THE OOLITES OF KANSAS CITY
and
THEIR FAUNA.

by

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and the Faculty of the Graduate School in
partial fulfillment of the requirements
for the Master's degree.

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A picture of the colitic beds as exposed on the bluff in Kansas City, Missouri, near the site of the old Union Depot. The cross-bedding is well seen in the upper ~~right~~ left hand corner.

A picture of the exposure of the oolite in the small quarry near Seventy-fifth and Prospect Streets Kansas City, Missouri, showing the characteristic cross-bedding. The lower two-thirds of the formation shown in the picture is more compact than in the upper part. The upper part outcrops on the surface at this point.

THE OOLITE OF KANSAS CITY AND THEIR FAUNA.

INTRODUCTION.

The purpose of this paper is to give a somewhat detailed description of the beds of oolitic limestone in the region of Kansas City and a fairly accurate list of the fossils which have been found in them. These strata do not appear to have ever been described in detail while the fossils which occur so abundantly have never been separately considered. Owing to the peculiar nature of the lithology and the abundance and excellent preservation of the contained fossils, it is deemed worth while to make special study of the oolitic strata.

DESCRIPTION OF EXPOSURES.

The oolites are found in and about Kansas City, using the term to include both cities. Good exposures are found in the quarries on the north bluff of the Kansas River to the west of the city where the stone is sufficiently compact to use for building. Excellent exposures also occur in the bluff just above the position of the old union depot. Other small outcrops occur at different places in the southern portion of Kansas City, Missouri, and it may be confidently expected that with the progress of building operations other exposures will be made. The most southern exposure [illegible] seen is in the extreme southern portion of the city, near 75th. and Prospect streets.

In the region of Kansas City, Missouri, the formation containing the oolite is about seventy-five feet above the river and is best seen on the north bluff above the site of the old depot and in the quarries to the north. Going west along the Kansas River there are a number of outcrops and, as in the city itself, these are found only where some kind of work has exposed them. On the south side of the river but two outcrops west of the city are known. One of these is about a mile west of Turner on the side of a hill about 75 feet above the river. The other is at the level of the railroad track about a mile east of Holliday, west of which it does not occur at the surface. The oolite is well shown on the north side of the river in the Muncie hills near the mouth of a creek of the same name, and about four miles west of the city. The principle outcrops are where the Bonner Springs car line has cut through the sides of the river bluff. To the west of these hills the country is more sloping from the river and no exposures are found.

STRATIGRAPHIC POSITION OF THE OOLITE.

Stratigraphically the oolites are considered by Beede and Rogers (1) to be the equivalent of the Drum

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(1). Beede and Rogers, 1900. Kan.? Univ. Geol. Surv. Vol. 8, p. 331.

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limestone found farther south in the state. This is based on the character of the formation and its relation to other and more persistent formations and not on any fossil content. There seem to be some reasons for this interpretation. It lies between the Dennis and Iola limestones as does the Drum and varies in thickness over short distances. Beede and Rogers also mention the Drum as being semi-oolitic. There are two other formations at Kansas City, however, which come in between the Dennis and the Iola and which are not to be found farther south. These are known among quarrymen as the Grey and the Calico and there is a possibility that either one may represent the Drum and as the latter is quite variable in lithology, little weight can be placed on the resemblance of sediments. A section of the strata at Kansas City shows the correlations which are possible. (2). Dr. Bennett, who has perhaps

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(2). The section at Kansas City is about as follows:

Iola	- on the tops of the hills and varies in thickness according to amount eroded.
Shale	- about 20 feet.
Calico	- up to 5 or 6 feet.
Shale	- about 6 feet.
Grey	- about 5 to 8 feet.
Shale	-
Oolite	- up to 12 feet.
Shale	-
Dennis	-

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given more detailed field study to the Kansas

Pennsylvanian section than any living geologist, will not commit himself as to which division the Drum limestone is equivalent, and suggests that either the Calico or the Grey comes as near being the equivalent of the Drum as the oolite. This would fit in well with the character of the oolite beds which are in no place of wide extent.

STRUCTURE AND THICKNESS OF THE OOLITIC BEDS.

The oolite is very uneven in structure and in thickness. On the bluff north of Kansas City, Missouri the formation is about eight feet thick and compact, being quarried in a number of places for building stone. On the bluff by the old depot the strata are about twelve feet in thickness and composed of two divisions, each of about six feet. The lower one of these divisions is more compact while the upper is more granular and soft, being easily weathered away. In the small quarry near 75th. and Prospect there are about fifteen feet of the formation and it is again divided into two divisions, the upper being the softer and more granular.

On the north side of the river in the Muncie Hills the oolite is not as thick, probably not exceeding five feet and at Turner on the south side the same thickness obtains. A half mile east of Holliday on the Santa Fe

railroad the formation disappears with only about eighteen inches of oolite appearing in the exposure. From the measurements it would seem that, in general, the formation thins toward the west. The thickness of the oolite, however, is quite variable, in many places being replaced by crystalline limestone. There are places along the Bonner Springs line, in the Muncie Hills, where oolite strata are around two feet thick and within twenty-five yards only a trace of oolite texture remains. Almost everywhere between the compact part and the more granular part there is a seam of shale. These seams are the most uneven part of the formation, in places showing only a trace and within 75 or 100 feet being a foot thick. A common thickness is about three inches. As a rule the oolite is distinctly cross-bedded.

THE ABUNDANCE AND PRESERVATION OF FOSSILS.

The fossils which are best preserved are found in the more granular part of the formation. Dr. Bennett states that the fossils in the more compact part are generally good and not dwarfed, but they are hard to get. It does not seem from the abundance of fragments in this part of the formation that the fossils are lacking but that they were not preserved in good form.

The fossils in the granular part of the formation are of small and dwarfed forms, and the fauna is largely molluscan. This makes the oolite bed in striking faunal contrast with the other coal measure beds, which are predominatingly molluscoidean. Fossils of molluscs outnumber the molluscoids three or four to one. This seems to be characteristic of oolite of other parts of the country.

HYPOTHESES OF THE ORIGIN OF OOLITES.

There has been a great deal written about the mode of formation of oolites, but judging from the divergence of published opinion there is no unanimity in regard to it. The resume which follows in no way pretends to be an exhaustive review of the literature on the subject. Enough will be taken up to give some idea of the theories held. Experiments have been carried on and expeditions have made special efforts to learn the cause of their formation, but no one method is acceptable to all.

G. Link (3) sums up four theories under which writing

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(3). G. Link. Die Bildung der Olithe und Rogenstein. Deutche Jahrb. (Neues) 1913, Beilage-Band. XVI.

