It's a fact
The world's largest tanker, the Jahre Viking, is almost two football fields longer than America's largest aircraft carrier.

DISCOVERY

EVERY TUESDAY, SCIENCE IN OUR TIMES

Reading list
"The Next Great Thing: The Sun, the Shining Engine, and the Drive to Change the World," by Mark Shelton (Norton, $25), examines an inventor's solar-power dreams.

Breaking another barrier

● OCEANOGRAPHY: The Arctic in many ways remains a vast expanse of mystery. Pioneered by icebreaking ships, 70 scientists plan what they say is a landmark expedition to find out more about physical phenomena in this part of the globe.

By Bill Dietrich
Seattle Times science reporter

The Arctic's Canadian Basin north of Alaska and eastern Siberia is the world's least explored ocean, a world of stunning colors and exotic wildlife that has recently been invaded by air and marine pollutants.

This summer two surface ships, including a Seattle-based icebreaker, will penetrate it for the first time while carrying a contingent of 70 scientists led in part by a veteran polar oceanographer from the University of Washington.

Also included will be two Inuit Eskimos who will help the vessels pick their way through the planet's thickest marine ice pack, spot animals and report back to their people on what the scientists find.

"This is a landmark undertaking," said Knut Aagaard, the physical oceanographer who has been planning the expedition for five years. "The breadth is quite remarkable. The logistical difficulties are quite remarkable. The focus of our work is global change, broadly construed."

Scientists will plumb the depths for ocean sediments, send balloons aloft and sample as much as possible in between to see what clues can shed light on climate change, air and water pollution, and the role of creatures ranging from marine plankton that absorb greenhouse gases to polar bears that concentrate pesticides in their fat.

In the past scientists have relied primarily on camps set up on ice floes, supplied by air. But in 1991 a German-Swiss expedition used icebreakers to approach the North Pole from the Europe side, giving European scientists the ability to bring the instruments and labs only a ship can carry.

Americans and Canadians decided to top that achievement by approaching the Pole from the Bering Strait, between Alaska and Siberia, where the intervening ice pack is twice as wide — 1,800 miles — thick and jumbled.

"It's the most difficult ice conditions on the globe," said Coast Guard Capt. Lawson Brigham, commander of the Seattle-based Polar Sea and a veteran of trips to both Antarctica and the Arctic.

The 399-foot-long Polar Sea will be accompanied by Canada's 396-foot Louis S. St. Laurent, the two ships taking turns breaking a path. The heavily reinforced ships have a bow that rides up over the ice pack and displaces it, with the Polar Sea featuring a special low-friction paint on the hull that discourages ice or snow from sticking.

Although the ships have the power to surge ahead with battering-ram force, "the strategy is to go where the ice is not, or the ice is weakest," Brigham explained. The ships are expected to average about three to five knots and are limited in range only by their fuel.

Russia has nuclear-powered icebreakers, which have penetrated to the Pole and have even carried tourists, but that country has not conducted an ambitious scientific expedition.

The Polar Sea will carry six trailer labs bolted to its deck with four more labs inside, and it will get scientists out onto the ice with two helicopters and landing craft. The Canadian ship has similar equipment.

While Arctic researchers are delighted to have the use of a ship platform with accompanying helicopters to aid their research, scientists in Antarctica — where summer ice pack is much less — have long used ships. Recently, they set up their first floating ice camp, like their Arctic counterparts, on Antarctica's Weddell Sea.

If time and fuel permit on the 55-day mission, the American-Canadian expedition will travel to the North Pole. The primary mission, however, is to map and study the ocean basin between that point and Alaska.

The Arctic is potentially a big trouble. Ozone depletion is most severe in polar regions. Global warming in the Arctic is expected to raise temperatures two to four times the planetary average, perhaps drastically changing the ecology. Pollution from Russian rivers is pouring into the basin and circulating toward the Canadian and Alaskan coastline. Air pollution from Russia and Europe produces haze at Barrow, Alaska.

It is not a place of "sheer beauty," Aagaard described in explaining why he is willing to give up most of a Seattle summer for two months of frequent overcast and freezing temperatures.

"The clarity of the sky is incredible, like being in the desert," he said. "There is the changing of breaking ice all around you, there is the solitude, there are incredible natural displays. The subtlety of colors in the north are marvelous."

"It's a great adventure," said Brigham.

Aagaard has worked in the arctic for three decades. He has been forced into emergency landings in aircraft, seen ice camps split in two as ice floes crack, and he has fallen into the chill water. "You get out in a hurry," he said.

A Twin Otter propeller plane he once was riding in landed on ice that broke. The pilot just got out a mayday from the sinking plane before near-freezing seawater shorted out the radio. Such experiences have not deterred him from returning.

Aagaard will concentrate on taking water samples to better understand the physics of ocean circulation.

There is a very practical reason for studying such a remote part of the earth, Aagaard said. "We are changing the globe in ways that have the potential for very much affecting the way we live," he said of pollution.

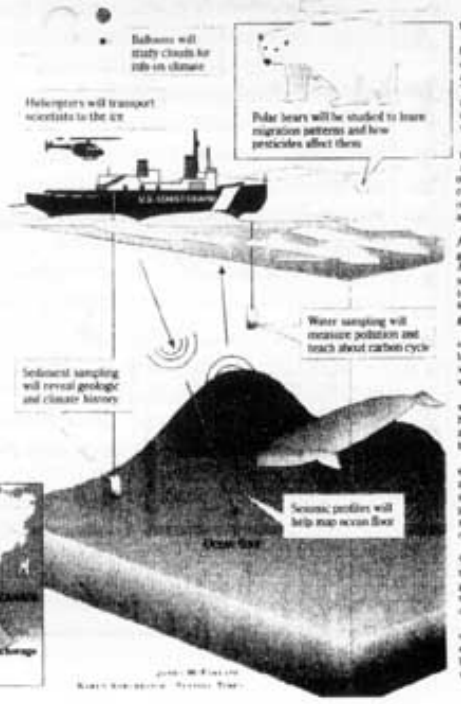
Because the Arctic is so empty of most human influences, it can serve as an early warning of disastrous trends.

