EXCURSION TO CHARNWOOD FOREST.

WHITSUNTIDE, 1902.

SATURDAY, MAY 17TH, TO TUESDAY, MAY 20TH.

Directors: Prof. W. W. WATTS, M.A., Sec.G.S., C. FOX STRANGWAYS, F.G.S., and W. F. MARTIN.

Excursion Secretary: E. P. RIDLEY, F.G.S.

(*Report by* PROF. WATTS.)

THE excursion of the first day, *Saturday, May 17th*, was confined to the east and north-east of Charnwood Forest, because in this district the structure is simpler than elsewhere, the dip and the succession of the rocks is not much obscured, and the exposures are numerous and connected. The main disadvantage is that some of the more important "index-beds" are invisible, while others are not typical and do not show well the characters which have earned their names for them. Consequently there was at times a slight demur in receiving some of the statements of the Director on this day, although in the end a fair idea of the general succession of the main subdivisions was acquired.

By the kind permission of Mrs. Herrick the party was quite free to wander at will through the grounds of the Hanging Rocks and Beacon Hill, the beautiful annexe to Beaumanor Park. Work was begun in the Southern Slate Quarry, within sight of Woodhouse Eaves. Purple and green slates are exposed here, with Keuper Marl resting in a little valley scooped out of the edges of the slate. The dip, cleavage, contortion, and shearing of the slate were well seen, and also the scanty breccia of large angular fragments forming the base of the Marl. Just at the back of the quarry there is an exposure of the Brand Conglomerate with its pebbles of quartzite and slate, the lowest division of the Brand Series. It was pointed out that the strike of these two divisions did not conform to that of the other rocks in the Grounds, and that the next rock in *apparent* succession would be the great mass of the Hanging Rock itself, a coarse tuff with irregular and distorted bands of pale hornstone. Below this came the green hornstones, and, forming a base to so much of the Woodhouse Series as is here visible, came a second agglomerate in which hollow bombs and masses of slate were eventually found. This agglomerate displayed the usual pillar-like jointing, and it is correlated with the Slate-agglomerate.

The party next ascended Beacon Hill, passing over an area of Trias and on to scattered occasional exposures of the typical

fine-grained siliceous tuffs which the Director referred to as hornstones. These are generally well banded in green, pink, and white colours, and show their succession clearly, although towards the summit of the hill the strike is much disturbed by one or two considerable faults which break across the country in both longitudinal and transverse directions. Some bands of epidote grit occur on the summit, and under a crag formed by one of them, capped by pale cream-coloured contorted hornstones, the party took its well-earned rest and refreshment.

The carriages were resumed for a few yards, and the next halt was made at an unnamed wood north of Black Hill, where a large number of blocks of the Felsitic-Agglomerate were seen, probably not far from their natural position, and at the base of the Beacon Hill division of the Maplewell Series. The fact, noted by Hill and Bonney, that the clastic character of this rock is only visible on a fractured surface, was easily noted here for the first time. The next exposure visited was at Alderman's Haw, where a porphyritic andesite (porphyroid), which appears to be intrusive, is visible on about the horizon of the Felsitic-agglomerate. A little further, and the well-known Whittle Hill was reached, the quarry from which the Charley honestone is obtained. This rock is a very fine and even-grained tuff, hardened by the intrusion of a small dyke of syenite, and jointed so that it breaks into pieces convenient for the making of hones. Just above the rock of the quarry is a small crag of coarse tuff, which occupies the position, and has some of the characters of the Felsitic-agglomerate, whilst it is in line with exposures of a similar rock in Roe's Plantation, which there was not time to visit.

Lack of time also rendered it necessary to abandon the proposed visit to Morley Quarry, where there are hornstones and grits of the Blackbrook division, but the drive towards Newhurst gave the party its first example of one of the old longitudinal fiords now filled with Triassic Marl, through which small and large islands of the old rock, like that of Shortcliffe, here and there project. At Newhurst, recent quarrying operations have rendered very clear the relations of a great mass of syenite intrusive into the Blackbrook and Maplewell Rocks, probably along a line of fault which here separates the two series and repeats the succession. This fault is the eastern thrust-plane shown in the annexed diagrammatic section (Fig. 57), the south-eastern interior of which crosses the long section (Pl. XVII.) in the eastern flank of Beacon Hill and accounts for the large area occupied here by the Beacon Hill Hornstones. After getting specimens of the syenite, which is here dark, basic, and very tough, so that it is capable of resisting a high crushing stress, the party drove on to Forest Gate, beginning work again on the highest members of the rock visible in that region.

