

EARLY PENNSYLVANIAN MICROFAUNAS OF THE ILLINOIS BASIN

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ABSTRACT.—Early Pennsylvanian fusulinids and ostracods of the Illinois Basin from Butler and Hancock Counties, Kentucky, and from many localities along the eastern margin of the Illinois Basin as far north as Warren County, Indiana, are discussed. Microfaunas include numerous species of ostracods, the fusulinids *Millerella*, *Paramillerella*, several species of *Profusulinella*, unnamed species of *Pseudostaffella*, specimens of questionable *Fusulinella*, and abundant specimens of *F. iowensis*. One new species of *Profusulinella* is described from Indiana. The lower Pennsylvanian strata are divisible into two ostracod biostratigraphic zones. The lower zone is characterized especially by *Amphissites rothi*, and three subzones are suggested. The upper biostratigraphic zone is characterized especially by *A. centronotus*. The ostracod fauna associated with *Fusulinella* from Des Moinesian rocks of the central part of the United States has been described previously.

Pennsylvanian rocks occur in the Illinois Basin over most of Illinois, a part of western and southwestern Indiana, and a large area in the north-central part of western Kentucky (Fig. 1). These rocks have been extensively studied by the Illinois, Indiana, and Kentucky Geological Surveys, and these state surveys have been the source of much of the information we have used to direct our study of the early Pennsylvanian microfaunas of the Illinois Basin in this region. It became evident to us during an early period of our study that the most primitive units available to surface observation and collecting are to be found in a belt extending from central Kentucky near Morgantown in Butler County along

the eastern margin of the Pennsylvanian part of the Illinois Basin as far north as Warren County, Indiana (Fig. 2). Therefore, a progressive study of older to younger microfaunas was conducted in this part of the Basin.

Our purpose is to review the status of knowledge on early Pennsylvanian fusulinids and ostracods of the Illinois Basin, and to make available our new information derived from extensive collections from lower Pennsylvanian rocks in Kentucky, Indiana, and Illinois (Table 1).

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INFORMATION DERIVED FROM FUSULINIDS

Dunbar and Henbest published a report in 1942 concerning all of the fusulinids known to them at that time from rocks of the Pennsylvanian System of Illinois. Their collections included extensive fusulinid faunas from the part of the Illinois section correlated with the Des Moinesian Series, as well as collections from the stratigraphically higher Livingston, Omega, Shumway, and Greenup Limestones of central Illinois. The collections from these four limestones contain species of *Tribi-*

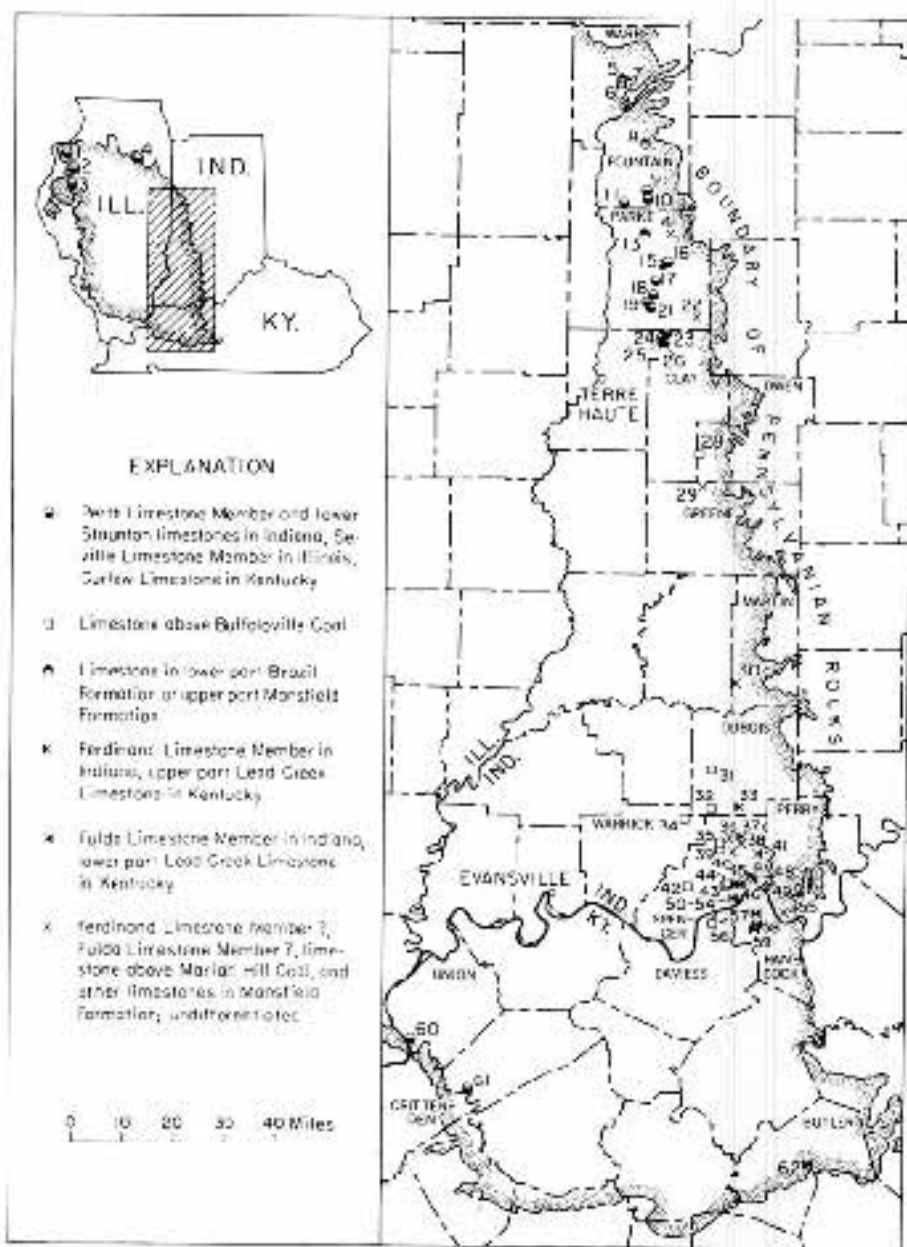


FIGURE 1.—Map of the southeastern part of the Illinois Basin showing collecting localities for lower Pennsylvanian microfossils.

cites that indicate a late Pennsylvanian age. The fusulinid fauna, including such species as *T. collosus* Dunbar and Henbest from the Green-up Limestone in Cumberland County, is one of the most advanced to have been described from Illinois. The most primitive fusulinids described by Dunbar and Henbest from Illinois include the widely distributed *Fusulinella iowensis*. This was from the limestone caprock of the Rock Island (No. 1) Coal (Fig. 1, locs. 1, 2, and 3).

Collections of limestone containing a typical fauna of *Fusulinella stouti* were sent to Thompson by Erik N. K. Waering in the 1930s from Crittenden County, Kentucky (loc. 61). These samples had been collected by D. W. St. Clair for the Shell Oil Company and were established by Shell geologists to be near 400 feet above the pre-Pennsylvanian surface. *F. stouti* was originally described by Thompson (1936) from rocks of the Pottsville Series of Ohio, and later was reported by Dunbar and Henbest (1942) from the limestone that forms the caprock over the Rock Island (No. 1) Coal in Illinois. The occurrence of *F. stouti* in Crittenden County, Kentucky, served to demonstrate that at least more than 400 feet of Pennsylvanian rocks are found in this area below the Curlew Limestone (Thompson, Shaver, and Riggs, 1959). This occurrence also encouraged Thompson to send students from the University of Wisconsin into Kentucky in search of fusulinid faunas representing the Zone of *Fusulinella*, the Zone of *Profusulinella*, and the Zone of *Millerella*.