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on the subject can be classed: first, clastic rocks formed by the rounding of shells and pieces of limestone;

second, those formed by organic agencies; third, those formed by chemical and physical means; fourth, those which are metamorphic in origin. The first group would be possible and would be easily distinguished from the oolites of concentric structure; they also would correspond to any other water-worn particles. The fourth includes oolites supposed to have been formed out of limestone after its formation by re-deposition from solution about some foreign particle in the mass of limestone. It is hard to understand how this could take place and give rise to a bed of any extent. The most interest and attention of writers on the subject is divided between the second and third theories. Link carried on a long series of experiments with sea water in which he found that the under-saturation of sea water precludes the deposition of lime without some precipitation reagent, and this he found in the sodium and ammonium carbonate resulting from the decay of organic matter. The precipitation is generally in the form of sphaeroliths or concretions of aragonite with or without a central grain, those with the central grain forming near the shore and those without forming in the open sea. He considers that all pisolites and oolites are of chemical or inorganic origin and where organic matter is found it is

mechanically enclosed and not a part of the formation; or where the forms are unicellular the algae used the oolite as a place to fasten to. In the open sea they sink while the shore formations are sorted and drifted by the water and wind into irregular forms. In the course of time they are converted into calcite.

In sharp contrast to the results of the experiments by Link is the work and investigation of Dr. A. Rothpletz (5). He arrives at his conclusions in

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(5). Dr.A.Rothpletz, American Geologist, Nov. 1892. Vol. 10, p. 279. Translation by Crayen.

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a deductive way by the examination of oolites at places where they are forming and in the use of cross sections of oolites. He finds algoid bodies consisting of bodies of Gloeocapsa and cells of Gloeotheca, which richly secrete lime carbonate. The lime is enclosed in the algae body in the form of round tubercules which often group themselves into larger irregular bodies. Three forms, in general, are found; first, irregular bodies several mm. in diameter; second, spherical or oval forms about 1/3 to 1/2 mm. in diameter; third, long thin rods 1/2 mm. long and 1/10 mm. in diameter. On dissolving the oolites in weak

acid, especially those found in Great Salt Lake, the dead shriveled forms of the algae became free. The forms show the concentric forms as well as radial lines. The radial lines are sometimes calcite crystals and ascribed to enclosed algae of a different sort and which do not necessarily secrete lime. Rothpletz mentions oolites described by Joh. Walther as occurring on the shores of the Red Sea along the west coast of the Sinai peninsula and in the region of Suez. These oolites are hard to distinguish from the Great Salt Lake oolites except that they generally have a sand grain for a center. In this region they are drifted inland by the wind for great distances. Rothpletz concludes, "I am inclined to believe that the majority of the marine calcarious oolites with the regular zonal and radial structure are of plant origin; the product of microscopically small algae of low rank, capable of secreting lime."

E. B. Weathered,(6) takes the ground that oolites are

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(6) E.B.Weathered,Quar.Jour.Geol.Soc.May,1895,vol.51,p.196.

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formed by organic means. He pictures and described cross-sections of oolites from different places which show distinctly the concentric and radial structure. The tube-like structures he ascribes to some low plant form like

Girvenella. He states as follows: "I do not wish, however, to commit myself by saying that the tabulated form of growth in oolitic grains are allies to the algae. This may be so, but on the other hand, they may even be lower in the scale of life. Girvenella is the first type of oolite forming organisms discovered, and is a simple tubule."

"The exact process seems to be this: Minute fragments of the remains of calcareous organisms, such as corals, polyzoans, foraminifera, crinoids, etc., collected on the floor of the sea. These became nuclei to which the oolite forming organisms attached themselves, gradually building up a crust. Sometimes this growth was concentric and sometimes at right angles to the nucleus, or the two combined. When the growth was concentric the other tubules often cropped up in the other directions and crossed the concentric tubules. At the same time calcareous material is secreted and the interstital spaces between the tubules is filled."

"The explanation of the formation of the oolitic granules I have given is simple, and much more reasonable than to suppose that they originated from the chemical deposition of concentric strata around a nucleus in the open sea, a condition that is contrary to what is possible

according to our present knowledge of the laws of chemical combination and precipitation.'

Oolites regarded as due to algous growth have been described from the salt lakes of the Kalahari desert of Africa.(7).

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(7) E. Kalkowsky,1908. Zeitschrift der deutschen geologischen Gesellschaft,pp.68-125,pls.4-11. (from Grabau) Stratigraphy 1913)

Other places on the shores of seas, the water of which holds much lime and other dissolved salts, particles of broken shells, grains of sand, and other foreign particles are encrusted with lime, forming particles of oolitic texture. Oolites are forming in Great Salt Lake along the shore between the Jordan River and Blackrock where it constitutes the material of the beach, and is drifted shorewards in dunes. (8).

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(8)G.K.Gilbert,Monog.on Lake Bonneville,U.S.G.S.I.1890. pp.169/252,who also refers to the former high percent of dissolved salts in the Jordan River.

In this locality the oolite is exclusively a shore formation. In Pyramid Lake, one of the remanant lakes of Lake Lahontan, I.C.Russell (9) describes 'clean creamy

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(9) I.C.Russell, Geological History of Lake Lahontan/ A Quaternary Lake of N.W.Nevada, Mon.U.S.G.S.XI, 1885/pp.61,168,186.

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sands among the Needles which are oolitic. They are formed of concentric layers of carbonate of lime, which is being deposited near where warm springs rise in the shallow margin of the lake. In some places they are cemented into rock which is hard enough to polish. On the shore of the lake the oolites form irregular layers several inches thick which slope lakeward at a low angle, (10). On the shores of the

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(10) Grabau, Stratigraphy 1913-,p.336. quoted from L. von Buch.

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island of Gran Canaria in the Canary Islands, between Las Palmas and Iselta, encrustations of lime are found around broken fragments of molluscs and small grains of basalt and trachite. This sand becomes consolidated and is quarried at low tide. In Mexican lakes and lagoons oolites are formed, according to Virlet d'Oost, (11) by the encrustation of lime on the eggs of insects.

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(11) Also taken from Grabau where no reference is given. Previous citation p.

On the coast of Ascention Island, according to Darwin (12)

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oolites are formed by the encrustation of rounded fragments of shells. Similarly, fragments of shells and grains of coral sand on the south coast of Tahiti are coated with lime and transformed into oolites.(13).

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(13) James D.Dana, Corals and Coral Islands. 1872.

The pisolites of the Carlsbad Springs in Bohemia is a typical example, formed by the encrustation of minute particles of quartz or feldspar, held in suspension by the rising waters, and turned in all directions so as to be coated equally on all sides. Gas and air bubbles may also form the center around which the lime collects, the resulting pisolites having a hollow center.

FOSSIL OOLITES. (14).

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(14) The following summary of fossil oolites is taken for the most part from Grabau, Stratigraphy,1913.

