

**CONTRIBUTIONS FROM THE MUSEUM OF PALEONTOLOGY  
UNIVERSITY OF MICHIGAN**

**Vol. VI, No. 6, pp. 113-130 (3 pls.)**

**FEBRUARY 10, 1944**

---

**REVISION OF E. A. STRONG'S SPECIES  
FROM THE MISSISSIPPIAN POINT AU  
GRES LIMESTONE OF GRAND RAPIDS,  
MICHIGAN**

**BY**

**G. M. EHLERS AND W. E. HUMPHREY**



**Contributions from Department of Geology  
University of Michigan  
No. 4 (1944)**

**UNIVERSITY OF MICHIGAN PRESS  
ANN ARBOR**

## CONTRIBUTIONS FROM THE MUSEUM OF PALEONTOLOGY

### UNIVERSITY OF MICHIGAN

*Editor:* EUGENE S. MCCARTNEY

The series of contributions from the Museum of Paleontology is a medium for the publication of papers based entirely or principally upon the collections in the Museum. When the number of pages issued is sufficient to make a volume, a title page and a table of contents will be sent to libraries on the mailing list, and also to individuals upon request. Correspondence should be directed to the University of Michigan Press. A list of the separate papers in Volumes II-V will be sent upon request.

- VOL. I. The Stratigraphy and Fauna of the Hackberry Stage of the Upper Devonian, by C. L. Fenton and M. A. Fenton. Pages xi + 260. Cloth. \$2.75.
- VOL. II. Fourteen papers. Pages ix + 240. Cloth. \$3.00.  
Parts sold separately in paper covers.
- VOL. III. Thirteen papers. Pages viii + 275. Cloth. \$3.50.  
Parts sold separately in paper covers.
- VOL. IV. Eighteen papers. Pages viii + 295. Cloth. \$3.50.  
Parts sold separately in paper covers.
- VOL. V. Twelve papers. Pages viii + 318. Cloth. \$3.50.  
Parts sold separately in paper covers.

### VOLUME VI

1. A Nearly Complete Turtle Skeleton from the Upper Cretaceous of Montana, by E. C. Case. Pages 1-19, with 18 text figures. Price \$.40.
2. *Lepidodendron Johnsoni*, sp. nov., from the Lower Pennsylvanian of Central Colorado, by Chester A. Arnold. Pages 21-52, with 11 plates and 4 text figures. Price \$.60.
3. Observations on Fossil Plants from the Devonian of Eastern North America. V. *Hyeria Banksii*, sp. nov., by Chester A. Arnold. Pages 53-57, with 1 plate. Price \$.20.
4. Some Paleozoic Plants from Central Colorado and Their Stratigraphic Significance, by Chester A. Arnold. Pages 59-70, with 3 plates. Price \$.25.
5. An Interpretation of the Skull of *Buettneria*, with Special Reference to the Cartilages and Soft Parts, by John Andrew Wilson. Pages 71-111, with 14 text figures. Price \$.60.

(Continued on inside of back cover)

REVISION OF E. A. STRONG'S SPECIES  
FROM THE MISSISSIPPIAN POINT AU  
GRES LIMESTONE OF GRAND RAPIDS,  
MICHIGAN

By G. M. EHLERS AND W. E. HUMPHREY

INTRODUCTION

IN 1872 Professor E. A. Strong, a member of the public school system of Grand Rapids, Michigan, and in later life a professor of physics at Michigan State Teachers College at Ypsilanti, Michigan, wrote a paper entitled "Notes upon the Fossil Remains of the Lower Carboniferous Limestone Exposed at Grand Rapids, Michigan." In this very rare paper, No. 3 of *Miscellaneous Papers of the Kent Scientific Institute*, he described the new species *Allorisma elongata*, *A. quadrata*, *Nautilus ellipticus*, *N. kentensis*, *Phillipsia longispina*, and *Cladodus irregularis*<sup>1</sup> and noted the occurrence of several fossils previously recorded from strata of other areas. Unfortunately Professor Strong did not describe his new species in sufficient detail for their certain recognition. His failure to illustrate types makes the identification of most of the species almost impossible.

Shortly after the death of Professor Strong in 1920 the senior author secured from his daughter a collection of fossils containing most of the specimens that served as the basis for his descriptions. The collection includes several Point au Gres limestone fossils from Grand Rapids which Strong had sent to Professor Alexander Winchell at the University of Michigan for investigation. Draw-

<sup>1</sup> The writers have been unable to locate specimens of *Cladodus irregularis* in Professor Strong's collections. It is possible that specimens will be collected at Grand Rapids agreeing with his description.

ings of some of the latter were prepared by Winchell with a view to publication. These drawings and many more made by Winchell to illustrate his species from the Marshall group of Michigan and other strata of Devonian and Mississippian ages are now preserved in the library of the University of Michigan but have never appeared in published form.

In addition to the material mentioned above, the writers had available for study other collections from the Point au Gres limestone at Grand Rapids. Two of these, made by Professor Strong, were kindly loaned to the authors by Dr. Myron T. Sturgeon, of the Michigan State Teachers College, and by Dr. Paul L. Rice, of Alma College. Two others, assembled by Professor Winchell and Dr. Carl Rominger during the course of their work for the Michigan Geological Survey and now preserved in the Museum of Paleontology of the University of Michigan, aided considerably in revising the descriptions of Strong's species and in indicating the paleontological and stratigraphical relationships of the Point au Gres limestone fauna.

The authors were unable to examine a small part of Strong's collection given to the Kent Scientific Institute. It is now stored at the new Grand Rapids Public Museum, but has not been unpacked.

