David Staples: New thinking in diamond exploration points to beautiful stones in Alberta

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Alberta is home to a promising site for diamond exploration, one that could well be a lucrative deposit of the world’s most beautiful stones.

Thomas Stachel, a University of Alberta geology professor and the western world’s only professor devoted full-time to studying diamonds, is involved in work that overturns the main paradigms of diamond exploration.

His work is also bringing increased attention to a new diamond belt that extends across Western Canada, with the current exploration site of Buffalo Head Hills in northern Alberta a good possibility for a deposit that is economic to mine.

“Essentially the exploration job is not finished in Alberta. I hope they will start to revive it,” Stachel said.

The thinking about where it’s best to find diamonds has for decades been strongly influenced by how and where diamonds were first found in the rich South African diamond belt, Stachel said.

The precious stones form under high pressure and temperatures about 150 to 250 km in the mantle under the Earth’s surface. Diamonds are carried to the surface by volcanic eruptions that pass through diamond-forming zones. The diamonds then sit in volcanic channels or pipes, known as kimberlites, made up of igneous rock.

In South Africa, the original discovery was on a geological formation known as a craton, which are very old areas (at least 2.5 billion years old) and hundreds of kilometres across. The Canadian Shield is made up of three or four major cratons, Stachel said. Cratons tend to be well stocked with rich minerals, such as platinum, gold and diamonds.

“Canada is absolutely blessed with having a huge area that is covered by cratons,” Stachel said.

According to the rules of South African exploration, formed in the 1950s, a good diamond-producing craton should be at least 2.5 billion years old and should not have had anything major happen to it in geological terms afterwards.

All the diamonds discovered in South Africa were found to be more than 2.5 billion years old.

The South African paradigm of diamond exploration was reinforced because, in nearby Namibia, there were all kinds of kimberlites not located in cratons but they were all barren of diamonds.

“They developed this model that if you were on the craton you have the good (diamond-rich) kimberlites, but if you’re off the craton you have the bad kimberlites,” Stachel said.

One other major rule of exploration was developed in South Africa. It relates to two important rock types in the mantle, harzburgite and lherzolite. In South Africa, they found the rocks beneath the diamond-rich cratons were 85 per cent harzburgite and 15 per cent lherzolite. Hence, to find diamonds, look for hazbergitic rocks on the surface.

Stachel came here from Germany in 2001 in response to the growth of the Canadian diamond sector that now produces $2 billion in diamonds per year. In Canada, he
was struck by the number of unconventional diamond finds that didn’t conform to the South African rules for exploration.

In Alberta, the Buffalo Head Hills kimberlites are not on a craton and the area is 1.9 billion years old, not 2.5 billion or more. In the area of the Victor Mine in northern Ontario, which has been an active mine since 2008, there was a major geological event, the mid-continental rift that 1.1 billion years ago threatened to break up North America. This rift heated up that area for hundreds of millions of year, greatly disturbing its geology.

“It isn’t exactly a high grade deposit but it’s probably the mine with the highest value production in the world ...” Stachel said of the Victor Mine. “The diamonds were absolutely beautiful. Absolutely exquisite quality.”

When he studied these Victor diamonds, Stachel dated them as 700 million years old and found they were created in lherzolite — not harzburgite — formations. “No one had seen that before in a mine.”

Buffalo Head Hills is also full of diamonds formed out of lherzolitic rock, and the same is seen at a Saskatchewan diamond site. “We seem to have this belt of lherzolite-dominated deposits through Western Canada. People haven’t traditionally looked at these things because that didn’t fall in the paradigm views for exploration. These areas were considered too young, they were considered too messed up (geologically). But they have diamond potential. You just have to look for different indicator minerals.”

Just what might this new thinking mean to the diamond industry worldwide?

Stachel said a new wave of diamond exploration could now come about, similar to what happened with the shale gas revolution of the recent decade.

“We can make a fundamental shift,” he said.

Source: Edmonton Journal