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*GENNAEOCRINUS CHILMANAE*, A NEW CRINOID FROM  
THE MIDDLE DEVONIAN SILICA FORMATION IN  
SOUTHEASTERN MICHIGAN

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### VOLUME 22

1. New species of Porocrinidae and brief remarks upon these unusual crinoids, by Robert V. Kesling and Christopher R. C. Paul. Pages 1-32, with 8 plates and 14 text-figures.
2. Two unusually well-preserved Trilobites from the Middle Devonian of Michigan and Ohio, by Erwin C. Stumm. Pages 33-35, with 1 plate.
3. The corals of the Middle Devonian Tenmile Creek Dolomite of northwestern Ohio, by Erwin C. Stumm. Pages 37-44, with 3 plates.
4. Mouth frame of the ophiuroid *Onychaster*, by Philip R. Bjork, Paul S. Goldberg, and Robert V. Kesling. Pages 45-60, with 4 plates and 4 text-figures.
5. Rugose corals of the Silica Formation (Middle Devonian) of northwestern Ohio and southeastern Michigan, by Erwin C. Stumm. Pages 61-70, with 4 plates.
6. A redescription of the Middle Silurian compound rugose coral *Grabaephyllum johnstoni* Foerste, by Erwin C. Stumm. Pages 71-73, with 1 plate.
7. Systematics and faunal analysis of a Lower Pliocene vertebrate assemblage from Trego County, Kansas, by Richard L. Wilson. Pages 75-126, with 17 text-figures.

# GENNAEOCRINUS CHILMANAE, A NEW CRINOID FROM THE MIDDLE DEVONIAN SILICA FORMATION IN SOUTHEASTERN MICHIGAN

ROBERT V. KESLING

ABSTRACT—A new species of *Gennaeocrinus* from the Middle Devonian Silica Formation is characterized by subconical cup, strongly ornamented BB, RR, and X<sub>1</sub>, radial ridges on PBrBr, IBrBr<sub>1</sub>, IBrBr<sub>2</sub>, and XX<sub>2</sub>, sharp central nodes on higher IBrBr, and unornamented XX plates. The posterior interray is wide and especially prominent. No arms are preserved, but SB<sub>2</sub> is evidently a secundaxil, indicating at least 20 arms.

## INTRODUCTION

BECAUSE THE MARTIN-MARIETTA QUARRY was in operation for only a short time, fossils collected there are particularly important in establishing the fauna of the Middle Devonian Silica Formation in Michigan. This quarry is situated in Augusta Township, Washtenaw County, Michigan, about one mile east of U. S. Highway 23 on Arkona Road. In 1965 the Martin-Marietta Company stripped the thin glacial drift and the Silica Formation to expose the Dundee Limestone below. In 1966, drilling for a crusher pit tapped sulphide-charged water which gushed up and began a serious flooding of the operation. Attempts to bring the flow under control failed, and in 1967 the company abandoned the quarry project. It is now a large water-filled pit. Little opportunity was available to study the strata of the Silica Formation in place, and most of the fossils from the shale were found on dump piles.

Mrs. Ruth Berner Chilman, Research Associate at the Museum of Paleontology, found the specimen which is named for her. Professors C. A. Arnold and E. C. Stumm critically read the manuscript. Mr. Karoly Kutasi did the photography and Mrs. Gladys Newton the typing. To all who assisted, my generous thanks.

## SYSTEMATIC DESCRIPTION

### Class CRINOIDEA

Subclass CAMERATA Wachsmuth & Springer  
Order MONOBATHRIDA Moore & Laudon  
Family PERIECHOCRINITIDAE Austin & Austin

By its three equal BB, complete cirlet of RR + X<sub>1</sub>, three XX<sub>2</sub>, hexagonal PBrBr<sub>1</sub>, and unflattened base of cup, the new crinoid without question belongs in this family. Its generic placement, however, is not as clearly indicated.