Fossil oolites occur in almost all geological horizons, either as those formed in place or those transported from other places. Those transported generally

show evidence of wind transportation. This is well shown in the Silurian oolites of Gotland and in the Jurassic oolites of England. The oolites of the Upper Silurian of Michigan have been referred by Sherzer (15) to have an origin similar to those of Great Salt Lake. Oolites from the Lias and the Triassic Wetterstein Kalk of the northern Alps are regarded by Rothpletz as due to algous growth. From the carboniferous of England, oolites have been described and referred to algous origin. The same is true of the Jurassic oolites of England. Walther (15) suggests that the Rogenstein may have been

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(15) Johanes Walther, 1910, Lehrbuch der Geologie von Deutchland.

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formed in a salt lake in a desert similar to those forming now in the Great Salt Lake and in the salt lakes of the Kalahari desert. The siliceous oolites of Pennsylvania are Ordovician and are considered by Wieland (16) to have

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(16) G.R.Wieland, Am.Jour.Sci.(4) Vol.4, p.262. 1897.

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been formed by hot springs. In the region around Suez oolites of Quaternary age are found which are formed into a hard rock. Not only are conditions at Great Salt Lake such that oolites are forming now but the same conditions prevailed at earlier stages of the lake as oolites are

found on some of the terraces high up from the present shore.

Still more recent are the Pliocene oolites of the Florida Keys.(17). The Miami oolite is quarried and

(17) Thomas Wayland Vanghan, Carnagie Inst., Vol.IV.

used for building. The oolite also forms the Keys from No Name and Little Pine to Boco Grande except for the purely mangrove keys.

It seems that geologists in general agree that the characteristics of oolitic beds are indicative of shallow water formations such as might be formed in an inland sea or in places where there is an excess of salts dissolved in the water. In practically all cases the formations show the characteristic shallow water formation in being cross-bedded.

APPLICATION OF HYPOTHESES TO KANSAS CITY OOLITES.

The oolites of the Kansas City region conform in general features to all the essential characters of other oolites. The conditions under which they were formed must have varied from time to time; one condition prevailing at the time the more granular part was formed and another condition when the more compact part was laid

down, and with some near-shore condition to cause the deposition of mud between the two. The more granular part seems to have been formed nearer the shore. The mud layers are not always confined to the contact between the two unlike parts of the formation but in some places occurs between rock of the same compactness, indicating that the same conditions of deposition returned as existed before the mud was put down. A stream emptying near the place and a flood of high water carrying mud farther out than usual would explain such a condition.

The grains of oolite in the Kansas City formation vary in size and form indicating that there was a variation in the causes of formation, as well as the sorting of sizes, for grains of the same size are sorted together. The grains vary in size from about 1/4 mm. in diameter to one mm. Some are hollow in the center; some have calcite crystals for centers; some have sand grains; and some have other foreign particles. The grains with the foreign particles for centers are often larger and vary in shape according to the object encrusted. Fusilina, bryozoans, and fragments of shells form the centers of most of these larger examples. It would therefore seem that no one of the theories for the formation of oolites would explain the varied forms. It

seems that one condition might have prevailed in one place and another in another place. As in the case of the oolites forming where the hot springs rise in Pyramid lake, one kind of oolite might form there and another kind form on the shore a little distance away. The formation would indicate varying conditions along a shore line where the water was clear, except for the occasional flood which carried the mud farther out for the time, and where the water was shallow enough for cross-bedding either by wave action or by clear streams emptying into the body of water where the oolite was forming, and a possibility of wind deposits on the shore. It shows a condition where the water was heavy in salts as possibly would occur in a partly enclosed arm of the sea or a temporary inland sea with no outlet. In any case the streams emptying into it would be clear for the most of the time. The thinning of the oolite to the west would indicate that the shore line of the sea of deposition lay near to and to the east of Kansas City, while to the westward it shelved off into deeper water.

DESCRIPTION OF OLD AND NEW FOSSILS FROM THE OOLITE OF KANSAS CITY.

Introduction.

No attempt is made to give a complete bibliography of the literature on the described fossils, only such references as to indicate the author of the species. In most cases the first published account, with the date, is given; in cases where it is not the first, the reference is to papers by the same author or authors which are well illustrated and more easily obtained. In case of species considered as new a full description is attempted, otherwise only a note is made of any variations from the type. The locality references apply only to the oolite. No attempt has been made to determine the stratigraphic range or geographic distribution in other formations.

BRACHIOPODA.

CLIOTHYRIDINA ORBICULARIS McChesney.

1860. Athyris orbicularis. McChesney, Desc. New Pal. Foss., p. 47.

The specimens of this species from the oolite are not different from those of other horizons.

Locality: Muncie Hills, occurs sparingly.

COMPOSITA ARGENTEA Shepard.

1838. Terebratula argentea. Shepard, Am.Jour.Sci. (1). Vol. 34, p. 152, fig. 8.

1859. Spirigera subtilita. Meek and Hayden. Proc. Acad. Nat. Sci. Phil. p. 28.

1895. Seminula subtilata. Hall and Clark. Pal. N. Y. Vol. 8, pt. 2, pl. 47, figs. 17-31.

This species is very common in the oolite as it is in other Coal Measure strata. The specimens vary greatly in shape, some have a marked sinus while others do not.

Locality: All outcrops of the oolite.

DERBYA CRASSA Meek and Hayden.

1852. Orthis umbraculum?. Hall, Stansb. Expedition Great Salt Lake. p. 412, pl. 3, fig. 6.

1892. Derbya crassa. Hall and Clark. Pal. N. Y. Vol. 8, pt. 1, pl. 10, figs. 10-11; pl. 11A, figs. 28-33; pl. 11B, figs. 23, 24; pl. 20, figs. 12, 13.

All the specimens from the oolite are smaller than those illustrated by Hall and Clark. No measurements are at hand for comparison.

Locality: Turner, occurs sparingly.

DERBYA sp.

This specimen is similar to those referred by Beede to Derbya keokuk, a Mississippian species. The writer does not consider it probable that the identification is correct and so prefers to refer it as above.

Locality: Turner

DIELASMA BOVIDENS Morton.

1836. Terebratula bovidens. Morton, Am. Jour. Sci. (1) vol. 29, p. 150, pl. 2, fig. 4.

1895. Dielasma bovidens. Hall and Clark, Pal. N. Y. vol. 8, pt. 2. pl. 81, figs. 29-35.

This species occurs in the oolite in somewhat larger examples than the type, whose dimensions were given as 3/4 inches long, 1/2 inch wide. A number of specimens from the oolite are as much as 1 1/4 inches long and many more exceed an inch in length.

Locality: Occurs in all outcrops of the oolite, but is extremely abundant at Turner.

HUSTEDIA MORMONI Marcou.

1858. Terebratula mormoni. Marcou, Geol. N. A. p. 51, pl. 6, figs. 11-11c.

1895. Hustedia mormoni. Hall and Clark, Pal. N.Y. Vol. 8, pt. 2, pl. 51, figs. 1-9.

This little species occurs somewhat abundantly, mainly in the Muncie Hills, and is much smaller than in other horizons. Out of some two-hundred specimens the largest is only a little over half the size as given by Hall and Clark. The largest is 6 mm. long, 5 mm. wide, convexity 4 mm. The average size is about 5 mm. long, 4.5 mm. wide, convexity 4 mm.