In the course of their study the writers received very helpful information on the cephalopods from Professor A. K. Miller, of the University of Iowa; on the productids from Dr. A. H. Sutton, of the University of Illinois; and on the trilobites from Dr. J. Marvin Weller of the Illinois State Geological Survey. They acknowledge with thanks the assistance kindly given by these paleontologists.

#### THE POINT AU GRES LIMESTONE AT GRAND RAPIDS

##### *Stratigraphic Nomenclature*

The presence of the strata at Grand Rapids which yielded fossils to Professor Strong was known to Dr. Douglass Houghton, the first state geologist of Michigan, as early as 1838. He (1838, p. 282) briefly noted the occurrence of limestone along the Grand River at Grand Rapids.

Two years later C. C. Douglass (1840a, pp. 252-253; 1840b, pp. 112-113), in the third annual report of Douglass Houghton, also mentioned the presence of the limestone in the rapids of the Grand River and correctly identified this rock with the limestone exposed at Bellevue in Eaton County. He (1840a, pp. 252-253; 1840b, pp. 112-113) referred the formation to the "upper lime rock" and considered it a part of the coal-bearing group of rocks.

The next year Bela Hubbard (1841, p. 561), in Douglass Houghton's fourth annual report, likewise noted the presence of the limestone at Grand Rapids, placing it at the base of the "Coal Measures."

In the same annual report Douglass (1841, pp. 545, 547) defined the Point au Gres limestone, which is typically exposed at Point au Gres on the western side of Saginaw Bay, Lake Huron, as follows:

This rock is, for the most part, of a light cream color, of a compact structure, and will afford a tolerable building material. It contains numerous fossils. From this point north, on the lake shore, to Sulphur island, rock was seen at intervals, forming the bed of the lake, which rock was referred to the sandstone formation. This space is undoubtedly occupied by sandstones and shales, the equivalent of those on the coast of Lake Huron from Point aux Barques south, to White Rock.

Limestone of a very siliceous character occurs on Charity and other islands of Saginaw bay, where it was seen in contact with, and overlying, the sandstone, and occupies the same superposition as the limestone at the rapids of Grand river.

The definition of the Point au Gres limestone is significant in that Douglass correctly correlated the limestone at Point au Gres, Charity Island, and other nearby islands with the limestone at the rapids of Grand River. It is also of interest to note that in his definition Douglass states that the Point au Gres limestone overlies the sandstones of the coast at Point aux Barques and vicinity now recognized as belonging to the Marshall group. Although strata of the Michigan formation are now known to occupy a position between the Point au Gres limestone and the Marshall group, Douglass' statement is, nevertheless, a correct deduction based on the evidence available to him.

The name "Point au Gres" for the limestone exposed at Point au Gres, Grand Rapids, Bellevue, and other places in the

Southern Peninsula of Michigan was not used by Professor Alexander Winchell and Dr. Carl Rominger in their studies of this formation. Winchell (1861, pp. 98-112) designated the formation the "Carboniferous limestone." Rominger (1876, pp. 102-121) included it and the underlying "Michigan Salt group" of Winchell, now known as the Michigan formation, in his "Carboniferous limestone."

In more recent years other names have been given to the Point au Gres limestone. It is necessary to discuss the use of these names, especially the most extensively applied name "Bayport," in order to determine the proper designation for the formation.

Dr. A. C. Lane, as reported by M. E. Wadsworth (1893, p. 66), used the term "Grand Rapids Group" for strata including the Point au Gres limestone and the Michigan formation. The "Grand Rapids Group" was placed in the "Sub-Carboniferous" and indicated as having a thickness of 300+ feet and as being underlain by the Marshall sandstone and overlain by the Parma sandstone. A formal definition and a detailed description of the lithology of the stratigraphic unit were not given.

In 1895 Lane (1895, pp. 16-17, pl. 73) discussed the Grand Rapids group in considerable detail. He noted the lithology of the strata, the presence of rocks of Winchell's "Michigan Salt group" in the lower part of the unit, and the position of the Grand Rapids group between the Marshall and Parma sandstones.

Four years later Lane (1899, p. 81) used the terms "Grand Rapids limestone" and "Bay Port limestone." He applied them in a casual manner, as is indicated by his statement that "the Bay Port limestone" has the strongest possible resemblance to the Grand Rapids limestone in character and in fossils, and both are intimately associated with, and underlain by, sandstones."

In 1900 Lane (1900, pp. 12-15) divided the Grand Rapids series of Huron County into two parts, "the upper being the limestone of Bayport, equivalent to the Maxville limestone of Ohio" and the lower being the Michigan series. In the geological column of Huron County he (1900, pl. 1) indicates the Grand Rapids as consisting of the "Michigan" and the "Maxville."

Nine years later, in discussing the geologic section of Michigan, Lane (1909, pp. 84-85 and fig. 5, p. 43) used both "Maxville" and "Bayport" for the limestone of the "Upper Grand Rapids" and correlated the formation with the Upper St. Louis limestone of the Mississippi Valley states.

Since the publication of Lane's paper in 1909 numerous geologists have applied the name "Bayport" to the limestone. They were impressed with the fact that the formation is especially well exhibited at Bayport in Huron County, but failed to recognize that Lane used the name only casually for this formation. They seem not to have noticed that Lane (1909, pp. 84-85) believed the formation to be the same as the Maxville limestone of southeastern Ohio and that his statement (1909, p. 85), "I do not know any good reason for not calling it Maxville," indicates that he favored the use of the Ohio name rather than Bayport.