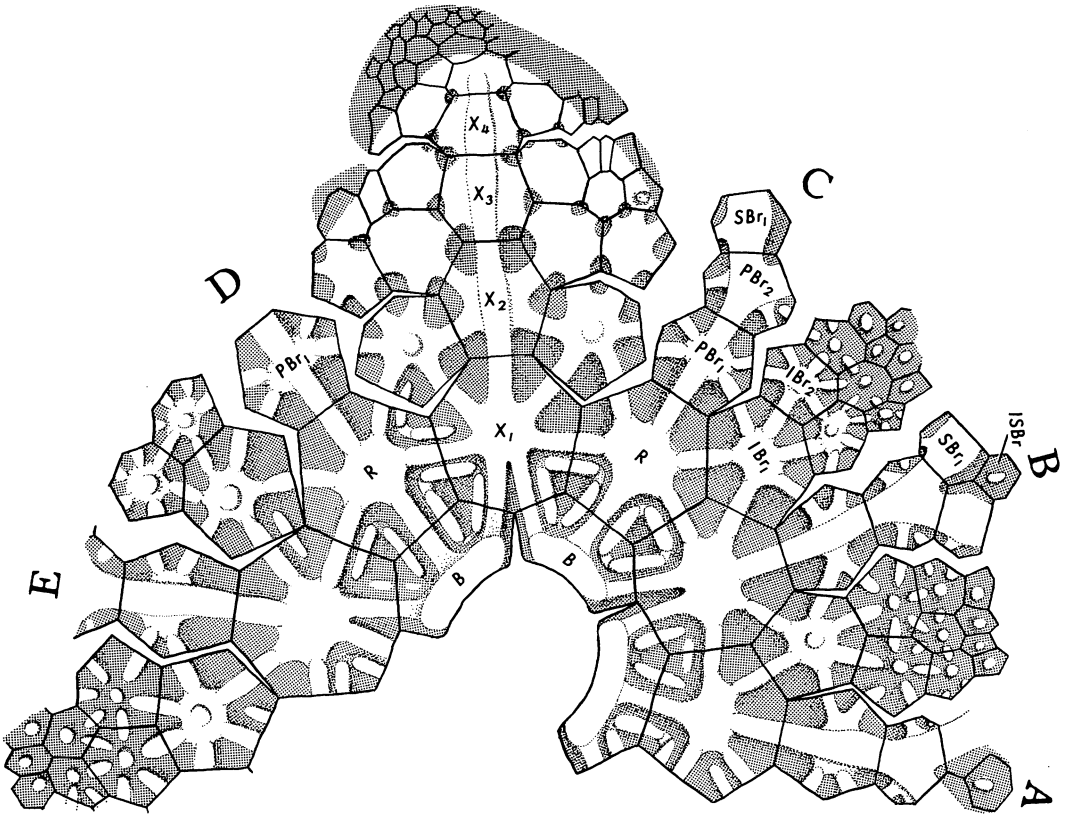
The posterior interray of the new species is

exceptionally wide and prominent, more closely resembling that of *Corocrinus* than of *Gennaeocrinus*. On the other hand, the gradual decrease in size of ray plates is more like that of *Gennaeocrinus*. The crinoid is here assigned to *Gennaeocrinus*, which has been granted such a latitude of characteristics that it may very well encompass several genera. Some species of *Gennaeocrinus* are rather high and conical, approaching *Periechocrinites* or *Corocrinus*, whereas others are low and basally rounded, approaching *Megistocrinus*. Some are nearly smooth, others are ornamented in low relief, and several are coarsely ornamented with nodes, spines, radiating ridges, and bands of parallel carinae. At present, no clear lines of separation have been worked out within the various kinds of shapes and ornamentation, and wide gradations are known, even in the ontogenetic series of what is called one species.

Genus GENNAEOCRINUS Wachsmuth & Springer  
GENNAEOCRINUS CHILMANAE n. sp.