Locality: Muncie Hills.

LINGULA sp.

Two specimens of Lingula are in the collection but their species has not been determined.

Locality: Turner.

PRODUCTUS CORA D'Orbigny.

1847. Productus cora. De Koninck, Monog. du Gen. Prod. et Chon. p. 50, pl. 4, figs. 4a,b. pl. 5, figs. 2a-2d.

1872. Productus prattenianus. Meek. U. S. Geol. Surv. Nebr., p. 163, pl. 2, figs. 5a-c; pl.5,fig.13; pl.8,figs,10a,b.

~~Lower Coal Measures, Illinois.~~

This species occurs in the usual size and does not differ from the specimens in other horizons. It is not as common in the oolite as in other Coal Measure strata.

Locality: Turner.

PRODUCTUS NEBRASCIENSIS Owen.

1852. Productus nebrasciensis. Owen, Geol. Rep. Wisc. Iowa,and Minn., p.594,tab.5,fig.3.

1894. Productus nebrasciensis. Keyes,Mo.Geol.Surv. Vol.5,p.48,pl.37,figs.3a-c.

This common Coal Measure fossil is found in great abundance in the oolite; but does not attain as great size as in other formations.

Locality: Muncie Hills and Turner.

SPIRIFERINA KENTUCKYENSIS Shumard.

1852. Spirifer octoplicata? Hall, Stansb. Exped. Great Salt Lake, p.409, pl.4, figs.4a, b.

1855. Spiriferina kentuckyensis. Shumard, Geol. Rep. Mo. p.203.

1895. Spiriferina kentuckyensis. Hall and Clark. Pal. N. Y. Vol.8, pt.2, pl.29, fig.17; pl.36, figs.14-16.

Of thirty specimens of this species from the Muncie Hills the largest is only about half the size as given by Hall and Clark. It is not very abundant.

Locality: Muncie Hills and other outcrops.

CEPHALOPODA.

ASYMTOCERAS cfc CAPAX Meek and Worthen.

1865.Nautilus(Cryptoceras) capax. Meek and Worthen,Proc. Acad.Nat.Sci.Phil.p.262.

The cast of a single specimen referred to this species has been collected from the oolite.

Locality:Kansas City Oolite.

COLOCERAS GLOBATUS Meek and Worthen.

1866.Nautilus globatus?. Meek and Worthen ,Geol.Surv.Ill., vol.2,p.305,pl.24,figs.5a,b.

The specimens of this species from the oolite are not different form those of other localities.It is not a common species.

Locality: Turner.

DOMATOCOCERAS LASALLENSIS Meek and Worthen.

1865.Domatococeras lasallensis. Meek and Worthen, Proc. Acad.Nat.Sci.Phil.,p.261.

1873.Nautilus lasallensis. Meek and Worthen.Geol.Surv.Ill., vol.5,p.610,pl.31,fig.1.

Only one specimen is referred to this species and that with some doubt,as it is not well preserved.

Locality: Muncie Hills.

EPHIPPOCERAS FERRATUM Cox.

1857. Nautilus ferratus. Cox, Geol. Rep. Ky., vol. 3, p. 574, pl. 10, figs. 2, 2a.

This species appears to be represented by two specimens which are somewhat below the medium size.

Locality: Turner.

METACOCERAS SANGAMONENSIS Meek and Worthen.

1860. Nautilus (Discus) sangamonensis. Meek and Worthen, Proc. Acad. Nat. Sci. Phil., p. 470

1894. Metacoceras sangamonensis. Meek and Worthen, Geol. Surv. Ill., vol. 2, p. 386, pl. 29, figs. 3-3b.

This species is represented in the collection from the oolite by a single specimen.

Locality: Turner.

NAUTILUS PLANORBIFORMIS Meek and Worthen.

1866. Nautilus planorbiformis. Meek and Worthen, Geol. Surv. Ill., vol. 2, p. 386, pl. 29, figs. 4a-c.

Good specimens of this form are rare.

Locality: Turner.

ORTHOCERAS MUNSTERIANUM Meek and Worthen.

1873. Orthoceras munsterianum. Meek and Worthen, Geol. Surv. Ill., vol. 5, pl. 23, figs. 5a-d.

This is one of the largest forms occuring in the oolite. It is not very common.

Locality: Turner.

ORTHOCERAS RUSHENSE McChesney.

1860. Orthoceras rushense. McChesney, Desc. New Pal. Foss. p68.

1873. Orthoceras rushense?. Meek and Worthen, Geol. Surv. Ill., vol. 5, p. 612, pl. 30. fig. 4.

Good specimens of this rather common species are not very commonly found.

Locality: Turner.

TAINOCERAS OCCIDENTALIS Swallow.

1858. Nautilus occidentalis. Swallow, Trans. St. Louis Acad. Sci. vol. 1, p. 196.

1872. Nautilus occidentalis. Meek, U.S. Geol. Surv. Nebr., p. 234, pl. 11, fig. 17.

This species in typical form is not uncommon in the oolite.

Locality: Turner.

PELECYPODA

ASTARTELLA GURLEYI White.

1878. Astartella gurleyi. White, Proc. Acad. Nat. Sci. Phil. vol. p. 35.

A few small forms of this species are collected from the oolite. One of them is somewhat larger than the others; the small ones are 3 mm. long, 4 mm. wide, and 3 mm. thick.

Locality: Muncie Hills.

ASTARTELLA VERA Hall.

1858. Astartella vera. Hall, Geol. Surv. Iowa, vol. 1, p. 715, pl, 29, figs. 1a-c.

1894. Astartella vera. Keyes, Mo. Geol. Surv., vol. 5, p. 125, pl. 46, fig. 6.

Only one specimen from the oolite is referrable to this species. Except for being a little smaller it agrees with specimens from other places.

Locality: Turner.

AVICULA LONGA Geinitz.

1866. Gervillia longa. Geinitz, Carb. und Dyas in Nebr., p. 32, tab. 2, fig. 15.

But a few specimens of this species are found in the oolite. One of the specimens is somewhat longer than figured by Geinitz, otherwise they seem to be the same.

Locality: Turner.

AVICULA SULCATA Geinitz.

1866. Gervillia (an Avicula) sulcata. Geinitz, Carb. und Dyas in Nebr.,p.33,tab.2,fig.16.

This little species is rare and differs in no way from the type of Geinitz.

Locality: Muncie Hills.

ALLORISMA COSTATUM Meek and Worthen.

1852. Allorisma costata. Meek and Worthen,Proc.Acad. Nat. Sci. Phil.,p.171.

1894. Allorisma costatum. Keyes,Mo.Geol.Surv.,vol. 5,p.128,pl.46,fig.12.

This species is only fairly abundant. The ornamentation is well marked and hence the shell is easy to identify. One or two specimens are a little longer than described by Meek and Worthen.

