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THE FAUNA OF THE ELY GROUP IN THE ILLIPAH AREA OF NEVADA

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ABSTRACT—The fauna of the Ely Group consists largely of a prolific association of spiriferid and productid brachiopods. The association of fossils in the Ely Group is considered to be Atokan to Early Desmoinesian in age. Transitional elements from the Mississippian are rare. *Diaphragmus fasciculatus* (McChesney) occurs above Atokan fusulinids and cannot be considered indicative of only Mississippian age as it generally has been hitherto.

The fauna of the Ely Group in the Illipah quadrangle is described. One genus, five species and one subspecies are described as new. These comprise *Rhipidomella elyensis*, n. sp., *Cranaena minuta*, n. sp., *Antiquatonia elyensis*, n. sp., *Lissomarginifera nuda*, n. gen. and n. sp., *Hustedia rotunda*, n. sp., and *Husteida miseri gibbosa*, n. subsp.

INTRODUCTION

Stratigraphy

THE fauna of the Ely Group has been studied and described in an effort to determine the age limits of some Pennsylvanian formations in East Central Nevada. Pennsylvanian stratigraphy in the Illipah quadrangle can be summarized briefly as follows. Lawson (1906) named the Ely Limestone; however, he specified no type section, and the limits of the formation have been in question since then. For this study the writer has adopted the term Ely Group of Dott (1955), which is represented in the Illipah region by two formations whose characteristics have been shown graphically by the writer in a previous publication (Lane 1960, p. 115). The Ely Limestone has been restricted to the massive portion some 1500 feet thick which overlies the Chainman Shale and Diamond Peak Quartzite of Mississippian and Pennsylvanian age.

The lower 400 feet of the Ely Limestone contains as many as three prominent cherty bands, each about 50 feet thick, above which lies a succession of relatively less cherty but very massive, grey limestones which comprise the middle third of the formation. About 450 feet below the top of the formation is the top of a silty zone about 80 feet thick which commonly makes a topographic reentrant. The massive limestones above the reentrant commonly contain a noteworthy zone of *Chaetetes* and *Profusulinella*, about 40 feet thick, and then a spectacular zone of silicified fossils above it and about 100 feet below the top of the formation.

An unnamed silty limestone 900 feet thick conformably overlies the Ely Limestone and is separated from the overlying Permian Reipe Spring Limestone of Steele and "Rib Hill" or Reipetown Sandstone of Steele at a disconformity whose presence is indicated by a persistent bed of conglomerate and a notable disparity in age of fossils above and below the conglomerate. A more complete report of the stratigraphy will be published elsewhere.

Procedure

Collections were made from outcrops measured in detail in the Illipah quadrangle in the summers of 1956, 1957 and 1958. Fossils were compared with extensive collections of Carboniferous faunas from the Midcontinent available in the Department of Geology of the University of Southern California. All types, figured specimens, and comparative materials are deposited in the collections of the Department of Geology at the University of Southern California, and bear "USC" numbers in this report to indicate that depository. Likewise, locality numbers refer to the USC locality register.

Acknowledgments

This research represents a portion of a doctoral dissertation submitted to the Faculty of the Department of Geology of the University of Southern California. The problem was suggested by Professor W. H. Easton, who also guided the field work and research. This project was supported by a grant from the Union Oil Company of Cali-

fornia, in addition to which, Dr. J. C. Hazzard of that Company gave permission for the use of the extensive collections, notes, measured sections, and faunal lists pertaining to the Ely Limestone.

THE FAUNA

The Ely fauna is characterized primarily by a prolific association of spiriferid and productid brachiopods.

Lowermost strata are characterized by *Linoproductus* and *Spirifer occiduus* Sadlick, of which the latter is common in the Pottsville Series of Ohio. The coral *Caninia* is present higher in the section, and a tabulate coral, *Chaetetes*, is associated with the fusulinid *Profusulinella* in the upper third of the Ely Limestone. Near the top of the Ely Limestone brachiopods become diverse and abundant. Particularly characteristic are *Punctospirifer campestris* (White), a new species of *Rhipidomella*, and a new marginiferid. This zone of brachiopods locally is silicified in the Illipah quadrangle, in which case a distinct and remarkably preserved fauna can be removed by acidation of the limestone.

The entire fauna (table I) contains forty-nine genera, a somewhat meager number in comparison with some other Pennsylvanian faunas. However, the Ely Limestone is richly fossiliferous. Systematically the genera are distributed as follows: Foraminifera, four genera and four species; corals, five genera and four species; one conulariid; bryozoans, two genera and two species; brachiopods, twenty-one genera and twenty-seven species; molluscs, thirteen genera; trilobites, one genus; worms, one genus; crinoids, one genus. One genus, five species and one subspecies are described as new.

A comparison of the Ely fauna with other Pennsylvanian faunas indicates an Early Pennsylvanian age. The fauna differs from the Morrowan in several aspects. Primarily there are fewer residual species from the Mississippian in the Ely fauna than in the Morrowan. Mather (1915, p. 78) listed eighteen genera and twenty species which he considered to be residual in the Morrowan of Oklahoma and Arkansas. In the Ely Limestone there are three, *Punctospirifer transversus* (McChesney), *Diaphragmus fasciculatus* (McChesney) and *Cranaena minuta*. The last is described as a new species, but the genus is usually considered to be Mississippian.

Hustedia miseri Mather is associated with fossils of Morrowan age in the central states. A subspecies of *H. miseri*, here described as new, occurs above Atokan fusulinids, however, and cannot be considered as indicative of Morrowan age.

There are only three species in common with the Redoak Hollow fauna which Elias (1957, p. 526) considered to be transitional between the Mississippian and Pennsylvanian with a slightly more Mississippian aspect than Pennsylvanian. These species are *Punctospirifer transversus*, *P. campestris* and *Diaphragmus fasciculatus*.

Crinoids and blastoids are common in the Morrowan of Oklahoma and Arkansas, whereas they are notably lacking in the Ely fauna. Beds of crinoidal debris and columnals do occur in the Ely Limestone, but they do not comprise a significant portion of the fauna. Only one crinoid calyx is present in the Ely collections, and there are no blastoids.

Little had been known of Springeran (earliest Pennsylvanian) megafaunas until Elias published in 1957–58 on the Redoak Hollow Formation of Southern Oklahoma. The only species described by Elias which have been found in the Ely group can be considered as residual Mississippian forms. It is possible that some of the Springeran of the Midcontinent is equivalent to some rocks which have been assigned to the Morrowan in the Cordilleran area, but the Ely fauna of the Illipah region does not contain fossils clearly indicative of either Springeran or Morrowan age.

It would appear that the Ely fauna is distinctly Early Pennsylvanian, and higher than Morrowan. The presence of residual forms from the Mississippian is considered (because of their association with veritable Pennsylvanian species) to indicate an extended range for these older species rather than to indicate a Mississippian age for part of the Ely Limestone. Moreover, the presence of these Mississippian forms does not necessarily indicate a transitional stage between Mississippian and Pennsylvanian, as the species comprise a small fraction of the total number of the species in the fauna.

18

1. Chester 4. Atoka 7. Relative abundance
2. Springer 5. Des Moines C = Common R = Rare
3. Morrow 6. Missouri A = Abundant

	1	2	3	4	5	6	7
Textularia sp.	X		X	X	X	X	R
Millerella sp.	X		X	X	X	X	C
Profusulinella aff. P. regia Thompson				X	X		A
Fusulinella devexa Thompson				X			R
Chaetetes favosus Moore and Jeffords				X	X	X	A
Syringopora sp.	X		X	X	X	X	C
Caninia torquia (Owen)			X	X	X		C
Lophophyllidium aff. L. proliferum (McChesney)				●	X	X	C
Conulariid	X		X	X	X	X	R
Archimedes sp.	X		X	●			R
Rhombopora lepidodendroides Meek			X	X			C
Orbiculoidea capuliformis (McChesney)				●	X	X	C
Rhipidomella elyensis n. sp.				●			A
Schizophoria resupinoides (Cox)			X	X			C
Dielasma bovidens (Morton)			X	X	X	X	R
Cranaena minuta n. sp.				●			C
Rhynchopora magnicosta Mather			X	X	X	X	R
Wellerella sp.			X	X	X	X	C
Derbyia aff. D. haesitans Dunbar and Condra				●	X	X	C
Chonetina flemingi (Norwood and Pratten)				●	X	X	R
Diaphragmus fasciculatus (McChesney)	X		X	●			R
Dictyoclostus americanus Dunbar and Condra			X	X	X	X	C
Antiquatonia hermosana (Girty)				●	X		C
Antiquatonia elyensis n. sp.				●			C
Lissomarginifera nuda n. gen. and n. sp.				●			C
Linoproductus magnispinus Dunbar and Condra				●	X	X	C
Linoproductus prattenianus (Norwood and Pratten)				●	X	X	C
Spirifer occiduus Sadlick			X	X			C
Neospirifer triplicatus (Hall)				●	X	X	C
Crurithyris planoconvexa (Shumard)			X	X	X	X	R
Hustedia rotunda n. sp.				●			A
Hustedia miseri subsp. gibbosa n. subsp.				●			A
Cleiothyridina orbicularis (McChesney)			X	X	X	X	C
Composita argentea (Shepard)				●	X	X	C
Composita subtilita (Hall)			X	X	X	X	R
Punctospirifer campestris (White)			X	X			A
Punctospirifer transversus (McChesney)	X		X	X			R

TABLE I.—Ranges of diagnostic fossils of the Ely limestone. X indicates reported occurrence. ● indicates species in the Ely limestone not previously reported in the Profusulinella zone.

Of the brachiopods, which comprise a major portion of the fauna, many have definite affinities with described Desmoinesian species. *Composita argentea* (Shepard) and *Linoproductus prattenianus* (Norwood & Pratten) are not reported below the Desmoinesian, and several others referred to hereafter in the Faunal Analysis are characteristic of Desmoinesian and Missourian strata. The fusulinids presumably comprise the strongest line of evidence as to the age of the Ely Group. *Fusulinella* and *Profusulinella* in the upper portion of the Ely Limestone indicate Atokan to possibly Early Desmoinesian age for that part of the Ely fauna.

Except for the cephalopods of the Winslow formation of Arkansas and Oklahoma, there is little to characterize Atokan megafaunas of the Midcontinent. The Atokan of the Great Basin is characterized by the association of productid and spiriferid brachiopods as seen in the Ely Limestone in the Illipah quadrangle. *Spirifer occiduus*, *Linoproductus* spp., *Punctospirifer campestris*, *Hustedia rotunda*, *H. miseri gibbosa*, *Rhipidomella elyensis* and *Lissomarginifera nuda* comprise a distinctive association of brachiopods. These fossils occur in association with the coral *Chaetetes favosus* and the fusulinids *Fusulinella devexa* and *Profusulinella*.

FAUNAL ANALYSIS

Foraminifera are comparatively rare in the Ely Limestone. They were observed in only two zones near the top of the sequence. In these two zones, however, they are abundant. The first of these two zones is the *Chaetetes-Profusulinella* faunizone. Specimens of *Profusulinella* in this zone have affinities with *P. regia* Thompson. The genus ranges from lower to Middle Atokan. *Fusulinella devexa* Thompson occurs stratigraphically above the *Chaetetes-Profusulinella* zone and has a range from Middle Atokan to Middle Desmoinesian.

Both *Textularia* and *Millerella* are present in the fusulinid zones of the upper portion of the Ely; however, they are not referred to any species and are not diagnostic as genera. *Textularia* is extremely rare and *Millerella* only slightly less rare.

Tabulate corals are represented by two genera, *Chaetetes* and *Syringopora*. The latter of these is common from the early Paleozoic through the Permian. *Chaetetes*, however, is a distinctive coral and is locally a useful one. In the Midcontinent *Chaetetes* is particularly common in strata of Desmoinesian age (Dunbar & Condra, 1932, p. 245). In the Illipah quadrangle *Chaetetes* occurs with *Profusulinella* of Atokan age and is present below the highest occurrence of *Spirifer occiduus* which is indicative of Early Pennsylvanian age. *Chaetetes favosus* Moore and Jeffords occurs in two distinct horizons in the Illipah quadrangle. It is present in the *Chaetetes-Profusulinella* zone in the upper third of the Ely Limestone. A second zone occurs 320 feet above the massive Ely Limestone in thin-bedded limestones which comprise a formation that the writer proposes to name in a later publication.

Of the tetracorals, *Caninia torquia* (Owen) is the most abundant. This coral was originally described from the Beil Limestone (Missourian) of Nebraska. It has since been widely reported throughout the Pennsylvanian. In this area it ranges from the middle of the Ely to the middle of the unnamed formation just mentioned.