The first pre-Desmoinesian microfaunas studied by us (Thompson,

Shaver, and Riggs, 1959) from the Illinois Basin were obtained from central Kentucky on the southeast edge of the outcrop belt of Pennsylvanian rocks. These rocks occur as two thin limestones and associated shales exposed just north of Green River on the west side of U. S. Highway 281 in Butler County, about 760 feet above the pre-Pennsylvanian surface at locality 62. The fauna described from this area includes *Profusulinella kentuckyensis* Thompson and Riggs, *Millerella* spp., and *Paramillerella* spp. Cooper (1946) had previously described ostracod species of approximately similar ages from Spencer County, Indiana, including the diagnostic early Pennsylvanian species *Amphissites rothi* Bradfield and *Aurikirkbya triseriata* Shaver (— *Kirkbya kellestae* Cooper).

Hancock and Daviess Counties, Kentucky.—An examination of the limestone, and the fossiliferous shales and limestones 18 to 25 feet below this limestone, in Hancock County, Kentucky (locs. 57, 58, and 59) demonstrated the presence of numerous minute discoidal fusulinids of the genera *Paramillerella* and *Millerella*. Common to abundant specimens of elongate fusulinids also occur in these shales and limestones that seem identical in all measurable and observable features to *Profusulinella kentuckyensis* previously described from Butler County, Kentucky. These stratigraphic units are the rocks to which Crider (1913, p. 279) applied the name Lead Creek Limestone. Two characteristic exposures of this stratigraphic unit are found in county roadcuts that are about 1.0 mile south of Hilldale Church

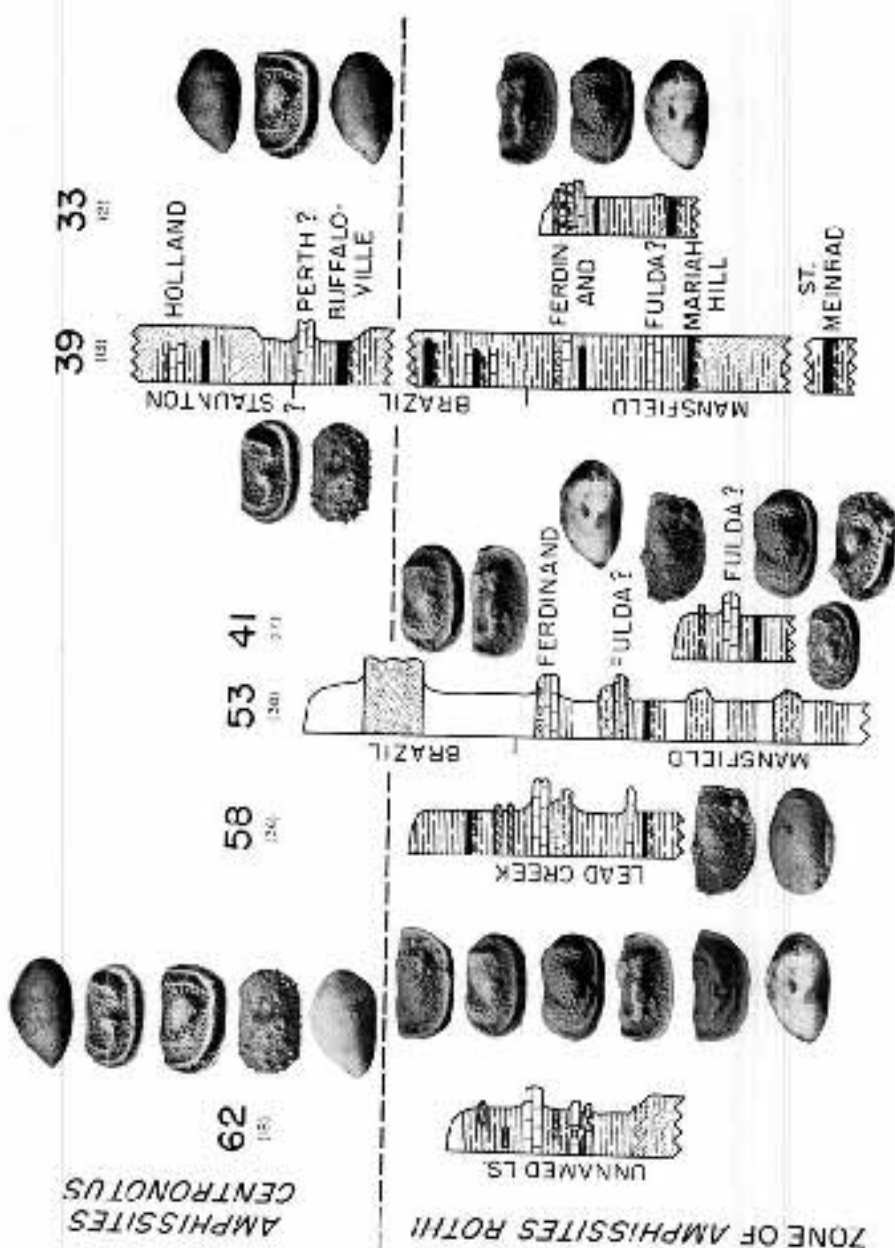
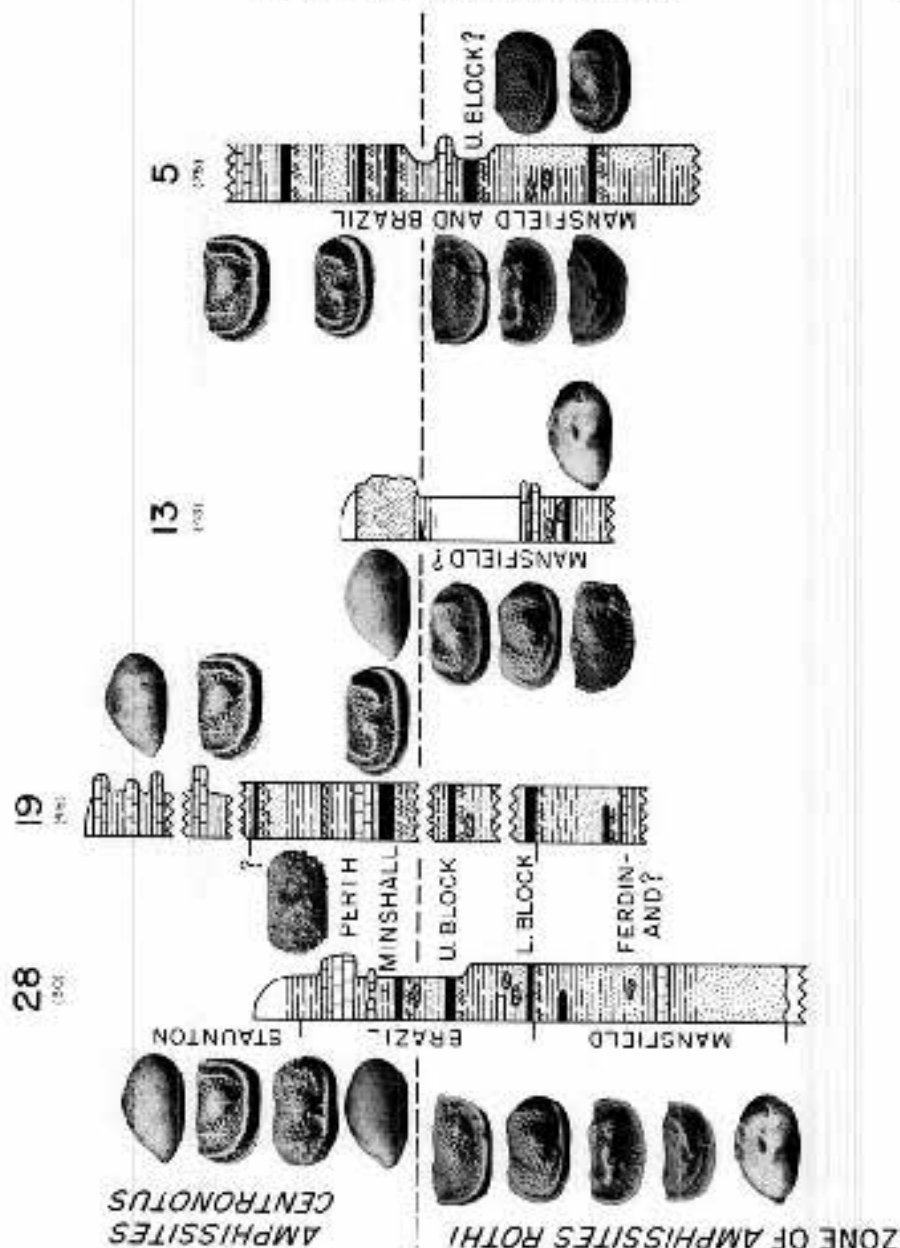


