

THE CHANNAHON AND ESSEX LIMESTONES IN ILLINOIS.*

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The Channahon and Essex limestones represent certain early Silurian strata that have a restricted distribution in northern Illinois and in the Mississippi valley. Small remnants or outliers of these rocks have been found only in the counties of Will and Kankakee. This paper is based on field studies and fossil collections made by Mr. A. J. Ellis and the writer for the State Geological Survey.

THE CHANNAHON LIMESTONE.

The rocks referred to as the Channahon limestone outcrop in the south bank of the Des Plaines River, about one mile southeast of the village of Channahon, in Will County. They also underlie the surficial materials over a limited area on the north side of the river. A section of the strata exposed at the former locality is as follows:

	Feet.
SECTION OF CHANNAHON LIMESTONE.	
3. Dark gray to brown, rather fine-grained, impure limestone in layers 3-6 inches thick, containing many fossils.....	1½
2. Dark colored limestone, consisting of a fine-grained matrix in which are imbedded numerous simple corals, besides the fossils <i>Leptæna rhomboidalis</i> , <i>Schuchertella curvistriata</i> , <i>Pterinea elegans</i> , <i>Metapolichas ferrisi</i> and others.....	2½
1. Fine-grained, yellowish-gray, laminated sandstone, without fossils, to the level of the water in the river.....	5

In the foregoing section there is no apparent unconformity between the different members, although the lithology of the sandstone at the base is markedly different from that of the overlying limestone, and the numerous corals occurring in the second member are absent in the upper bed. The contact of the rocks described in the foregoing section with the Maquoketa shale below, or with the Niagara limestone above, cannot be seen at the point where the section was made. However, normal lower

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Niagara strata, carrying the common fossils of that horizon, are well exposed a few rods east of this point, at a level only four or five feet higher than the top of the uppermost member of the section. A blue plastic shale, that doubtless represents the Maquoketa, outcrops in the bank of the river about one-half mile further east, at an altitude slightly above that of the top of the section. At two points in the vicinity of Millsdale, where the contact of the lower beds of the Niagara limestone with the underlying Maquoketa shale is well exposed, the Channahon limestone is absent, and there are present no intervening strata of any kind.

The limestone members of the foregoing section furnished the following very interesting assemblage of fossils:

FOSSILS FROM THE CHANNAHON LIMESTONE.

- ²*Zaphrentis channahonensis*, n. sp.
- Zaphrentis stokesi* Edwards and Haime?
- Atrypa putilla* (Hall and Clarke)?
- Dalmanella elegantula* var.
- Homocospira channahonensis* n. sp.
- Gypidula* cf. *simplex* Foerste.
- Leptaena rhomboidalis* (Wilckens).
- Leptobolus illinoisensis* n. sp.
- Pholidops channahonensis* n. sp.
- Rhipidomella hybrida* (Sowerby).
- Rhynchotretra intermedia* n. sp.
- Schuchertella curvistriata* n. sp.
- Whitfieldella acuminata* n. sp.
- Whitfieldella ovoides* n. sp.
- Holopea illinoisensis* n. sp.
- Pterinea elegans* n. sp.
- Dawsonoceras tenuilineatum* n. sp.
- Cyphaspis intermedia* Weller.
- Metapolichas ferrisi* Weller.
- Proetus channahonensis* Weller.

CORRELATION: In the foregoing list of fossils, the species *Dalmanella elegantula* var., *Gypidula* cf. *simplex* and *Rhipidomella hybrida* indicate a Silurian age, but the fauna as a whole cannot be directly correlated with that of any known Silurian horizon. The greater number of the species have been found at no other place. Out of twenty species in the list, only two species of corals and four of the brachiopods have been described from other localities. The remaining fourteen species are known only from the strata under consideration at this place, and so are of no help in the correlation of the bed. Of the old species, the corals are not definite markers of any Silurian horizon. Of the brachio-

2. Note: The species of fossils in this paper designated as new, have been described by the writer in a paper that will soon be published in the Bulletin of the Geological Society of America.

