

Proceedings of the Iowa Academy of Science

Volume 62 | Annual Issue

Article 39

1955

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Recommended Citation

Tuttle, Sherwood D. and Northup, Richard C. (1955) "A New Outcrop of the Rockville Conglomerate," *Proceedings of the Iowa Academy of Science*, 62(1), 366-372.

Available at: <https://scholarworks.uni.edu/pias/vol62/iss1/39>

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A New Outcrop of the Rockville Conglomerate

By SHERWOOD D. TUTTLE AND RICHARD C. NORTHUP¹

During the summer of 1953, an outcrop of ferruginous pebble conglomerate was found in central Jones county, Iowa. This outcrop is located about three miles north of the town of Olin, along the eastern edge of Iowa Highway 38 between Olin and the junction of Highways 38 and 64. It is near the center of the SE $\frac{1}{4}$ of section 25, T. 84 N., R. 3W. (Jackson Township) Jones County. Topographically, it occurs about midway up the gentle north side of the valley of the Wapsipinicon River.

The rock at this locality extends horizontally for about thirty feet and has about five feet of its thickness exposed. Along the tops of the exposed bedding planes, weathering has produced a mottled black-gray color. On fresh surfaces and on some of the vertical fractures, the rock is light-gray, pale yellow-brown, or dull-red in color.

Most of the pebbles are under one inch in diameter, averaging a quarter to half inch in size. The larger ones are fairly well rounded, but some of the smaller fragments are subangular. The pebbles consist of quartz, chert, dark-colored, dense mafic rocks, feldspar, and occasionally granite. The interstices between the pebbles are filled with iron-stained quartz sand held together by both ferruginous and calcareous cement. The material is poorly sorted except in a few sand beds. The bedding is indistinct and is marked chiefly by the alterations in size between sand and pebbles. Beds are horizontal and in general about three to six inches thick. There are three vertical joints in the outcrop which strike a little north of east.

The bottom of the outcrop is covered; but approximately one mile north along Highway 38, and at a higher elevation, beds of the Hopkinton formation of Silurian age outcrop. Thus the conglomerate probably rests on eroded Silurian strata. Above the conglomerate, lie three or four feet of coarse iron-stained unconsolidated gravel, possibly pro-Kansan in age. Above the gravel, in turn, is approximately twenty feet of oxidized and leached Kansan till capped by a thin dark-brown ferretto zone. On top of the till is a cover of several feet of leached loess. No other exposures of this rock were discovered in the immediate vicinity.

There are three possible correlations that may be made with this unit: (1) the Rockville conglomerate referred to as Cretaceous

¹This paper is presented with the permission of the Director of the Iowa Geological Survey.

by McGee, (2) an outlier of Pennsylvanian clastics similar to those found in a number of places in eastern Iowa, and (3) as a well-cemented Pleistocene deposit.

Between 1876 and 1888, W. J. McGee made a detailed reconnaissance study of much of the area of the Upper Mississippi River Valley concentrating on northeast Iowa. He discovered near the town of Rockville, Iowa, an outcrop of (McGee 1889) . . . "a dark-brown puddingstone of well worn quartz pebbles in a matrix of earthy limonite, or of obscurely stratified ferruginous sandstone." This rock was found . . . "half a mile west of Rockville, Delaware County . . . the conglomerate is exposed only in artificial cuttings which are now talus covered; but large blocks of the rock yet lie scattered about the abandoned quarry and in the village, where they were once used as building material." He estimated that the conglomerate varied in thickness between zero and twenty feet. According to McGee, pebbles in the conglomerate at Rockville consist of quartz, chert, limestone, and granitoid rocks.

The outcrop at Rockville described by McGee, NW $\frac{1}{4}$ SE $\frac{1}{4}$ NW $\frac{1}{4}$ section 24, T. 88 N., R. 3 W. (North Fork Township) Delaware County is no longer exposed. In 1954, fragments of conglomerate were found between the corn rows just below the crest of a small hill which is itself a part of a larger hill. The float occurs on the south face of the knob. No sign of the outcrop, quarry, or building stone is visible at the present time. All the buildings of the town of Rockville, except three walls of a large stone mill, are gone; and no conglomerate is visible there. It is apparent that as a type locality the exposure at Rockville is no longer visible. As in the case of the new outcrop near Olin, the type locality at Rockville probably lies on an eroded surface of the Silurian Hopkinton formation; and outcrops of the latter occur both up and down hill from the location of conglomerate float. This locality is also along the valley side of a fairly large stream, the North Maquoketa River. At Rockville there are a few feet of stony Iowan till on top of the conglomerate.

In an earlier discussion, McGee (1879) points out that fragments of the conglomerate occur throughout the tills of eastern Iowa and are "believed to be a product of a continental glacier," because they contain crystalline fragments, are unstratified, and occur at various levels on an eroded surface.

