The Huron Group in Western Monroe and Eastern Greene Counties, Indiana.

By F. C. Greene.

The opening of the right-of-way of the Indianapolis Southern Railway between Indianapolis, Indiana, and Effingham, Illinois, presented an unusual opportunity for the study of the so-called Huron group, west of Bloomington, Indiana, in western Monroe and eastern Greene counties. The Huron group is the youngest formation of the Mississippian of Indiana. The name Huron was first apyplied by Dr. Ashley in his paper on the Lower Carboniferous Area of Southern Indiana.[1]

The type locality is at Huron, Lawrence County, a station on the B. & O. S.-W. Railway. According to his definition, the boundaries of the Huron group are fixed at the base of the lowest sandstone in the group and the unconformity at the top which marks the division between the Mississippian and Pennsylvanian. The discussion of his reasons for so drawing the limits at these points may be found in his report and will not be repeated here. However, as the name Huron is preoccupied[2], it must be replaced by another, and it is here proposed to substitute the name Chester, as the group can be correlated with the upper Mississippian of Illinois or Kentucky.

Blatchley gives a concise summary of the formation.[3] He says, "In Orange County, where the Huron group is perhaps the most typically exposed, it is represented by a lower limestone, a lower sandstone, a middle limestone, an upper sandstone and an upper limestone. . . . . .

The lower Huron limestone is a compact, smooth-grained, ash-gray to blue limestone, which varies from five to eight feet in thickness. In structure it is a close-grained, fine-textured, non-crystalline stone, breaking with a sub-conchoidal fracture. . . . . .

[1] Ashley, G. H., Dept. of Geol. and Nat. Res. of Ind., 1902.

[2] In the Rept. of Progress in 1869, Geol. Survey of Ohio, Part I, p. 18, Dr. S. W. Newberry proposed the name Huron for a shale formation of the Devonian of Ohio.

[3] Blatchley, W. S., Thirtieth Ann. Rept. Ind. Dept. Geol. and Nat. Res., pp. 144-145.

The middle Huron limestone is usually a close-textured, semi-crystalline, gray fossiliferous limestone which varies in thickness from 5 to 30 feet, averaging about 16 feet. . . . . .

The upper limestone averages about 15 feet in thickness, is more nearly crystalline in structure, varies from dark to light gray in color, and contains many crinoid stems and bryozoa. It takes a fine polish and resembles marble when so treated, but does not hold its polish when exposed to the atmosphere.

The general section in the area under discussion is:

		Ft.
	10—Shale and sandstone of Pennsylvanian age, which is unconformable on the beds below. Huron (Chester) Group.	
Upper limestone.	9—Limestone and shale, calcareous, grading from brecciated limestone at bottom to shale at top; limestone composed largely of bryozoa with few foraminifera: locally known as marble	25
Upper sandstone.	8—Sandstone, a heavy bed of ferruginous, reddish, brown, or white, hard or soft, laminated	40
Middle limestone.	7—Limestone, crystalline, generally light colored, occasionally oölitic, foraminiferal	6–21
Middle sandstone.	6—Shale, argillaceous or arenaceous, weathers red in places	20–25
	5—Sandstone, similar to upper, except much more cross-bedded	25
	4—Shale, dark, bituminous	0–12
Lower limestone.	3—Limestone, thin bedded, oölitic or lithographic	2–5
Lower sandstone.	2—Shale, arenaceous or sandstone	½–12
	Mitchell limestone.	
	1—Limestone, white, finely oölitic.	

SUMMARY OF PREVIOUS WORK.

Cox, in a report on the geology of Greene County[4], says:

"Sub-Carboniferous Limestone.—At the mouth of Fish Creek, in the northern part of the county, limestone belonging to the Chester group of the sub-carboniferous formation, outcrops in the bluff bank of the creek, and is exposed to the depth of 15 to 20 feet, and is at this place overlaid by drift, but at a short distance to the southwest it is increased by the addi-

[4] 1st Ann. Rept. Geol. Survey Ind., 1869, p. 87.

tion of 2 to 5 feet of shale, with an irregular thin bedded seam of Coal A and the Millstone Grit. Some of the layers contain a few fossils. The following comprise all that could be recognized: Orthis umbraculum, Archimides wortheni, Athyris subtilita, Pentremites obessus, P. pyriformis, Spirifer incrassatus, Productus carbonarius, P. cora, and an abundance of encrinite stems. It belongs to the upper member of the sub-carboniferous limestone, and is designated by Prof. A. H. Worthen in the Geological Report of Illinois as the Chester Group.