FIGURE 2.—Selected lower Pennsylvanian sections in Indiana and Kentucky. Some sections generalized from Hutchison (1956, 1959, 1961). See Figure 1 for locations of sections; numbers in parentheses are Shaver's field numbers. Illustrated ostracod specimens: to right of section 62 (ascending), *Bairdia dornickhiltensis* Harlan, *Kirkbya magna* Roth, *Amirikirkbya triseriata* Shaver, *Amphisites rothii* Bradford, *A. marginiferus* Roth, *Kirkbya* cf. *K. inornata* Roth, *Bairdia dornickhiltensis* Harlan, *Kounoyella* cf. *R. simplicissima* (Knight), *Amphisites cen-*



transes (Ulrich and Bassler), *A. girtd* Knight, and *Bairdia oklahomaensis* Hariton; below section 58 (ascending), *Caveolinella casci* Bradfield and Kirkby sp. (= *K. cf. K. reflexa* Cooper); below section 41, *Amphissites weaveri* Roth; to right of section 41, *Polytalites wapanuckensis* (Hariton); to right of section 23, third specimen from top, *Bairdia dorvickhillexis* Hariton; to left of section 28, third specimen from top, *Amphissites harrisi* (Cooper); and to right of section 3, at top: *Amphissites rothi* Bradfield. All other figures are duplicates.

TABLE 1.—List of Localities and Stratigraphic Positions Collectively for lower Pennsylvanian Fusulinid and Ostracod Collections of the Illinois Basin.

No.	Sample No. M.I.T. G3	R.I.S.	Location	Stratigraphic Position
1			Mercer Co., Ill. (see Dunbar and Henbest, 1942)	Spoon Formation, Seville Limestone Member
2	580		Warren Co., Ill. (see Dunbar and Henbest, 1942)	Spoon Formation, Seville Limestone Member
3	G7		Fulton Co., Ill. (see Dunbar and Henbest, 1942)	Spoon Formation, Seville Limestone Member
4	2219	108½	Island in Des Plaines River in the NW¼ sec. 29, T. 34 N., R. 9 E., south of Channahon, Will Co., Ill. (collected by J. M. Weller or J. E. Culver, 1932)	Limestone in lower part local Pennsylvanian section (Seville?)
5	Ind-28	75	Tributary to Pine Creek in the SW¼, SE¼ sec. 16, T. 22 N., R. 8 W., at abandoned Burr Mine, Warren Co., Ind.	Limestone in lower part Brazil Formation or upper part Mansfield Formation
6	109		Ravine in the north center NE¼ sec. 21, T. 23 N., R. 8 W., 250 yards south of county road, Warren Co., Ind.	Limestone in lower part Brazil Formation or upper part Mansfield Formation
7	74		Tributary to Pine Creek in the NE¼ sec. 23, T. 22 N., R. 8 W., 200 yards below junction of Fall Creek, Warren Co., Ind.	Limestone in lower part Brazil Formation or upper part Mansfield Formation
8	Ind-108	108	Hytex Brick Co. clay pit in the NW¼ sec. 31, T. 20 N., R. 7 W., 2.0 miles north of Veedersburg, Fountain Co., Ind.	Limestone in lower part Brazil Formation or upper part Mansfield Formation
9	Ind-112	112	Tailings from abandoned coal mine in the SW¼ sec. 7, T. 18 N., R. 7 W., at Yeddo, Fountain Co., Ind.	Limestone in lower part Staunton Formation or upper part Brazil Formation
10	Ind-33	70	Morgan Coal Co. pit in the SW¼ sec. 20, T. 18 N., R. 7 W., 0.25 mile east of U. S. Highway 41, Fountain Co., Ind.	Limestone in lower part Staunton Formation or upper part Brazil Formation
11	Ind-51	60	Bank of Mill Creek in the NE¼ SE¼ NW¼ sec. 28, T. 18 N., R. 8 W., north of iron bridge, Fountain Co., Ind.	Limestone in lower part Staunton Formation or upper part Brazil Formation
12	Ind-60	48	South bank of Square Rock Branch in the NW¼ NW¼ NW¼ sec. 31, T. 17 N., R. 7 W., 0.25 mile southwest of Port-O-Woods landing field and 200 yards west of bridge, Parke Co., Ind.	Limestone in upper part Mansfield Formation or lower part Brazil Formation

14		69	Waugo Creek bank in the center of east line NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 36, T. 17 N., R. 7 W., west of iron bridge, Parke Co., Ind.	Limestone in Mansfield Formation
15	Ind-67	67	Sand Creek bank in the SE $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 33, T. 16 N., R. 7 W., at bridge on county road, Parke Co., Ind.	Brazil Formation, Perth Limestone Member
16	Ind-31	68	East valley wall in the SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 34, T. 16 N., R. 7 W., about 35 feet above stream and along woods road at about 645 ft. altitude, Parke Co., Ind.	Brazil Formation, Perth Limestone Member
17	Ind-30		Stream valley in the west corner of the NE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 17, T. 15 N., R. 7 W., Parke Co., Ind.	Limestone in upper part Brazil Formation or lower part Staunton Formation
18	Ind-55	47	Gully in the NE $\frac{1}{4}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 5, T. 14 N., R. 7 W., 1.5 miles northeast of Minshall, Parke Co., Ind.	Limestone in upper part Brazil Formation or lower part Staunton Formation
19		46-3	Ravine in the SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 7, T. 14 N., R. 7 W., across a divide from and west of iron bridge and county road, near Minshall, Parke Co., Ind.	Limestone in upper part Brazil Formation or lower part Staunton Formation
21	Ind-26	46-0	Stream bed in the SE $\frac{1}{4}$ sec. 7, T. 14 N., R. 7 W., west of road and just north of southernmost of two bridges at Minshall, Parke Co., Ind.	Limestone in Mansfield Formation
22		65	Stream bank in east part of south line SE $\frac{1}{4}$ sec. 23, T. 14 N., R. 6 W., Parke Co., Ind.	Brazil Formation, Perth Limestone Member (type section)
23	Ind-34	45	Abandoned coal pit in the south center of the SW $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 3, T. 13 N., R. 7 W., 0.5 mile northwest of Perth, Clay Co., Ind.	Brazil Formation, Perth Limestone Member
24	Ind-116	116	Abandoned coal mine slope in the SE $\frac{1}{4}$ NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 3, T. 13 N., R. 7 W., in valley bottom, Clay Co., Ind.	Brazil Formation, Perth Limestone Member
25	Ind-117	117	Abandoned quarry in the SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 10, T. 13 N., R. 7 W., south of Little Creek, Clay Co., Ind.	Brazil Formation, Perth Limestone Member
26	Ind-115	115	Abandoned quarry in the NE $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 10, T. 13 N., R. 7 W., near New York Central Railroad overpass, Clay Co., Ind.	Brazil Formation, Perth Limestone Member
28	Ind-38	30	Abandoned coal pit in the SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 2, T. 9 N., R. 6 W., 1.0 mile north of Coal City, Owen Co., Ind.	Limestone in Brazil Formation (Perth Limestone Member?)
29	Ind-98	98	Gully in the NW $\frac{1}{4}$ SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 6, T. 8 N., R. 5 W., in pasture northeast of farm house at about 570 ft. altitude, Greene Co., Ind.	Mansfield Formation, limestone below Lower Block Coal (Ferdinand Limestone Member?)
30		122	P. & R. Coal Co. coal pit in the SW $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 24, T. 2 N., R. 5 W., Martin Co., Ind.	Limestone in Mansfield Formation (Ferdinand Limestone Member?)