Text-fig. 1; pl. 1, figs. 1-6

*Description.*—Cup rather high, turbinate, very ornate (pl. 1, figs. 2-5). Wide posterior interray with prominent median series of plates, so that cup appears to have 6-fold radial symmetry (pl. 1, fig. 6). BB three, subequal, set around spacious columnar facet; all ornamented alike. Each B a broad hexagon with a wide basal ridge along most of its dorsal border, the three BB ridges forming a disrupted blunt flange around base of cup (pl. 1, figs. 2, 3, 6). Three narrower and lower ridges extending ventrally from basal ridge: one median and vertical, the other two lateral and nearly parallel to the B-B suture. Four still narrower and lower short ridges: one on each side and parallel to median ridge, and one inside and parallel to each lateral ridge (pl. 1, figs. 2, 3). Narrow



TEXT-FIG. 1.—*Gennaeocrinus chilmanae* n. sp. Generalized plate diagram of holotype. Large Roman letters indicate rays. Only central plates of  $X_2$ ,  $X_3$ , and  $X_4$  series labeled.

furrow along B-B suture, set between ends of basal ridges and extending between lateral ridges. BB plates supporting RR of A, C, and D rays atop their ventral sides and RR of B and E rays and  $X_1$  on their angular shoulders (text-fig. 1).

RR +  $X_1$  forming complete circlet of two alternating kinds of plates. RR of A, C, and D rays alike, each hexagonal with radiating ridges from large central elevation to each side. RR of B and E rays and  $X_1$  alike, each septagonal, with radiating ridges to each side (the two dorsal ridges forming a narrow V, confluent with lateral ridges of adjacent BB). Each R with

two dorsolateral ridges to adjacent RR or to R and  $X_1$ , two ventrolateral ridges to  $IBrBr_1$  or or to  $IBr_1$  and a lateral  $X_2$ , one ventral (median) ridge to  $PBr_1$ , and one or two ridges to BB (as described).  $X_1$  with two dorsolateral ridges to RR, two ventrolateral ridges to  $LX_2$  and  $RX_2$ , one ventral (median) ridge to  $X_2$ , and two ridges to BB (pl. 1, fig. 5). All primary radiating ridges centrally expanded, some tapering very slightly toward central elevation and all tapering distinctly toward plate sutures (pl. 1, figs. 4–6). Within triangles formed by radial ridges linking RR,  $X_1$ , and BB, narrower and lower ridges forming sides of concentric tri-

#### EXPLANATION OF PLATE 1

All figures  $\times 5$ ; specimen lightly coated with sublimate of ammonium chloride

FIGS. 1–6.—*Gennaeocrinus chilmanae* n. sp. Holotype UMMP 57173. 1, 2, views centered on ventral (tegmina) end and A (anterior) ray. 3, 4, views centered on C and B rays. 5, view centered on CD (posterior) inter-ray. 6, view of dorsal (basal) end, with posterior interray uppermost. Unretouched.

