

Gibraltar Rock: Here by Chance for all to Enjoy!

When you explore the recently constructed addition to the Gibraltar Ice Age Trail Segment, keep your eyes on the rocks as well as the trees. There are scattered erratics that were carried by the glacier from a long distance, but most of the large boulders around the steeper slopes are blocks of sandstone that have tumbled down from higher up. Most rolled down after the glacier left, because the sliding and flowing glacier would have removed the loose blocks and carried them westward to the glacier edge. This sandstone is called the St. Peter sandstone and you can see it all along the top of Gibraltar Rock. Much of this rock layer, which extends south to Arkansas and Tennessee, east to Ohio and west to Nebraska and Kansas, was deposited in a shallow, tropical sea about 470 million years ago. At that time this spot was about 20° south of the Equator. To the (what is now) north, the continent was a barren landscape, perhaps looking like the surface of Mars today. There were no land plants or animals, and some places were blanketed by sand dunes. The sand grains on this lifeless continent were eroded by rivers that carried them to the sea, where they sank to the bottom and through time were buried by younger and younger deposits. Much of the St. Peter sandstone west of here was deposited in that shallow sea, but the rocks on top of Gibraltar Rock were likely deposited as sand dunes above sea level. Eventually the sea rose and covered the dunes here as well.



Glacial striations show ice flow direction.
Dave's dog Maisy points the way.

By sometime after 400 million years ago, what is now Wisconsin had slowly risen above sea level and rivers began to erode the rocks above (younger than) the St. Peter. From that time until the glaciers arrived about 30,000 years ago, this was an eroding landscape. It was this erosion that produced the hills and valleys right around Gibraltar Rock—glaciers only shaped the hills that were already there. So, almost 400 million years of earth history went unrecorded in southern Wisconsin, but then the glaciers left us evidence of what was happening on the landscape. The ice of the Late Wisconsin glaciation advanced from the northeast, with the glacier edge extending west to the Badger Ammunition Plant site and Devil's Lake. The glacier reached nearly 1000 feet thick over the top of Gibraltar Rock—that's 4 times higher than the cliff you look down from at Gibraltar Rock today!

We know the glacier covered the top of Gibraltar Rock because there is till, a mixture of sand, clay and rocks deposited by the glacier, over its surface. The sliding ice also left striations—scratches on the rock surface that show the direction of glacier movement. Can you find them? They have been exposed to the weather for years, so have partly worn away, but they are there—showing the glacier was flowing toward the southwest when the scratches were made.

So, why is Gibraltar Rock here? It is mostly by chance. During the hundreds of millions of years after the sand was deposited, the grains were cemented with silica cement. In some spots the sand grains were hardly cemented, and were easily eroded. In other areas, sand grains were tightly cemented together making the St. Peter sandstone a very resistant cliff-former in southern Wisconsin—and Gibraltar Rock is a great example of this!

Dave Mickelson is retired from teaching in Geoscience at U.W. Madison. He is a trail-wide member of the Ice Age Trail Alliance and is serving his first full term on the IATA Board of Directors. He is co-author of "Geology of the Ice Age National Scenic Trail", which was published in 2011. (<https://www.facebook.com/pages/Geology-of-the-Ice-Age-National-Scenic-Trail/174530675976228>)

