

## **Utilization of Geological Techniques to Help Solve an Archaeological Puzzle: When Did People Arrive in North America?**

Knut Fladmark hypothesized that as soon as boat technology was developed 40,000 years ago, people probably traveled the oceans. The 40,000-year-ago shoreline is now below 150-160 ft (50 m) of water and an unknown thickness of sediment. So evidence for boat transport by maritime people would be under the today's oceans. Geological data could provide locations of specific paleoshorelines and general sedimentation rates. Palynological data from cores could provide information about introduction of medicinal and food plants from distant sources. Underwater geophysical techniques such as magnetic mapping, resistivity methods, seismic profiling and ground penetrating radar might be useful too.

An interesting idea about changing shorelines was successfully tested by Thomas Dillehay and Ruth Gruhn at the Monte Verde cave sites in Chile. They suggested searching for onshore caves along narrow continental shelves. Submarine canyons also should be searched because they are often fracture zones. Such places not only might have now-submerged caves but are also subjected to periodic sediment removal. So, submarine canyons might be good places for deep SCUBA divers to search for caves and buried artifacts.

It is easy to envision early maritime people, staying by the paleo-shoreline, taking advantage of abundant marine food sources. Through time, descendants would have followed the rise and fall of sea level. At the time of peak glaciation 21,000 years ago, the entire continental shelf was exposed. Then as sea level rose upon glacial melting, village sites would have moved shoreward accordingly. The 8,000-year-ago shoreline is now below 1.5-6 m (5-20 ft) of water. Indeed, large, heavy artifacts from a submerged village of that age are often seen by divers especially near the La Jolla Beach and Tennis Club. Around 7,000 years ago, an episode of intense erosion occurred, which would have reduced water clarity, affected marine animal distribution, and forced people toward onshore sources of reliable food.

Other evidence for early marine travel might be in the creation songs of today's coastal indigenous people. Many songs tell of creation from the ocean and mention boats. One even tells of the arrival of the "new people" who hunted big game. The creation songs may help prove that the earliest ancestors arrived here very, very long ago by boat. Geologists are needed to help lead the search.

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