"The greatest development of this limestone seen in Greene County, is on Beech Creek, a branch of Richland Creek, on section 12, township 7, range 4, where it forms a great mural precipice, capped with sandstone of the Millstone Grit series. The following section was obtained at this locality:

"Brownish-gray sandstone, in thick beds which has the appearance of being most excellent building stone	25 feet 0 in.
Shale, which thickens up to many feet and in places contains Coal A	1 in.
Buff colored limestone in which I saw Pentremites obessus, P. pyriformis, and Archimides wortheni	20 feet
Gray silicious shale, partly covered	25 feet
Bluish limestone (in which I saw no fossils, with intercalations of sandstone, mostly covered by talus	50 feet
Total	120 feet 1 in.

"At the junction of the sandstone and limestone at this locality, there gushes forth a mammoth spring of good cool water. . . . . .

"The sub-carboniferous limestone makes its appearance at the base of the hills along this creek for a distance of several miles, and is overlaid by a few feet of shales and the massive sandstone at the base of the Millstone Grit. It also makes its appearance at the ore banks on Ore Branch of Richland Creek in section 28, township 7, range 4, and on the eastern border of the county line near the Virginia blast furnace along Richland Creek."

Professor Cox has probably mistaken the heavy sandstone above the middle limestone for the Millstone Grit (Mansfield sandstone), and has confused the limestones.

Ashley, in the coal report on Greene County[5], says:

"Lower Carboniferous.—The Kaskaskia is well represented in this county by limestone and sandstone, with some shales.

"The uppermost limestone, which is not very persistent here, usually is found but a few feet below Coal I or the equivalent horizon. This limestone, while often absent, attains a thickness of 20 feet in places. Then comes a variable thickness of sandstones and shales, and below that still heavier beds of limestone. The lower limit of the Kaskaskia is somewhat in doubt, as by some it is drawn at the top of this lower limestone, by others part way down it. The lower part of this limestone is probably of St. Louis age, and extends down into the Mitchell limestone."

Paragraph 1258[6]. Section at William Sexton's spring, S. W. of S. E. of Sec. 16-6-3. (C. E. S.)

1. Massive buff sandstone (Mansfield) 20
2. Heavy limestone (lower carb.) 14
3. Bluish gray shale 6

In the report on the road materials of Greene County, Blatchley says:* "Huron Limestone—The rocks of the Huron group lie close to the surface over the greater part of Greene County, east of White River. On the highest ridges and hills they are capped with the Mansfield sandstone. For the most part the exposed Huron rocks are also sandstone, but several localities there are outcrops of hard bluish Huron limestone, which appear well adapted for road improvement.

"The principal one of these exposures visited was on the land of George Cox, southwest quarter of the northwest quarter of section 3 (7 N., 4 W.). At this point the Indianapolis Southern Railway Company was constructing a viaduct 2,215 feet in length and 147 feet in height across Richland Creek, and a quarry had been opened to secure crushed rock for the concrete work in connection therewith. In this quarry the blue limestone was exposed in fourteen layers, each four to thirty inches in thickness, and aggregating seventeen feet. This limestone was both overlain and underlain with a Huron sandstone, the overlying portion being three to seven

[5] Ashley, G. H., 23d Ann. Rept. Ind. Dept. Geol. and Nat. Res., 1898, p. 770, par. 1250.

[6] Op. cit. page 772.

* Blatchley, W. S., 30th Ann. Rept. Ind. Dept. Geol. and Nat. Res., 1905, p. 894.

feet in thickness, which, with a foot of soil, had to be stripped. The limestone appeared to be very hard and semi-crystalline in structure. . . .

"Another exposure visited was on the land of George Shipman, northeast quarter section 15 (7 N., 4 W.), where a quarry has been worked for macadam road material. At this point the blue Huron limestone was exposed to a thickness of fifteen to seventeen feet, with four to seven feet of buff Huron sandstone overlying. Sufficient material to cover six miles of road had been secured at this quarry, the supply in sight being practically inexhaustible.

"The same stone outcrops at many points along Beech Creek, and especially in section 12 (7 N., 4 W.), where it forms part of a great precipice or perpendicular bluff, 120 or more feet in height, the upper portion of which is a massive bed of Mansfield sandstone."

This latter is evidently the same exposure as that measured by Cox.

Shannon, in the report on the iron ores of Greene County[7], cites several instances of the replacement of limestone by iron as in section 6 below, but does ot discuss the stratigraphy.

From the foregoing it will be seen that very little work has been done on the stratigraphy or paleontology of the Chester in this area.

