

# THE AGE AND FOSSILS OF THE OLENTANGY SHALE OF CENTRAL OHIO.

ROGER C. BAKER.

ABSTRACT. The Olentangy shale contains a depauperate fauna and flora which is well developed at the type locality in Delaware, Ohio, and at several other localities a few miles to the south. The presence of such forms as *Melocrinus clarkei*, *Chonetes minutus hemisphericus*, *Anaptychus?* [*Spathiocaris?*] *emersoni*, *Aspidichthys clavatus*, and particularly representatives of the ammonoid genus *Manticoceras* indicate clearly that the Olentangy is of Upper Devonian age.

The fossils suggest a close relationship with the overlying Ohio shale and confirms Grabau's interpretation that the Olentangy is a basal facies of the Ohio shale.

## GENERAL STATEMENT.

TYPICALLY the Olentangy of central Ohio is a blue-gray argillaceous shale about 35 feet thick. It contains several thin layers of nodular limestone, mainly in its lower portion, and two or three black shale layers in its upper part. The Olentangy is overlain by the brownish black Ohio shale of Upper Devonian age, and it is underlain by the Middle Devonian Delaware limestone. The formation crops out in the valley of the Olentangy River in central Ohio and correlative Devonian rocks are exposed to the south along the Ohio River and farther south in Kentucky. North of Delaware, Ohio, the Olentangy crops out near Troy Chapel, beyond which the exposure is covered by drift on the divide between the Lake Erie drainage and that of Ohio River. In northern Ohio and southern Canada Devonian formations are exposed around Lake Erie.

In the fall of 1935 the writer discovered that in central Ohio the Olentangy contains a depauperate but well developed fauna and flora. These fossils seemed more than ordinarily interesting, not only because they had not been reported from the formation, but because they appeared to offer definite evidence as to the age of the Olentangy shale.

## ACKNOWLEDGMENTS.

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#### PREVIOUS WORK.

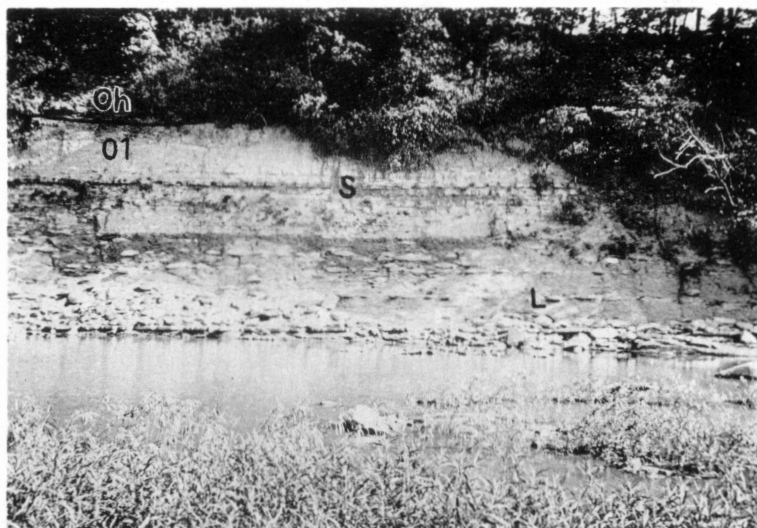
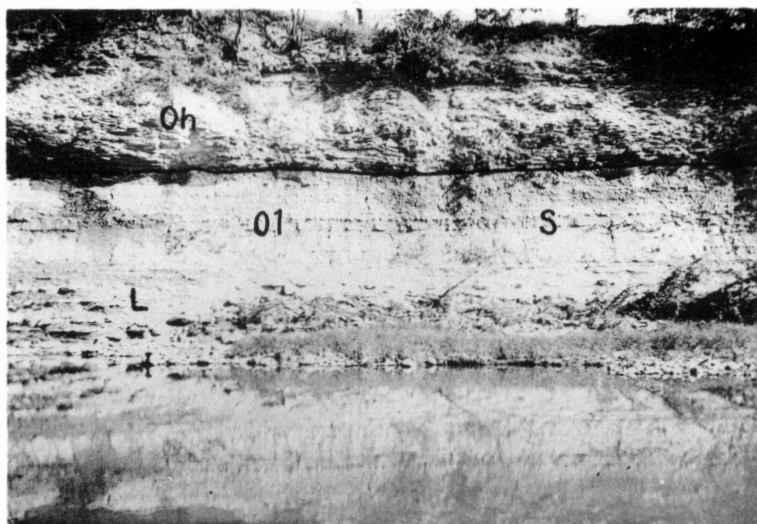
Winchell (1874) described the Olentangy shale from the excellent outcrop (Pl. I, Figs. 1 & 2) at Delaware, Ohio, as underlying the Huron shale, which is Upper Devonian in age. However, Stauffer (1916) later correlated the Olentangy shale of central Ohio with 35 feet of blue-gray shale in northern Ohio. There the section, near Prout Station, is as follows:

