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NEW BRACHIOPODS FROM THE WARSAW  
FORMATION OF WAYNE COUNTY,  
KENTUCKY

BY

G. M. EHLERS AND M. S. CHANG



UNIVERSITY OF MICHIGAN  
ANN ARBOR

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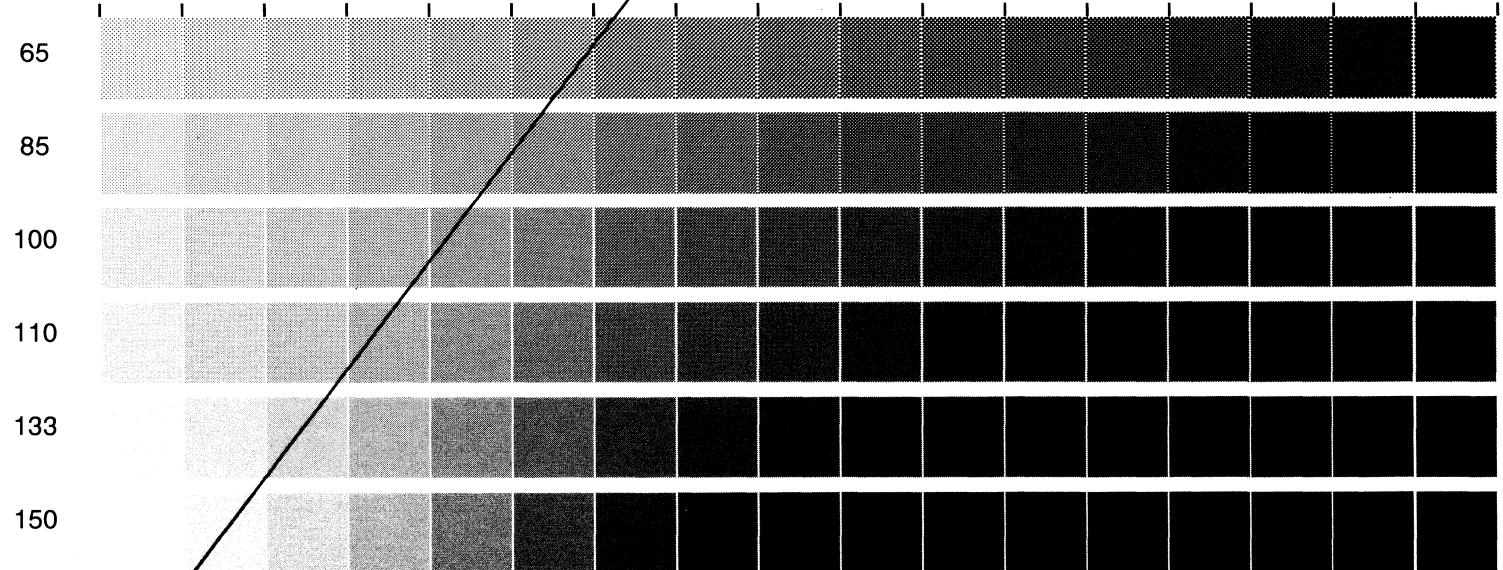
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CONTRIBUTIONS FROM THE MUSEUM OF GEOLOGY

UNIVERSITY OF MICHIGAN

*Editor:* EUGENE S. McCARTNEY

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NEW BRACHIOPODS FROM THE WARSAW  
FORMATION OF  
WAYNE COUNTY, KENTUCKY

G. M. EHLERS AND M. S. CHANG

INTRODUCTION

THE new brachiopods described in this paper are a part of a large collection of fossils obtained from the Mississippian strata of the region about Mill Springs, Wayne County, Kentucky. This collection was made by the instructors and students attending the summer camp maintained at Mill Springs by the University of Michigan for instruction in field geology and geography and subsequently deposited in the Museum of Geology of this institution.

The brachiopods described below and certain others of the collection were recently sent to Professor Stuart Weller of the University of Chicago, who kindly gave the writers very helpful information regarding their specific relationship. For this information the writers acknowledge their indebtedness.

DESCRIPTION AND OCCURRENCE OF BRACHIOPODS

*Spiriferina praetransversa*, n. sp.

