GUIDE BOOK

Third Annual

Indiana Geologic Field Conference

Silurian Formations and Reef Structures

of

Northern Indiana

1949

GUIDE BOOK

Third Annual Indiana Geologic Field Conference

May 13, 14, and 15, 1949

on

SILURIAN FORMATIONS AND REEF STRUCTURES OF NORTHERN INDIANA

Conference Leader
Ralph E. Esarey

Sponsored by

Department of Geology, Indiana University, and
Division of Geology, Indiana Department of Conservation,
Charles F. Deiss, Chairman and State Geologist.

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Indiana University

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INTRODUCTION

In response to popular demand, the Silurian formations and associated reef structures of northern Indiana were chosen as the subject for the 1949 Field Conference. The numerous quaquaversal structures in the Niagaran of northern Indiana were long the subject of controversies and objects of mystery until, in 1927, Cumings and Shrock showed conclusively that they are ancient coral and stromatoporoid reefs. In the past few years, interest in reefs, recent and ancient, has been revived. The vast number of soundings taken in coral reef lagoons during the war and recent studies in connection with the Bikini atom bomb tests have shed much new light on present day reefs, and recent oil field discoveries associated with reef structures have stimulated much interest and study of the Paleozoic reefs.

The conference has been planned to provide group observation and to promote group discussion of Niagaran reefs. Silurian stratigraphy is emphasized and special attention is given to lithology of reef core, reef flank, and inter-reef strata, as well as to the effect of reef structure on the overlying Devonian rocks. We hope that discussion combined with actual field examples will be of mutual benefit. This opportunity to become better acquainted and to exchange ideas is the most important part of the program.

SUMMARY OF PROGRAM

Headquarters for the conference is Hotel La Fontaine, Huntington., Indiana.

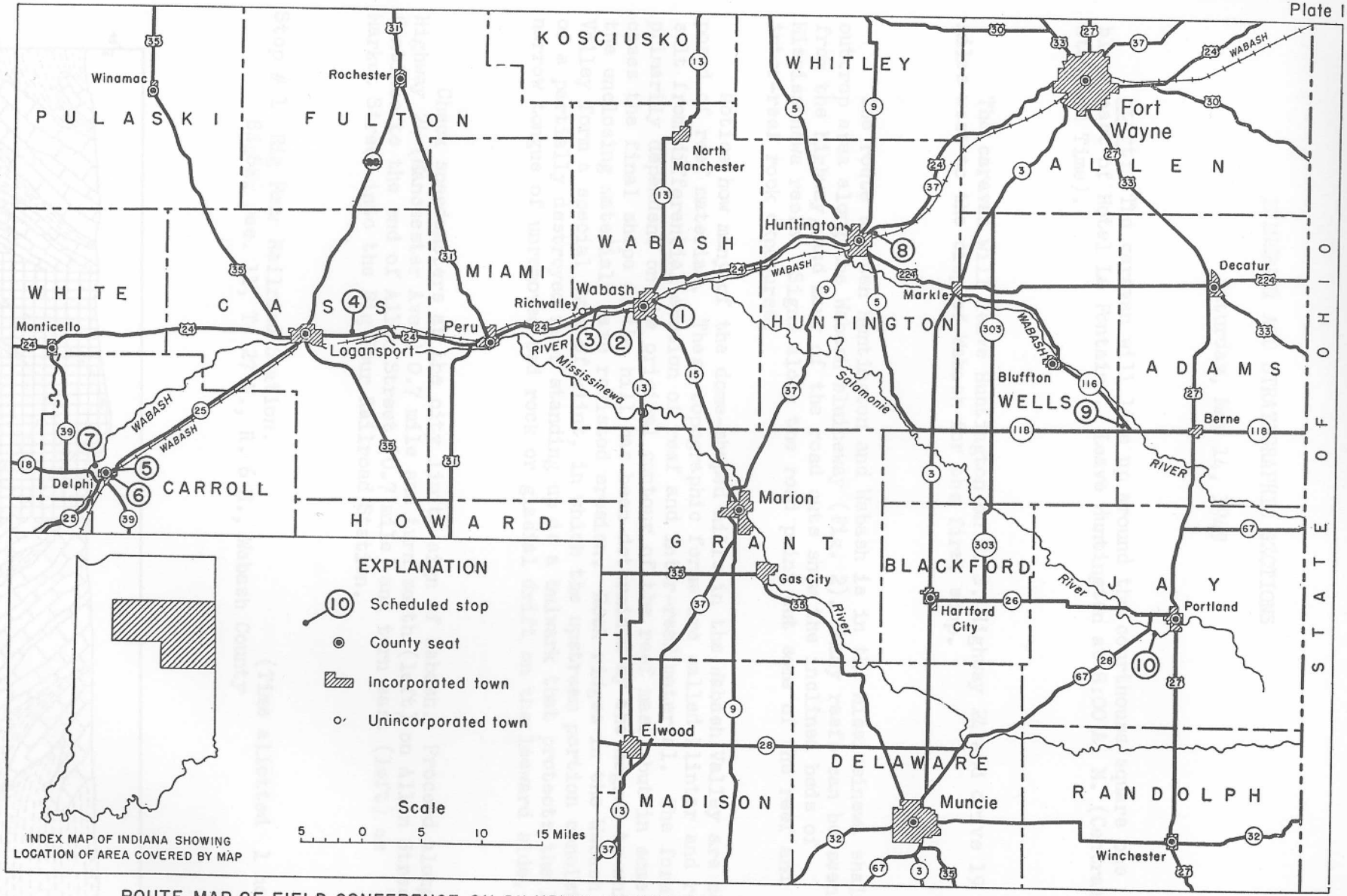
The conference opens Friday evening, 7:30 (Central Standard Time), May 13, with discussions of the physiography and regional structure of northern Indiana and of the stratigraphy, lithology, and reef structures of the Silurian rocks in northern Indiana. Short talks will be given by Dr. C. A. Malott, Indiana University, Dr. H. A. Lowenstam, University of Chicago, Dr. R. R. Shrock, Massachusetts Institute of Technology, and Mrs. D. F. Bieberman, Division of Geology. After the talks, Mr. R. E. Esarey, Conference Leader, will conduct an informal discussion in which you are invited to participate.