TABLE 1. — Continued

No.	Sample No. M.L.T. Ind-7	Location	Stratigraphic Position
31	24	Roadcut in the east center NW $\frac{1}{4}$ sec. 18, T. 2 S., R. 5 W., an eighth mile south of Pulaski River, Dubois Co., Ind.	Limestone in upper part Brazil Formation or lower part Staunton Formation (limestone above Ruffalo-ville Coal?)
32	77	Abandoned coal pit in the SE $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 31, T. 2 S., R. 5 W., north of county road, Dubois Co., Ind.	Brazil Formation, limestone above Ruffalo-ville Coal
33	Ind-23	Roadcut in the NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 29, T. 3 S., R. 4 W., 1.0 mile northwest of Ferdinand, Dubois Co., Ind.	Ruffalo-ville Coal
34	124	Indiana Geol. Survey drill hole 43 in the SE $\frac{1}{4}$ NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 5, T. 4 S., R. 6 W., Underhill farm, 170.6 to 175.3 ft., Warren Co., Ind.	Mansfield Formation, Ferdinand Limestone Member (type area)
35	Ind-13	Roadcut in the southeast corner of the SW $\frac{1}{4}$ sec. 83, T. 4 S., R. 5 W., north side of road and 1.5 miles east of Lincoln City, Spencer Co., Ind.	Brazil Formation, limestone above Ruffalo-ville Coal
35	Ind-37	Abandoned coal pit in the SW $\frac{1}{4}$ sec. 26, T. 4 S., R. 5 W., east of blacktop road, Spencer Co., Ind.	Mansfield Formation, limestone above Mariah Hill Coal Member?
37	Ind-43	Ind. Highway 163 cut in the NE $\frac{1}{4}$ NW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 29, T. 4 S., R. 4 W., Spencer Co., Ind.	Mansfield Formation, limestone above Mariah Hill Coal Member?
38	Ind-42	Roadcut in the SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 25, T. 4 S., R. 5 W., Spencer Co., Ind.	Limestone in upper part Mansfield Formation or lower part Brazil Formation (Ferdinand Limestone Member?)
39	Ind-32	Abandoned coal pit in the NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 9, T. 5 S., R. 5 W., Spencer Co., Ind.	Mansfield Formation, limestone above Mariah Hill Coal (Pulda Limestone Member?)
40	Ind-49	Abandoned coal pit in the NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 12, T. 5 S., R. 5 W., Spencer Co., Ind.	Brazil Formation, limestone above Ruffalo-ville Coal
41	17	Ind. Highway 545 cut in the SW $\frac{1}{4}$ NE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 11, T. 5 S., R. 4 W., 1.5 miles south of Pulda, Spencer Co., Ind.	Mansfield Formation, limestone above Mariah Hill Coal (Pulda Limestone Member?)
42	124	Indiana Geol. Survey drill hole 43 in the SE $\frac{1}{4}$ SE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 16, T. 6 S., R. 6 W., Trunkel farm, 385.0 to 388.8 ft., Spencer Co., Ind.	Limestone in Mansfield Formation (Pulda Limestone Member?)
			Brazil Formation, limestone above Ruffalo-ville Coal

42	Ind-8	11	Ind. Highway 70 cut in the SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 16, T. 6 S., R. 5 W., 0.5 mile west of Newtonville, Spencer Co., Ind.	Brazil Formation, limestone above Buffaloville Coal
44	Ind-44	89	County roadcut in the SW $\frac{1}{4}$ SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 10, T. 6 S., R. 6 W., an eighth mile north of Ind. Highway 70, Spencer Co., Ind.	Brazil Formation, limestone above Buffaloville Coal
45	Ind-12	12	Ind. Highway 70 cut on the south line of the SW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 7, T. 6 S., R. 4 W., 2.75 miles east of Newtonville, Spencer Co., Ind.	Limestone in Mansfield Formation (Ferdinand Limestone Member?)
46	Ind-15	16	Abandoned clay pit in the SW $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 9, T. 6 S., R. 4 W., east of county road, Spencer Co., Ind.	Limestones in Mansfield Formation (Fulda and Ferdinand Limestone Members?)
47	Ind-105	106	Roadcut at the center of the south line SW $\frac{1}{4}$ sec. 34, T. 6 S., R. 4 W., 0.5 mile south of Ryanston, Spencer Co., Ind.	Limestone in Mansfield Formation (Ferdinand Limestone Member?)
48		107	County roadcut in the west center SE $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 2, T. 6 S., R. 4 W., near Maxville, Spencer Co., Ind.	Limestone in Mansfield Formation (Fulda Limestone Member?)
49	Ind-61	4	Ind. Highway 66 cut in the NW $\frac{1}{4}$ SE $\frac{1}{4}$ sec. 13, T. 6 S., R. 4 W., near top of cut, east of Troy, Perry Co., Ind.	Calcareous sandstone in Mansfield Formation
50	Ind-54	90	Quarry in the SE $\frac{1}{4}$ SW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 25, T. 6 S., R. 5 W., north of Ind. Highway 66, Spencer Co., Ind.	Limestones in Mansfield Formation (Fulda and Ferdinand Limestone Members?)
51	Ind-9	7	Abandoned sandstone quarry in the west center of the NE $\frac{1}{4}$ sec. 35, T. 5 S., R. 6 W., north side of Ind. Highway 55, Spencer Co., Ind.	Limestone in Mansfield Formation (Ferdinand Limestone Member?)
52	Ind-5	8	Bluff above Ind. Highway 46 in center of the NE $\frac{1}{4}$ NE $\frac{1}{4}$ sec. 35, T. 6 S., R. 5 W., Spencer Co., Ind.	Limestone in Mansfield Formation (Ferdinand Limestone Member?)
53	Ind-20	38	Bluff above Ind. Highway 55 in the SE $\frac{1}{4}$ SW $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 20, T. 6 S., R. 4 W., southwest of county road north of highway, Spencer Co., Ind.	Limestones in Mansfield Formation (Fulda and Ferdinand Limestone Members?)
54	Ind-12	10	County roadcut in the west center of the NE $\frac{1}{4}$ NW $\frac{1}{4}$ sec. 20, T. 6 S., R. 4 W., 0.25 mile northwest of Ind. Highway 46, Spencer Co., Ind.	Limestones in Mansfield Formation (Fulda and Ferdinand Limestone Members?)
55		35	Ind. Highway 247 cut in the NW $\frac{1}{4}$ sec. 5, T. 7 S., R. 3 W., 2.0 miles north of Cannelton, Perry Co., Ind.	Limestone in Mansfield Formation
56	Ky-II	39	Alcove above abandoned mine drift, south side of Blackford Creek, 100 yards west of Louisville and Nashville Railroad trussile, 4.5 miles southwest of Lewisport, Daviess Co., Ky.	Lower Pennsylvanian limestone (higher than Lead Creek Limestone)

TABLE 1. - Continued

No.	Sample No. M.L.T. R.H.S.	Location	Stratigraphic Position
57	Ky-12 40	Coal pit 0.2 mile south of U.S. Highway 60, 0.7 mile west of crossroads with RM 506, 4.5 miles west of Hawesville, Hancock Co., Ky.	Upper and lower parts of Lead Creek Limestone
58	Ky-8,9 36	Both sides of county roadcut just south of junction with RM 435, 1.0 mile south of Lilledale Church, 4.0 miles west of Hawesville, at 474 to 503 ft. altitude, Hancock Co., Ky.	Upper and lower parts of Lead Creek Limestone
59	Ky-10 37	Both sides of county roadcut about 1.0 mile south of BM 435, south side of stream valley, 2.0 miles south of Lilledale Church, 4.5 miles west of Hawesville, 448 to 479 ft. altitude, Hancock Co., Ky.	Upper and lower parts of Lead Creek Limestone
60	Ky-4 21	Having southwest side of Indian Hill, 1.0 mile south of Curlew, Union Co., Ky.	Curlew Limestone
61	Ky-1	Kentucky Highway 120 cut, north side, 5.3 miles west of Providence in Crittenden Co., Ky.	Curlew Limestone
62	Ky-2,3 18	U. S. Highway 231 cut, north of Green River, 1.0 mile north of Morgantown, Butler Co., Ky.	Lower Pennsylvanian limestone (Lead Creek Limestone equivalent?)