(Plate I, Figs. 1-3)

*Description.* — Shell broadly subtriangular in outline, slightly more than twice as wide as long and the thickness about one half the length. Cardinal extremities slightly rounded to almost acute. The dimensions of the holotype which is a specimen of average size are: length of pedicle valve, 11.5 mm.; length of brachial valve, 9.75 mm.; width along hinge-line, 24 mm.; thickness, 6 mm.; height of cardinal area, 2.5 mm.; and width of mesial sinus in front, 3.25 mm.

Pedicle valve slightly convex, most pronounced in the umbonal region, the surface sloping from the umbo to the cardinal extremities in a slightly concave line and curving gently to the anterior margin; mesial sinus shallow at the beak, becoming deeper, wider and more distinct toward the front; bottom of mesial sinus is somewhat flattened anteriorly and bears an extremely low, ill-defined median plication, which is indicated chiefly by the backward and upward curvature of the lamellose growth-lines; beak small, pointed and moderately incurved; cardinal area large, marked with horizontal growth-lines, slightly concave with the curvature increasing toward the beak, its lateral margins sharply defined, its lower flatter portion standing at an angle of about 150 degrees to the plane of the valve; delthyrium large, the width and height being nearly equal; each lateral slope marked by twelve simple, rounded plications, which originate along the cardinal margin and decrease in size and distinctness as traced from the sinus to the cardinal extremities.

Brachial valve less convex than the pedicle, greatest convexity posterior to the middle, the surface curving gently from the point of greatest convexity to the anterior margin and a little more abruptly to the cardinal margin; mesial fold well-defined and marked by a faint median furrow, which originates about one fourth the distance from the beak; beak small and incurved; cardinal area very narrow, practically parallel with the plane of the valve; each lateral slope marked by plications similar to those of the pedicle valve and alternating with them.

The surface of each valve is marked by fine, regular, imbricating sublamellose lines of growth, about four of which occupy the space of one millimeter near the front of the shell. The shell substance is finely punctate; the punctations like those of *Spiriferina transversa* (McChesney) tend to be arranged in concentric lines in an imperfect manner.

*Occurrence.* — The holotype was collected by the senior author from weathered argillaceous limestones of the upper part of the Warsaw formation exposed at the top of a ravine on the western side of Shinbone Cliff, which rises from bank of the Cumberland River about 5 miles west and 2 miles north of Mill Springs, Ken-

tucky. The topographic map of the Monticello Quadrangle, Kentucky, published by the United States Geological Survey, shows the position of a bench mark (elevation, 988 feet) about one eighth mile west of the top of Shinbone Cliff. About one hundred yards to the east of this bench mark and at an elevation of about 970 feet is the ledge from which the type was obtained.

*Type.* — The holotype of this species is preserved in the Museum of Geology of the University of Michigan, where it bears the number 9583.

*Remarks.* — In general structure this species is closely related to *Spiriferina transversa* (McChesney), which occurs in the higher strata of the Chester group. It is so closely related to *Spiriferina transversa* that it may very likely have been the forerunner of the latter species. The trivial name *praetransversa* is chosen for this species in order to indicate the close specific relationship and the fact that this species antedated *Spiriferina transversa*.

*Spiriferina praetransversa* may be distinguished from *Spiriferina transversa* by its more elevated cardinal area, in being less thick and in having a much less prominent medial plication in the mesial sinus and a median groove in the mesial fold.

***Spirifer casei*, n. sp.**

(Plate I, Figs. 4-12)

*Description.* — The shell selected as the holotype of this species is imperfectly preserved, due chiefly to the fact that it has been crushed in a dorso-ventral direction; parts of the shell about its anterior margin and one of the cardinal extremities are missing.

Shell broadly subtriangular, the width more than twice the length, the greatest width along the hinge-line, the cardinal extremities acutely angular. The dimensions, which probably approach very closely the measurements of the holotype in the unbroken state are: length of pedicle valve, 24 mm.; length of brachial valve, 21 mm.; greatest width along the hinge-line, 62 mm.; thickness, 11 mm.; and height of cardinal area, 4.5 mm.

