctica and the climate inextricably linked. The videos below demonstrate the type of clothing worn to stay warm in Antarctica and pitching a Scott Polar Tent. What is the difference between ice sheets, ice shelves and sea ice? Ice sheetsare defined as masses of glacial ice made from snow and ice that has fallen on land covering more than 50,000 square kilometres. These flow slowly out towards the sea as gravity acts on the enormous weight of the ice. Ice shelvesare the floating extensions of the land-based ice sheets. They form around the edges of Antarctica, making up almost half of the coastline. Sea iceis formed from frozen sea water and is free floating. It usually expands during winter and melts during summer, but in some places, it can remain throughout the year. At its winter maximum extent, sea ice effectively doubles the size of the continent when viewed from space. Over the last 30 years, sea ice has expanded in Antarctica this is surprising when we consider that the global climate has warmed in this time. NIWA researchers are working to understand why. They think that warmer sea water underneath the ice shelves close to the South Pole may be melting the underside of the ice, causing cold water to flow away from the pole and freeze again on the edges of the continent. RV Tangaroa works its way into the coast along the Daniell Peninsula to conduct coastal research. Ross Sea Antarctica. How does Antarcticas climate affect the rest of the world? The climate of Antarctica is closely connected to the climate of the rest of the world through the ocean and the atmosphere. For example, ice melting in Antarctica is causing sea-level rise in other parts of the world and warming seas are impacting the animals living in the ocean. Sea ice is one of the main features of Antarctica that impacts the climate of the rest of the world. It does this in several ways: The bright white surface of sea ice reflects the suns light back out into space. This means less heat is absorbed into the ocean, helping to keep the planet cool. The reflectiveness of the ice is known as its albedo. During winter when there is more sea ice, the ice-albedo effect causes heat to be reflected out to space. During the summer months there is less sea ice and more dark, open sea water. As dark surfaces absorb heat more easily, more heat is absorbed by the ocean causing the water to warm. Heat absorbed into the ocean makes it harder for ice to form and increases the chance of the ice next to the water melting. As the planet continues to get warmer the ice albedo effect is increased, and sea ice is melting at a quicker rate. It is expected that the continued melting of sea ice will cause sea-level rise in other areas of the planet. In the following video, NIWA Antarctic researcher Natalie Robinson explains more about ice-albedo feedback. Sea ice is important to support ecosystems. When sea ice forms it creates a solid structure that algae can grow on. Algae form an important part of the food web and, with declining sea ice, the production of algae could decrease and have knock-on effects for the rest of the food web. For example, krill, little crustaceans that support most of the ocean food web, feed on this algae. Krill populations have been declining as the sea ice has decreased. Sea ice also provides a protective habitat for fish and other animals in the ocean. During winter, sea ice covers a large proportion of the ocean. This works like a blanket that protects the upper ocean from the very cold atmospheric temperatures and in turn protects the animals living in the water.Another way sea ice in Antarctica affects our climate is by influencing where storms form around the icy continent. This is because the sea ice forms a barrier between warmer water below and cooler air above, meaning that the air over sea ice tends to be cooler and drier than air over water. This in turn impacts the weather around the world, especially countries in the southern hemisphere. Here in Aotearoa our most ferocious storms tend to come up from down south. Sea ice is made of mostly fresh water. This is because theres no space for the salt to be incorporated into (or included in) ices crystal structure. When sea ice is forming, the salt is squeezed out of the water and left behind in the surrounding water, making it extra salty This extra salty, cold water is denser (heavier) than normal seawater so sinks to the bottom of the ocean and flows away from Antarctica in to all the deep ocean basins around the globe. This causes warm, less salty water from the tropics to be drawn down towards Antarctica to take the place of the cold, salty water that has flowed away. This process contributes to the global ocean conveyor belt which drives ocean currents around the world, carrying heat and nutrients with it. It is a huge system. It is estimated that a complete circuit around the conveyor belt would take almost 1,000 years. This means that changes to the ocean that happen now take a long time to make their way through the system and it will be a long time before we fully understand their impacts. How does a warming global climate affect Antarctica? Antarctica is divided into three regions: East Antarctica (covered by the East Antarctic Ice Sheet), West Antarctica (covered by the West Antarctic Ice Sheet) and the Antarctic Peninsula. Because of how big Antarctica is, the impact of warming temperatures is not the same across the continent. West Antarctica is one of the fastest warming areas on Earth and the ice here is melting more quickly than in other areas of Antarctica. The melting of sea ice in Antarctica is also having an impact on the animals that live here. For example, krill populations have been declining as sea ice coverage decreases (see Supporting ecosystems). In turn, the number of Adlie penguins in Antarctica has decreased, in part because there is less krill for them to feed on. Adelie penguins sit on icebergs off the coast of the Daniell Peninsula in the Ross Sea. Antarctica and sea-level rise Rising global temperatures cause the ice in Antarctica to melt, which in turn, causes the level of the oceans to increase around the world. This is known as sea-level rise. Sea level rise is caused by the addition of extra water into the ocean from the melting of ice (e.g. ice sheets and glaciers), as well as the thermal expansion of water (water expands as it warms). Sea level rise is expected to increase in future as global temperatures continue to increase. In New