

since it is a socially acceptable and legal drug, alcoholism treatment has a strong constituency and a long and venerable history. DuPont says the alcohol people would strongly resist incorporating with the drug people now that they have their own institute, and they don't want alcoholics to be classed with the criminal drug-using element. People at the DAC say it is attitudes like this that prevent policy-makers from developing realistic perceptions about drug abuse: "Any drug policy is doomed to failure that is based on the enormous and fraudulent dichotomy between licit and illicit drugs," says Pekkannen.

Public apathy towards the drug problem and its political manifestation—thin supplies of money—makes it unlikely that significant new treatment initiatives are in the offing. The NIDA budget has been hovering at about \$222 million a year, and if the additional \$30 million requested for fiscal 1977 is granted, it will go to expansion of current programs rather than research and experimentation. NIDA-funded research (whose budget dropped from \$34 million to \$31 million in fiscal 1976) continues to be heavily focused on the causes and treatment of heroin abuse, with particular emphasis on the development of new, long-acting narcotic antagonists that could block the effects of any dosage level.

Right now the most visible trend is in the domestic law enforcement arena—the decriminalization of marihuana. So far, six states have decriminalized the private possession of small amounts of pot,* and just about everyone agrees that widespread

decriminalization is desirable and inevitable—if only for the practical reasons that use of the drug has become socially acceptable anyway, and valuable resources are being squandered on prosecuting users. Even DuPont, who thinks the spread of marihuana use is "terrible" and who ideally would like to see a world where no one used any drugs (DuPont himself, according to an aide, has given up drinking and smoking and even coffee), believes private possession should not be penalized.

At present, the federal government is still trying to sort out its drug responsibilities—no mean task for a problem that ranges across seven cabinet departments and 17 agencies. The Drug Enforcement Administration, organized 2 years ago as the lead agency for drug law enforcement, is still without a permanent director following the firing last May of John R. Bartels, Jr., to placate those who were leveling charges of corruption within the agency, and it has yet to figure out how to curb the flow of an estimated 10 tons a year of cheap, high-quality brown heroin from Mexico. A coordinating body to carry on the total strategy functions of SAODAP (which are now in the Office of Management and Budget) and foster co-operation between the legal and medical-educational (or supply and demand) sides of the problem is yet to be set up. A bill creating an Office of Drug Abuse Prevention in the Executive Office of the President was passed by both houses of

*Most states have made pot possession a misdemeanor rather than a felony; no criminal arrest record is attached to the offense in California, Oregon, Alaska, Ohio, Maine, and Colorado.

Congress, but the Administration believes this function should be pushed out of the presidential nest and made the responsibility of the relevant agencies. So the white paper has recommended instead the creation of a Cabinet Committee on Drug Abuse Policy, with subcommittees on treatment, research, criminal justice, and so forth.

Whatever arrangement finally emerges probably won't matter too much in absence of renewed public commitment to controlling drug use. Smith says efforts to combat drug use are hobbled by the "cyclical and capricious" nature of funding policies which follow political exigencies, the delayed and warped responses to real need. He believes the only answer is national prepaid health insurance for drug treatment so that the money would follow the customers. Senay, distressed though he is by the money problem, believes there is a limit to what the government can do in a society whose every sacred value has been "ravaged and torn apart," leaving a culture whose maturity level is at the adolescent stage, where hedonism and "do your own thing" prevail. He doesn't believe much will change until an "outraged citizenry" gets its dander up—in which case there is always the danger of a rush to the kind of punitive drug laws that have been adopted in New York State.

