

CRACKS IN THE ICE

by Barbara Mitchell

"The world is small and rapidly getting smaller," Admiral Richard E. Byrd wrote in 1935, but "the Antarctic has shrunk least of all." His observation still holds true, even though the world, driven by science and by economic and political imperatives, is steadily moving in on the continent.

Today, scientists are extracting new information from Antarctica about our planet—its past, its climate, and its inhabitants—and about the universe itself. While they have not found rubies and diamonds, today's explorers are uncovering other kinds of wealth: Coal, copper, iron ore, and uranium all exist on the continent, in quantities not yet fully known. There is also reason to believe that Antarctica's continental shelf may contain sizable reserves of oil and natural gas, perhaps matching those of Iran. And fishing fleets have already begun harvesting krill, the shrimp-like creatures, high in protein, that flourish in Antarctic waters. For the 14 nations with direct interests in the continent, the payoff may not be far away.

Politically, Antarctica was sliced up like a pie before the end of World War II, with wedge-shaped national claims radiating from the South Pole to the coast. Britain pressed the first claim, in 1908, on the basis of its early exploration of the continent. Later, it ceded territory on the continent to New Zealand and Australia, and France staked a claim in 1939. Anxious to forestall a "land grab" by Nazi Germany, Norway advanced a claim in 1939, citing the expeditions of Roald Amundsen and others. Chile and Argentina staked claims on the easily accessible Antarctic Peninsula in 1940 and 1943 respectively, both tracing their historical rights to a Papal Bull of 1493 and to the 1494 Treaty of Tordesillas, which granted all lands west of the 46th meridian to Spain. (These two claims, and Britain's, overlap.)

The Germans never did get a slice of the continent, although Nazi Reichsmarshal Hermann Goering in 1938 dispatched the catapult ship *Schwabenland* to the Queen Maud Land region of Antarctic for the specific purpose of claiming territory for Hitler's Germany. Seaplanes launched from the ship's deck mapped 350,000 square miles of the continent by air, dropping steel markers stamped with swastikas to establish the claim. After World War II, however, both East and West Germany de-

cided not to press the matter, apparently to avoid the appearance of renewed German expansionism.

Antarctica played only a minor role in the war. Beginning in 1940, Nazi cruisers operating from Antarctic waters attacked allied cargo vessels rounding the Cape of Good Hope and Cape Horn, sank the Australian cruiser *Sydney*, and mined the Australian harbors of Sydney, Melbourne, Hobart, and Adelaide. Britain responded by sending warships south to search for the German raiders, but they eluded detection. In 1944, London launched Operation Tabarin, establishing a base at Deception Island to deny use of its natural harbor to the Third Reich.

A Giant Aircraft Carrier?

The war highlighted one conflict on the continent that did not simmer down after V-E Day. During the war, British and Argentinian shore parties ripped up each others' flags and destroyed claim markers where the "territories" of the two countries overlapped on the Antarctic Peninsula. In 1952, an Argentine naval unit fired machine guns over the heads of a British party coming ashore in a disputed sector. The Argentines later apologized for the incident, explaining that the gunfire was merely a friendly greeting. A year later, the British arrested two Argentine nationals for "trespassing" on Deception Island.

Argentina, like neighboring Chile, has always considered the defense of its beachhead on the nearby continent a matter of national honor. Leaders of both countries have consistently denied the validity of claims based on discovery alone, insisting that "effective occupation" is required. To that end, in 1973, the President of Argentina took his entire Cabinet to Vicecomodoro Marambio station, on an island off the peninsula's coast, and declared it the provisional capital of his country. (It is the law of the land in both nations that all locally published maps depict Antarctic territory as part of the mother country.)

For all the postwar difficulties regarding claims and boundaries, potentially the most troublesome rivalry over Antarctica arose between two countries with no formal claims: the Soviet

Barbara Mitchell, 31, is a project director at the International Institute for Environment and Development in Washington, D.C. Born in London, she received a translator's diploma from the University of Geneva (1971) and an M.A. in international relations from the University of Sussex (1974). She is the author of Antarctica and Its Resources (1980, with Jon Tinker) and The Management of the Southern Ocean (1980, with Richard Sandbrook).

