

ANTARCTICA IS NOT QUITE of this world. Spectacular canyons, pelucid air, mountains 16,000 feet high thrusting through permanent ice, temperatures suitable for Mars, huge weathered icebergs, teeming penguin colonies, and a notable absence of strife among human occupants: No other wilderness on Earth can match Antarctica's size, purity, and grandeur.

Science is the common ground upon which Antarctica's peculiar political system is built. Sixteen countries cooperatively manage the continent and promote the principles of peaceful research, nonmilitarization, and environmental protection outlined in the 1959 Antarctic Treaty.

But the nations of the world may soon no longer be content to extract only knowledge from the seventh continent. Anxious appraisals of the Earth's dwindling resources have fueled speculation about possible Antarctic oil and minerals. For two years nations signatory to the Antarctic Treaty have been quietly negotiating a "minerals regime," a legal framework that would allow licensing, exploration, and exploitation of Antarctica's natural resources to proceed in an orderly fashion. The critical question of whether these resources, if they exist, should be developed at all is in danger of never being thoughtfully asked.

Inspired by the successful scientific cooperation that characterized the 1957-58 International Geophysical Year, the 12 nations then participating in Antarctic research met in Washington, D.C., to work out "joint administrative agreements" for the continent. The result was the Antarctic Treaty, a document of great significance not only because of the speed with which it was negotiated but also because it was signed at the height of the Cold War—a time when an agreement embodying the principles of peaceful cooperation and exchange could hardly have been less likely.

By 1959, seven nations (Argentina, Australia, Chile, France, Great Britain, New Zealand, and Norway) had already laid claim to pie-shaped slices of the frozen continent. The United States and the Soviet Union intentionally asserted no claims, preferring to move freely about Antarctica and to reserve the right to make a claim at any time. They joined the other nonclaimant states in ignoring the existence of any claims. (Originally, these nonclaimant states included Belgium, Japan, and South Africa; Poland, West Germany, Brazil, and India were more recently admitted to the treaty "club.") The volatile issue of who owned Antarctica was addressed by delicately ambiguous wording in the treaty: "No acts or activities taking place while the present treaty is in force shall constitute a basis for asserting, supporting,

GALE WARNER

# STAKING CLAIMS ON THE LAST FRONTIER



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or denying a claim to territorial sovereignty in Antarctica." Despite the overlapping of many claims (see map, page 53), all nations have continued to exchange information in ways that would be unthinkable in other parts of the world.

Nevertheless, political maneuvering in Antarctica has been motivated partially by fond hopes that eventually the area would prove to be a rich storehouse of mineral wealth. Real enthusiasm for Antarctic oil flourished during an era of consternation over rising energy prices: An oft-quoted 1974 United States Geological Survey (USGS) report estimating that 45 billion barrels of oil lie beneath the continental shelf raised many eyebrows. Sanguine predictions of oil fields comparable to those in Saudi Arabia were given credence by the detection of hydrocarbons in test holes drilled by an American ship in the Ross Sea. A 1976 State Department report hazarded

that oil reserves "could be in the range of tens of billions of barrels."

But more recent USGS reports stress that while seismic surveys indicate thick sedimentary basins in the Ross, Weddell, and Amundsen seas, the evidence for oil is still sketchy. As David Elliot, a geologist who is director of Ohio State University's Institute of Polar Studies, points out: "When you compare [Antarctica with] the eastern seaboard of the U.S.—the subject of a comparably vast number of studies that revealed the strong possibility of oil, but which has so far produced virtually nothing—you can see that to presume there are huge oil fields in Antarctica is to go beyond current scientific information. But on the other hand, you can't disprove it."

It is also possible that Antarctica may have sizable deposits of strategically important minerals. Plate-tectonic evidence suggests that Antarctica was once part of an



A polar ship makes its way toward the Antarctic continent, which pack ice renders inaccessible from mid-March to December. Opposite page: the extent of the summer thaw.

of its fresh water. Huge quantities of energy would be needed to melt the ice so that mineral deposits might be reached. Over-land transport and shipping would be technically nightmarish—in winter, pack ice forms an impenetrable ring around the continent that extends as far as 1,000 miles from land.

Whether resource exploitation would ever be less than prohibitively expensive is open to question. According to Columbia University economist Giulio Pontecorvo, “There are so many alternative sources of oil all over the world that I think people are going to look elsewhere for a long time before they look to Antarctica. It would be an awfully long pipeline.” In a recent USGS report, geologist John Behrendt cautioned, “It is probable that nothing smaller than giant, and more probably supergiant, fields would be economical in the harsh Antarctic environment.”

