

OCEAN explorer

For the Young Associates of

Woods Hole Oceanographic Institution

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On a cold autumn night in the western Arctic, bands of light called the *aurora borealis*, or Northern Lights, flicker and shift in the sky like a huge neon sign. This effect may be caused by high-energy particles shot from the sun and drawn to the earth by the magnetism of the North Pole.

DAVID C. HERTZ

Arctic Adventure

At the top of the world, beneath a massive blanket of ice that constantly shifts, grinds and cracks, lie five million square miles of chilly water called the Arctic Ocean. Here, the sun scarcely rises in the winter and scarcely sets in the summer. Here, winter temperatures may drop below -50°F (-45.5°C).

The Arctic Ocean is contained within the Arctic Circle, a 3,300-mile ring around the top of the earth, at lat. 66.3° . It is surrounded by the northernmost tips of Alaska, Canada, Siberia, Greenland and Northern Europe. "It is a bare and desolate waste, silent but . . . for the dis-

mal howling of the hungry wolf, or the even more dismal howling of the wind," said S. K. Hutton, an early twentieth-century Arctic medical missionary.

For centuries, hardy explorers have tried to conquer the Arctic. Each mission battled terrible odds in pursuit of a quest, whether it was to find a quick passage from Europe to Asia, to fill a ship's hold with whale oil, to plant a flag on the North Pole, or to drill the ocean floor in search of oil.

In this issue, travel to the Arctic with Ocean Explorer.

ALSO IN THIS ISSUE:

"I've Been to the Arctic"
says John G. Bockstoe, age 15

The Drifters
*Polar Scientists
Ride Ice Floes*

**Arctic
Phenomena**
*Including: Why Is
It So Cold?*

POLAR LIFE
(see page 6)



PAULINA WYKAZ



Arctic Ocean researchers climb a thirty-foot (ten metres) high hunk of ice.



PHILIP JALON

Keith von der Heydt



KEITH VON DER HEYDT

Equipment in a science hut.



PHILIP JALON

Arthur Baggeroer



KEITH VON DER HEYDT

An international ice camp.

The Drifters *Polar Scientists Ride Floes to Study the Arctic Ocean*

A helicopter flies above the frozen surface of the Arctic Ocean on a March afternoon. Arthur Baggeroer of the Massachusetts Institute of Technology and Keith von der Heydt of Woods Hole Oceanographic Institution peer out its big bubble window. In every direction, they see bright, white ice.

Both men are looking for a sturdy ice floe—a sheet of floating ice that may be as large as a small island and about fifteen feet (about five metres) thick—that has survived a number of Arctic storms and will likely survive many more. When they find the right floe, they radio back to their base camp. Airplanes arrive carrying equipment, supplies, and two dozen other scientists. For the next couple of months, the group will camp on this natural “research vessel,” drifting slowly

across the Arctic Ocean, taking measurements and readings along the way. The floe is carried by the Transpolar Drift—an ever-present current that flows from Siberia to Greenland.

Since 1978, Arthur and Keith have been on seven Arctic research missions. Arthur studies ocean acoustics (the science of sound). Using instruments that make or receive sounds, he can learn about the Arctic Ocean’s temperature, its salinity (saltiness), depth, and the shape of its floor. Other scientists on the expedition may study wind speed, humidity (moisture), or the temperature of air and water.

Keith is an engineer. He invents instruments to make the measurements Arthur and his fellow scientists need.

Not much is known about the Arctic

Ocean, because it is so hard to work there. But there is much to learn. Most of the basic research that has been done on other oceans, such as mapping their floors, remains to be done in the Arctic. In addition, some people want to learn more about the interaction between Arctic air, sea and ice because they think this interaction may affect weather patterns around the world.

Living on an ice floe can be very noisy. “It’s exciting to have an ice ridge right next to you in camp,” says Keith. “Ice ridges make an impressive set of sounds as they slam together. They can sound like squealing animals. They can sound like gunshots. They can even sound like trains chugging along. They twang, too.”

When people hear these sounds for the first time, they say, “What on earth is



KEITH VON DER HEYDT

A scientist outside a hut where instruments are prepared (top). Lowering a "noisemaker" to transmit sounds under the ice (bottom).



KEITH VON DER HEYDT

that? "They sometimes worry that the ice might crack around them. 'But we've never lost anybody,' says Keith.

