How does world's oldest water taste? 'Terrible.'

June 14 2013, by Deborah Netburn

Nearly 1.5 miles beneath Earth's surface in Canada, scientists have found pockets of water that have been isolated from the outside world for more than 1 billion years.

The ancient water, trapped in thin fissures in granitelike rock, has been bubbling up from a zinc and copper mine for decades in Timmins, Ontario. Only recently have scientists been able to calculate the age of this water and determine that it is the oldest ever discovered - possibly as old as 2.6 billion years, when Earth was less than half its current age. And it may harbor life.

Barbara Sherwood Lollar, an Earth sciences professor at the University of Toronto, described the water in a report published last month in the journal *Nature*. She discussed the prehistoric liquid with the Los Angeles Times.

Q: What is very, very old water like?

A: What jumps out at you first is the saltiness. Because of the reactions between the water and the rock, it is extremely salty. It is more viscous than tap water. It has the consistency of a very light maple syrup. It doesn't have color when it comes out, but as soon as it comes into contact with oxygen it turns an orangy color because the minerals in it begin to form - especially the iron.

Q: So you've tasted it?

A: I have to admit I have tasted it from time to time. It tastes terrible. It is much saltier than seawater. You would definitely not want to drink this stuff.

We are interested in the saltiest waters because they are the oldest, and tasting is the quick-and-dirty way to find which are the most salty. I don't let the students do it, though.

Q: It's not like this water was sitting in a big underground reservoir, right?

A: Right. The water is in a thin network of veins that are spread out through what looks like solid granite rock. They look like the cracks in the foundation of a house. But when the veins open up, there is enough water to bubble right out.

Q: How does water get trapped for more than a billion years?

A: The rocks in the Timmins mine formed about 2.6 billion years ago on what was an ancient ocean floor. Some of the water trapped in them could be remnants of ocean water that was in contact with the rock when it formed, and some of the water probably moved through cracks in the rock over time and then got stuck there.

Q: How did you first come across this water?

A: The mining community has known about it for a very long time. There are records of it in the annual reports of the Canadian Geologic Survey from as far back as the 1880s.

In the 1980s, when I was a graduate student, we were contacted by some of the mines because the water was corroding their equipment. That's when we began to research where it was coming from.

Q: How did you figure out its age?

A: That came about from a technique that our colleagues at the University of Manchester in England have refined. The longer a fluid sits in the Earth over time, the more it interacts with the rock and creates radiogenic isotopes of the noble gases. By measuring the radiogenic isotopes in the water, we get an estimate of how old it is. These are some of the most radiogenic-rich waters that have ever been identified.

Q: How old was the previous record holder?

A: Before we found this water, we found water in a gold mine in South Africa that is on the order of tens of millions of years old. It was 1.6 miles beneath the surface.

Q: In your Nature paper, you and your colleagues say the water is between 1 billion and 2.6 billion years old. That's a pretty big spread.

A: That spread represents the range of ages we got from measuring the isotopes of the five different noble gases, but the key finding is that in five different systems, this is the oldest water that has ever been measured.

Q: In your paper, you speculated that there might be life in this ancient water. What makes you think so?

A: The water has the same kind of energy that supports the microbial life found near deep-sea vents and in the South African gold mine. We have shown these waters are habitable. The next question is whether or not they are inhabited.

Q: How would life have developed in water that has been isolated for so long?

A: Microbes could have gotten into the water from the time the rocks formed, or they could have flowed in later with water that might have penetrated the rock.

Q: How can you figure out whether the water harbors life?

A: We take cultures, but it is hard to replicate in the lab the exact mix of environmental conditions that the microbes need to grow. They just don't breed well in captivity. So we also collect cells from the water and do genetic investigations. We look at the DNA fingerprints to identify what's in there.

It will probably be about a year before we have results.

Q: Do you think there are other pockets of ancient water on Earth? Could some water be even older?

A: It's really hard to say. This research shows us that water can be trapped in rocks so much longer than we thought was possible.

Q: You've said this study has implications for finding life on Mars. Can you explain?

A: Scientists have found evidence that there was once water on the surface of Mars. It could be that there is water trapped in rock hidden deep beneath the planet's surface in the same way the water was trapped in the ancient rock in the Timmins mine.

Q: What's next with your research?

A: We want to go to a variety of different sites and create a time scale of water. We'd like to figure out how much there is, find out the range of ages and understand how much of this ancient water is available. We'd

also like to see what is living in each of these time capsules.