from the iron oxide. Almost all the limonite iron ores of the region contain some manganese, and in some mines the ore averages from 1 to 3 percent of manganese. Such ores have always been in demand for the production of basic iron. In general, the limonite ores of the Cambrian quartzites, which are found along the slopes of the mountains and which are termed "mountain ores," contain the highest percentage of manganese. The manganese-bearing material in most of the ore is a mixture of pyrolusite and psilomelane, although specimens of each separately are sometimes found.

Where the manganese is associated with limonite it can seldom be recognized except by the darker color of the ore. In certain limonite mines layers of ore high enough in their manganese content to be called manganese ores have been found. Several mines in the region have shipped small quantities of this ore, but it was always incidental to the mining of the iron ore. In the Wharton mine of the Thomas Iron Co., about one and one-half miles southeast of Hellertown, the iron ore averaged more than 2 percent of manganese and here and there specimens of nearly pure manganese oxide were found. One of these specimens, which showed beautiful dendritic structure, and which was presented to the museum of Franklin and Marshall College, Lancaster, Pa., by Dr. R. F. Fackenthal, Jr., yielded the following results when analyzed in the laboratory of the Thomas Iron Co.: Fe 0.868, SiO₂ 0.46, P 0.046, Mn 52.72.

The manganese content of the limonite ores found in the limestone regions is apt to be lower than in those just described, yet in some mines very small pieces of high-grade manganese ore have been found.

Although manganese is widespread throughout the region in association with the limonite ores there is no probability that any deposit is rich enough in manganese to be developed independently of the iron ores.

Mineral Pigments

For many years the mining and preparation of mineral pigments has been an active industry in this part of Pennsylvania, and at the present time (1938) paint companies are located in Bethlehem and Easton. The bulk of raw materials used comes from other regions, as each plant requires a great variety of materials, such as no one district produces. The paint industry of the region, however, owes its original development to the local occurrence of ocher, umber, and black shales, which have long been mined in limited quantities.

Ocher.—Ocher, which is a mixture of clay and limonite, is almost invariably associated with the limonite iron ores that have been so extensively worked in different parts of the county. During the