Political factors, however, could warp economic ones. As Barbara Mitchell points out in her book *Frozen Stakes: The Future of Antarctic Minerals*, “Energy supplies are so liable to fluctuation that a secure supply, be it in Antarctica or the moon, may be too valuable to be left alone.” Governments might be encouraged to underwrite risky investments in oil exploration by their desire to enhance sovereign claims and their eagerness not to be left behind should a minerals regime open some areas to leasing. (In 1970, Texaco attempted to obtain an Antarctic exploration license, and Gulf has repeatedly expressed its interest in carrying out intensive surveying.)

Five countries have recently completed or are currently conducting seismic “geophysical research” on the continental margins. Digging for minerals on land is considered even more economically preposterous than exploration at sea, but again, in the words of David Elliot, “The real wild card in the pack is the political end of things.” He continues: “The world platinum market is controlled by a relatively few countries. If, for example, there were radical political changes in South Africa, the West could become very interested in the resource potential of the Dufek Massif. The Soviets’ extensive work there shows that we’re not the only ones interested. The question becomes how inaccessible the area and its resources really are.”

Despite its reputation as a bleak desert of ice, Antarctica is an unparalleled wildlife sanctuary. Shrouded by darkness half the year, but bathed in almost continuous light the other six months, the Southern Ocean’s

ancient supercontinent geologists call Gondwanaland, and there are geologic similarities between the mineral-rich Bushveld Complex in South Africa and the Dufek Massif in Antarctica’s Pensacola Mountains, where traces of platinum, titanium, cobalt, nickel, uranium, molybdenum, and chromium have been found.

Antarctica’s climate makes it exceptionally ill-suited for industrialization, however. A list of the factors that might prove discouraging to would-be developers has to include the continent’s short summer season, its distance from supplies, labor, and markets, and its frequent storms, persistent winds (commonly reaching 200 miles per hour), and extreme cold. The world’s lowest temperature (minus 127 degrees Fahrenheit), was recorded in Antarctica, and minus 35 degrees is considered a warm summer’s day at the South Pole. In typical Antarctic weather a dropped

steel bar can shatter like fine crystal.

Offshore oil operations would have to contend with some of the roughest seas in the world, unpredictable currents, an unusually deep continental shelf, and colossal “scouring” icebergs capable of shearing off underwater production rigs. (One iceberg approximately the size of Massachusetts was recently sighted near the Ross Ice Shelf.) Pack ice can suddenly close in and crush even hardened ships; last year a 6,600-ton U.S. icebreaker, the *Westwind*, suffered a 50-yard-long gash in its port side when it was unexpectedly trapped in ice in the Weddell Sea.

Mining on the continent would be even more problematic. Nearly 98 percent of Antarctica is covered by an immense icecap that averages more than a mile in thickness; this icecap depresses one third of the continent’s landmass below sea level and contains 90 percent of the world’s ice and 70 percent

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The ice sheet of Antarctica, formed sometime between 25 million and 42 million years ago, covers about 98 percent of the continent. Coastal temperatures rarely rise above freezing.



Adelie penguins (above) return to Antarctica each spring to breed. Some Adelie rookeries contain up to 250,000 birds. A Weddell seal (below) rests on the shore. A deep diver, the Weddell has eyes especially adapted for low-light underwater vision.