Saturday morning, May 14, at 8:00, the party leaves Huntington for the first stop on the itinerary. A lunch stop will be made in Peru, Miami County, Indiana. After lunch the caravan will reassemble and proceed to Stop # 4. The caravan disbands at Stop # 7, the last stop of the day. No formal program is planned for Saturday evening.

Sunday morning, May 15, at 8:00, the party will assemble at the Erie Stone Company (quarry on the east side of Huntington. The conference ends at noon at the Rockledge Quarry, southwest of Portland, Jay County, Indiana. No arrangements have been made for Sunday dinner.

Guests of Hotel La Fontaine should check out before leaving Sunday morning unless they plan to return to Huntington.

Plate I



ROUTE MAP OF FIELD CONFERENCE ON SILURIAN FORMATIONS AND REEF STRUCTURES OF NORTHERN INDIANA

April, 1949

ITINERARY AND STRTIGRAPHIC SECTIONS

Saturday, May 14, 1949

Start: The caravan will line up around the courthouse square one block east of Hotel La Fontaine. Leave Huntington at 5:00 A. M. (Central Standard Time).

The caravan wi11 leave Huntington on U. S. Highway 24 and drive 19 miles west to the city of Wabash for the first stop.

The route between Huntington and Wabash is in the Mississinewa shale outcrop area along the Wabash sluiceway (Fig. 2). Many reefs can be seen from the highway, and many of the road cuts show the inclined beds of Mississinewa reefs. Signs along the road point out some of the reef and inter-reef rock exposures.

Notice how many of the dome-shaped hills in the Wabash Valley are composed of reef material. These topographic forms are called klintar and result front differential erosion of reef and inter-reef material. The form is primarily dependent on the original contour of the reef mass, but in some cases the final shape of the hill has been determined by the degree to which the enclosing materials have resisted erosion. Rock ridges in the Wabash Valley form a special type of klint, in which the upstream portion consists of a partially destroyed reef standing up as a bulwark that protects the low narrow tongue of unremoved bed rock or glacial drift on the leeward side.

Check speedometers at the city limits sign of Wabash. Proceed along Highway 24. (Manchester Ave.) 0.7 mile and turn south (left) on Allen Street. Continue to the end of Allen Street (0.7 mile) and turn east (left) on Market Street into the Big Four Railroad Station.

Stop # 1 Big Four Railroad Station. (Time allotted 1 hour.)
SE¼SE¼ sec. 11, T. 27 N., R. 6 E., Wabash County

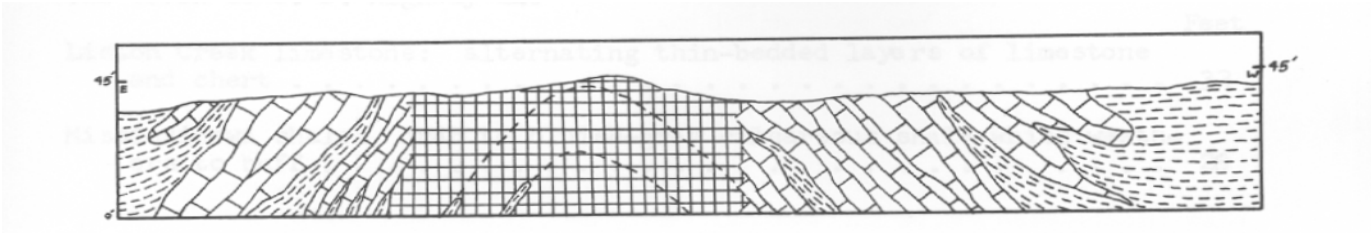


FIGURE 1. Wabash Reef. After Cumings and Shrock, 1925.