Not all Arctic Ocean research is conducted from ice floes. Some researchers work at the edge of the pack ice, where there is much more open water. They may travel in specially-equipped ships called icebreakers that do exactly that—break up the ice and then move through it.

Keith would rather be on an ice floe than on a ship, even though the working conditions are tough, with high winds and temperatures colder than -45°F (-43°C) or even colder. "It takes a little getting used to," he admits. "But on an ice floe, I can go for a walk. I have to bring my gun, of course," he adds. "Polar bears do sometimes appear—and they are very unpredictable."

"I've Been to the Arctic"

says John G. Bockstoce, age 15

It's hard to get to sleep in the Arctic on a summer night, according to John G. Bockstoce, who has spent several summers there with his father, an Arctic archaeologist and historian. For one thing, it doesn't get dark. Mosquitoes present a problem, too. "The only place to get away from them was in my sleeping bag," says John.

By travelling with his father, John has seen things that most people will never see. "If we ever found any abandoned shacks or huts, he'd tell me about their history," says John. "He'd say, 'That used to be a fish factory.' When I saw those old places, I liked to imagine what it was like to live there."

How did it feel to be so far away from civilization? "It felt great," he remembers. "There was nobody around. I saw lots of animals, like caribou, seals, and polar bears, even in the hottest part of the summer." Was it ever hot

enough to go swimming? "No, but I went anyway." The water was just above freezing!

On his trips to the Arctic, John has eaten some unusual food. "I ate caribou," he says. "It tastes okay, if you like meat." He has spent a lot of time with people in the Northwest Territory, particularly a family called the Porters. In this family, there are kids John's age. "They have a lot tougher life than I have," says John. "They live way up in the Arctic, in a town of 209 people. It is cold all year round. In the summer, it's light all night. In the winter, it's dark all day."

Does John want to go back to the Arctic? "Not as a tourist. I'd like to have a job, or some other important reason to be there."

What John remembers most about the Arctic is how unspoiled a lot of it seems. "The Arctic air is so clean and pure, it's really heaven up there," he says.



RODOLPH OLSEN

John on ice floes.

The Lost Franklin Party

A Tale of Bravery and Tragedy

Over the centuries, many explorers have died trying to conquer the Arctic's vast, merciless expanse. Of all the lost voyages, perhaps none so captivated the world as that of Sir John Franklin and his party. Franklin had successfully completed three Arctic expeditions, two sea voyages and one overland. At fifty-nine, he was ordered by the admiralty to return to the Arctic. He set sail in May, 1845, with two ships, the *Erebus* and the *Terror*, and 138 officers and men. They were never heard from again. After two years, Sir John's wife, Lady Jane Franklin, helped convince the British government to send out search expeditions. Many rescue missions were undertaken over the next fourteen years by British and American and a few French explorers.

What route had Franklin taken? How did ice, wind and storms affect his course? Party after party returned without an answer, though on their journeys,

much was learned about Arctic geography, and polar exploration techniques were enhanced.

Between 1850 and 1854, remains of Franklin's first wintering sites, including a forge and empty meat cans, were discovered on Devon Island. But there

were no clues as to what had happened to the men or where the ships had gone. In 1854, searchers who spoke with Eskimos learned that many of the party had died of starvation, possibly after resorting to cannibalism. Finally, in 1859, a Lieutenant Hobson and his party discovered a rusty can that contained word of the failed missions: the *Erebus* and the *Terror* had been

frozen in the ice in the summer of 1846. Sir John Franklin died on the 11th of June, 1847. One year later, the officers and crew, consisting of 105 men, abandoned the ships, and died during the second winter. Nobody ever found out where Franklin was buried, or how he died.



Franklin

ARCTIC EXPLORATION TIMELINE

MEDIEVAL ERA

late 800s

Vikings settle Iceland.

900-930

Gunnbjörn Ulf-Krakuson, a Norseman, discovers Greenland.

982

Eirik the Red explores the southwest coast and fjords of Greenland, and returns to establish a colony in 986.

AGE OF EXPLORATION AND THE SEARCH FOR THE NORTHWEST PASSAGE

1497-1616

A Northwest Passage through the Arctic Circle from Europe to Asia sought by many, including John and Sebastian Cabot, Corte-Real, Cartier, Verrazano, Sir Martin Frobisher, John Davis, Henry Hudson, and others.