Union and the United States. Nazi Germany's marauding warships had proved that Antarctic waters could serve as a useful military base. In a war between the two superpowers, some Americans feared the Soviet Union might use the continent as a kind of giant, immobile aircraft carrier or, worse, as a base for intercontinental ballistic missiles.

Hammer and Icicle

In 1946, the United States sent 4,000 men and 13 ships south in Operation Highjump, the largest exploratory expedition ever assembled. During Highjump, the Navy mapped many small sections of the coastline, with the secret objective of establishing the basis for a U.S. claim "over the largest practicable area of the Antarctic continent." The expedition also served as an opportunity to train soldiers and try out equipment for use in polar regions. But a plan to test submarines in the Antarctic failed when the diesel submarine *Sennet*, running on the surface, was battered by pack ice and had to be towed out by an ice breaker. Since then, Antarctica has not figured prominently in the Pentagon's view of the world.

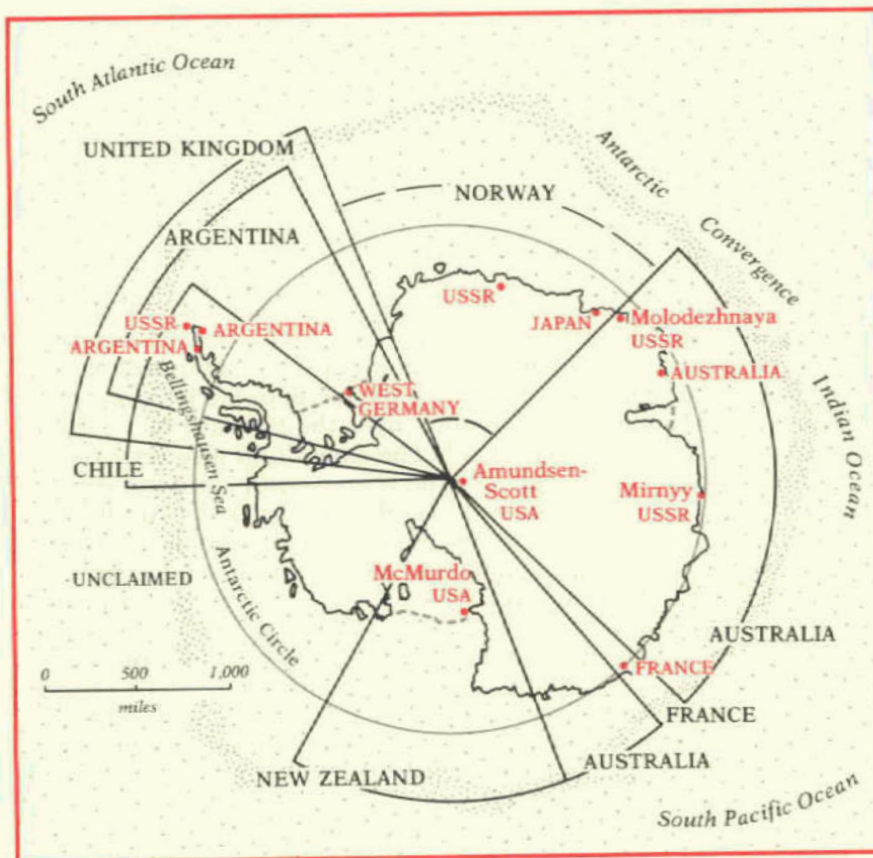
The Soviets, for their part, established a stake in Antarctic affairs by asserting in 1949 that the Russian admiral Thaddeus von Bellingshausen had been the first to sight the continent in 1820. The hammer and sickle flew over Antarctica in 1956, with the establishment of a Soviet base in the Australian sector. The Soviet presence has continued to expand, but there is no evidence that the Soviets see any more military significance in Antarctica than America does.

The 1957–58 International Geophysical Year (IGY) was a turning point for the continent. During the IGY, scientists around the world carefully coordinated their experiments and observations in many fields—climatology, meteorology, and cosmic ray research—in order to further their knowledge of global phenomena. The effort brought scientists and military support units from 12 nations to Antarctica, where they worked together without friction.

The chief lesson of the IGY seemed to be that international scientific cooperation could work, at least in Antarctica. In 1959, at the urging of the United States, representatives from the 12 countries active on the continent put together an Antarctic Treaty and signed it in Washington.* The treaty is a remarkable

*The original signatories included the seven claimant countries (Argentina, Australia, Britain, Chile, France, New Zealand, and Norway) and five others (Belgium, Japan, South Africa, the Soviet Union, and the United States).