The famous Wabash reef is located in the railroad cut northeast of the Big Four Railroad Station in the city of Wabash. The railroad cut bisects the reef and exposes a section of reef core, reef flank, and normal inter-reef rock about 900 feet long and 45 feet high. Neither the top nor the bottom of the reef can be seen in this exposure. (See Fig. 1.)

The massive reef core, about 250 feet across, is composed of unstratified gray and tan dolomite which is splotched by small pockets of calcite and is cut by curved joint planes. The original reef-building material has been altered extensively, and few fossils can be recognized in it. Stromatoporoids stand out on the weathered surface on the back of the isolated spur east of the tracks, and Bryozoa are plentiful in shale pockets. Few corals are present in this reef.

The reef flank is composed of highly inclined tan and gray dolomite beds which wedge out away from the core and interfinger with normal interreef rock. Some of the dips are as high as 65°. The flank beds thin and thicken rapidly and probably represent talus slopes made from reef sands and stony organic fragments. The beds are more fossiliferous than the reef core.

The normal inter-reef rock in this section is the Mississinewa shale. It occurs on both sides of the reef and has normal bedding within a few feet from the reef flank.

The caravan turns around and proceeds west on Market Street 1 mile to Mill Street and continues west on Mill Street 1.2 miles to an old water filled quarry at Helms Creek on the north side of the road.

Stop # 2 Helms Creek Section (Time allotted 45 min.)
SE¼ sec. 9, T. 27 N., R. 6 E., Wabash County

This is a stratigraphic stop. Normal Mississinewa beds overlain by Liston Creek can be seen in the quarry face. The party will walk up Helms Creek to examine the contact of the Mississinewa shale and the Liston Creek limestone. The following section was measured on the quarry face and up the creek to U. S. Highway 24.

	Feet
Liston Creek limestone: alternating thin-bedded layers of limestone and chert	32
Mississinewa shale: drab to bluish-gray calcareous shale which weathers to buff	28

ITINERARY AND STRATIGRAPHIC SECTIONS

The caravan continues west on Mill Street 0.7 mile to junction with U. S. Highway 24. Proceed 2.4 miles west on Highway 24 to overpass of Wabash Railroad. Turn southeast (left) on quarry road about 200 feet beyond (west of) overpass. This road leads into the Rich Valley reef quarry which is located 1 mile east of Rich Valley Station.

Stop # 3 Rich Valley Reef (Time allotted: 45 min.)
SE¼ NE¼ sec. 13, T. 27 N., R. 5 E., Wabash County

The Rich Valley reef can be seen in three exposures, two of which are small quarries and the third is the railroad cut north of the quarries. Because of the limited amount of time that can be spent at each stop, the party will visit only the quarry sections.

The first quarry (beside the highway) cuts near to the reef core. Dips can be seen in three directions. The quarry face is 56 feet from top to bottom. This section illustrates the Liston Creek type of reef. Notice the absence of chart in the quarry. One important characteristic of Liston Creek reefs is absence of the chart normally found in the Liston Creek formation.

The second quarry is located about 750 feet east of the first. Notice the amount of chart present in the quarry. This quarry lies on the outer edge of the reef flank. On the west side, massive flank beds filled with chart nodules dip steeply to the east, but on the east side, the flank beds have a greatly reduced dip and rest upon thin-bedded limestone of typical Liston Creek lithology. The great variety of rock materials (limestone, dolomite, sandstone, shale, huge calcite crystals, and chart nodules) present in the quarry is due to the position of the quarry on the reef flank.

The railroad cut crosses the reef and exposes a section over 1500 feet long and 15 feet high. At the east end of the cut cherty Liston Creek beds dip toward the reef, but reverse and rise steeply as the core is approached. The downwarping of beds at the peripheral zone was probably caused by the settling of the heavy reef mass into the underlying sediments.

The caravan proceeds west on U. S. Highway 24 into Peru, Miami County. The caravan disbands in Peru for an hour lunch stop and will reassemble at the western city limit sign on Highway 24.

The caravan drives 10.7 miles west on U. S. Highway 24 to the France Stone Company plant and quarry, which is located 2.3 miles east of the city limits of Logansport. The plant and quarry are on the north side of the highway.

