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FEATURE

Prospecting the Biodiversity of Yellowstone

The next best resource doesn't involve logging, mining, or depleting an environment of its vitality. In fact, you can't even see it without the help of a microscope. And that's precisely the point.

By Contributing Writer, 12-03-06

In 1969, Thomas Brock, a bacteriologist from the University of Indiana, traveled to Yellowstone National Park. He had heard of unique bacteria in the Park, and wanted to see firsthand the potential of this diverse environment. Unsure of what his discoveries would bring, Brock set about simply collecting and cataloguing samples. In the decades that followed Brock's trip to Yellowstone, biochemical researchers employed one of his samples in furthering DNA research through the development of the polymerase chain reaction. The research was revolutionary to the scientific community, and even brought one researcher the 1993 Nobel Prize in Chemistry.

Caption: The Main Terrace at Mammoth Hot Springs, photo courtesy of the National Park Service.

The sense of wonder that drove Brock to the Park remains very much alive; Park visitors still want to see firsthand the potential of the earth's natural environment. Our world is a fascinating place, a place where discoveries such as Brock's can be made, put away, and then, in time, rediscovered. And just as fascinating as what these discoveries bring is where they come from. Some are made in exotic rainforests, others in the depths of the oceans. And some, like Brock's, take place in nothing more and nothing less than a bubbling, multihued thermal pool isolated in the backcountry of northwestern Wyoming's Yellowstone National Park.

An early morning drive in June of 2006 delivers us to Yellowstone's north entrance at Gardiner, Mont. An hour after entering the Park, we're hiking. The steep, switchbacking trail crisscrosses consistently up the lightly treed hillside on the south side of the road. From where we've parked the van, a short hike brings me and five colleagues to a plateau. We're surrounded by cauldron-like thermal pools and actively hissing vents. The air has a strange, impure quality to it, noticeably tainted with thermal gas. What was a healthy, forested environment five minutes down the trail has now transformed into a hostile scene, at first glance devoid of life. The ground is no longer dirt, no longer soft and dark. It is now sharp, white, and crumbly, extraterrestrial in appearance -- and dangerous, too. The numerous avenues of thermal activity directly below, out of sight, have caused the ground to weaken in spots. It takes a trained eye to navigate safely through this mysterious environment.

Leading the way through the invisible maze is Dr. Mark Young, a virology professor from Montana State University. In recent years, Dr. Young has extensively researched viruses in Yellowstone's thermal features. "Follow me, and watch your step," he says with a huge grin, leading us across a small, bubbling stream, up a slight incline, and then back toward a small thermal pool near the edge of the plateau. We wind up not ten feet from the end of the trail, yet have to travel nearly four times that distance to reach our destination. Chances are one of us would have fallen through the fragile crust had we simply beelined it for the pool. But despite our fragile path through this desolate landscape, I can't help but think of the potential that lies within these pools. Even in this seemingly hostile zone, says Dr. Young, life abounds. While he continues talking about the wonders of the microscopic world through his own discoveries, I drift off to considering the prospects of microbial diversity. Here, on this small plateau in the northern environs of Yellowstone National Park is something mysterious to us, something intriguing and distinctly foreign. But it is also available to us, ready and waiting to be discovered. Who will go searching, and what will they find?

In August of 1997, Yellowstone National Park signed into a benefits sharing agreement with the Diversa Corporation, a San Diego based biotechnology company interested in naturally occurring enzymes and their application to developing environmentally friendly alternative fuels and cost effective specialty industrial processes. Diversa had been extracting enzymes of this sort from a number of Yellowstone's thermal features. They subsequently succeeded in discovering a profitable and useful application for one of their discoveries and entered into a benefits sharing agreement with the Park. The agreement, designed to allow Yellowstone rights to the intellectual and monetary benefits of Diversa's research, fell under scrutiny by a number of environmental groups for its lack of an environmental impact statement, or EIS. The dispute went to court in March of 1998. The resulting court order required Yellowstone to draft an EIS for activities relating to research of microbial diversity in the Park. This would become pertinent to the future search for Yellowstone's hidden life forms.

Like Brock, Diversa was lured to Yellowstone by the prospects of exploring its biological mysteries. Not certain of the outcome but nonetheless determined to explore the possibilities, these researchers represented a new wave in the ever-evolving natural resource industry, something that came to be known as bioprospecting. This search for potentially profitable and beneficial microbial diversity emerged with the realization that the bacteria comprising the world's microbial diversity was equally as valuable as the forests we log and the mines we tap. Unlike logging and mining, however, bioprospectors can stake their claim without devastating their environment. And it is exactly for this reason that Yellowstone, famous for its concentration of thermal features, is all the rage with independent researchers such as Brock and corporate bioprospectors such as Diversa.

A short drive south of Yellowstone National Park's north entrance is Mammoth Hot Springs. Mammoth, one of the Park's most popular destinations, is recognized for its extensive, terraced thermal features. Mammoth is also the park's administrative hub, and following our hike through Yellowstone's backcountry with Dr. Young, I find myself seated in a conference room at the heart of this administrative core. Having spent a better half of the day zipping around the park's roadways and hiking through its woodlands in search of thermal activity, we settle in for an afternoon of examining the bureaucratic side of the Park's diverse thermal features.