Zealand, most of our towns and infrastructure are located in coastal areas, making them very vulnerable to the impacts of sea-level rise. These areas are likely to experience increased flooding and erosion as sea-level rises. Science on the ice NIWA oceanographer Dr Natalie Robinson gives a glimpse into life as a scientist on the ice, from the many layers of warm clothes and nifty equipment she uses to the curious locals. RSV NuyinaPhoto: Pete Harmsen Clouds rolling in over CaseyPhoto: Barry Becker RSV Nuyina pushes through pack icePhoto: Pete Harmsen Lenticular clouds over CaseyPhoto: Barry Becker Icebreaking on RSV NuyinaPhoto: Pete Harmsen Learn about the Australian Antarctic Program, including opportunities to work with us in Australia or the Antarctic. Meet Australias Antarctic scientists and learn about their scientific research. Learn about the wildlife and environment, and the human experience of the icy continent historically and today. Learn more about our stations, travel and expeditioners. We acknowledge the Traditional Owners of Country throughout Australia and recognise their continuing connection to land, waters and culture. We pay our respects to their Elders past and present. 30 November 2025 New joint research initiatives focused on climate and ecosystem change expand the long-standing collaboration between New Zealand and the United States on Antarctic science and logistics.Science, Innovation and Technology Minist Read More 27 November 2025 Antarctica is changingand the science shows why it matters for all of us.The Antarctic Science Platform has launched its Impact Portfolio, a comprehensive synthesis of seven years of research. This resource makes complex scienc Read More 11 November 2025 The Antarctica New Zealand's Annual Report 2024/25 is now available. It provides an overview of our key achievements, financial performance and strategic direction over the past year.This years report also highlights progress o Read More 17 July 2025 Antarctic science has hit the big screen in this years national Doc Edge Festival, with the story of three women studying sea ice near Scott Base taking home two awards. Mighty Indeed premiered at HOYTS EntX in Antarctic Gatewa Read More 16 July 2025 Antarcticas Southern Ocean is full of unanswered questions and this years Antarctica New Zealand scholarship recipients are on a mission to help solve them. Each of the 2025 Antarctica New Zealand scholarships is backing a y Read More 8 July 2025 Antarctica New Zealand and the Swiss Polar Institute have officialised their cooperation in polar science.The two programmes signed a Memorandum of Arrangement (MoA) in Auckland on Monday 8 July, which will facilitate the develo Read More Antarctica is Earth's fifth largest continent. Image credit: NASA Pack your snowshoes, hat, gloves, and the puffiest jacket you have because Antarctica is the coldest place on Earth! The average temperature in Antarctica in the winter is minus 34.4 Celsius (minus 30 degrees Fahrenheit). The temperature in the center of Antarctica is much lower than the temperature on the coasts. The lowest temperature ever recorded in Antarctica was minus 89.4 C (minus 129 F). The highest temperature ever recorded in Antarctica was 15 C (59 F). Antarctica has just two seasons: summer and winter. Antarctica has six months of daylight in its summer and six months of darkness in its winter. The seasons are caused by the tilt of Earth's axis in relation to the sun. The direction of the tilt never changes. But as the Earth orbits the sun, different parts of the planet are exposed to direct sunlight. During summer, Antarctica is on the side of Earth tilted toward the sun and is in constant sunlight. In the winter, Antarctica is on the side of Earth tilted away from the sun, causing the continent to be dark. Antarctica has only two seasons because of Earths 23 degree axial tilt. If you love long summers and winters, Antarctica is the place for you! Image credit: NASA-JPL/Caltech Though Antarctica is really, really chilly, it is considered a desert because it receives very little rain or snowfall. The small amount of snow that does fall does not melt but builds up over hundreds and thousands of years to form large, thick ice sheets. Antarctica's terrain is made up of glaciers, ice shelves and icebergs. Antarcticas terrain is made up of glaciers, ice shelves and icebergs thats a lot of ice! Credit: Kimberley R. Miner/NASA/JPL-Caltech Though Antarctica is way too cold for people to live there for a long time, scientists take turns going to the icy continent to study the chilly place. NASA scientist Kimberley Miner snapped this photograph when she went to Antarctica! Credit: Kimberley R. Miner/NASA/JPL-Caltech Would you take a swim in this ice water off the coast of Antarctica? Credit: Kimberley R. Miner/NASA/JPL-Caltech Glaciers galore in Antarctica. Credit: Kimberley R. Miner/NASA/JPL-Caltech Antarctica has no trees or bushes. The only plants that can survive the extreme cold are lichens, mosses and algae. Imagine sledding here, on Beardmore Glacier in central Antarctica! Image credit: Commander Jim Waldron USNRAntarctic Photo Library/National Science Foundation Who lives in Antarctica? Antarctica is too cold for people to live there for a long time. Scientists take turns going there to study the ice. Tourists visit Antarctica in the summers. The oceans surrounding Antarctica are home to many types of whales. Antarctica is also home to seals and penguins. Come for the sledding, stay to chill out with the seals! Image credit: Kimberley R. Miner/NASA/JPL-Caltech What can NASA learn about Earth from studying Antarctica? NASA uses satellites to study the ice on Antarctica and how the continent is changing. Scientists want to know how changes in Earth's climate are affecting Antarctica's ice sheets. They also want to know how changes in Antarctic ice might affect Earth's climate. One tool that NASA uses is the Ice, Cloud, and Land Elevation Satellite, or ICESat. Using ICESat, NASA can measure changes in size of Antarctica's ice sheets. ICESat also helps NASA understand how changes in Earth's atmosphere and climate affect polar ice and global sea levels. Melting ice sheets may impact sea levels all over the world. Illustration of NASAs Ice, Cloud and land Elevation Satellite-2 (ICESat-2), a mission to measure the changing height of Earth's ice. Image credit: NASA NASA instruments have also helped scientists create detailed maps of the surface of Antarctica. The maps help