Photographed by Bruno J. Zehnder, New York City

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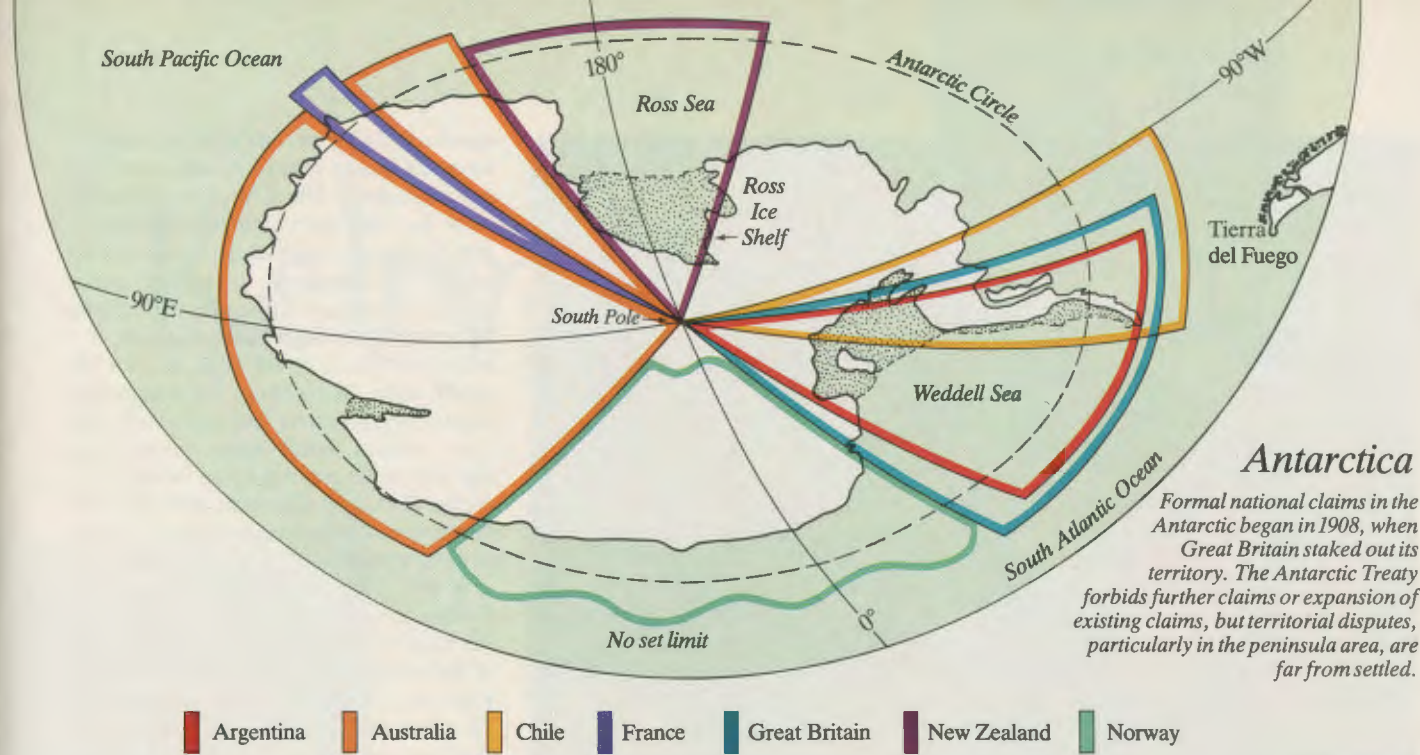
frigid, nutrient-rich waters support a highly productive marine ecosystem. Whales (including the endangered blue, fin, humpback, and southern right species), seals, penguins, squid, fish, and pelagic birds all feed on an abundant, shrimplike crustacean called krill. Although the continent has only two species of flowering plants and no resident land animal larger than the wingless midge, hundreds of species of algae, mosses, and lichens have managed to adapt to its extreme conditions. Mysteriously snow-free “dry valleys” were thought to be completely lifeless until a healthy microflora of lichens and bacteria was discovered living *inside* porous rocks.

Given the continent’s unique living systems, exploratory activities could wreak nearly as much havoc as actual development might. Even prospecting may pose significant risks: Evidence from the Arctic indicates that intense seismic surveying creates enough noise pollution to disturb feeding whales. Another major risk is the possibility of a blowout or a tanker spill. Oil slicks caught in circular currents and carried ashore could have disastrous effects on breeding birds and seals. Slicks might also impair the formation of pack ice while damaging the algae that grow on the ice’s surface. (These algae generate about 20 percent of the Southern Ocean’s primary photosynthetic production.)

Control and cleanup of a significant oil spill could be hampered by the short season. If pack ice were to move in before a gusher could be capped, the oil could flow beneath the ice for nine months. *Any* release of oil, including the low-level emissions that normally accompany oil-production activities, may have disproportionate consequences in the icy Southern Ocean. Oil may persist up to 100 times longer in that environment than in temperate oceans, and the lack of natural oil seepage in Antarctica has raised fears that no oil-degrading bacteria may be present there.

Antarctica’s severe cold means that biodegradation takes place very slowly; no softening cover of weeds hides scars on the land. Mines would have severe local impact—a footprint scar in Antarctic moss takes a decade to heal—and would spew particulates into Antarctica’s unpolluted air, diminishing the continent’s value as a pristine laboratory for monitoring global pollution levels. A layer of dust on the ice could precipitate melting and alter the reflectivity of the icecap, which is thought to play a crucial role in regulating global climate.

