

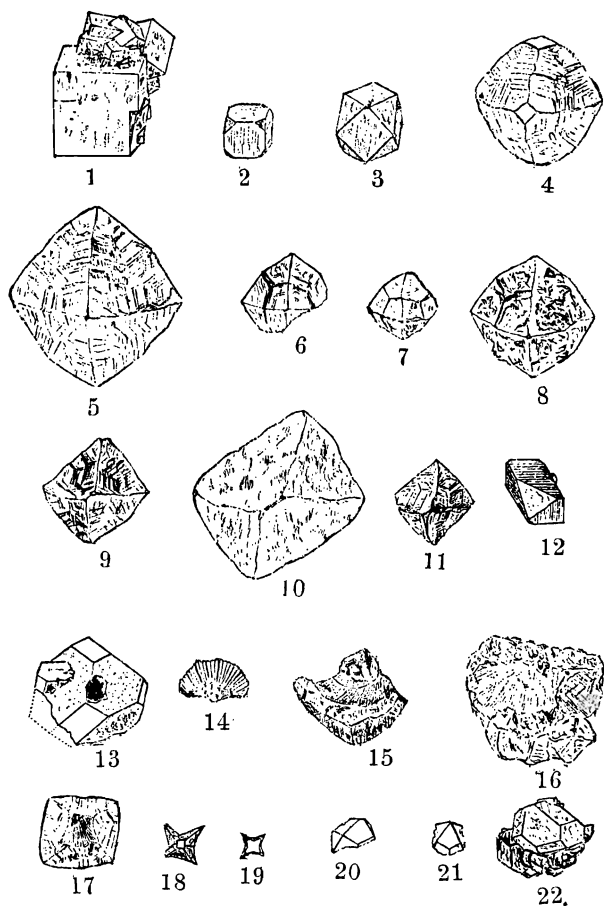
ART. XXXI.—*Limonite Pseudomorphs after Pyrite*; by JOHN G. MEEM.

SEEING an article in the May issue, vol xxxi of this Journal, on limonite pseudomorphs, it was thought that a short account of the pseudomorphs occurring in Rockbridge County, Va., would be of interest. These crystals are found on a hill sloping gently to a small stream (Hoffman's Run) about three-quarters of a mile southeast of Lexington, where they occur in the soil, on or near the surface, with outcropping limestones of the Lower Silurian age. In color they vary from a very light to a very dark brown, and in some cases are almost black. Some faces have a fine luster, others none at all. The pseudomorphs are hydrous and give a yellow powder, showing them to be limonite. Most of the crystals have undergone a complete alteration, there being no pyrite visible to the naked eye. In some, the unaltered pyrite is found forming a nucleus at or around the center; in others, it forms the bulk of the crystal, the latter then having only a coating of limonite. Bedded in the limestones from the same locality, unaltered pyrite occurs, though not in well defined or isolated crystals.

The forms of these pseudomorphs present some features worthy of notice. The most common is the octahedron. This generally occurs combined with the cube, and of these combinations we have every variety from large octahedral and very small cubic faces to the other extreme (see figs. 2, 3, 4).

One of the points of interest is noticed in the following. On nearly all the octahedral faces (1, Dana) striations running at right angles to the edges of these faces are observed (figs. 4, 5). Col. M. B. Hardin, Professor of Chemistry, etc., called attention to it and suggested that it pointed to a tendency in the crystal to form trapezohedral faces, that is, to an oscillation between the octahedron and trapezohedron. Observations were begun with the view to settle this if possible. Specimens were obtained in which the angles varied more and more from the octahedral angles, and in which the tendency to trapezohedral faces ($m\text{-}m$) was more marked, until finally some were found that had the faces ($m\text{-}m$) fully developed, the striæ obliterated and the edges very clean cut (figs. 6, 7, 8, 20, 21). In some of the faces (1) in which there are no striations observable, the angles are distorted from the true octahedral angles by a slight bulging at the center of the faces. Aggregations of these crystals are very common (fig. 1, example of cubes). In some of the crystals whose form is shown to be trapezohedral by projecting edges, this aggregation of the small trapezohedrons is carried to such an extent and in such a manner on the

principal faces ($m-m$), as to present a general outline almost spherical, this outline being made up for the most part of apices of trapezohedral pyramids. In another spherical aggregation the projecting crystals are combinations of cubes and trapezohedrons, the faces of the latter in one or two of the crystals being perfectly developed, while in many of the other crystals



the trapezohedrons are only filled out along the edges, making star-shaped figures around the cubic face (fig. 18). This depression of the faces ($m-m$) in some instances has encroached on the cubic face, making of it a star-shaped figure (fig. 19) but not like the other. Another aggregate has the exterior crystals very small, and its form is remarkably like that of an acorn and

its cup. In some of the octahedrons the effect caused by the repeated interruption of the tendency to form the faces (*m-m*) on the face (1) is often quite striking, producing step-like formations (figs. 9, 11). Another point observed was that in some of the combinations of the cube and octahedron the faces of the latter were unequally developed, while those of the cube were elongated into rectangles (figs. 13, 22). It was found that the development took place in alternate faces of any half of the octahedron, that is, that the large and small faces alternated above and below, and it was also found that the cubic faces which were parallel were elongated in directions at right angles to each other. As elongation or distortion of the octahedron could not produce either of these effects, the conclusion is that the octahedron is composed of plus and minus tetrahedra, notwithstanding the fact that all the faces (1) are the same in general appearance. In this combination the edges of the tetrahedron whose faces are more largely developed are replaced by cubic faces. These faces (H) have luster, while the faces (1) have not.

The distortions occurring in these crystals produce singular effects (figs. 9, 10, 11). In some of the octahedrons, one of the axes will be so much inclined that a crystal is produced decidedly monoclinic in appearance. In others two axes are inclined, giving a triclinic appearance. Some of the cubes have been distorted into prisms apparently tetragonal or orthorhombic. One of the latter (fig. 12) has two of its diagonally opposite angles replaced by large faces (1), and the other angles by very small faces or none at all. In some of the crystals fossils are found (figs. 14, 15, 16, 17), sometimes in the crystal, sometimes on a face, the fossils being composed of limonite. Most of the crystals examined were obtained from Col. J. H. Morrison, Adjunct-Professor Chemistry, etc., who has collected them in large numbers.

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