From the preceding paragraphs it is evident that the name "Point au Gres" instead of "Grand Rapids" or "Bayport" should be used for the limestone. Such usage is based on the clear definition of the formation by C. C. Douglass in 1841. Continued reference to the limestone as "Bayport" would be unfortunate, especially since this name and also "Grand Rapids" were used only in a casual manner by A. C. Lane.

#### *Description of Exposures*

Several exposures of the Point au Gres limestone at Grand Rapids and vicinity were known to Dr. Strong; the Grand River at Leonard Street bridge, Scribner's, Taylor's and Wells' quarries, and the bed of Coldbrook are localities noted by him (1872, pp. 1-5) in recording the occurrences of various fossils.

So far as the writers have been able to determine, the outcrops observed by Dr. Strong are no longer accessible. Low dams placed across the Grand River have raised the water above beds of limestone once exposed along the river at the Leonard Street bridge. In the course of excavation of the river bottom at this bridge about ten years ago blocks of limestone containing a fairly large number of specimens of *Lithostrotion proliferum* Hall and a smaller number of molds of *Allorisma quadrata* Strong were

brought to the surface. Apparently Scribner's, Taylor's, and Wells' quarries have been covered by fillings of soil and by buildings. Efforts on the part of the writers to find the sites of these old quarries were unsuccessful. Scribner Avenue, just west of and parallel to the Grand River, and Taylor Avenue, also parallel to but east of the river, probably were named after the families that operated two of the quarries. Three city blocks west of Scribner Avenue is Quarry Avenue, which possibly suggests an area for one or more old excavations. The bed of Coldbrook, mentioned by Dr. Strong, very probably was in the vicinity of Coldbrook Street, which intersects Taylor Avenue at the northwest corner of Reservoir Park three blocks east and two blocks south of the Leonard Street bridge. Apparently the drainage of Coldbrook has been diverted and the bed of the stream filled with soil.

A description of the rocks formerly exposed in Taylor's quarry is given by Dr. A. C. Lane (1909, pp. 85-86) in his annual report to the Michigan Geological Survey for 1908; according to this investigator, it was prepared by E. A. Strong for Alexander Winchell. It is not so detailed as stratigraphers of the present day would desire, nor does it list the species of fossils occurring in the various beds. The description is reproduced and commented on below because it may be helpful to an understanding of the stratigraphy when it is compared with sections of the formation likely to be exposed in future years during the course of excavation for buildings or other municipal projects.

#### Stratification at Taylor's Quarry.

##### Subcarboniferous Limestone — Grand Rapids.

2°	Soil — reddish with boulders . . . . .	1
1°	Soil, with thin flakes of limestone . . . . .	2
	Found everywhere above the limestone.	
4'	Impure magnesian limestone, much fractured . . . . .	3
	A stratum very like Nos. 3 and 5 is found in the bed of the river below the D. & M. R. R. bridge.	
4'	Do massive, of conchoidal fracture . . . . .	4
7'	Like (3) . . . . .	5
2'	Shale, very soft . . . . .	6
6'	Like (4) . . . . .	7
2'	Shale . . . . .	8



1½°	Massive lime rock .....	9
2'	Shale .....	10
1½°	Limestone — impure — 'red band' .....	11
	Entirely local.	
3'	Shale .....	12
2°	Fractured limerock .....	13
2'	Shale .....	14
3½°	Massive limestone .....	15
5'	Shale, dark, with <i>Cyathophylli</i> , etc. ....	16
6'	Like (15) .....	17
2'	Like (16) .....	18
4½°	Massive lime rock irregularly banded with shale .....	19
	This stone is dark blue, blotched and veined with darker and has the appearance of the lower bed at Scribner's quarry.	

Notes

(3) and (5) are quite fossiliferous, abounding especially in *Allorisma*, etc. The upper surface of (4) is covered with a small conchifer. (7) is like (3) and (5) except in structure. In places it is so filled with lamellibranchs that I have designated it the *Allorisma* bed. (9), (15) and (19) yield a very good lime. This stratum, spoken of at length in my notes of last year, is not found useful as a building stone. Within the compass of 40 feet it changes to an ordinary limestone. (13) resembles (3) and (5) except that fossils are rare. It has the same smooth rectangular fracture and like them, though hard when fresh, crumbles quickly upon exposure.

The above section was taken early in August, since which the rock has been penetrated to a depth of about 25 feet in stone mainly like No. 19. I have exaggerated the color in my statement above (No. 19). The stone however in the upper part is much blotched.

The measurements were made at the northeast angle of the quarry. The strata vary much in thickness, especially the shale. On the south side a mass of sandstone containing carbonaceous particles is obtruded through Nos. (19), (18), (17), (16), and (15). It cleaves away from the limestone on either side, keeping its structure quite up to the limestone. Near by a bulging mass of indurated clay is thrust up from No. (18) nearly through No. (15). The former is irregular, and does not continue across the excavation, and is usually about 2 feet in thickness; the latter is a flattened hemisphere of about 2 feet radius. So far as obtained in the neighborhood Nos. (3), (4), (5), (7) and (16) are uniform and persistent.

Since the degree sign (°) and prime sign (') of the numbers in the left-hand column of the description represent respectively feet and inches, a thickness of 19 feet and 9 inches of strata is indicated. According to Strong's description, rock mainly like that of the lowest interval, Number 19, was penetrated to a depth of 25 feet. The occurrences of local masses of sandstone and

shale in the section as noted by Strong indicate that clastic material was swept into the shallow limestone-depositing sea of Point au Gres time. It is of interest to note that *Allorisma* is very abundant in Interval 7; the primary types of *A. strongi*, nom. nov., and *A. quadrata* Strong, described in detail in subsequent pages of the present paper, probably were collected from the limestone of Interval 7 or higher strata.