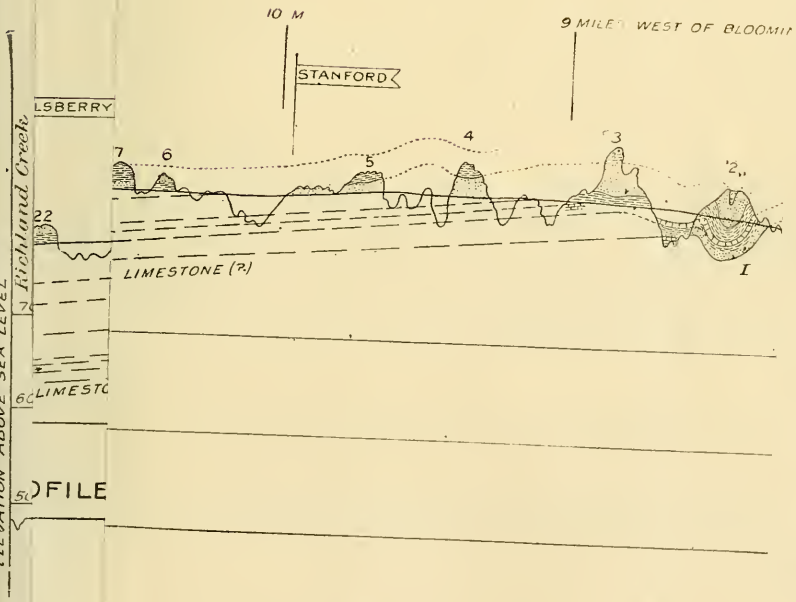
SECTIONS.

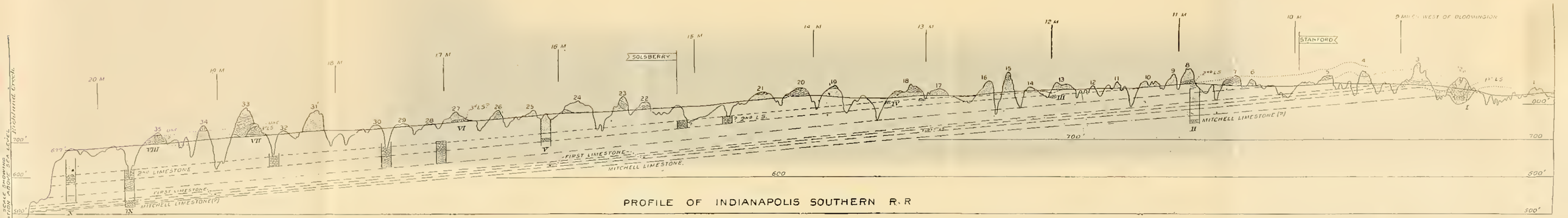
The following sections were obtained along the right of way of the Indianapolis Southern Railway, with the exception of Number IX, which was taken at the locality mentioned by Cox and Blatchley on Beech Creek, being about three-fourths of a mile south of VIII. The sections are shown on the profile.

I.	5—Shale, sandy, and soil	15
	4—Sandstone, soft, reddish	22
	3—Shale, argillaceous, sandy in places and grading into sandstone at bottom	12
	2—Limestone, upper 2 in. oölitic and very fossiliferous, lower part with very few fossils beside foraminifera	2
	1—Shale, argillaceous, to track	10-12
II.	7—Sandstone, soft, ferruginous, cross-bedded	20
	6—Limestone, hard, fossiliferous, oölitic in places	6

[7] Shannon, C. W., 31st Ann. Rept. Ind. Dept. Geol. and Nat. Res., 1906, p. 373.

	5—Talus	3	
	4—Covered slope	30	
	3—Sandstone	17	
	2—Covered slope	27	
	1—Mitchell limestone (exposed)	5±	
III.	4—Sandstone in cut	10	
	3—Covered slope to track	10±	
	2—Limestone with spring at base	10	
	1—Covered slope to creek.		
IV.	4—Sandstone and shale, with thin coal and iron-ore (Pennsylvanian).		
	3—Covered	12–15	
	2—Limestone, exposed	4	
	1—Covered	4	
V.	4—Covered to level of track.		
	3—Sandstone	40	
	2—Covered slope	20	
	1—Limestone, spring at base—exposed	7	
VI.	3—Clay, shale and sandstone	24	6
	2—Iron-ore (replaced silicious limestone)		6
	1—Coal		6
VII.	4—Shale and sandstone, latter predominating	2	
	3—Sandstone, rather calcareous	1	6
	2—Shale, argillaceous or calcareous	12	
	1—Sandstone	0–5	
VIII.	17—Soil	4–5	
	16—Sandstone, thin-bedded	3–4	
	Unconformity.		
	15—Limestone, ferruginous, weathers to iron-ore		6
	14—Shale	4	
	13—Limestone, impure	3	
	12—Covered slope, fragmentary limestone and sandstone, but mostly shale	10	
	11—Limestone	1	6
	10—Shale		4
	9—Limestone like No. 7	1	