In this old quarry slates and conglomerate, with a little

quartzose grit (almost quartzite) are seen, but the best specimens now to be seen are in the neighbouring walls. The "trachose grit" has formerly been also quarried in this neighbourhood, for many fragments may still be seen lying about. On working downwards from here the Beacon Hill Hornstones were again met with at Buck Hill, and the position of the Slate-Agglomerate in the Outwoods was pointed out but not visited.

The next halt was at Pocket Gate Farm, and there the rock elicited many inquiries; but the Director was unable to give the information required. Instead, he offered a small reward to anyone who could tell him the dip, strike, position, composition, age, or origin of the rock; but the reward was not claimed. As a matter of fact, two or three longitudinal faults appear to actually converge in the quarry, and an important transverse fault passes within a few yards, so that the rock is mangled out of all recognition. The party preferred to walk from this point to Woodhouse Eaves, and were rewarded by visiting the Northern Slate Quarry, under the kindly guidance of Mr. Humphries.

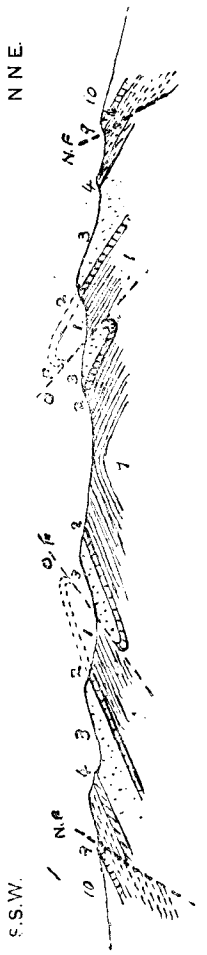

FIG. 57.—GENERALISED SECTION ACROSS CHARNWOOD FOREST.—*By W. W. Watts.*

To Show the Structure and Faulting.

N.F.—Normal Faults. O.F.—Overthrust Faults.
10, Swithland Slates. 3, N.W. Agglomerates, etc.
9, Brand Conglomerate. 2, Felsitic agglomerate.
4, Slate-agglomerate. 1, Hornstones and Grits.
(See also index to Plate XVII.)

This rock succeeds the coarse tuff of the Hanging Rock in regular order, and if there is no faulting it must be on the horizon of the rocks of the Southern Slate Quarry. But it has no affinity

with this, and is a coarse-grained slate with beautiful ripple-jointing, a feature observed generally throughout the Forest in the highest division of the Woodhouse Stage of the Maplewell Series. Hence it is concluded that a longitudinal fault runs along the eastern border of the main crags of the Hanging Rocks, separating them from those of the Southern Slate Quarry. The line of this fault passes through the west side of the Brand Grounds, as noted below. The circular markings which have been described as fossils were seen in this quarry. From Woodhouse the Association drove back to Quorn, and soon reached its comfortable quarters at Nottingham.

On *Monday*, *May 19th*, the drive from Quorn Station gave the party a very good view of the general appearance of the Forest. They toiled over the long hill of the Beacon, and then traversed one of the Trias-filled fiords to Charley Cross Roads, and on to the Oaks, noting on the journey the abrupt changes in the landscape wherever the streams or ablation had scooped out enough of the Marl to expose the Charnian Rock beneath. Some of these streams were longitudinal, and followed on the surface of the Trias the direction of fiords now filled with the Marl. But many of them turn out of the course of the old fiords at right angles, and escape from the Forest by passing transversely across the ribs which divided the fiords. So surely as this is done the landscape becomes immediately wilder and more rugged, the valleys are steeper and rockbound, and the vegetation changes. But immediately beyond the Oaks the Blackbrook stream, while still following the direction of the Triassic fiord, has cut down so deeply through the Marl that it has cleared the Trias completely out of it, and lays bare the only example of such a fiord in the region. Hence it is not surprising that this valley has characters of its own not elsewhere seen. Its abrupt sides, its rocky flanks and bed, and its meandering course, remind one of nothing so much as the "gutters" in the Longmynd. The foot of this fiord has been selected by the Loughborough Corporation for a reservoir, which is to occupy, on a larger scale, the site of the old reservoir of the Charnwood Forest Canal. Fortunately, Mr. Hobson, the engineer engaged in constructing the reservoir, was on the spot, and he gave to the Association a lucid and most interesting explanation of the site and its advantages, and pointed out the special difficulties which had been met with in the preparations for the lofty dam which is to convert so many of the middle reaches of the Blackbrook valley into a lake. The trench excavated for the masonry dam has given a new and unequalled section of the rocks of this part of the valley, and it shows the normal Blackbrook hornstones and thin grits, associated with a rock which is probably an intrusive porphyroid of a type similar to that of High Sharpley. The rocks of this section are about the lowest seen in the Charnwood anticline and the succeeding