Drug abuse treatment is still a newcomer to the health field, and as such is particularly vulnerable to political trends. At the moment it is out of fashion: neither a great crusade nor a matter of garden-weeding but, rather, a grim holding operation.—CONSTANCE HOLDEN

Icebergs and Oil Tankers: USGS Glaciologists Are Concerned

The potential environmental problems associated with transporting oil from Alaska's North Slope to U.S. markets have been under discussion for so long that it is surprising for a worrisome new problem to turn up now, but it looks as though one has. A recent U.S. Geological Survey report—warning that icebergs from the huge, 425-square-mile Columbia Glacier near the port of Valdez may pose a menace to the supertankers that will soon be calling daily to take on oil from the Trans-Alaska Pipeline System (TAPS)—has

stirred concern enough at the U.S. Coast Guard headquarters in Washington for one of the admirals to send for the glaciologists.

What the glaciologists are saying is that the glacier, which juts into Prince William Sound just west of the Valdez Arm, may be on the verge of a "drastic retreat" and could discharge up to 50 cubic miles of ice into the sound over the next 30 to 50 years. Moreover, the fact that dangerous icebergs—which are not always readily detectable—could be borne by winds and

currents from the vicinity of the glacier into the shipping lanes is already compellingly evident in the northern end of the sound and especially at the entrance to the Valdez Arm.

Alyeska, the consortium that will operate TAPS, has said that even if the glacial retreat does occur, the consequences for the tanker fleet would be minimal, involving no more than occasional delays in the movement of ships in and out of Valdez. El Paso Alaska, the company which is seeking permission (*Science*, 24 October) to build a trans-Alaska natural gas pipeline and run a fleet of 11 liquefied natural gas (LNG) tankers from a terminal at Gravina Point, some 40 miles from the glacier, has as yet given no indication that it sees any potential problem at all.

But the Coast Guard's Office of Marine Environment and Systems, headed by Rear Admiral Robert I. Price, has asked

for the two glaciologists who have led the Columbia Glacier study to meet with the admiral on 6 November. These scientists are Mark F. Meier, the USGS project chief for glaciology, and Austin Post, author of the as yet unpublished "open file" report on the glacier. They are based in Tacoma, Washington.

From the discussion with these scientists, Admiral Price hopes that the potential iceberg problem can be better defined with a view to devising whatever special navigation safeguards might be necessary. The movement of supertankers in and out

of the port of Valdez will begin in late 1977 or early 1978, as the first oil from Prudhoe Bay begins to flow. The Coast Guard will be responsible for controlling this tanker traffic, and, to that end, it plans to invest about \$7 million in such new facilities as a radar station on the Valdez Arm and a microwave communications relay.

Meier and Post will explain to the admiral why they suspect that the glacier is now at a point of critical instability—and why, at the present stage of their investigation, they can't offer firm predictions as to its behavior. What follows here pretty much

sums up what they know about the glacier, and what they are still trying to find out.