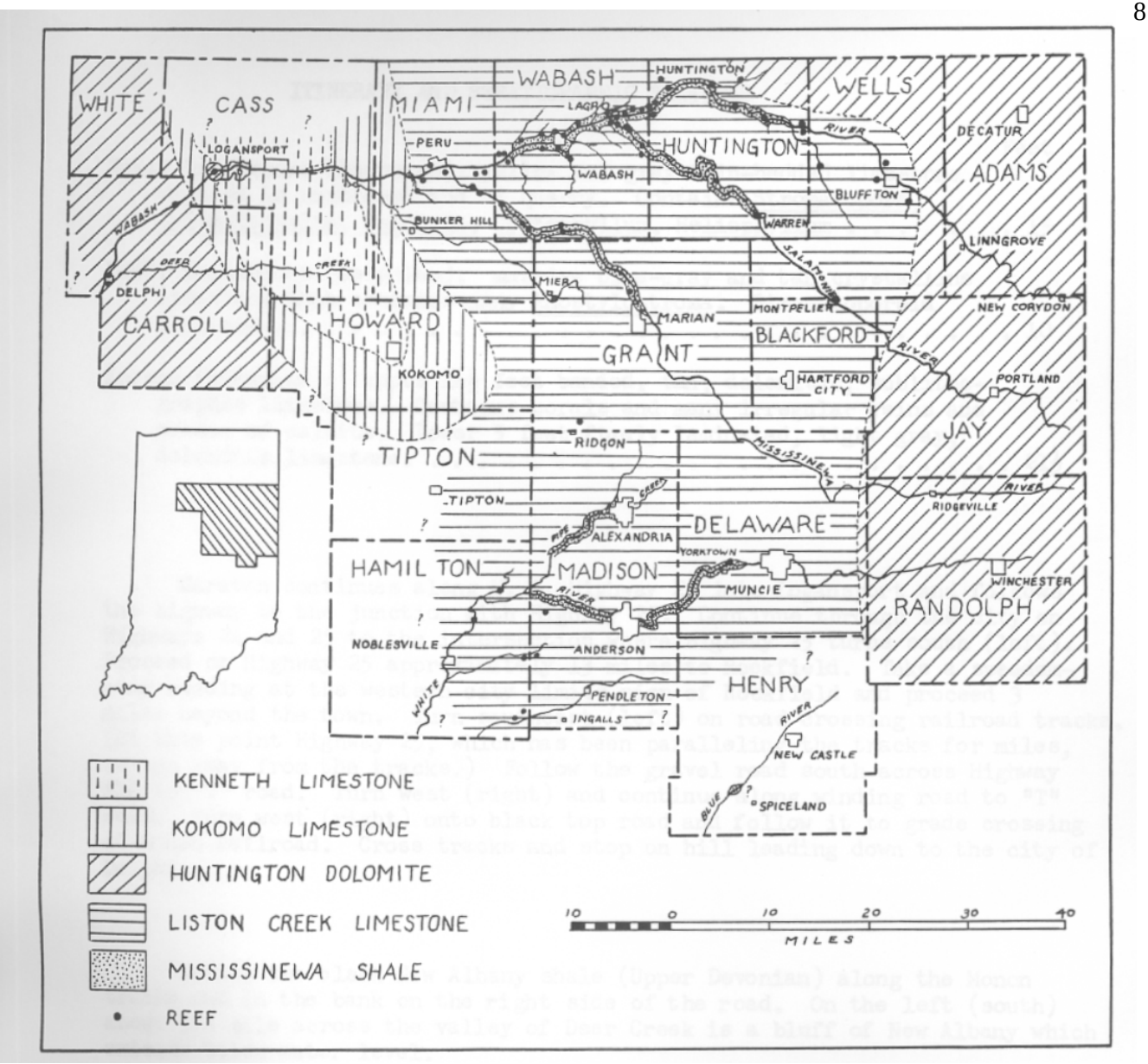


FIGURE 2. Geologic map shooing areal distribution of Silurian formations in northern Indiana. After Comings and Shrock, 1928.

Stop # 4 France Stone Company Quarry (Time allotted ½ hour.)
N½ sec. 27, T. 27 N., R. 2 E., Cass County

The Kokomo and Kenneth formations of Cayugan age crop out around Logansport and roughly outline the Logansport sag (Fig. 2). This stop is the only one in the itinerary that shows Upper Silurian rocks. Typical Kokomo limestone occurs in the lower part of the quarry and is overlain by Devonian limestone of Hamilton age. The Kenneth limestone is not present in this section.

ITINERARY AND STRATIGRAPHIC SECTIONS

	Feet
Upper Logansport (Devonian): yellow and gray thin-bedded limestone exposed in southeast end of quarry. Contains Stromatopora, Prismatophylum, Emmonsia, Cystophyllum, Heliophyllum	15
Lower Logansport (Devonian): massive blue-bray and tan crystalline limestone that contains many Anostylostroma. Stromatoporoid biostrom	10
Kokomo (Silurian): upper 16½ feet banded, tan, dolomitic, sublitho-graphic limestone. Contains corals and many irregular veins and masses of calcite. Lower 5 feet finely laminated, light gray, dolomitic limestone	21½

Caravan continues along U. S. Highway 24 into Logansport and follows the highway to the junction with Highway 25, Continue through the city on Highways 24 and 25 to the intersection where Highway 25 turns south (left). Proceed on Highway 25 approximately 13 miles to Rockfield. Take a speedometer reading at the western city limits sign of Rockfield and proceed 3 miles beyond the town. Turn southeast (left) on road crossing railroad tracks. (At this point Highway 25, which has been paralleling the tracks for miles, strings away from the tracks.) Follow the gravel road south across Highway 218 to "T" road. Turn west (right) and continue along winding road to "T" road. Turn west (right) onto black top road and follow it to grade crossing of Monon Railroad. Cross tracks and stop on hill leading down to the city of Delphi.