Another coral is referred questionably to the genus *Caninia*. In reality the coral represents a transition between *Triplophyllites* and *Caninia*. The appearance is much like that of a *Caninia* with a narrow dissepimentarium. The taxonomic position of such a coral is unclear. It could be an advanced Mississippian *Triplophyllites* or a primitive Pennsylvanian *Caninia*.

Lophophyllidium is present in the Ely fauna but occurs only rarely. The ones that are present are exceptionally large for the genus. They have affinities with *L. proliferum* from the Pennsylvanian of Illinois; however, they are much too large to be referred to that species.

Archimedes represents one of the residual elements of Mississippian age present in the Pennsylvanian Ely. Mather (1915, p. 66) cited *Archimedes* in Pennsylvanian rocks from Arkansas and Oklahoma. However, he reported it no higher than the Brentwood Limestone of Morrowan age. Other occurrences of *Archimedes* in the western states are exceedingly rare. Condra & Elias (1944) report *Archimedes* from the Oquirrh (Penn-

sylvanian) of Utah. Sadlick has collected *Archimedes* from the Chester, Springer, Morrow and Des Moines also in Utah (Echols, 1948). *Archimedes* sp. from the Ely Limestone occurs along with *Fusulinella devexa* of Atokan-Desmoinesian age which indicates an extended range for the genus rather than Mississippian age for the outcrop. *Archimedes* is rare in the Ely Limestone.

Rhombopora lepidodendroides Meek is abundant throughout the Ely and is common in many Pennsylvanian rocks.

Inarticulate brachiopods are uncommon in the Ely fauna. Only a few specimens of *Orbiculoidea capuliformis* (McChesney) were collected from the lower part of the section. This species is reported by Dunbar & Condra (1932, tab. D) from the Lansing Group in Nebraska, and McChesney's species is from the Desmoinesian. The presence in the Ely Limestone represents an extended range downward for this species.

Orthid brachiopods are represented by only two genera, but one of these, *Rhipidomella*, is locally abundant. The other, *Schizophoria*, is represented by only one species and a few specimens. The *Rhipidomella* is described as a new species, differing from typical Pennsylvanian Rhipidomellas. *Ripidomella carbonaria* (Swallow) is a small species; *R. nevadensis* (Meek) is a very large and gibbous species. *Rhipidomella elyensis* is distinctly larger than *R. carbonaria* and smaller and less gibbous than *R. nevadensis*. Dott (1955, p. 2227) reported *R. nevadensis* from the Ely Group (Tonka Formation); however, this writer has not seen typical *R. nevadensis* in the Ely Limestone in the Illipah quadrangle. Rather it is present in pre-Ely strata of Pennsylvanian age and may indicate Morrowan age whereas *R. elyensis* represents Atokan age.

Dielasma bovidens (Morton) is present but rare in the collections of the Ely fauna. Of more significance is the presence of the small terebratulid, *Cranaena*. This genus is one of the residual Mississippian forms and occurs in the uppermost Ely in great abundance. The species, described here as new, is very small. It was first thought that the myriad small shells represented immature terebratulids. However, the presence of gerontic characteristics in many specimens indicates that they are mature. The interiors of these minute Cranaenas show quite a bit of variation from the typical forms.This variation is most likely to result from resorption of the brachiophore, a phenomenon noted in living terebratulids. Thus, all variants were described as one species.

Strophomenoids are represented by two genera and two species. The first of these, *Derbyia*, has affinities with *D. haesitans* Dunbar & Condra from the Missourian Series of Nebraska. It occurs in thin layers containing mats of *Derbyia* in the lower Ely in beds similar to the "*Derbyia* ledges" described by Dunbar & Chondra (1932, p.110). *Chonetina flemingi* (Norwood & Pratten) originally described from the Kansas City Group of Missouri is the only other strophomenoid, and it is rare. The rarity of *Chonetina* may result from ecological factors, as this genus occurs more commonly in argillaceous sediments than in pure limestone such as is present in the Ely Limestone.

Productid brachiopods comprise a major portion of the fauna. Many of these are typical Desmoinesian fossils. *Linoproductus magnispinus* Dunbar & Condra, however, was described by the authors from the Americus Limestone of latest Pennsylvanian age. Its presence in the Ely Limestone extends the range downward considerably. *Dictyoclostus americanus* Dunbar & Condra has a wide range although it is especially common in the Upper Pennsylvanian. *Antiquatonia hermosana* (Girty) is one of the most common productids present. It is widespread in rocks of Early Pennsylvanian age in the Cordilleran region, but its exact range has not been ascertained. A new species of *Antiquatonia* is smaller than typical representatives of the genus. It is also common, both in basal beds and in the upper part of the Ely. An unusual margiferid is described as new. This new genus, *Lissomarginifera*, is typically non-costate even in specimens with spines preserved. It is common in the silicified fauna of the upper portion of the Ely Limestone.

One specimen of *Diaphragmus fasciculatus* (McChesney) was collected from the unnamed sequence above the Ely Limestone. Thus, *Diaphragmus* occurs above the *Chaetetes-Profusulinella* zone which is definitely

Atokan in age. In fact, *Diaphragmus fasciculatus* occurs in the upper *Chaetetes* zone above *Fusulinella* and is presumably Desmoinesian in age. *Diaphragmus* can therefore be a residual form from the Mississippian; however, Desmoinesian is apparently the youngest age recorded for this fossil. The presence of *Diaphragmus* this late in the Pennsylvanian Period considerably lessens the value assigned it as an indicator of Mississippian age in the Great Basin by Nolan, Merriam, & Williams (1956, pp. 60,61) and by Hose & Repenning (1959, p. 2173).

The spirifers, including three superfamilies, are the most common fossils in the Ely fauna. Spirifericae are represented by *Spirifer occiduus* Sadlick (formerly commonly recorded as *Spirifer occidentalis* Girty) which is widely distributed in the Lower Pennsylvanian and occurs commonly in the lower part of the Ely Limestone; by *Neospirifer triplicatus* (Hall,) typically represented in the Kansas City Group; and by *Crurithyris planoconvexa* (Shumard), described from the Lawrence Shale of Kansas. The last species is rare in the Ely Limestone, as it is usually associated with argillaceous deposits.

Rostrospiricae are abundantly represented. Two species of *Hustedia* are described as new, and both are common in the silicified fauna of the upper part of the Ely. *Hustedia rotunda* n. sp. is a rotund form as opposed to elongate shape of most Hustedias. The other *H. miseri* subsp. *gibbosa*, more nearly resembles *H. miseri* Mather but differs primarily in the angularity of the costae and the gibbosity of the valves.

Cleiothyridina orbicularis (McChesney) is also a common rostrospirifer. It ranges from the bottom to the top of the Ely sequence and is common in Pennsylvanian rocks elsewhere in the United States.

Punctospiricae are represented by one genus and two species. *P. transversus* (McChesney) is a rare, residual species from the Mississippian. Only one specimen is present in the collection. *P. campestris* (White) is the most abundant single species in the fauna. It ranges from the lower third of the sequence to the top where there is a flood of *Punctospirifer campestris* in a silicified zone.

Molluscs comprise only a small fraction of the Ely fauna. Where they are present, they are almost always minute. A large *Euomphalus* occurs with *Fusulinella devexa*, but all other molluscs are small. Some of them may be mature, and some of them may have selectively been sorted by currents. If these small specimens are mature, they may have some ecological significance; however, their stratigraphic value is insignificant.

FAUNAL SUMMARY

The fauna of the Ely Group represents the first complete Pennsylvanian megafauna described from the Cordilleran region. Atokan faunas are described and figured together for the first time.

Atokan faunas of the region are characterized by an assemblage of brachiopods and fusulinids as occur in the Ely Group. The Atokan-Desmoinesian boundary is established in the interval between *Chaetetes-Profusulinella* zone and the occurrence of a *Fusulinella* zone near the top of the restricted Ely Limestone. *Chaetetes*, abundant in the Desmoinesian of the Midcontinent, is associated with Atokan fusulinids in the *Chaetetes-Profusulinella* zone, and also occurs in a higher zone of presumed Early Desmoinesian age. Ninety feet above this zone is a silicified zone containing a prolific association of brachiopods characteristic of the upper Ely Limestone. One hundred and eighty feet above the silicified zone there is a zone of Early Desmoinesian *Fusulinella*. It is within this interval of 270 feet that the Atokan-Desmoinesian boundary must be placed. *Chaetetes* also occurs in a higher zone of apparent Early Desmoinesian age, in the unnamed formation above the restricted Ely Limestone.

Analysis of the Ely fauna is based on fossils collected from outcrops measured in detail and compared with other Pennsylvanian faunas. One genus, five species and one subspecies are described as new.

SYSTEMATIC DESCRIPTIONS

Order FORAMINIFERA

Family TEXTULARIDAE d'Orbigny

Genus TEXTULARIA Defrance, 1824

TEXTULARIA sp.

Pl. 125, fig. 6

Numerous biserial foraminifers occur in

both the upper and lower *Chaetetes* zones. Initial chambers are planispiral, and later chambers are biserially arranged. The stratigraphic range of *Textularia* in the Ely Limestone is unknown, inasmuch as thin sections were prepared only for rocks known to contain fusulinids.

Locality.—310.

Family FUSULINIDAE Moller
Genus MILLERELLA Thompson, 1942
MILLERELLA sp.
Pl. 125, fig. 5

Minute tests ascribed to the genus *Millerella* occur in thin sections ground from middle Ely rocks. The figured specimen is from the *Chaetetes-Profusulinella* faunizone.

Locality.—310.

Genus PROFUSULINELLA Rauser-Cernousscva & Beljaev, 1936
PROFUSULINELLA aff. P. REGIA Thompson, 1948
Pl. 125, figs. 3,4

Profusulinella from the Ely Limestone is compared with Thompson's species from Powwow Canyon, Texas. The Ely specimens are similar in size, shape and the number of volutions but appear to be more broadly fluted toward the polar extremities than *P. regia*. *Profusulinella* in the Ely Limestone is restricted to the *Chaetetes-Profusulinella* zone; however, they are quite abundant in that zone.

Locality.—310.

Genus FUSULINELLA Moller, 1877
FUSULINELLA DEVEXA Thompson, 1948
Pl. 125, figs. 1,2

Fusulinella devexa Thompson, 1948, p. 94; pl. 32, fig. 6,10; pl. 35, figs. 1–15; pl. 36, figs. 7–10, 12–17.

Description.—Shell rather large for the species, lateral slopes concave and polar ends are bluntly rounded. Axis of coiling is straight, and septal fluting is pronounced poleward although fluting continues in towards the proloculus. Chomata well developed. Tunnel angle 29° in a specimen 3.8 mm. in length.

Locality.—317.

Phylum COELENTERATA
Class ANTHOZOA
Subclass TABULATA
Family CHAETETIDAE Edwards & Haime
Genus CHAETETES Fischer, 1829
CHAETETES FAVOSUS Moore & Jeffords, 1945
Text-figs. 1–3

Chaetetes favosus Moore & Jeffords, 1945, p. 191, figs. 207,208.

EXPLANATION OF PLATE 125

FIGS. *1,2—Fusulinella devexa* Thompson. *1*, longitudinal section, USC 5024, ×20; *2*, transverse section, USC 5025, ×20.

3,4—Profusulinella aff. *P. regia* Thompson. *3*, Longitudinal section, USC 5026, ×20; *4*, transverse section, USC 5027, ×20.

5—Millerella sp. Transverse section, USC 5028, ×30.

6—Textularia sp. A transverse section somewhat off center, (specimen lost), ×25.

7—Syringopora sp. View of the surface of a colony, USC 5029, ×1.

8,9—Orbiculoidea capuliformis McChesney. *8*, Pedicle valve, USC 5030, ×1; *9*, external mold of a brachial valve, USC 5031, ×1.

10–16—Rhipidomella elyensis, n. sp. *10–14*, Pedicle valve, brachial valve, anterior, posterior and side view of the holotype, USC 5032, ×1; *15*, pedicle interior showing muscle scars, USC 5034, ×1; *16*, brachial interior, USC 5035, ×1.