Pods, *Dalmanella elegantula* and *Rhipidomella hybrida* are common Niagara species; *Gypidula simplex* was described by Foerste from the Waldron bed at Newsom, Tennessee; *Atrypa putilla* was described by Hall and Clarke from very early Silurian strata in Pike County, Missouri, which have been correlated with the Edgewood¹ formation in Alexander County, Illinois. Several of the other species in this list, while not specifically identical with forms occurring in the Edgewood formation of southwest Illinois, have very close affinities with species found in that formation. These are shown in the following comparative table:

COMPARATIVE TABLE OF FOSSILS.

Fossils from the Channahon Limestone in Will County. <i>Zaphrentis channahonensis</i> . <i>Atrypa putilla</i> ? <i>Dalmanella elegantula</i> var. <i>Leptaena rhomboidalis</i> <i>Rhynchotreta intermedia</i> <i>Schuchertella curvistriata</i> <i>Whitfieldella acuminata</i> <i>Pterinea elegans</i> <i>Dawsonoceras tenuilineatum</i> <i>Cyphaspis intermedia</i> <i>Metapolichas ferrisi</i> <i>Proetus channahonensis</i>	Fossils from the Edgewood Formation in Alexander County. <i>Zaphrentis channahonensis</i> <i>Atrypa putilla</i> <i>Dalmanella elegantula</i> var. <i>Leptaena rhomboidalis</i> <i>Rhynchotreta thebesensis</i> <i>Schuchertella propinqua</i> <i>Whitfieldella billingsana</i> <i>Pterinea thebesensis</i> <i>Dawsonoceras</i> cf. <i>tenuilineatum</i> <i>Cyphaspis intermedia</i> <i>Metapolichas clintonensis</i> <i>Proetus determinatus</i>
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While the correspondence of the respective species of fossils compared from the two areas is not identical, yet the differences between them are slight. The fauna from the Channahon locality is more closely related to that of the Edgewood formation than to any other known fauna.

It is thought that the strata in the two areas represent about the same general period of deposition; and that the differences in the specific characters of the forms above compared are largely due to local differences in the marine environments of the faunas in the respective regions.

Whether the sea in which the Channahon limestone accumulated was connected southward with the Pike County, Missouri, and Alexander County, Illinois, basin, or whether it had a northern connection as did the sea in which the overlying Niagara limestone was deposited, cannot be determined until other exposures of these early Silurian beds are discovered and their faunal relations are better known.

¹Savage, T. E.: Ill. State Geol. Surv., Bull. No. 16, 1911.

THE ESSEX LIMESTONE.

The strata comprising the Essex limestone overlie the Maquoketa shale in an exposure along the north bank of Horse creek, about one and one-half miles east of the town of Essex, in Kan-
kakee County. Plate VII. shows the character of the rocks at
this place, and a detailed section of the strata is given below:

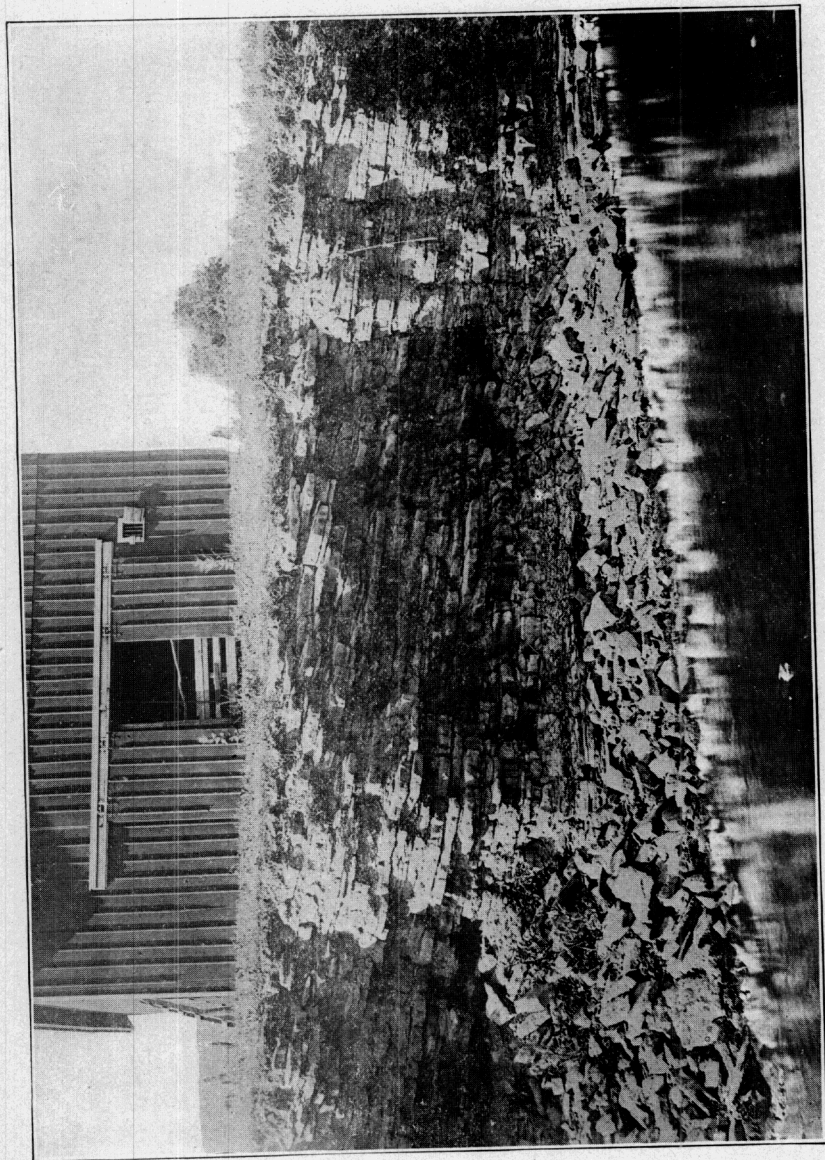
SECTIONS OF ROCKS OUTCROPPING ALONG HORSE CREEK.