researchers when planning trips to Antarctica. They also give the public a clearer view of the continent. What can NASA learn about space from studying Antarctica? Antarctica is also a good place to find meteorites, or rocks that fall from space to Earth. The number of meteorites found in Antarctica is equal to the number of meteorites found in the rest of the world combined. Meteorites are easier to see on the white ice. Also, meteorites that fall to Antarctica are preserved in ice for a long time. Members of the Antarctic Search for Meteorites (ANSMET) program collect a carbonaceous chondrite meteorite from the base of Mt. Ward, Antarctica. Image credit: Christine Floss NASA scientists have used the Antarctic environment to study Mars. The desert conditions in Antarctica are like the conditions on Mars. NASA tested robots in Antarctica that later landed on Mars. NASA scientists went to Antarctica to study astronaut nutrition. Like people in Antarctica in the winter, astronauts in space are not in the sunlight. The sun helps the human body make vitamins. Scientists study people that visit Antarctica to learn how to help astronauts in space get enough vitamins. Antarctica is also an important region to study the effects of climate change. NASAs NISAR (NASA-ISRO Synthetic Aperture Radar) will measure changes in sea ice, snow extent, permafrost, and surface melting in higher resolution than ever before. Rising sea level from melting ice sheets can create dangerous conditions for people living close to the ocean. Measurements taken now will be used to predict future changes and help scientists better understand our planet's changing climate. Scientists like Dr. Kimberley Miner visit Antarctica to conduct research and learn more about our Earth. Image credit: Kimberley R. Miner/NASA-JPL/Caltech. Antarctica is Earths southernmost continent, covering an area of 13.72 million square kilometers, making it the fifth-largest continent by land area. Despite its massive size, Antarctica has no permanent population due to its harsh climate, icy terrain, and remote location. The continent is governed by the Antarctic Treaty System, which ensures it remains a zone dedicated to peace and scientific research. Continent Name: Antarctica Population (2025): 0 permanent residents Land Area: 13,720,000 km Density: 0 people/km Coldest temperature ever recorded: 89.2C (Vostok Station) Contains 90% of the worlds ice and 70% of its fresh water Although no one permanently resides in Antarctica, the continent hosts more than 70 scientific research stations operated by over 30 countries. These stations are usually staffed seasonally (summer) and some operate year-round. Scientists study climate change, astronomy, glaciology, biology, and moremaking Antarctica a hub of critical environmental research. The Antarctic Treaty, signed in 1959, prohibits military activity and resource extraction while promoting scientific collaboration and environmental protection. The region is not owned by any country, though several nations have made territorial claims that are held in suspension under the treaty. While Antarctica lacks human settlement, it supports a unique and resilient ecosystem. Key species include: Penguins (e.g., Emperor & Adelie) Seals (e.g., Weddell, Leopard) Whales (e.g., Blue, Minke) Cold-tolerant microorganisms and lichens These species survive in extreme conditions and play vital roles in the Southern Oceans ecosystem. Climate Indicator: Changes in Antarctic ice sheets affect global sea levels. Scientific Frontier: A critical region for understanding Earths past and future. International Cooperation: A rare example of global scientific and political unity.Q: Does anyone live in Antarctica permanently?A: No, it has no permanent residentsonly seasonal researchers. Q: Who owns Antarctica?A: No one. It is governed by an international treaty for peaceful research. Q: How big is Antarctica?A: It spans 13.72 million km, larger than Europe or Australia. Q: What animals live in Antarctica?A: Penguins, seals, whales, and cold-adapted birds and microbes. Q: What is the coldest place on Earth?A: Antarctica, with temperatures dropping below 89C. Asia Africa Europe North America South America Oceania Icy waters teeming with penguins and pods of killer whales, swirling clouds of krill and majestic humpback whales the oceans surrounding Antarctica are some of the most pristine and productive in the world.However, its incredible biodiversity is threatened by climate change, and increased fishing and marine pollution. Antarctica is a massive frozen landmass at the bottom of our planet and is the fifth-largest continent in total area. The ocean surrounding Antarctica the Southern Ocean covers an area of 20,327,000km. Even though it covers a significant area, Antarctica does not have an indigenous human population or any permanent residents. Not only is Antarctica extremely cold reaching temperatures as low as -94C - it also happens to be the driest and windiest continent. Interestingly, it does not experience much snow and is so dry that it is considered a polar desert. As a result, there are no trees on the continent, and there are only two known kinds of native flowering plants. Antarctica and the Southern Ocean around it is home to a wide variety of marine wildlife from tiny antarctic krill to the biggest animal on the planet, the blue whale. You can find half of the worlds penguin species, 15 species of whale and dolphin, as well as over 30 species of seabird and seal. In fact, Antarcticas surrounding oceans are home to more than 8,000 marine species, more than half of which are seen nowhere else in the world. While the North and South Poles share similar extremely cold environments, polar bears are not found in Antarctica living exclusively across the Arctic Ocean.Antarctica is much more than just an icy pole for our planet it is vital for our survival too. Antarctica plays a significant role in maintaining the planets heat balance. Ice being much more reflective than land or water, the massive Antarctic ice sheet helps deflect some of the suns rays away from the Earth, keeping temperatures liveable.The waters around Antarctica also play a significant role in the ocean conveyor belt. Its cold and incredibly dense waters forces warmer water to rise or upwell. This upwelling is so strong it moves water across the entire planet. Without it, Earths waters would become imbalanced and struggle to circulate efficiently.Antarcticas waters are also