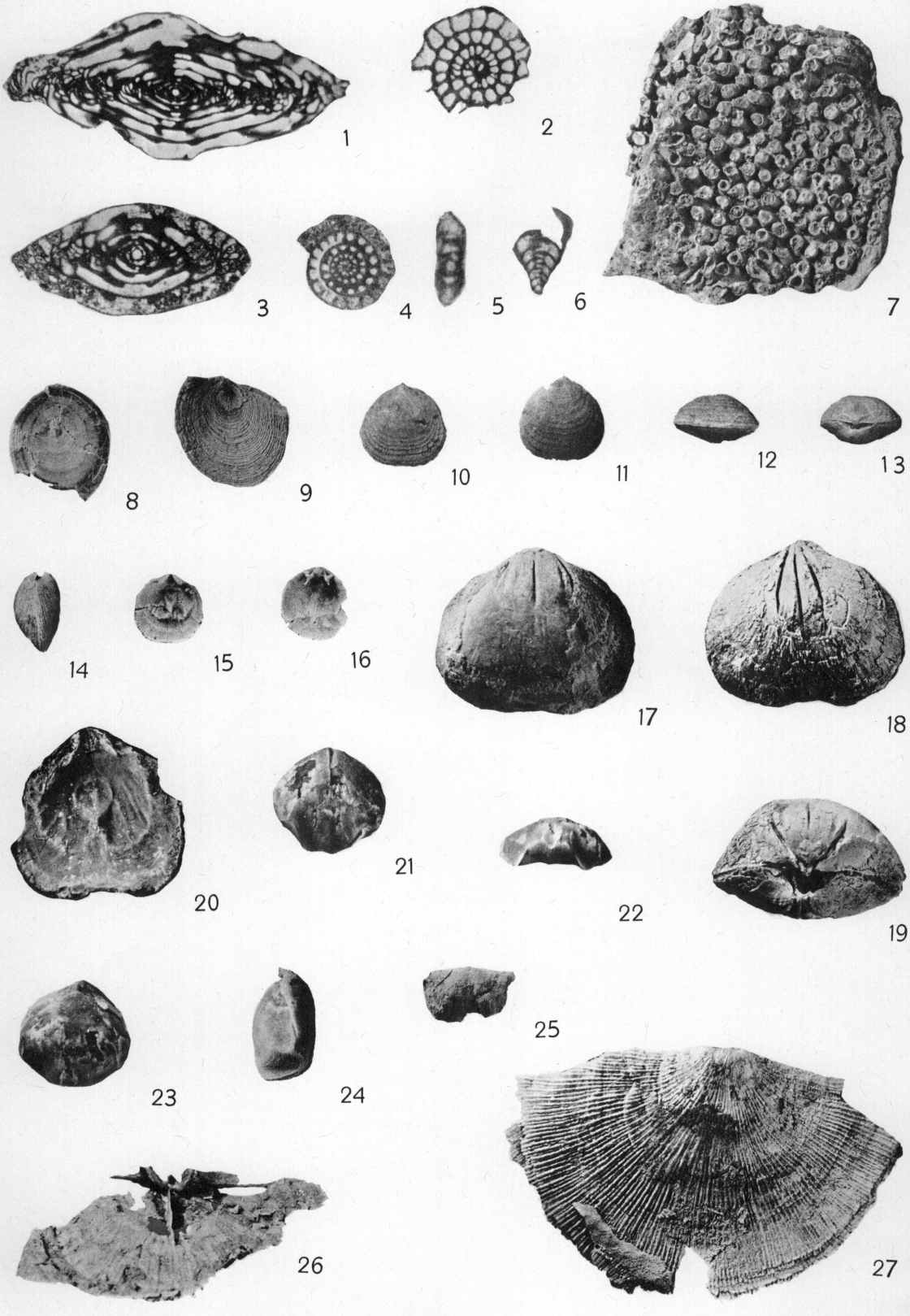
17–19—Schizophoria resupinoides (Cox). Brachial exterior, pedicle exterior and anterior view showing dental lamellae and median septa, USC 5037, ×1.

20—Rhipidomella nevadensis (Meek). Pedicle interior showing muscle scars, USC 5038, ×1.

21–24—Wellerella sp. Pedicle exterior, anterior showing plicate anterior commissure, brachial exterior and side view, USC 5039, ×3.

25—Chonetina flemingi (Norwood & Pratten). Pedicle exterior, USC 5041, ×1.

26,27—Derbyia aff. *D. haesitans* Dunbar & Condra. *26*, Pedicle interior showing high median septum, USC 5042, ×1; *27*, pedicle exterior, USC 5043, ×1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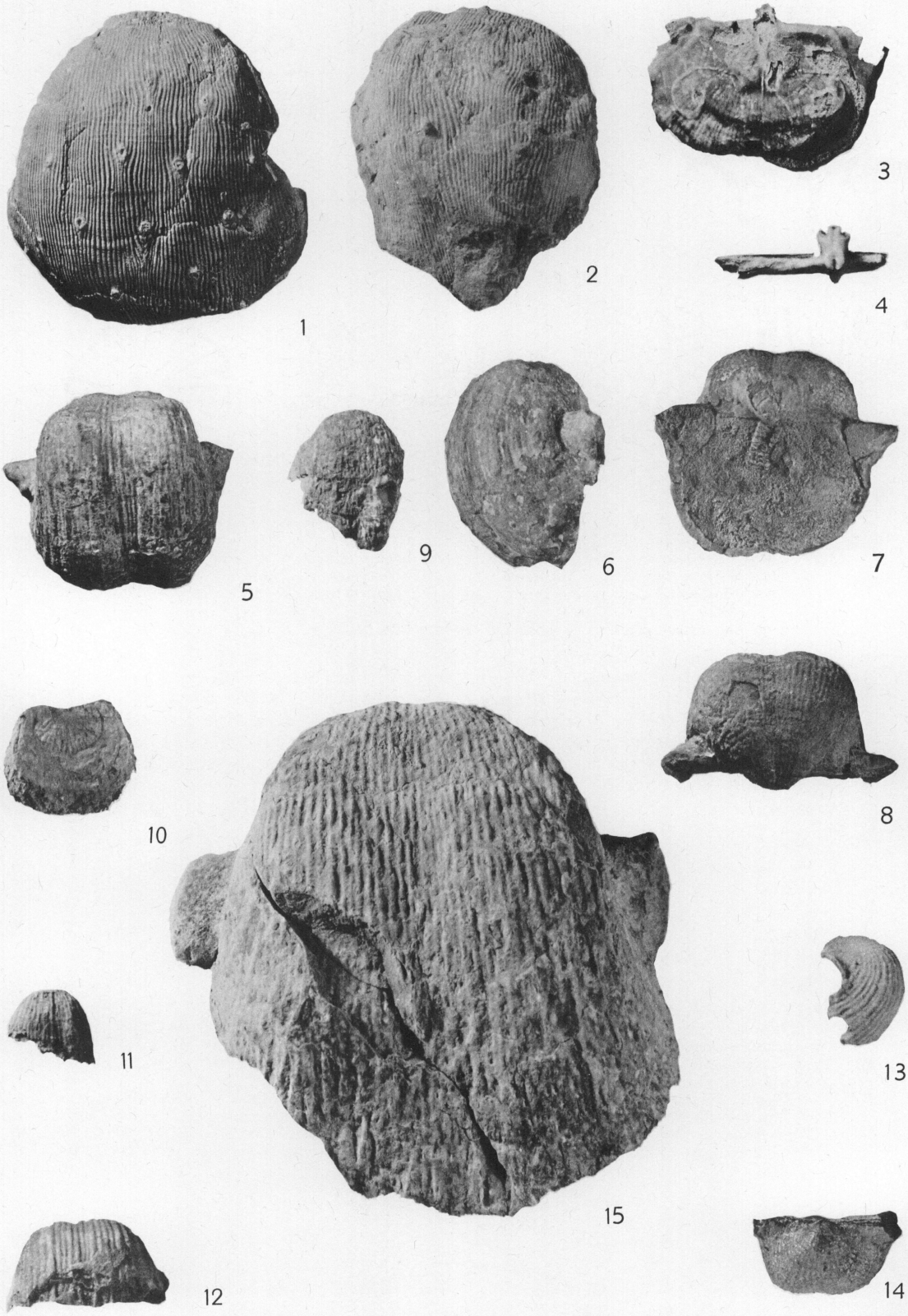
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Tabulae may be present. When they are present, they are remote and often incomplete.

Locality.—311 (figured specimen). 361.

Family SYRINGOPORIDAE Milne-Edwards & Haime

Genus SYRINGOPORA Goldfuss, 1826

SYRINGOPORA sp.

Pl. 125, fig. 7

This common genus is widespread in Paleozoic rocks of North America and occurs generally throughout the Ely Limestone. The Ely specimens are assigned to no species because the writer believes that a great deal of work must be done with *Syringopora* before this genus can be of any notable stratigraphic value.

Locality.—312

Subclass TETRACORALLA

Family CYATHOPSIDAE Dybowski

Genus CANINIA Michelin *in* Gervais, 1840

CANINIA TORQUIA (Owen, 1852)

Text-figs. 4–6

Cyathophyllum torquium Owen, 1852, tab. 4, fig. 2.

Caninia torquia (Owen), Easton, 1944, pl. 22, figs. 2–7.

Description.—Simple, cylindrical corallum with deep, straight-walled calyx. Floor of the calyx is flat without a boss. In transverse section of one large specimen 42 mm. in diameter, 48 major septa are present. These septa are undilated and extend slightly more than half of the distance to the center of the corallite. Minor septa are short, being about one-fourth as long as the major septa. Dissepimentarium extends a little less than half the distance to the center of the corallum. Dissepiments occur in twelve to fourteen ranges, the first six or so being concentric and the innermost ones being arranged in a herringbone pattern.

In longitudinal section, tabulae are closely spaced, about ten in ten millimeters, flattened to gently depressed in the middle, and reflexed distally.

Discussion.—This *Caninia* is slightly larger than the typical *C. torquia* and has a wider dissepimentarium.

? CANINIA sp. A

A few small corals that represent a transition from *Triplophyllites* to *Caninia* occur in the Ely Limestone. These corals are small ceratoid forms that strongly resemble *Triplophyllites*, yet they have a narrow dissepimentarium that presists into the upper regions of the corallum. These corals occur irregularly and their taxonomic position is uncertain.

Family LOPHOPHYLLIDIIDAE Moore & Jeffords

LOPHOPHYLLIDIUM aff. L. PROLIFERUM (McChesney, 1860)

Text-fig. 7

Two well preserved specimens of *Lophophyllidium* show marked affinities with *L. proliferum*. One specimen is 46 mm. long and 18 mm. in diameter at the calyx. This specimen has the following septal formula: K 9 A 4 C 4 A 8, thus 29 major septa. Both specimens are exceptionally large for the genus; however, the septal configuration resembles that of *L. proliferum*.

Locality.—309.

Class SCYPHOZOA

Order CONULARIIDA Miller & Gurley

Family CONULARIIDAE Walcott

CONULARIID

Pl. 128, fig. 27

One specimen preserved as an external mold is referred to this group. The specimen is fragmental and was collected from the base of the Ely Limestone.

Locality.—313.

Phylum BRYOZOA

Order CYCLOSTOMATA

Family FENESTELLIDAE King

Genus ARCHIMEDES Owen, 1838

ARCHIMEDES sp.

Pl. 128, fig. 30

Description.—Axis contains ten volutions in a distance of 7.5 cm. Shaft is 2.9 mm. in diameter at the base of the flange and 5.5 mm. at the top. The surface of the shaft is finely striate. Volution height averages 7.5 mm.

Fronds are not attached to the spire of the specimen in this collection, although the spire rests in a hash of fenestellid debris. Fenestrules are elongate and bluntly rounded at either end. Width of fenestrules is 3.5 mm. and the length-width ratio is three to one. Branches are narrow and closely spaced,

averaging 3.7 mm. in width. Dissepiments are 1 mm. in width, smooth and set below the surface of the frond. Apertures are rounded and alternately spaced on either side of a strongly pronounced carina at a distance of about 0.3 mm.

Discussion.—This species of *Archimedes* occurs with the fusulinid, *Fusulinella devexa* of Middle Pennsylvanian age. It differs from other species reported in post-Mississippian rocks primarily in the greater length of the volutions of this *Archimedes*.

Locality.—318.

Family RHABDOMESIDAE Vine
Genus RHOMBOPORA Meek, 1872
RHOMBOPORA LEPIDODENDROIDES Meek, 1872

Rhombopora lepidodendroides Meek, 1872, p. 141, pl. 7, figs. 2a–f.

Description.—Branches are small averaging 2.5 mm. in diameter. Apertures are elongate oval, 0.3 mm. in length and 0.15 mm. in width. Megacanthopores are prominent and well developed, being about half the diameter of the apertures. Micropores are present but are difficult to distinguish on weathered surfaces.

Discussion.—This *Rhombopora* is somewhat larger than typical representatives of the species. However, its wide range throughout the Ely Group limits its stratigraphic value.