|                                               | Ft. | In. |
|-----------------------------------------------|-----|-----|
| Ohio shale .....                              | 4   | 0   |
| Hamilton rocks (Middle Devonian) Prout or     |     |     |
| Encrinal limestone .....                      | 8   | 10  |
| Covered interval .....                        | 6   | 0   |
| Blue clayey shale with several layers of fos- |     |     |
| siliferous limestone .....                    | 28  | 6   |

Stauffer based his correlation on the similar lithologic nature of the two shales, on the fact that the contact of the Olentangy and Ohio shales in central Ohio is undulating, and on a meager fauna consisting of only *Melocrinus* sp., *Leiorhynchus* sp., *Orbiculoidea* sp., *Pleurotomaria* sp., and *Orthoceras* sp. The undulating contact should not be interpreted as an unconformity, however, as it is merely a result of the growth of large secondary concretions in the Ohio shale a few feet above the contact. According to Stauffer's correlation, the Olentangy of central Ohio is Middle Devonian in age, and there is an unconformity between the Ohio and Olentangy.

Grabau (1917) regarded the Olentangy as a basal facies of the Ohio shale because of the interbedding and the conformable relations of the two formations in central Ohio. He believed (1) that the Olentangy is Upper Devonian in age, (2) that it is in the form of a lentil which "pinches out" to the north, and (3) that in Ohio and adjacent areas there is a great hiatus between the Upper Devonian shales and the underlying formations.

Westgate (1926) showed that in Delaware County the upper portion of the Olentangy shale contains several black shale layers, and that in places layers of blue-gray clay several feet thick and similar to the Olentangy occur well up in the Ohio



Figs. 1 and 2. Views of Olentangy shale at type locality at Delaware.

Oh=Ohio shale

Ol=Olentangy shale

S=black shale layer in Olentangy

L=nodular limestone layer in Olentangy



Fig. 1. View of Olentangy-Delaware contact at Alcorn Run. Note limonite layer at contact and parallel bedding of the two formations.

Ol=Olentangy shale

D=Delaware limestone



Fig. 2. View of Olentangy-Delaware contact in Hagar Run showing nodular chert and limonite layer at the contact.