home to one of the most fundamental species to the Antarctic food web the Antarctic krill. These shrimp-like creatures are the primary food source for countless species, including penguins, seals, and whales. To top it off, Antarctic krill are carbon-storing powerhouses with reports revealing that krill in the Antarctic Peninsula and Scotia Sea have the capacity to sink 23 megatonnes of carbon annually. In fact we are only just learning about the potential role krill play in climate change.Learn about Antarctic krillOf the world's 18 penguin species, half are found only within the Southern Ocean. Antarcticas waters also provide critical habitat and feeding grounds for 80-90% of the world's whale species, including the humpback whale, which is only now recovering from being hunted to the brink of extinction. Global warming Climate change is the greatest long-term threat to the region. Some parts of Antarctica are experiencing significant ice retreat, including the collapse of ice shelves along the Antarctic Peninsula, while other areas are increasing. If our climate continues to warm and acidify the Southern ocean, scientists predict that krill populations could be devastated, undermining the entire food chain.Increased fishing pressure and illegal fishingAs global fisheries become depleted, there is growing interest to expand fishing throughout the region. In particular, krill fishing needs to be closely monitored and controlled to ensure whales, penguins and other wildlife are protected. Illegal, unregulated and unreported (IUU) fishing also threatens fish stocks in some areas of the Southern Ocean and thereby the seabirds and marine mammals that depend upon them. The harmful fishing methods used by IUU fishing vessels also cause the direct deaths of countless seabirds.Invasive speciesMany Antarctic species have evolved in isolation from the rest of the world. Consequently, they have developed no means of defending themselves from the invasive species carried aboard ships. WWF catalysed and helped fund the removal of rabbits from Macquarie Island and is now helping to remove mice from the Antipodes Islands.By partnering with First Peoples, governments, industry and coastal communities to achieve impact at scale to protect seascapes and Saltwater Country. By increasing local, regional, federal and global-level advocacy to enable more robust frameworks and calling on the Australian Government to play their part in protecting whales within Australia and its surrounding waters such as the Southern Ocean and Antarctica. Read more Most species in Antarctica seem to be the descendants of species that lived there millions of years ago. As such, they must have survived multiple glacial cycles. The species survived the periods of extremely cold climate in isolated warmer areas, such as those with geothermal heat or areas that remained ice-free throughout the colder climate.[116] Emperor penguins with juvenilesInvertebrate life of Antarctica includes species of microscopic mites such as Alaskozetes antarcticus, lice, fleas (Glaciopsyllus antarcticus),[117] nematodes, tardigrades, rotifers, krill and springtails. The flightless midge Belgica antarctica, the largest purely terrestrial animal in Antarctica, reaches 6mm (14in) in size.[118] Antarctic krill, which congregates in large schools, is the keystone species of the ecosystem of the Southern Ocean, being an important food organism for whales, seals, leopard seals, fur seals, squid, icefish, and many bird species, such as penguins and albatrosses. Some species of marine animals exist and rely, directly or indirectly, on phytoplankton. Antarctic sea life includes penguins, blue whales, orcas, colossal squids and fur seals.[120] The Antarctic fur seal was very heavily hunted in the 18th and 19th centuries for its pelt by seal hunters from the United States and the United Kingdom.[121] Leopard seals are apex predators in the Antarctic ecosystem and migrate across the Southern Ocean in search of food.[122] There are approximately 40 bird species that breed on or close to Antarctica, including species of petrels, penguins, cormorants, and gulls. Various other bird species visit the ocean around Antarctica, including some that normally reside in the Arctic.[123] The emperor penguin is the only penguin that breeds during the winter in Antarctica; it and the Adlie penguin breed farther south than any other penguin.[120] A Census of Marine Life by some 500 researchers during the International Polar Year was released in 2010. The research found that more than 235 marine organisms live in both polar regions, having bridged the gap of 12,000km (7,456mi). Large animals such as some cetaceans and birds make the round trip annually. Smaller forms of life, such as sea cucumbers and free-swimming snails, are also found in both polar oceans. Factors that may aid in their distribution include temperature differences between the deep ocean at the poles and the equator of no more than 5C (9F) and the major current systems or marine conveyor belts which are able to transport eggs and larva.[124] In January 2025, the detachment of the massive iceberg A-84 (comparable in size to the city of Chicago) from the George VI Ice Shelf provided a rare opportunity to explore the seafloor beneath floating ice shelves using robotic submersibles. Researchers uncovered ecosystems unexpectedly rich in large corals, ancient sponges, icefish, giant sea spiders, and even octopuses at depths of up to 1,300 metres (4,300ft). These ecosystems may harbor novel species that have remained concealed for centuries, sustained by nutrient-bearing ocean currents.[125][126][127] An orange lichen (perhaps Caloplaca) growing on the Yalour Islands, Wilhelm Archipelago About 1,150 species of fungi have been recorded in the Antarctic region, of which about 750 are non-lichen-forming.[128][129] Some of the species, having evolved under extreme conditions, have colonised structural cavities within porous rocks and have contributed to shaping the rock formations of the McMurdo Dry Valleys and surrounding mountain ridges.[130] The simplified morphology of such fungi, along with their similar biological structures, metabolism systems capable of remaining active at very low temperatures, and reduced life cycles, make them well suited to such environments. Their thick-walled and strongly melanised cells make them resistant to UV radiation.[130] An Antarctic endemic species, the crust-like lichen Buellia frigida, has been used as a model organism in astrobiology research.