Phylum BRACHIOPODA
Class INARTICULATA
Family DISCINIDAE
Genus ORBICULOIDEA d'Orbigny, 1847
ORBICULOIDEA CAPULIFORMIS (McChesney, 1860)
Pl. 125, figs. 8,9

Discina capuliformis McChesney, 1860, p. 72.

Description.—Shell is subcircular in outline. Flattened pedicle valve has an elongated foramen which is bounded on either side by low, rounded ridges. Apex is low and posterior. Growth lines appear distinctly flat and are wider at the apex than at the margins of the valve. In a shell 2.1 cm. in diameter there are 31 growth lines in a distance of 1 cm. These lines appear occasionally to bifurcate and may result from irregular growth.

Brachial valve is an eccentric cone, the markings of which are like those of the pedicle valve. The apex stands 1.2 cm. high in a shell 2.2 cm. long. The largest shell in this collection is a ventral valve which measures 3.1 cm. in length and 2.8 cm. in width.

Locality.—313.

Class ARTICULATA
Order PROTREMIDA-TELOTREMIDA
Suborder ORTHINA
Superfamily ORTHICAE
Family RHIPIDOMELLIDAE
Genus RHIPIDOMELLA Oehlert, 1890
RHIPIDOMELLA ELYENSIS, n. sp.
Pl. 125, figs. 11–16

Description.—Shell is small, subovate in outline, about as wide as it is long. Greatest width is just anterior to the middle of the shell. Shell subequally biconvex, brachial valve more or less evenly convex, anterior half of the pedicle valve is almost flat, becoming gibbous in the umbonal region. Surface of both valves is marked by numerous, hollow lirae, the openings of which produce a punctate surface. Lirae increase by intercalation. Along the line of commissure 70 to 110 lirations may be counted on mature specimens, the average being about four per millimeter.

Cardinal area of both valves is quite small, that of the pedicle valve being incurved, whereas that of the brachial valve is almost in a plane with the line of commissure. The hinge line is about one-fourth the width of the shell. Dimensions of an average specimen are as follows: length 11 mm., width 11 mm., thickness 4.8 mm. Sizes range from juvenile forms of 3 mm. in length to adult specimens 13 mm. in length.

Internally the pedicle valve bears large, flabellate diductor muscle scars that surround an elevated platform which in turn bears the slender adductor scars. Stout dental lamellae diverge and continue onto the floor of the valve where they form a slight ridge around the diductor scars. This ridge is more pronounced along the anterior of the scar than along the lateral margins.

Muscle patterns of the brachial valve are small and indistinct. The cardinal process is small and does not extend onto the floor of the valve as in some species. Crural processes are stout and diverging.

Discussion.—*Rhipidomella elyensis* differs from *R. carbonaria* (Swallow) in that *R. elyensis* is larger, less gibbous and has finer and more closely spaced lirations. It differs from *Rhipidomella nevadensis* (Meek) in that it is smaller than *R. nevadensis* and somewhat less gibbous.

Locality.—309.

Superfamily DALMANELLICAE
Family SCHIZOPHORIIDAE
Genus SCHIZOPHORIA King, 1850

Discussion.—The diagnosis of *Schizophoria* and *Rhipidomella* differ only slightly, the characteristic difference being internal. *Schizophoria* has a median septum and dental lamellae that extend onto the floor of the shell, whereas *Rhipidomella* has no median septum and the dental lamellae surround the muscle scars as elevated ridges.

SCHIZOPHORIA RESUPINOIDES (Cox, 1857)
Pl. 125, figs. 17–19

Schizophoria resupinoides Cox, 1857, p. 570, pl. IX, figs. 1–1b.

Description.—Shell is subquadrate in outline, width about one-fourth greater than length. Valves subequally biconvex, the brachial valve being more gibbous than the pedicle. Hinge-line short, about one-third the width of the shell. Line of commissure is distinctly resupinate. Pedicle valve bears a broad, shallow sulcus. The surface of both valves is lirate.

On the interior of the pedicle valve two thin, dental lamellae bound a narrow muscle field and extend slightly more than one-third the distance to the anterior edge of the valve. A narrow median septum stands well above the floor of the valve and bisects the muscle field.

Crural lamellae extend from the beak of the brachial valve about one-third the distance to the anterior. These lamellae are shorter and more widely divergent than those of the pedicle valve. A low median ridge stands above the floor of the valve but does not extend from the beak.

The single specimen in this collection measures 3.1 cm. in width, 2.6 cm. length and 1.7 cm. in thickness.

Locality.—311.

Suborder TEREBRATULINA
Superfamily TEREBRATULICAE
Family DIELASMATIDAE
Genus DIELASMA King, 1859
DIELASMA BOVIDENS (Morton, 1836)
Pl. 127, fig. 15

Terebratula bovidens Morton, 1836, p. 150.

Discussion.—Two specimens from the lower Ely are assigned to this widely distributed species on the basis of external form only. These large terebratulids appear to fit the concept of *D. bovidens* in shape, but the genus is based on internal features which were not observed in the specimens at hand.

Locality.—313.

Family TEREBRATULIDAE
Genus CRANAENA Hall & Clark, 1893
CRANAENA MINUTA, n. sp.
Pl. 127, figs. 16–21

Description.—Shell is typically terebratelliform, biconvex and elongate with greatest width anterior to mid-region of the shell. Anterior commissure is rectimarginate to uniplicate, beak incurved, pedicle foramen rounded.

Brachial interior is characterized by a perforate, free hinge plate. The posterior end of the plate is bluntly mucronate, and the plate is wider than long—transversely ovoid. The lateral portions are rounded, and there is a slight reentrant along the lateral margin of the plate. The perforation is elongate to oval and is in the center of the plate. At the perforation, the plate is deeply concave.

Crura originate near the anterior end of the perforation, dividing the plate into three distinct regions. At the anterior margin of the plate, two curural processes extend toward the pedicle valve for a short distance. The brachidium is elongate, showing a *Dielasma*-like loop and extends approximately half the distance of the valve.

Pedicle interior is marked by stout dental lamellae which extend to the floor of the valve but not out onto the floor. These lamellae may be adjacent and fused to the sides of the shell so as to form ridges along the side of the shell, or they may be directed more nearly towards the center of the valve, thus leaving a space between the lamina and the shell wall. In neither valve is there a

median septum. A typical specimen is 8 mm. long, 4.5 mm. wide and 3.0 mm. thick. A gerontic form is 7.5 mm. long, 5.5 mm. wide and 5.5 mm. thick.

Discussion.—*Cranaena* in this collection are somewhat smaller than typical members of the genus. It is assumed that these shells are mature, however, for there are specimens that show gerontic characteristics such as crowding of growth lines along the anterior margin and increased gibbosity of the valves.

Cranaena is usually considered to be a Mississippian genus with a range of Middle Devonian to Mississippian. The perforate hinge plate in these Pennsylvanian specimens places them unmistakably in that genus. *Cranaena minuta* is distinguished from all earlier species by its much smaller size and the length of the brachidium which in earlier species does not reach the middle of the valve.

Locality.—309.

Family CENTRONELLIDAE
Genus RHYNCHOPORA King, 1865
RHYNCHOPORA MAGNICOSTA Mather, 1915
Pl. 127, figs. 12–14

Rhynchopora magnicosta Mather, 1915, p. 176, pl. X, figs. 11–11c.

Description.—Shells are subpentagonal; posterolateral margins are almost straight; anterolateral margins are broadly rounded. The anterior is truncate. Greatest width is at about the anterior third of the shell. The width is somewhat greater than the length.

Pedicle valve is gently convex in the umbonal region, becoming flat toward the mid-section. The lateral portions of the anterior third of this valve are somewhat higher than the mid-portion. It is this elevation of the sides rather than an actual depression of the middle that forms the sulcus. At the anterior margin, the valve is sharply geniculate at 90° or more, forming a tongue which protrudes into the dorsal fold. In the pedicle sulcus there are four coarse, flattened plications in the space of 8 mm. and six on each of the lateral slopes.

The brachial valve has three plications in the space of 5 mm. on the fold. Each of the lateral slopes bears six or seven plications. The length of one specimen from the Ely Limestone is 13 mm., the width 14 mm. and the thickness is 9.5 mm. The surfaces of both valves are coarsely punctate.

Locality.—313.

Suborder RHYNCHONELLINA
Superfamily RHYNCHONELLICAE
Family CAMAROTOECHIIDAE
Genus WELLERELLA Dunbar & Condra, 1932
WELLERELLA sp.
Pl. 125, figs. 21–24

Discussion.—Several small shells resembling *Wellerella* are present in the collections from the Ely Limestone. These are exceedingly small, few in number and quite variable in form. The shells average 5.2 mm. in width, 5.0 mm. in length and 3.1 mm. in thickness. All have plicate anterior commissures. It is impossible to determine from evidence at hand whether these forms are juvenile or whether they represent small, mature individuals.

Locality.—309.

Suborder STROPHOMENINA
Superfamily STROPHOMENICAE
Family STROPHOMENIDAE
Genus DERBYIA Waagen, 1884 (emend. Girty, 1908)
DERBYIA aff. D. HAESITANS Dunbar & Condra, 1932
Pl. 125, figs. 26–27

Description.—Shell is large, hinge-line straight, greatest width at or near the hinge line. Cardinal extremities are somewhat rounded, although earlier growth stages appear to be quite rounded. Interarea forms an angle of about 100 degrees with the line of commissure and has an apical angle of 160 degrees. The perideltidal area is faintly visible on some specimens and appears to form an angle of about 90 degrees. A deltidal plate covers the delthyrium which has an apical angle of 40 degrees.

The pedicle valve is almost flat, but some specimens exhibit a ventral curvature along the anterior margin, producing a somewhat concave valve. The beak is very low and inconspicuous. Lirae are high, sharp ridges separated by somewhat wider, flattened striae, and they increase by intercalation. Thus, every third or fourth lira is stronger

than the intervening ones. In a mature specimen there are about 20 lirations per centimeter.

The brachial valve is uniformly convex longitudinally. Transversely the umbonal slopes taper off rather sharply, forming a faint ear-like platform. The umbo is thus rather gibbous. Concentric growth lines interrupt the lirae at irregular intervals across the pedicle valve and are more prominent than those on the brachial valve.

Internally the pedicle valve bears a high median septum which extends from the apex of the delthyrium approximately one-third the length of the shell. The highest point of the septum is just anterior to the delthyrium. From this point it tapers off slowly. Dimensions of a typical specimen are as follows: length 5.4 cm., width 8.1 cm., thickness 2.3 cm.

Discussion.—This species of *Derbyia* is closely allied to *D. haesitans* Dunbar and Condra particularly in shape and outline. However, it may be distinguished from the latter by the nature of its surface ornamentation. The surface of *D. haesitans* is marked by rounded, radial lirae which are separated by narrower striae, whereas the lirae of this *Derbyia* are narrow and ridge-like and are separated by wider, flattened areas.

Locality.—309.

Family CHONETIDAE

Genus CHONETINA Krotow 1888

CHONETINA FLEMINGI (Norwood & Pratten, 1854)

Pl. 125, fig. 25

Chonetes flemingi Norwood & Pratten, 1854, p. 26, pl. 2, fig. 5a–e.

One pedicle valve of a *Chonetina* is present in the collections of the Ely fauna. The valve is radially striate with a narrow, deeply incised sinus.

Locality.—328.

Superfamily PRODUCTICAE

Family PRODUCTIDAE

Genus DIAPHRAGMUS Girty, 1911

DIAPHRAGMUS cf. D. FASCICULATUS McChesney, 1860)

Pl. 127, figs. 9–11

Productus fasciculatus McChesney, 1860.

Discussion.—Two specimens are referred to *Diaphragmus* on the basis of the wide diaphragm and to *D. fasciculatus* on the basis of the length-width ratio of the visceral disc. In *D. fasciculatus* the visceral disc is about one and one-third times wider than it is long. *Diaphragmus* is usually thought of as a Mississippian genus. However, it also occurs in Pennsylvanian rocks in Nevada.

Locality.—311, 323.

Genus DICTYOCLOSTUS Muir-Wood, 1930

DICTYOCLOSTUS AMERICANUS Dunbar & Condra, 1932

Pl. 127, fig. 15

Dictyoclostus americanus Dunbar & Condra, 1932, p. 218, pl. 34, figs. 3–6.

Description.—Shell is subquadrate, length about equal to width. Hinge-line straight, slightly less than the greatest width. Pedicle valve convex regularly across posterior half of the shell. A vague median sulcus is evident from the middle of the visceral disc to the anterior margin of the trail. On the trail, the sulcus is broad and shallow. Fine costae cover the surface, the posterior two-thirds of which is marked by concentric rugae whose strength is equal to that of the costae. The resulting reticulations appear as uniform squares. The ears are of moderate size and are not sharply delineated from the umbonal slopes. Reticulations extend over the ears. Minute spines are distributed irregularly over the surface, although they are coarser on the ears and slopes.

