



LINCOLN  
CITY & COUNTY MUSEUM PUBLICATIONS,  
No. 1.

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THE  
**Lincolnshire Keuper  
Escarpment.**

And its Bearing on, and Relation to the County.

**By F. M. BURTON, F.L.S., F.G.S.**

*Reprinted from the "Transactions of the Lincolnshire Naturalists'  
Union."*

**JUNE, 1908.**

**PRICE ONE PENNY.**

SOLD AT THE MUSEUM.



Photo by

JUNCTION OF THE FOSS DYKE AND TRENT AT TORKSEY.

P. A. Burton.



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## The Lincolnshire Keuper Escarpment.

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On the west side of the County of Lincoln, a long cliff, or escarpment, of the Keuper, the highest formation of the Triassic series, runs in a fairly straight line from north to south, for a distance of about eighteen miles, bordering the eastern bank of the river Trent; the formation of the cliff being the natural result of the carving out by that river of the valley through which it flows. These upper Keuper beds consist of red and variegated marls which are readily affected by erosion, but in places this soft, yielding, substance becomes indurated by slabs and veins of gypsum, and other materials, which enable it to resist denudation to a great extent. Hence we have, in some places, hardened masses of Keuper rock standing out in bluffs and headlands; while in others, where the soft marls prevail, and have been subjected to water erosion, the surface gets worn down almost to the ordinary level of the land around. What these unprotected areas meant in relation to the County when the Trent floods prevailed, we shall presently see.

Starting from the north of the County we meet with the first traces of the escarpment at Hardwick hill, about fifteen miles south of the spot where the Trent falls into the Humber; the intervening area being worn down to a low level by river and glacial erosion. From this hill the escarpment runs southwards through Laughton to Blyton, and, after passing another region of denudation coming from the east, it reaches Gainsborough; from whence it extends (with occasional coverings of sandy drift, deposited

when the river flowed at a higher level, before the existence of the Trent valley) to Marton, where we meet with the first serious break in its continuity; and the first bank made by the Romans to keep the flood-waters of the Trent away from their colony on the Lindis river. Here, a little way beyond the village of Marton, the cliff recedes eastwards towards Brampton, having been cut back and worn away by floods which have left traces of their tracks on its side. Passing on to Torksey we find another break through the line of the escarpment, on the north side of the church, which also admitted the flood-waters of the river; after which, a little further on, we come to the Foss Dyke—shown in the accompanying photograph—which was constructed by the Romans to put Lincoln into communication with the Trent.

About two hundred yards from the entrance to this Dyke the Trent waters are kept in check by a lock, and the stream flows on to Lincoln, joining the rivers Till and Witham on its way. After which the combined stream, under the name of the latter river, passes on to Boston and falls through another lock into the sea; and so level is the land the whole way—a distance of about forty-three miles—that only two intermediate locks are required—one at Lincoln and the other at Bardney—to hold up the water and render navigation practicable.

The part of the escarpment we are now entering on has been so well described by the late Mr. J. S. Padley, in his valuable book, on the "Fens and Floods of Mid-Lincolnshire" (a work that was published by subscription and so is not generally accessible), that I cannot do better than use, as far as possible, his own words in dealing with the district. Mr. Padley, whose kindly, courteous manner will be recalled by many of us with pleasure, had gathered much information about the flooding of this area by the waters of the Trent breaking through the escarpment; and, in his work alluded to above, he says: "Before the time of the Romans, every flood of the Trent flowed down to Lincoln. A range of low sandhills extends from the village of Girton in Nottinghamshire to Marton Cliff in Lincolnshire," and in this low region he describes five openings through which the water was accustomed to flow; the first, and the most southerly one, was in



H. Preston F.G.S.

## NEWTON CLIFF.

Photo by

the township of Spaldford; the second in the parish of Newton; the third near the south side of the Foss Dyke, at its entrance into the Trent; the fourth in the parish of Torksey, on the north of the church; and the fifth in the township of Brampton—the fourth and fifth being those near Torksey and Brampton which we have already alluded to. “Doubtless these openings (Mr. Padley goes on to say), were embanked by the Romans, but since their time, being neglected, the banks have broken at different periods, and allowed the flood-water to inundate the country down to Lincoln, and so into the Fens.” The Spaldford Bank was the most dangerous, and Mr. Padley gives an interesting description of some of the great floods that came from that quarter. One of them, in 1795, flooded great parts of Nottinghamshire and Lincolnshire, and covered nearly twenty thousand acres west of Lincoln, the water there being dammed up by the High Street; while the flood-mark at the time “was nearly eight feet above the ordinary water in the Foss Dyke, or ten feet above the present level of the land.” Other floods which did great damage are mentioned by Mr. Padley up to the years 1852 and 1877; but it is well known that the Trent has repeatedly broken through its banks, not those made by the Romans only, but others as well, almost down to the present day; and parts of Lincoln and Gainsborough, and many of the villages around have suffered from floods, which, however, in these days of precaution are happily getting less frequent; while skating in severe, wet winters from Lincoln, and even from Gainsborough, to Boston, over the flooded area, has occasionally been possible.

