

group proper by a fault not yet fully ascertained."⁴ In subsequent examinations of the region by Logan and Hall conjointly a narrow belt of Loraine shales was traced along the *east side* of the Hudson to a point a little above Hyde Park where the boundary between the two formations crosses to the west bank, and the rocks of the older series thence occupy both sides of the Hudson down to the Highlands. (Azoic Rocks, pp. 120-121.)

In concluding the note of 1876, cited above, it was said "the author many years since pointed out that the fossiliferous Levis strata near Quebec hold in their conglomerates pebbles from the crystalline Huronian rocks which were described by Logan as altered Levis and Lauzon rocks. These crystalline schists were by Logan maintained to belong to this horizon because they are in some places overlaid by Sillery sandstone, but inasmuch as it now appears that the Sillery is really the lowest member of the Quebec group, it is clear that these crystalline schists must belong to a more ancient series."

It is to be noted that while the Second, or what we may call the Ordovician Graywacke, has for its lower member the Utica slate overlaid by the Loraine shale and terminated by the massive Oneida sandstone and conglomerate this order is reversed, in the First or Cambrian Graywacke, the Upper Taconic as defined by Emmons, a massive sandstone there forming the base of the series. For the rest, the general lithological resemblances between the two Graywacke series are such that as we have seen, Emmons from the apparent stratigraphy of the Quebec section was at first led to refer it to the Second Graywacke, a determination accepted without hesitation by Logan, who shared in the general mistrust and disfavor shown to the later conclusions of Emmons until convinced at the end of 1860 that the contention of the latter with regard to the Upper Taconic was true. Meanwhile, accepting the metamorphic hypothesis of Mather, which maintained the transformation of the Levis and Lauzon sedimentary strata into crystalline schists, the small amounts of oxyds of titanium, chrome and nickel, of magnesian silicate (and even the distinct portions of serpentine) found in certain beds of the Sillery divis-

⁴See *Geology of Wisconsin*, 1862, p. 443, cited in the author's report on Azoic Rocks, E., Second Geological Survey of Pennsylvania, page 118.