TABLE 2.—Characteristic Species from Marine Zones of the lower Pennsylvanian Rocks of the Illinois Basin.
The ostracod lists in part are collective for the zones.

Rock Unit and Area	Fusulinids	Ostracods
Perth Limestone Member of Brazil Formation; Limestone in lower part Staunton Formation, west central Ind.; Seville Limestone Member of Spoon Formation, Mercer, Warren, Tulton, and Will Counties, Ill.; Curlew Limestone, western Ky. Limestone above Buffaloville Coal of Brazil Formation, Dubois, Spencer, and Warrick Counties, Ind.; Limestone in Brazil Formation near Coal City, Owen Co., Ind.; Limestone on Blackford Creek, Daviess Co., Ky.	<i>Fusulinella towensis</i> Thompson <i>F. stoupi</i> Thompson (Localities 1-3, 9-11, 15-18, 21, 23-26, 60, 61) <i>Fusulinella?</i> (Localities 28, 31, 35, 39, 43, 44, 50) <i>Profusulinella luyckensis</i> , n. sp. <i>Pseudostafella</i> sp. <i>Millerella</i> spp. <i>Paramillerella</i> spp. (Localities 5, 8, 13)	<i>Amphissites centronotus</i> (Ulrich and Bassler) <i>A. girya</i> Knight <i>A. karitoni</i> (Cooper) <i>Bavida bornickhillensis</i> Hariton <i>Rouandella</i> cf. <i>R. simplicioides</i> (Knight) (Localities 4, 11, 19) <i>Amphissites centronotus</i> (Ulrich and Bassler) <i>A. girya</i> Knight <i>Bavida bornickhillensis</i> Hariton <i>Rouandella</i> cf. <i>R. simplicioides</i> (Knight) (Localities 28, 32, 34, 39, 42)
Limestone in lower part Brazil Formation or upper part Mansfield Formation, near Pine Creek, Warren Co.; near Veedersburg, Fountain Co.; Square Rock Branch, Parke Co.; all Ind.	<i>Millerella</i> (Locality 20) <i>Profusulinella kentuckyensis</i> Thompson and Riggs <i>Pseudostafella</i> sp. <i>Millerella</i> spp. <i>Paramillerella</i> spp. (Localities: 22, 27, 45-47, 50-54, 57-59) <i>Profusulinella kentuckyensis</i> Thompson and Riggs <i>Millerella</i> spp. <i>Paramillerella</i> spp. (Localities 16, 34, 57, 58)	<i>Amphissites marginiferus</i> Roth <i>A. rothi</i> Bradfield <i>Aurikerkya triseriata</i> Shaver <i>Bavida bornickhillensis</i> Hariton <i>Kirkbaya magna</i> Roth <i>K. cf. K. inornata</i> Roth (Localities 5-8, 13) <i>Amphissites rothi</i> Bradfield (Locality 30) <i>Amphissites marginiferus</i> Roth <i>A. rothi</i> Bradfield <i>Aurikerkya triseriata</i> Shaver <i>Bavida bornickhillensis</i> Hariton <i>Kirkbaya magna</i> Roth <i>K. cf. K. inornata</i> Roth (Localities 35, 46, 60, 63, 54, 58) <i>Amphissites marginiferus</i> Roth <i>A. rothi</i> Bradfield <i>Aurikerkya triseriata</i> Shaver <i>Bavida bornickhillensis</i> Hariton <i>Kirkbaya magna</i> Roth <i>K. cf. K. inornata</i> Roth <i>K. sp.</i> (= <i>K. cf. K. seifera</i> Cooper) (Localities 40, 48, 51, 67-69)
Limestone below Lower Block Coal (Ferdinand Limestone Member?), Greene Co.; Ferdinand Limestone Member, Martin Co.; both Ind.		
Upper part Lead Creek Limestone, Hancock Co., Ky.; Ferdinand Limestone Member, Spencer and Dubois Counties, Ind.		
Lower part Lead Creek Limestone, Hancock Co., Ky.; Fuda Limestone Member?, Spencer Co., Ind.		

TABLE 2. . . Continued

Rock Unit and Area	Fusulinids	Ostracods
Limestone above Mariah Hill Coal of Mansfield Formation, Spencer Co., Ind.	<i>Profusulinella kentuckyensis</i> Thompson and Riggs <i>Millerella</i> spp. <i>Paranillerella</i> spp. (Localities 35, 38, 40)	<i>Amphissiles rothi</i> Brudfield <i>Auriskirbya triseriata</i> Shaver <i>Bairdia dornickhallensis</i> Harlton <i>B. cf. B. ardmooresensis</i> Harlton (Locality 62) <i>Amphissiles meryginiferus</i> Roth <i>A. rothi</i> Brudfield <i>A. weaveri</i> Roth <i>Auriskirbya triseriata</i> Shaver <i>Kirbya</i> sp. (— <i>K. cf. K. reflexa</i> Cooper) <i>Polygylites wepmannkeensis</i> (Harlton) (Locality 41) <i>Amphissiles meryginiferus</i> Roth <i>A. rothi</i> Brudfield <i>Kirbya</i> sp. (— <i>K. cf. K. reflexa</i> Cooper) (Localities 14, 25)
Lower Pennsylvanian Limestone at Morgantown, Butler Co., Ky.	<i>Profusulinella kentuckyensis</i> Thompson and Riggs <i>Millerella</i> spp. <i>Paranillerella</i> spp. (Locality 62)	<i>Bairdia dornickhallensis</i> Harlton <i>Glacotinella casei</i> Brudfield <i>Kirbya</i> sp. (— <i>K. cf. K. reflexa</i> Cooper) (Localities 49 and 55)
Fulda Limestone Member? south of Fulda, Spencer Co., Ind.	<i>Profusulinella</i> sp. (Locality 49)	
Limestone in Mansfield Formation, eastern Parke Co., Ind.		
Limestone in Mansfield Formation, near Cannelton and Troy, Perry Co., Ind.		

and 4.0 miles west of Hawesville (loc. 58) and 2.0 miles south of Hilldale Church and 4.5 miles west of Hawesville (loc. 59). The Kentucky Geological Survey has determined, from the best well data available, that this limestone is about 270 feet above the pre-Pennsylvanian surface in this area.

A limestone that is exposed 100 yards west of the Louisville and Nashville Railroad trestle over Blackford Creek in Daviess County, Kentucky (loc. 56), contains numerous specimens of an undescribed species of *Fusulinella*?. Further studies of these specimens will be necessary before definite identifications or generic assignments can be made. The actual vertical distance of the limestone exposed at locality 56 above the Lead Creek Limestone has not been determined. No elements of the prolific faunas of *Müllerella* and *Paranüllerella* found in the Lead Creek Limestone near Hawesville, Kentucky, were recognized among our specimens from the limestone exposed in the bluffs of Blackford Creek. This limestone (loc. 56), described by Crider (1913, p. 278), is tentatively correlated by the Indiana geologists and us with the limestone that occurs over the Buffaloville Coal of the Brazil Formation (upper Polisville) in Spencer County, Indiana. The Indiana geologists also have considered this limestone to be the approximate equivalent of the Perth Limestone Member of the Brazil Formation in Clay County and more northerly counties, Indiana; we obtained no information from the fusulinids that support this correlation.

The fusulinid *Fusulinella iowensis*, considered to be a younger form than

Profusulinella, has not been recognized in our collections from Butler, Hancock, and Daviess Counties, Kentucky.

Spencer, Dubois, and Perry Counties, Indiana.—Several limestone exposures have been described and named from Spencer and Dubois Counties, Indiana, that seem similar in several respects to the Lead Creek Limestone west of Hawesville in Hancock County, Kentucky, and the limestone on Blackford Creek in Daviess County, Kentucky. One of the oldest stratigraphic marine units that we recognize in the Pennsylvanian of southern Indiana crops out at an altitude of 585 feet along Indiana Highway 237, about 2.0 miles north of Cannelton, Perry County, Indiana (loc. 55). The limestone here is coarsely crystalline and does not contain any fusulinids; it does contain elements of the early ostracod faunas described herein (Table 2). Another of the lower Pennsylvanian fossiliferous units is a calcareous sandstone or limestone conglomerate that crops out in the bluff along Indiana Highway 66, just east of Troy, Perry County (loc. 49). It contains weathered and possibly detrital specimens of *Profusulinella* and elements of the early ostracod faunas (Table 2).

