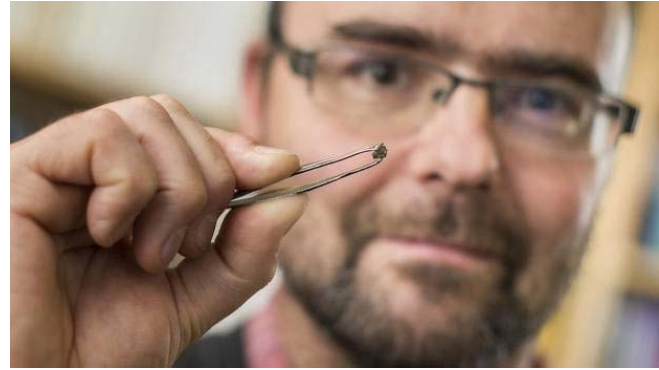


# Water from a stone: Tiny diamond contains secrets of Earth's mantle



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**Water locked within a diamond formed deep inside the earth offers new insights into what makes our planet tick – and suggests a vast reserve of water locked below the surface**

A pea-sized diamond picked up a decade ago by a Brazilian prospector has unlocked evidence that, hundreds of kilometres under our feet, Earth's mantle holds as much water as all of our planet's oceans.

The discovery by a University of Alberta team bolsters theories about the existence of a water-saturated zone between the Earth's rocky layers that would explain volcanic activities and the interaction of tectonic plates.

The diamond's route from the alluvial plains of Brazil's Mato Grosso province to the University of Alberta's labs is a tale blending an exotic setting with reminders of Jules Verne's classic science fantasy of a sea in the centre of Earth. The research, published this week in the journal *Nature*, confirms the terrestrial existence of ringwoodite, a high-pressure form of a common silicate.

What was most striking about the ringwoodite discovery, by a team led by University of Alberta professor Graham Pearson, was that 1.5 per cent of it was water, bound chemically to the mineral. Based on projections of how much ringwoodite scientists believe is in the Transition Zone, between 410 and 670 kilometres down, Dr. Pearson estimated that it contains "a very, very large amount of water."

"The amount of water is possibly up to all the water contained in all the world's oceans," he said.

The tiny ringwoodite sample, too small to be visible to the human eye, was trapped in the diamond, which itself was encased in kimberlite, a volcanic rock ejected to the Earth's surface during the Cretaceous period, 90 million years ago, when dinosaurs roamed the planet.

Erosion exposed the gem amid river gravel in a tributary of the Rio Aripuana, and a *garimpeiro*, an artisanal miner, sieved it out and sold it to a diamond geologist a decade ago.

Ringwoodite is a high-pressure form of a common silicate mineral, olivine, also known as peridot. Until now, it had been found only in shattered remains of meteorites and the mathematical models of scientists parsing seismic sensor results.

"It's not stable at the Earth's surface. It's only when trapped within a diamond and brought to Earth quickly that you see it. This is the first time it's been seen," said Dr. Pearson, who is the University of Alberta's Canada Excellence Research Chair in Arctic Resources.

The presence of water in the rock at the depth of the Transition Zone weakens it and reduces its melting point, Dr. Pearson said. This would play a role in creating magma and destabilizing the roots that anchor continental plates.

French geophysicist Nathalie Bolfan-Casanova, who did not take part in the research, said Dr. Pearson had made a very important finding.

"It is already exceptional to have a sample that preserved such a high-pressure phase ... and, in addition, with water!" Dr. Bolfan-Casanova, a researcher at Université Blaise-Pascal Clermont-Ferrand, said in an e-mail.

The diamond, labelled JUC29, came from a batch bought by geologist Mark Hutchison, a director of Trigon GeoServices Ltd., a prospecting firm based in Las Vegas.

For years, Dr. Hutchison has been buying diamonds from Juina, in the Brazilian interior near the border with Bolivia.

Juina diamonds are usually of poor quality, which makes them perfect for researchers interested in the minerals encased in the gems' tiny flaws, Dr. Hutchison said in an interview.

He described Juina as a mining community where *garimpeiros* sell their stones on wooden tables in little shacks. The surrounding area is a lush, flat grassland where meandering rivers expose diamond-rich gravel flood plains.

The *garimpeiros* scoop up the gravel with diesel pumps, then sieve the material through shaking tables.

Dr. Hutchinson acquired diamond JUC29 a decade ago and identified it as a potential research target. It took four years of tests to prove it contained ringwoodite.

"Jules Verne speculated 100 years ago that there was an ocean floating in the deep Earth," Dr. Pearson said, referring to the French author's classic novel *Journey to the Center of the Earth*.

"Well, this is an ocean mass of water, but it's not free water. It's bound to silicate rock."

URL: <http://www.theglobeandmail.com/news/national/how-a-tiny-diamond-implies-oceans-of-water-hidden-deep-inside-the-earth/article17466735/>