ANTARCTICA



Source: *Polar Regions Atlas*, Washington, D.C.: U.S. Central Intelligence Agency, 1978.

The map above shows the location of stations staffed year-round by an average of 30 or more people. In all, there are 45 bases on the Antarctic mainland or nearby islands, distributed among 12 nations: Argentina (10), the Soviet Union (nine), the United States (six), Britain (five), Australia and Chile (three each), Japan, New Zealand, and Poland (two each), and France, South Africa, and West Germany (one each). Pinched financially, Norway and Belgium closed their last bases in 1959 and 1961, respectively, but retain full standing as signatories of the Antarctic Treaty. Norway has purposely left the northern and southern limits of its claim undefined; legal recognition of the "sectoral" principle could endanger its claims in the Arctic. In the unclaimed sector, where the United States has the strongest legal case for title, the United States and Soviet Union each maintain a tiny base. The Soviets have no formal claim anywhere on the continent.

agreement. It freezes the legal status quo in Antarctica, theoretically suspending the struggle over claims at least until the pact becomes subject to review in 1991. (The treaty will be reviewed only if one of the signatories requests it.) Until then, the continent is supposed to remain a kind of open-air laboratory, with free access to the whole continent guaranteed to any nation that cares to send an expedition there. Local testing of nuclear weapons and the disposal of nuclear wastes are banned, and each treaty nation has the right to inspect the others' facilities. No military activities are allowed, although military personnel and equipment can be used "for scientific research or other peaceful purposes."

There is no secretariat and no headquarters. Representatives from each signatory country simply meet every two years in a different capital to discuss plans and coordinate activities. (The most recent treaty meeting was held in Buenos Aires in June 1981.) The treaty provides that any intractable dispute be referred to the International Court of Justice at the Hague (with the consent of all concerned), but that has never been necessary.

Antarctica on \$400 a Day

The Antarctic Treaty has made the continent the province of scientists, who conduct research there in such fields as glaciology, paleontology, ornithology, and even human psychology. Approximately 900 people spent the 1980 austral winter on the continent; during the summer of 1980-81, the population rose to more than 2,000.

The accommodations have improved since the days of Scott and Amundsen. At McMurdo Station, the main American base, managed by the Navy, the summer residents can avail themselves of four saloons, a chapel, a Jacuzzi bath in the fire station, fresh kiwi fruit from New Zealand, and piña colada-flavored frozen yogurt. Windows sometimes have to be kept open in the dormitories—the rooms are heated to 85 degrees. The Annual Scott's Hut Race, a five-mile run over ice, draws many local joggers.

Antarctica even has a small tourist industry, the only commercial activity on the mainland. Two airlines began flying sightseeing tours over the mainland from New Zealand and Australia in 1976, but these tours were suspended in 1979 after an Air New Zealand DC-10 crashed into Mount Erebus. All of the 257 people aboard were killed instantly. Today, only the Australian airline offers the tours. Cruise ships have visited the continent regularly since 1966, bringing some 900 tourists to the far

south each year. A five-week tour can cost up to \$14,000. The ships visit research stations, penguin rookeries, and abandoned whaling bases.

Antarctica is no playground, however. Each of the 45 stations is a hub of research activity. About one-quarter of McMurdo's summertime population are scientists; the rest are Navy and civilian staff who provide support services.

Nature's "Anti-Freeze"

Hardly touched by man, Antarctica is remote from factories and their by-products, providing an ideal location for monitoring global trends in pollution. Scientists based in Antarctica track pollutants in the upper atmosphere and measure their accumulation as they fall on the continent's ice. Antarctica's purity serves other purposes. Last winter, a microbiologist from the University of Wisconsin used McMurdo's isolated population to test iodine-soaked "killer Kleenexes" as a cure for the common cold. (Due to their isolation, those who winter-over seldom catch colds or other common illnesses until new people arrive in the spring. Then everyone gets sick.)