Franklin (1944) proposed the name Ferdinand Limestone without giving a precise outcrop for its type section. The name is presumed to have been proposed in part for limestone exposed on the road about 1.0 mile northwest of the town of Ferdinand (loc. 33) and at several places to the northeast of Ferdinand in southern Dubois County (T. 3 S., R. 4 W.). The Ferdinand is here con-

sidered to have member status in the Mansfield Formation.

The name Fulda Limestone was published by Franklin (1944), and exposures presumably of one limestone bed, south of Fulda on the road to New Boston, were intended to be the type section.

The stated location of Franklin's section illustrating the Fulda Limestone and Ferdinand Limestone relationships is not in the Fulda Limestone type area. Thus we are uncertain of the stratigraphic relationships of the one remaining good exposure south of Fulda (Table 1, loc. 41) to the Ferdinand Limestone and to other exposures mentioned by Franklin. We provisionally use the name Fulda Limestone, however, which is here accorded member status in the Mansfield Formation, for the lower of two limestones that are seen in the upper part of the Mansfield Formation in many sections in Spencer County (Table 1).

No fusulinid has been found from the Fulda Limestone south of Fulda (loc. 41). At this locality, however, Shaver found numerous ostracods (Table 2) with Chesterian (late Mississippian) and early Pennsylvanian affinities. Probably Cooper's (1946) ostracod locality 1 is the same, although his location is stated differently.

Fusulinids referable to the genera *Profusulinella*, *Millerella*, and *Paramillerella* have been found in the Ferdinand Limestone exposed along the highway about 1.0 mile northwest of Ferdinand (loc. 33). These specimens of *Profusulinella* include many that seem identical to the type specimens of *Profusulinella kentuckyensis* from Morgantown, Ken-

tucky. They are associated with abundant unnamed species of *Millerella* and *Paramillerella* similar to the group of specimens illustrated from Morgantown by Thompson and Riggs (*in* Thompson, Shaver, and Riggs, 1959). They are also associated with abundant specimens referable to *Pseudostaffella*.

The Ferdinand Limestone exposed northwest of Ferdinand is highly cherty and contains scattered chert masses throughout. Drill records from nearby wells show that this limestone lies about 270 feet above the pre-Pennsylvanian surface. Numerous exposures of cherty limestone, probably of the Ferdinand, are found on the bluffs of the Ohio River north of Indiana Highway 66 for several miles northeast of Grandview in Spencer County (locs. 50-54) and in a roadcut on Indiana Highway 70, 2.75 miles east of Newtonville (loc. 45). Two prominent fossiliferous intervals have been recognized in this area. The upper one is the highly cherty limestone that is composed almost entirely of chert at some places. In many places, locality 54 for example, it contained great numbers of *Profusulinella kentuckyensis* and numerous ozawainellid fusulinids. The lower fossiliferous zone, about 16 feet below the upper zone, contains limestone and highly calcareous shale, as shown at localities 46 and 54. Both the shale and the limestone have numerous specimens of *Profusulinella kentuckyensis* and ozawainellid types of fusulinids. The upper cherty limestone, and the fossiliferous shale 13 to 20 feet below, are well exposed at localities 50, 53, and 54, and especially in the abandoned clay pit at locality 46. Some

of these limestone exposures were named the Grandview Limestone by Franklin (1944), which he considered to be above the Ferdinand Limestone; Hutchison (1959), however, considered that the two ledges are exact or approximate equivalents of the Fulda and Ferdinand Limestones, and that these beds lie below the position of the Buffaloville Coal.

A coal in the northwestern and central parts of Spencer County has an overlying caprock limestone that bears, informally, the name Buffaloville Limestone, the same local name as the coal. To the northeast of Lincoln State Park (loc. 35), on and near Indiana Highway 70 near Newtonville (locs. 43 and 44), and near Buffaloville in the northern part of Spencer County (loc. 39), a thick limestone has been recognized above the Buffaloville Coal that contains common specimens of *Fusulinella?* which resemble or are identical to the specimens that we obtained at the bluffs of Blackford Creek in Daviess County, Kentucky (loc. 56). A similar fauna was found in limestone near the Paroka River in Dubois County (loc. 31).

The limestone, possibly the Fulda Limestone, over the Mariah Hill Coal near the town of Mariah Hill in northern Spencer County, in the abandoned strip mines at localities 36 and 40, and in a county roadcut at locality 38, contains great numbers of *Profusulinella kentuckyensis* and abundant specimens of unnamed species of *Millerella* and *Paramillerella*. There are several structural disturbances between the Mariah Hill area and the Ohio River, including anticlines and synclines (Hutchison, 1959). As a result, we are uncertain

of the stratigraphic relationships of the Fulda and Ferdinand Limestones on the Ohio River bluff (locs. 50-54) to the limestone over the Mariah Hill Coal, but their fusulinids are similar. Two probable Ferdinand Limestone exposures yielding *Profusulinella* in the area of the Mariah Hill Coal are found at localities 37 and 47. The probable Ferdinand Limestone has been recognized as far north as locality 29, southwest of the Eel River in northern Greene County, Indiana. Here the limestone lies below the Lower Block Coal and contains abundant specimens of *Millerella*, but no other types of fusulinids. This occurrence is interesting because it represents one of the more prolific faunas of *Mutterella* observed from this part of Indiana.

Owen and Clay Counties, Indiana.

--The broad alluviated valleys of the Patoka and White Rivers interrupted our systematic northward collecting from the lower part of the Pennsylvanian between southern Dubois County and Owen County, Indiana. The floodplain of the Eel River also restricts Pennsylvanian exposures in Clay and Owen Counties. Collections from the limestone at locality 28 yielded several specimens of fusulinids that resemble specimens of *Fusulinella?* collected from the limestone over the Buffaloville Coal in Spencer County, Indiana (loc. 35), and the limestone on Blackford Creek in Daviess County, Kentucky (loc. 56). The limestone near Coal City (loc. 28), formerly called the Minshall Limestone (Kottlowski, 1959), was traced northward through Clay County (Hutchison, 1956). Hutchison (1960) correlated this limestone with the Perth Limestone

Member of the Brazil Formation. The fusulinid evidence does not support this determination; the ostracod evidence does not oppose the correlation.

Parke, Fountain, and Warren Counties, Indiana.—The deeply entrenched valley and tributaries of Sugar Creek have exposed the caprock limestones, black shales, and thin coal beds just to the southwest of Port-O-Woods landing field in northern Parke County, Indiana (loc. 13). The limestone at this locality on the south side and in the bottom of Square Rock Branch has yielded fusulinid faunas of *Profusulinella*, *Millerella*, and *Pseudostaffella* (Pl. 1, figs. 8, 11, 13, 14) which indicate beds, generally considered to be a part of the Mansfield Formation or a lower part of the Brazil Formation, that are only slightly younger stratigraphically than the *Profusulinella* found in the Ferdinand Limestone of southern Indiana, the Lead Creek Limestone of northern Kentucky, and the limestones at Morgantown, Kentucky.

The Hytex Brick Company clay pit located about 2.0 miles north of Veedersburg in Fountain County (loc. 8) contains a discontinuous massive limestone that occurs about 80 feet above the pre-Pennsylvanian surface, as determined from data from nearby wells. This limestone contains a fauna of *Profusulinella burrensis*, n. sp. (Pl. 1, figs. 1-10), described below, undescribed species of *Millerella* (Pl. 1, figs. 12, 13), and scarce specimens of an undescribed form of *Pseudostaffella* (Pl. 1, fig. 14). The fusulinid faunas found in the limestone near Veedersburg seem to be identical to those that are found

in the limestone at locality 5 in Warren County, discussed below.

