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NATROLITE FROM HOUDAILLE INDUSTRIES QUARRY BOUND BROOK, SOMERSET COUNTY, N. J.

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Compared to other quarries in the first Watchung sill of Northern New Jersey, the Houdaille Industries Quarry located 1.7 miles northwest of Bound Brook, Somerset County, New Jersey, produces few specimens of interest to the collector. A visit to the quarry in early summer of 1960 in company with Mr. Gene Vitali of North Haledon, N. J., produced specimens of ordinary calcite and, unexpectedly, natrolite crystals of unusual size and transparency. The latter are quite unlike any hitherto reported from New Jersey localities.

The Houdaille Quarry, commonly called the Chimney Rock quarry, is an oval opening approximately one third mile in length penetrating the thick basalt sill of the First Watchung Mountain. An excellent map of basalt and diabase outcrops, including the Watchung sills, plus descriptions of New Jersey trap minerals, appears in Mason (1). Current quarrying is confined (1960) to the west wall where enormous slopes of broken basalt are searched for minerals by local collectors. The exposed section of sill is divided by parallel, vertical joints, the most prominent of which are oriented in a north-south direction. Thin calcite-filled veins are emplaced in joints, and, in favorable sites, open into lenticular cavities lined with good crystals of calcite and occasionally other minerals.

Due to chloritization of wall rock, vein material separates readily from basalt and entire sections may be found in the blast rubble. One such mass revealed several small cavities lined with large rhombohedral crystals of calcite with open spaces criss-crossed by prismatic crystals of natrolite as shown in Fig. 1. Natrolite prisms were found coated almost completely by very small scalenohedral crystals of calcite of uniform size and habit. Underneath each such coating was found a layer of minute colorless gypsum crystals, simple in habit, and perfectly transparent except for a slight pearly luster upon the *b*(010) faces. Beneath this layer and immediately in contact with the natrolite was found more gypsum as a white spongy inner layer consisting of numerous

interlocked, partly-developed crystals. Centers of cavities were filled almost entirely by rhombohedral calcite which also enclosed the crystals of natrolite. Where exposed in openings, rhombohedral calcite formed crystals of about one and a half inches in length of simple habit but with curved faces. No other minerals were recognized from the vein.

Natrolite developed at an early stage within the fissure opening but possibly was not the first mineral to form in the entire fissure system in

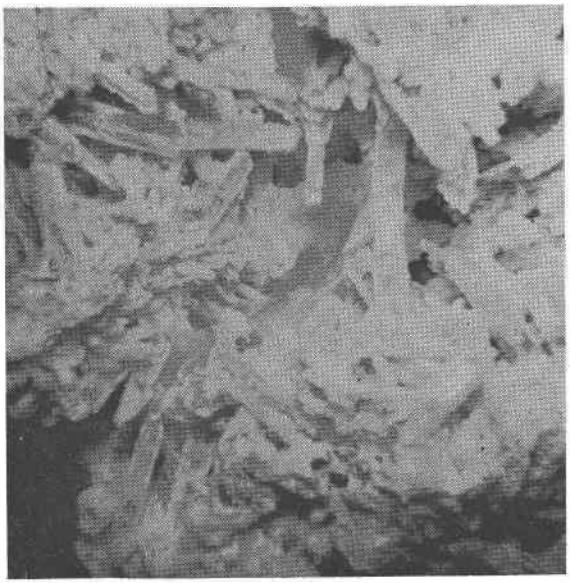

FIG. 1. Natrolite-calcite-gypsum vein filling, Houdaille Quarry. The section shown is approximately 6 inches in height. The formless mass in the center is a remnant of calcite filling remaining behind after acid treatment.

view of the presence of gypsum. The latter is known to form from anhydrite in other basalt occurrences, especially in the quarries near Montclair, Great Notch and Paterson some miles north of Bound Brook. However, in this instance at least, there was no valid evidence of the presence of anhydrite. After formation of natrolite, gypsum deposited upon its crystals and was in turn succeeded by rhombohedral calcite. The last mineral to form was scalenohedral calcite.

Natrolite prisms range in size from extremely slender individuals scarcely as thick as a sewing needle to a few stout prisms one quarter inch in diameter and two inches in length. The majority are deeply etched on surfaces not coated with gypsum and lightly etched under-

neath such coatings. Although hydrochloric acid had to be used to dissolve much of the obstructing calcite, its effect upon the natrolite was not very pronounced when prism sections were compared before and after acid treatment. Many of the natrolite crystals were broken into segments and later cemented together with gypsum. A very few terminated crystals were found, each termination displaying a number of pale grayish-green phantoms (chlorite?) corresponding to pyramidal faces. The majority of crystals and fragments are absolutely colorless and transparent while a great many are free of inclusions of any kind.

In addition to $m(110)$ and $o(111)$, $b(010)$ is present on almost all larger crystals which are not so severely corroded as to destroy all plane surfaces. This latter form bevels the edges between m faces selectively, some bevels being scarcely more than a trace but others being as broad as adjacent m faces. Upon a single crystal there may be several b faces, each of widely varying width.

Readings obtained upon the natrolite, using a Rayner refractometer and a polished prism section of a natrolite crystal, are as shown below compared to Hey values kindly supplied by Brian Mason (2).

Natrolite, Houdaille Quarry	Natrolite (M. H. Hey)
Biaxial, positive	Biaxial, positive
$\alpha=1.479$	$\alpha=1.479$
$\beta=1.481$	$\beta=1.482$
$\gamma=1.491$	$\gamma=1.491$
$\gamma-x=$ .012	$\gamma-x=$ .012

Additional optical tests by Brian Mason (2) show that the Houdaille quarry material exhibited straight extinction, $Z=c$, while an x-ray check produced a pattern for natrolite.

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