drive to the east ascended the sequence until the equivalent of the Felsitic-agglomerate was passed, and two or three exposures in the agglomerates which seem to be the western equivalent of the Beacon Hill Hornstones were visited. At Trilobate Plantation, after it had been pointed out, in answer to an inquiry, that trilobate was not synonymous with trilobite, specimens of a very fresh and brittle porphyroid were collected, and near Hob's Hole a coarse and massive agglomerate was well shown. The party drove through Whitwick until it arrived at High Sharpley, from which a grand view of the entire country opened out, tempered, however, with the gloom caused by the rapid approach of a heavy thunder shower. The rocks of the hill were well examined, and the curious knobby character and slaggy look due to the shearing of a nodular igneous rock was seen and explained, only just before the arrival of the storm compelled a hasty retreat into the fissures and caves of the rock, which were capacious enough to contain the whole party in comfort.

This storm heralded the break-up of the weather for the day, and it was a very wet party which stopped at the drive to Charnwood Lodge, or pushed on towards the smoky hospitality of the "Forest Rock." Those who faced the weather saw the magnificent exposure of massive, cleaved agglomerate exposed along the Drive, the sheared porphyroid near to Charnwood Forest Farm, the agglomerates and interbedded slate of Warren Hills, and above all these one of the exposures of a typical Slate-agglomerate, followed by hornstones like the Woodhouse Hornstones of the Hanging Rocks which had been visited on the preceding Saturday. These exposures of Slate-agglomerate serve to link the east and west sides of the anticline, and to make it almost certain that the main group of agglomerates, from Flat Hills and Timberwood Hill to Warren Hills and Abbots Oak are the equivalent of the Lower Maplewell Series of the east of the anticline, from the Felsitic-agglomerate to the Slate-agglomerate, inclusive.

It was found necessary to abandon the projected visit to Peldar Tor Quarry and Birch Hill, and the carriages drove direct to Bardon Hill, where, in the most difficult sections of the area, the rain rendered it practically impossible to make out the relations of the rocks. The intrusive junction of the porphyroid on the south flank of the quarries was not so plain as when the second stage was less cut back, while a new type of breccia was now exposed on the northern side by the quarrying away of a buttress in which rocks of "Slate-agglomerate type" had been formerly recognised by Bonney and Hill. It seemed to be the general opinion that this breccia was partly cataclastic in origin.

It was not found possible to visit the Trias junction or the new quarries in the higher part of the hill, although the whole area had been thrown open by the kindness of Messrs.

Ellis and Everard. Nor was it thought advisable to complete the rest of the day's programme; so the carriages were reluctantly turned homeward, and driven straight back to Loughborough.

On *Tuesday, May 20th*, the first halt was made at Woodhouse Eaves to study the exposure of purple-and-green-beds, conglomerate, little purple slate, quartzite, and "trachose grit" in the old quarry under the church.

The next halt was at the Brand, kindly thrown open by Mr. R. F. Martin, and here similar beds were again seen in the type locality for the Brand Series. Purple-and-green-beds, conglomerate, little slate, quartzite, trachose grit, and Swithland Slate all succeed one another in regular order, but a prolongation of the Hanging Rocks fault cuts off the purple-and-green-beds abruptly, and brings in the Slate-agglomerate to the westward after a very short interval. The very fine exposure of the Slate-agglomerate of Roecliffe was seen next, with the kind permission of Mrs. Heygate, and it gave for the first time a true idea of the characters of this remarkable rock, a coarse andesitic tuff, laden with small fragments of slate, and enclosing here and there large bent masses of similar slate.

