A RARE IRON CONGLOMERATE OCCURRING IN NORTHEASTERN HARDIN COUNTY, KENTUCKY

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While engaged in an oil and gas reconnaissance of the geology of a portion of the valley of the Rolling Fork of Salt River lying from 1 to 3 miles southwest of the village of Boston in western Nelson and eastern Hardin County, Kentucky, on December 9, 1958, the writer inadvertently discovered a rare type of iron cemented pebble-stone[1] in the channel of a steep intermittent hillside branch. Representative samples were collected and subsequently given to the Kentucky Historical Society to be added to the rapidly growing rock collection of this organization seated in the old State House in Frankfort. Intrigued time and again during the flight of the succeeding years by recollections of this unique, heavy brown iron conglomerate, a return to the locality of its discovery in eastern Hardin was made on October 1, 1965. The significant results of this examination follow.

The iron conglomerate, of 1958 record, was quickly found to be entirely disconnected stratigraphically with any part of the New Providence (Lower Mississippian) formation which outcrops there at the base of the first Muldraugh Hill in a thickness of about 50 feet. The pebble-stone occurs as a very limited fluvial deposit in a sharply etched, roughly circular erosional basin about 3.5 feet in diameter, some 15 to 18 feet below an intermittent falls of upper hillside branch water. The course of this small stream leaves a normal shallow drain in brush and cull timber and debouches over the south face of a deep wood cut in the New Providence Shale into which it has eroded a shallow channel of very steep angle to the aforesaid circular basin, below which the stream at a greatly lowered angle finds its way to the south ditch of Highway No. 62, thence on to the broad flat bottoms of the Salt River.

The pebbles found in this iron conglomerate, with one exception, are all slightly stream washed from nearby residual rock waste occurring at levels 80 to 125 feet higher in the New Providence and the formerly overlying Keokuk (Lower Mississippian) formation. Cherts of various types, brown and light tan to chalky white, both solid and porous, angular and subangular, predominate. But fine to medium sand pebbles, some oval flat, others rounded, also occur in this fluvial