Ol=Olentangy shale

D=Delaware limestone

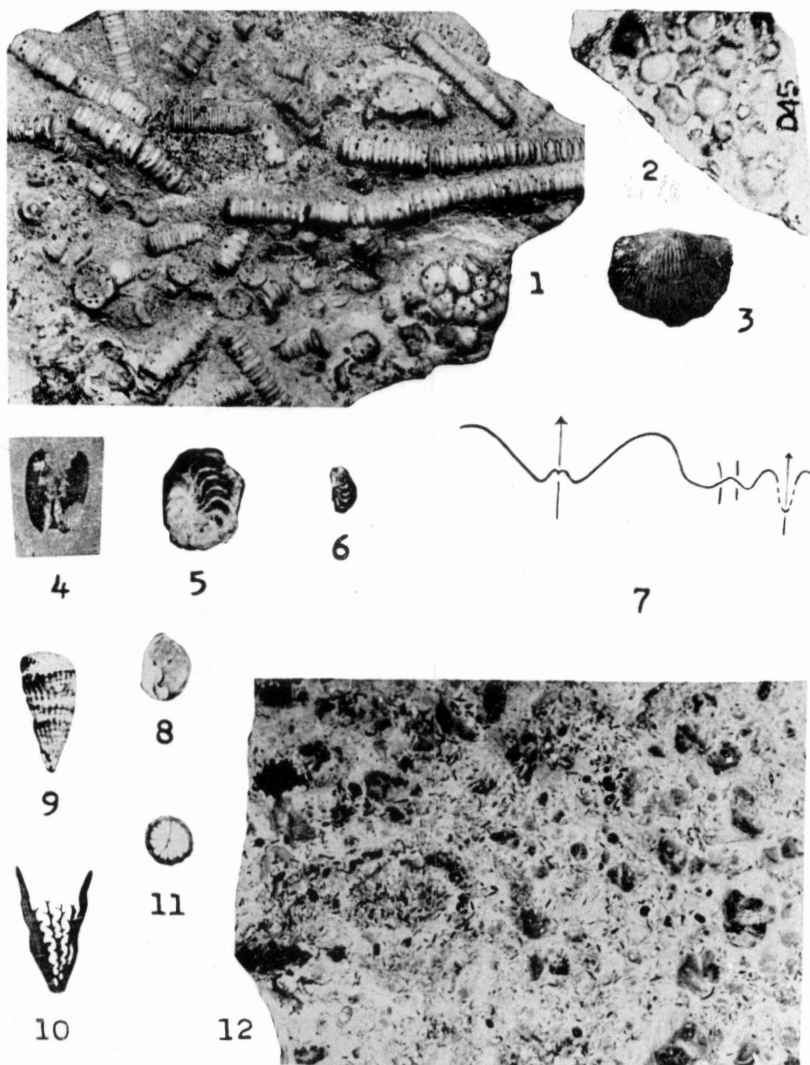


Fig. 1. *Melocrinus clarkei* (Hall Ms) Williams, view of 2 heads and several columnals, x 1.

Fig. 2. *Aspidichthys clavatus* Newberry, fragment of a plate, x 1.

Fig. 3. *Chonetes minutus hemisphericus* Baker, n. var. view of ventral valve, x 7.

Fig. 4. *Anaptychus?* [*Spathiocaris?*] *emersoni* (Clarke) em Trauth, poorly preserved specimen from a black shale layer, x 1.

Figs. 5-8. *Manticoceras* sp. 5, 6, and 8 are view of different individuals, x 1. 7 is drawing of suture of 6, x 9.

Figs. 9-11. *Lopholasma delawarensis* Baker, n. sp. 9, view of paratype x 1. 10, diagrammatic tangential section of holotype x 1. 11, diagrammatic transverse section of paratype x 1.

Fig. 12. View of fossiliferous limestone slab, x 1. Note the small *Tentaculites gracilistriatus*.

shale. He reviewed Stauffer's and Grabau's views as to the age of the Olentangy, and on the basis of the above evidence he agreed with Grabau's interpretation and stated that there was an unconformity at the base of the Olentangy.

In southern Ohio the lower portion of the Ohio shale is so interbedded with blue shale that it is almost impossible to distinguish the blue shale as a separate formation. Lamborn (1927) showed that this blue shale and the Ohio shale in southern Ohio are the result of continuous deposition and that the blue shale rests on successively older formations from central to southern Ohio. At Delaware the Olentangy rests on the Delaware limestone, and to the south the blue shale rests successively on the Columbus limestone, the Monroe limestone, and limestones of the Niagaran. Lamborn concluded that the blue shale in southern Ohio is the Olentangy, and he agreed with Grabau's interpretation that the Olentangy is Upper Devonian in age and that it rests unconformably on the underlying limestones.

Thus, at present the age of the Olentangy is a moot question. Stauffer correlates it with a Middle Devonian shale of similar lithology in northern Ohio and believes that stratigraphically it lies unconformably under the Ohio shale. In central Ohio Westgate and Grabau, and in southern Ohio Lamborn regard the Olentangy as Upper Devonian in age and as an introductory facies of the Ohio, and all three believe that it lies unconformably on formations of Middle Devonian and Silurian age.

#### OCCURRENCE OF FOSSILS.

Most of the fossils collected were found on weathered fragments of the limestone beds. However, a few kinds, chiefly conodonts, ostracodes, and plant remains are common in the black shale layers.

There are three outcrops of the Olentangy that are particularly fossiliferous. At the type locality, which is on the east bank of the Olentangy River about half a mile south of the junction of State Highway 42 and the Olentangy River, just south of the city limits of Delaware, there is a considerable accumulation of fossiliferous weathered material at the foot of the cliff. An outcrop on the same side of the river about one mile north of the type locality exposes fossiliferous limestone layers of the Olentangy. One of the most important outcrops

is in Lewis Center Run, which empties into the Olentangy River from the east, about seven miles south of Delaware. This run has two forks, the south one of which starts just north of Lewis Center. Fossils occur in a nodular limestone layer in the bottom of the north fork, about 200 yards northeast of the confluence of the branches. The shale immediately above and below this layer contains ostracodes in abundance.