[131] The same features can be observed in algae and cyanobacteria, suggesting that they are adaptations to the conditions prevailing in Antarctica. This has led to speculation that life on Mars might have been similar to Antarctic fungi, such as Cryomyces antarcticus and Cryomyces minteri.[130] Some of the species of fungi, which are apparently endemic to Antarctica, live in bird dung, and have evolved so they can grow inside extremely cold dung, but can also pass through the intestines of warm-blooded animals.[133] Deschampsia antarctica at Collins Glacier, Antarctica. This species is one of only two flowering plants native to Antarctica, the other one being Antarctic pearlwort (Colobanthus quitensis).Throughout its history, Antarctica has seen a wide variety of plant life. In the Cretaceous, it was dominated by a fern-conifer ecosystem, which changed into a temperate rainforest by the end of that period. During the colder Neogene (172.5Ma), a tundra ecosystem replaced the rainforests. The climate of present-day Antarctica does not allow extensive vegetation to form.[134] A combination of freezing temperatures, poor soil quality, and a lack of moisture and sunlight inhibit plant growth, causing low species diversity and limited distribution. The flora largely consists of bryophytes (25 species of liverworts and 100 species of mosses). There are three species of flowering plants, all of which are found in the Antarctic Peninsula: Deschampsia antarctica (Antarctic hair grass), Colobanthus quitensis (Antarctic pearlwort) and the non-native Poa annua (annual bluegrass).[135] Of the 700 species of algae in Antarctica, around half are marine phytoplankton. Multicoloured snow algae are especially abundant in the coastal regions during the summer.[136] Even sea ice can harbour unique ecological communities, as it expels all salt from the water when it freezes, which accumulates into pockets of brine that also harbour dormant microorganisms. When the ice begins to melt, brine pockets expand and can combine to form brine channels, and the algae inside the pockets can reawaken and thrive until the next freeze.[137][138] Bacteria have also been found as deep as 800m (0.50mi) under the ice.[139] It is thought to be likely that there exists a native bacterial community within the subterranean water body of Lake Vostok.[140] The existence of life there is thought to strengthen the argument for the possibility of life on Jupiter's moon Europa, which may have water beneath its water-ice crust.[141] There exists a community of extremophile bacteria in the highly alkaline waters of Lake Untersee.[142][143] The prevalence of highly resilient creatures in such inhospitable areas could further bolster the argument for extraterrestrial life in cold, methane-rich environments.[144] Refuse littering the shoreline at Bellingshausen Station on King George Island, photographed in 1992The first international agreement to protect Antarctica's biodiversity was adopted in 1964.[145] The overfishing of krill (an animal that plays a large role in the Antarctic ecosystem) led officials to enact regulations on fishing. The Convention for the Conservation of Antarctic Marine Living Resources, an international treaty that came into force in 1980, regulates fisheries, aiming to preserve ecological relationships.[1] Despite these regulations, illegal fishingparticularly of the highly prized Patagonian toothfish which is marketed as Chilean sea bass in the U.S.remains a problem.[146] In analogy to the 1980 treaty on sustainable fishing, countries led by New Zealand and the United States negotiated a treaty on mining. This Convention on the Regulation of Antarctic Mineral Resource Activities was adopted in 1988. After a strong campaign from environmental organisations, first Australia and then France decided not to ratify the treaty. Instead, countries adopted the Protocol on Environmental Protection to the Antarctic Treaty (the Madrid Protocol), which entered into force in 1998.[148] The Madrid Protocol bans all mining, designating the continent as a "natural reserve devoted to peace and science".[149] A whale in the Southern Ocean Whale SanctuaryThe pressure group Greenpeace established a base on Ross Island from 1987 to 1992 as part of its attempt to establish the continent as a World Park.[150] The Southern Ocean Whale Sanctuary was established in 1994 by the International Whaling Commission. It covers 50millionkm2 (19millionsqmi) and completely surrounds the Antarctic continent. All commercial whaling is banned in the zone, though Japan has continued to hunt whales in the area, ostensibly for research purposes.[151] Despite these protections, the biodiversity in Antarctica is still at risk from human activities. Specially protected areas cover less than 2% of the area and provide better protection for animals with popular appeal than for less visible animals.[145] There are more terrestrial protected areas than marine protected areas.[152] Ecosystems are impacted by local and global threats, notably pollution, the invasion of non-native species, and the various effects of climate change.[145] Antarctica is a unique continent in that it does not have a native human population.Biology, Earth Science, Geology, Oceanography, Geography, Human Geography, Physical GeographyThe continent of Antarctica makes up most of the Antarctic region. The Antarctic is a cold, remote area in the Southern Hemisphere encompassed by the Antarctic Convergence. The Antarctic Convergence is an uneven line of latitude where cold, northward-flowing Antarctic waters meet the warmer waters of the worlds oceans. The Antarctic covers approximately 20 percent of the Southern Hemisphere.Antarctica is the fifth-largest continent in terms of total area. (It is larger than both Oceania and Europe.) Antarctica is a unique continent in that it does not have a native human population. There are no countries in Antarctica. Seven countries made defined claims to Antarctic territory prior to the Antarctic Treaty of 1959. The treaty does not legally recognize any claims.The Antarctic also includes island territories within the Antarctic Convergence. The islands of the Antarctic region are: South Orkney Islands and South Shetland Islands, claimed by the United Kingdom; South Georgia and the South Sandwich Islands, administered by the United Kingdom and claimed by Argentina; Peter I Island and Bouvet Island, claimed by Norway; Heard and McDonald