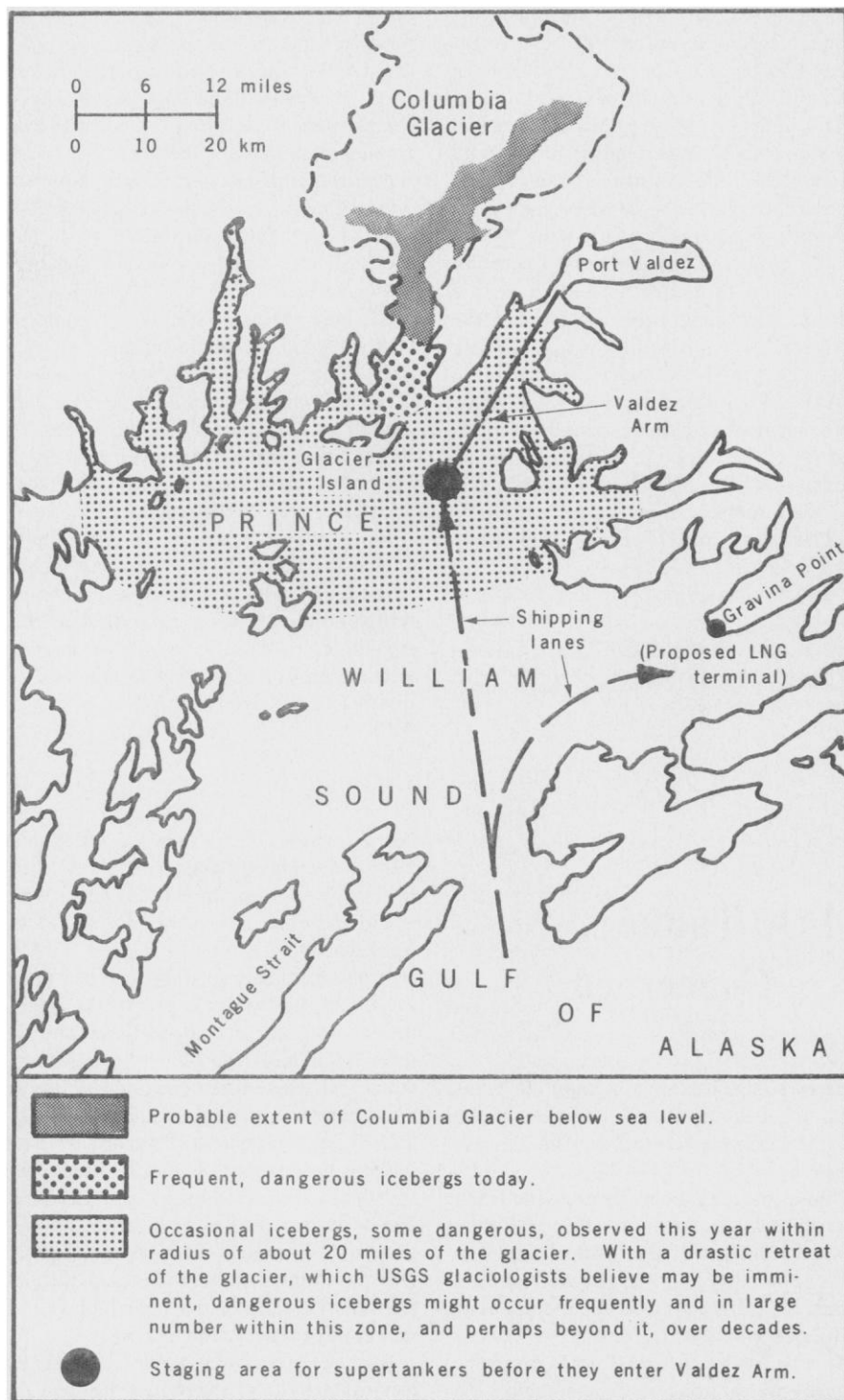
At its terminus on Prince William Sound, the Columbia Glacier is about 4 miles wide and presents a towering ice cliff which, in places, is as much as 300 feet or more above the sound. The glacier has remained in a relatively stable condition during this century, in that its advances and retreats have tended to offset one another, with the changes in the position and configuration of its terminus being relatively minor. In this it has been unique, because the other tidal glaciers in North America have all made retreats from extended positions. For instance, the Muir Glacier, in what is now the Glacier Bay National Monument (about 100 miles east of Juneau), has retreated 21 miles since 1900.

It was in the summer of 1973 that Austin Post first began to suspect that the Columbia Glacier, too, might now be on the verge of an abrupt and drastic retreat. So extensive were the embayments existing along the west side of the terminus, it appeared that a good half of this part of the glacier was not resting on the moraine shoal that had supported and confined it. Being subject to "plastic flow" as well as sliding and melting, glacial ice will not stand up unless supported, and Post wondered if conditions were now such as to cause a rapid break up of the glacier.

In his judgment, three key questions had to be answered. First, he wanted to know whether the moraine shoal was comparatively narrow, occurring only along the terminus, without reaching "upstream" beneath the glacier. Second, was much of this great river of ice below sea level—or, to put it another way, was it confined in a deep fiord, with the ice extending down hundreds, if not thousands of feet? If so, as the glacier fell back from its extended position on the moraine, an immensely high ice face would be left exposed and unsupported. Third, was the glacier in a declining "state of health"? That is, was the annual "wastage" of snow and ice greater than the annual accumulation?