1. Author's field *Note Book* "*AA*", p. 25, No. 38. Dec. 9, 1958; also Book "HH", pp. 3-4. No. 10. Oct. 1, 1965.

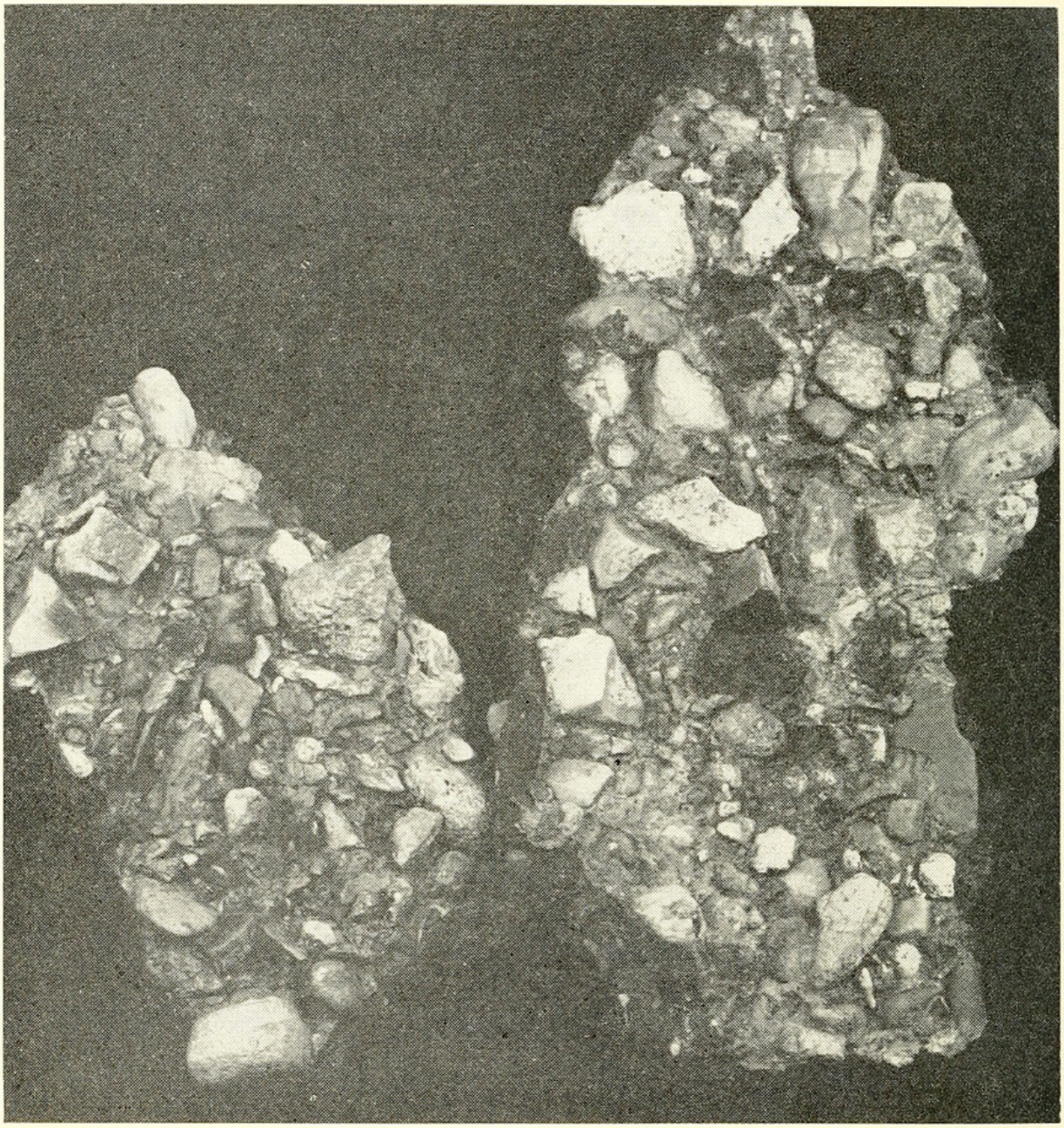

Figure 1—Iron Conglomerate from Hardin County, Kentucky. The length of the larger specimen is 14 inches, the smaller one 9.5 inches. The pebbles comprising these conglomerate fragments are here, accordingly, greatly reduced in size.

conglomerate. Occasionally a solid white or tan quartz Pottsville (Lower Pennsylvanian) pebble is noted, derived from remnant patches of hilltop fluviatile gravels deposited during the late Miocene or early Pliocene epochs of the Tertiary in the shallow, meandering, long abandoned channels or on the lower parts of the flood plain of the ancient high level Rolling Fork River. The pebbles, thus variously sourced, and of widely differing lithology, range in size, when elongate from 1 to 2.5 inches and when rounded or oval from .5 to 1.5 inches.

Of fossils, large or small, there is a very great scarcity, in fact, none have been noted except a very few short three or four plate crinoid or blastoid stem sections exhibiting diameters ranging from 1.5

to 2 tenths of an inch. The genera, much less the species of these wandering organic fragments, are of course entirely indeterminate. One or two Pottsville quartz pebbles, of medium to small size have been noted in each specimen of this conglomerate, generally rather deeply imbedded in the dark brown to black central iron stone matrix, which is very solid and frequently quite brittle. Its thickness ranges from .5 to 1.25 inches usually, but one or two specimens have been seen where the central iron layer exhibited a thickness of from 1.50 to a full 2 inches. This greater thickness, however, is quite exceptional.

The pebbles, occurring in this conglomerate, accordingly are in many instances exposed, of course, only partially, usually to an extent of about ¼ to ⅝ of their thickness or their entire mass, either at the top or the bottom of this extraordinary agglomerated rock. Chemical analyses of the iron ore matrix of this particular conglomerate, desirable as they might be as an accessory description, have not been made as this facility has not been immediately available to the writer, but based upon experience is here quantitatively estimated to be about 40 to 55% FeO with the balance of insolubles showing as SiO_2 and Al_2O_3.