## FOSSILS OF THE OLENTANGY SHALE.

|                                                                                        | Delaware (North) | Delaware (South) | Alcorn Run | Smith Run | Hagar Run | Bartholomew Run | Lewis Center Run | Welch Run | Hyatts Run |
|----------------------------------------------------------------------------------------|------------------|------------------|------------|-----------|-----------|-----------------|------------------|-----------|------------|
| Plant remains                                                                          |                  |                  |            |           |           |                 |                  |           |            |
| <i>Sporangites huronensis</i> Dawson .....                                             | x                | x                |            | x         | x         |                 | x                |           |            |
| <i>Callixylon newberryi</i> Dill .....                                                 | x                | x                |            | x         | x         |                 | x                | x         | x          |
| Corals                                                                                 |                  |                  |            |           |           |                 |                  |           |            |
| <i>Lopholasma delawarensis</i> , n. sp. ....                                           | x                | x                |            |           | x         | x               | x                |           | x          |
| <i>Streptolasma</i> sp. ....                                                           | x                | x                |            |           | x         |                 | x                |           | x          |
| Crinoids                                                                               |                  |                  |            |           |           |                 |                  |           |            |
| <i>Melocrinus clarkei</i> (Hall Ms.) Williams                                          |                  | x                |            |           |           |                 |                  |           |            |
| Bryozoans                                                                              |                  |                  |            |           |           |                 |                  |           |            |
| <i>Reptaria stolonifera</i> Rall .....                                                 |                  | x                |            |           |           |                 |                  |           |            |
| <i>Hedrella</i> sp. ....                                                               |                  | x                |            |           |           |                 |                  |           |            |
| Brachiopods                                                                            |                  |                  |            |           |           |                 |                  |           |            |
| <i>Lingula</i> sp. ....                                                                |                  | x                |            |           |           |                 |                  |           |            |
| <i>Chonetes minutus hemisphericus</i> , n. var.                                        | x                | x                |            |           |           | x               | x                |           |            |
| <i>Ambocoelia umbonata</i> (Conrad)? ....                                              |                  |                  | x          |           |           |                 |                  |           |            |
| <i>Crania</i> ? sp. ....                                                               |                  |                  | x          |           |           |                 |                  |           |            |
| Pelecypods                                                                             |                  |                  |            |           |           |                 |                  |           |            |
| <i>Nucula</i> sp. ....                                                                 |                  |                  |            |           | x         |                 |                  |           |            |
| Gastropods                                                                             |                  |                  |            |           |           |                 |                  |           |            |
| <i>Straparollus</i> cf. <i>S. hecale</i> Hall .....                                    | x                | x                |            |           |           |                 | x                |           |            |
| <i>Straparollus</i> cf. <i>S. rudis</i> Hall .....                                     | x                | x                |            |           |           |                 | x                |           |            |
| <i>Tentaculites gracilistriatus</i> Hall .....                                         | x                | x                |            |           |           | x               | x                |           |            |
| Cephalopods                                                                            |                  |                  |            |           |           |                 |                  |           |            |
| <i>Manticoceras</i> sp. ....                                                           | x                | x                |            |           |           |                 | x                |           |            |
| <i>Tornoceras uniangulare</i> (Conrad) ? ...                                           |                  | x                |            |           |           |                 |                  |           |            |
| <i>Orthoceras</i> sp. ....                                                             |                  | x                |            |           |           |                 |                  |           |            |
| <i>Anaptychus</i> ? [ <i>Spathiocaris</i> ?] <i>emersoni</i> (Clarke) em. Trauth ..... | x                | x                |            | x         | x         |                 | x                |           | x          |
| Vertebrata                                                                             |                  |                  |            |           |           |                 |                  |           |            |
| <i>Aspidichthys clavatus</i> Newberry .....                                            | x                |                  |            |           |           |                 |                  |           |            |
| Fish fragments .....                                                                   |                  |                  | x          |           |           |                 |                  |           |            |
| Ostracodes and conodonts .....                                                         | x                | x                |            | x         | x         | x               | x                | x         | x          |

*Description of a New Species and a New Variety*

*Lopholasma Delawareensis*, n. sp.