The Countess of Stamford was good enough to allow the Association to traverse her woods in the neighbourhood of Bradgate Park and the Park itself, and full advantage was taken of this permission. Benscliffe Wood with its exposures of Felsitic-Agglomerate was first crossed, nearly along the line of the group of anticlinal faults which cause the frequent repetition of this band, in the wood itself and in a neighbouring plantation. In Hunt's Hill the Slate-agglomerate was found, nearly half-a-mile from its correct position, thrown back by a pair of faults, which account for the remarkable gap in the outcrop line of the Agglomerate at Old John Tower, and which bring on a slice of the ripple-jointed Olive Hornstones into this position. At the Tower Mr. Fox-Strangways gave an account of the Triassic and newer rocks of the immediate neighbourhood, calling attention to the features which could be observed from this admirable if windy point of view. The Slate-Agglomerate was again found in its normal position, after the fault had been crossed and recrossed, and then the party advanced over the half-mile or so of Olive Hornstones with their beautiful ripple-jointing, to reach the Quartzite and slates of Deerbarn Wood and the Stable Pit, intruded upon by outlying dykes from the great mass of syenite which floors the south-western part of the Park. Unfortunately no worm tracks were found on this occasion in the slaty rocks.

After a short halt at Newtown Linford, the party pushed on to the Altar Stones at Markfield, one of the finest exposures of the Slate-agglomerate; they visited New Plantation with its splendid exposure of quartzite in contact with syenite; passed the old slate

TERRACED AND SMOOTHED SURFACE OF GRANITE UNDER KEUPER MARL. MOUNTSORREL GRANITE QUARRY.

(From a photograph by Prof. H. E. Armstrong.)

workings at Bradgate Farm, and drove on past the great syenite quarries of Groby to Leicester, where the excursion closed.

A small party, however, took advantage of a fine day to visit the Mountsorrel granite area. The old quarry of Buddon Wood, with its granite and its dykes, was first visited; next the great quarries of Mountsorrel itself were reached, and the rock, with its variations and dykes, was studied. Greater interest, however, was aroused by the junctions with the overlying Trias, and the evidences of supposed wind-erosion on the granite surfaces. At the entrance to the quarry lie the blocks derived from the first terraced surface found on removing the boulder-clay, which have been carefully preserved by Mr. Martin, and some of which he would be glad to see deposited and cared for in a museum. But in the quarry itself was a newly exposed surface of great beauty, only just being uncovered from its coating of undisturbed Keuper Marl. Several fine photographs were thereupon and afterwards taken of this—the finest exposure which has yet been seen of terraced granite under Keuper Marl. By the kindness of Prof. H. E. Armstrong, we are enabled to reproduce one of these photographs (Plate XVIII), which shows the terraced and grooved granite to the right of the shovel, and the bedded Keuper Marl to the left of it. Although no doubt existed in the Director's mind before, this exposure rendered it absolutely certain that the *smoothing and terracing* of the granite first originated *during* or *before* the deposition of the Keuper Marl. Other examples of smoothed and terraced surfaces were seen at Hawcliffe, and a little search at this spot yielded several specimens of glazed and ribbed fragments with wind-polish on them. The railway cutting out of Nunckley Hill Quarry still displayed a previously described terraced surface of granite in contact with a thin skin of Marl, both covered directly with a boulder-clay in which were abundant glaciated fragments of hard chalk. The next point visited was the reservoir of Buddon Wood, kindly opened for the Association by the Corporation of Leicester. The gardens, machinery, filter beds, and methods of sand washing were exhibited, and excited much interest. The day's work closed with a walk to Brazil Wood, where the old quarry with its granite dykes and highly altered slates now converted into hornfels was seen.

To summarise, the general plan of the Excursion was to display the succession of the Charnian rocks and the rock-structure of the Forest, and to give the evidence from which this structure—an anticline traversed by thrust-planes and drop faults, both longitudinal, and crossed by transverse faults—had been made out. The keys to the position are :—(1) the Felsitic-agglomerate (2) the Slate-agglomerate, (3) the Brand Conglomerate and its associated beds of quartzite, "trachose grit," and slate. The last-named member was traced round the Forest from Forest

Gate, through Hanging Rocks, Woodhouse, the Brand, and Deer Barn Wood, to New Plantation. The Slate-agglomerate in the Outwoods was not visited, but south of this point it was traced through Hanging Rocks, the Brand, Roecliffe, Bradgate Park, Altar Stones (and possibly Bardon Hill) to Warren Hills at the back of Forest Rock. The Felsitic-agglomerate was picked up at Whittle Hill and then traced through the plantation near Black Hill, to Benscliffe. In the north-west of the area it becomes merged into the massive Agglomerates of Flat Hill, Warren Hill (N.), and Charnwood Lodge. Inside the lowest of these three divisions come the Blackbrook Rocks; outside them the Swithland Slates; between them the two divisions of the Maplewell Series, the Beacon Hill Hornstones and the Woodhouse Beds respectively.

