

# Antarctica: Mystery continent holds key to mankind's future

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In this Jan. 20, 2015 photo, wooden arrows show the distances to various cities near Chile's Escudero station on King George Island, Antarctica. Thousands of scientists come to Antarctica for research. There are also non-scientists, chefs, divers, mechanics, janitors and the priest of the world's southernmost Eastern Orthodox Church on top of a rocky hill at the Russian Bellinghausen station. (AP Photo/Natacha Pisarenko)

Earth's past, present and future come together here on the northern peninsula of Antarctica, the wildest, most desolate and mysterious of its

continents.

Clues to answering humanity's most basic questions are locked in this continental freezer the size of the United States and half of Canada: Where did we come from? Are we alone in the universe? What's the fate of our warming planet?

The first explorers set foot in Antarctica 194 years ago hunting 19th century riches of whale and seal oil and fur, turning tides red with blood. Since then, the fist-shaped continent has proven a treasure chest for scientists trying to determine everything from the creation of the cosmos to how high seas will rise with global warming.

"It's a window out to the universe and in time," said Kelly Falkner, polar program chief for the U.S. National Science Foundation.

For a dozen days in January, in the middle of the chilly Antarctic summer, The Associated Press followed scientists from different fields searching for alien-like creatures, hints of pollution trapped in ancient ice, leftovers from the Big Bang, biological quirks that potentially could lead to better medical treatments, and perhaps most of all, signs of unstoppable melting. The journey on a Chilean navy ship along the South Shetland islands and vulnerable Antarctic Peninsula, which juts off the continent like a broken pinky finger, logged 833 miles (1,340 kilometers) and allowing the AP team a firsthand look at part of this vital continent.

Antarctica conjures up images of quiet mountains and white plateaus, but the coldest, driest and remotest continent is far from dormant. About 98 percent of it is covered by ice, and that ice is constantly moving. Temperatures can range from above zero in the South Shetlands and Antarctic Peninsula to the unbearable frozen lands near the South Pole. As an active volcano, Deception Island is a pot of extreme conditions.

There are spots where the sea boils at 212 degrees Fahrenheit (100 degrees Celsius), while in others it can be freezing at below 32 (0 degrees Celsius). And while the sun rarely shines on the long, dark Antarctic winters, nighttime never seems to fall on summer days.

While tourists come to Antarctica for its beauty and remoteness, scientists are all business. What they find could affect the lives of people thousands of miles away; if experts are right, and the West Antarctic ice sheet has started melting irreversibly, what happens here will determine if cities such as Miami, New York, New Orleans, Guangzhou, Mumbai, London and Osaka will have to regularly battle flooding from rising seas.

Antarctica "is big and it's changing and it affects the rest of the planet and we can't afford to ignore what's going on down there," said David Vaughan, science director of the British Antarctic Survey.

Often, scientists find something other than what they were looking for. Last year researchers calculated that ice on the western side of the continent was melting faster than expected. Last month, scientists researching vital geology in that melting were looking a half mile under the ice in pitch dark and found a surprise: fish a half foot (15 centimeters) long and shrimp-like creatures swimming by their cameras.



In this Jan. 22, 2015 photo, a Gentoo penguin feeds its baby at Station Bernardo O'Higgins in Antarctica. "To understand many aspects in the diversity of animals and plants it's important to understand when continents disassembled," said Richard Spikings, a research geologist at the University of Geneva. "So we're also learning about the real antiquity of the Earth and how (continents) were configured together a billion years ago, half a billion years ago, 300 million years ago," he said, adding that the insights will help him understand Antarctica's key role in the jigsaw of ancient super continents. (AP Photo/Natacha Pisarenko)

Geologists are entranced by Antarctica's secrets. On a recent scientific expedition led by Chile's Antarctic Institute, Richard Spikings, a research geologist at the University of Geneva, wielded a large hammer to collect rock samples in the South Shetlands and the Antarctic Peninsula. Curious members of a penguin colony on Cape Legoupil watched as he pounded on slabs of black granite and diorite rising out of the southern ocean. By the end of the two-week trip, his colleagues had jokingly begun calling him "Thor."

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important to understand when continents disassembled," Spikings said. "So we're also learning about the real antiquity of the Earth and how (continents) were configured together a billion years ago, half a billion years ago, 300 million years ago," he said, adding that the insights will help him understand Antarctica's key role in the jigsaw of ancient super continents. With names like Rodinia, Gondwana and Pangaea, scientists believe they were significant landmasses in Earth's history and were periodically joined together through the movement of plates.

Because there is no local industry, any pollution captured in the pristine ice and snow is from chemicals that traveled from afar, such as low levels of lead found in ice until it was phased out of gasoline, or radiation levels found from above-ground nuclear tests thousands of miles away and decades ago by the U.S. and the Soviet Union, Vaughan said.