Scientists studying the formation of the solar system are taking advantage of one of the continent's most plentiful resources—meteorites. In Antarctica, one can find meteorites that fell to the ice a million years ago and, thanks to the cold, remain uncontaminated. The shifting ice sheet has clustered them together in just a few locations—making Antarctica this planet's biggest known depository of other-worldly refuse. A dozen years ago, only 2,000 meteorites had been found anywhere in the world. But, since the Japanese first discovered meteorites in the Antarctic in 1969, over 5,000 samples have been collected there. In some of these specimens, scientists have discovered amino acids, leading to the conclusion that these chemicals, which are essential building blocks of life, must exist on other planets.

Researchers have also been trying to pin down precisely how Antarctica's few plant and animal species adapt to their harsh environment. For example, it appears that Antarctic fish contain glycoproteins that prevent their blood from freezing. The proteins seem to bind to the minute ice crystals that form in the blood of the fish, somehow melting them before they grow large enough to do damage. These "anti-freeze" proteins may have a number of practical applications. Transplant organs, sperm, and blood, for example, could be stored for far longer periods of time than is now possible if they could be kept at very low temperatures without freezing. A patient with failing kidneys would



Courtesy British Antarctic Survey; Library of Congress.

The 1957–58 British Transantarctic Expedition traveled in vehicles such as the “Sno-cat” (christened Rock ‘n’ Roll) above; the men of Scott’s second expedition (inset) did not have it so easy in 1911–12.

not have to wait for a donor to die if doctors could build up a supply of these organs.

Other scientists, working in Antarctica’s “dry valleys,” have discovered a completely unique form of life. Free of snow and ice, the dry valleys lie between snow-covered mountains in a few scattered locations, inland from the Ross Sea. They were probably created when the surrounding glaciers receded and have been kept clear by the winds roaring off the polar plateau. They are as dry as a desert, and their rocky brown soil seems entirely barren and forbidding.

In one of these valleys, however, near the Ross Sea, there is a frozen lake fed by the occasional summer run-off from nearby glaciers. Two American scientists burned a hole through the permanent 15-foot-thick ice covering it and dove into what one of them called “a window on the past.” In the middle of the lake, 120 feet below the surface, there is no gaseous oxygen in the water; the scientists found algae that seemed to be thriving on hydrogen sulfide instead of the oxygen that is essential to most other forms of life. The lake’s blue-green algae are extremely

primitive. They were among the first forms of life to appear on the planet and thrive in Antarctica virtually unchanged.

Antarctica's ice has provided a record of past climatic conditions. Two U.S. scientists recently put forward the controversial theory that the volume of nitrates preserved each year in the accumulating ice sheet provides a record of the sun's annual energy output. These scientists maintain that they can detect the impact of the Little Ice Age, between 1645 and 1715, when solar energy levels were lower and average temperatures declined by about 2°F.

Because the polar plateau is so high (it is a mile above sea level, on the average), and because ice is such a poor conductor, Antarctica serves as a perfect radio "tower." At one U.S. station in the interior, scientists strung a 13.6-mile-long cable on 15-foot poles to make an antenna for very low-frequency, long-distance radio experiments. Anywhere else in the world, it would have cost hundreds of millions of dollars to build towers that high above sea level. The Antarctic antenna cost only \$75,000.

Inevitably, man's extensive scientific investigation of Antarctica has also produced a growing inventory of the continent's natural resources. Ever since 1909, when Ernest Shackleton found a coal seam near the Beardmore Glacier, geologists have been aware that the continent is more than just ice and worthless rock. But Antarctica's remoteness and hostile climate make exploitation a difficult business.

Looking for Oil

Today, with the widening search for scarce resources, development is increasingly attractive. Indeed, a good deal of the scientific work being done in Antarctica today overlaps with simple resource exploration. It was "pure" science that provided some of the first indications of Antarctica's potential wealth. If the Gondwana hypothesis (the theory that some 250 million years ago, Antarctica, South America, Australia, Africa, and India were all joined together in a "supercontinent") is correct, land that was once contiguous should have similar geologic characteristics. If certain minerals are common in, say, the Andes, then there is reason to believe that they will also be found in the Antarctic Peninsula.

Oil drilling or exploration is already under way off the coasts of New Zealand, Australia, and Argentina. Not surprisingly, researchers have detected thick layers of sedimentary rock beneath the ocean floor of Antarctica's continental shelf—suggesting the presence of oil and gas. In 1972 and 1973, the U.S.

research ship *Glomar Challenger*, plying the Ross Sea, discovered methane, ethane, and ethylene, even stronger indicators. (The ship avoided drilling in the most likely locations of oil deposits, for fear of creating a blowout, which it was not equipped to control.)

