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The Devonian Section at the Klein Quarry, Johnson County, Iowa

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This paper is a renewal of a practice carried on by L. W. Wood[2] in the 1930s, that of presenting each year one of the more interesting geologic sections encountered during the year's work by the members of the geology section of the Iowa State Highway Commission.

The Devonian section at the Klein quarry in the NW¼ Sec. 2, T. 79 N., R. 7 W., Johnson County, was chosen because the exposed face and extensive coring offered an opportunity to study the members of the Cedar Valley formation and the upper members of the Wapsipinicon formation in a single location, in an area where the study of these units must be carried out at widely separated exposures.

In June of 1956 Concrete Materials and Construction Company began exploratory drilling to determine their potential rock reserves, to verify the presence of, and to ascertain the quality of the Davenport limestone. A 74-foot core drilled in the quarry floor appears to have extended at least six feet into the Spring Grove member of the Wapsipinicon formation. Because this core offered a good insight into the relationships of these formations in this area, this opportunity is taken to present a description of the exposed face and this core. Some suggestions as to the stratigraphic assignments of these units are also included.

The following 140 foot section records a generalized description of the lithologies exposed by the working face and penetrated in the core. A detailed geologic section and representative chip samples of each bed of this core are on file at the Iowa State Geological Survey in Iowa City, Iowa.

Bed No.	Description	Feet
00	Overburden; about 12.0 feet of loess and 20.0 feet of clayey till.	32.0
	Cedar Valley Limestone Formation, 113.0 feet:	
	Coralville Limestone Member, 31.2 feet:	
14	Limestone; light gray to blue gray; fine grained to sublithographic; crystalline zones; very hard; a few shale partings; bedding irregular; *Idiostroma* predominate.	12.25
13	Limestone; blue gray to black; finely crystalline to fragmental; softer than bed No. 14 and weathers crumbly; bed is largely a biostrome predominantly of *Idiostroma; Stromatopora* and bryozoans; petroliferous oder; carbonaceous; easily traceable unit.	5.9

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12	Limestone; pinkish gray to dark brown; may be color banded; fine to coarse grained; numerous shale partings; harder than bed No. 13; fossiliferous, corals dominate; petroliferous oder. Rapid — Solon Members ± 81.8 feet:	13.0
11	Shale; gray black; blocky; very calcareous; abundant *Atrypa waterlooensis;* traceable unit marking the top of the member.	0.4
10	Limestone; blue gray to black; color banded; medium grained with coarse grained zones; black bryozoans, atrypoid brachiopods abundant.	5.5
9	Limestone; like bed No. 10 but finer grained, not banded; black and white spotted fossiliferous chert nodules; petroliferous oder; traceable unit.	3.5
8	Limestone; like bed No. 10 with a few chert nodules at top; some small cream colored lens shaped arragonite inclusions; numerous black fossils.	6.0
7	Limestone; gray; coarse at top to fine grained at base; dolomitic; *Prismatophyllum* corals form prominent biostromes at top and base of this unit making it traceable throughout quarry.	7.5
6	Limestone; gray; fine grained; wavy black color bands; thin bedded in middle portion to massive at base; black fossils, predominantly brachiopods and bryozoans.	18.7
5	Limestone; light gray to dark brown, may have blue cast near middle; medium grained to coarsely crystalline; slickensided shale partings; black fossils as in bed No. 6, atrypoid brachiopods (possibly *bellula*) prominent; argillaceous; soft and thin bedded at base marking approximate contact with Solon member. Solon Limestone Member? ± 20.3 feet:	19.9
4	Limestone; tanish gray to dark brown; finely crystalline to coarse grained; slightly argillaceous; mostly hard; shale partings; some slickensides; fossiliferous, corals, brachiopods; lower 3.0 feet fragmental with brown fine grained sub-rounded limestone fragments.	20.2
3	Shale; black; hard; calcareous; possibly representative of Independence formation. Wapsipinicon Limestone Formation: Davenport Limestone Member, 24.4 feet:	0.1
2	Limestone; tan to dark gray, finely color banded; fine grained to lithographic; fragmental with sub-rounded lithographic to fine grained fragments (some of which are dolomitic) in a fine grained matrix; shaley; stilolitic; non-fossiliferous. Spring Grove Dolomite Member:	24.4
1	Dolomite; tan to gray; medium grained; saccharoidal texture; may be porous; color laminated with thin dark streaks; strong petroliferous oder; somwhat cross-bedded.	6.6

Since June 1956 the quarrying operations have deepened the quarry by some 20 feet below the old floor. This places the present floor somewhere near the Rapid-Solon contact.

The following physical properties of stone taken from various beds in the quarry were determined by the Iowa State Highway Commission laboratory:

Bed No.	Percent Loss F&T "A"	Percent Loss Los Angeles Abrasion
13, 14	6.4 (average)	27 (average)
12	3.7	24
10	21.0	25
6	13.0	22
5 (lower 15 ft.)	13.0	22
4 (upper 6 ft.)	15.0	—
4 (lower 14 ft.)	10.0	23
2 (upper half)	20.0	28
2 (lower half)	3.0	—
1	1.2	—

Note: F & T "A" — 16 cycles freezing and thawing in water-alcohol solution.