Coals that are mined on or near Pine Creek of central Warren County have an overlying caprock that is only a few feet thick. The caprock is highly variable in thickness along its exposures and has very irregular top and bottom surfaces. Fossils are common throughout this limestone, and thin sections reveal an abundant fauna of *Profusulinella burrensis* and common specimens of *Millerella* sp. and *Paramillerella* sp. A number of exposures of the limestone have been observed among the tributaries of Pine Creek, but fusulinids have been found in only one of them at locality 5, which is known locally as Burr Mine. Although some Indiana and Illinois geologists, Hutchison (1961) for example, have considered these limestone exposures to be correlative with the Perth (Minshall of older reports), the microfauunas, both fusulinids and ostracods, suggest that they belong to a lower unit, possibly in the Brazil Formation.

Perth and lower Staunton limestones in Clay, Parke, and Fountain Counties, Indiana.—The name Perth Limestone Member, of the Brazil Formation, was proposed by Hutchison (1960, p. 20) for the limestone exposed in the strip mine excavations half a mile northwest of the town of Perth, Clay County, Indiana, located in the Brazil West Quadrangle (loc. 23). It replaces for the most part the name Minshall Limestone of older reports, which was applied to limestones in several stratigraphic positions. The type section lies about 340 feet above the pre-Pennsylvanian surface at this locality according to data from nearby deep wells.

The Perth Limestone is 6.3 feet thick at its type exposure (Hutchison, 1960). Its upper and lower surfaces are irregular to knobby, and it contains abundant chert masses. Limestones considered to be the time equivalent of the Perth Limestone were studied by us at numerous places between the type locality of the Perth Limestone in Clay County and the southern part of Fountain County at localities 9 and 10. Hutchison (1961) considered that some of these exposures in southern Fountain County belong in the Staunton Formation, but the fusulinids suggest that they correspond in age to the Perth Limestone. Fusulinids that are referable to the species *Fusulinella iowensis* are abundant throughout these limestone exposures. Specimens of *F. iowensis* are not associated with specimens of *Millerella* or *Paramillerella* at any of the numerous localities where *F. iowensis* has been studied by us.

Fusulinella iowensis is also found in closely associated limestones, assigned to the Staunton Formation by Indiana geologists, at localities 15, 16, 17, 18, and 21 in Parke County, locality 11 in Fountain County, and localities 24, 25, and 26 in Clay County. Thus the Perth Limestone or closely associated lower Staunton limestones, with an abundant fauna of *F. iowensis*, are found commonly between localities 9 in southern Fountain County and 25 in extreme northern Clay County. *F. iowensis* was also described by Thompson and Riggs (*in* Thompson, Shaver, and Riggs, 1959) from the Cudlew Limestone on Indian Hill in Union County, Kentucky (loc. 60).

INFORMATION DERIVED FROM OSTRACODS

The ostracods that have been collected from a few score localities along the eastern margin of the Illinois Basin show that the lower part of the Pennsylvanian section can be assigned to two easily recognized biostratigraphic zones. Many of these ostracods are illustrated on the accompanying Figure 2 together with characteristic sections at the selected locations.

The lowest zone, an assemblage zone here named the Zone of *Amphisites rothi*, is characterized especially by *A. rothi* Bradfield and by *A. marginiferus* Roth, *A. weaveri* Roth, *Aurikirkbya triseriata* Shaver (= *Kirkbya kellellae* Cooper), *Bairdia darniekhüllensis* Harlton, *Cavellinella casei* Bradfield, *Kirkbya magna* Roth, *K. cf. K. inornata* Roth, *K. sp.* (= *K. cf. K. reflexa* Cooper), and *Polytylites wapanuckaensis* (Harlton). This fauna, associated with *Profusulinella kentuckyensis* or *P. burrensis*, *Millerella* spp., and *Paramillerella* spp., comes collectively from shales associated with unnamed lower Pennsylvanian limestones at Morgantown in Butler County, Kentucky (loc. 62), the Lead Creek Limestone (Cascyville in age) in Hancock County, Kentucky (locs. 57, 58, and 59), and from limestones in the Mansfield Formation (lower Pottsville), which crop out in the area between the Ohio River and Parke County, Indiana, including Fulda and Ferdinand Limestones. Some exposures yielding this fauna are found in the Ohio River bluff northeast of Grandview, Spencer County (locs. 46, 48, 50, 53, and 54),

in roadcuts in the bluff in southern Perry County (locs. 49 and 55), a roadcut 1.0 mile northwest of Ferdinand, Dubois County (loc. 33), in the P. & R. Coal Company mine in southwestern Martin County (loc. 30), on Square Rock Branch, and other small tributaries in Parke County (locs. 13, 14, and 22). Thus the Zone of *Amphissites rothi* embraces the sequence of lower Pennsylvanian rocks that contain the fossiliferous marine units next below the Buffaloville Coal and the Perrh Limestone Member of the Brazil Formation. The *Amphissites rothi* fauna is also found in shale and limestone associated with what is here considered to be the Upper Block Coal of the Brazil Formation, or a lower coal near what has been called Burr Mine in Warren County, Indiana (locs. 5, 6, and 7) and in the shaly part of the limestone near the top of the Hytex Brick Company clay pit 2.0 miles north of Veedersburg, Fountain County (loc. 8). At the Warren County site both the rock sequence and the fauna, in which *Kirkbya* cf. *K. inornata*, a modified form of *Aurikirkbya triseriata*, is characteristic, suggest that a higher subzone (of the Zone of *Amphissites rothi*) would be a useful biostratigraphic unit. This fauna occurs with the new fusulinid species, *Profusulinella burresis*, described below.

The early Pennsylvanian species *Amphissites weaveri* and *Polytyrites wapamuckaensis*, both having Chesterian affinities, are found associated with *A. rothi* only in the rocks at locality 41, generally called the Fulda Limestone, in Spencer County, Indiana. In the absence of

spindle-shaped fusulinids from this location, they may indicate a lower part of the Zone of *Amphissites rothi*.

In the absence of satisfactory knowledge of ostracods of Alaskan age from the Midcontinent area, the *Amphissites rothi* fauna of this study can be compared closely only with faunas from Midcontinent rocks that have been considered to be Morrowan in age. These Midcontinent faunas are from the Joliff and Otterville Limestones of the lower part of the Dornick Hills Group of southern Oklahoma, from the basal part of the Marble Falls Limestone of Texas, which has been called Morrowan in age, from the Johns Valley Shale of Oklahoma, and from the Wapamucka Limestone of Oklahoma. In eastern Ohio a comparable fauna comes from the Poverty Run Limestone that is above the Vandusen Coal in the Pottsville Series (Marple, 1952). Thus, although some students (Kosanke, Simon, Wanless, and Willman, 1960) have considered the rocks of this zone in Indiana to be Desmoinesian in age, the ostracods offer no supporting evidence.

The zone containing the *Amphissites rothi* fauna is overlain in sharp faunal contrast by a zone, not named formally here because of its indeterminate upper boundary, that is characterized especially by *A. centrostius* (Ulrich and Bassler) and by *A. girtyi* Knight, *A. harltoni* (Cooper), a modified form of *Bairdia dornickhillensis* Harlton (Shaver, 1960, sample 3), *B. oklahomensis* Harlton, and *Roundyella* cf. *R. simplicissima* (Knight). These ostracods occur with *Fusulinella?* listed elsewhere herein and with the species

Fusulinella iowensis. The lowest positions of this fauna in Indiana are in the limestone and shale above the Buffaloville Coal of the Brazil Formation in Spencer County (locs. 39 and 42), Dubois County (loc. 32), Warren County (loc. 34), and in the limestone, called the Perth by Hutchison (1960), and associated shale of the Brazil Formation in Owen County (loc. 28). It has also been found extensively in shales associated with limestones, including beds containing the fusulinid *Wedekindella* (loc. 19), which are in the lower part of the Staunton Formation in Parke and Fountain Counties (locs. 11 and 19). In Illinois, *Amphissites centronatus* was found in limestone near the base of the local Pennsylvanian section on an island in the Des Plaines River, Will County (loc. 4).