No one has actually pumped a drop of oil in Antarctica—or even proved that it is there—but the evidence of petroleum deposits is overwhelming. A U.S. government report prepared for the 1976 meeting of the Antarctic Treaty nations in Paris stated that “it appears that the Antarctic continental shelf could contain potentially recoverable oil in the order of magnitude of tens of billions of barrels.” In 1979, a Gulf Oil spokesman estimated that the Ross and Weddell Sea reserves alone would come to 50 billion barrels. But there is probably oil beneath the Bellingshausen Sea as well.

A Last Resort

Over the past 12 years, a number of U.S. oil companies have made tentative inquiries at the State Department about obtaining licenses for exploratory work. The governments of Norway, Japan, and West Germany have funded offshore seismic surveys—a good example of mixed scientific research and resource exploration.

But oil and gas exploration is proceeding slowly, in part because a big strike would raise a vexing question: Who owns the deposit? Moreover, there would be environmental problems. In the event of a spill, oil would decompose very slowly in the severe cold and might damage the coastal seal and penguin rookeries and the offshore fisheries.* The environment also poses other obstacles: The great depth of Antarctica’s continental shelf, the brief summer, and the difficulty of drilling through the constantly shifting ice that covers the seas would all have to be overcome. Yet no one believed that the oil companies would be able to drill successfully in the Arctic, either.

Antarctica contains the world’s largest coal field and enough iron ore to supply the planet’s needs for 200 years. But both coal and iron are still available in great quantities elsewhere in the world, where they are more accessible and cheaper to mine. Antarctica’s coal is located mainly in the forbidding Transantarctic Mountain range, and no one is likely to consider exploiting it until coal prices climb a great deal higher.

* Such concerns led the treaty powers to conclude a very loose “gentlemen’s agreement” at their 1977 London meeting. It provides that they will delay industrial exploration or exploitation so long as negotiations on a minerals treaty, scheduled to begin next year, are “making progress.”

TO THE SOUTH POLE STATION

The longest day at the U.S. South Pole Station lasts from September 22, when the sun rises after the dark austral winter, to March 22, when the sun sets once again. This is Antarctica's summer, and the station's population swells to 70 scientists and staff. Around New Year's Day, the temperature peaks at about -18°F . But by mid-February, the weather begins to deteriorate and the last plane leaves for McMurdo Sound, 800 miles away. For the next eight months, the South Pole Station's skeleton crew of 17 will be alone, under the auspices of the National Science Foundation, continuing experiments in astronomy, meteorology, and glaciology initiated 24 years ago during the International Geophysical Year.

Americans who winter over at the Pole inhabit three buildings of modest size protected by a 52-foot-high geodesic dome. The complex, only 155 yards from the Pole, was completed in 1975, replacing a collection of steel and wooden huts that had fallen victim to 40 feet of drifted snow. (The new dome will be covered over before 1990.) Living quarters are cramped, but there is wall-to-wall carpeting, central heating, and modern plumbing. The mess-hall diet is varied: lobster Newburg, steak, cherry cheesecake—a far cry from the hard biscuits and pemmican (dried beef bars) that sustained Robert Falcon Scott.

This peculiar environment leaves its mark. Average body temperature drops to 96.6°F , and most people, for unknown reasons, are deprived of deep "slow wave" sleep. Work that takes an hour in summer may consume five hours in winter. Tedium is the main enemy; odd rituals, the main weapon against it. Thus, a tape of the Super Bowl, kept since January, is screened on Midwinter Day, June 22. In August, when the mercury first dips below -100°F , tradition requires the winter staff to sprint naked from the station sauna to the barber pole that marks the bottom of the world. (Actually, the red-and-white striped pole is some 55 yards off the mark, but by 1986 the moving ice will have positioned it precisely above the geographic South Pole.)

Despite such diversions, the isolation, monotony, and close company are exacting, and few researchers seek to prolong their tour of duty. Billiards, ping-pong, and reading pall after eight months. Insomnia, the "big eye," is common. (In the mid-1960s, one winter scientist grew irrational and violent and was temporarily confined in an improvised brig.) Small comfort that one can theoretically nudge time along by walking around the pole and crossing the International Dateline, thereby advancing Thursday, say, to Friday.