Notice the black New Albany shale (Upper Devonian) along the Monon tracks and in the bank on the right side of the road. On the left (south) about ? mile across the valley of Deer Creek is a bluff of New Albany which extends below water level.

Stop # 5 East Delphi Section (Time allotted 30 min.)
SE¼SE¼ sec. 20, T. 25 N., R. 2 W., Carroll County

Although most of the bedrock of Carroll County is Devonian, steeply dipping Silurian beds crop out in and about the city of Delphi. Before the Silurian quaquaversal structures of northern Indiana were proved to be reefs, dips on the Silurian beds in this area seemed to indicate an anticline or dome. Two wells were drilled to the Trenton in the hope that oil would be found on the crest of the structure, but the top of the Trenton followed regional dip. From this evidence, Logan (1926, p. 33) concluded that the so-called anticline was a reef.

ITINERARY AND STRATIGRAPHIC SECTIONS

The Delphi reef is the largest reef known to crop out in northern Indiana. Many quarries were opened in the Niagaran dolomite about 50 years ago and, at that time, Delphi was one of the chief lime-producing centers of Indiana. From these old quarries and from natural outcrops, the reef can be traced approximately 2 miles north-south and two miles east-west. Stops 5, 6, and 7 give a general picture of the Delphi area.

The area covered in Stop # 5 lies on the southeast flank of the large Delphi reef and shows Devonian beds dipping away from the reef. The small creek which passes under the Monon Railroad embankment and under the black top road flows south over Devonian beds into Deer Creek. About 200 feet south of the concrete bridge, the Devonian dolomite forms a small waterfall in the creek bed. At this place the Devonian dips steeply to the southeast. The Devonian beds are Hamilton in age and are composed of brown, fine-grained, dense, thin-bedded dolomite stained with oil.

North of the black top road and east of the creek, 12 feet or more of blue-gray shale are exposed on the hillside. This shale represents the basal section of New Albany and rests on the Devonian dolomite. The gray shale grades upward into the typical black New Albany shale exposed in the road cut to the east. In the south bank of Deer Creek ¼ mile southeast, the New Albany shale extends below water level at a lower elevation. The shale outcrop is 60 feet thick in the river bluff, and the beds dip eastward at an angle of 1 to 2º.

Another outcrop of the same dense, chocolate-brown, Devonian dolomite occurs 100 feet northwest of the junction of the black top road and State Highway 25. Here, at an elevation 18 feet above the waterfall, the exposed beds dip 5º to the southeast.

The caravan proceeds west to Highway 25 and turns southwest (left) into Delphi. Proceed ½ mile to old quarry at the junction of Deer Creek and the abandoned channel of Deer Creek.

Stop # 6 Old Deer Creek Quarry (Time allotted 45 min.)
NE¼SE¼NW¼ sec. 29, T. 25 N., R. 2 W., Carroll County

Silurian beds crop out for a short distance along the north bank of Deer Creek about 30 feet east of the abandoned channel of Deer Creek. The typical Devonian dolomite of this area unconformably overlies the Silurian (Niagaran) dolomite, and the irregular line of contact can be traced for a short distance. About 20 feet of Devonian can be seen in the old quarry located at the junction of Deer Creek and the abandoned channel of Deer Creek. Probably the total thickness of Hamilton beds is represented in the old quarry. About the same thickness of Devonian dolomite was obtained from two wells drilled 5 and 6 miles southwest of Delphi.

ITINERARY AND STRATIGRAPHIC SECTIONS

An old quarry is located about 4 mile north in the abandoned channel. In this quarry the Silurian beds dip 20º to 40º southeast. The Silurian in the quarry is approximately 35 feet higher than the Silurian in the bank of Deer Creek. The rate of dip of the Devonian beds southward off the reef compares favorably with dips off reefs in Sullivan and Vigo Counties which are now covered with 2000 feet or more of sediments.

The caravan returns to Highway 25 and follows it southwest through Delphi to junction with Highway 39. Turn right (north) on Highway 39 and continue 0.8 mile to the Stuntz-Yoeman Company Quarry, which is east of the highway and west of the Monon Railroad. This is the last stop of the day.

Stop # 7 Stuntz-Yoeman Company Quarry (Time allotted 30 min.)
SW¼SW¼ sec. 19, T. 25 N., R. 2 W., Carroll County

This quarry is located on the western flank of the Delphi reef. Niagaran beds lie at high angles and dip 26º to 40º northwest, west, and southwest. The rock exposed in the quarry face is a blue-gray, fine-grained dolomite which contains many cavities filled with or stained by petroleum. Clay seams are prominent in the west wall, and a sandstone lense occurs in the east wall. The beds are quite fossiliferous, but many forms are poorly preserved.

