

ART. XXXI.—*On the Occurrence of Olenellus in the Green Pond Mountain Series of Northern New Jersey, with a Note on the Conglomerates*; by CHARLES D. WALCOTT.

IN company with Dr. John C. Smock, State Geologist of New Jersey, I visited, in October, 1893, several localities of the Green Pond Mountain rocks in northern New Jersey, and also crossed into Orange County, New York, to see the section of the southwestern portion of Skunnemunk Mountain.

The first locality that we examined was at a point four miles northeast of Newfoundland and two miles north of Lake Macopin, where the succession from below upward is, gneiss, bedded quartzite, massive-bedded siliceous limestone, and a belt of shales that pass beneath the conglomerate of Kanouse Mountain. The latter formation extends to the southwest and merges into the Copperas Mountain conglomerate. Fragments of *Olenellus* were found in the limestone. Subsequently I visited the Gould quarry, one mile north of Macopin Lake, where the section is essentially the same, but more complete.* The quartzites are separated by a slight interval of soil from the gneiss, and pass above into a conglomerate formed of white quartz pebbles in a reddish matrix. Reddish-purple sandstones also occur associated with the conglomerate, the whole forming a mass not over ten feet in thickness. The superjacent limestone has been extensively cut into in quarry-

* Geol. Surv. New Jersey, Ann. Rept. 1884, p. 52.

ing operations and dips beneath a conglomerate formed of white quartz pebbles, essentially the same as those in the conglomerate beneath the limestone. As in the section one mile to the north, an interval of slate occurs between the low ridge formed by the limestone and associated rocks and the massive conglomerate of Kanouse Mountain on the west. The discovery of the *Olenellus* fauna in the limestone is a positive addition to the data for working out the stratigraphy of the Green Pond Mountain area. Occurring, as it does, in a limestone that merges above and below into beds of conglomerate that are essentially of the Green Pond Mountain type, it proves that the conditions under which this characteristic formation was formed began in *lower* Cambrian time.

In a recent paper Mr. A. F. Foerste* states that "Since the rocks all dip west the conglomerates forming the eastern side of Copperas and Kanouse Mountains must be Oneida, the red sandstone above the same, the Medina, the underlying limestone, the Magnesian limestone, and the basal sandstone, the Cambrian; but instead of the term Potsdam it is necessary now until further developments, to call it *Olenellus* Cambrian. It is a quartzite sandstone from ten to fifteen feet thick, and so far has not furnished fossils."

The danger of correlation by lithological characteristics is shown by the reference of the limestone in which I found *Olenellus* to the Magnesian limestone of the Pennsylvania and New York sections. The use of the term "*Olenellus* Cambrian" for the sandstone or quartzite is objectionable. In the absence of fossils the correlation of the basal sandstone of one basin of sedimentation with the basal sandstone of another basin of sedimentation must necessarily be more or less conjectural.

In the report of 1868 Dr. Geo. H. Cook, the then state geologist, referred the conglomerates of Copperas and Kanouse Mountains to the Potsdam epoch of the New York series on account of their being at the base of the Paleozoic series. Mr. Foerste is now confident that they are of the age of the Oneida conglomerate of the New York section. From the data at present available it may be that the latter is correct; but, from the fact that the sediments of the Green Pond Mountain area were deposited in a basin distinct from that to the west and north, it is evident that any attempt to make exact correlations between the rock series of this basin and that of the more extensive basin of New York, western New Jersey, and Pennsylvania will be more or less theoretical. The sedimentation of the Green Pond Mountain area of New

* This Journal, vol. xlvi, 1893, p. 441.

Jersey and southeastern New York is peculiar to itself; and the use of the term "Oneida conglomerate" for the conglomerate of Kanouse and Copperas Mountains is confusing to one acquainted with the stratigraphy, and much more so to the student who endeavors to class two such unlike formations as one and the same formation. If it is desirable to correlate the conglomerate of Kanouse, Copperas and Green Pond Mountains with the Oneida conglomerate of the New York series, I think less confusion would be caused by calling it the Green Pond conglomerate, and stating that this conglomerate is correlated with the Oneida conglomerate under the belief that it occupies the same stratigraphical position. When I speak of the Green Pond conglomerate, it is understood that the conglomerates of Skunnemunk and Bear Fort Mountains are not included. There appear to be several horizons of conglomerates in the Green Pond Mountain region, viz :

- 1st. The Macopin Lake, of *lower* Cambrian age;
- 2d. The Green Pond, Kanouse and Copperas Mountain conglomerate, Ordovician or Silurian;
- 3d. The white conglomerate west of Greenwood Lake, etc.
- 4th. The narrow belt of conglomerate beneath the shales carrying the Hamilton fauna, on Greenwood lake, *lower* Devonian.
- 5th. The massive Devonian conglomerate of Skunnemunk Mountain, which appears to extend to the southwest into Bellevale and Bear Fort Mountains.

Of these the 2d and 5th are massive and important formations. The 1st, 3d and 4th are local and appear to be of little stratigraphical importance. With the exception of the 3d, they serve to emphasize the fact shown by the 2d and 5th,—that conglomerates of essentially the same type may be repeated at several horizons within the same basin of sedimentation.

Mr. N. H. Darton informs me that he arrived at essentially the same conclusions from a much more thorough study of the Green Pond Mountain region than I was able to make. He presented his paper at the Boston meeting of the Geological Society of America (Dec., 1893) and I cheerfully yield him priority, as his work was done before I entered the field. These conclusions were not known to me until more than three months after the writing of the preceding notes and after they were in type.