If all these questions could be answered affirmatively, then Post believed that he would be able to predict that a drastic retreat of the glacier was in fact imminent and inevitable.

In the summer of 1974, a team of USGS glaciologists headed by Mark Meier began taking some of the critical measurements. By deploying a small, unmanned, remote-controlled boat from the University of Alaska's 85-foot research vessel, the *Acrona*, they were able to take fathometer readings along the face of the glacier which confirmed that the moraine shoal is indeed narrow and does not extend much beneath the ice. From these readings, together with other available information, they con-



Map by Eleanor Warner.

cluded that, within embayments extending no more than a quarter of a mile or so into the ice face, the water might be as much as 300 feet deep, compared to the depths of about 10 to 150 feet found along the shoal.

Also, by means of a radar device which they were able to deploy at various points along the glacier, the team obtained readings on the thickness of the ice which showed that the glacier extends below sea level for more than 20 miles of its length and that in some places it reaches as much as 2000 feet below. But they were not able to take enough measurements to draw firm conclusions as to the glacier's state of health, and this key question remains unanswered today.

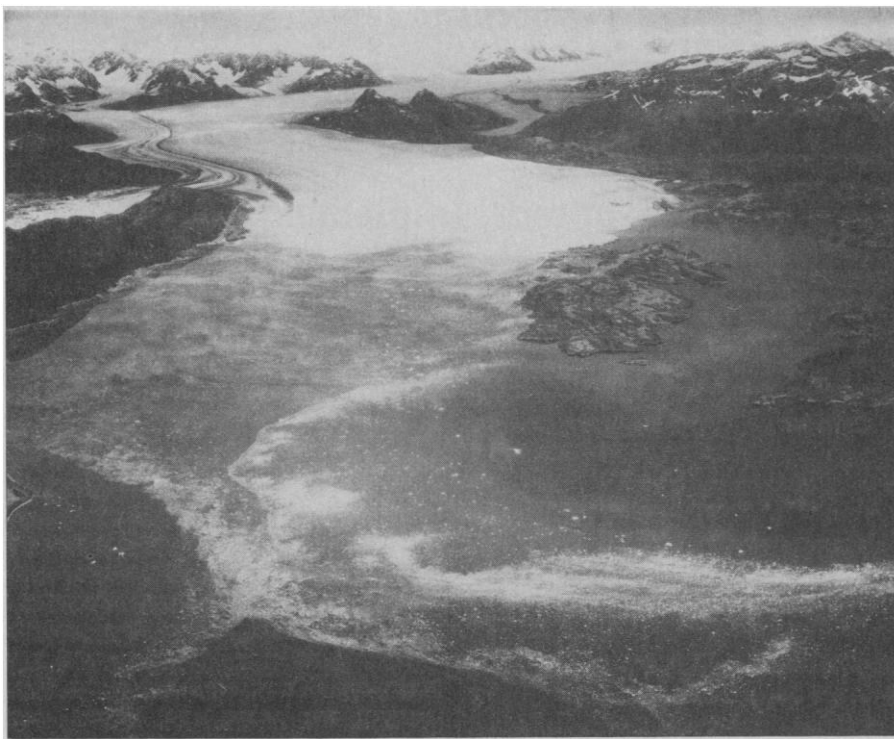
The occurrence of unusually heavy calving near the center of the terminus during the past 2 months has, however, reinforced the USGS investigators' belief that a drastic retreat of the glacier may be at hand. One embayment now measures fully a mile both in width and lateral depth, and at least two-thirds of the entire west side of the terminus is believed to be off the shoal. If the retreat occurs, it could progress at an astonishing rate, with the terminus withdrawing a mile or more each year until it reaches a stable retracted position at the head of the fiord.