10 M
STANFORD
9 MILES WEST OF BLOOMI
LSBERRY
7
6
5
4
3
2
1
LIMESTONE (?)
LIMESTC
FILE
Richland Creek
SCALE SHOWING
ELEVATION ABOVE SEA LEVEL



PROFILE OF INDIANAPOLIS SOUTHERN R. R

	8—Shale, olive		6
	7—Limestone, hard		4
	6—Shale, olive		8
	5—Limestone, four layers, cross-bedded, hard crystalline, fossiliferous	3	
	4—Limestone, cross-bedded and brecciated	2	
	3—Shale parting with a limestone lens		0–10
	2—Limestone, hard, fossiliferous, brecciated, so-called "marble"	3	9
	1—Sandstone, shaly	2	6
IX.	7—Sandstone, even bedded	40±	
	6—Limestone	20	
	5—Shale, sandy or argill., weathers red in places	30±	
	4—Covered	25	
	3—Limestone, thin-bedded	5	
	2—Sandstone, thin intercalation		2–6
	1—Limestone, oölitic, probably Mitchell	10	
X.	3—Covered slope to track, sandstone in lower part and probably all sandstone	40	
	2—Limestone	17	
	1—Covered slope and sandstone to Richland Creek	99	

DISCUSSION OF STRATIGRAPHY.

When the attempt to unravel the stratigraphy of the group was begun, some trouble was encountered: (1) the unconformity which limits the group at the top; (2) the deposit of glacial drift in the area bordering Richland Creek; (3) the solution of the underlying Mitchell limestone on the eastern border, developing large folds and the collapse of strata; (4) solution of the limestone layers in the Solsberry formation; and (5) the fact that the Solsberry sandstones and shales have a tendency to be more or less cross-bedded and lenticular, as would be expected of a shore deposit. These factors detract somewhat from the correct interpretation of the stratigraphy.

Sections in the underlying Mitchell limestone in the region studied show that in most cases the top of the latter formation consists of a very typical white oölite, differing materially from that of the Chester. Ash-

ley[8] noted the occurrence of oölite in the Mitchell limestone in many places; it has therefore been thought safe to consider this oölite, in the area studied, of Mitchell age, especially as the stratigraphic relations seem to confirm this view.

At 1[9], the Mitchell oölite is at the level of the track and is overlain by 8.5 feet of sandstone. West of this the Mitchell limestone forms the

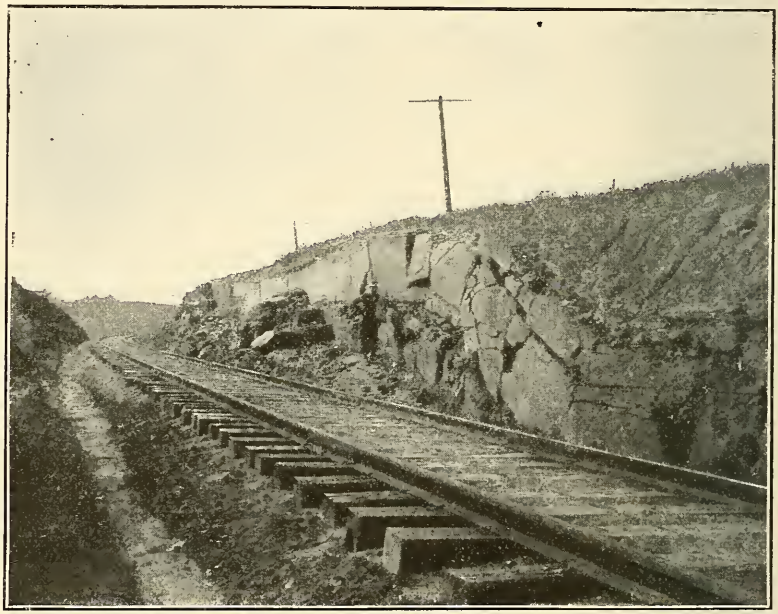


Fig. 1.

surface rock so that sinkholes are a conspicuous feature, but sandstone fragments are found. The relations of the strata at 2 have been greatly disturbed by the solution of the underlying Mitchell limestone so that a synclinal fold has been developed. Section I was taken at this point in the eastern part of the cut. The lower limestone, No. 2 of the section, has been dissolved to such an extent that only isolated blocks remain in the

[8] Ashley, G. H., Carboniferous Area of Southern Indiana, 27th Ann. Rep. Ind. Dept. Geol. and Nat. Res. 1902, p. 82.