Locality: Turner.

ALLORISMA SUBCUNEATUM Meek and Hayden.

1852. Allorisma regularis?.Owen,Geol.Rep.Wis.,Iowa, and Minn. tab.5,fig.13.

1866. Allorisma subcuneatum. Geinitz, Carb. und Dyas in Nebr., p. 14.

But one specimen which can be referred to this species has been collected from the oolite.

Locality: Turner.

AVICULOPECTEN CARBONIFERUS Stevens.

1858. Pecten carboniferus. Stevens, Am. Jour. Sci. (2) vol. 2, p. 97.

1894. Aviculopecten carboniferus. Keyes, Mo. Geol. Surv., vol. 5, p. 111, pl. 43, figs. 4a, b,

This is one of the abundant fossils of the oolite. It is about one-fourth smaller than the normal specimen of the same species from other formations.

Locality: Turner.

AVICULOPECTEN OCCIDENTALIS Shumard.

1855. Pecten occidentalis. Shumard, Geol. Rep. Mo., p. 207, pl. C, fig. 18.

Aviculopecten occidentalis. Meek and Worthen, Geol. Surv. Ill., vol. 2, p. 131, pl. 27, figs. 4, 5, 5a.

There is no fossil in the oolite more common than this species and it in no way departs from the typical form.

Locality: Turner and other outcrops.

AVICUPLOECTEN PROVIDENSIS Cox.

1857. Pecten providencesis. Cox, Geol. Surv. Ky., vol. 3, p. 566, pl. 8, fig. 1.

This species does not commonly occur in the oolite. The specimens agree with the descriptions of Cox in all but size, being about one-fourth smaller. One specimen collected from the same horizon but not in the oolite is as large as given by Cox.

AVICULOPECTEN SCULPTILIS Miller.

1892.Aviculopecten sculptilis. Miller,17th Rep.Geol. Sur.Ind.,p.702,pl.20,fig.5.

A single specimen collected from the oolite agrees in all respects with the description of the original specimen.

Locality:Turner.

CYPRICARDINIA CARBONARIA Meek.

1871.Cypricardinia? carbonaria. Meek.Proc.Acad.Nat.Sci. Phil.,p.163.

1887.Cypricardinia? carbonaria. Herric,Bull.Denver Univ. vol.2,p.35,pl.4,figs.17,18.

This species occurs quite abundantly and the specimens agree with Meek's description of the species.

Locality: Turner and Muncie Hills.

CONOCARDIUM PARRISHI Worthen.

1890.Conocardium parrishi. Worthen,Geol.Surv.Ill.,vol.8, p.112,pl.20,fig.7.

Several specimens of this species are present.They are much smaller than C. obliquum and the central rib is not as oblique.

Locality: Muncie Hills.

EDMONDIA NEBRASCENSIS Geinitz.

1866.Astarte nebrascensis. Geinitz,Carb.und Dyas in Nebr., p.16,tab.1,figs.25,8a,b.

A good many of this species are occurred and they agree in every way with typical specimens from other localities. There is considerable variation in the distinctness of the concentric lines.

Locality: Turner and Muncie Hills.

MACRODON cf. OBSOLETUS Meek.

1871. Macrodon obsoletus. Meek. Rep. Regents Univ. W. Va.,

1875. Macrodon obsoletus. Mee, Pal. Ohio, vol. 2, p. 334, pl. 19, fig. 9.

The original description of this species was based on casts and it is with some doubt that the above reference is made.

Locality: Kansas City Oolite.

MACRODON SANGAMONENSIS. Worthen.

1890. Macrodon sangamonensis, Worthen, Geol. Surv. Ill/, vol. 8, p. 123, pl. 21, figs. 3, 3a.

The largest specimens from the oolite are fully one-third smaller than those from other localities, but otherwise there are no differences. Only a few specimens have been collected.

Locality: Turner.

MODIOLA SUBELLIPTICA Meek.?

1866. Clidophorus (an Pleurophorus) occidentalis. Geinitz, Carb. und Dyas in Nebr., p. 23, tab. 2, fig. 6. /not Pleurophorus occidentalis Meek and Hayden, 1858.)

1872.Modiola? subelliptica. Meek,U.S.Geol.Surv.Nebr., p.211,pl.10,fig.5.

One poorly preserved specimen is doubtfully referred to this species.

Locality: Turner.

MONOPTERIA LONGISPIRA Cox.

Gervillia longispira.Cox,Geol.Surv.Ky.,vol.3,p. 568,pl.8,fig.6.

This form is much like M.gibbosa but is not so gibbous and has a much longer wing;in good specimens they are easily distinguished.It is not so abundant as M.gibbosa.

Locality: Turner and Muncie Hills.

MONOPTERIA GIBBOSA Meek and Worthen.

1866.Pterinea(Monopteria) gibbosa. Meek and Worthen,Geol. Surv.Ill.,vol.2,p.340,pl.27,figs.11-11b.

1894.Monopteria gibbosa. Keyes,Mo.Geol.Surv.,vol.5,p.114, pl.43,figs.2a,b, .

This form occurs quite abundantly and in all respects agrees with the type.

Locality: Turner and Muncie Hills.

MONOPTERIA MARIAN White.

1874.Monopteria marian.White,Prel.Rep.Inv.Foss.,p.22.

1877.Monopteria marian. White,U.S.Geol.Surv.W.100th Merid.,vol.4,p.151,pl.11.figs.4a,b,c.

This species in typical forms occurs commonly in the

oolite.

Locality: Turner.

MYALINA AMPLA Meek and Hayden.

1864.Myalina ampla. Meek and Hayden.Pal.Upp.Mo.,p.33,figs, A,B.

1864.Myalina subquadrata. Ibid.p.32.

The specimens of this species are smaller by one-fourth than those on which the description of Meek and Hayden was based.Only a few specimens are found in the oolite.

Locality: Turner.

MYALINA CONGENERIS Walcott.

1884.Myalina congeneris .Walcott.Pal.Eureka.Dist.,p.237, pl.19,fig.6; pl.22,fig.10.

Three or four specimens are referred to this species and seem to agree in all respects with the type.

Locality: Muncie Hills.

MYALINA KANSASENSIS Shumard.

1858.Myalina kansasensis .Shumard,Trans.St.Louis Acad. Sci.vol.1,p.213.

This form is found plentifully in the oolite and is easily recognised by its crenulated surface.

Locality:Turner and Muncie Hills.

MYALINA PERATTENUATA Meek and Hayden.

1858.Myalina (Mytelus) perattenuata. Meek and Hayden, Trans.Alb.Inst.,vol.4,p.77.

1873.Myalina perattenuata.Meek and Worthen,Geol.Surv. Ill.,vol.5,p.582,pl.26,fig.11.

This species is not very common.It agrees with the descriptions in every respect.
Locality: Turner.