The only previously described comparable faunas from the Midcontinent area are Desmoinesian in age; in Ohio and Illinois comparable faunas are found respectively in the Lower Mercier Limestone (middle Pottsville) (Marple, 1952) and in the Seville Limestone Member of the Spoon Formation (Cooper, 1948), also of Desmoinesian age.

SYSTEMATIC PALEONTOLOGY

The fusulinid fauna that we obtained from thin sections of limestone over the coal at Burr Mine on Pine Creek in central Warren County (loc. 5), from the limestone in the clay pit north of Veedersburg (loc. 8) in Fountain County, and from limestones associated with the black shales along Square Rock Branch near Port-O-Woods landing field in Parke County (loc. 13) have

revealed numerous types of fusulinids, including ozawainellids, *Pseudostaffella*, *Profusulinella*, and several unidentifiable forms of fusulinids. Although it is not our purpose to describe in this paper all of the faunas encountered in these different limestones, it does seem important that a brief description is published at this time concerning some of them. This seems especially true concerning the new form of *Profusulinella*. It also seems important that we illustrate some of the associated specimens found with this species of *Profusulinella*, including such forms as *Millerella* sp., *Pseudostaffella* sp., and the undescribed form of *Profusulinella* from the limestones exposed in Square Rock Branch, northern Parke County.

Profusulinella burrensis

Thompson and Shaver, new species
Pl. 1, figs. 1-10

The shell of *Profusulinella burrensis*, n. sp., is short and inflated fusiform in shape with convex to irregular lateral slopes, slightly shifting axis of coiling, and pointed polar ends. Mature shells of six to seven volutions measure about 2.4 to 3.0 mm in axial length and about 1.0 to 1.3 mm in width, giving form ratios of about 2.4 at maturity. The form ratios of length to width of the first to the sixth volution are about 0.9, 1.1, 1.5, 1.9, 2.1, and 2.4, respectively. The prolocentus is almost perfectly spherical and is moderately large. Its outside diameter measures about 86 microns. The heights of the chambers in the first to the sixth volution of the holotype specimen are about 30, 48, 69, 86, 120, and 139 microns, respectively.

The spirotheca is thin and is composed of moderately thick upper and lower tectoria and a distinct central layer, the tectum.

The tunnel is distinct, and its path is straight. The tunnel sides of the chomata are steep to overhanging, and their poleward slopes extend to the axis of coiling in the fourth to the sixth volution of mature specimens, giving the

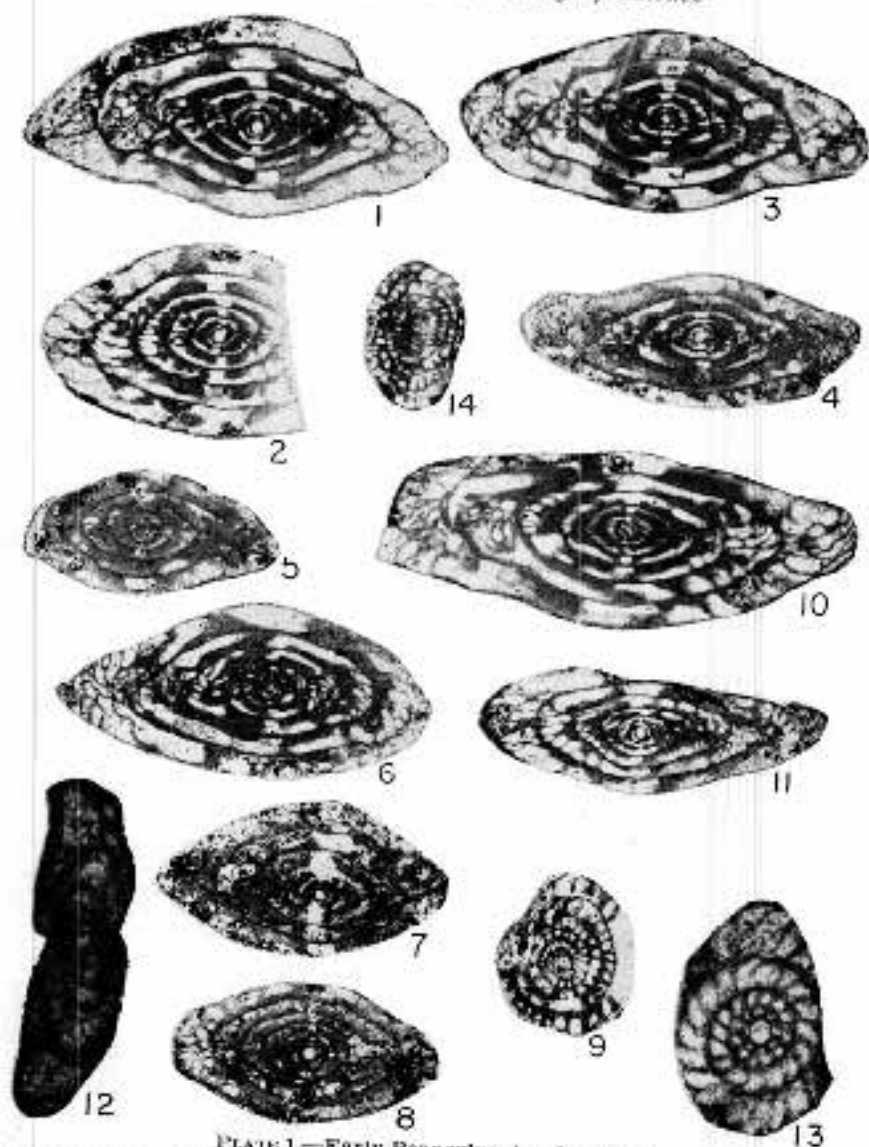


PLATE 1.—Early Pennsylvanian fusulinids.

FIGURES 1-10.—*Profusulinella burrensis* Thompson and Shaver, n. sp. 1, Axial section of the holotype, x 20 (loc. 5); 2, 4-7, axial sections of paratypes, x 20 (loc. 5); 3, axial section of a paratype, x 20 (loc. 8); 8, axial section of a paratype, x 20 (loc. 13); 9, sagittal section of a paratype, x 20 (loc. 5); and 10, section tangent to the second volution, x 20 (loc. 8).

FIGURE 11.—*Profusulinella* sp. Axial section of an elongate specimen that shows typical wall structure, x 20 (loc. 13).

FIGURES 12-13.—*Mitterella* sp. 12, Axial section, x 100 (loc. 8), and 13, sagittal section, X 100 (loc. 13).

FIGURE 14.—*Pseudostaffelia* sp. Slightly oblique parallel section tangent to the second or third volution, x 20 (loc. 13).

false impression that the shell has axial fillings. The tunnel angle measures about 25, 18, and 40 degrees in the fourth to the sixth volution. The septal counts of the first to the sixth volution are about 10, 14, 15, 19, 21, and 24. The septa are slightly fluted in the extreme polar ends of the shell, but they are unfluted in other parts of the shell.

Remarks.—*Profusulinella burrensis* can be distinguished from *P. kentuckyensis* Thompson and Riggs by its shorter and more inflated shell, distinctly more massive chorata, and its more inflated chambers. Its tunnel angle is considerably smaller for corresponding parts of the shell.

Occurrence.—*Profusulinella burrensis* is abundant in the caprock limestone over the coal at Burr Mine near Pine Creek in central Warren County (loc. 5), and it has been found in the limestone in the clay pit north of Veedersburg (loc. 8) where it is associated with scarce specimens of *Millerella* sp. (Pl. 1, fig. 12). *P. burrensis* is scarce in the limestones along Square Rock Branch in Parke County (loc. 13) where it is associated with *Profusulinella* sp. (Pl. 1, fig. 11), *Millerella* sp. (Pl. 1, fig. 13), and *Pseudostafella* sp. (Pl. 1, fig. 14).

Repository.—All illustrated fusulinid specimens from this study are catalogued with the Illinois State Geological Survey under the number 33P. All illustrated ostracod specimens from this study are catalogued with the Indiana Geological Survey under the number 7G.

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