The ice tells how levels of carbon dioxide, the heat-trapping gas, have fluctuated over hundreds of thousands of years. This is also the place where a hole in the ozone layer, from man-made refrigerants and aerosols, periodically parks for a couple months and causes trouble. It happens when sunlight creeps back to Antarctica in August, triggering a chemical reaction that destroys ozone molecules, causing a hole that peaks in September and then closes with warmer weather in November.

Exploring Antarctica is something Chilean Alejo Contreras, 53, began dreaming about as a teen after reading Robert Falcon Scott's journal of his journey to the South Pole. When Contreras finally got to the South Pole in 1988, he stopped shaving his beard, which today hangs down to his chest and often goes every which way, similar to his explorations.

Antarctica is "like the planet's freezer," said Contreras, who has led 14 expeditions to the continent. "And none of us would dare litter the ice."

Because of the pristine nature of the bottom of the world, when a meteorite lands here it stays untouched. So researchers find more meteorites, often from nearby Mars, including one discovered nearly 20 years ago which had scientists initially thinking, incorrectly, they had found proof that life once existed on Mars.



In this Jan. 20, 2015 photo, a church is lit in the town of Villa Las Estrellas on King George Island, Antarctica. Geologists are entranced by Antarctica's secrets. Clues to answering humanity's most basic questions are locked in this continental freezer the size of the United States and half of Canada: Where did we come from? Are we alone in the universe? What's the fate of our warming planet? (AP Photo/Natacha Pisarenko)

This is a place with landscapes out of an alien movie set. NASA uses the remoteness of the continent to study what people would have to go through if they visited Mars. The dry air also makes it perfect for



astronomers to peer deep into space and into the past.

During a recent trip to Deception Island, Peter Convey, an ecologist for the British Antarctic Survey who has been visiting Antarctica for 25 years, braved heavy rain, near freezing temperature and winds of more than 20 knots to collect samples of the spongy green and brown mosses that grow in patches on the ash of the volcanic island's black rock mountains. He was looking for clues in their genetics to determine how long the species have been evolving on Antarctica, in isolation from other continents.

"I've been lucky and I've gone to the middle of the continent, so I've been isolated from the next human being for 400 to 500 kilometers (250-300 miles)," Convey said. In this remoteness are odd life forms, raising hope that life might once have existed in other extreme environments such as Mars or is even now hidden below the ice of Jupiter's moon Europa.

"This is one of the more extreme places where you could expect to find life. It's even here," said Ross Powell, a Northern Illinois University scientist who in January was using a remote-controlled submarine deep under the ice in another part of Antarctica to figure out about melting, when the unusual fish and shrimp-like creatures swam by.



In this Jan. 22, 2015 photo, Chilean Navy officers push away ice by moving their boat in circles as they approach the Aquiles navy ship where they will pick up international scientists and take them to Chile's scientific Station Bernardo O'Higgins in Antarctica. While tourists come to Antarctica for its beauty and remoteness, scientists are all business. What they find could affect the lives of people thousands of miles away. (AP Photo/Natacha Pisarenko)

About 4,000 scientists come to Antarctica for research during the summer and 1,000 stay in the more forbidding winter. There are also about 1,000 non-scientists—chefs, divers, mechanics, janitors and the priest of the world's southernmost Eastern Orthodox Church on top of a rocky hill at the Russian Bellinghausen station.

But the church on the hill is an exception, a glimmer of the world to the north. For scientists, what makes this place is the world below, which provides a window into mankind's past and future.



"Antarctica in many ways is like another planet," said Jose Retamales, the director of the Chilean Antarctic Institute, while aboard a navy ship cruising along Deception and the other South Shetland islands. "It's a completely different world."



In this Jan. 28, 2015 photo, Chilean Alejo Contreras looks through a window on King George Island in Antarctica. Exploring Antarctica is something Contreras, 53, began dreaming about as a teen after reading Robert Falcon Scott's journal of his journey to the South Pole. When Contreras finally got to the South Pole in 1988, he stopped shaving his beard. Antarctica is "like the planet's freezer," said Contreras, who has led more than a dozen expeditions to the continent. (AP Photo/Natacha Pisarenko)



In this Jan. 24, 2015 photo, Peter Convey, an ecologist for the British Antarctic Survey, searches for samples on Deception Island, part of the South Shetland Islands archipelago in Antarctica. Convey, who has been visiting Antarctica for 25 years, braved heavy rain, near freezing temperature and winds of more than 20 knots to collect samples of the spongy green and brown mosses that grow in patches on the ash of the volcanic island's black rock mountains. He was looking for clues in their genetics to determine how long the species have been evolving on Antarctica, in isolation from other continents. (AP Photo/Natacha Pisarenko)



In this Jan. 24, 2015 photo, a scientist stands behind a window on the Spanish base Gabriel de Castilla on Deception Island, part of the South Shetland Islands archipelago in Antarctica. If experts are right, and the West Antarctic ice sheet has started melting irreversibly, what happens here will determine if cities such as Miami, New York, New Orleans, Guangzhou, Mumbai, London and Osaka will have to regularly battle flooding from rising seas. (AP Photo/Natacha Pisarenko)