Seated at the head of the small conference table is Tom Olliff, Chief of the Yellowstone Center for Resources. Olliff, clad in his standard issue Park Service gray and green and armed with a laptop computer and projector, is here to speak with us about the Park's involvement in bioprospecting and the soon to be released EIS. Having recently completed a draft of the impact statement, he rubs his temples and sighs, slightly exhausted but relieved to be nearing the end. The drafting process has been extensive, involving a good deal of precise revision. He makes it clear that since the impact statement will apply service wide for the National Park Service, getting it right the first time will be crucial. And for those following in the footsteps of Brock, the EIS will determine the extent of future searches and discoveries, Olliff says.

Shortly after the release of the EIS in September of 2006, I caught up with Olliff to talk about the EIS and discuss the future of bioprospecting in the National Parks. "The draft EIS we're doing covers all the park units in the National Park Service. This is not just for Yellowstone. It applies nationwide to all Park Service units. What we're trying to do is propose some procedures for benefits sharing," said Olliff, making it clear that the release of the EIS does not necessarily mean that benefits sharing agreements will be implemented. "We're trying to decide what procedures we'd use if we did decide to implement some benefits sharing agreements."

Furthermore, Olliff noted that the release of the EIS satisfies the 1998 court order to study the impact of bioprospecting on the Park's ecology. In light of this, I asked him to discuss his thoughts on the potential of benefits sharing agreements. "I don't necessarily know that the benefits back to the park will be monetary as much as [they will be] new information gained and new relationships gained with the scientists. It's pretty hard to predict. The EIS predicts we might see anything from zero to $150,000 annually. As the manager of the Park, I'm not expecting to make any kind of money. We benefit a lot from our relationships with scientists, and we learn a lot from outside scientists."

And it is precisely the relationships Yellowstone is cultivating with researchers outside of the Park that will drive the bioprospecting industry into the future. Still present on the Park's research scene are scientists from Diversa. Following their 1997 agreement with the Park, it remains in the best interests of corporate development to keep with the spirit of the benefits sharing agreement. "From a corporate community standpoint, from the standpoint of benefits sharing, these are the types of agreements we want to sign, not because they're making us do it, but because we want to do it, because it's a win-win for everyone," says Martin Sabarsky, Vice President of Corporate Development for Diversa. "Stealing biodiversity is not the way we've done business. We really pioneered going in there and making sure that technology transfer, training scientists, providing funding, and providing scientific knowledge were our priorities." Diversa has proven itself as an innovator in the field of biotechnology. Partnerships with various industry companies such as DuPont and Syngenta have yielded breakthroughs in the ability to efficiently convert corn into ethanol, a technique that has strong potential in providing alternative fuel sources. Just as revolutionary as these avenues toward alternative energy is Diversa's focus on the use of naturally occurring enzymes to catalyze these advancements. And, according to Sabarsky, the plot of land in northeastern Wyoming is doing more than ever to help unearth these enzymes. "What is a better use of our national treasures and resources than to assist our country in becoming independent on imported oil? I can think of no better way to assist in this. Yellowstone in particular has the distinction of being at the center of the latest or most important revolutions in science and the biotechnology industry. To the point that biodiversity can significantly transform industries, and for the fact that since Yellowstone has the most incredibly unique biodiversity on the planet, we owe it to ourselves to use these in ways that can transform our society and the world."

Olliff echoes these sentiments, even when I inquire as to whether or not bioprospecting will affect Yellowstone's sustainability. What I want to know is whether management decisions associated with bioprospecting will lead to the devastation of the Park. "The bioprospecting I'm aware of is really one of the least impacting types of research we have seen. Basically, researchers are collecting small amounts of water, small amounts of soil."

I am still not quite convinced. What if, I ask Olliff, the research proves successful? Will researchers be back for more, depleting the resource entirely? No, says Olliff. He concludes that at most, researchers will gather "Less water than a camper would collect in his water bottle." That's something the Park can live with. And so can I.

At its very core, bioprospecting in Yellowstone is in every way consistent with the park's mandate to conserve and preserve the environment while at the same time providing knowledge for future generations. But that isn't Yellowstone's only motivation for working so hard to promote the practice of bioprospecting, to draw up benefits sharing agreements, and to maintain relationships with outside researchers. It's in the name of something that all of these contribute to, something that Thomas Brock instilled in the spirit of Yellowstone when he made it available to us during his visit to the Park in 1969. Even Olliff, despite having dealt with political red tape and years of delays in hopes that Yellowstone might one day benefit from the park's microbial diversity, knows the virtues of bioprospecting in Yellowstone. "It is amazing how scientific discoveries and what scientists learn from organisms can impact our lives," he says. "What it's all about is scientific discovery."

Read the draft environmental impact statement from the Park Service here. The comment period on the eis closes December 15.

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