The map which accompanies this report is a first attempt to portray the rock-structure of Charnwood Forest as it would appear if the Trias and more recent rocks were stripped off. While theoretical at many points, it is thought by the Director that it gives an approximate explanation of the facts observed in the field, while the faults inserted are the simplest series he has been able to think out to explain the facts known to him. Most of these facts were collected while he was surveying the geology of the district as a member of H.M. Geological Survey, but a considerable amount of field and office work has been carried out since that time in the area.

In closing this account, the Directors wish to express their very hearty thanks to those ladies and gentlemen who helped to make the Excursion successful: The Countess of Stamford, Mrs. Herrick, and Mrs. Heygate; Mr. R. F. Martin, Mr. W. F. Martin, Mr. Edwin de Lisle, Mr. H. A. Payne, Captain Heygate, Messrs. Ellis and Everard, Messrs. G. and F. W. Hodson, the manager of the Whitwick Granite Quarries, the members of the Leicester Literary and Philosophical Society, and the Leicester Corporation. The Directors are also glad to take this opportunity of giving their especial thanks to Mr. Coke; and to Mr. E. P. Ridley, to whose care and businesslike management as Excursion Secretary the comfort and smoothness of all arrangements were due.

REFERENCES.

1-inch Ordnance Survey Map, Sheets 141, 142, 155, 156. Price 1s. each.
Geological Survey Map, New Series, 1-inch, Sheet 155. Price 3s.
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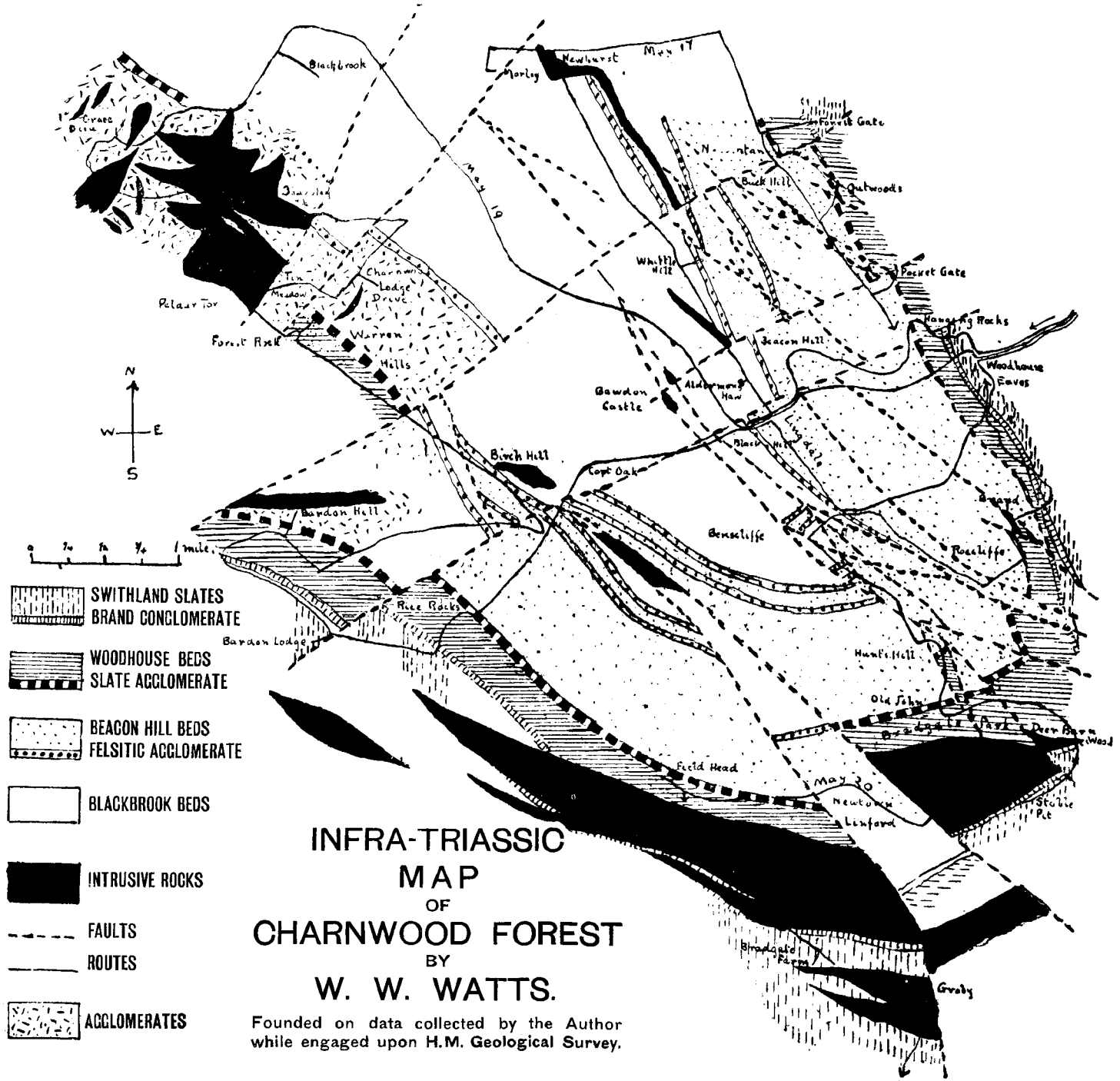
2. BONNEY, Prof. T. G.—"Note on a Contact-Structure in the Syenite of Bradgate Park." *Quart. Journ. Geol. Soc.* (1891.)