Pedicle valve when uninjured most convex posterior to the middle, the surface curving rather abruptly from the umbonal region to the cardinal margin on each side of the beak, the slope

to the cardinal extremities nearly straight or slightly concave and that to the anterior margin gently convex; toward the cardinal extremities the surface is compressed in a direction subparallel to the cardinal area. Beak small, pointed and moderately incurved. Cardinal area slightly arched, becoming more curved toward the beak, its lateral margins sharply defined and sloping gently from the beak to the cardinal extremities, its surface marked by vertical striae and horizontal lines of growth. Delthyrium large, nearly as high as wide. The better preserved lateral slope of the valve bears thirty-four narrow plications, a few of which originate by bifurcation on the posterior surface of the valve; plications rounded posteriorly and flattened anteriorly, where they bear very shallow median grooves, the depth of which is accentuated by weathering; toward the cardinal extremities and the posterior edge of the valve, the plications become smaller and merge into the more or less flattened surfaces of the valve. Mesial sinus rounded in the bottom, originating at the beak where it is sharply defined, becoming more or less ill-defined anteriorly; it is marked by ten or twelve plications at its anterior margin, the exact number being in doubt because of the crushed and broken condition of the anterior part of the valve. The points of origin of these plications, except for those of the two bounding ones which arise at the beak, can not be seen because the posterior half or more of the sinus is encrusted by a thin bryozoan, probably belonging to the genus *Stenopora*.

Brachial valve less convex than the pedicle; its greatest convexity when not crushed was probably near or slightly posterior to the middle. The slopes of the surface of the valve are similar to those of the pedicle valve. Beak small, pointed and moderately incurved. Cardinal area arched slightly more than that of the opposite valve, becoming more curved toward the beak; lateral margins of area sharply defined and sloping very gently from the beak to the cardinal extremities; surface of area marked by vertical striae and horizontal lines of growth. Plications of the lateral slopes similar in form and number to those of the pedicle valve. Mesial fold originating at the beak; it does not rise much above the general surface of the valve, owing to the fact that it has been flattened by the crushing of the entire shell. At a point



about one third the length of the valve posterior to its anterior margin, the fold exhibits eight plications, similar to those of the sinus and lateral slopes; two or three additional plications would with little doubt be seen at the anterior margin of the fold if the shell were uninjured. The plications of the fold originate from a single plication at the beak by bifurcation.

One specimen, selected as a paratype, shows the nature of the mesial sinus and fold considerably better than the holotype. The mesial sinus of the paratype, like that of the holotype, is sharply defined posteriorly and ill-defined anteriorly; it is quite evident that the mesial sinus, which is considerably crushed anteriorly, originally existed as a broad shallow groove near the anterior margin of the shell. At the front the sinus is marked by eleven plications; the median one originates near the beak and continues to the front as a simple rib, the lateral ones originate from the inner margins of the two bounding plications or through the bifurcation of plications so originating. The mesial fold originates at the beak where it is sharply defined by deeper furrows but scarcely elevated above the general surface of the valve; anteriorly, for about one half the length of the valve, it becomes rather prominently elevated; nearer the front, it was undoubtedly more broadly rounded and less elevated when not crushed. The fold at the front seems to have ten plications; eleven may be present, but this can not be determined on account of the crushed and broken condition of the anterior part of the fold. At the beak the fold is represented as a single plication, which divides into two plications at a very short distance from the beak and these in turn bifurcate. About one and one-half millimeters from the beak a plication arises on the outer slope of each of the first two plications. About three and one-half millimeters from the beak and on the outer slope of each of the second two plications originates another plication, which bifurcates toward the front.

The paratype is quite similar to the holotype in most respects; it differs from the latter in having about forty instead of thirty-four plications on each lateral slope of the brachial valve.

A few better preserved parts of the surfaces of the shells are marked by very fine, crowded, concentric, lamellose lines of growth;

a few, slightly more conspicuous lines of growth are present at distant intervals.

*Occurrence.* — The types were collected by Professor E. C. Case of the Department of Geology of the University of Michigan from the upper slopes of a ravine immediately south of the Cumberland School, about three and three-quarter miles west and one and one-eighth miles north of Mill Springs, Wayne County, Kentucky. These slopes are composed of weathered gray shale and thin beds of yellowish, argillaceous limestone bearing few specimens of *Spiriferina praetransversa* and specimens of several species diagnostic of the Warsaw formation.

*Types.* — The holotype and the paratype of this species, which is named after Professor E. C. Case, are preserved in the Museum of Geology of the University of Michigan, where they bear the numbers 9584 and 9585, respectively.