islands, claimed by Australia; and Scott Island and the Balleny Islands, claimed by New Zealand.Physical GeographyPhysical FeaturesThe Antarctic Ice Sheet dominates the region. It is the largest single piece of ice on Earth. This ice sheet even extends beyond the continent when snow and ice are at their most extreme.The ice surface dramatically grows in size from about three million square kilometers (1.2 million square miles) at the end of summer to about 19 million square kilometers (7.3 million square miles) by winter. Ice sheet growth mainly occurs at the coastal ice shelves, primarily the Ross Ice Shelf and the Ronne Ice Shelf. Ice shelves are floating sheets of ice that are connected to the continent. Glacial ice moves from the continents interior to these lower-elevation ice shelves at rates of 10 to 1,000 meters (33 to 32,808 feet) per year.Antarctica has a number of mountain summits, including the Transantarctic Mountains, which divide the continent into eastern and western regions. A few of these summits reach altitudes of more than 4,500 meters (14,764 feet). The elevation of the Antarctic Ice Sheet itself is about 2,000 meters (6,562 feet) and reaches 4,000 meters (13,123 feet) above sea level near the center of the continent.Without any ice, Antarctica would emerge as a giant peninsula andarchipelago of mountainous islands, known as Lesser Antarctica, and a single large landmass about the size of Australia, known as Greater Antarctica. These regions have different geologies.Greater Antarctica, or East Antarctica, is composed of older, igneous and metamorphic rocks. Lesser Antarctica, or West Antarctica, is made up of younger, volcanic and sedimentary rock. Lesser Antarctica, in fact, is part of the Ring of Fire, a tectonically active area around the Pacific Ocean. Tectonic activity is the interaction of plates on Earths crust, often resulting in earthquakes and volcanoes. Mount Erebus, located on Antarcticas Ross Island, is the southernmost active volcano on Earth.The majority of the islands and archipelagos of Lesser Antarctica are volcanic and heavily glaciated. They are also home to a number of high mountains.The oceans surrounding Antarctica provide an important physical component of the Antarctic region. The waters surrounding Antarctica are relatively deep, reaching 4,000 to 5,000 meters (13,123 to 16,404 feet) in depth.ClimateAntarctica has an extremely cold, dry climate. Winter temperatures along Antarcticas coast generally range from -10 to -30C (14 to -22F). During the summer, coastal areas hover around 0C (32F) but can reach temperatures as high as 9C (48F).In the mountainous, interior regions, temperatures are much colder, dropping below -60C (-76F) in winter and -20C (-4F) in summer. In 1983, Russias Vostok Research Station measured the coldest temperature ever recorded on Earth: -89.2C (-128.6F). An even lower temperature was measured using satellite data taken in 2010:-93.2C (-135.8F)Precipitation in the Antarctic is hard to measure. It always falls as snow. Antarcticas interior is believed to receive only 50 to 100 millimeters (two to four inches) of water (in the form of snow) every year. The Antarctic desert is one of the driest deserts in the world.The Antarctic region has an important role in global climate processes. It is an integral part of Earths heat balance. The heat balance, also called the energy balance, is the relationship between the amount of solar heat absorbed by Earths atmosphere and the amount of heat reflected back into space.Antarctica has a larger role than most continents in maintaining Earths heat balance. Ice is more reflective than land or water surfaces. The massive Antarctic Ice Sheet reflects a large amount of solar radiation away from Earths surface. As global ice cover (ice sheets and glaciers) decreases, the reflectivity of Earths surface also decreases. This allows more incoming solar radiation to be absorbed by Earths surface, causing an unequal heat balance linked to global warming, the current period of climate change.Interestingly, NASA scientists have found that climate change has actually caused more ice to form in some parts of Antarctica. They say this is happening because of new climate patterns caused by climate change. These patterns create a strong wind pattern called the "polar vortex." Polar vortex winds lower temperatures in the Antarctic and have been building in strength in recent decadesas much as 15 percent since 1980. This effect is not seen throughout the Antarctic, however, and some parts are experiencing ice melt.The waters surrounding Antarctica are a key part of the ocean conveyor belt, a global system in which water circulates around the globe based on density and on currents. The cold waters surrounding Antarctica, known as the Antarctic Bottom Water, are so dense that they push against the ocean floor. The Antarctic Bottom Water causes warmer waters to rise, or upwell.Antarctic upwelling is so strong that it helps move water around the entire planet. This movement is aided by strong winds that circumnavigate Antarctica. Without the aid of the oceans around Antarctica, Earths waters would not circulate in a balanced and efficient manner.Flora and FaunaLichens, mosses, and terrestrial algae are among the few species of vegetation that grow in Antarctica. More of this vegetation grows in the northern and coastal regions of Antarctica, while the interior has little if any vegetation.The ocean, however, teems with fish and other marine life. In fact, the waters surrounding Antarctica are among the most diverse on the planet. Upwelling allows phytoplankton and algae to flourish. Thousands of species, such as krill, feed on the plankton. Fish and a large variety of marine mammals thrive in the cold Antarctic waters. Blue (Balaenoptera musculus), fin (Balaenoptera physalus), humpback (Megaptera novaeangliae), right, minke, sei (Balaenoptera borealis), and sperm whales (Physeter macrocephalus) have healthy populations in Antarctica.One of the apex, or top, predators in Antarctica is the leopard seal (Hydrurga leptonyx). The leopard seal is one of the most aggressive of all marine predators. This three-meter (nine-foot), 400-kilogram (882-pound) animal has unusually long, sharp teeth, which it uses to tear into prey such as penguins and fish.The most familiar animal of Antarctica is probably the penguin. They have adapted to the cold, coastal waters. Their wings serve as flippers as they fly through the water in search of prey such