

### Mikaelshula

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Mikaelshula has been developed in granite-gneiss situated on a steep cliff at Norsjø in Skien municipality. It is named after the archangel St. Michael and has been used for religious purposes. The article has information about the source material, a bibliography of older literature and pictures and maps of the cave and the terrain. The cave is a protected site due to its historic heritage.

Some of the oldest and most interesting references are:

The cave, or mountain where the cave is, is featured in a murder case from the Friday before Pentecost in the year 1340.

Bishop Eystein jordebok was written during the period 1388-1401 and is named after Øystein Aslaksson, the Bishop of Oslo 1386-1407. Øysteins purpose was to provide an overview of the ecclesiastical estates the bishop oversaw. The book mentions the cave, or more precisely, the church.

The Dane Ole Worm published in 1643 his main work in 6 volumes: Monument Danica (Danish memorial). The piece is written in latin, as practices were at the time, and is based on reported information about rune inscriptions. But in Volume No. 6, in between rune pictures, Worm has discussed Mikaelshula. The chapter is called Templum Mirabile. The renowned Danish biologist Otto Frederik Müller visited the area in 1775. The cave is described on page 23-25 in his book.

Edouard Romeo Vargas-Bedemar conducted mineralogical expeditions to Norway in 1810-1812 and 1814. Mikaelshula is mentioned in two of his books, the first one is in Chapter VIII of the Antiquariske Annaler from 1817.

The Swedish Finnish Wilhelm Maximilian Carpelan went to Telemark in September 1823 and wrote about his visit to the cave in an article in 1824.

Christian Christoph Andreas Lange was a historian and national archivist from 1845. Lange commissioned Christian Olavius Zeuthen, a Danish architecture and landscape painter, to draw Mikaelshula in Zeuthen's Norway trip in 1845. Lange has a long description of the cave in the article Notits om St. Michaels Kirkehule i Thelemarken i Norge in Annaler for Nordisk Oldkyndighed og Historie, where two drawings of Zeuthen are included (front page of this journal).

Geologist Hans Henrik Reusch described Mikaelshula in Geological Survey of Norway (NGU) yearbook for 1920-1921. He said that the rock is granite, in which an easily weathered zone occurs.

Professor Anders Bugge led an archaeological expedition to Mikaelshula in July 1947, together with the Danish and Norwegian archaeologists with "good names". As preliminary results were confirmed traces of partitions which appear to have divided the room in a fairly large porch, an almost twice as large nave and a rounded chancel where the ceiling had dome-like holes, perhaps to hang a clock in. The likelihood suggests that the sanctuary originated from early Norwegian Christianity, and that St. Michael, as he often did, took a place for pagan cults in his service.

The story of the retired sea captain blasting the cave in 1983 took its course through the legal system and up to the Supreme Court. His actions were illegal.

Mikaelshula was mapped down to the lake Norsjø using DistoX and PocketTopo the 11.3.2012. The floor of the opening is 48 meters above sea level, the roof of the opening 52 m.a.s.l. Cave length was measured to 27 meters. The innermost point (roof) is 57,5 m.a.s.l. The cave is thus 9,5 meters deep (greatest vertical height difference). The vertical distance from the surface to the innermost point is approx. 27 meters. The data shows a horizontal area of 114 m<sup>2</sup>.

Reusch (1920) stated that Mikaelshula has been eroded out of a zone of weathered rock. Probably it was formed by wave erosion after the ice age when the land was lower than today. There are zones of weathered rock on the walls of the cave. In recent years there have been some major problems of rock avalanches and water-leaks in the tunnels in the eastern part of Norway. Much research has resulted in an overview of the problem areas. The difficulties of the mountain quality are mostly due to deep weathering in ancient times. In the Jurassic period Norway was further to the south, and the climate was subtropical. 150 million years later, during the ice age, the sediments on the surface were eroded away by the glacier, but the deep weathering zones were preserved. Thus they lead to the tunnel problems - or even caves. So even if they are not so large, there may be holes in granite.

The altitude of the cave entrance corresponds to the height where the land uplift began to slow, ref. Ulf Hafsten (18) description of the bend in the shoreline diagrams in the area: In the Oslofjord diagrams this bend may be traced at 70-75 m in the Oslo and Ski area, at about 55 m in S. Østfold and S. Vestfold, and at about 50 m on the coast of Telemark, where this 'transgression marker' becomes more pronounced. The sea had a longer period of time to process the weakness zone where the cave is, than similar zones or cracks higher up the mountain. The formulas to Pålsson (19) were used to calculate that it is 9200 years ago since the sea was in what is now the height of the roof of the entrance to Mikaelshula (52 m) and 8700 years ago, sea level was at the floor of the entrance.