	Feet
3. Yellowish-brown, magnesian limestone, containing small nodules and masses of chert, and bearing <i>Pentamerella ? manniensis</i> and other fossils	1½
2. Yellowish-brown, thin bedded, magnesian limestone, in layers 3 to 5 inches thick, with numerous fossils.....	8½
1. Rather hard, bluish colored, barren shale, in layers 2 to 6 inches thick, exposed above the level of low water.....	2

The lowest member of the foregoing section represents the Maquoketa shale. This shale is better exposed a few rods further down the stream, where a thickness of eleven feet may be seen, with no trace of the overlying limestone. The dolomitic limestone, comprising the second and third members of the section, constitutes the Essex limestone and contains the following fossils:

FOSSILS FROM THE ESSEX LIMESTONE.

- Zaphrentis* sp.
Favosites cf. *niagarensis* Hall.
Halysites catenulatus Linn.
Atrypa marginalis (Dalman).
Atrypa putilla (Hall and Clarke).
Atrypa sp.
Camarotoechia near *acinus* Hall.
Camarotoechia ? cliftonensis Foerste.
Dalmanella elegantula var.
Gypidula sp.
Leptaena rhomboidalis (Wilckens).
Pentamerella ? manniensis Foerste.
Rhipidomella hybrida (Sowerby).
Rhynchotretra simplex Foerste.
Rhynchotretra thebesensis Foerste.
Schuchertella sp.
Schuchertella subplana (Conrad).
Strophonella sp.
Whitfieldella cylindrica Hall.
Whitfieldella sp.
Bellerophon sp.
 cf. *Cyclora alia*.
Conularia sp.
Platyostoma sp.
Pleurotomaria sp.
Loxonema sp.
Modiolopsis sp.
Mytilarca mytiliformis (Hall).
Pterinea sp.



View of Exposure of Essex Limestone, near Essex, Illinois.

CORRELATION: In the foregoing list of fossils only thirteen species are certainly identified. Of this number, *Halysites catenulatus* and *Leptaena rhomboidalis* have no definite stratigraphic value. *Atrypa marginalis*, *Atrypa putilla*, *Dalmanella elegantula* var., and *Rhynchotretra thebesensis* occur also in the Edgewood strata of southwest Illinois. *Atrypa marginalis* and *Dalmanella elegantula* have also been reported from the Clinton bed at Clifton, Tennessee.

Of the remaining seven identified species, *Camarotoechia ? cliftonensis*, *Pentamerella ? manniensis* and *Rhynchotretra simplex* were described by Foerste from strata that he considered of Clinton age, at Clifton and near Riverside, in western Tennessee, where they were said to occur with such other typical Ohio Clinton species as *Triplecia ortoni*, and *Illaenus daytonensis*. *Whitfieldella cylindrica* and *Mytilarca mytiliformis* were described by Hall from the Clinton strata of New York. *Rhipidomella hybrida* and *Schuchertella subplana* are common species of the Niagara limestone.