Sunday, May 15, 1949

Start: The caravan assembles in the Erie Stone Company Quarry on the east aide of Huntington at 8:00 A. M. (Central Standard Time).

From: Hotel La Fontaine, follow East State Street 1.3 miles east to North Broadway Street. Turn north (left) on North Broadway. Proceed 0.4 mile to Sabine Street. Turn east (right) onto road leading to Erie Stone Company Quarry.

ITINERARY AND STRATIGRAPHIC SECTIONS

Stop # 8 Erie Stone Company Quarry (Time allotted 1½ hours.)
SE¼SW¼SE¼ sec. 12, T. 28 N., R. 9 E., Huntington County

The Erie Stone Company Quarry is located in a reef complex, and both high angle reef beds and low angle flank beds can be observed in the quarry walls. The east and southeast faces of the quarry are composed of massive, light-gray, dolomitic, reef rock that contains many poorly preserved fossils. The most common fossils are Conchidium, Halysites, Favosites, horn corals, and stromatoporoids. The north quarry face is near the edge of the reef and exposes well-bedded, cherty dolomite. Normal country rock is not present in this quarry, butt judging from the section described by Cumings and Shrock (1928, pp. 91-92) in the quarry now filled with water, ? mile northwest, probably most of the rock exposed in the quarry is of Liston Creek age.

The area surrounding the Erie Quarry is dotted with old water-filled quarries. Around the edge of the quarries rocks can be seen dipping from 1º to 20º. Directions of dip change rapidly over short distances and prove that this is, indeed, a reef complex. In the square mile surrounding the Erie Quarry, Mississinewa shale, Liston Creek limestone, and Huntington dolomite have been mapped by Cumings and Shrock (1928, Fig. 19) from quarries now filled with water.

The Huntington dolomite was named by Kindle (1904, p. 408), who gave the Huntington quarries as the type section. Cumings and Shrock (1928, P. 95) relocated the type section because several distinct formations occur in the quarries and because the area is complicated by a great reef complex. The Huntington type section was moved to Little River, which lies about k mile south of the Erie Quarry. The present type section follows Little River for approximately 1½ miles. The old quarry located about 650 feet east of the Erie Quarry lies within the Huntington outcrop area.

The caravan turns south on Broadway and proceeds 0.4 mile to East State Street. Turn west--(right) on East Broadway and proceed 1.2 miles to Jefferson Street. Turn southeast (left) on Jefferson Street and cross bridge over Little River. Continue on Jefferson Street (U. S. Highway 224) out of the city. Proceed 9 miles to Markle. Follow U. S. Highway 224 through Markle and about 3 miles east to junction with Highway 303. Turn south (right) on Highway 303 and proceed about 12 miles to junction with Highway 118. Turn east (left) on Highway 118 and proceed about 11.5 miles to Meshberger Quarry just north of highway and west of the junction of Highway 118 and Highway 116.

ITINERARY AND STRATIGRAPHIC SECTIONS

Stop # 9 Meshberger Bros. Stone Company Quarry (Time allotted 30 min.)
SE½ sec. 33, T. 26 N., R. 13 E., Adams County