MYALINA RECURVIROSTRA Meek and Worthen.

1860.Myalina recurvirostra.Meek and Worthen, Proc. Acad.Nat.Sci.Phil.,p.456.

1866.Myalina recurvirostra. Meek and Worthen.Geol.Surv. Ill.vol.2,p.334,pl.26,figs.9a-c.

Except in size the specimens from the oolite are similar to typical forms from other locations.They are,however, only half so large as those from elsewhere. They are not common.

Location: Turner.

MYALINA SWALLOVI McChesney.

1860.Myalina swallovi.McChesney,Desc.New Pal.Foss.p.57.

1866.Myalina swallovi. Meek and Worthen. Geol.Surv.Ill., vol.2,p.341,pl.27,figs.1a-d.

Occurs plentifully and except in size does not differ from typical forms from other localities.Some specimens measure 3.8 cm.long,this being about one-third longer than those described by Meek and Worthen.

Locality:Turner and all other outcrops.

NUCULA VENTRICOSA Hall.

1858.Nucula ventricosa. Hall,Geol.Iowa,vol,1.pt.2,p.716, pl.24,figs.4,5a,b.

Specimens referred to this species are very common in the oolite.They are very variable,the variation being mainly in thickness;they range from about 3 mm. up to 6 mm. in thickness. Some very thin forms placed here are probably of another species.

Locality:Turner;Muncie Hills,and other outcrops.

NUCULA PARVA McChesney.

1860.Nucula parva.McChesney,Desc.New Pal.Foss.,p.54.

This little species is extremly abundant and is quite variable in thickness.

Locality:Muncie Hills.

NUCULANA BELLISTRIATA VAR.ATTENUATA Meek.

1866.Nucula kazenensis.Geinitz,Carb.und Dyas in Nebr., p.20,tab.1,figs.34,33.(not N.kazenensis,de Vern,1845)

1872.Nuculana bellistriata var.attenuata. Meek,U.S.Geol. Surv.Nebr.,p.206,pl.10,figs.11a,11b.

This little species is rather common in the oolite and shows no variation from the typical forms..

Locality: Turner and Muncie Hills.

PLEUROPHORUS COSTATUS Meek and Worthen.

1865.Pleurophorus Subcostatus. Meek and Wotthen,Proc.Acad. Nat.Sci.Phil?, p.246.

This species occurs in great abundance.Several specimens are somewhat larger than others,measuring about two inches in length;on the smaller shells the radiating costae are very faint.

PLEUROPHORUS TROPIDOPHORUS Meek.

1875.Pleurophorus tropidophorus. Meek,Pal.Ohio,vol.2, p.388,pl.19,figs,10a,b.

Rather rare and not different from the typical forms.

Locality: Turner.

PROTHYRIS ELEGANS Meek.

1871:Prothyris elegans. Meek,Am.Jour.Conch.,vol.7,p.8, pl.1,fig.3.

This shellis extremly abundant and of typical form.

Locality: Turner and Muncie Hills.

PSEUDOMONTIS HAWNI VAR.EQUISTRIATA.

1899:Pseudomontis hawni var. equistriata.Beede,Kansas Univ.Quart.VIII p.82,pl.18,figs.3-3b.

The type of this variety is in the collection of the University of Kansas and new specimens agree with it.

Location:Turner and Muncie Hills.

PSEUDOMONTIS HAWNI Meek and Hayden.

1858.Montis hawni. Meek and Hayden,Trans.Albany Inst., vol.4,p.76.

This species occurs in great abundance and variety of forms. The variations are found both toward Beede's P.equistriata and P.robusta,and a dividing line is hard to make.

Locality: Turner and Muncie Hills.

PSEUDOMONTIS KANSASENSIS Beede.

1899.Pseudomontis tenuistriata.sp? var?/ Beede, Kansas Univ.Quart.VIII,p.81,pl.18,figs.1-1d.

1900.Pseudomontis kansasensis.Nom.nov . Univ.Geol.Surv. Kansas,vol.9,p.133,pl.14,figs.1-1d.

This species is not greatly different from P.equistriata and possibly one grades into the other.

Location: Turner and Muncie Hills.

PSEUDOMONTIS?ROBUSTA [illegible].

1899.Pseudomontis? robusta sp? var? . Beede,Kansas Univ. Quart.VIII,p.82,pl.18,figs.2-2c.

The type of this species is in the University collection and is from the oolite.

Location:Turner.

SCHIZODUS cf. WHEELERI Swallow.

1858. Schizodus obscurus. Swallow, Trans. St. Louis Acad. Sci. vol. 1, p. 193. (not Axinus obscurus Sowerby, 1823)

1872. Schizodus wheeleri. Meek, U.S. Geol. Surv. Nebr., p. 209, pl. 10, figs. 1a-f.

The specimens from the oolite which have been referred to this species are not so large as those on which Meek's description is based. Individuals are 13 mm. long and 10 mm. wide.

Locality: Muncie Hills and Turner.

YOLDIA SUBSCITULA Meek and Hayden.

1858. Leda subscitula. Meek and Hayden, Trans. Alb. Inst. vol. 4, p. 79.

1894. Yoldia subscitula. Keyes, Mo. Geol. Surv., vol. 5, p. 123.

This species is quite rare and the specimens which have been collected from the oolite are not essentially different from those of other horizons and localities.

Location: Turner and Muncie Hills.

GASTROPODA

ACLISMA STEVESANA Meek and Worthen.

1866.Turritella ?? stevensana. Meek and Worthen ,Geol. Surv.Ill.,vol.2,p.382,pl.27,figs.8,8a.

1894.Aclisma stevensana. Keyes,Mo.Geol Surv.,vol.5,p.202.

This is a rather common form and specimens are not different from those of other localities.

Locality: Muncie Hills.

BULIMORPHA NITIDULA Meek and Worthen.

1860.Bulimorpha nitidula. Meek and Worthen, Proc.Acad. Nat.Sci.Phil., p.465.

The specimens from the oolite are a little smaller than those from other strata.The species is somewhat abundant in the oolite.

Locality:Muncie Hills.

BULIMORPHA INORNATA Meek and Worthen.

1860.Loxonema inornata. Meek and Worthen,Proc.Acad.Nat. Sci.Phil.,p.465.

1894.Bulimorpha inornata. Keyes,Mo.Geol.Surv. vol.5. pl.55,fig.6.

This little species occurs rather abundantly and is not different from the typical form.

Location: Muncie Hills.

BELLEROPHON CRASSUS Meek and Worthen.

1866.Bellerophon crassus. Meek and Worthen.Geol.Surv. Ill., vol.2,p.385,pl.31,figs.16a,b.

Small specimens referred to this species are rather common in the oolite.

Locality: Oolite of Kansas City.

BELLEROPHON MARCOUIANUS Geinitz.

1866.Bellerophon marcouianus. Geinitz,Carb.und Dyas in Nebr.,p.7,tab.1,fig.12.