1725-41

Vitus Bering searches for a separation of Siberia and America (1728). Later explores Bering Strait.

1784

Russians establish first foreign settlement in Alaska at Kodiak Island.

1818-27

British Parliament offers reward for discovery of Northwest Passage. Edward Parry explores region. He later leads mission to North Pole that ends only 500 miles short of goal. Note that Parry was nearly 100 years ahead of others who sought to conquer the North Pole.

1831

James Clark Ross locates exact position of North Magnetic Pole on Boothia Peninsula.

1845

Sir John Franklin and others set out for the Arctic. Spend first winter on Devon Island, then two in the ice of McClintock Channel before abandoning their ships and disappearing forever. Many rescue parties try to find a trace of the lost voyage. (see page 3)

ARCTIC P

Why Is It So Cold?

It is cold at the earth's poles for a number of complex reasons, but here are two important factors. First, not all parts of the earth are warmed equally by the sun. Most of the sun's warming rays strike at the equator, in the middle of the earth. The Arctic and Antarctic regions receive much less direct sunlight. As a result, it never gets warm enough in either place to melt the ice that has covered both poles for several million years, at least. Also, this unmelted ice makes the polar regions colder still, for its bright whiteness reflects the sun's heat back out into space.

Ice Talk

Many different types of ice are found in this frozen realm. Here are just a few:
Glaciers: These are formed on land, often at high altitudes, from solidly-packed snow. The largest glaciers, called ice caps, cover plateaus or mountains. Glaciers can sometimes move for great distances at a very slow rate. When they reach the sea, they break up, and become icebergs.

Icebergs: These are floating mountains of fresh-water ice that have broken off glaciers. One-eighth of an iceberg pokes above the surface of the water; seven-eighths of it lie below. This is because freshwater ice weighs about seven-eighths as much as sea water. Every spring, icebergs leave the Arctic Ocean and float in a parade into the North Atlantic, where they become a danger to ships at sea.

Pack Ice: This is the ice, made from salt water, that forms over the Arctic Ocean. It is always forming, freezing, cracking and colliding, with a tremendous racket. Ships passing through rapidly-moving pack ice are at great risk of being crushed.



THE ARCTIC

Floating icebergs can pose a great danger to ships at sea.



ERA OF WESTERN ARCTIC WHALING

PHENOMENA

Even The Compass Becomes Confused

You may think that when a compass needle points north, it points to the North Pole. Actually, it points to a place called the North Magnetic Pole. This is located on the Boothia Peninsula, at the northernmost point of the Arctic Coast of North America. The North Magnetic Pole was discovered by Sir James Clark Ross in 1831.

To make matters dizzier still, there is no one particular spot that is called the North Magnetic Pole. It travels around in a 20-mile circle. It might even shift back and forth between morning and night!

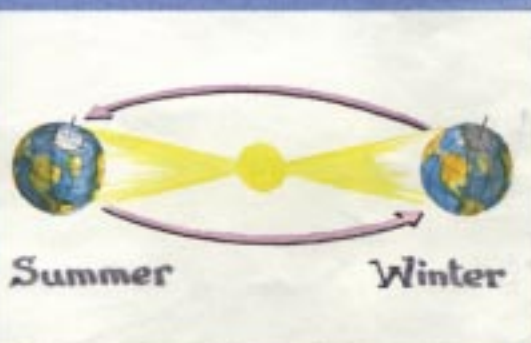
Though this twenty-mile area is accurate enough a location to serve as a compass point from distant parts of the world, when explorers actually draw near to it, they find that their compass needles go haywire. Needles may point west when they should point north. They may even spin crazily around. Arctic explorers have special charts and equipment that compensate for this situation.



ARCTIC CIRCLE

Why Are The Days So Long In Summer And So Short In Winter?

As the earth spins around the sun, its axis is at a tilt. Therefore, the sun strikes the earth differently at different times of the year. This effect is most extreme at the poles. In the summer, the North Pole leans towards the sun. At that time of year, the sun can be seen there most of the day



and night. In the winter, the North Pole tilts away from the sun. At that time of year, the sun can scarcely be seen at all.

1848-1914

Great era of Yankee Whalers in Western Arctic. During this time, over 18,650 bowhead whales are killed for commercial purposes.