In early November, the first aircraft of the season flies in from McMurdo Sound with fresh faces from the outside world, and the cycle begins again.

Many other minerals have been found, but none (so far) in quantities large enough to spur commercial development. On the Antarctic Peninsula, there are small quantities of chromium, nickel, cobalt, copper, gold, silver, manganese, and molybdenum. Elsewhere, explorers have found titanium, platinum, lead, zinc, tin, and uranium.

The most likely site for any mineral extraction on land is the relatively hospitable peninsula, but unless a large, accessible deposit of an extremely valuable mineral is discovered, mining even there will remain too costly for a long time to come.

Palate vs. Protein

One Antarctic resource that is already being exploited is the krill, a three-inch crustacean resembling a prawn that abounds off the coast and lives nowhere else in the world. (*Krill* is a Norwegian word that means "small fish.") Antarctica, the world's most barren continent, is surrounded by what are among the world's richest seas. About 450 miles off the tip of the Antarctic Peninsula, the frigid polar waters collide with the warmer oceans, producing a strong upwelling that lifts great quantities of mineral nutrients from the ocean bottom. This Antarctic Convergence, as it is called, forms an irregularly shaped, constantly shifting ring around the continent.

The convergence is an ideal habitat for phytoplankton, and the tiny plant-like organisms turn the seas a muddy brown. When frozen into the sea ice, they produce extraordinary hues of blue and green. Krill feed on phytoplankton, and in turn serve as the main food source for the whales, seals, and birds that range about in these waters.

Until the 1960s, krill was left strictly to these gourmands. But the decline of other fisheries and the extension of coastal limits (Exclusive Economic Zones) to 200 miles encouraged countries with large fishing fleets to take a closer look at Antarctic krill. By the late '70s, the Soviet Union, Japan, Poland, Chile, West Germany, Taiwan, South Korea, and East Germany had all fished for krill in the southern ocean.

The total annual catch was probably less than 200,000 metric tons until 1979. But last winter, a West German research ship spotted a Soviet fishing fleet of about 50 vessels, including factory ships, near Elephant Island. West German scientists estimate that the Soviets alone netted 360,000 tons of krill during the 1980-81 Antarctic fishing season.

Krill are easy prey. They congregate near the surface in dense swarms up to half a mile across. (The Soviet fishing ves-

sels off Elephant Island reportedly encountered one exceptional swarm of 10 million metric tons covering several square miles.) How much krill could we harvest? Some older estimates put the possible total as high as 110 to 115 million tons each year. That would triple the world's total annual fish catch. A group of U.S. scientists has estimated that between 1 and 2.5 million tons of krill could be caught each year without damaging the convergence ecosystem. That would still place krill among the world's top 10 fish catches.

Information about krill is sketchy. Scientists are not sure how much of it is needed to ensure the survival of its predators. Because the whales, seals, and birds have no other major source of food, overfishing of krill could cause widespread starvation. A blue whale alone consumes up to five tons of krill a day.

Another problem is getting people to eat krill. It tastes something like crab and contains as much protein (15 percent by weight) as steak or lobster. It could be an extremely valuable food, but no one has figured out quite how to market it. The Japanese have been fairly successful, probably because small, whole shrimp are already a major part of their diet.

The "Iceberg Prince"

Processing presents obstacles, as well. Krill must be cooked or frozen on factory ships as soon as it is caught, for it decomposes rapidly. Because its digestive enzymes have adapted to the frigid Antarctic waters and continue to work when frozen at normal temperatures, krill is very difficult to freeze effectively.

Most of the krill-fishing nations have used it to make fish meal as feed for cattle and poultry. There have also been a number of innovative experiments. The Chileans have dipped frozen krill bars in batter, selling them as "krill fingers." The Soviets have pioneered the development of krill paste, which they use as an additive in sausages, cheese, and soup. They have even brewed a krill beer. However, none of these products has been a big seller.*

Antarctica's most abundant resource is also the one most often overlooked—its ice. The Antarctic ice sheet contains about 70 percent of the fresh water supply in the world. If it all melted, the oceans would rise by between 150 and 300 feet, submerging cities such as New York up to their penthouses.