Locality.—327.

Genus ANTIQUATONIA Miloradovich, 1945

Diagnosis.—Semireticulate productids characterized by a pre-aural ridge on either side of the umbo of the pedicle valve. This ridge is the external expression of a vertical partition which separates the visceral cavity from ears. Spines along this ridge are arranged in a single row and increase in size toward the lateral slopes.

Discussion.—Girty (1935, p. 7) pointed out and described the ridge and row of spines between the ears and umbones of some productids he had described earlier, mentioning specifically *Productus hermosanus* and *P. coloradensis*. At the time, Girty apparently did not consider these features of generic value, for the status of the two mentioned species remained unchanged. Miloradovich (1945, p. 496), sepa-

rated the genus *Antiquatonia* from the genus *Dictyoclostus* on the basis of the pre-aural crests described by Girty. The crests and spines are well displayed on several of the Ely *Antiquatonia*.

ANTIQUATONIA HERMOSANA (Girty, 1903)
Pl. 126, figs. 5–8

Productus semireticulatus var. *hermosanus* Girty, 1903, p. 358, pl. II, figs. 1–4.

Description.—Shell is subquadrate in outline. Pedicle valve is gibbous and geniculate. A sulcus begins anterior to the beak as a broad, gentle depression and continues towards the front increasing only slightly in depth. The sulcus is most pronounced on the anterior slope, becoming obsolescent both at the beak and along the anterior margin. Costae are small and rounded on the visceral disc and are uniformly crossed by concentric rugae at intervals about twice the distance of the costae, thus producing more or less rectangular reticulations. On the visceral disc costae increased by bifurcation.

On the anterior slope, the costae increase greatly in strength and in some cases coalesce. The ears are moderately large, and are bluntly rounded to somewhat mucronate. Beginning just anterior to the beak and above the auriculations, there is a single row of spines along a raised costation, the curvature of which parallels that of the visceral portion of the pedicle valve. The posterior spines are small and rather close together, but spines are coarser and more widely separated towards the anterior. Spines elsewhere about the shell are coarse and irregularly spaced. The spines do not appear to affect the pattern of the surface markings. A typical specimen is 35 mm. in length, 40 mm. in width, and 21 mm. in thickness.

This species is common in the Ely Limestone, particularly in the lower part of the sequence.

Locality.—314.

ANTIQUATONIA ELYENSIS, n. sp.
Pl. 126, figs. 12–14; pl. 127, figs. 8–11

Description.—Shell is subquadrate longitudinally. Beak is small; hinge-line is straight. Pedicle valve is gibbous, convex, geniculate. A median sulcus begins on the visceral disc as a vague, shallow depression and continues down the anterior slope where it is more deeply sinuate in some specimens than in others. Low rounded costae are crossed by concentric rugae on the visceral disc; on the slopes, the costae increase by intercalation. Eight to ten costae occur in the space of 1 cm., and their width is about equal to the space separating them. The surface is marked by numerous slender spines distributed more or less regularly over the surface. A single row of pre-aural spines runs from the beak along the anterolateral margin. There is a ridge parallel to this row of spines as in *Antiquatonia hermosana.*

The brachial valve is moderately concave, being almost flat across the visceral disc, and in some shells there is a slight fold corresponding to the sulcus of the pedicle valve. The visceral disc is reticulate and without visible spines. A typical specimen is 20 mm. in length, 25 mm. in width, and 13 mm. in thickness.

Internally, the brachial valve shows a strong cardinal process from which two short ridges protrude laterally. There is no median septum.

Discussion.—*Antiquatonia elyensis* differs from *Antiquatonia hermosana* (Girty) in that the former is much smaller than *A. hermosana;* from *A. morrowensis* (Mather) in that *A. elyensis* is costate whereas *A. morrowensis* is lirate.

Locality.—314, 309.

Subfamily MARGINIFERINAE
LISSOMARGINIFERA, n. gen.

Diagnosis.—Faintly ornamented Marginiferinae characterized by a pair of spines on each ear, an outer coarse spine directed posteriorly in line with the lateral margin of the ear, and a very short slender inner spine half of the distance from the beak to the tip of the ear. Otherwise, the surface is commonly devoid of ornamentation. Faint rugae may be seen on the visceral discs of some specimens, and discernible striae are also occasionally present, but they are not characteristic. The surface is marked by only a few coarse spines, usually with one on either umbonal slope and four to six scattered irregularly about the mesial por-

tion of the pedicle trail. The brachial valve is without spines.

The cardinal process is rather short and stout, with three lobes projecting posteriorly, the central lobe being the longer. Muscle scars of the brachial valve are elevated, flabellate platforms separated by a low median ridge which arises just anterior to the base of the cardinal process and continues forward half the distance of the visceral disc. Anterior and lateral to the muscle scars are reniform brachial impressions. Along the anterior margin of the visceral disc there are six to eight small spines which would seem to ally the genus to Marginifera. At the posterolateral margins of the disc, there are wrinkles that correspond to those of the ventral valve and may result in facilitated articulation.

The pedicle interior is typically smooth with only faint diductor scars. Adductor scars are on a prominent platform that is raised well above the floor of the valve. This platform extends about halfway across the valve and is bluntly rounded at the anterior end. The posterior end of the adductor muscle platform tapers narrowly and does not reach to the hinge-line of the shell.

Genotype.—*Lissomarginifera nuda* n. sp.

Discussion.—This genus closely resembles *Marginifera* Waagen, particularly in the marginal flange of the brachial valve that characterizes both shells. However, this genus differs from *Marginifera* in its disposition of spines and its typically smooth surface.

LISSOMARGINIFERA NUDA, n. sp.
Pl. 127, figs. 1–7

Description.—Shell is evenly rounded in outline anterior to the hinge-line. Greatest width is at the hinge-line, and the shell is wider than it is long. Ears are distinct from the umbonal slope and are angular to almost mucronate. The pedicle valve is strongly convex, and the curvature is geniculate. The surface of both valves is typically devoid of prominent ornamentation, although faint striae and rugae are present. Some specimens with the spines still intact exhibit a completely smooth surface, and the

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EXPLANATION OF PLATE 127

FIGS. *1–7*—*Lissomarginifera nuda*, n. sp. *1–5*, pedicle exterior showing distribution of spines over the surface, brachial exterior showing spines along the hinge-line, anterior, and side view of genoholotype, USC 5055, ×1; *6*, brachial interior, USC 5057, ×1; *7*, pedicle exterior showing faint costae, USC 5056, ×1.

–11—*Antiquatonia elyensis*, n. sp. Brachial view of a partial valve, pedicle exterior, hinge-line, side view, USC 5054, ×1.

12–14—*Rynchopora magnicosta* Mather. Lateral view, brachial exterior, pedicle exterior, USC 5059, ×1.

15—*Dielasma bovidens* (Morton). Pedicle exterior, USC 5060, ×1.

16–21—*Cranaena minuta*, n. sp. *16–19*, pedicle exterior, brachial exterior, side view, anterior view of holotype, USC 5061, ×3; *20*, interior view of hinge-line showing perforated hinge-plate, USC 5063, ×3; *21*, lateral view of a gerontic specimen showing crowded growth lines, USC 5062, ×3.

22–29—*Punctospirifer campestris* (White). *22–25,28*, brachial exterior, pedicle exterior, anterior, side view, hinge-line, USC 5065, ×1; *26*, brachial interior, USC, 5067 ×1; *27*, pedicle interior of a distorted specimen, USC 5066, ×1; *29*, pedicle exterior of a gerontic specimen, USC 5068, ×1.

30—*Punctospirifer transversus* (McChesney). Anterior of a specimen with the ears broken, USC 5069, ×1.

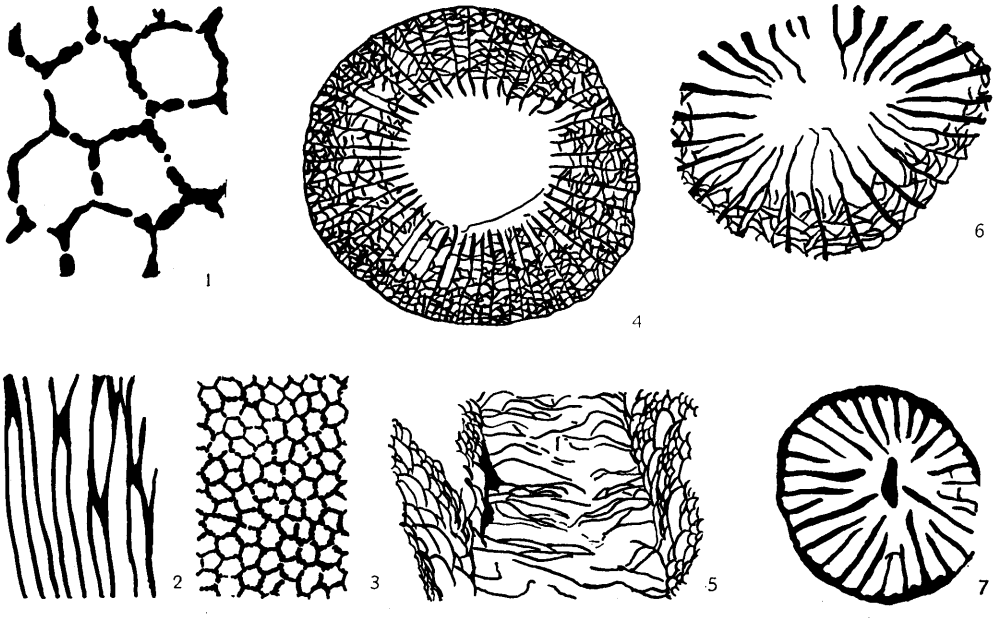
31–33—*Composita argentea* (Shepard). Anterior, brachial exterior, pedicle exterior, USC 5070, ×1.

34–35—*Crurithyris planoconvexa* (Shumard). Lateral view, pedicle exterior, USC 5071, ×3.

36–37—*Cleiothyridina orbicularis* (McChesney). Brachial exterior, pedicle exterior of an exfoliated specimen, USC, 5072, ×1.

38–41—*Hustedia miseri* subsp. *gibbosa*, n. subsp. Pedicle exterior, brachial exterior, side view, hinge-line of the holotype, USC 5073, ×1.

42–45—*Hustedia rotunda*, n. sp. Hinge-line, side view, brachial exterior, pedicle exterior of the holotype, USC, 5075, ×1.