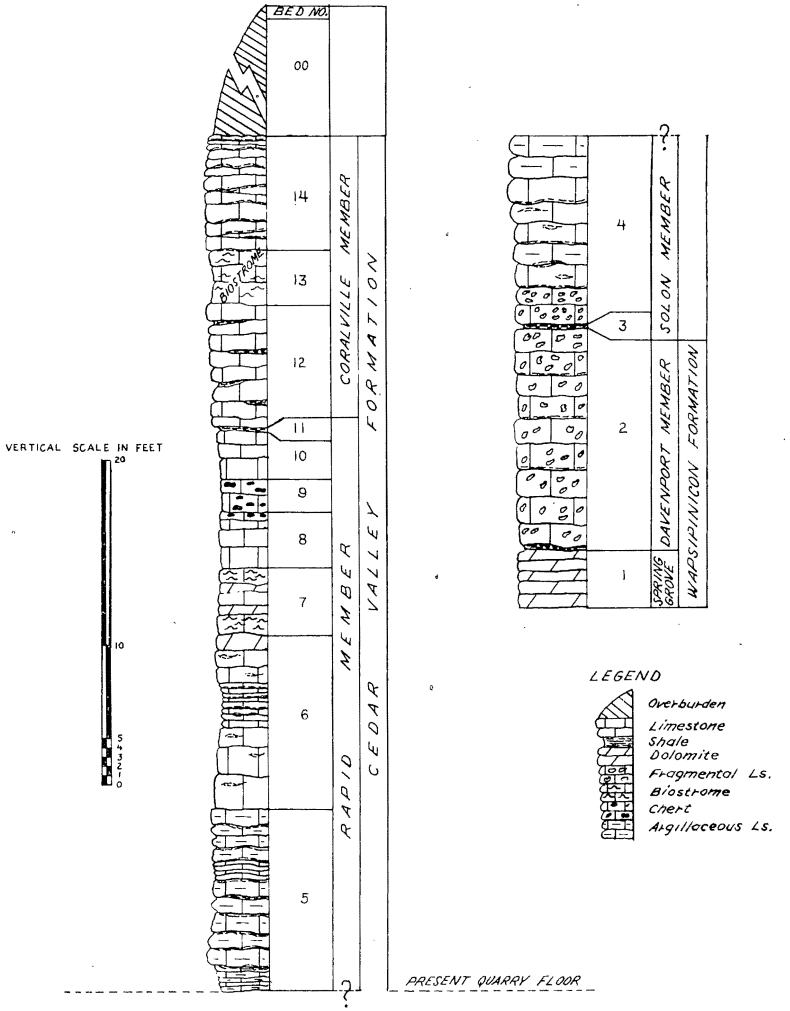

Figure 1. Geologic section of the Klein quarry, Johnson County, Iowa.

Fauna: Although a detailed faunal analysis was not undertaken there are several easily recognized fossil horizons which should be mentioned.

There are one or two beds filled with *Stromatopora, Idiostroma* and Bryozoa in the Coralville member. Numerous species of long-winged *Spirifer* and *Atrypa,* including *Atrypa waterlooensis,* can be found in bed No. 11 and in the 6 to 8 feet just below bed No. 11. A small crenulated species of *Atrypa,* that appears to be A. *bellula,* occurs in a ten foot zone near the base of the present exposed face (bed No. 5).

The unit that is here tentatively assigned to the Rapid is characterized by an abundance of black fossils: Bryozoa, *Atrypa, Sperifer, Stropheodonta.* These fossils appear to be uniformly distributed in bands throughout the entire 60 foot section.

Numerous atrypoid brachiopods and some *Csytiphylum* corals occur in the top one half of bed No. 4. Identification of the brachiopods was difficult because of the lack of complete specimens.

Discussion: The scope of this paper does not permit a detailed discussion of the evidence used for the suggested stratigraphic assignments of the units described in this section. Therefore only a brief summary of the evidence used will be given.

There does not seem to be any doubt as to the assignment of the upper 30 feet at Klein to the Coralville member, and to the position of its contact with the Rapid. There is, however, some doubt as to the correlation of the Rapid and Solon members in the remaining 82 feet of the Cedar Valley. The Rapid-Solon contact as suggested in the core was based on the following criteria: 1. The absence of the black fossils in bed No. 4 which are so abundant in the overlying beds. 2. The change in lithology from a blue-gray, fine grained, argillaceous limestone to a brown, coarse grained, crystalline limestone. 3. The change in physical properties of the units as indicated by their reactions to abrasion and freeze and thawing tests. 4. A comparison with exposures at the Wendling quarry in Sec. 8, T. 78 N., R. 2 W., Muscatine County; Linwood quarry Sec. 13, T. 77 N., R. 2 E., Scott County; and cores from Pints quarry Sec. 36, T. 89 N., R. 12 W., Black Hawk County; and B. L. Anderson's quarry Sec. 28, T. 85 N., R. 11 W., Benton County. 5. The presence of what appears to be *Atrypa bellula* which occurs near the base of the Rapid (Stainbrook 1941) in bed No. 5.

Before these units can be assigned with certainty a complete study should be made of all available exposures and subsurface information from well cuttings and cores. A study of this nature is at present

being conducted by the geologists of the Highway Commission and Iowa State College.

The contact of the Solon member of the Cedar Valley formation with the underlying Davenport member of the Wapsipinicon formation is placed at the top of the unfossiliferous, brecciated, lithographic limestone. The Independence formation does not appear to be present in the core, or it may be represented by the thin black shale at the base of the Solon. The platy, tan, laminated dolomite is assigned to the Spring Grove.

Economics

The principal use of the crushed stone produced in the Klein quarry is for road construction. The top 32 feet of rock, Coralville, has been found suitable for use in portland cement concrete. The remaining rock which has less resistance to physical tests has been used for rolled stone base and surfacing stone.

Literature Cited

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