[9] Numbers refer to cuts on accompanying profile section.

eastern part of the cut, while it has entirely disappeared from the western end. It is likely that the layer is thicker than two feet, as other exposures seem to show. The area between cuts 2 and 3 is a large compound sink. On the north side of the track, the Mitchell is found about thirty feet below, with ten feet of hard, light-colored sandstone overlying. On the south side, fifteen feet below the track, three feet of the lower limestone out-

Fig. 2.

crop. Shale occurs below it, but most of the section is covered. In cut 3 the following section was obtained:

4—Soil	6	ft.
3—Sandstone, ripple-marked and cross-bedded	31.5	ft.
2—Shale, blue, soft, clayey	8–11	ft.
1—Limestone, lower, in ditch.		

In the eastern part of this cut the solution of the underlying Mitchell has again caused a synclinal folding of the beds. The shale No. 6 (of gen. sec.) first occurs in the top of the next cut 4 and continues in 5, 6, 7 and 8. It is a sandstone or arenaceous shale at the bottom, becoming more

shaly in the middle and finally a clay shale at the top, in cut 8. From the exposures in cuts 4 and 5 it appears that a slight local unconformity may exist below this shale. In the eastern part of 8, the middle limestone first appears. Section II shows it to be 77 feet above the Mitchell as exposed in the valley below, which conforms with the dip and thickness of the underlying beds. This limestone appears at nearly every point west of cut 8, where its level is reached and its lower limit is marked by a spring

Fig. 3.

horizon. The correlation is based on stratigraphic, lithologic and paleontologic evidence and on the presence of springs in a few instances. It thickens progressively to the west, and on the east bluff of Richland Creek a quarry in it furnished rock for the railway viaduct. The cuts 8 to 21, inclusive, are in the upper sandstone with the exception of 18 and 20. This sandstone forms one of the prominent features of the topography. It is a reddish, ferruginous, laminated stone, appearing soft in the cuts but generally weathering into a hard bluff-forming stone where the drainage has cut through it. At places shale appears at the level of this sandstone.

These places may indicate lenses in the sandstone or shale of the overlying unconformable Pennsylvanian rocks.

At 18 the cut shows the unconformity and a mass of bog iron ore, coal and purplish-drab shale, resting on the sandstone only a few feet above the upper limestone. In cut 20 and the top part of 21, Pennsylvanian shale rests unconformably on the upper sandstone.

Fig. 4.

Between Solsberry and the viaduct, the railroad grade is about on a level with the top of the upper sandstone so that nearly all the cuts are in Pennsylvanian rocks. At 27, section VI was obtained. The iron ore (replaced limestone) of this section appears to be correlative with the upper limestone from stratigraphic and faunal evidence, which, however, is rather meagre. Coal occurs beneath it, while the sandstone above is probably of Pennsylvanian age.

Owing to the fact that it is replaced, only casts of shells remain, and in many cases these are unidentifiable. In view of this the correlation with the upper limestone must be tentative.

Section VII was obtained in the eastern part of cut 33, known as the "Head Cut." The western part of the cut is Pennsylvanian, an unconformity occurring about half way through the cut and above the upper limestone, so that the limestone may have been thicker than now exposed. This limestone is undoubtedly to be correlated with that in cut 35 (see section VIII) on stratigraphic and lithologic relations as well as faunal evidence.

Fig. 5.

The lower layers of the limestone in section VIII are brecciated and the limestones in both sections VII and VIII contain fragments of a sandstone similar to the underlying upper sandstone, while many species appear for the first time. The intervening cut, 34, contains sandstone, probably of Pennsylvanian age, and obscures the relations of cuts 33 and 35.

From the foregoing it will be seen that there is an apparent unconformity between the upper sandstone and limestone, which may account for the peculiarities of section VI.

