

ART. XXXVIII.—*Observations on the fossils of the Metamorphic rocks of Bernardston, Mass.; by R. P. WHITFIELD.*

I HAVE received from Professor J. D. Dana, and from Professors Emerson and Clark, of Amherst and Northampton, Mass., collections of fossils from metamorphic sandy shales at Bernardston, Mass., and also some from a bed of crystalline limestone below them, with a request to examine them with a view to determining their age.

In the shales I find many casts and impressions of Brachiopods, of some of which the generic relations can be determined. Among them I recognize *Strophomena rhomboidalis*, a *Spirifera* (quite abundant), resembling in most of its features *Sp. disjuncta* as it occurs in the Chemung group of New York, but not showing any plications on any of the internal casts, though impressions of a shell having plications of about the same size and form have been detected in several instances among Professor Clark's specimens; two *Rhynchonellas* (common), their relations not determined, although some three or four impressions of one of the species strongly remind one of *R. neglecta* Hall; casts of a *Terebratuloid* shell, resembling very strongly those of the ventral valve of *Cryptonella eudora*, and also a single ventral cast of a *Cyrtina* closely resembling *C. Hamiltonensis*, from the Hamilton and Chemung groups of New York. Besides these there are numbers of undetermined forms, some of which might be classed with *Meristella*, but are extremely uncertain. There is also a cast of a species of *Petraia* or *Strepelasma*, which might represent equally well the species from the Niagara, Lower Helderberg and Hamilton groups.

From the limestone I recognize two species of *Favosites*, and several stems of Crinoids of large size; also from specimens sent to the American Museum of Natural History, by Professor C. H. Hitchcock, a form strongly resembling a species of *Syringopora*, but somewhat doubtful.

The *Favosites* are not in a condition to be identified specifically with certainty. One of them, however, has many characters resembling *F. favosa*, and forms a mass about four inches in diameter by about two in height. The other form is parasitic around a large crinoid stem, and has cells of about the size and form of *Astrocerium venustum* Hall; yet I cannot distinguish in it the peculiar features of that genus.

From the evidence furnished by these specimens I should conclude that the limestones may be of Middle Silurian age, and that the shales were most probably of Middle Devonian

age, the forms mostly resembling those from the New York Chemung group.

In the spring of 1882 we received at the museum a collection of rocks and fossils from near Littleton, N. H., sent by Professor C. H. Hitchcock, who has kindly permitted me to use the evidence furnished by them in this connection. Among them I recognize the corals *Halysites catenulata* and *Favosites Niagarensis*, also a finer form of *Favosites* which I identified, with but little doubt, with *Astrocerium venustum* Hall, and an undetermined Cyathophylloid coral. There are also many fragments of a *Pentamerus*, which I identified without question with *P. nysius* H. & W. (24th Rept. State Mus. N. Y., p. 184. and pl. x, fig. 1-7 of 27th Rept. State Mus.), a type of *Pentamerus* which ranges from the Clinton to the Guelph limestones, but which is not known above the latter horizon. From this assemblage of fossils there can be no doubt of the Middle Silurian age of these Littleton limestones (probably Niagara); and as they were supposed, from stratigraphical evidence alone, to be the same as the *Bernardston* limestones before the fossils were examined, I think these are strong reasons for not only making them equivalents, but also for considering both as of the age which I have assigned to them.

*Note by J. D. Dana.*—The “shale” referred to by Mr. Whitfield is a laminated part of the quartzite which immediately overlies the limestone, and occurs only along the junction, and locally so; the specimens are rusted from oxydized pyrite, and cavernous from the removal *probably* of calcareous material; and in the removal the laminated structure has become apparent. The calcareous material I have attributed to a passage of the limestone in places into the quartzite, the two being, to all appearance, directly consecutive formations. Since the publication of my last paper on this subject, the region has been thoroughly studied by Professor B. K. Emerson of Amherst, and before long he will publish his very important results, and give his final conclusions on the stratigraphical point suggested by the fossils,—which, though very poorly preserved, have great interest on account of the large variety of micaceous, hornblendic, gneissic and other metamorphic rocks occurring in the same series with the beds containing them. Mr. Whitfield’s examinations correct my inference as to one of the Brachiopods. Professor Emerson hopes to make further discoveries, that will remove the doubts which still exist, and bring together chronologically the associated strata.