Agate Hunters Point Way to an Impact Crater

Recognition that some agates can form in rocks produced from the impact of an asteroid on the earth has lead Finnish geologists to the site of a previously unrecognized impact crater. This is one example of how observations made by rock hounds can lead to a major scientific discovery. Finland is a bit like Minnesota and Wisconsin in that much of it is covered by glacial sediments, with little bedrock exposed. In the 1960's rockhounds began finding agates in the gravel pits north of Helsinki. These were attractive banded nodules up to 2 inches across. Their color bands ranged from white to red to brown to reddish orange. Chlorite and various zeolites minerals, particularly mordenite were associated. Unlike Minnesota and Wisconsin, the bedrock of Finland was not volcanic, consisting mostly of schist, gneiss and granite which do not bear agates. The bedrock source of these agates was unknown, and constituted a major mystery.

A Finnish geologist, H Papunen, noted that the agates were found with chunks of other rocks that were typical of those found in craters formed by asteroid impact with the earth. Rocks melted by such a powerful event would form gas bubbles just like those in conventionally formed lava flows. These gas bubbles could then easily be filled later on by agate-forming solutions. The agates, being so hard and chemically resistant were much more likely to survive weathering and erosion than the typical rocks formed by such impact. Consequently the agates would be widely disbursed by the glacier that scrapped through the older crater. Papunen (1969) began plotting the location of the pits in which rockhounds were finding agates. Those pits formed a distinct trail leading north. Using the known direction of glacial movement in that area, he was able to trace the agates back to what he thought was the buried site of the crater. Drilling and geophysical work verified that there was in fact a buried crater there. This crater came to be called the Lake Saaksjarvi crater, and turned out to be 5 kilometers across. None of it outcropped at the surface.

A recent study by Karla Kinnunene and Krisitan Lindqvist (1998) of the Finnish Geological Survey investigated whether these agates were different from agates formed in other environments. They found that the impact agates were similar in all measured physical, chemical and structural aspects to those agates formed in sedimentary or volcanic environments. Consequently, the presence of agates in an area such as ours, where agates from other sources are widely distributed in the glacial drift will not be useful in identifying the location of buried asteroid impact sites. In other areas, where agates aren't ordinarily found in the bedrock, agates may form a useful "path-finder" mineral pointing the way to the discovery of more impact structures.

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References:

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