In this Jan. 22, 2015 photo, Chilean Navy officers transport scientists to Chile's Station Bernardo O'Higgins in Antarctica. Because there is no local industry, any pollution captured in the pristine ice and snow is from chemicals that traveled from afar, such as low levels of lead found in ice until it was phased out of gasoline, or radiation levels found from above-ground nuclear tests thousands of miles away and decades ago by the U.S. and the Soviet Union, according to David Vaughan, science director of the British Antarctic Survey. (AP Photo/Natacha Pisarenko)



In this Feb. 1, 2015 photo, Holy Trinity church stands illuminated at Russia's Bellinghausen station on King George Island in Antarctica. Holy Trinity is the world's southernmost Eastern Orthodox Church. (AP Photo/Natacha Pisarenko)



In this Jan. 24, 2015 photo, a worker from the Chile's Antarctic Institute sits on the snow on Robert Island, part of the South Shetland Islands archipelago in Antarctica. NASA uses the remoteness of Antarctic to study what people would have to go through if they visited Mars. The dry air also makes it perfect for astronomers to peer deep into space and into the past. (AP Photo/Natacha Pisarenko)





In this Jan. 26, 2015 photo, pinguine footprints cover the beach in Punta Hanna on Livingston Island, part of the South Shetland Islands archipelago in Antarctica. Earth's past, present and future come together here on the northern peninsula of Antarctica, the wildest, most desolate and mysterious of its continents. (AP Photo/Natacha Pisarenko)



In this Jan. 24, 2015 photo, members of the Spanish base Gabriel de Castilla, and scientists watch a movie on Deception Island, part of the South Shetland Islands archipelago in Antarctica. As an active volcano, Deception Island is a pot of extreme conditions. There are spots where the sea boils while in others it can be freezing. And while the sun rarely shines on the long, dark Antarctic winters, night time never seems to fall on summer days. (AP Photo/Natacha Pisarenko)



In this Jan. 24, 2015 photo, a chair sits in the snow, left behind by someone who kept watch for a delayed ship, on the Risopatron Base on Robert Island, part of the South Shetland Islands archipelago in Antarctica. Often, scientists find something other than what they were looking for. Last year researchers calculated that ice on the western side of the continent was melting faster than expected. Last month, scientists researching vital geology in that melting were looking half a mile under the ice in pitch dark and found a surprise: fish half a foot (15 centimeters) long and shrimp-like creatures. (AP Photo/Natacha Pisarenko)



In this Jan. 22, 2015 photo, ice floats in the Bellingshausen Sea near Chile's O'Higgins station in Antarctica. The ice in Antarctica tells how levels of carbon dioxide, the heat-trapping gas, have fluctuated over hundreds of thousands of years. (AP Photo/Natacha Pisarenko)



In this Jan. 27, 2015 photo, an iceberg floats in the Bahia Almirantazgo near Livingston Island, part of the South Shetland Island archipelago in Antarctica. Antarctica conjures up images of quiet mountains and white plateaus, but the coldest, driest and remotest continent is far from dormant. The majority of it is covered by ice, and that ice is constantly moving. (AP Photo/Natacha Pisarenko)



In this Jan. 27, 2015 photo, penguins walk on the shore of Bahia Almirantazgo in Antarctica. Antarctica "is big and it's changing and it affects the rest of the planet and we can't afford to ignore what's going on down there," said David Vaughan, science director of the British Antarctic Survey. (AP Photo/Natacha Pisarenko)





In this Jan. 21, 2015 photo, scuba diver Luis Torres tests the water near the Chilean scientific station Escudero in Villa Las Estrellas on King George Island, part of the South Shetland Islands archipelago in Antarctica. For a dozen days in January, in the middle of the chilly Antarctic summer, The Associated Press followed scientists from different fields searching for alien-like creatures, hints of pollution trapped in pristine ancient ice, leftovers from the Big Bang, biological quirks that potentially could lead to better medical treatments, and perhaps most of all, signs of unstoppable melting. (AP Photo/Natacha Pisarenko)



In this Jan. 24, 2015 photo, snow surrounds buildings used by Chile's scientists on Robert Island, part of the South Shetland Islands archipelago in Antarctica. Temperatures can range from above zero in the South Shetlands and Antarctic Peninsula to the unbearable frozen lands near the South Pole.(AP Photo/Natacha Pisarenko)



In this Jan. 22, 2015 photo taken through a window, a scientist collects samples outside near Chile's station Bernardo O'Higgins in Antarctica. The first explorers set foot in Antarctica hunting 19th-century riches of whale and seal oil and fur. Since then, the continent has proven a treasure chest for scientists trying to determine everything from the creation of the cosmos to how high seas will rise with global warming. "It's a window out to the universe and in time," said Kelly Falkner, polar program chief for the U.S. National Science Foundation. (AP Photo/Natacha Pisarenko)

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