as squid and fish. Their feathers retain a layer of air, helping them keep warm in the freezing water.Cultural GeographyA Culture of ScienceWhile the Antarctic does not have permanent human residents, the region is a busy outpost for a variety of research scientists. These scientists work at government-supported research stations and come from dozens of different countries. The number of scientists conducting research varies throughout the year, from about 1,000 in winter to around 5,000 in summer.Researchers from a variety of scientific backgrounds study the Antarctic not only as a unique environment, but also as an indicator of broader global processes. Geographers map the surface of the worlds coldest and most isolated continent. Meteorologists study climate patterns, including the ozone hole that hovers over the Antarctic. Climatologists track the history of Earths climate using ice cores from Antarcticas pristine ice sheet. Marine biologists study the behavior of whales, seals, and squid. Astronomers make observations from Antarcticas interior because it offers the clearest view of space from Earth.Even astrobiologists, who study the possibility of life outside Earths atmosphere, study materials found in the Antarctic. In 1984, a meteorite from Mars was found in Antarctica. The markings on this meteorite were similar to markings left by bacteria on Earth. If this meteorite, millions of years old, actually has the remains of martian bacteria, it would be the only scientific evidence for life outside Earth.Daily Life at Antarcticas Research StationsAntarctica is a unique cultural place that is best defined by daily life at its diverse research stations. McMurdo Station is a U.S. research center on the southern tip of Ross Island, a territory claimed by New Zealand. McMurdo is the largest station in Antarctica, capable of supporting 1,250 residents. Most of these residents are not scientists, but work to support station operations, construction, maintenance, and daily life. McMurdo has more than 80 buildings and operates like a small city. It has world-class laboratory and research facilities but also a firehouse, dormitories, stores, and the continents only ATM.Like all Antarctic research stations, McMurdo has a specific method of receiving necessary supplies. Once a year, cargo ships bring more than fiv million kilograms (11 million pounds) of equipment and supplies, ranging from trucks and tractors to dry and frozen foods, to scientific instruments. These cargo ships can only reach Winter Quarters Bay, McMurdos harbor, during summer, when the pack ice can be breached by U.S. Coast Guard icebreakers. Additional supplies and personnel are flown in from Christchurch, New Zealand, when weather permits.Base Esperanza, Argentinas largest Antarctic facility, is located in Hope Bay on the tip of the Antarctic Peninsula. The station is known for a number of Antarctica firsts. It is the birthplace of Emilio Marcos Palma, the first person to be born in Antarctica. Base Esperanza also houses the first Catholic chapel (1976) and first school (1978) built on the continent. In 1979, Base Esperanza became the continents first shortwave radio broadcaster, connecting the research station with Argentinas continental territory.Davis Station is Australias busiest scientific research station. It is located in an ice-free area known as the Vestfold Hills. Like most research stations in Antarctica, food is very important at Davis Station. Residents live and work closely together in facilities and outdoor environments that are often very monotonous. As such, food plays an important role in providing variety to residents like those at Davis Station.Food supplies are, however, very limited. The food supply for a year at Davis Station is rationed, per person per year. Residents live mostly on frozen and canned food. The chef is often thought of as one of the most important people at Davis Station. He or she must make sure to use all commodities in such a way that is both creative and sustainable. Some of the stations most important events revolve around the chefs creations, such as the Midwinter Dinner, a traditional, sumptuous feast first celebrated during the 1901-04 British Antarctic Expedition.Like many of Antarcticas research facilities, Davis Station has a hydroponic greenhouse. Hydroponics is the practice of growing plants with water and nutrients only. Hydroponics requires excellent gardeners because produce is grown without soil. Fresh produce adds variety and nutrition to Antarctic meals. The greenhouse also serves as a sunroom for sunlight-deprived residents, especially during the long winter months.Political GeographyHistoric IssuesFor many European and North American powers, Antarctica represented the last great frontier for human exploration. Fueled by nationalist pride and supported by advances in science and navigation, many explorers took on the Race for the Antarctic.Explorers first skimmed the boundaries of Antarctica on sea voyages. By the early 20th century, explorers started to traverse the interior of Antarctica. The aim of these expeditions was often more competitive than scientific. Explorers wanted to win the Race to the South Pole more than understand Antarcticas environment. Because early explorers confronted extreme obstacles and debilitating conditions, this period of time became known as the Heroic Age. Roald Amundsen, Robert Falcon Scott, Edward Adrian Wilson, and Ernest Shackleton all competed in the Race to the South Pole.In 1911, Amundsen, of Norway, and Scott, of the United Kingdom, began expeditions with the aim of becoming the first man to reach the South Pole. Amundsens team set out from the Bay of Whales in the Ross Sea on October 19, while Scott set out from Ross Island on November 1.Each team used different methods, with drastically different levels of success. Amundsens team relied on dog sleds and skiing to reach the pole, covering as much as 64 kilometers (40 miles) per day. Scotts team, on the other hand, pulled their sleighs by hand, collecting geological samples along the way. Amundsens team became the first to reach the South Pole on December 15. The team was healthy, and successfully made the journey out of Antarctica. Scotts team reached the South Pole on January 17, 1912, suffering from malnutrition, snow blindness, exhaustion, and injury. They all died on their journey home.Hoping to one-up his predecessors, Shackleton, of the United Kingdom, attempted the first transcontinental