DISCOVERY OF TRANS-POLAR CURRENT

1879

George Washington De Long of U. S. Navy sails on the *Jeannette* from San Francisco. The boat is crushed in the ice of the Western Arctic. Three years later, wreckage of the *Jeannette* is found across the ocean, in Greenland.

CONQUERING THE NORTH POLE

(also see entry for 1818-27)

FUTURE

1990s

Scientists study the Arctic Ocean to learn more about its make-up, its resources, and about its relationship to the world's climate.

1969

S.S. *Manhattan* makes first commercial traverse of Northwest Passage.

1959

United States nuclear submarine *Nautilus* achieves first under-ice crossing, travels from Point Barrow to Spitsbergen (1,830 miles) in 96 hours.

MODERN DAY

1931

Sir Hubert Wilkins attempts to cross the Arctic Ocean in his submarine, the *Nautilus*.

1926

Road Amundsen, Lincoln Ellsworth and Umberto Nobile become first men to fly over North Pole in the dirigible *Norge*.

1908-9

Robert Peary of the United States leads a foot expedition of over 900 miles on ice to reach the North Pole at noon on April 6, 1909. His party includes Matthew Henson, the first African-American to journey to that region.

1893-96

Fridtjof Nansen of Norway tries to reach North Pole by drifting with transpolar current.

Polar Life

Above and Below the Ice

In spite of the harsh conditions, all sorts of wild creatures call the Arctic home, as you can see in this cutaway drawing of a cold Spring day at the edge of the pack ice. In the sky, two arctic terns fly by, having recently returned from Antarctica. Arctic terns fly for seven months of the year, ranging between both poles. On the ice, you can see a mother polar bear and her cub, just emerged from a den. The mother bear may be hungrily eyeing the bearded seal that is poking its head above the ice.

Nearby crouches an arctic fox, hoping to feed on some scraps from a kill made by the polar bear. The arctic fox still wears its white winter coat, though its darker summer coat will begin to come in before too long.

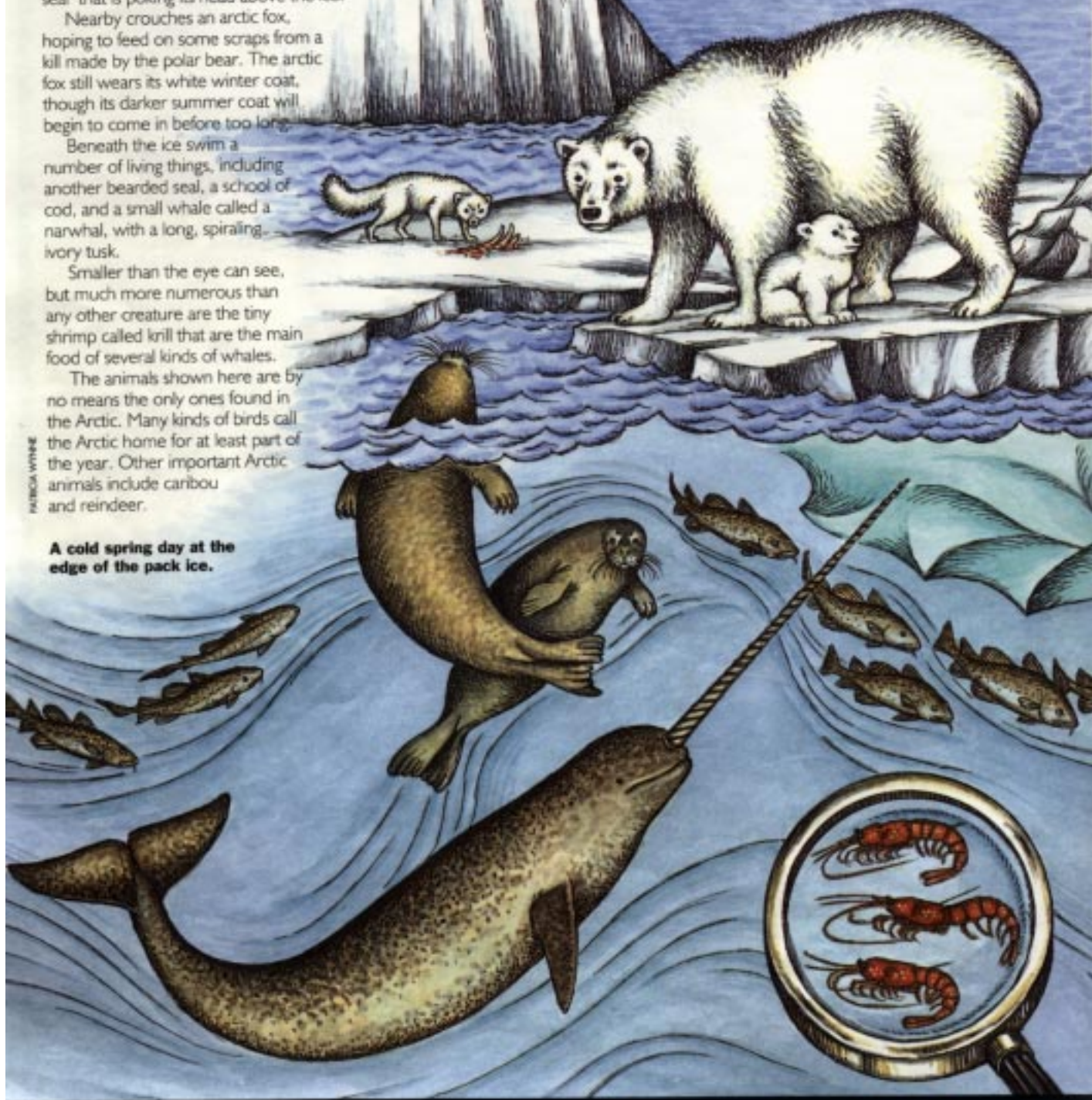
Beneath the ice swim a number of living things, including another bearded seal, a school of cod, and a small whale called a narwhal, with a long, spiraling ivory tusk.