1872.Bellerophon marcouianus. Meek , U.S.Geol.Surv. Nebr.,p.226,pl.4,fig.17;pl.11,figs.13a,b.

But two specimens have been collected which have been referred to this species.

Locality: Kansas City oolite.

BELLEROPHON STEVENSANUS McChesney.

1860.Bellerophon stenensianus.McChesney,Desc.New Pal. Foss.,p.61.

Specimens referred to this species agree in all respects to the descriptions and occur rather abundantly in the oolite.

Locality: Muncie Hills and Turner.

LOXONEMA SEMICOSTATA Meek.

1873.Loxonema semicostata. Meek and Worthen, Geol.Surv. Ill.,vol.5,p.596,pl.29,fig.2.

The transverse lines on the specimens from the oolite are a little larger than described for the type,otherwise they seem to be the same. Only two specimens are referred to this species.

Locality:Muncie Hills.

LOXONEMA PEORIENSIS Worthen.

1884.Loxonema peoriensis. Worthen,Bull.No.2, Ill., State Mus.Nat.Hist.,p.7.

1890Loxonema peoriensis Worthen,Geol.Surv.Ill., vol.8, p.139,pl.23,figs.10-10b.

The cast of one specimen from the oolite is referred to this species.

Locality: Turner.

LOXONEMA CERITHIFORMIS Meek and Worthen.

1860.Loxonema cerithiformis. Meek and Worthen,Proc.Acad. Nat.Sci.Phil.,p.465.

Only a part of one specimen is referred here, but its markings are sufficiently distinct for determination.

Locality: Muncie Hills.

LOXONEMA RUGOSUM Meek and Worthen.

1860. Loxonema rugosam. Meek and Worthen, Proc. Acad. Nat. Sci. Phil., p. 465.

1866. Loxonema rugosa. Meek and Worthen. Geol. Surv. Ill., vol. 2, p. 378, pl. 31, figs. 11a-c.

On the specimens from the oolite the vertical lines of ornamentation hardly form a straight line from the base to the top as given for the type. There is also some variation in the lines on different specimens, some being more distinct than others.

Locality: Turner and Muncie Hills, very common at the latter place.

LOXONEMA MULTICOSTATUM Meek and Worthen.

1861. Loxonema multicostatum. Meek and Worthen, Proc. Acad. Nat. Sci. Phil., p. 146.

1866. Loxonema multicostatum. Meek and Worthen, Geol. Surv. Ill., Vol. 2, p. 378. pl. 31, figs. 12a-c.

The angle of the specimens from the oolite is about two degrees less than given for the type; in other respects they agree.

Locality : Muncie Hills:

MACRODON N. SP.

This shell is much like M. cornica Meek and Worthen, but has two rows of spiral nodes instead of three.

MURCHISONIA LASALLENSIS Worthen.

1890.Murchesonia lasallensis. Worthen,Geol.Surv.Ill., vol.8,p.141,pl.25,figs.7,7a.

Quites a number of specimens of this species have been found in the oolite;they agree with the description of the above species in all respects.

Locality: Muncie Hills.

NATICOPSIS ALTONENSIS McChesney.

1865.Naticopsis altonensis. McChesney,New Spec.Foss.,p.o, pl.2,figs,14a,b.

1873.Naticopsis altonensis. Meek and Worthen ,Geol.Surv. Ill.,vol,5,p.595,pl.28,fig.11.

There are several specimens in the different collections from the oolite which have been studied and which agree with the published descriptions of the species.

Locality:Turner.

ORTHONEMA SALTERI Meek and Worthen.

1860.Eunema? salteri. Meek and Worthen, Proc.Acad.Nat. Sci.Phil. p.464.

1866.Orthonema salteri. Meek and Worthen, Geol.Surv. Ill., vol.2,p.381,pl.31,figs.14a-c.

Typical specimens of this species are common in the oolite exposed in the Muncie Hills.

Locality: Muncie Hills.

ORTHONEMA SUBTAENIATUM Geinitz.

1866. Murchesonia subtaeniatum. Geinitz, Carb. und Dyas in Nebr., p. 12, tab/1, fig. 18.

The apical angle of the specimens from the oolite is less than that given by Geinitz and the ornamentation is not as distinct. The species is not common.

Locality: Muncie Hills.

PHANOTREMA GREYVILLENSIS Norwood and Pratten.

1858. Pleorotomaria greyvillensis. Norwoo and Pratten, Jour. Acad. Nat. Sci. Phil., (2) vol. 3, p. 75, pl. 9, figs. 7a, b.

1872. Pleurotomaria greyvillensis. Geinitz, Carb. und Dyas in Nebr., p. 9, tab. 1, fig. 9.

This species is not very plentiful in the oolite. It resembles P. illinoisensis, but has a much smaller angle.

Locality: Turner.

PLEUROTOMARIA BONHARBORENSIS Cox.

1857. Pleurotomaria bonharborensis. Cox, Geol. Surv. Ky., vol. 3, p. 567, pl. 8, figs, 4, 4a.

Specimens of this little species occur in great abundance, the collection having about two-hundred and fifty specimens. Judging from the description of Cox, they are of the typical form.

Locality: Muncie hills.

PLEUROTOMARIA CONOIDES Meek and Worthen.

1866. Pleurotomaria conoides. Meek and Worthen, Proc. Acad. Nat. Sci. Phil., p. 271. (not P. conoides, Deshayes, 1831.)

Only a single specimen of this species has been collected from the oolite.

Locality: Muncie Hills.

PLEUROTOMARIA GIFFORDI Worthen.

1884. Pleurotomaria giffordi. Worthen, Geol. Surv. Ill., vol. 8, p. 135, pl. 23, figs. 8, 8a.

Only a single specimen referrably to this species has been collected.

Locality: Muncie Hills.

PLEUROTOMARIA GRANULOSTRIATA Meek and Worthen.

1866. Pleurotomaria granulo-striata. Meek and Worthen, Geol. Surv. Ill., vol. 2, p. 356, pl. 28, figs. 2a-d.

The above species seems to be represented by a single specimen from the oolite.

Locality: Muncie Hills.

PLEUROTOMARIA ILLINOISENSIS Worthen.

1857. Pleurotomaria depressa. Cox, Geol. Surv. Ky., vol. 3, p. 569, pl. 8, fig. 10, 10a. (not P. depressa Phillips, 1836)

1890. Pleurotomaria illinoisensis. Worthen, Geol. Surv. Ill., vol. 8, p. 135, pl. 23, figs. 6-6b.

This species is not extremely abundant. Its large apical

and depressed form permit its ready identification.

Locality:Muncie Hills and Turner.

PLEUROTOMARIA MONILIFERA White.

1880.Naticopsis monilifera. White,Cont.to Inv.Pal. No. 8,p.168,pl.42,figs.3a-c.