#### Thickness

The total thickness of the Point au Gres limestone in the Grand Rapids area probably is 50 to 70 feet. Alexander Winchell (1861, p. 102) stated that the Carboniferous limestone (= Point au Gres limestone) "is 51 feet thick at Scribner's well at Grand Rapids, and the whole thickness in this vicinity is probably not less than 70 feet." According to Carl Rominger (1876, p. 111), "the approximate thickness of the limestones [= Point au Gres limestone] at Grand Rapids is 50 or 60 feet."

#### Correlation

Most of the Point au Gres limestone of the Grand Rapids region has a fauna distinctly related to that of the St. Louis limestone, a Mississippian formation underlying large areas in Indiana, Illinois, Iowa, Missouri, and Kentucky. *Lithostrotion proliferum* Hall and *Linoproductus tenuicostus* (Hall), present in abundance in both the Point au Gres and the St. Louis limestones, are two species that definitely indicate a correlation of these formations.

Some of the strata at Grand Rapids, now included in the Point au Gres limestone, supplied E. A. Strong with a few fossils that suggest the presence of a fauna younger than that of the St. Louis. One of these fossils, which the senior author of the present paper cannot distinguish from *Girtyella brevilobata* (Swallow), is very indicative of the Chester group in the upper part of the Mississippian.

It is possible that the few fossils suggesting a post-St. Louis age for some of the Point au Gres strata may prove to have a

greater stratigraphic range than is now recognized or to be strikingly similar precursors of later Mississippian species. Until the exact positions of these few fossils in the Point au Gres limestone are known and the entire fauna of the formation is studied, it is best to regard all the Point au Gres strata as belonging to a single unit.

## DESCRIPTION OF SPECIES

*Allorisma strongi*, nom. nov.

(Pl. I, Figs. 1-7)

1872. *Allorisma elongata* Strong, Kent Sci. Inst., Misc. Papers, No. 3, p. 5. [(Not *Pholadomya elongata* Morton, Am. Journ. Sci., Ser. 1, Vol. 29, p. 153, pl. 26, fig. 37, 1836 = *Allorisma elongatum* (Morton); not *Allorisma elongata* Worthen, Bull. Illinois State Mus. Nat. Hist., No. 2, p. 12, 1884 = *A. worthenanum* Miller)]
1900. *Allorisma elongata* Lane, Geol. Rep. on Huron County, Michigan. Geol. Surv. Mich., Vol. 7, pt. 2, pp. 300 (Table VI), 302.

*Original description.* — "Like the above [*Allorisma sinuata* McChesney], except more elongated posteriorly, wholly without sinus upon the ventral margin or depression upon the valves, and beaks nearer the anterior end. An undistorted specimen of medium size gives the following measurements: Length, 64; height to hinge line, 23.5; height to summit of beaks, 25.4; greatest thickness, 20. Beaks one-ninth the length of the shell from the anterior end (varying in different specimens from one-seventh to one-tenth); twenty-eight concentric ridges — which, in this case, are pretty persistent — can be counted upon each valve. A specimen one and one-half inches long gave analogous results."

*Revised description.* — The following description is based on the examination of molds, no specimens with replaced shells being known to the writers.

Shell of medium size, elongate-subquadrate, slightly gaping posteriorly, equivalve, and very inequilateral; anterior end short and gibbous, projecting a relatively short distance in front of beaks; anterior margin almost continuous with anterior edge of umbones, slightly compressed and bluntly rounded; ventral mar-

gin gently convex, increasingly so posteriorly; posterior margin bluntly curved, meeting the hinge line at an obtuse angle; dorsal margin straight, raised above lateral slopes in a well-defined ridge posterior to escutcheon; beaks prosogyrate; umbones small and tumid; lunule shallow, depressed, not separated from umbonal slopes by well-defined ridge; escutcheon shallow, narrow, extending posteriorly from beaks about one third distance to posterior extremity of shell and not separated from the dorsal and lateral slopes by a well-defined ridge.

Valves convex and gibbous in the umbonal region, becoming less convex toward the ventral margin; markedly flattened between a poorly defined rounded ridge extending from umbone to posteroventral angle and low ridge adjacent to dorsal margin; ventral edge of valves of some shells with a slight sinuosity produced by a very wide, shallow depression trending posteroventrally from the umbone to the ventral margin.

Hinge characters and interior of shell unknown.

Surface marked by strong grooves and ridges of equal width, paralleling the contour of the valve and becoming finer and crowded toward the margins; grooves and ridges less prominent on posterodorsal area of shell; above poorly defined rounded ridge extending from umbone to posteroventral angle they curve abruptly forward, meeting the hinge line at an obtuse angle.

Dimensions in millimeters of syntypes and hypotypes:

	<i>Length</i>	<i>Height</i>	<i>Width</i>
Syntype (No. 22272) . . . . .	42	19	13.5
Syntype (No. 21415) . . . . .	57	22	20
Syntype (No. 21416) . . . . .	64	24	20
Hypotype (No. 21418) . . . . .	67	27	22.5
Syntype (No. 21417) . . . . .	72	27	24
Hypotype (No. 21419) . . . . .	85	28.5	23

(Some of the measurements, particularly those for length, are approximations, being based on reconstructions of broken parts of specimens.)