crossing of Antarctica in 1914. Shackleton planned the trip by using two ships, the Aurora and the Endurance, at opposite ends of the continent. Aurora would sail to the Ross Sea and deposit supplies. On the opposite side, Endurance would sail through the Weddell Sea to reach the continent. Once there, the team would march to the pole with dog teams, dispose of extra baggage, and use supplies left by Aurora to reach the other end of the continent.The plan failed. The Endurance became frozen in the pack ice of the Weddell Sea. The pack ice crushed and sunk the ship. Shackletons team survived for roughly four months on the ice by setting up makeshift camps. Their food sources were leopard seals, fish, and, ultimately, their sled dogs. Once the ice floe broke, expedition members used lifeboats to reach safer land and were picked up on Elephant Island 22 months after theyd set out on their journey. Although some of the crew sustained injuries, they all survived.The journey of the Endurance expedition symbolizes the Heroic Age, a time of extreme sacrifice and bravery in the name of exploration and discovery. Apsley George Benet Cherry-Garrard, a polar explorer, summed up the Heroic Age in his book The Worst Journey in the World: "For a joint scientific and geographical piece of organisation, give me Scott; for a Winter Journey, Wilson; for a dash to the Pole and nothing else, Amundsen: and if I am in the devil of a hole and want to get out of it, give me Shackleton every time.Contemporary IssuesThe second half of the 20th century was a time of drastic change in the Antarctic. This change was initially fueled by the Cold War, a period of time defined by the division between the United States and the Soviet Union, and the threat of nuclear war.The International Geophysical Year (IGY) of 1957-58 aimed to end Cold War divisions among the scientific community by promoting global scientific exchange. The IGY prompted an intense period of scientific research in the Antarctic. Many countries conducted their first Antarctic explorations and constructed the first research stations on Antarctica. More than 50 Antarctic stations were established for the IGY by just 12 countries: Argentina, Australia, Belgium, Chile, France, Japan, New Zealand, Norway, South Africa, the Soviet Union, the United Kingdom, and the United States.In 1959, these countries signed the Antarctic Treaty, which established that: the region south of 60S latitude remain politically neutral; no nation or group of people can claim any part of the Antarctic as territory; countries cannot use the region for military purposes or to dispose of radioactive waste; and research can only be done for peaceful purposes.The Antarctic Treaty does support territorial claims made before 1959, by New Zealand, Australia, France, Norway, the United Kingdom, Chile, and Argentina. Under the treaty, the size of these claims cannot be changed and new claims cannot be made. Most importantly, the treaty establishes that any treaty-state has free access to the whole region. As such, research stations supported by a variety of treaty-states have been constructed within each of these territorial claims. Today, 47 states have signed the Antarctic Treaty.The Antarctic Treaty was an important geopolitical milestone because it was the first arms control agreement established during the Cold War. Along with the IGY, the Antarctic Treaty symbolized global understanding and exchange during a period of intense division and secrecy.Many important documents have been added to the Antarctic Treaty. Collectively known as the Antarctic Treaty System, they cover such topics as pollution, conservation of animals and other marine life, and protection of natural resources.The yearly Antarctic Treaty Consultative Meeting (ATCM) is a forum for the Antarctic Treaty System and its administration. Only 28 of the 47 treaty-states have decision-making powers during these meetings. These include the 12 original signatories of the Antarctic Treaty, along with 16 other countries that have conducted substantial and consistent scientific research there.Future IssuesTwo important and related issues that concern the Antarctic region are climate change and tourism. The ATCM continues to address both issues.Antarctic tourism has grown substantially in the last decade, with roughly 40,000 visitors coming to the region in 2010. In 2009, the ATCM held meetings in New Zealand to discuss the impact of tourism on the Antarctic environment. Officials worked closely with the International Association of Antarctica Tour Operators (IAATO) to establish better practices that would reduce the carbon footprint and environmental impact of tour ships. These include regulations and restrictions on: numbers of people ashore; planned activities; wildlife watching; pre- and post-visit activity reporting; passenger, crew, and staff briefings; and emergency medical-evacuation plans. The ACTM and IAATO hope more sustainable tourism will reduce the environmental impacts of the sensitive Antarctic ecosystem.Tourism is one facet of the ACTMs climate change outline, discussed during meetings in Norway in 2010. Climate change disproportionately affects the Antarctic region, as evidenced by reductions in the size of the Antarctic Ice Sheet and the warming waters off the coast. The ACTM recommended that treaty-states develop energy-efficient practices that reduce the carbon footprint of activities in Antarctica and cut fossil fuel use from research stations, vessels, ground transportation, and aircraft.The Antarctic has become a symbol of climate change. Scientists and policymakers are focusing on changes in this environmentally sensitive region to push for its protection and the sustainable use of its scientific resources.Fast FactPopulation Density of Antarctica0.00078people per square kilometerFast FactHighest Elevation in AntarcticaVinson Massif (4,892 meters/16,050 feet)Fast FactMost Renewable Electricity Produced in Antarcticacontinent-wide (20%; wind, solar)Fast FactAntarctica's Largest Urban AreaMcMurdo Station, operated by the United States Antarctic Program: 1,000 people (summer) or 250 people (winter)Fast FactLargest WatershedAntarctic Ice Sheet (14 million square kilometers/ 5.4 million square miles)The audio, illustrations, photos, and videos are credited beneath the media asset, except for promotional images, which generally link to another page that contains the media credit. 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