

# GEOTHERMAL PIPELINE

Progress and Development Update  
from the Geothermal Progress Monitor

## WYOMING

### Biotech Companies Profit from Yellowstone Hot Springs

Yellowstone's more than 10,000 geysers, hot springs, mud pots and fumaroles awe and delight 3 million park visitors each year. They are also drawing the interest of biotechnology companies and academic researchers like Ward, a professor at Montana State University, and Ramsing, a postdoctoral student. Long thought to be too hot and harsh to sustain any form of life, the park's geothermal attractions contain an astonishing variety of micro-organisms, whose ability to survive both high temperatures and extremes of acidity and alkalinity--from battery acid to household ammonia--makes them potentially valuable.

The spur for this biological gold rush is *Thermus aquaticus*, discovered in the nearly boiling waters of Mushroom pool, about 8 miles from Old Faithful. An enzyme from Taq, as the microbe is known, drives the polymerase chain reaction, or PCR. This laboratory genecopying process in turn makes possible DNA fingerprinting, which has revolutionized the study of blood and other evidence in criminal investigations. Cetus, the company that patented Taq and the PCR technique, sold them for \$300 million in 1991 to Hoffmann-LaRoche, which now earns more than \$100 million a year from sales of the process.

While the Taq Enzyme has proved to be a microbial mother lode. Yellowstone thermophiles are being used in other commercial applications as well. These include converting organic wastes like cellulose into ethanol and other fuels, producing an environmentally safe road de-icer and a non-toxic paint stripper for military aircraft, and various genetic engineering projects. They also are used in pulp and paper processing, gold and copper mining, acid mine drainage and reclamation, food processing and the perfume industry.

And scientists from the National Aeronautics and Space Administration are studying the geothermal features as a possible model for evidence of past life on Mars.

About 40 universities and private laboratories hold permits to hunt for the thermophiles in Yellowstone's bubbling primordial pools. Researchers liken the vast, largely untapped microbial ecology of the park's hot springs to the incredible biodiversity of the Brazilian rain forest. "The biotechs are hunting hard, hot and heavy," says Ward, who also serves as a kind of guide for companies wanting to prospect the pools. "Everyone wants to discover another *Thermus aquaticus*."

Though Yellowstone's \$20-million budget for next year isn't enough to prevent cutbacks in visitor services or to repair some of the national park system's worst roads, the cash-strapped park has yet to see a dime of the hundreds of millions of dollars Hoffmann-LaRoche and other biotech companies have made from its microbes. The federal government, which sells timber from the national forests and profits from royalties paid on oil, gas and coal leases on public lands, has no similar provisions for selling micro-organisms; although, it is angling for a share of the potentially immense future profits.

Academics on tight budgets fear that being forced to pay for the privilege of doing basic research in a public park could crimp their efforts. But park officials and some biotech companies eager to claim rights to any valuable new discoveries think Yellowstone should be able to cash in on its unique resource. The park's chief scientist, John Varley, wants biotech companies to pay a royalty of 0.5 percent to 1.5 percent on new discoveries. For the park, that could turn billions of tiny organisms into gold. (Source: *U.S. News & World Report*, December 2, 1996)