# Earth Science

## Alaskan glacier races forward

The term "glacial" can describe the pace of lines at the Post Office or the plodding progress of Congress. But there's nothing slow about the speed of the Bering Glacier, the largest stream of ice on the North American continent. Last spring, a small patch of the glacier dramatically accelerated its normally stately flow downslope (SN: 8/7/93, p.95). Since then, the surging region has spread to include half the 5,175-square-kilometer surface area of the glacier, says Bruce F. Molnia of the U.S. Geological Survey in Reston, Va.

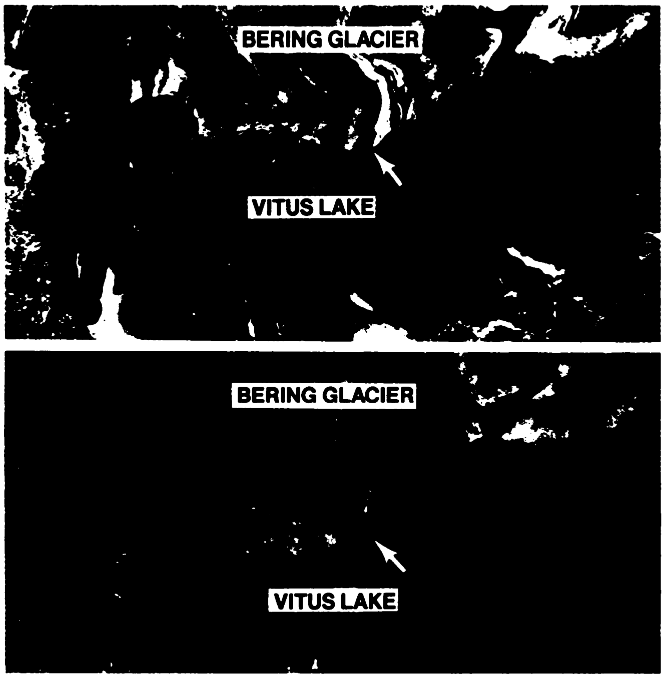
The surge started in the middle of the glacier and expanded from there until it reached the end of the Bering in late August. Photos taken by airplane on July 10 (top) and September 10 (bottom) show the advance of the glacier's terminus (arrow), which moved forward more than 1,500 meters in just three weeks, spreading into part of Vitus Lake at the end of the glacier. In late August and early September, the glacier's foot marched forward at speeds approaching 100 meters per day, nearly 100 times its normal pace. Ice calving off the terminus has filled much of Vitus Lake with icebergs, which appear white in the pictures.

The glacier has surged roughly once every two decades during the 20th century, with the last such event ending in 1967. Studies on smaller glaciers suggest that they surge when the plumbing system below the ice gets clogged with silt. Water that normally flows out from under a glacier then accumulates beneath the ice, eventually lifting it off the bedrock. That reduces friction between the ice and the ground, sending the glacier sliding downhill.

Since they don't have instruments set up under the Bering Glacier, scientists can't be sure that the same process caused the current surge there. But some circumstantial evidence points in that direction.

Molnia says scientists studying the glacier and pilots flying over it this year have noted large numbers of ephemeral lakes on the surface of the ice, suggesting that the drainage system through the glacier has become plugged.

Past surges of the Bering Glacier have lasted about 18 months and have, at times, filled virtually all of the Vitus Lake basin with ice. Once the glacier slows, its foot retreats back up-slope, reopening the lake basin.




Photos: David Hirst/USGS

# Environment

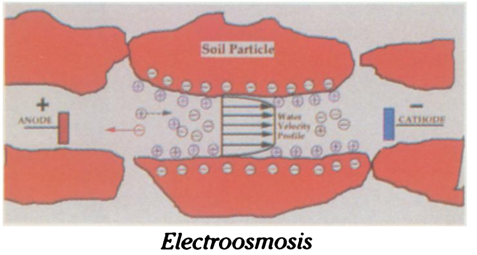
*Janet Raloff reports from St. Louis at a meeting of the Council for the Advancement of Science Writing*

## Lasagna: A new recipe for 'dirty' soils

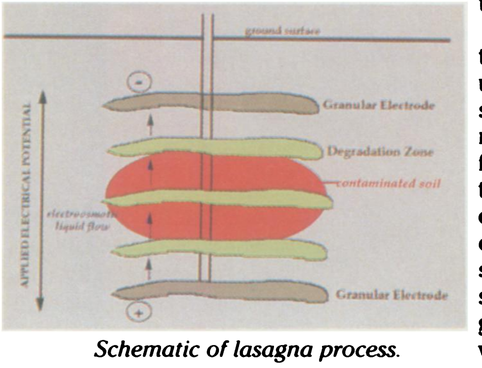
Earlier this year, several large manufacturing companies decided to team up with the federal government to solve a common—and currently intractable—environmental problem: how to clean up chemical contamination of deep clay soils.

Chemicals that seep into the ground and enter the fine pores of a buried layer of clay can become all but impossible to extract, observes Philip H. Brodsky of Monsanto Co. in St. Louis. And that's bad news, he says, because heavy layers of such clay underlie at least half the major chemical spill and toxic waste sites in the United States.

But Brodsky has tested in the laboratory a new cleanup scheme that the industry-government consortium expects to test at a chlorinated-solvent spill site early next year. Brodsky reports that this Lasagna Project — named for the alternating layers of wastes and cleanup zones it involves — will broker a novel marriage of three mature technologies.




*Electroosmosis*




Monsanto

*Schematic of lasagna process.*

Hydraulic fracturing will be used to create a series of treatment sites inches from the clay. In this technique, crews bore holes down to the desired depths. A slurry of guar gum and sand, which breaks up the soil, is injected into each hole. When inserted enzymes later break the goo down into water, there remains a series of pancake-shaped zones of permeable sand some 15 feet or more in diameter and up to one-half-inch thick.

For in-ground cleanup, engineers then deliver into each fracture zone materials that have been tailored to treat the nearby wastes. Microbes and a nutrient cocktail, for example, might be used to break down compounds such as polychlorinated biphenyls (PCBs). Or iron filings could be packed into the zone to foster the catalytic breakdown of chlorinated solvents, Brodsky notes. Treatment managers could even break down contaminants electrochemically.

The project would then use electroosmosis to release clay-bound contaminants and transport them to treatment sites (degradation zones). The negatively charged surface of clay particles tends to attract water droplets. But when a negative and a positive electrode are put outside the contaminated clay, the water travels toward the negative electrode — with the contaminants in tow (upper diagram).

Electroosmosis should be able to draw buried chemicals to degradation zones (lower diagram) in just a week or two, Brodsky says. And by periodically reversing the electrodes' polarity, he adds, chemicals could be shunted back and forth between zones until their breakdown is complete.

Last week, officials at Monsanto, EPA, the Energy Department, General Electric Co., and E.I. Du Pont Co. to work out details that will allow each to collaborate fully while retaining rights to any proprietary technologies.



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