In 1977, Prince Muhammad al-Faisal of Saudi Arabia, the "Iceberg Prince," hired the French engineering consortium

*It is worth remembering that when Albert P. Halfhill first canned albacore tuna in San Pedro, California, in 1903, local fishermen declared, "That ain't eatin' fish."

Cicero to study the feasibility of bringing Antarctic ice to Jidda. Cicero concluded that it would be possible to cut up an 85-million-ton tabular iceberg like a loaf of bread, cover the "slices" to protect them from the sun and erosion by the sea, and tow them to Saudi Arabia for conversion to drinking water. It would be cheaper than the desalinated sea water the Saudis rely on, the French predicted. This ambitious plan came to nothing when the French company went bankrupt, but the idea is still alive. Today, New Zealand, Australia, and Britain are all looking into the possibility of towing icebergs to arid lands.

Yours, Mine, or Ours?

Because of the potential wealth and political prestige that a stake in Antarctica might bring, many governments are beginning to give the continent more of their attention. In a 1975 speech to the General Assembly, the president of the UN Law of the Sea Conference, Shirley Amerasinghe, argued that the principle of "equitable sharing of the world's resources" should somehow be applied to Antarctica. The idea has not gained much public support so far, largely because Third World governments have more pressing issues to confront. Privately, however, many Third World officials regard Antarctica as the undeserved exclusive preserve of a rich nations' "club."

The parties to the Antarctic Treaty, for their part, have worked out several agreements to demonstrate that the continent is under responsible management. In 1972, they drew up a treaty on the conservation of Antarctic seals, followed in 1980 by a treaty regulating the harvesting of krill.* Their next goal is to establish a set of rules governing the development of Antarctic oil and minerals.

The twelve treaty countries have kept a firm grip on Antarctic affairs. To join their ranks, a nation must demonstrate interest in Antarctica by conducting "substantial scientific research activity" on the continent, which in effect means they must establish a scientific research station. Since 1961, when the treaty became effective, only two countries (Poland and West Germany) have joined the club. West Germany spent \$100 million to build its station.

The possibility of hidden wealth in Antarctica has aroused some dissension even among parties to the Antarctic Treaty. New Zealand, once the leading "internationalist" party to the accord (during the 1950s, Wellington offered to abandon its ter-

*The agreement on krill sets no quotas but contains an innovative provision prohibiting krill fishing that would damage the other convergence species that rely on it for food.

ritorial pretensions if the others would follow suit), has become much more interested in protecting its claim now that it is thought to include rich offshore oil deposits. Australia has become almost as intransigently "territorialist" as Chile and Argentina.

The United States has stuck to the position articulated by Secretary of State Charles Evans Hughes in 1924. Hughes, sounding much like the leaders of Argentina and Chile, declared that sovereignty over a claim is not ensured "unless the discovery is followed by an actual settlement of the discovered country." The United States has never made an official claim although Admiral Byrd and other veteran explorers and their allies tried to rally public support for such a move. The United States refuses to recognize other claims and reserves the right to advance its own if the Antarctic Treaty should lapse. On the basis of claims made by American explorers (particularly Byrd) but never formally pressed by the State Department, the United States could annex large chunks of the continent.

One reason the United States chose not to make a formal claim was that the sector where the legal foundation is strongest, Marie Byrd Land, seemed to lack promise, and its icebound coast was impenetrable to ships. (American icebreakers did not make it through the pack until 1960.) Today, geologists think Marie Byrd Land's continental shelf may prove to be among the most promising oil and gas sites. Marie Byrd Land remains the continent's only unclaimed sector.

Settling for Utopia

Another reason why Washington held back was that the State Department believed the United States had more to gain by demonstrating an interest in the *entire* continent. As State Department spokesman Herman Phleger testified during the Senate's hearings on the treaty's ratification in 1960, "If we were to make a claim right now, we might be confined to an area of 20 percent [of the continent]. . . . We would have to give up, certainly, the claim which we have maintained to date, that we have a right in all of Antarctica." Today, the State Department insists that all new agreements on Antarctic resources must provide for free international access to the entire continent.