Perhaps the most serious and unavoidable impact of minerals development would be the direct competition between production facilities and wildlife for ice-free coastline. This raises a thorny issue: What constitutes



“acceptable environmental damage” in an unspoiled area bigger than the U.S. and Mexico combined?

A 1979 report by an independent advisory group, the Scientific Committee on Antarctic Research (SCAR), expressed a startlingly cavalier attitude. After listing the “severe and irreversible local impacts” of an oil spill, the report stated that these impacts “overall effects may not be significant, because the area involved would be slight in relation to the total area of coastline or exposed rock or soil. . . . Because the overall number of penguins is so vast and the breeding colonies are widespread, even the destruction of a complete colony would be insignificant in relation to the total stock.”

Explains Robert Hofman, a biologist with the Marine Mammal Commission and science advisor to the U.S. Antarctic delegation, “If we apply the conservation standard we use in our domestic wildlife acts, such as the Endangered Species Act, we should be concerned with species, subspecies, and populations. If a single colony is a discrete population, then we should be concerned with preserving it. The trouble is, there’s virtually no place in the Antarctic where there is exposed coastline where there are not resident populations of birds and seals, and if we apply this standard, we could not build *any* support facilities, including those for scientific activities like the ones that are already there.” Environmentalists are skeptical of phrases filled with undefined terms, such as this one from the SCAR report: “Local effects would only be important if they significantly affect a unique local ecosystem.” If there is any bias for development to proceed, this kind of language would make the “significance” of impacts subject

to broad and self-serving interpretations.

Rational evaluation of environmental risk may also be hamstrung by the need to accommodate the various positions of claimant and nonclaimant nations. Even if a minerals regime proclaims sound environmental principles, politically expedient decision-making structures could sabotage their implementation. The 1980 Convention for the Conservation of Marine Living Resources (CCMLR), a regime regulating the harvest of Antarctic fish and krill that was negotiated in secret by Antarctic Treaty nations, has a novel “ecosystem standard” requiring that the effects of fishing on other species (notably endangered whales) be considered when setting quotas. But CCMLR’s effectiveness may be limited by the need for consensus among treaty nations—including fishing states—for all substantive decisions, such as catch restrictions and research budgets. (A “count me out” clause permits any nation unhappy about a quota to declare that it simply will not comply.)

Meanwhile, the exclusivity of the Antarctic Treaty club and the inordinate secrecy surrounding its meetings has piqued many developing nations, who see Antarctica as “an area being grabbed up by developed countries who have the technology before [the developing nations] can get their fair share,” according to Pat Scharlin, director of the Sierra Club’s International Earthcare Center in New York City.

Many small nations would like to see the principle that the seabeds and oceans are “the common heritage of mankind”—as defined in the Law of the Sea Convention—extended to include Antarctica. Declaring that “the days when the rich nations of the world can take for themselves whatever ter-

ritory and resources they have access to are over,” Malaysia and Antigua and Barbuda succeeded in putting Antarctica on the United Nations General Assembly agenda in the fall of 1983. Forty nations debated the issue and called for a year-long U.N. study on all aspects of the Antarctic question. Antarctic Treaty nations have adamantly resisted attempts by the U.N. to meddle in Antarctic affairs, claiming that developing nations will have no interest in preserving the Antarctic environment. Some observers suspect the treaty nations of wanting to nail down a minerals framework quickly, before the U.N. has a chance to interfere. “If the lead time before development becomes commercially feasible is so long, why the urgent need to do a regime now?” asks Malaysia’s U.N. ambassador, A. W. Oardin.

The treaty nations passed a resolution in 1977 that termed the establishment of a minerals regime “a matter of urgency.” The resolution called for a policy of “voluntary restraint” on exploratory activities so long as significant progress on minerals negotiations was being made. According to R. Tucker Scully, head of the U.S. Antarctic delegation and director of the State Department’s Office of Oceans and Polar Affairs, “The time has come for working out a system under which such activities can take place in a controlled fashion.” The technology for serious exploratory drilling under Antarctic conditions now exists, Scully explains, and sooner or later someone will be unable to resist the temptation to poke a few holes in the continental shelf. If something valuable were found, a mad scramble would ensue, with dire environmental and political consequences.

