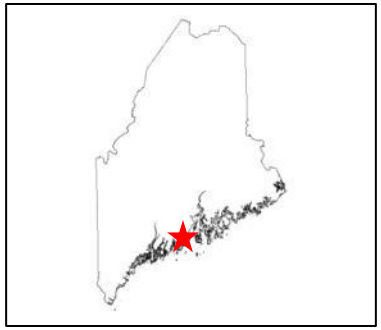
Geologic Site of the Month

May, 2002

Thomaston Prison Quarry, Thomaston, Maine



44 4‘ 35.22“ N, 69 11‘ 36.31“ W

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Introduction

On February 14, 2002, an era in Maine prison history closed when the last inmate at the State Prison at Thomaston was transferred to the new facility in Warren. For a few brief days following, the public was invited to view the "dark and comfortless abode of guilt and wretchedness" that the Legislature approved for construction in 1823 and that will soon be torn down to make way for a park (Figure 1). For those of you unfortunate enough to have spent time at the quarry while it was in use, this site will serve as a reminder of those days. For the rest of us who are fortunate to have never spent any time at the prison, this site will provide a vignette of some remarkable geology that will henceforth remain hidden.

Photo by R. Marvinney

Figure 1. The main vehicle entrance to the Maine State Prison.

Introduction

Part of the prison facility on what was known as "Limestone Hill" includes a small marble quarry that was originally used for hard labor by the inmates. When in 1923 the original prison burned, the rubble was pushed into the bottom of the quarry, covered over and flattened to make an outdoor recreational area that most recently hosted the prison's baseball diamond (Figure 2). A stratigraphy thus begun will be continued as rubble from the razed prison will yet again be pushed into the hole.

Figure 2. Overview of the marble quarry.

Regional Geology

The Thomaston area is underlain with a variety of metamorphic rocks ranging in age from Precambrian to Ordovician (Figure 3). The Precambrian rocks may be as old as 650 million years and the Ordovician rocks may be as young as 450 million years.

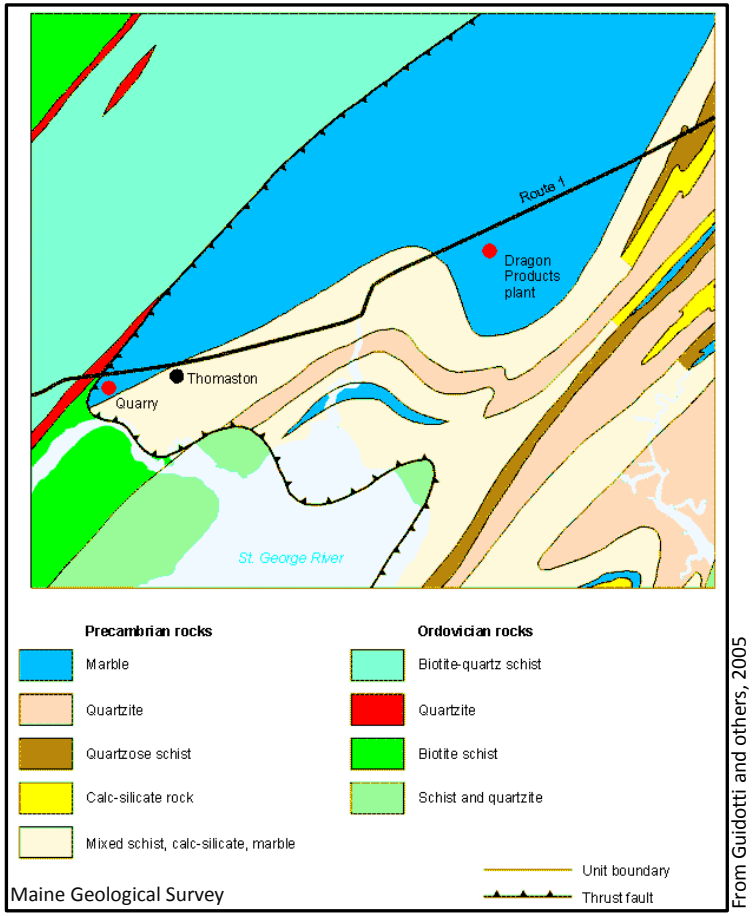

Figure 3. Regional geology of the Thomaston area, modified from Guidotti and others, in press.

Regional Geology

The Precambrian metamorphic rocks are thin units of thinly bedded marble, schist, quartzite, and units in which all these rock types are mixed. From Thomaston these Precambrian rocks extend northeastward to Camden. Numerous abandoned water-filled quarries can be seen along the back roads to the northeast. Chasing after the very best marble for lime production, the 19th and 20th century quarrymen left very steep sided, narrow and long pits in the nearly vertically bedded rocks. New England's only Portland cement plant, the Dragon Products plant, still quarries the marble in pits immediately adjacent to U.S. Route 1 in Thomaston.

The Ordovician rocks are mostly schists with variable amounts of graphite, garnet, and rusty-weathering minerals. Within the broad belt of schist are several thin quartzite units. This package of Ordovician rocks extends from the Port Clyde area in the south to just south of Camden.

Both the Precambrian and Ordovician rocks are part of regional thrust sheets that were set in place during the Devonian Period about 400 million years ago when a microcontinent called Avalon collided with North America. This mountain building event is termed the Acadian orogeny by geologists. It is responsible for the complex folding and faulting seen in rocks throughout the coastal area of Maine.

The quarry is composed almost entirely of thinly bedded marble with variable amounts of graphite and interbedded schist. Situated at the end of the thrust sheet of Precambrian rocks, the quarry represents the farthest southwestern extent of these rocks. The thrust stops here.