It will be noticed that Mr. Padley in his description of this area makes no mention of the Cliff at Newton, nor of the escarpment, beyond speaking of “a range of low sandhills” between Girton and Marton. The escarpment, however, after leaving Torksey, is plainly discernible, though at a low elevation, skirting the east side of the Trent, while at Newton it forms a conspicuous object known as the “Newton Cliff,” a photograph of which, through the kindness of Mr. H. Preston of Grantham, we are able to produce. Either Mr. Padley had no knowledge of the escarpment, or, what is more probable, took no notice of it beyond the

way in which it affected his "Fens and Floods." The Cliff at Newton is remarkably picturesque, and the Lincolnshire Naturalists' Union held one of its most interesting meetings there this year.

As before stated the portions of the escarpment which remain at the present time owe their durability, for the most part, to the gypsum they contain. This mineral, which is an aqueous deposit, found in many sedimentary beds, is formed, and is being formed in the present day, in a variety of ways. It is usually white, but in places it gets stained with impurities and becomes dirty-looking and dull, or red and yellow when discoloured by iron oxide. Sir Archibald Geikie, in his text book, mentions several modes in which it may be formed—such as "a chemical precipitate from solution in water, as when sea water is evaporated;" or from the decomposition of sulphide acting on limestone; or through the action of sulphurous vapours upon calcareous rocks, &c.; and it is to the first of these methods that the gypsum in the Keuper Marls owes its origin, for the Keuper once formed the fringe of a large inland sea, or salt lake, which has left traces of its former condition in the pseudomorphous crystals, filling up the cavities which the true salt crystals once occupied; many of which are found in those parts of the escarpment which have been dug into and disturbed.

Gypsum occurs in various forms on the line of the Lincolnshire escarpment. On the north of Gainsborough it appears as fibrous, satiny bands. At Gainsborough, and on the south of the town, we meet with it in granulated rubbly masses, interstratified with layers of hardened sandstone. Further south it lies in isolated, saccharoid nodules, which are highly soluble; (so much so that I once saw a good sized block, which was lying exposed on the Railway bank, pierced, in a short time, clean through by the continual drip, drip, from the cornice of a bridge above it), while in the Newton Cliff, as the photograph above referred to shows, it occurs in lenticular bands and veins running in all directions, some of which frequently cross and intercross one with another, producing a remarkable, but not uncommon, effect.

Had the escarpment all along the line, being fortified and

hardened, by gypsum, as it is at Gainsborough, Gate Burton, and Newton, there would have been no need of the Roman banks; and the land on the west of Lincoln could not have been worn down by floods to its present low level; and even the fen land on the east of the city (though kept alive by the overflowing tides of the Wash, and fed by other rivers beside the Witham), might, for lack of supply from the Trent floods, and probably would, have borne a very different aspect.

### **Lincolnshire Rock Specimens.**

A collection of the above is being made, and arranged in the City and County Museum at Lincoln. Among those already acquired is a series that show the geological position of the Keupers, so well described in the foregoing article by Mr. F. M. Burton, F.G.S.

A series of specimens from the Boring at Boultham (presented by the Lincoln Waterworks Committee), shows that the Keuper is met with at 669 feet below the surface, in the valley of the Witham, and at that point is 868 feet in thickness. At Newton Cliff, about eleven miles westward of Lincoln, the Keuper outcrops and gives the name to that area, standing above the Trent some fifty feet or more. Mr. T. S. Bavin has presented a series of specimens from a bore made to locate coal in which the Keuper is found to be at the West of the County 850 feet in thickness.

Another series of specimens consist of the red and grey marls, and selected pieces of gypsum taken from the cliff itself at the point illustrated in Mr. Preston's photograph. Visitors to the Museum are therefore able to see actual specimens of this formation, also their relative position as shown in two instances, by the very deep borings at Boultham and Collingham, Mr. Burton has also presented an interesting ripple-marked slab, or waterstone, from the Keuper, which is placed in the same case. It should be noted that the "dip" of this formation is shown by the two borings. The Keuper standing 50 feet above the surface at Newton, is at Lincoln 669 feet below the surface, in the valley. The distance between the two points being about eleven miles.

A. SMITH.