But Jim Barnes, director of a Washington-



Chilean geologists gather data on Deception Island, site of one of the two remaining active volcanoes in Antarctica. Chile maintains four scientific bases on the continent.

based organization called The Antarctica Project, thinks it highly unlikely that any country would risk antagonizing its Antarctic Treaty partners by initiating such wildcat exploration. Because the treaty nations do not even agree on whether Antarctica is closed to mineral activities until opened, or open until deliberately closed, Barnes says, "it could mean the end of the treaty if someone tried to go down there without a legitimate framework. But if they're really worried about people going down there and starting to develop, there's an easy way around that—one that environmentalists have been pushing for years: Make the voluntary-restraint policy a binding long-term moratorium."

The State Department's Scully dismisses the idea of a moratorium as unrealistic, calling it "an artificial avoidance of the issue, and quite an unstable thing if the results of continued scientific activities give a real smell of resources. There would be very strong pressures to move forward and develop, and a moratorium would break down." However, because research aimed at assessing resources is stepping up precisely *because* it appears likely a regime will be negotiated soon, Scully's prediction smacks of self-fulfilling prophecy, according to Barnes. By maintaining that only a minerals regime will prevent uncontrolled exploration, the treaty nations are promulgating the assumption that development is natural and inevitable while prevention of development is unnatural and ephemeral. They are also denying their own remarkable history of

self-restraint in Antarctica for the sake of the common interest. Over the years, the treaty powers have come to several significant conservation agreements, including the setting aside of sites of special scientific interest and specially protected areas.

"The Antarctic Treaty powers have done a generally good job up to now in protecting the environment," says Roger Wilson, a British organizer of Greenpeace International. "But while they are concerned about preventing a disaster as they develop, they still want to develop. It's my contention that we're going to have to find another way to cope without oil sooner or later, and we should do that *before* we rip Antarctica apart rather than after."

In 1972, the U.S. was the only treaty nation to oppose the idea of a moratorium on minerals development. In 1975, New Zealand proposed the creation of a "world preserve" to be maintained under Antarctic Treaty auspices, offering to withdraw its territorial claim. Now, according to Scully, "there's no real disposition among any of the treaty nations to declare Antarctica's resources off-limits. One can argue that it's simply not in the cards, given the attitude of the participants."

Several mechanisms for saving Antarctica from commercialization have been put forth, such as a special protocol to the World Heritage Convention or use of the U.N.'s Man and the Biosphere program to declare the continent an "international biosphere reserve." If the minerals regime itself were to have extremely rigorous environmental

standards, and if its regulatory committees were not biased toward development, the regime might be able to function as a framework for protection rather than exploitation. Conservationists are lobbying their respective governments to require public review of lease applications, for provisions that specially protected areas (such as a whale sanctuary) be set aside, and for observer status at meetings for nongovernmental organizations and interested non-treaty nations. Some conservationists are advocating the creation of an independent commission, with a full-time scientific staff, to oversee all projects affecting the Antarctic environment.

In 1977, Pat Scharlin of the Sierra Club's Earthcare Center was named to represent the concerns of the conservation community at that year's meeting of the treaty nations. Currently, 130 conservation organizations in 24 countries belong to the Antarctic and Southern Ocean Coalition, which monitors the preservation of the continent.

Wary of the pitfalls of commercial secrecy (which might curtail on-site inspection rights essential to the treaty's disarmament agreements), conservationists are also advocating a noncommercial, scientific approach to any oil exploration that does take place, with governments conducting drilling cooperatively and sharing results publicly. But, cautions Barnes, "we don't want them to forget that we think the best solution is to have no industrialization at all."

Delegates to the minerals meetings arrive with a primary mandate from their governments—"get the best possible deal for us"—and are not in a position to hinder access to resources without a groundswell of public support for this option. "If we're going to win, we have to have the same level of public awareness and action as the whale-hunting and seal-hunting issues," says Greenpeace's Wilson. "If we wait until industrial activities begin and then have to fight it with rearguard action, step by step, regulation by regulation, it will be much more difficult—and we'll be at that point in only a few years."

Ultimately, more is at stake in Antarctica than the fate of penguins and whales. Will the bottom of the world turn into a stage for international squabbling over who has dibs on a last frontier? Or can we take a bold, imaginative step in the direction of environmental prudence, debunking the myth that resource extraction must inexorably proceed until the Earth is wrung dry? Defining Antarctica's future will be a challenge—and an astonishing opportunity. □

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