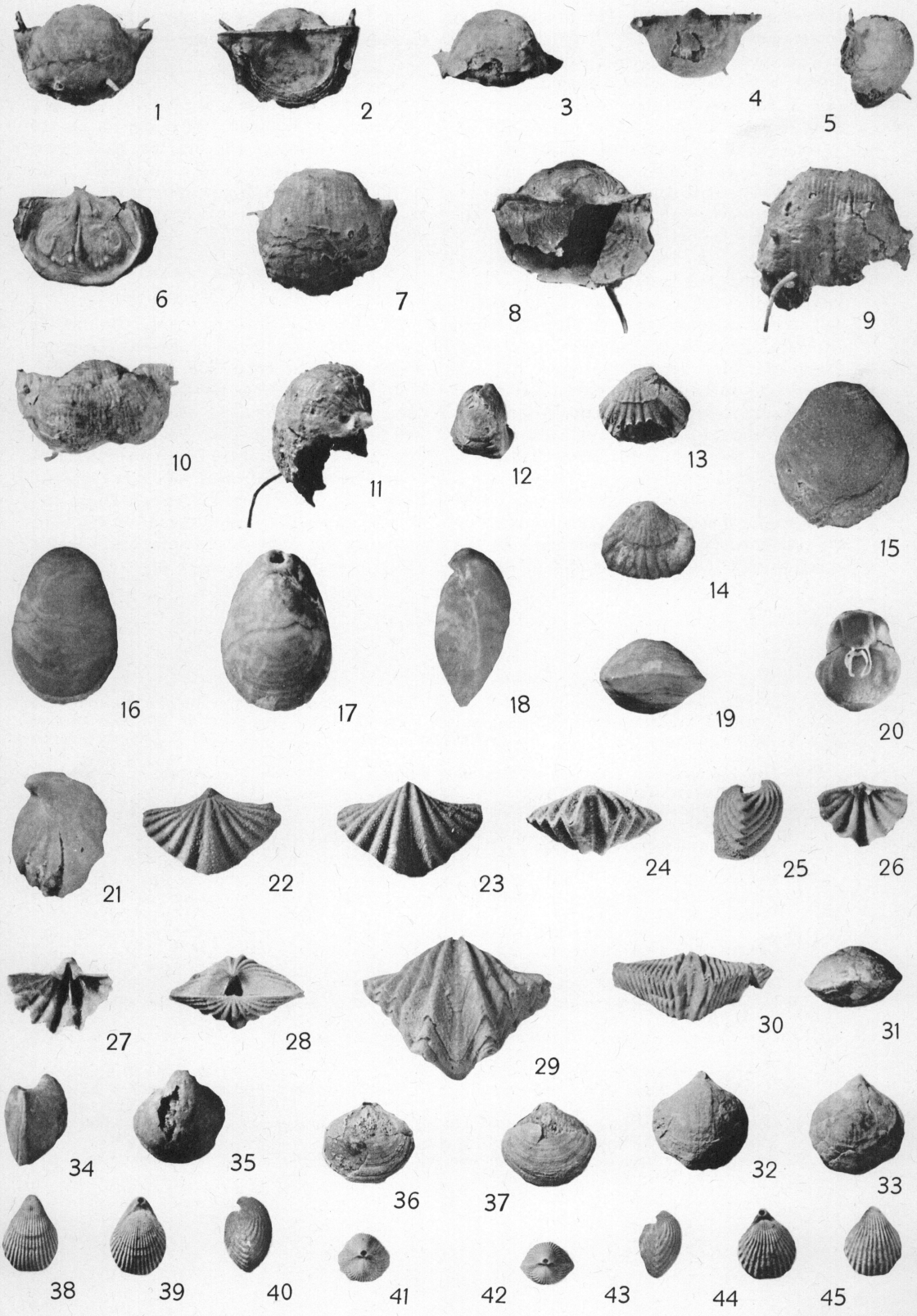
TEXT-FIGS. *1–3*—*Chaetetes favosus* Moore & Jeffords. *1*, transverse section, USC, 5018, ×45; *2*, longitudinal section, USC 5019, ×15; *3*, transverse section, USC 5018, ×15.
4–6—*Caninia torquia* (Owen). *4*, transverse section of a large specimen, USC 5020, ×1⅓; *5*, longitudinal section. Tabulae in this specimen are broken, USC 5022, ×1⅓; *6*, transverse section of an immature specimen in which the theca is eroded away, USC 5021, ×2½.
7—*Lophophyllidium* sp. Transverse section, USC 5023, ×1½.

Description.—Massive, rounded to subcylindrical colonies are composed of fine, prismatic corallites. Tubes are nearly straight although they curve from the center of the colony so as to intersect the surface of the colony at right angles.

In transverse section the corallites appear generally uniform in both size and shape. The walls of the corallites appear spongy and have irregular edges. The porous appearance results from wall structure rather than the presence of mural pores. Pseudosepta are present but rare. Corallites average 0.3 mm. in diameter.

EXPLANATION OF PLATE 126
All figures ×1

FIGS. *1,3,4*—*Linoproductus prattenianus* (Norwood & Pratten). *1*, pedicle exterior, USC 5044; *3*, brachial interior, showing muscle scars, USC 5046; *4*, cardinal process, USC 5047.
2—*Linoproductus magnispinus* Dunbar & Condra. Pedicle exterior, USC 5045.
5–8—*Antiquatonia hermosana* (Girty). Pedicle exterior, side view, brachial exterior, view of the hinge-line, USC 5048.
9–11—*Diaphragmus* cf. *D. fasciculatus* (McChesney). *9*, pedicle exterior, USC 5049; *10*, brachial interior showing diaphragm, USC 5051; *11*, pedicle exterior of a smaller specimen, USC 5050.
12–14—*Antiquatonia elyensis*, n. sp. Anterior, side view, hinge-line of holotype, USC 5052.
15—*Dictyoclostus americanus* Dunbar & Condra. Pedicle exterior of a very large specimen, USC 5103.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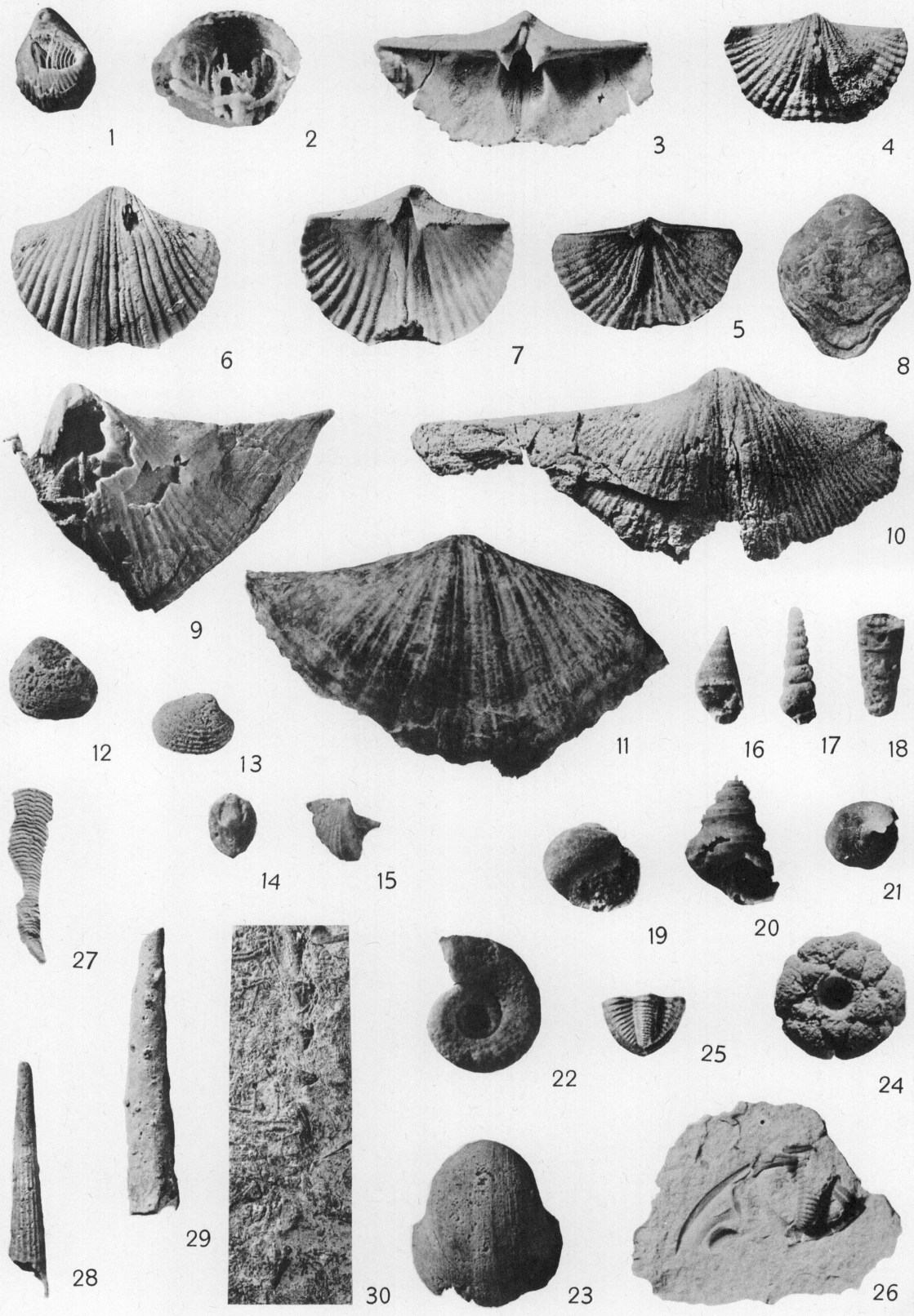
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presence of the spines precludes erosion of the costae.

From each of the ears, two spines arise. An outer, coarse spine is directed posteriorly in the same plane as the lateral margin of the ear. An inner, smaller spine, quite short and slender, is half the distance from the beak to the tip of the ear, and is directed dorsally.

The brachial valve is moderately concave except for the margin which is produced by crowded growth lines which form a shelf-like margin. The width of this marginal shelf is about one-fourth the length of the brachial valve, and it extends along the lateral margins almost to the hinge-line.

Internally, the features of the brachial valve are distinctive. Beginning at the cardinal process, a flange-like ridge extends around the periphery, and the posterior margin of this marginal flange is crenulate. The median septum is quite low in the posterior portion of the shell, becoming high at the anterior margin of the visceral disc. At the anterior margin of the visceral disc, there is a row of from eight to ten coarse, short spines. These spines are arranged in an arc in front of each brachial impression. A typical specimen is 15 mm. in length, 21 mm. in width, and 10 mm. in thickness.

Discussion.—*Lissomarginifera nuda* differs from *Kozlowskia splendens* (Norwood & Pratten) in that *L. nuda* lacks a sulcus and essentially lacks surface ornamentation. It also has a high median septum that reaches the anterior edge of the visceral disc, whereas *K. splendens* has a low median septum that does not reach the margin of the visceral disc.

Locality.—309.

EXPLANATION OF PLATE 128

FIGS. *1,2*—*Hustedia rotunda*, n. sp. *1*, interior showing spire, USC 5077, ×1; *2*, interior showing ornamentation of the jugum, USC 5104, ×3.

3–7—*Spirifer occiduus* Sadlick. *3*, pedicle interior showing thickening along the hinge-line, USC, 5078, ×1; *4,5*, brachial exterior brachial interior, USC 5079 ×1; 6,7 pedicle exterior, pedicle interior USC 5080, ×1.

8—*Composita subtilita* (Hall). Pedicle exterior, USC 5081, ×1.

9–11—*Neospirifer triplicatus* (Hall). *9*, pedicle exterior showing mucronate extremities, USC 8052, ×1; *10*, pedicle exterior of a portion of an extremely large specimen, USC 5083, ×1; *11*, pedicle exterior of a typical specimen, USC 5102×1.

12—*Nuculana* sp. Left valve of a poorly preserved specimen, USC 5085, ×3.

13—*Astartella* sp. Right valve, USC 5084, ×3.

14,15—*Conocardium* sp. Left valve, cardinal view of a very small specimen, USC 5086, ×3.

16—*Meekospira* sp. Side view, USC 5087, ×3.

17—*Leptozyga* sp. Side view, USC 5089, ×3.

18—*Pseudorthoceras* sp. Side view, USC 5091, ×3.

19—*Platyceras* sp. Side view, USC 5090, ×3.

20—*Baylea* sp. Side view, USC 5088, ×3.

21—*Spirorbis* sp. Tightly coiled shell, USC 5092, ×3.

22—*Amphiscapha* sp. Basal view, USC 5096, ×3.

23—*Bellerophon* sp. Back view showing ornamentation, USC 5093, ×3.

24—Crinoid cup in which the anal plate is shown within the basal circlet, USC 5097, ×1.

25,26—*Ditomopyge ?* sp. *25*, pygidium, USC 5098, ×1; *26*, a free cheek and a portion of a pygidium, USC 5099, ×1.

27—Conularid. External mold, USC 5100, ×1.

28—*Dentalium* sp. Side view showing ornamentation, USC 5094, ×3.

29—*Plagioglypta* sp. Side view. *Spirorbis* is encrusted on the surface, USC 5095, ×1.

30—*Archimedes* sp. Side view of the spire, USC 5101, ×1.

Genus LINOPRODUCTUS Chao, 1927
LINOPRODUCTUS MAGNISPINUS Dunbar & Condra, 1932
Pl. 126, fig. 2

Linoproductus magnispinus Dunbar & Condra, 1932, p. 244, pl. XXVII, figs. 6–8.

Description.—Shell is elongate with greatest width along hinge-line. Pedicle valve is geniculate and its beak is incurved. Shell is thin and ornamented with numerous lirations. In a typical shell, there are seven or eight lirations in the space of 5 mm. across the middle of the pedicle valve. A few stout spines are scattered over the surface with one or two in the center of a slight mesial sulcus. Five or six spines are on each ear and are smaller than the body spines. The bases of the spines are formed at the anastomosing of three or four lirations, which separate on the anterior side of the spine. Ears are of moderate size and are somewhat angular. Four or five wrinkles appear on each ear but fade away on the anterolateral slopes.

The brachial valve is somewhat concave, although the visceral disc is rather flat. At the trail the valve is sharply geniculate.

A typical specimen is 3.8 cm. in width and 4.6 mm. in length.

Locality.—316.

LINOPRODUCTUS PRATTENIANUS (Norwood & Pratten, 1855)
Pl. 126, fig. 1

Productus prattenianus Norwood & Pratten, 1855, p. 17, pl. 1, figs. 10a–d.

Description.—Shell is suboval in outline. Pedicle valve is uniformly convex and almost hemispherical. Greatest width is at the hinge-line. Shell is geniculate at the trail. A typical specimen is 4.8 cm. wide.