*Remarks.* — As indicated by the dimensions and illustrations of the types, the shells of this species increase in size chiefly in a direction parallel to their length. Most of this increase is at the posterior edge, relatively little taking place at the anterior mar-

gin; the growth in height and width is much less than that along the length.

The species is exceedingly abundant, being found in most exposures; it is an excellent index fossil for the formation.

*Syntypes*. — Nos. 21415, 21416, 21417, and 22272; hypotypes Nos. 21418 and 21419.

*Occurrence*. — Point au Gres limestone at Grand Rapids, Bellevue, Eaton County, Point au Gres, and several other localities in Arenac County, along Johnstone Creek in southwestern Iosco County and at Bayport, Huron County, Michigan.

*Allorisma quadrata* Strong

(Pl. II, Figs. 1-2)

1872. *Allorisma quadrata* Strong, Kent Sci. Inst., Misc. Papers, No. 3, p. 5.

1900. *Allorisma quadrata* Lane, Geol. Rep. on Huron County, Michigan. Geol. Surv. Mich., Vol. 7, pt. 2, pp. 300 (Table VI), 302.

*Original description*. — "Like the above [*Allorisma elongata* Strong = *A. strongi*], except smaller, relatively broader, with posterior end more quadrate. A specimen of full size, and *undistorted*, gives the following admeasurements: Length, 31; height, 15.8; of beaks, 16.3; height at 5 mm. from posterior end, 15; thirty-nine concentric ridges in fasciculi of two, three, or four, which often unite upon the posterior end."

*Revised description*. — The following description is based on the examination of molds, no specimens with replaced shells being known to the writers.

Shell of small size, subquadrate, equivalve, very inequilateral, anterior end flattened in front of beaks, more convex at anteroventral margin, projecting in front of beaks about one fifth total length of shell; anterior margin broadly rounded to subquadrate; dorsal and ventral margins subparallel posterior to beaks; posterior margin bluntly rounded, more quadrate than anterior edge, curving forward dorsally, meeting the hinge line at an obtuse angle; beaks prosogyrate; umbones small and flattened; lunule shallow, separated from umbonal slopes in some specimens by a well-defined preumbonal ridge; escutcheon shallow, narrow, not separated from dorsal and lateral slopes by a well-defined ridge.

Valves convex, greatest gibbosity in the umbonal areas delineated by pre- and post-umbonal ridges extending from the beak to the anteroventral and posteroventral angles respectively.

Hinge characters and interior of shell unknown.

Surface marked by groups of three to five striae alternating with relatively thicker ridges, paralleling the contour of the shell; surface markings curve abruptly toward the dorsal margin at the postumbonal ridge, accentuating the quadrate appearance of the shell.

Dimensions in millimeters of syntypes:

	<i>Length</i>	<i>Height</i>	<i>Width</i>
Syntype (No. 21421) .....	28.4	14.2	7.4
Syntype (No. 21422) .....	29	13	7.2
Syntype (No. 21423) .....	30.5	14.9	8
Syntype (No. 21424) .....	31.8	17	9

(Some of the measurements, particularly those for width, are approximate, being based on distorted specimens.)

*Remarks.* — The species differs from *Allorisma strongi* in having a considerably smaller shell, much finer surface markings, and a relatively greater prolongation of the shell in front of the beaks.

Strong, in a paragraph following his description of the species, stated that almost every degree of variation existed between *Allorisma quadrata* and *A. elongata* (= *A. strongi*) and specimens from the old quarries at Grand Rapids which he thought resembled *A. clavatum* McChesney, *A. sinuatum* McChesney, and *A. regularis* Owen (= *A. subcuneatum* Meek and Hayden). At the end of the same paragraph he said that "it is questionable whether we have more than one species of this genus."

The present writers have compared *Allorisma quadrata* and *A. strongi* with the three species mentioned above and are convinced that the former are different from the latter and that *A. quadrata* and *A. strongi* are distinct species. Although there is considerable variation in the shells of *Allorisma* found in the Point au Gres limestone of Grand Rapids, this variation is not of such character as to show that only one species is present, as is indicated by Strong.

*Allorisma quadrata* is very abundant in the Point au Gres

limestone and, like *A. strongi*, is an excellent index fossil for the formation.

*Syntypes*. — Nos. 21421–21424.

*Occurrence*. — Point au Gres limestone at Grand Rapids (Taylor's quarry and probably others noted by Strong), Bellevue, Eaton County, Point au Gres, Arenac County, and along Johnstone Creek in southwestern Iosco County. It will probably be found at many other exposures of the Point au Gres limestone.

*Endolobus? kentensis* (Strong)

(Pl. II, Figs. 3–4)

1872. *Nautilus Kentensis* Strong, Kent Sci. Inst., Misc. Papers, No. 3, p. 4.

1900. *Nautilus kentensis* Lane, Geol. Rep. on Huron County, Michigan. Geol. Surv. Mich., Vol. 7, pt. 2, p. 300 (Table VI).

*Original description*. — “The form locally known by this name cannot be referred to any species known to me. The last whorl is much like *N. Niotensis*, M. and W., but as the shell expands the dorsal region becomes more prominent and sharply curved, which with the flattened ventral side gives a triangular appearance to the section; transverse and dorso-ventral diameters subequal; breadth of chambers, one-fourth to one-fifth the diameter. Same locality as above [*Nautilus ellipticus* Strong = *Vestinautilus? ellipticus* (Strong)], and possibly a distorted form of the preceding.”