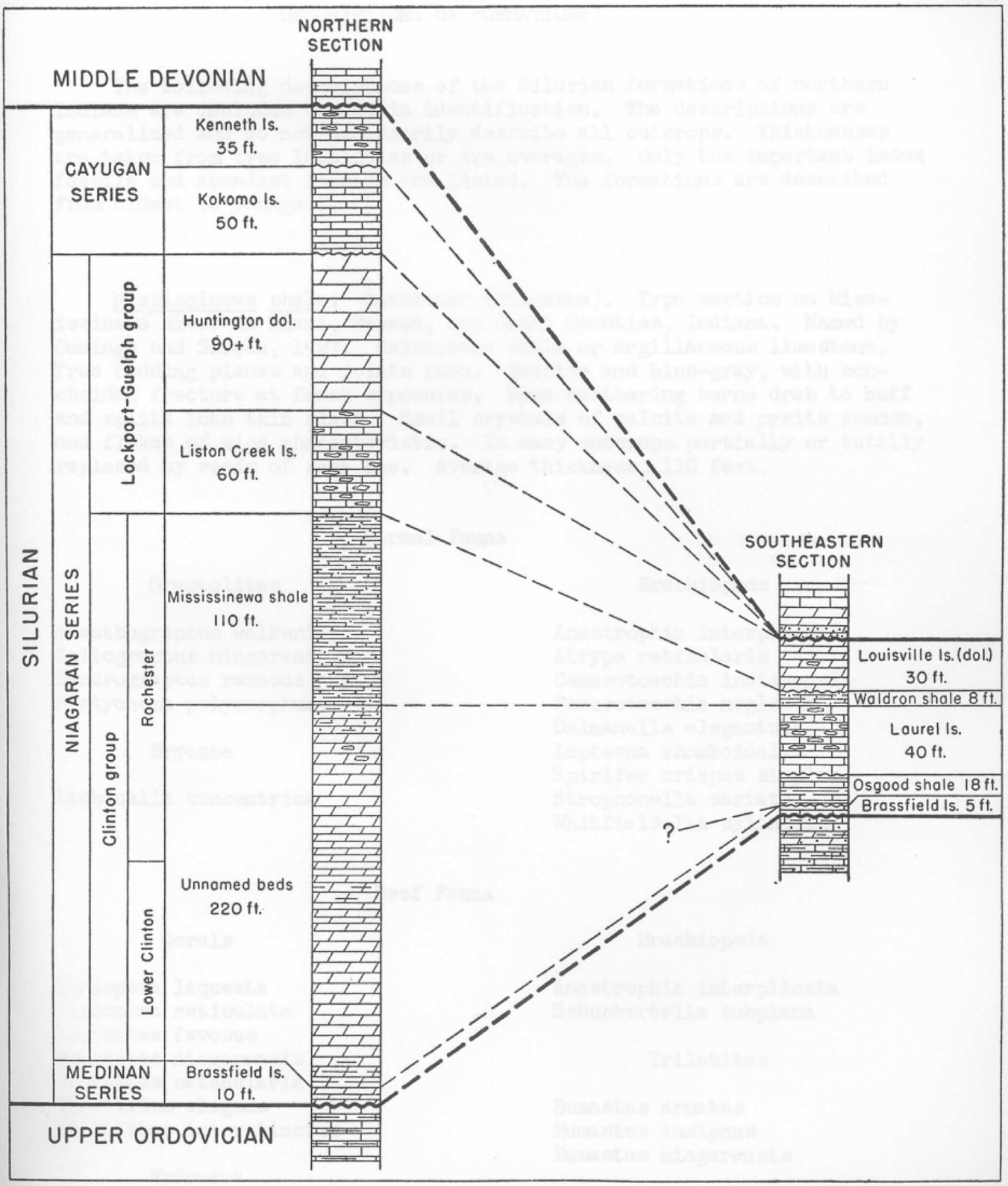
The rock in this quarry represents the New Corydon phase of the Huntington dolomite. At the east end of the quarry 20 feet of thick-bedded dolomite is overlain by 18 feet of thin-bedded dolomite. The rock is fine-grained, tan and brown mottled, and filled with solution cavities to 2 inches in diameter. The massive beds contain a few chert nodules and many poorly preserved corals and stromatoporoids.

The caravan continues east on Highway 118 to junction with U. S. Highway 27 at the western edge of Berne. Turn south (right) on U. S. Highway 27 and drive 15 miles to northern city limits of Portland. Proceed 0.5 mile to first stop light and turn west (right) onto Highways 26 and 67. Take a speedometer reading at point where Highway 26 and Highway 67 separate. Follow Highway 67 for 0.6 mile and jog left onto old paved road. Follow paved road south for 0.5 mile and jog left again onto crushed stone road. Cross Salamonie River and railroad tracks. Rockledge quarry on left side of road.

Stop # 10 Rockledge Products Company Quarry (Time allotted 30 min.)
NW¼ sec. 30, T. 23 N., R. 14 E., Jay County

The 52½ feet of rock exposed in the quarry is Huntington dolomite. Neither the top nor the bottom of the formation can be seen. This yellow and gray, porous, fossiliferous dolomite is similar in appearance to the dolomite along Little River east of Huntington, type locality for the Huntington dolomite.

This concludes the field conference.



Compiled by R. E. Esarey and D. F. Bieberman
March, 1949

GENERALIZED STRATIGRAPHIC COLUMNS OF
SILURIAN ROCKS IN NORTHERN AND SOUTHEASTERN INDIANA

DESCRIPTIONS OF FORMATIONS

The following descriptions of the Silurian formations of northern Indiana are included to aid in identification. The descriptions are generalized and do not necessarily describe all outcrops. Thicknesses are taken from type localities or are averages. Only the important index fossils and abundant fossils are listed. The formations are described from oldest to youngest.

Mississinewa shale: Rochester (Niagaran). Type section on Mississinewa River in Miami, Wabash, and Grant Counties, Indiana. Named by Comings and Shrock, 1927. Calcareous shale or argillaceous limestone. True bedding planes and joints rare, Massive and blue-gray, with conchoidal fracture at fresh exposures. Upon weathering turns drab to buff and splits into thin slabs. Small crystals of calcite and pyrite common,, and flakes of mica characteristic. In many outcrops partially or totally replaced by reefs of same age. Average thickness, 110 feet.