The United States protects its interests by maintaining a considerable presence on the continent. The base at McMurdo Sound is the largest on the continent and, until recently, had Antarctica's only airstrip. The United States spent \$63 million on Antarctic programs in 1981, up slightly from the previous

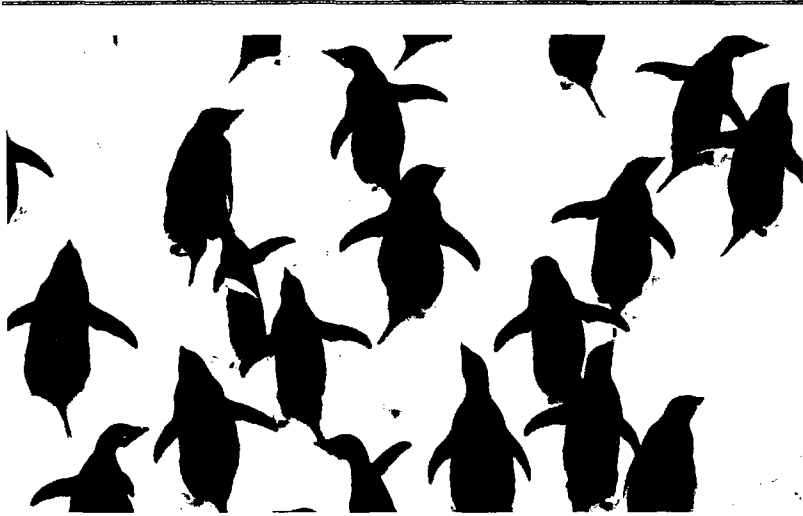


Photo William Curtsinger, courtesy United States Navy.

year. But most of the budget is consumed by the cost of providing support services, particularly air travel, which is increasingly expensive due to the rising price of fuel. Only about \$10 million of the Antarctic budget goes directly to research.

The Soviets do not publish their budget for Antarctic research, but the USSR maintains nine bases, and more than 250 Soviets winter over every year, by far the largest contingent from any nation.

The Soviet Union has one of the most extensive onshore geologic research programs in Antarctica and initially seemed very interested in offshore oil and gas, too. Publicly, however, the Kremlin has supported the idea of an indefinite moratorium on the "industrial" exploration and exploitation of minerals on the grounds that such activities could be environmentally harmful.

Sending scientists to Antarctica serves various nonscientific purposes: bolstering the treaty; defending territorial claims; supporting the grounds for free access. As Edward Todd, director of the National Science Foundation's Division of Polar Programs, said during a 1979 visit to the continent: "What we have here is a mutually beneficial symbiosis between science objectives and foreign-policy objectives. If the Antarctic Treaty ceases to be effective, our research program gives us an excuse to be here. In a free-for-all, our presence is well established."

Political considerations also affect the location of research stations on the continent. The U.S. South Pole station serves no

indispensable scientific function, but it *does* give the United States a foot in each sector of Antarctica, claimed or unclaimed. Deprived of the convenient South Pole site, the Soviets achieved a similar end by building a chain of stations along the continent's periphery in almost every sector.

Men have been trying to conquer Antarctica since the 1820s. First, they sent down explorers, now they send down scientists. Yet Antarctica remains untamed and beyond national jurisdictions. The Antarctic Treaty has proved to be a workable interim measure that sets some precedents worth preserving.

In some ways, indeed, the treaty is a utopian model. It includes the most comprehensive disarmament agreement in the world and is the only one to provide explicitly for on-site inspection. The treaty has fostered a remarkable degree of East-West cooperation: The exchange of research findings and scientists in Antarctica and the establishment of joint programs have no parallel elsewhere. A glance at the other end of the globe shows what Antarctica could be like. Arctic research is completely uncoordinated, and the exploration and exploitation of resources is going ahead with no international cooperation at all. Nor are there any limits on military activities in the Arctic.

But the success of the current treaty as a short-term solution is due precisely to its authors' failure to address the fundamental questions: Who owns Antarctica? How will Antarctica's krill, oil, gas, and minerals be exploited? Who will reap the benefits? How will the continent's environment be protected? These questions will have to be tackled before 1991, when the treaty will probably come up for review. By then, Third World governments will probably be demanding a role in the governance of the continent, and the parties to the Antarctic Treaty will have to consider that matter, too.

Conceivably, the 14 treaty powers could choose to maintain the status quo. But the stakes may be too high by 1991 to permit the perpetuation of a fuzzy legal regime. In that event, the alternatives would be either a free-for-all or the forging of an effective international agreement. There are many precedents for the former. Is it too much to hope that the latter might itself become a precedent?

