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## 2-Year Study of Polar Changes Set to Begin

By [ANDREW C. REVKIN](#)

Scientists from more than 60 countries are preparing to fan out around the North and South Poles in an ambitious two-year effort to understand the vital, shifting dynamics of ice, oceans and life at the ends of the earth.

With a budget of about \$350 million spread over more than [120 projects](#), researchers will camp on drifting Arctic Ocean sea ice and trek to largely uncharted [Antarctic](#) mountains.

They will use gliding underwater robots, giant icebreaking ships, satellites and other technologies to explore polar climate, biology, geology and ocean chemistry, and they will undertake physics and astronomy studies that can be done only at the poles.

A central goal of the effort — called the [International Polar Year](#) despite its two-year timetable — is to clarify the role of greenhouse gases and [global warming](#) in the rapid changes that are already occurring at both poles.

In the Arctic, sea ice in summer has been in an accelerating retreat. In parts of Antarctica that are warming, coastal ice shelves and inland ice sheets have been disintegrating and surging seaward in ways that could hint at a faster rise in global sea levels in coming decades.

But at both poles, scientists say, questions still outnumber answers.

The project will formally begin Thursday. Opening ceremonies will be held today in Washington, London and Strasbourg, France.

This is just the fourth such integrated Arctic and Antarctic science effort since 1881. The last such project, which included broader studies of the oceans and earth, ended in 1958.

John H. Marburger III, the science adviser to President Bush, said the United States had a vital interest in studies at both poles.

“The North Pole is in our backyard,” he said in an e-mail message. “The U.S. has huge

geopolitical interests in the Arctic region, and we need to understand the changes that are taking place there. Many other countries have direct economic interests in the Arctic, and all are served by joining forces in I.P.Y. research. Additionally the rapidly diminishing ice in the Arctic is creating new opportunities for transport and marine resource development.

“The South Pole is on a major continent, still poorly understood,” Dr. Marburger added. “With the exception of the Arctic Ocean, all the oceans of the [Earth](#) communicate in the Antarctic region, which makes it a significant factor in processes of global change, particularly as influenced by ocean currents. It offers remarkable opportunities for astronomy, and is already the site of a sophisticated neutrino detector utilizing the deep and stable ice deposits near the pole.

“Antarctic marine organisms are an integral part of the increasingly vulnerable marine wildlife environment, and play a significant role in the world food chain.”

Other studies will examine the impact of pollution, retreating sea ice, thawing tundra and other fast-changing conditions on native communities ringing the Arctic Ocean.

Some projects are utilitarian, like fresh surveys of ocean-bottom terrain and studies sifting for hints of oil and gas or other natural resources.

But the most pressing questions being pursued relate to warming caused by the atmospheric buildup of heat-trapping gases like carbon dioxide. Experts involved with the polar year say the earth’s coldest places are likely to be especially affected.

“The poles are going to lead the way in climate change,” said Ted Scambos, a researcher at the National Snow and Ice Data Center in Boulder, Colo. “To know what we’re in for in the next 10 years, in sea level or in climate, we need to look at the poles now. They are the amplifiers of the small warming that greenhouse gases cause.”

Particularly urgent, many experts said, is the need to improve understanding of the complicated forces that might cause warming ice sheets in Greenland and parts of Antarctica to flow more quickly into the sea.

Greenland’s vast ice cap is twice the size of California, and it holds as much water as the Gulf of Mexico. If it all melted, sea levels from Boston to Bangladesh would rise more than 20 feet, experts say.

The latest report on sea level trends by the United Nations Intergovernmental Panel on Climate

Change said such melting could take a millennium or more. But because of a lack of long-term measurements and poor understanding of the physics of ice, that analysis largely excluded hints of an accelerating flow of ice and meltwater from Greenland into the seas.

“The change of phase from snow and ice to water is the biggest tipping point in the earth’s system, and so although the International Polar Year covers a huge range of science, for me the big issue is climate change and the impact that it’s having here,” said Chris Rapley, the director of the British Antarctic Survey, in a message from Antarctica.

“Over the next two years, I’m looking forward to major progress on key issues,” he said. “The trillion-dollar question from the point of view of sea-level rise: how much, how quickly?”

The climatic equations are complicated. Over the two years — researchers want to study both regions through complete summer and winter cycles — teams will examine the effects of shifting solar activity, greenhouse gases and the synthetic chemicals that harm the ozone layer, which have an outsize impact at the poles.

Other scientists will intensively study the warming of the permafrost and tundra across vast stretches of northern continents for signs that thawing ground, bogs and lakes are giving up emissions of methane and carbon dioxide.

Marine scientists will plumb the Arctic Ocean and productive waters around Antarctica to see how shifts in sea ice and ocean currents affect species from clouds of shrimplike krill to whales, penguins and polar bears.

Most of these subjects have already been a focus of research. But several veteran earth and polar scientists said periodic intensive efforts like the polar years helped them to generate fresh ideas, collect data that individual countries lack the resources to pursue, and refresh the public’s appreciation for the splendor of the world’s least-habitable places.

Walter Munk, 89, an emeritus professor of geophysics at the [University of California](#), San Diego, who helped run the 1957-58 effort (called the International Geophysical Year), said that what was needed most was long-term studies of earth’s poles and oceans.

But he added that the polar year would provide a necessary short-term focus. “Our society is poorly conditioned for sustained efforts,” he said in an e-mail message. “I rather think that without the occasional burst there would have been even less of a sustained effort.”

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