An interesting angle of speculative thought involving the time element of formation of the rock, attaches to this particular Hardin County conglomerate and so logically appears in this paper, it may be, for the first time in the geological literature of the Ohio Valley, and perhaps, though this is of course less likely, in that of the entire country! All hard rocks require time, some a great deal of time, others much less for their induration. Volcanic lavas cool and harden very rapidly, especially if a thin flow on a steeply inclined mountain side is involved. All geological experience inclines to the view that the induration of the sedimentary beds is a slow, a very slow process involving not only vast stretches of time but also superimposed beds of great weight to bring about compaction. Old and long accepted trends of thought on the induration of sedimentaries must now, it appears, be laid aside with respect to this unique iron conglomerate, found at the base of the first of the Muldraugh Hills west of Salt River in Hardin County, Kentucky, as the following facts clearly indicate.

Thoroughly dependable records show that the grading and ditching of *the deep cut in the first low hill* on State Highway No. 62, west of the Salt River in eastern Hardin County, was completed and approved, following inspection, on June 24, 1925.[2] Erosion of the shallow, high angle channel of the "waterfall branch" across the upper part of

2. Letter to the author from D. M. Burgess, Director of Planning of the Kentucky State Dept. of Highways, Frankfort, Ky. Oct. 6, 1965.

the exposure of the New Providence Shale in this particular cut on the south side of Highway No. 62, some 2400 to 2500 feet southwest of the Salt River in Hardin County, began then or very shortly after this date in the mid-year of 1925. The small basin, in which the iron conglomerate was formed and is now found, was obviously formed during the first 5 or 10 years after 1925, before the ledge of rock producing the falls had receded some 15 or 20 feet to the position it now occupies.

At the present time and probably for a good many years branch water here has not fallen directly into the circular basin, but after leaving the "Falls Ledge" has cascaded down a steep shallow channel in the New Providence and passed on and over the old "Falls Basin" in a deepening, rock-cut channel to the south ditch of Highway No. 62. Close inspection of the lower part of the "Falls Branch" channel, indicates that the "Falls Basin" is now probably not nearly as deep as it once was, before the recession of the "Falls Ledge" and that for a good many years it has been simply a deep place in the otherwise shallow, highly tilted channel of the wet-weather "Falls Branch".

The mass of variegated, insoluble chert and sandstone pebbles which the Falls Branch gathered in the hills above and used as tools to cut the circular basin in the lightly resisting New Providence shale, remained in the bowl-like depression after the Falls had receded, perhaps rather abruptly following the fall of some ledge blocks, as frequently happens to all water falls. The small and more or less intermittent flow of iron-bearing waters leached from hilltop and upper channel beds, obviously sustained considerable evaporation at the Falls. As the upper water found its way, in dry periods, downwardly over innumerable ledges in the steep channel it was somewhat increased by subsurface waters issuing from beds of disseminated iron ore, sizeable kidneys and lenticles that plainly show here in the exposed stratigraphic section. These combined branch waters, tending with constant and rapidly increasing evaporation to greater and greater concentration of iron in solution, were collected and held in the fairly deep pebble-filled basin. In periods of extreme and extended dryness, as their volume shrank, and ceased its flow, as was the case at each period of examination, the iron content of these dwindling branch waters was precipitated in amongst and around the insoluble pebbles in the abandoned stream bed basin below the several iron ore horizons of the New Providence Shale.

The erosive action of intermittent streams of small flow has long been established as very slow. All physical factors and changing the circumstances of drainage apparently did not combine to increase concentration and bring about precipitation of the iron in the branch water

as a matrix solidifying all or most all of the gravels in the branch basin for probably at least 15 years—or until about 1940. The growth of the iron conglomerate found in this "Falls Branch" basin may therefore be said, with some degree of dependability, to have been accomplished within the last 25 years. This timing, it is thought, may be used with some assurance of accuracy in arriving at the time element required for the filling of veins and crevices in the bedded rocks of mineralized areas by downward percolating iron-bearing aqueous solutions.