SWITHLAND SLATES
BRAND CONGLOMERATE
WOODHOUSE BEDS
SLATE AGGLOMERATE
BEACON HILL BEDS
FELSITIC AGGLOMERATE
BLACKBROOK BEDS
INTRUSIVE ROCKS
FAULTS
ROUTES
AGGLOMERATES
INFRA-TRIASSIC
MAP
OF
CHARNWOOD FOREST
BY
W. W. WATTS.
Founded on data collected by the Author while engaged upon H.M. Geological Survey.
Blackbrook
Newhurst
Forest Gate
Buck Hill
Outwoods
Pocket Gate
Beacon Hill
Woodhouse Eaves
Bawdon Castle
Birch Hill
Copt Oak
Benscliffe
Roecliffe
Bawdon Hill
Rice Rocks
Bawdon Lodge
Old Fishy
Field Head
Newtown Linford
Stable Pit
Broadgate Farm
Groby
Forest Rock
Warren Hills
Lodge Drive
Meadow
N
W
E
S
0 ¼ ½ ¾ 1 mile.

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The Transactions of "The Leicester Literary and Philosophical Society" contain various papers on the Geology of Charnwood Forest.

EXCURSION TO READING.

SATURDAY, MAY 31ST, 1902.

Directors: O. A. SHRUBSOLE, F.G.S., and W. WHITAKER, B.A., F.R.S.

Excursion Secretary: A. K. COOMÁRASWÁMY, B.Sc., F.G.S.

(*Report by* THE DIRECTORS).

THE party on arriving at Reading proceeded to inspect a section of the Valley Gravel which is exposed in Kensington Road near the County Cricket Ground. There is about 20 feet in depth of gravel shown here forming part of a terrace left at a late stage of valley-erosion, since the surface is only 22 feet above the river Thames at the nearest point, which however is fully half-a-mile distant. The gravel is evenly bedded with sandy and chalky seams. It contains pebbles of chalk and many large fragments of black flint indicating the waste of the Upper Chalk at no great distance. A few pebbles from the Bunter conglomerate are found and also mammalian bones, generally too imperfect for determination, but recently canines of *Hippopotamus major* have been found. The gravel is generally destitute of traces of man, the finding of an implement being of rare occurrence, and in that case it might have been derived from an older gravel.

Thus it would seem as if man was not in the vicinity of the Thames at this time, and this stage might represent the supposed break between Paleolithic and Neolithic times in this country. How far the migration of man and possibly of other Mammalia might be a result of excessive humidity of climate was a matter for speculation. It is at least worthy of note that hippopotamus has occurred here and not at the higher levels. Mr. Whitaker pointed out the calcareous nature of the gravel as an indication of its comparatively late date and drew attention to the pipes that were already in course of formation at the surface of the gravel by chemical agency.