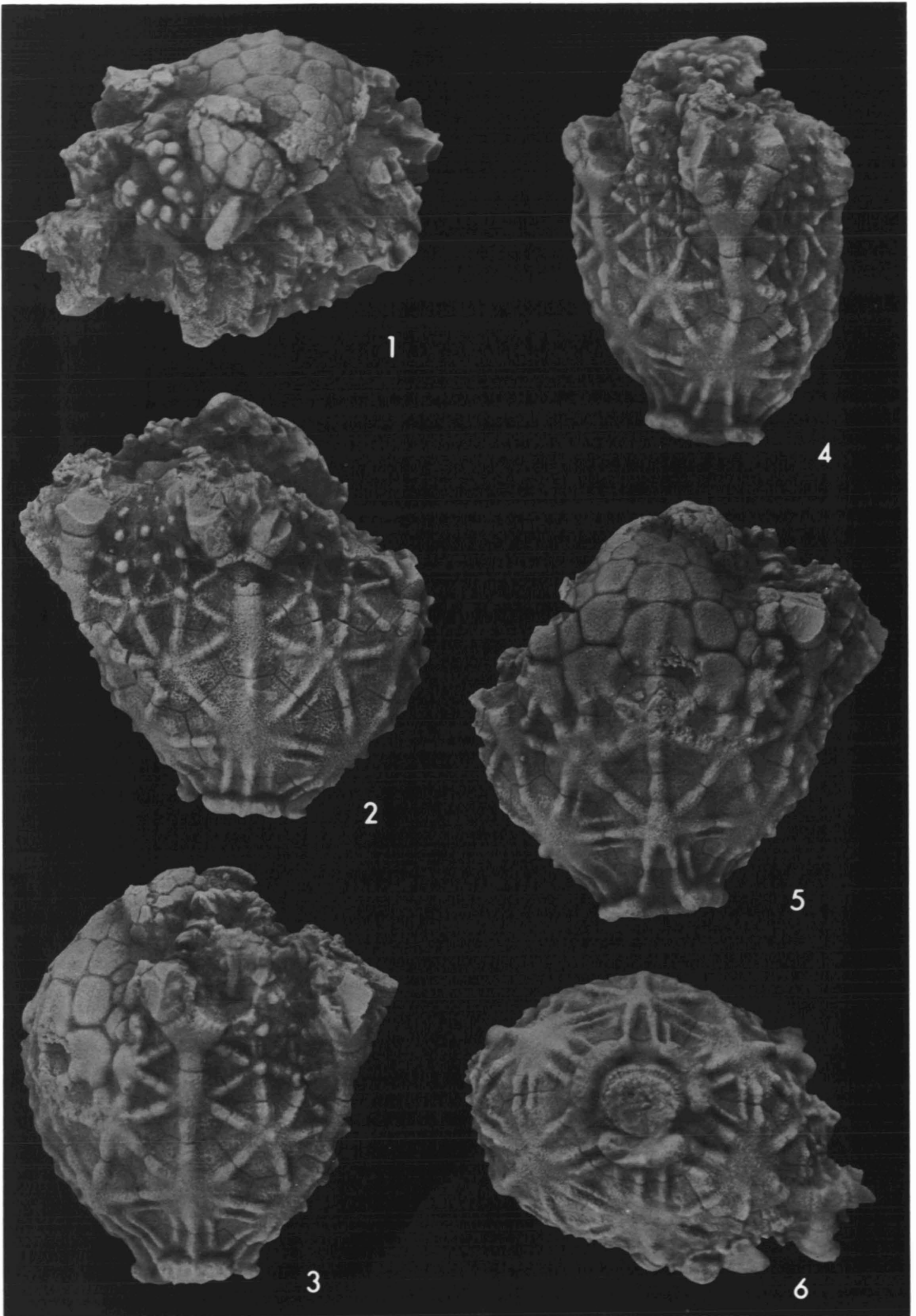


PLATE 1

angle with corners weakly developed or absent (text-fig. 1; pl. 1, figs. 3-5). Within triangles formed by RR, X<sub>1</sub>, and IBrBr<sub>1</sub> or lateral XX<sub>2</sub>, variously developed fragments of concentric triangle of low, irregular ridges (pl. 1, figs. 2, 5).

PBrBr<sub>1</sub> and X<sub>2</sub> of about same size, about  $\frac{2}{3}$  the height of underlying plate, each hexagonal, with rather strong radiating vertical ridges and somewhat narrower lateral ridges. PBrBr<sub>2</sub> slightly smaller than PBrBr<sub>1</sub>, axillary, septagonal, with well developed ray ridges and narrower and lower ridges (some incomplete) to sides bounded by IBrBr or XX.

SBrBr<sub>1</sub> distinctly smaller than PBrBr<sub>2</sub>; each hexagonal, bearing strong ray ridge and a small dorsolateral ridge to bordering IBr or X plate. Conspicuous hexagonal ISBr inserted in angle between SBrBr<sub>1</sub> pairs, ornamented with central short blunt spine or large tubercle (text-fig. 1; pl. 1, figs. 2, 4). SBr<sub>2</sub> preserved only on right side of B ray (pl. 1, figs. 2, 4), apparently pentagonal and axillary.