Smaller than the eye can see, but much more numerous than any other creature are the tiny shrimp called krill that are the main food of several kinds of whales.

The animals shown here are by no means the only ones found in the Arctic. Many kinds of birds call the Arctic home for at least part of the year. Other important Arctic animals include caribou and reindeer.

PATRICIA WYNN

A cold spring day at the edge of the pack ice.



To Find Out More About The Arctic

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An eddy swirls at the edge of pack ice.



ILLUSTRATION BY JEFFREY M. HAYES

Message in a Bottle

What Hurricanes Can We Look Forward To?

Dear Ocean Explorer,
 In your last issue you wrote the hurricane names in alphabetical order for 1991. Do they begin at the beginning of the alphabet at the beginning of every new year?

Amber Radant
 East Falmouth, MA

Dear Amber,
 Yes, hurricane names do start at the beginning of the alphabet each year. But different names are used every year, based on a rotating list. Aren't you glad that the hurricane season is finally over for this year?

Dear Ocean Explorer,
 Are there any women oceanographers?
 Laura Summers
 Citrus Grove, CA

Dear Laura,
 There are many women oceanographers. Watch for articles about women oceanographers in upcoming issues.

SEND QUESTIONS TO: Editor, Ocean Explorer, c/o Woods Hole Oceanographic Associates, Woods Hole MA 02543.

JASON Project Will Show Galapagos Islands to 500,000 Students

Dr. Robert S. Ballard, who found the RMS Titanic and the German battleship Bismarck, will lead the third JASON Project expedition to the Galapagos Islands December 2-14. Students at 20 sites around the U.S. and Canada will take part in this electronic field trip, interviewing scientists at work via a satellite connection, and remotely driving an underwater robot. Watch for a report on this exciting experience in the next issue of Ocean Explorer.



OCEAN EXPLORER

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Make a Blubber Glove

Have you ever wondered how whales and other marine mammals could stay warm in chilly Arctic waters? Find out by making a blubber glove.

WHAT YOU NEED:

- two one-gallon plastic bags
- one pound of solid vegetable shortening, such as Crisco
- duct tape
- a bucket of warm water
- a bucket of cold water

WHAT YOU DO:

1. Put the solid vegetable shortening in one plastic bag.
2. Put the other plastic bag on your hand. Wrap duct tape around your wrist and around the top of the bag, to seal the bag shut. Put your bagged hand into the bag that holds the vegetable shortening. Seal both bags shut with duct tape.
3. Put your bagged hand into the warm water. What does it feel like?
4. Put your bagged hand into the cold water. What does it feel like?
5. How do you think marine mammals' blubber protects them from extreme water temperatures?



This activity was originally developed for the Whale Kit created by the New England Aquarium for the Museum Alliance for Science. Reprinted by permission of New England Aquarium.