Low, rounded costae radiate from the beak and increase by intercalation across the valve. Costae also increase in coarseness towards the anterior slope. In the umbonal region ten or eleven costae occupy a space of 5 mm., whereas seven or eight occupy the same space across the visceral portion of the pedicle valve.

Spines are coarse and erect and uniformly disposed over the pedicle valve in a quincunxial pattern. Thirty-two spines are present on the visceral portion of a shell 4.8 cm wide. Spine bases may be formed from one or more (usually two or three) costae. These costae separate on the anterior edge of the spine base.

Internally the adductor muscle scars are closely spaced, being separated only by a low median ridge. The diductors are widely separated and somewhat tear-shaped, the attenuated portion being directed toward the center of the valve.

Locality.—309.

Suborder SPIRIFERINA
Superfamily SPIRIFERICAE
Family SPIRIFERIDAE
Subfamily SPIRIFERINAE
Genus SPIRIFER Sowerby, 1815
SPIRIFER OCCIDUUS Sadlick, 1960
Pl. 128, figs. 3–7

Spirifer opimus var. *occidentalis* Girty, 1927, p. 433, pl. 27.
Spirifer occiduus Sadlick, 1960, p. 1210.

Description.—Shell is spiriferoid in shape, the width being a little greater than the length, and the greatest width is at the hinge-line. A shell of average size has the following dimensions: width, 4.2 cm.; length 2.7 cm. The cardinal extremities may be slightly mucronate, but they are usually somewhat rounded.

Eleven to thirteen subangular plications mark the slopes of the pedicle valve. At the umbo, the ribs are simple, but as they begin to expand, they bifurcate and continue over the surface as simple plications. The sulcus contains three to five ribs of which the medial one is commonly rather prominent. The beak is slightly incurved. Brachial fold is well defined, usually having from four to six plications.

Short, stout dental lamellae support the teeth of the pedicle valve but do not extend out onto the floor of the valve. Adductor muscle scars are deeply incised, and the scar itself is usually saggitate in shape. This area is bounded by rounded, almost flabellate diductor scars. The valve is without a median septum.

Incipient deltidal plates border the delthyrium which forms a high narrow triangle. Interarea is broad and flat, the palintrope of which is serrate. The space beneath the interarea of the pedicle valve is usually much thickened.

Brachial interiors are simple without

median septa. There is a thin interarea which is cleft by a broad notothyrium. The latter is bounded by short brachiophores.

Locality.—320, 321.

Genus NEOSPIRIFER Fredericks 1919

NEOSPIRIFER TRIPLICATUS (Hall, 1852)

Pl. 128, figs. 9–11

Spirifer triplicatus Hall, 1852, Append. E, p. 410.

Description.—Shell is of medium size, typically about 5 to 7 cm. in width and 4 to 5 cm. in length. Outline is subtriangular, and cardinal extremities are sharply defined. A narrow sulcus bounded by two distinct ribs begins at the umbo and fans out into a broad shallow depression on the anterior slope. The ribs bifurcate just anterior to the umbo and increase thereafter by bifurcation. Towards the anterior, the fascicles usually consist of three subrounded ribs which are unequal in size. There are from ten to twelve fascicles present on a mature shell.

Ornamentation of the brachial valve is similar to that of the pedicle valve except that there are commonly one or two fewer fascicles on the brachial valve.

Locality.—309, 327.

Subfamily AMBOCOELIINAE George

Genus CRURITHYRIS George, 1931

CRURITHYRIS PLANOCONVEXA (Shumard, 1855)

Pl. 127, figs. 34,35

Spirifer plano-convexa, Shumard, 1855, p. 202.

Description.—Shell is small, plano-convex with the length and width about equal. Pedicle valve is quite convex, hinge-line short and straight, being about five-eights of the greatest width of the shell. Beak is high and incurved. Interarea is a high, narrow triangle, the flat surface of which contrasts sharply with the rounded surface of the posterolateral margins. Delthyrium is high and narrow, and bounded on the sides by low flanges. Brachial valve is variably concave, flat or convex.

The surface of both valves appears granular. Dunbar and Condra (1932, p. 345) state that these granules represent minute spine bases.

Discussion.—*C. planoconvexa* is rare in the Ely limestone, only seven specimens being found among a myriad small shells. These crurithyrids are also somewhat smaller than those recorded from other localities. An average specimen measures 5 mm. in width and 4.5 mm. in width.

Locality.—309.

Superfamily ROSTROSPIRICAE

Family RHYNCHOSPIRINIDAE

Genus HUSTEDIA Hall & Clark, 1893

HUSTEDIA ROTUNDA, n. sp.

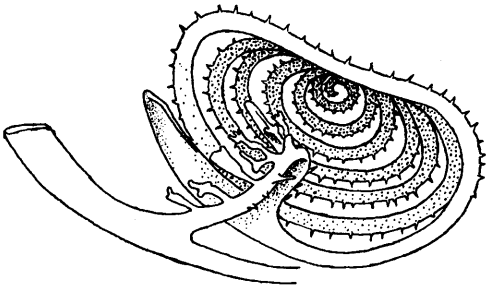
Pl. 127, figs. 42–45; text-fig. 8

Description.—Shell sub-ovate in outline, greatest width just anterior to middle portion of the shell, greatest thickness just anterior to brachial beak. Anterior margin slightly truncated in some specimens, and a vague sulcus is present on some pedicle valves. The surface is marked by 20 to 24 costellae with an average of 22. Costellae are rounded, equal to the depressions that separate them, and are of uniform size in the center of the shell, decreasing rapidly in size towards the posterolateral margins.

Pedicle valve more convex towards the beak. Beak sub-erect. Foramen terminal, sub-circular. Symphytium small, triangular with the apex truncated by the foramen. Posterior end is parallel with the line of commissure. Internally muscle scars are not visible, and there are no dental lamellae.

The brachial valve is more rounded in outline than the pedicle valve, being almost oval and is slightly less convex. Internally a short median septum extends anteriorly one-fourth the length of the valve and supports a tongue-like cardinal process which is recurved into the pedicle valve.

Internally the spiralia appear as com-



TEXT-FIG. 8—One arm of the spiralium of *Hustedia rotunda*, about ×7.

pressed cones of eight volutions and the outer rims are marked by numerous minute spines. The yoke is highly ornamented with spines and antler-like processes (text-fig. 8).

Dimensions (in mm.) of seven typical shells are as follows:

Length	Width	Thickness	No. of costellae
12.7	9.8	7.4	24
14.1	11.5	9.1	22
11.7	9.1	6.9	22
10.6	9.0	6.8	22
8.0	6.7	4.8	24
9.9	7.9	6.6	20

Discussion.—Well preserved specimens of *Hustedia rotunda* are easily distinguished from other Pennsylvanian species of that genus. *Hustedia rotunda* differs from *H. miseri* Mather in that the latter has "about 20 . . . plications," whereas *H. rotunda* has an average of 22. The costellae are coarse and of equal strength in the central portion of the shell, decreasing markedly in size towards the lateral margins. The most striking characteristic of this species, however, is the almost circular outline of the brachial valve, separating it from any other species of *Hustedia*, which consistently have elongate outlines. Rounded costae of *Hustedia rotunda* also serve to distinguish it from *H. miseri* which has markedly angular costae. *Hustedia mormoni* may be differentiated from *H. rotunda* by the smaller number of costae in *H. mormoni*.

Locality.—309.

HUSTEDIA MISERI subsp.
GIBBOSA, n. subsp.
Pl. 127, figs. 38–41

Description.—Shell oval in outline, somewhat incurved toward the beak. Anterior end and anterolateral margins tend to be truncated causing the oval outline in some specimens to appear polygonal. A vague sulcus is present on the pedicle valve without a corresponding fold on the brachial valve. Twenty to twenty-four rounded costellae are present on both valves. These costellae are coarse in the middle of each valve and decrease progressively in size towards the lateral margins.

The pedicle valve increases in convexity towards the beak. Beak sub-erect. Foramen terminal, subcircular. Symphytium small, subriangular, posterior portion slightly incurved towards the pedicle interior. Anterior portion lies in a plane with the line of commissure.

Brachial valve is oval and slighly less convex than the pedicle valve. Internally this species resembles *Hustedia rotunda*.

Discussion.—This species of *Hustedia* is distinguished from *H. rotunda* by its coarser costae, uniform decrease in size of costae towards lateral margin and more nearly oval brachial valve; from *H. miseri* and *H. mormoni* by its rounded and more numerous costae and more gibbous nature of the valves.

Locality.—309.

Family ATHYRIDAE
Subfamily ATHYRINAE
Genus CLEIOTHYRIDINA Buckman, 1906
CLEIOTHYRIDINA ORBICULARIS
(McChesney, 1860)
Pl. 127, figs. 36,37

Athyris orbicularis McChesney, 1860, p. 47.
Cleiothyridina orbicularis (McChesney), Dunbar & Condra, 1932, p. 359, pl. XLII, figs. 1–4.

Description.—Shell is almost equally biconvex, sub-oval in outline. Anterolateral and posterolateral margins tend to be somewhat straight, however, causing outline to be slightly angular. Greatest width is just posterior to the middle of the shell; greatest thickness is about in the center of the shell. Anterior margin may be truncated, and a vague sulcus may be present on the pedicle valve.

Pedicle valve is more gibbous than the brachial valve. Pedicle beak is incurved and erect with a small circular foramen at the tip. Deltidal plates are not seen, and palintrope is small.

Surfaces of both valves are marked with irregularly spaced, concentric lamellae. The anterior margins of the lamellae are produced into minute spines, causing well preserved specimens to appear almost fuzzy.

The largest specimen observed in the collection is 13.5 mm. in length, 15.2 mm. in width and 8.1 mm. thick. Several specimens approach this size and some fragments indicate that definitely larger specimens exist; however, the average length is somewhat smaller than 15 mm.

Locality.—309.

Genus COMPOSITA Brown, 1849
COMPOSITA ARGENTEA (Shepard, 1838)
Pl. 127, figs. 31–33

Terebratula argentea Shepard, 1838, p. 152, fig. 8.

Description.—Shell small, suboval in outline, greatest width about mid-region. Length approximately equal to width. Valves are nearly equally convex, with brachial valve being perhaps more so. Pedicle beak is low and incurved; in many shells the beak is only slightly more prominent than that of the brachial valve. The foramen is often obscure, but when present it is small and oval. There is no interarea. The surfaces of both valves are characterized by closely spaced, concentric growth lines. The anterior commissure is gently sinuate, reflecting a shallow pedicle sulcus and an almost obsolete brachial fold.

Dimensions of an average specimen are as follows: length, 16.5 mm.; width, 16 mm.; height 17 mm.; thickness 11 mm.

Discussion.—This writer follows the arguments of Dunbar and Condra in using the name *C. argentea* to distinguish small, subcircular compositas. Shells of this description occur commonly in the basal Ely, and it is felt that the species can be distinguished readily.

Locality.—313.

COMPOSITA SUBTILITA (Hall, 1852)
Pl. 128, fig. 8

Terebratula subtilita Hall, 1852, p. 409, pl. IV, figs. 1a–2c.
Composita subtilita (Hall), Dunbar & Condra, 1932, p. 363, pl. XLIII, figs. 7–13.

Description.—Shell oval, greatest width is anterior to the midregion of the shell, width is almost two-thirds the length. Pedicle beak is prominent, incurved and obscures the brachial beak. Pedicle valve bears a deep sulcus at the anterior margin where it is almost uniformly rounded. Toward the central part of the valve, the sulcus becomes narrow and shallow and remains so until it reaches the umbonal region.

A narrow fold beings near the beak of the brachial valve and continues almost imperceptibly across the central portion of the valve. Near the anterior margin, the anterolateral margins sweep down sharply toward the pedicle valve, thus forming a very prominent fold just at the anterior margin. The anterior of the shell is emarginate.

Concentric growth lines are irregularly spaced over the surface of both valves.

An average specimen has the following dimensions: length, 27 mm.; width, 25 mm.; thickness, 16 mm.

Locality.—313.

Superfamily PUNCTOSPIRICAE
Family SPIRIFERINIDAE
Genus PUNCTOSPIRIFER North, 1920

Internally, the pedicle valve bears a high median septum and short, strong dental lamellae. In the brachial valve the jugum is slender and V-shaped with its apex directed posteriorly and into the pedicle valve.

PUNCTOSPIRIFER CAMPESTRIS (White, 1874)
Pl. 127, figs. 22–29

Spiriferina spinosa var. *campestris* White, 1874, p. 21.
Spiriferina octoplicata Sowerby, White, 1877, p. 139, pl. X, figs. 8a–8c.