Posterior (CD) interray broad, with median series of prominent plates extending ventrally from X<sub>1</sub> in the RR + X<sub>1</sub> cirlet (text-fig. 1; pl. 1, fig. 5). Median interray ridge well developed on X<sub>1</sub> and X<sub>2</sub>, becoming lower and less distinct on X<sub>3</sub> and X<sub>4</sub>, hardly discernible on X<sub>5</sub>. Lateral XX<sub>2</sub> plates (LX<sub>2</sub> and RX<sub>2</sub>) with central boss or tubercle and radiating ridges, resembling IBrBr<sub>1</sub> plates in size and shape (text-fig. 1). Five XX<sub>3</sub> plates, of which only the outermost (LLX<sub>3</sub> and RRX<sub>3</sub>) with distinct radial ridges; other XX<sub>3</sub> and succeeding plates rather smooth, with corners depressed to form shallow pits. Lateral plates in X<sub>1</sub> and higher ranges becoming irregular in size and arrangement (pl. 1, fig. 5).

Other interrays rather narrow, each composed of one IBr<sub>1</sub>, two IBrBr<sub>2</sub>, three IBrBr<sub>3</sub>, and small irregular plates above. IBr<sub>1</sub> of interray hexagonal, about same size as LX<sub>2</sub> or RX<sub>2</sub> in posterior interray, only slightly larger than adjacent PBrBr<sub>1</sub>. IBr<sub>2</sub> hexagonal, distinctly smaller than IBr<sub>1</sub> (about  $\frac{3}{4}$  as wide). IBrBr<sub>3</sub> varying in size and shape. Each IBr with a central tubercle or short spine, those of lower plates larger and lower, those of upper plates smaller and sharply pointed (pl. 1, figs. 2, 4). Radiating ridges prominent on IBr<sub>1</sub>, less so on IBrBr<sub>2</sub>, incompletely developed on IBrBr<sub>3</sub>, and absent on higher plates.

Tegmen distorted, preserving only a few nodose plates (pl. 1, fig. 1). Probably 20 or more arms (judging from interpretation of an axillary SBr<sub>2</sub>), but none preserved. Plate dimensions, measured by Gaertner measuring microscope, in table 1.

*Remarks.*—*Gennaeocrinus chilmanae* differs from other highly ornamented species of the genus in the wide, ventrally smooth posterior interray and in details of ornamentation. The basal "rim" is more rounded and smaller than that in most species, in particular contrast to *G. mourantae* Goldring or *G. variabilis* Kesling & Smith. Secondary ornamental ridges (forming concentric triangles) are also present in *G. kentuckyensis* Lyon, but in that species they are more evenly distributed from base to tegmen and through the narrower posterior interray. Faint secondary ornamental ridges are likewise present in *G. sculptus* Rowley, but there they are more nearly radial from plate centers, tending to converge at plate corner junctions.

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TABLE 1—SELECTED MEASUREMENTS OF GENNAEOCRINUS CHILMANAE (in mm)

Plate	Dimen.	AE Interray	A Ray	AB Interray	B Ray	BC Interray	C Ray	CD Interray	D Ray	DE Interray	E Ray
BB	width height		3.96 1.43			3.51 1.71				3.67 1.76	
RR, X <sub>1</sub>	width height		4.01 3.73		3.74 3.77		3.98 3.68	3.75 3.88	3.92 3.86		4.10 3.94
LX <sub>2</sub>	width height							3.02 3.07			
X <sub>2</sub> , IBr <sub>1</sub>	width height	3.25 3.02		2.96 2.89		3.08 2.89				3.28 3.10	
RX <sub>2</sub>	width height							2.91 2.83			
LLX <sub>3</sub> , LIBr <sub>2</sub>	width height	2.16 1.95		2.06 1.71		2.16 1.84		1.97 2.04		... ...	
LX <sub>3</sub>	width height							2.41 2.13			
X <sub>3</sub>	width height							2.45 2.32			
RX <sub>3</sub>	width height							2.06 2.05			
RRX <sub>3</sub> , RIBr <sub>2</sub>	width height	2.22 2.15		2.05 1.72		1.77 1.62		1.81 1.84		... ...	
X <sub>4</sub>	width height							2.23 1.54			
PBr <sub>1</sub>	width height		2.71 2.61		2.46 2.39		2.70 2.36		2.84 2.55		2.87 2.75
PBr <sub>2</sub>	width height		... 2.27		... 2.13		2.42 2.00		... ...		... ...

