

COMMENTARY

A look at the mystery of Carolina gold

In 1827, a plantation owner named Benjamin Haile noticed a bright yellow stone lying on the bottom of a stream in Lancaster County. He leaned over, picked it up and immediately identified it.

Gold!

Benjamin Haile's discovery touched off a gold rush in South Carolina that has lasted, in fits and starts, right up to the present day. The Haile Mine produced more than \$6 million worth of gold prior to the Civil war, an incredible fortune by 19th century standards. As recently as 1992, South Carolina ranked seventh among the 50 states in gold production.

In the early days of the South Carolina gold rush, most of the gold was found in gravel at the bottom of stream beds.

As this easy-to-reach gold was quickly exhausted, miners began burrowing deeper into the earth to find the "veins" of quartz rock that contained more gold. As they dug, they began to notice something unusual. A good portion of the gold was present as tiny microscopic flakes, finely dispersed through sediments that had accumulated on the bottom of an ancient ocean. How, geologists wondered, could gold deposits form in this way?

This remained a mystery well over a hundred years. But last month, research published in the scientific journal *Applied and Environmental Microbiology* suggested an answer to the riddle.

Like all living creatures, bacteria have to eat and breathe. But whereas higher organisms are limited to breathing oxygen, some bacteria can breathe more exotic compounds. Derek Lovley, a microbiologist at the University of Massachusetts, has long been interested in bacteria that grow by "breathing" oxidized metals such as iron and manganese. Could it be, Lovley wondered, that these microorganisms were also able to "breathe" the oxidized gold present in seawater?

To find out, Lovley grew a culture of bacteria on oxidized iron, and then transferred the culture to a solution containing soluble

gold out of solution and precipitated it as a fine metallic sediment in the bottom of the test tube, just like the gold in the rocks of South Carolina.

Five hundred million years ago, what is now the Piedmont of South Carolina was located at the bottom of an ocean. Like the present-day Atlantic Ocean, this sea floor was being pulled apart by tectonic forces, and molten lava periodically erupted through the fissures that were created. This pumped a mixture of seawater and hot volcanic fluids through the sediments. Apparently, heat-loving bacteria present in the sediments were able to "breathe" the gold in these fluids, causing metallic gold to be deposited in the sediments.

Can you think of anything more bizarre than gold-breathing bacteria?

Well, maybe so. A few months ago, it was discovered that some groundwater in the Piedmont contains relatively high concentrations of uranium. It turns out that the very same metal-breathing bacteria that may form gold deposits are also capable of forming uranium deposits. It's entirely possible that the spotty concentrations of uranium in Piedmont rocks, which are now contaminating groundwater, were formed long ago by uranium-breathing bacteria.

The great thing about Mother Nature is that she never seems to grow weary of astonishing us. Microbiologists in particular have given up being surprised by the

unusual things that bacteria - supposedly the simplest creatures on Earth - can do.

Even they, it seems, can go for the gold.



Frank Chapelle

Guest Columnist

Dr. Chapelle is a hydrologist who lives in T Little Mountain