*Revised description*. — Shell tarphyceraconic, rapidly expanding, mature whorls subtrigonal in cross section, narrowly rounded ventrally and laterally, flattened and somewhat impressed dorsally; living chamber unknown; phragmocone consisting of about one and one-third whorls; umbilicus apparently perforate.

Sutures straight; siphuncle relatively large, subcentral in position, nearer the venter, structure unknown; ornamentation consisting of a single row of obscure low, lateral nodes.

Maximum diameter of imperfect holotype, measured from adoral end of phragmocone across umbilicus, 54.3 mm.; diameter at right angles to maximum diameter, 41.7; maximum width of outer whorl, 27.8 mm., maximum height, 26.8 mm.; maximum

width of umbilicus, 17.7 mm., about one third maximum diameter of conch.

*Remarks.* — This species is based on one specimen, a phragmocone with camerae filled with limestone. Neither the living chamber nor the wall of the phragmocone is preserved.

The species is referred to *Endolobus* with question because of its imperfect condition. The writers, on the advice of Dr. A. K. Miller, are redescribing and illustrating this form because of the paucity of information regarding Mississippian nautiloids in this country.

*Holotype.* — No. 21327.

*Occurrence.* — Point au Gres limestone of abandoned Taylor's quarry at Grand Rapids.

*Vestinautilus? ellipticus* (Strong)

(Pl. II, Figs. 5-6)

1872. *Nautilus ellipticus* Strong, Kent Sci. Inst., Misc. Papers, No. 3, p. 4.

*Original description.* — "Much resembling *N. Forbesianus*, McChesney, and *N. Spectabilis* M. & W., but having an aperture almost truly elliptical, one and a half times as high as wide, the section becoming more circular as the diameter decreases and expanding very rapidly as it passes from the septate to the non-septate portion, which latter is not nodose. This species is not rare at Taylor's quarry; is associated with *Zaphrentis spinulifera*."

*Revised description.* — Conch tarphyceraconic although evolute adorally, expanding rapidly, consisting of nearly two volutions; mature whorls depressed, elliptical in cross section, broadly rounded ventrally, narrowly rounded laterally, flattened dorsally; younger whorls subcircular in cross section; living chamber incomplete, comprising one quarter of a volution, about one half again as wide as high; phragmocone consisting of about one and one-half whorls; umbilicus perforate and relatively wide.

Sutures with broadly rounded ventral lobes; siphuncle small, subcentral in position, structure unknown; ornamentation consisting of a single row of low lateral nodes connected by an indistinct rounded ridge; nodes and connecting ridge become obscure adorally, surface of living chamber apparently being smooth.



Maximum diameter of imperfect holotype, measured from adoral end of conch across umbilicus, 67 mm.; diameter measured at right angles to maximum diameter, 51 mm.; maximum width of outer whorl, 42 mm., maximum height, 29 mm.; maximum width of umbilicus 22 mm., approximately one third greatest diameter of shell.

*Remarks.* — The holotype, the only specimen known to the writers, consists of a limestone mold of the living chamber and a cast of the outer surface of the phragmocone impressed on coarsely crystalline calcite. The preservation of the type is such that the siphuncle and septa behind the living chamber are missing, only the trace of the suture of the septum at the rear of the living chamber being recognizable.

The species is referred to *Vestinautilus* with question; it possibly belongs to a new genus. In making the generic assignment the writers are following the advice of Dr. A. K. Miller, who has informed them of the lack of a thorough knowledge of Mississippian and related European Carboniferous genera of cephalopods. Until a critical study of these genera is made it would be unwise to place the species, represented by a single imperfect individual, in a new genus.

*Holotype.* — No. 21328.

*Occurrence.* — Point au Gres limestone of abandoned Taylor's quarry at Grand Rapids.

*Kaskia longispina* (Strong)

(Pl. III, Figs. 1-3)

1872. *Phillipsia longispina* Strong, Kent Sci. Inst., Misc. Papers, No. 3, p. 3.

1900. *Phillipsia* sp. *longispina* Lane, Geol. Rep. on Huron County, Michigan. Geol. Surv. Mich., Vol. 7, pt. 2, pp. 300 (Table VI), 302-303.

*Original description.* — "Outline elongated elliptical, sides nearly straight, ends evenly rounded; head, thorax and pygidium nearly equal in breadth.

"Glabella with posterior lobes small, anterior moderately large, evenly convex, without margin; facial suture nearly as in *P. Portlockii*; neck segment about as wide as the thoracic, and

continued backward in a narrow spine which extends beyond the thorax and is applied so closely to it as not to interfere with the elliptical outline; neck furrow shallow, curving backward strongly and terminating at the lateral furrows of the cheeks. Thorax and pygidium much as in *P. Portlockii* except that the border of the latter is very broad, equaling in breadth the lateral lobes. One specimen from Scribner's quarry yields the following measurements: Length, 44.4; of head, 15.3; of thorax, 12.1; breadth of head, 21.2; of thorax, 21.9; of pygidium, 26.4."

*Revised description.*—Species based on one specimen, the holotype.