The above analysis of the fauna of the Essex limestone would seem to indicate a Clinton age for these strata. However, in this fauna, the typical species of the Ohio Clinton fossils are wanting, and the characteristic fossils of the New York Clinton are absent. In southwest Illinois there are present normal Ohio Clinton strata containing fossils similar to those found in the corresponding beds in Ohio; but such characteristic fossils of the Essex limestone, as *Camarotoechia ? cliftonensis*, *Pentamerella ? manniensis*, and *Rhynchotretra simplex* do not occur either in southwest Illinois or in the Clinton beds in Ohio. Since the normal Ohio Clinton fauna is present in the Clinton strata of Ohio and southern Illinois, but is absent in the Essex limestone in which *Camarotoechia ? cliftonensis*, *Pentamerella ? manniensis* and *Rhynchotretra simplex* are common, it seems strange that the faunas of the Ohio Clinton and of the Essex limestone should be intermingled in the Clinton bed at Clifton, Tennessee. That the Essex fauna entered the Mississippi valley from the south, as did also the Ohio Clinton, is indicated by its presence in Illinois and in western Tennessee, and its absence east of the Cincinnati arch. The *Pentamerella ? manniensis* horizon has also been found at an intervening point in Jersey county, Illinois.

In view of these facts, it is difficult to understand how such an important element of the Essex fauna could be mixed with the

Ohio Clinton fauna in the more southern locality, and the two faunas occur so distinctly separated further north in Illinois. This difficulty was called to the attention of Dr. Foerste,¹ who replied that he was now inclined to consider the strata at Clifton, Tennessee, that has been referred to the Clinton, as consisting of two distinct horizons; the upper part being coarser grained, and carrying the Ohio Clinton fauna, while the lower part is more cherty and contains the fossils *Rhynchotretra simplex*, *Camarotoechia ? cliftonensis*, *Pentamerella ? manniensis* and their associates, but not bearing the typical Ohio Clinton fauna. If this is the true interpretation of the so-called Clinton strata in western Tennessee it would indicate that the Essex limestone fauna was to be correlated with that of the strata immediately below the layers representing the normal Ohio Clinton at Clifton, Tennessee. The presence of the Edgewood species, *Atrypa putilla*, *Dalmanella elegantula* var., and *Rhynchotretra thebesensis* in the Essex limestone is further evidence that this fauna is older than that of the Ohio Clinton, which, in Alexander County, Illinois, overlies the Edgewood formation.

The above facts indicate that neither the Niagara limestone, nor even the Clinton, represents the earliest Silurian strata that were deposited in northern Illinois; that the Channahon and Essex limestones represent pre-Clinton beds of Silurian age that were probably spread over considerable areas in the Mississippi valley, but were later mostly removed by erosion prior to the deposition of the overlying Niagara strata.

The term Alexandrian* has been proposed as a geological series to receive all of the early Silurian strata in the Mississippi valley that are older than the Ohio Clinton beds and younger than the Richmond. The Girardeau limestone and the Edgewood formation of southwestern Illinois were assigned to this series. If the correlations of the Channahon and Essex limestones, suggested above, are correct, the Essex limestone would belong above the Edgewood, near the top of the Alexandrian series. The Channahon limestone should probably be referred to a horizon corresponding in general with that of the Edgewood formation, while the Girardeau limestone, in southwestern Illinois and southeastern Missouri, continues to hold a place in the lower part of the series.

*Savage, T. E., Am. Jour. of Sci., Vol. 25, p. 434, 1908.

The presence of such remnants of pre-Clinton Silurian formations as the Channahon and Essex limestones furnish abundant evidence that, even where apparently conformable, the Niagara limestone in northern Illinois is separated from the underlying Maquoketa (Richmond) beds by an important stratigraphic break of very considerable length.

1. Note: In a private letter in which the statement credited to Dr. Foerste was made, he says that this suggested differentiation of the faunas in the strata at Clifton, Tennessee, was from memory only, this subdivision of horizon not being suspected at the time the fossil collection was made.