Later, in 1889, McGee assigned the Rockville conglomerate to the Cretaceous because the granitic pebbles and abundant quartz are not common within the Pennsylvanian sandstone outliers, and because it more closely resembles Cretaceous rocks found to the north in Wisconsin, Minnesota, and Iowa. These Cretaceous rock units include outliers of definite Dakota sandstone as well as the Waukon iron ores, Windrow formation, and Ostrander beds.

Keyes (1892) believed that the ferruginous conglomerates of northern and northeastern Iowa (including McGee's Rockville conglomerate) that had been called Cretaceous in age are instead Carboniferous.

Samuel Calvin (1897) in the geology of Delaware County comments on the conglomerate at Rockville ". . . the conglomerate projects above the thin sod over an area only a few yards in extent, and small boulders of it lie scattered on the surface . . . the deposit is composed very largely of dark-brown ferruginous sand, which serves as a matrix in which a great number of small pebbles are embedded. Many of the pebbles seem to be quartz, but many are rolled fragments of local chert and associated with them are angular pieces of chert ranging up to an inch or more in diameter . . ."

According to Calvin, the original exposure described by McGee was a short distance farther west and on higher ground, while Calvin's outcrop was located on sloping ground, a few yards west of the middle of the east line of the SW $\frac{1}{4}$ of the NW $\frac{1}{4}$ of section 24, about a fourth mile west of Rockville. Calvin, in this report, accepts without question McGee's assignment of the Rockville to the Cretaceous. However, earlier, Calvin in 1895 inferred that seas during the lower Coal Measures epoch spread sandstones, shales, and conglomerates as far north as Rockville in Delaware County, thus suggesting Pennsylvanian as the age for McGee's conglomerate.

Thwaites and Twenhofel in 1921 published a discussion of the Windrow formation, a gravel of possible Cretaceous age, in Wisconsin and adjacent areas of Iowa and Illinois. They wrote after visiting the type locality of the Rockville (Thwaites and Twenhofel 1921) ". . . no ledge or outcrop was found, but merely loose boulders of drift gravel cemented by limonite. The formation is totally unlike that of the Windrow formation in the poor rounding of the pebbles and the presence of igneous rocks and can hardly be correlated herewith."

At the abandoned iron mines near Waukon, Iowa (Howell 1914), there are some pebble beds, now heavily coated with limonite. These conglomerates are referred to by Trowbridge (1948) as "Windrow gravel of Cretaceous age." Both at the mine and at two other localities in Allamakee County described by Calvin (1894), the Windrow gravels are not extensive, and appear to be only a thin disconnected series of pebble beds. They do not resemble the Rockville conglomerate in that they are much better sorted and generally the pebbles are smaller and better rounded.

Samples of float collected from the type locality of the Rockville are a uniform red-brown color. Apparently the deposits consist of alternating beds of conglomerate and a well sorted sand. Pebbles in the conglomerate vary considerably in size and are not well

rounded. There is also more chert and considerably fewer quartz pebbles in the float from Rockville than from the Olin locality. A few of the chert pebbles have a high polish similar to the Dakota and Windrow. Hand specimens of the conglomerate from Rockville, because of the dark-red color, look distinctly different from the gray-white rock found near Olin.

Four other localities where ferruginous sandstones and conglomerates appear have been discussed in conjunction with the Rockville conglomerate. McGee (1889) writes . . . "Another outcrop of pebbly ferruginous sandstone occurs three miles northeast of Oxford in Jones County; the exposures are less satisfactory than at Rockville and the abundance of sand in the matrix suggests that it represents an outlier of Carboniferous sandstone rather than the pebbly conglomerate." Calvin (1895), in the report on Jones County, indicates that the pebbly ferruginous sandstone referred to by McGee probably is Pennsylvanian. This is further substantiated by Savage (1905) who describes a large sandstone outlier of Pennsylvanian age in southwestern Jackson County. The nearest outcrops to Oxford that could be found in the summer of 1954 are in the valley of Bear Creek slightly over four miles from the town of Oxford Junction (Sec. 31, T. 84 N., R. 1 E., Mammoth Township, Jackson County). These are crossbedded sandstones, brown-yellow to white in color. Savage reports finding a basal conglomerate under the sandstone in some of these outliers which from their positions he interprets as eroded remnants of a channel filling.

Calvin (1897) reported sandstone and conglomerate exposed under the loess in the NE $\frac{1}{4}$ SE $\frac{1}{4}$ of section 34, T. 90 N., R. 4 W., Elk Township, Delaware County. This locality is about two and a half miles southeast of Greeley. When visited in 1954, the roads were being rebuild at this point; and while excellent exposures of loess, till, and gravel were visible, no conglomerate or sandstone were seen.

Calvin (1897) also reports finding . . . "Fragments of ferruginous sandstone resembling some phases of the Des Moines stage of the Carboniferous . . . from the bottom of Whittaker Hollow, a deep narrow stream valley in section 23, T. 87 N., R. 4 W., Union Township, Delaware County. These fragments lack the conglomeratic character of the exposure at Rockville . . . fragments of chert and silicified Niagaran corals are embedded in the sandstone but there are no coarse fragments of quartz . . . As to age, the Whittaker Hollow sandstone may provisionally be correlated with the Rockville and Greeley deposits until more definite information is at hand." During the summer of 1954, numerous fragments of friable brown and yellow sandstone were found in Whittaker Hollow. In all ways these resemble Pennsylvanian rocks found else-

where in Iowa and are not similar to the Rockville conglomerate.