*Remarks.* — A variation from the typical form of *Spirifer casei* seems to be represented by the specimen, illustrated by figures 10–12 on Plate I and preserved in the Museum of Geology of the University of Michigan under the number 9586. This specimen, which was collected from the same locality and strata as were the types, differs from them in having less width, less acute cardinal extremities, twenty-eight instead of thirty-four or more plications on the lateral slopes of the valves, eight instead of ten to eleven plications in the mesial sinus and seven instead of eight to ten plications on the mesial fold.

*Spirifer casei* seems to be related to *Spirifer tenuicostatus* Hall and *Spirifer subaequalis* Hall. It differs from the former in having a greater width along the hinge-line, more acutely angular cardinal extremities, higher mesial fold and more rounded plications, and from the latter in having a somewhat greater extension along the hinge-line, more pronounced mesial fold, smaller umbones and less thickness. The mesial fold of *Spirifer casei* is higher than that of *Spirifer tenuicostatus*, but somewhat lower than that of *Spirifer lateralis* Hall, from which it is readily distinguished by its rounded instead of carinate nature.

PLATE I

PLATE I



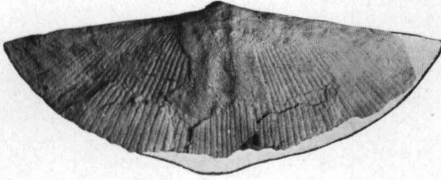
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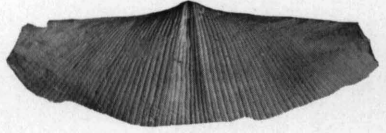
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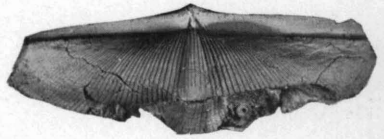
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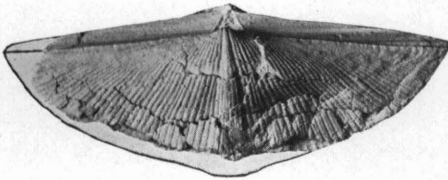
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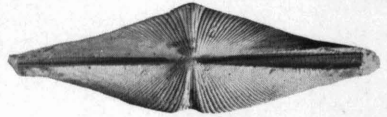
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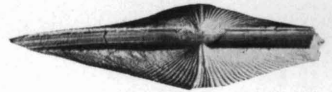
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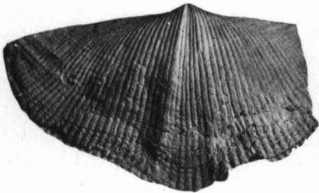
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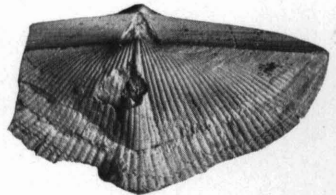
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## EXPLANATION OF PLATE I

(*Figures are of natural size*)

### *Spiriferina praetransversa*, n. sp.

1. View of pedicle valve of holotype, showing low median plication of sinus and fine, imbricating, sublamellose lines of growth. (No. 9583, Museum of Geology, University of Michigan)
2. View of brachial valve of holotype, showing very shallow median groove of mesial fold and decidedly elevated cardinal area.
3. Posterior view of same specimen.

### *Spirifer casei*, n. sp.

4. View of pedicle valve of holotype. The outline of the valve is indicated in part by the black line. (No. 9584, Museum of Geology, University of Michigan)
5. View of brachial valve of holotype, showing mesial fold and nature of plications of lateral slopes. High cardinal area and delthyrium of pedicle valve also well shown.
6. Posterior view of same specimen.
7. View of pedicle valve of paratype, showing nature of mesial sinus and points of origin of its included plications. (No. 9585, Museum of Geology, University of Michigan)
8. View of brachial valve of paratype, showing nature of mesial fold and points of origin of plications upon it.
9. Posterior view of same specimen, showing height of mesial fold and depth of mesial sinus. The thickness of the shell is accentuated as a result of crushing in an antero-posterior direction.
- 10-12. Posterior, pedicle and brachial views of a specimen, which varies from the typical form of the species in having less width, less acute cardinal extremities and a smaller number of plications in the mesial sinus, on the mesial fold and on the lateral slopes. (No. 9586, Museum of Geology, University of Michigan)





