

## MINNESOTA KIMBERLITES

Are there diamonds in Minnesota? None, to my knowledge, have ever been found. But small bodies of rocks that may once have been kimberlites have been found recently in central Minnesota. Kimberlite is the bedrock in which diamonds may be found.

The first discovery came as a result of a detailed study of minor variations in the earth's magnetic field over Minnesota. Such variations are often clues to bedrock geology in areas otherwise covered by glacial drift. Approximately 70 small but intense magnetic anomalies were noted in the Little Falls area where Morrison, Stearns and Benton counties come together near the Mississippi River. In 1986, the Minnesota Geological Survey drilled several shallow holes into one of the anomalous areas about 3 miles southwest of Little Falls. The core showed a highly altered rock with chemical and mineralogical features consistent with kimberlite. This rock was described by Dave Southwick and Val Chandler of the Minnesota Survey in a 1987 article.

The original minerals in the Little Falls sample were olivine, amphibole, pyroxene, and biotite. Serpentine had replaced most of these minerals, destroying the rock's original textures and chemistry. The rock forms a pipe similar in size and shape to kimberlite pipes found in Africa and elsewhere. Southwick and Chandler feel that the evidence is consistent with this being a kimberlite, but is far from conclusive. For example, several minerals common in kimberlites such as pyrope, magnesium-rich ilmenite and chrome diopside are lacking. The small sample size and alteration of the rock also restrict the interpretation.

A year or two later, Paul Weiblen, also of Minnesota Geological Survey, described small scattered outcrops of a similar rock along the Minnesota River near Franklin in Renville County, about 120 miles south of the Little Falls drill core site. The rock exposed is also "altered" but shows kimberlite "affinities" in its mineralogy and chemistry. The rock originally consisted of olivine, orthopyroxene, chrome spinel, amphibole and phlogopite. Later alteration formed quartz, serpentine and calcite. Again, the identification of this as a kimberlite is tentative.

It is risky to speculate based on two tiny samples, but kimberlites do occur in swarms, and it is certainly possible that a large, previously unrecognized, swarm exists under the glacial drift in central Minnesota. Kimberlites can contain diamonds, but not all of them do. The diamonds are also rather thinly dispersed through those that do. Until more work is done in these regions, one cannot tell if these rocks have any economic value.

Speaking of speculation, Southwick and Chandler suggest that the diamonds found in stream gravels near Rock Elm, Pierce County, Wisconsin could have come from kimberlites near Little Falls, Minnesota. This is consistent with the direction of the glacial motion, but one could ask why the glacier had to "escape to Wisconsin" before dropping its diamonds. Or, perhaps, diamonds do await discovery in a Minnesota gravel pit by a sharp-eyed rockhound.

- Dr. Bill Cordua, University of Wisconsin-River Falls

References:

Southwick, D. and V.W. Chandler, 1987, "Mica-bearing olivine pyroxenite of possible lamproite-kimberlite affinity in central Minnesota," *Economic Geology*, vol. 82, p. 2312-217.

Weiblen, Paul, 1988 rocks of kimberlite affinity in Minnesota, *Institute on Lake Superior Geology*, vol. -34, p. 45.