Besides meeting with Admiral Price of the Coast Guard on their trip to Washington, Meier and Post will also give a special briefing to the top staff of the USGS. In this briefing, requested by Vincent E. McKelvey, director of the USGS, the glaciologists will point out that \$100,000 or more will be required for each year over the next several years to continue the Columbia Glacier research project.

Much of the money would be spent on chartering helicopters. USGS crews and their snow toboggans, radar, and drilling and digging equipment must be transported about the surface of the glacier to permit the taking of further measurements. In addition to determining the glacier's state of health, the glaciologists want to map the shape of the fiord and thus be better able to say whether there are shoals or "islands" beneath the glacier that might slow down movement of the ice.

Although such research is of scientific interest, its primary justification—especially now, at a time when the USGS faces a tight budget—is that it could give the Coast Guard, Alyeska, and other navigation interests better information as to what, literally and figuratively, may be lying ahead. In fact, the possibility that the Coast Guard might be willing to support the research, either financially or by providing a helicopter or other services, is sure to be explored.

Any mention of icebergs always calls to mind the loss of the *Titanic*. But, actually,



A plume of icebergs is being discharged from Columbia Glacier and carried by prevailing currents toward the entrance of Valdez Arm, through which supertankers will pass in entering and leaving the port of Valdez. Some icebergs estimated to be as large as 90 feet across have been observed this fall drifting toward the shipping lanes. This photograph was taken in early October by Lawrence Mayo of the USGS, Fairbanks.

since that famous disaster of 1912, there seem to have been relatively few major maritime losses attributed to icebergs. The last one that a Coast Guard officer formerly with the International Ice Patrol in the North Atlantic recalls was the loss of the Danish motorship *Hedtoft*, which disappeared off the southern tip of Greenland in early 1959. In more than a century of operations in Alaskan waters, the Coast Guard has not found icebergs to be much of a problem there.

Nevertheless, icebergs are treated with respect, even small ones. An iceberg that is, say, 90 feet long, 60 feet wide, and 10 feet vertically represents a 6000-ton mass that the shipper of a heavily laden, 165,000 dead-weight-ton tanker cruising at 16 knots across Prince William Sound will not want to run into.

Icebergs of up to 100 feet or more in draft could escape over the moraine shoals and be carried by the prevailing currents out into the entrance of Valdez Arms and on into the main body of the sound. The Coast Guard, the glaciologists, and the captain of the excursion boat *Glacier Queen* have all observed icebergs in or around the shipping lanes during the past 2 months. A small iceberg normally melts within about a week, and thus is not likely ever to reach the lower region of the sound where it could be a menace to tankers calling at a liquefied natural gas terminal at Gravina Point, should such a facility ever be approved and built. Some larger bergs

might well enter these waters, however.

Various safeguards against icebergs are of course available. The tankers that will call at Valdez will all be radar equipped, and shore-based radar operated by the Coast Guard will provide coverage over the entrance to the Valdez Arm and that part of Prince William Sound adjoining it. Also, regular iceberg patrols could be carried out by Coast Guard vessels and aircraft should this appear necessary. "We will take whatever management and monitoring measures necessary to ensure safety," says Lieutenant Commander Kenneth W. Thompson, chief of port safety for the 17th Coast Guard District, Juneau.

Yet, while any iceberg problem that arises may well be manageable, the safeguards will not be foolproof. For, the fact is, some dangerous icebergs, particularly the smaller ones, can be hard to detect. If the water surface is agitated from high winds, a small berg may escape surveillance by either radar or the human eye. Furthermore, if an iceberg's natural buoyancy has been reduced by rock enclosed within the ice, the top of the berg may be barely awash or may even be hidden slightly below the surface.

All in all, the glaciologists' finding of a possible iceberg threat to the tanker traffic offers another illustration of the special, and sometimes unexpected, problems encountered as oil exploration and development is carried to increasingly difficult environments.—LUTHER J. CARTER