The stratigraphic relation of the middle and upper sandstones and the middle limestones are easily determined, but there is some doubt as

to the lower limestone and lower sandstone owing to the absence of exposures to the west. Section IX shows at the bottom of the slope, 15 feet of limestones, the upper 5 feet of which is thin bedded and contains fossils similar to the lower limestone in section I, except that the bryozoa are more conspicuous in the latter. The lower ten feet have a striking resemblance to the Mitchell limestone (oölite) both in appearance and fossil content, while between the two there is a thin intercalation of sandstone which is possibly the lower sandstone. The level of the rocks corresponds to the dip and thickness of the formation, but it is possible that the whole thickness belongs to either the Solsberry or Mitchell.

Fig. 6.

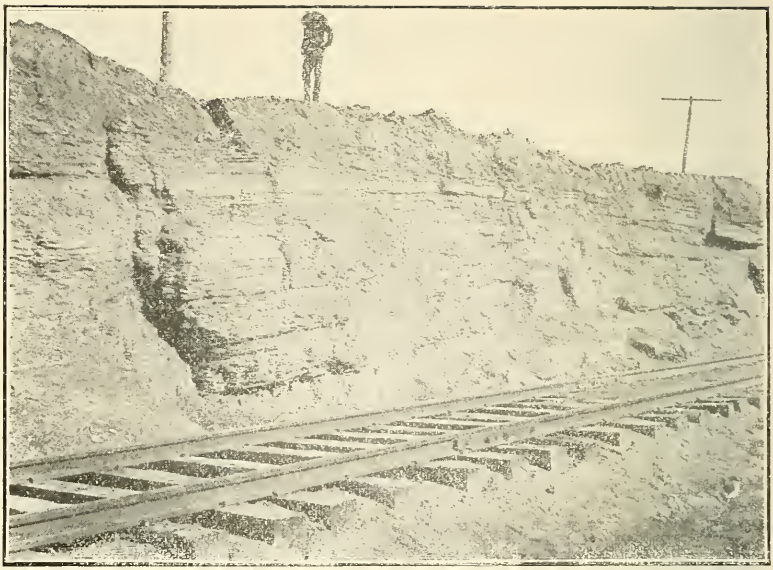


Fig. 7.

Fig. 8.

Fig. 9.

FAUNA.

The fauna of the limestones is rather large and well preserved, that of the sandstones and shale very meagre. The faunal lists follow[10]:

Lower limestone in section I.

Endothyra baileyi Hall.
Zaphrentis sp.
Echinocrinus sp.
Crinoidea 4 sp.
Batostomella abrupta ? Ulrich.
Fenestella sp.
Dielasma sp.
Productus burlingtonensis Hall. var.
Derbya sp.
Spirifer sp.
Martinia contracta M. & W.
Microdon subelliptica Hall.
Pelecypod sp.
Pleurotomaria subglobosa Hall.
Straparollus sp.
Strophostylus carleyana? (Hall) Keyes.
Loxonema yandellana Hall.
Solenospira attenuata (Hall) Ulrich.

[10] Prof. R. M. Bagg, of Illinois University, has kindly consented to examine the foraminifera of the collection, which appear to be rather abundant. At this time, his examination has not been completed and this important part of the fauna must be omitted.

Cyclonema leavenworthana Hall.
Bulimorpha buliformis Hall.
Microchelius stinesvillensis? Cumings.
Bellerophon sublævis Hall.
Orthonychia acutirostre (Hall) Keyes.
Leperdita carbonaria Hall.
Griffithides bufo? M. & W.

Mitchell ? limestone in section IX.
Hemitrypa ?? sp.
Polypora sp.
Martinia contracta M. & W.
Productus burlingtonensis Hall. var.
Dielasma turgida Hall.
Spirifer leidyi N. & P.
Derbya sp.
Bellerophon sublævis Hall.
Orthonychia acutirostre (Hall) Keyes.
Griffithides bufo M. & W.

Lower limestone in section IX.
Zaphrentis sp.
Crinoidea sp.
Streblotrypa nicklesi Ulrich
Cystodictya ocellata? Ulrich.
Intrapora undulata (Ulrich).
Stenopora tuberculata var. polymorpha Prout.
Fenestella tenax? Ulrich.
Fenestella sp. (reverse).
Batostomella abrupta Ulrich.
Rhombopora cf. nicklesi Ulrich.
Rhombopora sp.
Archimedes communis? Ulrich.
Bryozoa sp.
Martinia contracta M. & W.
Spirifer leidyi N. & P.
Spiriferina sp.
Productus sp.
Straparollus sp.