One specimen in the collection is much larger than the others but seems to have all the markings of the small ones which are similar to specimens of the species as described from other localities. Fairly abundant.

Locality: Muncie Hills.

PLEUROTOMARIA PERHUMEROSA Meek.

1872.Pleurotomaria perhumerosa. Meek, U.S.Geol.Surv.Nebr., p.232,pl.4,figs.13,13b?

This species is rather rare in the oolite,only a few specimens having been collected.

Locality:Muncie Hills.

PLEUROTOMARIA SCITULA Meek and Worthen.

1866.Pleurotomaria scitula. Meek and Worthen ,Geol. Surv.Ill.,vol.2,p.353,pl.28,figs.9a-d.

The species is represented by five specimens.They appear to be the same as the typical forms.

Location:Muncie Hills.

PLEUROTOMARIA SUBCONSTRICTA Meek and Worthen.

1866.Pleurotomaria subconstricta. Meek and Worthen,Geol. Surv.Ill., vol.2,p.351,pl.28.figs.6a-c.

The specimens of the above species which have been collected from the oolite are essentially the same as those described by Meek and Worthen .

Locality: Muncie Hills?

PLEUROTOMARIA SUBSINUATA Meek and Worthen.

1866.Pleurotomaria subsinuata. Meek and Worthen,Geol. Surv.Ill.,vol.2,p.358,pl.28,figs.4a-d.

One good specimen and several fragments from the oolite seem to belong to the above species.

Locality: Muncie Hills.

PLEUROTOMARIA SUBDECUSSATA Geinitz.

1866.Pleurotomaria subdecussata . Geinitz . Carb.und Dyas in Nebr., p.10,tab.1,fig.11.

This species occurs in some abundance in the oolite.

Locality: Turner and Muncie Hills.

PLEUROTOMARIA TURBINIFORMIS. Meek and Worthen.

1860.Pleurotomaria bicarinata McChesney,Desc.New Pal. Foss.,p.90.(not P.bicarinata Sowerby,1818.)

1866.Pleurotomaria turbiniformis. Meek and Worthen,Geol. Surv.Ill.,vol.2,p.359,pl.28,figs.8a-c.

This is a rather common form from the oolite and attains some size. It does not seem to differ from the specimens from other places.

Locality: Turner and Muncie Hills.

PLEUROTOMARIA SP?

This shell resembles P. scitula but does not have the spirals on the upper side of the whorls so marked and the transverse lines, if present at all, are very faint. It is probably a new form.

Locality: Muncie Hills.

SOLENISCUS BREVIS White.

1858. Macrocheilus ventricosa. Hall, Geol. Iowa, vol. 1, pt. 2, p. 718, pl. 29, fig. 8. (not Phasianella ventricosa Goldf. 1841)

This little species seems to be rare in the oolite, the ones collected are a little smaller than those described from other localities.

Locality: Turner.

SOLENISCUS NEWBERRYI Stevens.

1858. Loxonema newberryi. Stevens, Am. Jour. Sci. (2) vol. 25, p. 259.

The specimens collected do not differ from those of other places.

L Locality: Turner.

STREPTAXIS WHITFIELDI Meek.

1871. Streptaxis whitfieldi. Meek, Proc. Acad. Nat. Sci. Phil., p. 173.

1873. Streptaxis whitfieldi. Meek and Worthen, Geol. Surv. Ill., vol. 5, p. 596, pl. 29, fig. 1.

This minute species does not seem to be very common in the oolite. This may be on account of its small size, making it hard to find.

Locality: Muncie Hills.

STROPHOSTYLUS NANA Meek and Worthen.

1860. Platyostoma nana. Meek and Worthen, Proc. Acad. Nat. Sci. Phil., p. 463.

1866. Naticopsis nana. Meek and Worthen, Geol. Surv. Ill., vol. 2, p. 365, pl. 31, figs. 4a, b.

This little species is founr quite freely at Muncie Hills. The specimens are a little larger than those on which the description of Meek and Worthen was based.

Locality: Muncie Hills.

STROPHOSTYLUS PEORIENSIS McChesney.

1860. Platyostoma peoriensis. McChesney, Desc. New Pal. Foss. p. 62.

This is one of the more common fossils in the oolite and except that it is a little larger than the described specimens it agrees with them. Several smaller specimens are also referred here.

Locality: Turner.

TRACHODOMIA WHEELERI Swallow.

1860. Littorina wheeleri. Swallow, Trans. St. Louis Acad. Sci. vol. 1, p. 658.

1873. Naticopsis wheeleri. Meek and Worthen, Geol. Surv. Ill., vol. 5, p. 595, pl. 28, fig. 3.

Very few of these specimens are found in the oolite.

Locality: Muncie Hills.

TRACHODOMIA NODULOSA Worthen.

1884. Trachodomia nodulosa, Worthen, Bull. No. 2, Ill. State Mus. Nat. Hist., p. 8.

1891. Trachodomia nodulosa. Worthen, Geol. Surv. Ill., vol. 8, pl. 23, figs. 11, 11a.

Only a single specimen has been collected from the oolite which is referrable to this species.

Locality: Turner.

WORTHENIA BRAZONENSIS Shumard.

1860. Pleurotomaria brazonensis. Shumard, Trans. St. Louis Acad. Sci., vol. 1, p. 624.

1866. Pleurotomaria brazonensis, Meek and Worthen, Geol. Surv. Ill., vol. 2, p. 354, pl. 28, figs. 1a-d.

This is one of the most common fossils in the oolite.

Locality: Muncie Hills.

WORTHENIA SPECIOSA Meek and Worthen.

1860. Pleurotomaria speciosa. Meek and Worthen. Proc. Acad. Nat. Sci. Phil. p. 461.

1866. Pleurotomaria speciosa. Mee and Worthen, Geol. Surv. Ill., vol. 2, p. 352, pl. 28, figs. 5a-c.

Only a few specimens of this species have been collected from the oolite. The apical angle is a little larger than given for the type. Otherwise they are the same.

Locality: Turner.

WORTHENIA TABULATA Conrad.

1835. Turbo tabulata. Conrad, Trans. Geol. Soc. Penn. vol. 1, pt. 2, p. 267, pl. 12, fig. 1.

1858. Pleurotomaria tabulata. Hall, Geol. Iowa, vol. 1, pt. 2, p. 721, pl, 29, figs. 12a, b.

This species is rare in the oolite, only one specimen having been collected.

Locality: Muncie Hills.

FORAMINIFERA

FUSILINA SECALICA

Specimens of Fusilina are rather common. The specimens are generally coated with lime. Fragments are found as small as the oolite grains and appear in cross-section of the oolite. They are generally somewhat smaller than in other Coal Measure formations.

GLOBOGERINA ? ?

Two species of foraminifera referreble to the common type of Globerogina are in the collection. Their species has not been determined.

VERMES.

Two species of Vermes have been collected from the oolite. One is a species of Serpula, the other a species of Spirorbis, probably S. carbonarius.