(Plate III, Figures 9-11.)

Corallum small, conical, straight or slightly curved. Surface covered with low rounded longitudinal costae and fine irregularly spaced concentric lines. Corallum slightly rugose. Epitheca poorly developed. Septa twelve in number; they join to form a small pseudocolumella in the center. The cup is very deep, reaching about two-thirds of the way down the corallum. Carinae well developed but tabulae and dissepiments appear to be lacking. Average individuals are about 14 mm. long and they attain a maximum diameter of about 7 mm.

Remarks: This species is related to *L. tullium* Williams, but differs from it in reduction of septa, the greater depth of its calyx, and in the apparent absence of tabulae and dissepiments.

Types: Holotype—At Ohio Wesleyan University, Delaware, Ohio. A tangential section of an individual from the type locality at Delaware, Ohio. Plate III, Fig 10.

Paratypes—at Ohio Wesleyan University. A transverse section and a large individual from the type locality. Plate III, Figs. 9 and 11. In addition specimens of this species are at the Department of Geology, State University of Iowa, Iowa City, Iowa.

Occurrence. Limestone layers of the Olentangy shale at Delaware, Ohio, and in Bartholomew, Hyatts, and Lewis Center runs, near Delaware.

*Chonetes Minutus Hemisphericus*, n. var.

(Plate III, Figure 3.)

Shell, small, nearly semi-circular in outline, slightly wider than long, and with the hinge-line equal to the greatest width. The ventral valve is nearly hemispherical in outline with the greatest convexity near the beak, and in it there is a very broad shallow sinus which in some specimens is only slightly developed. The surface is covered by 28 to 45 fine radiating lineae and numerous fine concentric growth-lines. The spines on the hinge-line were not well preserved and not more than one was seen on any individual. Large individuals are about 2 mm. long and 2.5 mm. wide.

Remarks: This form is similar to *C. minutus* Prosser but it



differs in the greater gibbosity, the more numerous lineae, and the smaller size of the shell.

Types: Holotype—At Ohio Wesleyan University, Delaware, Ohio, from the type locality at Delaware, Ohio.

Specimens of this variety are also at the Department of Geology, State University of Iowa, Iowa City, Iowa.

Occurrence: Common in the limestone layers of the Olentangy shale at Delaware, Ohio, and in Lewis Center run, near Delaware.

#### AGE OF THE FOSSILS.

There are several forms in this group that give evidence, in one way or another, as to the age of the Olentangy shale. *Melocrinus clarkei* has been found previously in only the Genesee and the Portage of New York. *Chonetes minutus* was described from the Upper Devonian Chagrin formation of northern Ohio and has not been found elsewhere. *Anaptychus?* [*Spathiocaris?*] *emersoni* occurs in the Upper Devonian black shales of Indiana, Ohio, Kentucky, and New York and has not been recorded from Middle Devonian rocks. Specimens of the genus *Manticoceras* are of particular importance because all over the world this genus is regarded as an index to the Upper Devonian. In general, most of the other forms found in the Olentangy are of less importance, either because they represent long-ranging species or because the fossils are not well enough preserved to be identified specifically.

Another fact that may be of importance is that the black shale layers of the Olentangy are very similar in lithology to the black Ohio shale and they contain the same fauna and flora. *Sporangites huronensis*, *Callixylon newberryi*, and *Anaptychus?* [*Spathiocaris?*] *emersoni*, common fossils of the Ohio, are all found in the black shale layers of the Olentangy.

#### OLENTANGY—DELAWARE CONTACT.

The contact between the Olentangy and the underlying Delaware limestone is exposed in the bottom of Alcorn Run, 1.7 miles north of Hyattsville, and in the large run emptying into the Olentangy River from the west, just north of Liberty. The contact was examined in the hope that it might throw some light on the relationship of the two formations. The Delaware limestone is immediately overlain by an irregular, nodular-like layer

of limonite which contains many fish fragments, chert nodules and some quartz sand. Aside from the fact that this condition is the same as in southern Ohio where a break is known to exist there is no evidence of disconformity (Pl. II).

#### CONCLUSIONS.

From the evidence presented in the preceding paragraphs, it seems clear that the Olentangy is Upper Devonian in age, and that its fauna and stratigraphic relationships confirm Grabau's belief that the Olentangy is to be regarded as a basal facies of the Ohio shale.

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