Middle limestone in section II.
Endothyra baileyi Hall.
Zaphrentis sp.
Pentremites pyrimidatus Ulrich.
Echinocrinus norwoodi Hall (spines).
Crinoidea 2 sp. (stems and calyx
Lioclema? araneum Ulrich.
Rhombopora bedfordensis Cumings.
Rhombopora sp.
Fenestella serratula Ulrich.
Fenestella compressa Ulrich.
Fenestella sp.
Hemitrypa proutana Ulrich.
Fistulipora spergenensis ? Rominger.
Archimedes laxus? (Hall).
Polypora sp.
Dielasma turgida Hall.
Dielasma formosa Hall.
Martinia contracta M. & W.
Seminula trinuclea Hall.
Spirifer leidyi N. & P.
Derbya keokuk Hall.
Productus burlingtonensis Hall. var.
Productus parvus? M. & W.
Productus cora? D'Orbigny.
Cypricardinia indianensis Hall.
Microdon subelliptica Hall.

Nucula shumardana Hall.
Productus cestriensis Worthen.
Conocardium meekanum Hall.
Myalina? sp.
Pelecypod sp.
Pleurotomaria? wortheni Hall.
Pleurotomaria? subgolbosa Hall.
Loxenema yandellana Hall.
Straparollus similis M. & W.
Straparollus spergensis (Hall).
Straparollus sp.
Stropostylus carleyana Hall.
Cyclonema subangulata Hall.
Cyclonema leavenworthana Hall.
Solenospira turritella (Hall) Ulrich.
Solenospira vermicula (Hall) Ulrich.
Solenospira sp.
Bulimorpha caniculata Hall.
Bulimorpha? sp.
Holopea proutana Hall.
Bellerophon sublævis Hall.
Orthonychia acutirostre (Hall) Keyes.
Bairdia cestriensis Ulrich.
Cytherella ovatiformis Ulrich.
Griffithides bufo M. & W.
Fish 3 sp. (teeth).

Middle limestone in section III.
Fenestella serratula Ulrich.
Fenestella c. f. multispinosa Ulrich.
Anisatrypa solida Ulrich.
Archimedes sp.
Martinia contracta M. & W.
Dielasma formosa Hall.
Productus parvus ? M. & W.
Productus cestriensis? Worthen.
Productus cora? D'Orbigny.
Spirifer leidyi N. & P.
Griffithides bufo M. & W.

Middle limestone in section IV.
Endothyra baileyi Hall.
Martinia contracta M. & W.
Bellerophon sublævis Hall.

Middle limestone in section V.
Fenestella sp.
Martinia contracta M. & W.
Productus cestriensis? Worthen
Bellerophon sublævis Hall.

Middle limestone in section X.
Pentremites pyrimidatus Ulrich.
Crinoidea sp.
Archimedes sp.
Productus cestriensis Worthen.
Productus sp.
Spirifer leidyi N. & P.
Martinia contracta M. & W.

Upper ? limestone in section VI.
Zaphrentis spinulosa? M-E. & H.
Crinidea 3 sp. (segments).
Pentremites sp. (one poral plate).
Stenopora sp.
Fenestella cestriensis Ulrich.
Fenestella 2 sp.
Coeloconus rhombicus? Ulrich.
Polypora spinulifera Ulrich.
Archimedes sp.
Spirifer leidyi N. & P.
Derbya kaskaskiensis? Hall.
Dielasma turgida Hall.
Spiriferina spinosa N. & P.

Eumetria marceyi Shumard.
Productus parvus? M. & W.
Productus cestriensis? Worthen.
Productus cora? D'Orbigny.
Orbiculoidea sp. (cast).
Brachiopod sp. (cast).
Pleurotomaria sp. near tabulata Conrad.
Pleurotomaria sp. (cast).
Straparollus sp. (cast).
Bellerophon sublævis Hall.
Orthonychia chesterense ? M. & W.
Gastropod sp. (cast).
Bulimorpha sp. (cast).
Pleurophorus minimus Worthen.
Pleurophorus sp.
Microdon sp.
Nucula parva McChesney.
Modiala illinoisensis Worthen.
Schizodus ? sp.
Aviculopecten sp.
Pelecypoda 5 sp. (casts).
Primitia subæquata Ulrich.
Psammodus sp. (cast of tooth).
Cladodus spinosus ? M. & W. (cast of tooth).

Upper limestone in section VII.

