For explanation see page 1.
Glauberite Crystal Cavities in the Triassic Rocks in the Vicinity of Gettysburg, Pa.¹

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Among the specimens of Triassic rocks collected during the survey of the Fairfield and Gettysburg quadrangles, Pennsylvania, for folio publication, certain dark shales and hardened altered shales with molds of crystals were obtained, and were sent with specimens of metamorphosed sediments and igneous rocks to Prof. J. Volney Lewis for petrographic study. In a letter dated May 24, 1915, Professor Lewis wrote:

"The casts [molds] of crystals ... suggest very strongly the mineral glauberite and my conception of the climatic conditions under which these sediments accumulated would make this mineral entirely possible, even probable, in the muds and 'alkali' marshes. I happen to have some crystals that almost exactly fit the cavities, conforming in size and shape."

"I wish to add, as a matter of simple justice, that the first suggestion of glauberite as the original mineral of these cavities was made by Mr. W. S. Valiant, Curator of the Geological Museum of Rutgers College, who observed the striking resemblance while unpacking the specimens, or very soon afterward, before I began my studies of them. Later when I compared the molds and wax casts of some of them with crystals of glauberite, their essential identity was quickly established."

Explanation of Frontispiece

Molds of glauberite crystals in Triassic shales from vicinity of Gettysburg and crystals of glauberite from San Bernardino County, Cal. Photographed by J. Volney Lewis. Natural scale.

No. 1. From locality 1 (see Fig. 1.); shows mold of rhombic face of crystal with characteristic parallel growth striations.

No. 2. From locality 1; shows molds of rhombic face of crystal and characteristic aggregates of crystals.

No. 3. From locality 2; shows wedge-shaped (or lozenge-shaped) cross sections of cavities.

Nos. 4, 5, 6. Crystals of glauberite from San Bernardino County, Cal. Nos. 4 and 5 show the rhombic faces that correspond to the impressions in Nos. 1 and 2, and No. 6 shows aggregates of crystals which correspond to the molds in No. 3.

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This was the first intimation I had of the significance of these cavities. Since then two articles by Dr. Edgar T. Wherry\textsuperscript{2} have been published in which the mineral which formed similar cavities in the First Watchung Mountain zeolite deposits was described. In one of these articles (J. Wash. Acad. Sci., 6, 181-184, 1916) the mineral was named glauberite, and it was shown that it is a common mineral in the Triassic rocks of eastern Pennsylvania. In the other article (Am. Min., 1, 37-43, 1916) the distribution of glauberite crystals in the Triassic rocks of eastern Pennsylvania was studied in detail.

molds, in the Triassic rocks at several localities lying 100 miles or more further east, is shown to be glauberite.

In the Gettysburg quadrangle and adjoining areas specimens of the crystal cavities were obtained at three places, shown on the sketch map herewith, Fig. 1. The holes which compare most favorably with crystals of glauberite in the possession of Professor Lewis were photographed by him and are presented in the frontispiece. The fact that the glauberite crystals and the molds in this photograph are almost identical in shape and size supports the conclusion presented by Dr. Wherry in his papers referred to above.

Glauberite is a sodium-calcium sulfate, Na₂Ca(SO₄)₂, found in nature in rock salt deposits and on alkali flats in various parts of the world. It is evidently the product of slow desiccation of alkaline water in arid regions. The occurrence of this mineral in the Triassic sediments is probably to be explained, therefore, by deposition under similar climatic conditions, i.e., in ponded water in an arid climate (playa basins).

The Triassic sediments of the Gettysburg district, which is part of a belt that extends from New York to Virginia, are believed to have been deposited in an elongated continental basin into which streams from the adjacent highlands to the east brought an abundance of rock waste. The climate was arid and the rains were accordingly spasmodic and torrential, so that flooding of the basin by the streams during times of torrential rains in the mountains alternated with times of drought and evaporation of the ponded water. The coarser sands and arkoses were largely deposited as thin sheets of alluvium in flat, widespread, coalescing alluvial fans by the flood waters as they first spread out over the lowland plain, whereas the finer sediments were in large part laid down in ponded water after the inflow had ceased. Nearly all the beds, therefore, have a normal sedimentary habit. Numerous ripple marks, animal trails, rain prints, rills, and sun cracks on the surfaces of the beds bear evidence of frequent drying up of the lakes and exposure of the freshly deposited sediments in mud flats. The prevailing warm arid climate is indicated by the red color of most of the sediments, the rocks on the higher land having been deeply weathered and thoroughly oxidized before being washed into the basin. There was not sufficient organic matter deposited with these red sediments to transform the brilliantly colored
ferric oxide to the dull gray ferrous carbonate. During the
droughts, when the standing water was entirely or nearly
evaporated, the dissolved salts were concentrated to the point
of saturation, and crystals of the minerals in solution were formed
on the shores and possibly on the bottom of the ponds, which at
such times were probably reduced to alkali swamps or even to
dry encrusted playa flats. Glauberite and perhaps other allied
minerals crystallized out, altho molds of salt crystals have not
been observed in this region. The crystals that were formed
in the saturated muds, and others that were quickly covered by
sediment during the next influx of water into the basin, became
inclosed in the sands and clays and preserved in the strata.

The fact that in at least two and possibly all three occurrences
in the Gettysburg area the rocks which contain the molds are
somewhat altered and hardened by the action of heated waters
given off from the dikes or sills of diabase, whose proximity to
the localities where the cavities were found is shown in figure 1,
may perhaps be regarded as indicating that the glauberite
crystals were still present in these clays and sands at the time
when the igneous rocks intruded them and the sediments were
hardened around the crystals, so that when they were subse-
quently dissolved by circulating waters their molds were preserved
sharp and clear, as shown in the photographs (frontispiece).

It is probable, therefore, that glauberite crystallized out of
ponded waters at various times during the Triassic epoch; and
the crystals were inclosed at many horizons thruout the Triassic
section, altho thus far clearly defined molds of the mineral have
been found in this area only in beds which have been somewhat
hardened by the metamorphic action of the intrusive diabase.

BARITE FROM GREAT NOTCH, N. J. ERNEST H. WILSON. Caldwell,
N. J.—Some years ago the writer obtained at the Great Notch trap
quarry a 5 x 10 cm. specimen showing an aggregate of small crystals of a dull
white color, on a fragment of trap rock. This has recently been submitted
to Mr. H. P. Whitlock, of the American Museum of Natural History, who has
identified it by blowpipe tests as barite. Altho this mineral is not infrequently
associated with trap rocks, and has been found under such circumstances at
several other localities in New Jersey, this appears to be the first report of it
from this place. At one end of the specimen are a number of very small
calcite crystals and a couple of globular crystals of prehnite, but the barite
rests directly upon the trap, suggesting that it was one of the earliest minerals
to form.