Diagnosis.—Shell biconvex, greatest width at or near hingeline, cardinal extremities may be either rounded or angular. Interarea is a low, broad triangle, longitudinally concave.

Pedicle valve is more gibbous than the brachial valve. The beak is incurved, small and pointed. From the beak arise four subrounded plications, the others arising indistinctly from either side of the beak. In a shell measuring 27 mm. wide and 18.8 mm. long, twelve costae lie on either side of the sulcus. The floor of the sulcus is distinctly flattened.

The brachial valve is smaller than the pedicle and is less gibbous. There are six costae on either side of the mesial fold. In various mature specimens, this number varies from five to six. The angularity of the costae is inconsistent as well, so that a gradation from rounded to angular may be seen. The surface of both valves is ornamented with concentric, irregularly spaced growth lines. These lines may be obsolete in the early stages, but when they are present, they usually show rounded cardinal extremities even if the later ones are angular. Short spines may be present on the anterior third of both valves.

Discussion.—This species of *Puncto*

spirifer differs from *P. transversus* in that *P. transversus* has numerous, evenly spaced growth lines and the mesial fold is bilobed; from *P. spinosus* in that the latter has evenly spaced, rounded growth lines, a semicircular periphery, and is much smaller in size than *P. campestris;* and from *P. kentuckeyensis* in that *P. kentuckeyensis* possesses evenly spaced growth lines and a small plication in the bottom of the sulcus.

Locality.—309.

PUNCTOSPIRIFER TRANSVERSUS
(McChesney, 1860)
Pl. 127, fig. 30

Spirifer transversa McChesney, 1860, p. 42.
Spiriferina transversa (McChesney), 1915, p. 92, pl. XIII, figs. 7,8.

One specimen of *Punctospirifer transversus* was discovered in the Ely Limestone. The surface ornamentation and the small ridge in the pedicle sinus seem to place this *Punctospirifer* unmistakably in the species *P. transversus. P. transversus* is usually associated with Mississippian fauna. Mather, however (1915, p. 192), reported it from Morrowan rocks in Arkansas. It is here reported from younger Pennsylvanian rocks than heretofore.

Locality.—324.

Phylum MOLLUSCA
Class PELECYPODA

Several small pelecypods are present in the collections from the lower Ely Limestone. These specimens are poorly preserved and somewhat rare, being found at only one locality (USC 313). Three of these pelecypods are referred to the following genera:

Genus ASTARTELLA Hall, 1858
ASTARTELLA sp.
Pl. 128, fig. 13

Genus NUCULANA Link, 1807
NUCULANA sp.
Pl. 128, fig. 12

Genus CONOCARDIUM Bronn, 1834
CONOCARDIUM sp.
Pl. 128, figs. 14–15

Class SCAPHOPODA

Two scaphopods were collected from the lower portion of the section at USC locality 313. They are referred to two common Pennsylvanian genera.

Genus DENTALIUM Linnaeus, 1758
DENTALIUM sp.
Pl. 128, fig. 28

Genus PLAGIOGLYPTA Pilsbry, 1898
PLAGIOGLYPTA sp.
Pl. 128, fig. 29

Class GASTROPODA

Gastropods are much more commonly represented in the Ely Limestone than are the pelecypods, but they occur at only a few places; they are most common at USC locality 313. Since almost all of the shells are small, it is assumed that they represent a sorting phenomenon rather than an ecological association. One genus, *Baylea,* occurs rather commonly with *Amphiscapha* in silicified strata in the upper part of the Ely at USC locality 309. However, the shells are still quite small, averaging only about 5 mm. in length. A few large specimens of a species of *Euomphalus* are present in the collection; however, these are not silicified and occur only as fragments. The most common of the genera present are listed below. Some specimens are referred only tentatively to a genus.

Genus MEEKOSPIRA Ulrich and Scofield, 1897
MEEKOSPIRA sp.
Pl. 128, fig. 16

Genus? LEPTOZYGA Knight, 1930
LEPTOZYGA sp.
Pl. 128, fig. 17

Genus BAYLEA Koninck, 1883
BAYLEA sp.
Pl. 128, fig. 20

Genus PLATYCERAS Conrad, 1840
PLATYCERAS sp.
Pl. 128, fig. 19

Genus AMPHISCAPHA Knight, 1942
AMPHISCAPHA sp.
Pl. 128, fig. 22

Genus EUOMPHALUS, Sowerby, 1814
EUOMPHALUS sp.
Not figured

MURPHY, D. R., 1954, Fauna of the Morrowan rocks of central Utah: Brigham Young Univ. Research Studies, Geol. Ser., v. 1, no. 3, 64 p.

NORTH, F. J., 1920, On *Syringothyris* Winchell and certain Carboniferous brachiopoda referred to *Spiriferina* D'Orbigny: Quart. Jour. Geol. Soc. London, v. 76, p. 162–227.

NORWOOD, J. C., & PRATTEN, H., 1854, Notice of Producti found in the Western States and Territories, with descriptions of twelve new species: Acad. Nat. Sci. Philadelphia, v. 3, p. 5–31, il.

OWEN, D. D., 1852, Report of a geological survey of Wisconsin, Iowa, and Minnesota and incidentally of a portion of Nebraska Terr.: 38, 638 p., map, illus., Philadelphia.

PLUMMER, F. B., 1920, The Carboniferous rocks of the Llano region of central Texas: Texas Univ. Pub. 4329.

SADLICK, WALTER, 1960, New name for *Spirifer occidentalis* (Girty) and its geologic history: Jour. Paleontology, v. 34, no. 6, p. 1210–1214.

SHUMARD, B. F., 1855, Geological section on the Mississippi River from St. Louis to Commerce: Missouri Geol. Survey, Ann. Rept. 1–2, pt. 2, p. 139–208, maps, illus.

SPENCER, A. C., 1917, Geology and ore deposits of Ely, Nevada: U. S. Geol. Survey Prof. Paper 96, 189 p., maps.

STEHLI, F. G., 1954, Lower Leonardian Brachiopoda of the Sierra Diablo: Bull. Amer. Mus. Nat. Hist., v. 105, art. 3, 358 p.

THOMPSON, M. L., 1942, Pennsylvanian in New Mexico: New Mexico School Mines Bull. 17, 90 p., ils.

——, 1948, Protozoa; Studies of American Fusulinids: Kansas Univ. Paleontology Contr., no. 4, art. 1, 184 p., illus.

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WHITE, C. A., 1874, Preliminary report upon invertebrate fossils collected by expeditions of 1871, 1872 and 1873, with descriptions of new species: U. S. Geog. Survey west of the 100th Merid., 27 p.

——, 1877, Report upon the invertebrate fossils collected in portions of Nevada, Utah, Colorado, New Mexico, and Arizona . . . : U. S. Geog. Survey west of the 100th Merid., pt. 4, v. 1, 219 p., il.

MANUSCRIPT RECEIVED JUNE 26, 1961

Genus BELLEROPHON Montfort, 1808
BELLEROPHON sp.
Pl. 128, fig. 23

Class CEPHALOPODA

A few orthoceracones were collected with silicified fossils from USC locality 313. One specimen is here referred to the genus *Pseudorthoceras* on the basis of a slight curvature of the adapical region.

Genus PSEUDORTHOCERAS Girty, 1911
PSEUDORTHOCERAS sp.
Pl. 128, fig. 18

Phylum ANNELIDA
Class CHAETOPODA
Genus SPIRORBIS Lamarck
SPIRORBIS sp.
Pl. 128, fig. 21

Phylum ARTHROPODA
Class TRILOBITA
Order OPISTHOPARIDA
Genus DITOMOPYGE Newell, 1931
DITOMOPYGE? sp.
Pl. 128, figs. 25,26

Four pygidia and a portion of a free cheek represent the trilobites collected from the Ely Limestone. A specimen of average size has 15 axial segments and 11 pleural segments. The pygidial segments are spinose and the axial lobe strongly elevated. The pleural lobes are bounded by a distinct, narrow flange. These specimens bear some resemblance to *Paladin* as well as to *Ditomopyge.*

Locality.—313.

Phylum ECHINODERMATA
Subphylum PELMATOZOA
Class CRINOIDEA

The dorsal cup of a primitive inadunate crinoid was collected from the lower part of the Ely. In this specimen there are three anal plates, and the radianal is actually in the basal circlet. This Ely specimen resembles *Priasocrinus* and *Plaxocrinus;* however, in those two genera, the anals are well out of the basal circlet. This condition would seem to indicate an earlier evolutionary stage and probably represents an undescribed genus. Inasmuch as the specimen is without arms and is the only one in the collection, it is not described.

Locality.—315.

Columnals

Crinoid columnals occur commonly in the lower part of the Ely and are present throughout the entire sequence.

REGISTER OF LOCALITIES

309—SW¼, NE¼, NW¼, sec. 6, T16N, R59E, Illipah quadrangle. Tributary to Cottonwood Creek. Zone of silicified fossils lies about 100 ft. stratigraphically above *Chaetetes-Profusulinella* zone at fork in dry tributary to Cottonwood Creek.

310—NW¼, sec. 6, T16N, R59E. *Chaetetes-Profusulinella* zone strikes north perpendicular to the canyon and crops out just below the fork of the creek below locality 309.

311—Center of sec. 6, T17N, R59E, Illipah quadrangle. A silty bed crops out at the summit of the ridge about 312.

312—Center, E½, sec. 12, T17N, R58E, Illipah quadrangle. A massive limestone with nodular chert and few fossils crops out above a broad covered slope. The outcrop may be reached by climbing the hill east of the intersection of Hamilton road and U. S. Highway 50. The broad slope lies just above the top of the Ely Limestone.

313—Center, S½, sec. 10, T16N, R58E, Illipah quadrangle. Fossils occur abundantly on the talus slope on the southeast wall of Harris Canyon.

314—Center, S½, sec. 10, T16N, R59E, Illipah quadrangle. Fossils occur at the rim of the west side of Harris Canyon, about fifty paces north of locality 313.

315—Summit of Mokomoke ridge northwest of Hamilton and north of the Harris Canyon road. Sec. 8, T16N, R58E, Illipah quadrangle.

316—White Pine County, Nevada. Limestone with wood grain texture exposed in a road cut on the east side of Hamilton road 900 feet above prominent ridge of Diamond Peak Quartzite. E½, sec. 32, T17N, R58E, Illipah quadrangle.

317—SE¼, sec. 27 (projected), T17N, R61E, Reipetown quadrangle. From a bluff of limestone along the crest of the Egan Range, 200 yards north of the rounded peak.

318—On a spur south of Dutch John Mountain near the top of the hill and at the foot of the most prominent bluff. The spur can be reached by going 2.0 miles west on Stewart's Ranch road from the junction of U. S. Highway 93 and the Atlantic Mining District road, then bearing west at the curve of the road to Kixmiller Summit for 0.8 miles. Northwest corner sec. 34, T6N, R56E, Lincoln County, Nevada.

319—Limestones and shales reached by going 0.2 mile north of Skunk Spring, then west up to the creek bed 0.3 mile to a dry falls. Fossils occur in the topmost bed of the falls. Photo 38U-34, Confusion Range, Millard County, Utah.

320—Near Preston, White Pine County, Nevada, in NE¼, sec. 14, T14N, R61E, as shown on Ely Grazing District map. About one mile south of the intersection of the Ely-Preston road and U. S. Highway 6.
321—Sec. 10, T13N, R61E, north of Preston, White Pine County, Nevada.
322—NW¼, sec. 17, T6N, R63E, Lincoln Co., Nev. Flat lying beds west of east side of range between Trough Canyon and Horse Spring, southeast of Sunnyside, Nevada.
323—North end of Fox Mountains in limestone beneath volcanics north of road. Photo 2–90, E½, sec. 13, T4N, R61E, south of Sunnyside, Nye County, Nevada.
324—Grant Range in sec. 30, T6N, R59E, Nye Co., Nevada.
325—Southern Egan Range, near NE corner sec. 26, T6N, R62E (Fairchild photo 1–17), Lincoln County, Nevada.
326—North of Timber Pass Road, near locality 327, on the west side of the southern Egan range, surrounded by volcanics. Photo 2–111.
327—Timber Pass Mt., East of White River Valley near the junction of White Pine, Lincoln, and Nye Counties, Nevada, in T10N, R62E.
328—Southern Egan Range, Lincoln Co., Nevada. T8N, R62E, north of Sunnyside, Nevada.
361—Low bluff of limestone crossing north or main fork of creek a few hundred feet east of locality 309 and about 250 feet above the top of the Ely Limestone. Center, N½, sec. 6, T16N, R59E, Illipah quadrangle, White Pine County, Nevada.

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