Pentremites godoni DeFrance.
Pentremites florealis Schlotheim.
Pentremites pyriformis Say.
Pterotocrinus depressus Lyon and Cassiday (wing plates).
Acrocrinus shumardi Yandell.
Hydreionocrinus armiger M. & W.
Crinoidea 6 sp. (plates and segments).
Echinocrinus sp.
Thamniscus furcillatus Ulrich.
Fistulipora excelens? Ulrich.
Stenopora tuberculata Prout.
Stenopora rudis Ulrich.
Lioclema araneum Ulrich.
Coeloconus rhombicus Ulrich.
Fenestella flexuosa Ulrich.
Fenestella tenax Ulrich.
Fenestella cestriensis Ulrich.
Fenestella multispinosa? Ulrich.
Fenestella elevatopora? Ulrich.
Fenestella 2 sp.
Polypora cestriensis Ulrich.
Septopora subquadrans Ulrich.
Streblotrypa nickelsi Ulrich.
Batostomella spinulosa Ulrich.
Rhombopora minor Ulrich.
Rhombopora tenuirama Ulrich.
Rhombopora sp. near tabulata Ulrich.
Archimedes meekanus? Hall.
Ptilipora pauperi ? Ulrich.
Seminula trinuclea Hall.
Eumetria marceyi Shumard.
Cleiothyris sublamellosa? Hall.
Spiriferina spinosa N. & P.
Spirifer leidyi N. & P.
Productus parvus M. & W.
Dielasma turgida Hall.
Reticularia setigera Hall.
Trilobite sp.

Upper limestone in section VIII.

Zaphrentis spinulosa M-E. & H.
Pterotocrinus depressus Lyon and Casseday.
Hydreionocrinus armiger M. & W.

Crinoidea sp. (segments).
Pentremites sp.
Rhombopora sp. near tabulata Ulrich.
Rhombopora sp.
Stenopora sp.
Fenestella cestriensis? Ulrich.
Fenestella flexuosa Ulrich.
Fenestella sp.
Polypora spinulifera Ulrich.
Polypora cestriensis Ulrich.
Lioclema araneum Ulrich.
Streblotrypa nicklesi Ulrich.
Fistulipora excelens? Ulrich.
Archimedes distans Ulrich.
Archimedes sp.
Dielasma sp.
Productus sp.
Spiriferina transversa McChesney.
Spiriferina spinosa N. & P.
Spirifer leidyi N. & P.
Eumetria marceyi Shumard.
Brachiopod sp.
Aviculopecten c. f. monroensis Worthen.
Orthonychia chesterense M. & W.
Spirorbis c. f. imbricatus Ulrich.
Griffithides granulatus Wetherby.
Cladodus sp. (base of tooth).
Fish sp. (spine).

Discussion of fauna. From the foregoing lists, it will be seen that the fauna of the lower and middle limestones have many of the elements of the Salem fauna. This is particularly true at the eastern extensions of these beds where, in all probability, the shallow, lagoonal conditions favorable to this fauna, prevailed.

The lower limestone in section I has only two species which do not occur in the Salem limestone. These are *Martinia contracta* and *Batostomella abrupta*? The latter was not found in the middle limestone. The western extension of the lower limestone retains a few of the Salem species but indicates a condition of deposition farther from the shore-line. To the west it also contains *Batostomella abrupta*. In the collections from the lower layer, foraminifera are very scarce.

Collections from the middle limestone show that many Salem species continued to exist, but *Martinia contracta* is the most noticeable species, and *Pentremites* becomes a prominent member of the fauna. Thin sections from this horizon show under the microscope a great number of forms of foraminifera, and will undoubtedly yield many species, an element which will distinguish this limestone wherever found.

The faunal character of the upper limestone is entirely distinct from that of the two lower layers. It is of late Chester age and shows no distinct Salem forms.

If the limestone in section VI is to be correlated with the upper limestone, it shows what is probably a littoral phase of the layer, which to the west shows only deep water conditions.

CONCLUSIONS.

To briefly summarize, the Chester or Huron formation of western Monroe and eastern Greene counties consists of three limestones with separating sandstone and shale.

Dr. E. O. Ulrich, of the United States Geological Survey, has examined the lists of fossils given herewith and expressed the opinion that they represented the greater part of the Chester of Kentucky and southern Illinois. As the stratigraphy seems to confirm this, the following correlations are made:

Chester Group.	Upper (third) limestone. Upper sandstone.	Birdsville formation.	
	Middle (second) limestone.	Tribune Limestone.	
	Middle sandstone.	Cypress sandstone.	
	Lower (first) limestone. Lower sandstone. Oölitic upper portion of Mitchell.	Ohara limestone member. Rosiclare sandstone member. Fredonia oölitic member.	Ste. Genevieve Formation.
	Remainder of Mitchell.	St. Louis limestone.	

The line of division between the St. Louis and the oölitic above has not been located in Indiana, but the latter is probably at least 30 feet thick.