Geology of the prison quarry

Well exposed in the sides and southwest end of the quarry are beds of marble, originally deposited as horizontal layers, but now tilting steeply to the northwest. The marble is composed of thin beds generally an inch to several inches in thickness (Figure 4). Most beds are light gray in color, but this color is quite variable from bed to bed due to variations in the amount of graphite in each. The graphite came from organisms, presumably algae, that lived in the Precambrian sea. No fossils have been discovered in these rocks.

Photo by R. Marvinney

Figure 4. An example of thinly bedded marble typical of the prison quarry. Bedding is generally less than an inch thick to several inches.

Geology of the prison quarry

Minor folds are abundant in the prison quarry. These formed in response to the major geological events 400 million years ago that brought the Avalon microcontinent in contact with North America. Through detailed mapping of the folds around the quarry, we find that they take two forms: Z-folds and S-folds, imaginatively named after the letters they look like. Interestingly, most of the Z-folds are on the southeast side of the quarry (Figure 5) and most of the S-folds are on the northwest side of the quarry (Figure 6).

Photo by R. Marvinney

Figure 5. An example of a Z-fold in the southeastern wall of the quarry.

Geology of the prison quarry

Figure 6. Example of an S-fold in the northwestern wall of the quarry.

Geology of the prison quarry

The hinge lines of the folds plunge gently to the northeast (Figure 7). From all the information on the tilting of beds, the style and distribution of folds, and the orientation of their hinges, the geologist can draw a geologic map of the quarry (Figure 8).

Figure 7. Several fold hinges plunge gently to the northeast.

Geology of the prison quarry

The interpretation for the geology is that the quarry exposes a major syncline in the marble. A syncline is a fold with the youngest rocks in the middle. This syncline has a fold hinge line that plunges gently to the northeast at about 20 degrees. However, it has very steep sides or limbs with the southeastern side inclined about 70 degrees to the northwest. The northwestern limb has been folded up beyond vertical so that it also dips steeply to the northwest at about 80 degrees. Geologists call a fold of this nature an overturned fold.

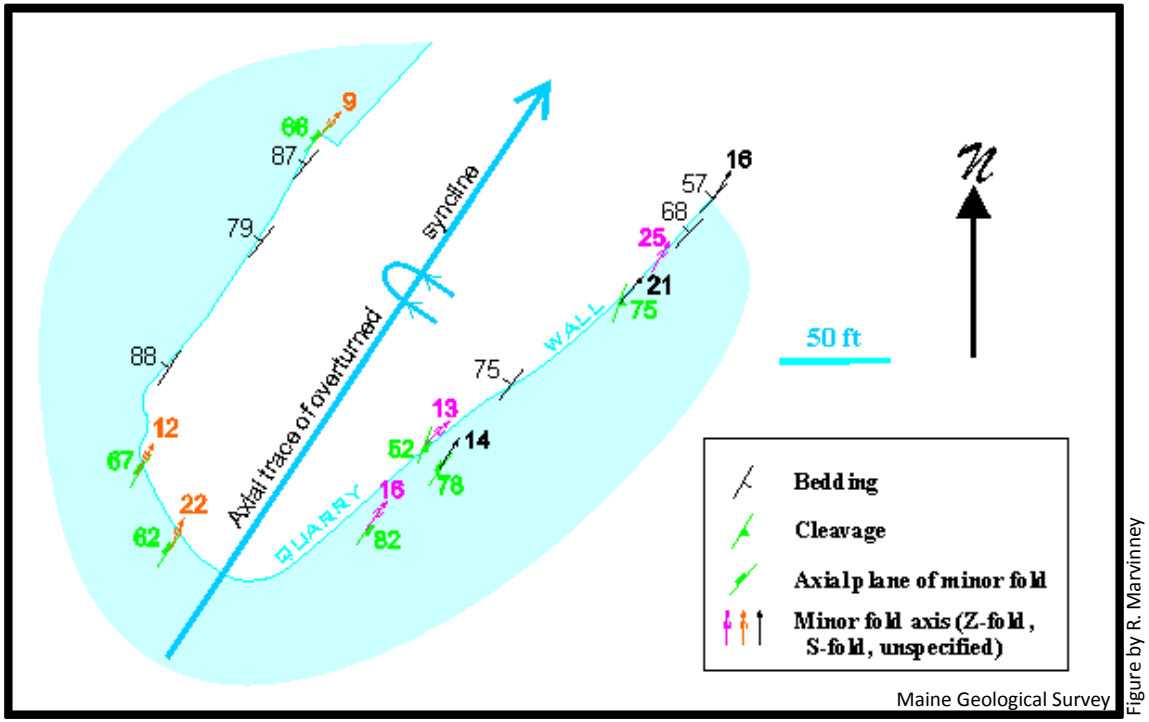

Figure 8. Bedrock structure map of the marble quarry at the State Prison facility, Thomaston. Axial trace of major overturned syncline is shown. (Data collected by Henry Berry, Maine Geological Survey, February 26, 2002.)

References and Additional Information

Guidotti, C. V., Schoonmacher, Adam, Berry, H. N., IV, and Ayuso, Robert, in press, Bedrock geology of the Thomaston quadrangle, Maine: Maine Geological Survey, Open-File Report, 1:24,000 scale.

Tucker, R. D., Osberg, P. H., and Berry, H. N., IV, 2001, The geology of part of Acadia and the nature of the Acadian orogeny across central and eastern Maine: American Journal of Science, v. 301, p. 205-260.