Udden (1898) reports “. . . on the west side of Pine Creek, a short distance north from where it leaves section 34, T. 78 N., R. 1 W., Muscatine County, there is a pebbly sandstone unlike the Coal Measure conglomerate in the surrounding country. It has a rather coarse texture and is somewhat more variable in this respect. The best exposure appears in a small gully, which comes down the hill from the west, some twenty rods north of the south line of the section. In all, a thickness of about sixteen feet is seen. . . . Some of the ledges are strong enough to be used for building stone . . . Even the hardest layers break easily under the hammer. In these, the sand and gravel is cemented by a black matrix of peroxide of iron. Two sets of quite regular joints cut the rock . . . Along these joints the ferruginous material is most profusely deposited. Some of the ledges are cut up into rhomboidal blocks about a foot in length and from eight to ten inches in width. These have a shining black, hard crust, half an inch or more in thickness, which on some of the blocks has separated from the lighter and softer rock within, forming thin, straight and smooth plates. Above this brown sandstone there is a yellow loose sand containing small boulders of greenstone and granite. On top of this sand there is a boulder clay and loess. Small exposures of the conglomerate occur for a distance of a quarter mile along the west side of the creek south of this place.

The degree of induration, in the pronounced jointing, and the general ancient aspect of this conglomerate render it reasonably certain that it is not a part of the drift which overlies it.

The only conclusion which can be drawn as to the age of this conglomerate is that it is post-Carboniferous and preglacial. Dr. Calvin, who has seen it recently, pronounces it identical in nature with the Rockville conglomerate described by McGee.”

The Geologic Map of Iowa compiled by Tester (1937) shows a small patch of Pennsylvanian sandstone (Des Moines series) just west of Rockville. Apparently at that time it was felt that the Rockville conglomerate of McGee should be considered as Pennsylvanian. Calvin's sandstone and conglomerate southeast of Greeley is also shown as Pennsylvanian, Des Moines series. Neither the Whittaker Hollow nor the Oxford occurrences are shown on the current geologic map of Iowa.

An examination was made of about two hundred well logs on file at the Iowa Geological Survey from Delaware, Dubuque, Jackson, and Jones Counties. Samples from several dozen wells were reexamined to see if gravels at the base of the drift sections might be Rockville conglomerate. None were found and as far as can be determined from the logs and samples, no Rockville con-

glomerate has been found in the subsurface. No fossils have been reported and none have been seen from any of these units under discussion.

Based on our analysis of the literature, well logs, the known exposures and by comparison with rock collections of the Iowa Geological Survey, the float from Rockville and samples from the outcrop at Olin are somewhat different and distinct from all the others. These other reported occurrences of the Rockville conglomerate, we believe, should be referred to the Des Moines series of the Pennsylvanian. Based also on our own experiences with the drift deposits of eastern Iowa, the materials from Rockville and Olin are probably not formed from Kansan or younger drift. However, Paul Potter and H. B. William (personal communications) have reported finding a cemented gravel near Peoria, Illinois. This rock, which is generally similar to the exposures at Rockville and Olin, they consider as Nebraskan outwash gravel. On this basis, perhaps the Rockville conglomerate should be assigned to the Nebraskan since it lies below Kansan till. Also Kay (1943) has reported cemented gravels in the Aftonian of southwest Iowa.

There is a possibility that the Rockville conglomerate can be correlated with the Lafayette gravels (late Tertiary or Quaternary in age) described by Horberg (1950) and Potter (1955), but the presence of pebbles of igneous and metamorphic rocks in the Rockville indicates that it is not Lafayette (H. B. Willman, oral communication).

If the conglomerates are not glacial in origin, it is rather difficult to assign any definite age to them other than post-Silurian, pre-Pleistocene. As noted above, both the outcrop at Olin and the float at Rockville are situated part way up on the flanks of fairly large stream valleys, within both the valleys of the North Maquoketa and Wapsipinicon Rivers. Because of their relatively poor sorting, the intermixing of sand and gravel, their present topographic positions, and with their limited areal extent, the conglomerates may have been deposited as alluvium which has since been consolidated and almost completely removed by stream and glacial erosion.

A fair argument can be made that these two deposits of conglomerate are about at the maximum northeastward extent of the Pennsylvanian overlap and perhaps represent channel fillings of beach, deltaic or estuarian sedimentation. However, the geographic position of the new locality north of Olin does not fit too well into the hypothesis.

As mentioned above, no definite age can be assigned to the conglomerate as we know it now. It is our conclusion that (1) they were formed at some time of aggradation, probably during

Tertiary time or (2) that they represent a consolidated Nebraskan or pre-Kansan gravel. Thus, the Rockville conglomerate should be updated in age to Tertiary-Quaternary and extended to include the new outcrop at Olin.

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