That is why it is no surprise that two Inuits are along, he said. "They have a huge stake in all this."

The Coast Guard's *Polar Sea will be one of two icebreakers carrying a contingent of 70 scientists to the Arctic this summer.*

Capt. Lawson Brigham *is the commanding officer of the Seattle-based Coast Guard icebreaker Polar Sea.*

How the Polar Sea and Louis St. Laurent will study the Arctic Ocean



What scientists hope to find in icy depths

Here are projects being conducted on this ambitious voyage:

• Carbon cycle: Plankton, algae and bacteria are the base of the arctic food chain and play a role in converting atmospheric carbon dioxide to carbon. Their abundance, biological role and the ultimate fate of their carbon after they die is largely unknown in the region the ships will traverse.

• Polar bears: Do these animals migrate far offshore into the central ocean? And because their fat intake is the highest of any animal in the world, are they concentrating pesticides in their fat? Also observed will be beluga whales, narwhals and ringed seals.

• Reconstructing the past: Has the Arctic climate changed? What is the geologic makeup of shifting plates on the Arctic Ocean bottom? Scientists will use sediment samples, sound signals and other techniques to reconstruct a climate history for 2.6 million years and map the sea's geology.

• Mapping: Despite submarine transits, many parts of the Arctic Ocean have never been sounded for depth. The expeditions will try to fill in gaps in the Canadian Basin, which is up to 13,000 feet deep.

• Ice characteristics: Scientists are working to understand how ice circulates, how far polluted ice can carry contaminants, and what climate change might mean to the ice pack.

• Pollution: How much human filth, especially from Russia, has made its way around the once-pristine Arctic? Water and sediments will be sampled and normal plankton examined to determine the spread of heavy metals, radioactive waste, oil, acid and raw sewage.

• Clouds and the greenhouse effect: Scientists will study the cloud cover to try to determine whether clouds caused by global warming, pollutants and so forth might counteract or reinforce climate change.

Powering big ships through a frozen ocean is just one technological advance the expedition represents. Satellite photos will be used to study the ice in front of the vessels and pick the easiest path.

DIGEST

Digest these stomach secrets

While Washington State University scientists have got a portfolio in a cow's safe to study its digestion and Battelle Laboratory scientists are cataloging underground bacteria, Oregon State University scientists are looking for helpful bugs in still another source: sheep and what sometimes.

Mammals have about 1,000 varieties of bacteria in their digestive systems to help them process food, and sheep have one that breaks down the alkaloid poisons in tansy ragwort, a weed that kills about $20 million in livestock each year in Oregon alone.

A company called Pioneer Hi-Bred has purchased the rights to develop the microbe as an additive for cows or other critters to protect them from tansy poisoning.

Meanwhile, OSU microbiologist Martin Craig was developing a testing program for sled dogs in Alaska's Iditarod Race when he was tipped by Eskimos to the digestive machinery of bowhead whales that allows them to consume oil-contaminated food without harm. Researchers hope that microbe can be harnessed to help clean up oil spills.

A gut reaction to lifestyle

Another microbe, one strain, is the primary cause of the peptic ulcers often blamed on high-pressure jobs, says Dr. Fred Silverstein, a University of Washington professor of internal diseases.

The culprit is a critter known as H. pylori, a common microbe that affects some people but not others, for reasons unknown. Silverstein advises that patients with ulcers should inquire about antibiotics to kill the germ before they blame the disease on their lifestyle.

Perplexing plutonium

The good news is that the U.S. and Russians are cutting their nuclear arsenals. The bad news is that there is no easy way to get rid of the plutonium fuel that powers the bombs, leaving the possibility of terrorists theft or sale by hard-pressed economies to countries such as North Korea or Iraq.

One National Academy of Sciences idea is to mix the plutonium with nuclear plant fuel and burn it, which destroys 30 percent and leaves the rest embedded in spent fuel, making it less accessible, says Chemical & Engineering News.

Another is to mix it into molten glass and make vitrified logs for storage underground, but it could not be easily retrieved. A third is dumping it down bore holes a kilometer or deep and sealing them, to keep out thieves.

No method is likely to be adopted soon enough to reduce the plutonium stockpile over the next decade.

Thunder rare in the NW

Newcomers who settle in the Northwest from other parts of the country are right if they think something is missing: thunderstorms. We just don't have many.

At any given time, roughly 7,000 thunderstorms are hurling bolts of lightning to Earth's surface. Fewer than 1 percent of these storms will be classified as severe, although any thunderstorm can produce severe weather. And in the United States, plenty strike Florida and the southeast plains of Colorado, which have the highest thunderstorm frequency.

They are rarer in Alaska, where they occur only about once a year, followed by the Pacific Northwest, where residents experience only two or three thunderstorms a year.

— *Bill Dietrich*

CALENDAR

• Snohomish County Cooperative Extension Offices will have a "Summer Bug Day" from 10 a.m. to 8 p.m. July 22, at the end of the road in McCollum Park, 600 128th St. S.E. Participants will learn to collect, identify and label insects. The $5 cost also buys three slices of pizza. Register by July 15 with Peggy Day, 367-2192.

Send dates for this calendar to Discovery Calendar, The Seattle Times, P.O. Box 70, Seattle, WA 98111. Deadline is [illegible]