Cephalon broadly rounded in front, without margin anterior to glabella; length, 14.7 mm., width, 21.3 mm.; genal spines long, acute, extending to second pleural segment of pygidium; glabella moderately inflated, expanded in front, with a slight constriction midway between eye and anterior margin; greatest width, 10.9 mm.; occipital ring wide; occipital furrow shallow adjacent to axial furrow, angular and impressed behind basal lobe and curved forward in the medial part of the glabella; basal lobes large, unelevated; basal furrows broad and shallow laterally, well impressed toward the middle, originating at point opposite center of eye and curving posteriorly; two, possibly three, short indistinct anterior furrows; fixed cheeks widen anteriorly from second anterior furrow with a faint preglabellar furrow; small pit on fixed cheek approximately midway between eye and anterior margin, and close to slight constriction in glabella; eyes twice as long as wide and nearly one third as long as glabella; cornea and palpebral lobes not shown; a broad shallow furrow, bounded below by a moderately sharp ridge, parallels base of eye; lateral slope of cheek steep below suborbital ridge, separated from gentle slope of lateral border or cephalic flange by broad moderately impressed lateral marginal furrow; posterior cheek slope gentle, separated from lateral cheek slope by a broad rounded ridge; posterior marginal furrow angular, moderately impressed; part of glabella anterior to basal lobes and axially adjacent to anterior furrows, coarsely granulose; glabella finely granulose to smooth toward front, becoming punctate on anterior border; basal lobes smooth

but minutely punctate; sides and possibly missing medial part of occipital ring granulose; triangular area enclosed by suborbital ridge, lateral and posterior marginal furrows coarsely pitted; posterior and lateral borders and suborbital furrow smooth but punctate.

Thorax of 9 segments; length, 12.3 mm., width, 19.2 mm.; axial lobe little more than one third width of thorax, narrowing slightly posteriorly; four anterior axial segments granulose; fifth and sixth, and possibly the remaining imperfectly preserved segments, ornamented with a single row of coarse granules on posterior edges; pleural lobes flattened on median half, depressed sharply on outer or lateral half; articulating furrows of pleural segments horizontal near axial lobe, bent forward at midwidth and directed backward laterally; pleural furrows approximately horizontal, shallowing and disappearing before intersecting axial lobe and lateral margin of thorax; posterior margin of sharply depressed lateral part of each unworn pleural segment marked by a single row of minute granules.

Pygidium incomplete, broadly rounded behind; length, about 16 mm., width at first pygidial segment, 19.2 mm.; axial lobe composed of 15 to 17 (?) segments, about one third width of pygidium; segments moderately elevated, crests in unworn condition probably ornamented with low granules; pleural lobes composed of 12 (?) segments, marked by a row of granules on posterior edge of posterior pleural band; rib furrows narrow, those of two anterior pleurae extending across wide slightly convex marginal flange of pygidium; pleural furrows broadly angular, shallowing and disappearing posteriorly; marginal flange smooth, punctate, marked by lirae.

*Remarks.* — An enrolled specimen in the Strong collection, illustrated by Figures 4-7 in Plate III and bearing the number 21222, is very similar to *Kaskia longispina*; it differs chiefly in the possession of a margin anterior to the glabella. It is tentatively referred to *K. longispina*.

*Holotype.* — No. 21223. Illustrated specimen, No. 21222.

*Occurrence.* — Point au Gres limestone of abandoned Scribner's quarry at Grand Rapids.

## LITERATURE CITED

- DOUGLASS, C. C. 1840a and b. Report to Douglass Houghton, included in the [Third] Annual Report of the State Geologist. a, Documents Accompanying the Journal of the House of Representatives, State of Michigan, Vol. 2, pp. 252-253, and b, Documents Accompanying Journal of the Senate, State of Michigan, Vol. 2, pp. 112-113.
- 1841. Report to Douglass Houghton, included in the [Fourth] Annual Report of the State Geologist. Documents Accompanying the Journal of the Senate, State of Michigan, Vol. 1, Senate and House Doc. No. 11, pp. 545 and 547.
- HOUGHTON, DOUGLASS. 1838. [First] Report of the State Geologist. Documents Accompanying the Journal of the House of Representatives, State of Michigan, No. 24, p. 282.
- HUBBARD, BELA. 1841. Report to Douglass Houghton, included in the Fourth Annual Report of the State Geologist. Documents Accompanying the Journal of the Senate, State of Michigan, Vol. 1, Senate and House Doc. No. 11, p. 561.
- LANE, A. C. 1895. The Geology of Lower Michigan with Reference to Deep Borings. Geol. Surv. Mich., Vol. 5, pt. 2, pp. 16-17, pl. 73.
- 1899. Water Resources of the Lower Peninsula of Michigan. U. S. Geol. Surv., Water-Supply Paper 30, p. 81.
- 1900. Geological Report on Huron County, Michigan. Geol. Surv. Mich., Vol. 7, pt. 2, pp. 12-15, 300 (Table VI), and 302-303.
- 1909. Notes on the Geological Section of Michigan. Part II. From the St. Peters Up. Geol. Surv. Mich., [Tenth] Annual Report of the State Geologist to the Board of the Geological Survey for the Year 1908, pp. 84-86 and fig. 5, p. 43.
- ROMINGER, CARL. 1876. Geology of the Lower Peninsula. Geol. Surv. Mich., Vol. 3, pt. 1, pp. 102-121.
- STRONG, E. A. 1872. Notes upon the Fossil Remains of the Lower Carboniferous Limestone Exposed at Grand Rapids, Michigan, Kent Sci. Inst., Misc. Papers, No. 3, 6 pp.
- WADSWORTH, M. E. 1893. Report of the State Geologist for 1891-1893. Robert Smith & Co., State Printers and Binders, Lansing, p. 66.
- WINCHELL, ALEXANDER. 1861. First Biennial Report of the Progress of the Geological Survey of Michigan, Embracing Observations on the Geology, Zoölogy and Botany of the Lower Peninsula. Hosmer & Kerr, Printers to the State, Lansing, 339 pp.