Normal Fauna

Graptolites

Acanthograptus walkeri
Callograptus niagarensis
Dendrograptus remosus
Dictyonema polymorphum

Bryozoa

Lichenalin concentrica

Brachiopods

Anastrophia interplicata
Atrypa reticularis
Camarotoechia indianensis
Camarotoechia neglecta
Dalmanella elegantula
Leptaena rhomboidalis
Spirifer crispus simplex
Strophonella striata
Whitfieldella cylindrica

Reef Fauna

Corals

Cladopora laqueata
Cladopora reticulata
Favosites favosus
Favosites niagarensis
Halysites catenularia
Heliolites elegans
Heliolites interstinctus

Hydrozoa

Stromatopora

Brachiopods

Anastrophia interplicata
Schuchertella subplana

Trilobites

Bumastus armatus
Bumastus insignus
Bumastus niagarensis

DESCRIPTIONS OF FORMATIONS

Liston Creek limestone: Lockport (Niagaran). Type section near mouth of Liston Creek, Wabash County, Indiana. Named by Cumings and Shrock, 1927. Lower member, Red Bridge limestone, 1 to 5 feet thick. Usually a single bed of blue-gray limestone, weathering to reddish brown. Only found in part of Wabash County. Upper member, Liston Creek limestone 60 feet thick, widespread. Series of alternating thin-bedded layers of limestone and chert. Limestone light gray, fine-grained, sometimes contains chert nodules, Chert not present in Liston Creek reef proper.

Normal Fauna

Corals

Cladopora striata
Favorites favosus
Favorites forbesi
Halysites catenularia
Heliolites interstinctus
Thecia major

Trilobites

Bumastus insignis
Calymene niagarensis

Hydrozoa

Clathrodictyon
Stromatopora

Brachiopods

Cyrtia exporrecta myrtia
Dalmanella elegantula
Rhipidomella hybrida
Strophonella striata

Cephalopods

Discoceras graftonense
Gomphoceras lineare
Kionoceras cancellatum
Orthoceras obstructum
Phragmoceras nestor

Reef Fauna

Hydrozoa

Clathrodictyon
Stromatopora

Corals

Amplexus shumardi
Cladopora fibrosa
Favosites favosus
Favosites occidens
Halysites catenularia
Heliolites interstinctus
Syringopora
Zaphrentis

Brachiopods

Atrypa reticularis
Conchidium laqueatum
Meristina maria
Rhipidomella hybrida
Spirifer radiatus
Stricklandinia gaspiensis
Strophonella striata

Trilobites

Calymene niagarensis
Dalmanites vigilans
Encrinurus indianensis
Sphaerexochus romingeri

DESCRIPTIONS OF FORMATIONS

Huntington dolomite: Lockport-Guelph (Niagaran). Type section (as redefined by Cunnings and Shrock, 1928) channel of Little River east of Huntington,, Huntington County, Indiana. Named by Kindle, 1901. Massive to slabby, even-bedded, yellow, gray, or pink saccharoidol dolomite. Commonly mottled. High porosity. Exact thickness unknown. Probably exceeds 90 feet in places. Never seen in contact with Liston Creek. New Corydon member, brown cherty layers of impure limestone. Exact position within Huntington unknown.

Fauna

Corals

Favosites favosus
Favosites occidens
Halysites catenularia
Heliolites interstinctus
Heliolites pyriformis
Pycnostylus elegans
Pycnostylus guelphensis

Gastropods

Bellerophon shelbiensis
Coelocaulus bivittatus
Pleurotomaria axion
Poleumita scamnata
Tremanotus alpheus

Brachiopods

Conchidiun greeni
Conchidium laqueatum
Conchidium multicostatum
Dalmanella elegantula
Dinobolus conradi
Monomorella noveboracum
Pentamerus oblongus
Spirifer radiatus

Cephalopods

Gomphoceras scrinium
Hexameroceras hertzeri
Kionoceras cancellatum
Phragmoceras parvum

Trilobites

Bumastus armatus
Calymene niagarensis
Cheirurus niagarensis
Sphaerexochus romingeri

DESCRIPTIONS OF FORMATIONS

Kokomo limestone: Bertie (Cayugan). Typo locality at Kokomo, Howard County, Indiana. Named by Foerste, 1904. Tan and gray, finely laminated, argillaceous limestone, sometimes brown, lithographic, and banded. Calcite in cavities. Crumpled laminae and intraformational breccia sometimes present. About 50 feet thick. Unconformably overlaps Niagaran formations.

Fauna

Corals

Cyathophyllum hydraulicum
Halyrsites labyrinthicus

Ostracodes

Laperditia ohioensis

Eurypterids

Eurypterus kokomoensis
Eurypterus ranilarva
Stylonurus longicaudatus

Brachiopods

Dalmanella parva
Pentamerus divergens
Spirifer corallinensis
Schuchertella interstriata

Calcareous algae

Buthotrephis divaricata
Buthotrephis newlini

Kenneth limestone: (Cayugan). Type locality at Kenneth Station, Cass County, Indiana. Named by Comings and Shrock, 1927. Tan and gray, lithographic, cherty limestone. Chert occurs as nodules and layers. Bedding planes irregular. Weathers into rubbly mass of limestone and chert pebbles.

Fauna

Brachiopods

Chonetes colliculus
Coelospira congregate
Dalmanella elegantula
Leptaena rhomboidalis

Ostracodes

Dizygopleura cf. clarkei paupera
Isochilina musculosa
Kloedenia kokomoensis

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