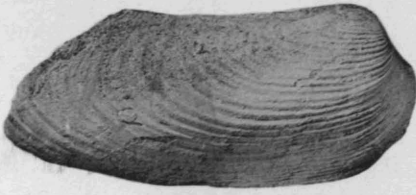
**PLATES I-III**

## EXPLANATION OF PLATE I

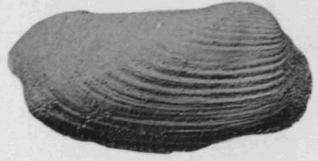
*Allorisma strongi*, nom. nov.

1. View of right side of a relatively small specimen. Syntype (No. 22272). × 1. Grand Rapids
2. View of right side of a medium-sized individual. Syntype (No. 21415). × 1. Taylor's quarry, Grand Rapids
- 3-4. Views of right and left sides of a fairly large specimen, exhibiting shallow depression trending posteroventrally from umbone to the ventral margin and the character of surface grooves and ridges. Hypotype (No. 21418). × 1. Headwaters of Au Gres River, Iosco County. Collector Dr. Carl Rominger
- 5-6. Anterior and dorsal views of the same specimen, showing thickness of shell, convexity of valves, and poorly defined lunule and escutcheon
7. View of left side of a large, nearly complete individual, showing curvature of the surface grooves and ridges and their prominent character except in the posterodorsal area. Hypotype (No. 21419). × 1. Quarry of Wallace Stone Company in Section 5, T. 16 N., R. 10 E., about three miles southeast of Bayport, Huron County. Collector G. M. Ehlers

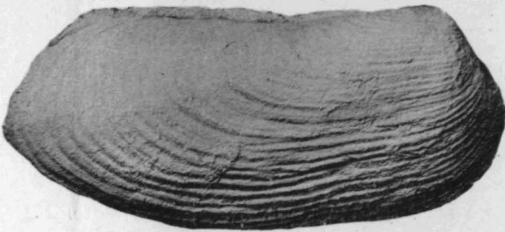
PLATE I



2



1



3



5



4



6



7

## EXPLANATION OF PLATE II

### *Allorisma quadrata* Strong

1. View of right valve and dorsal part of left valve of an individual showing subquadrate outline of shell and position of beaks with reference to anterior and posterior extremities. Syntype (No. 21422). × 1. Grand Rapids
2. View of left valve of a specimen showing character of surface ridges and intervening striae. Syntype (No. 21421). × 1. Grand Rapids

### *Endolobus? kentensis* (Strong)

3. Lateral view of holotype, showing spacing of septa and low lateral nodes. Holotype (No. 21327). × 1. Taylor's quarry, Grand Rapids
4. Ventral view of holotype, showing subtrigonal cross section of whorl. Dark irregularly shaped circular area in matrix of camera marks position of siphuncle. Smooth area on the left side of the specimen is an external mold of a part of the shell, a small fragment of which is available but too poorly preserved for illustration

### *Vestinautilus? ellipticus* (Strong)

5. Lateral view of holotype, showing extent of living chamber and low lateral nodes connected by an indistinct rounded ridge. Holotype (No. 21328). × 1. Taylor's quarry, Grand Rapids
6. Ventral view of holotype, showing elliptical cross section of living chamber and rapid increase in size of conch



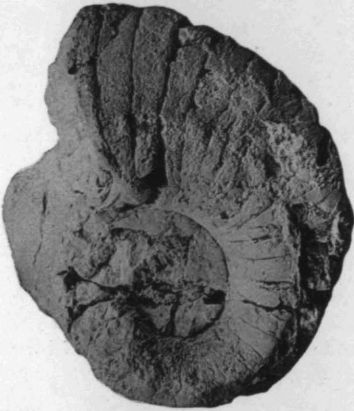
PLATE II



1



2



3



4



5



6

### EXPLANATION OF PLATE III

*Kaskia longispina* (Strong)

1. Dorsal view of holotype, showing lack of margin anterior to glabella, long genal spine, lobes, furrows and position of eyes of cephalon, segmentation of thorax and pygidium, and ornamentation. Holotype (No. 21223). × 2. Scribner's quarry, Grand Rapids
2. Anterior view of same specimen, showing convexity of cephalon. × 2
3. Side view of holotype, showing profile of carapace, position of base of eyes and lack of margin in front of glabella. × 2

Cf. *Kaskia longispina* (Strong)

- 4-7. Anterior, lateral, dorsal, and posterior views of an enrolled specimen, similar to *Kaskia longispina* except in the possession of a margin anterior to the glabella. Figured specimen (No. 21222). × 2. Scribner's quarry, Grand Rapids

PLATE III



1



2



4



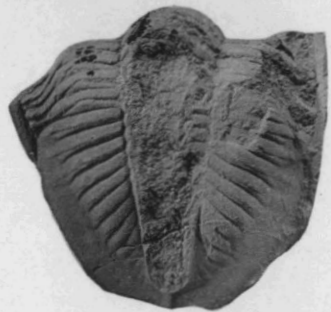
5



3



6



7



(Continued from inside of front cover)

6. Revision of E. A. Strong's Species from the Mississippian Point Au Gres Limestone of Grand Rapids, Michigan, by G. M. Ehlers and W. E. Humphrey. Pages 113-130, with 3 plates. Price \$.30.
7. The Anatomy and Affinities of *Medullosa Noei* Steidtmann, and Associated Foliage, Roots, and Seeds, by Waldo E. Steidtmann. Pages 131-166, with 10 plates and 7 text figures. Price \$.60.

