EXCURSION TO GREENHITHE AND STONE.

SATURDAY, AUGUST 30TH, 1919.

REPORT BY S. PRIEST, F.G.S., *Director of the Excursion.*

EIGHTEEN members arrived at Greenhithe Station at 3.8 p.m., walked south to London Road and Stone Castle Drive, which overlooks extensive chalk-workings (*M. coranguinum*-zone) along the Greenhithe-Bean dry valley, and viewed a broad shallow channel section on the eastern face. The chalk bordering the channel showed re-arrangement. Members agreed that the channel-drift appeared to be principally Thanet Sand downwash from the Western Cross and Knockhall Grove northward prolongation of the Mounts Wood Eocene outlier. Mr. Whitaker advised a search for freshwater shells in the channel material.

Examination of the centre of the section has since proved the following succession :—

	Feet.
Valley brick-earth, thickness irregular	1
Thanet Sand, not in situ, green-coated nodular Bullhead flints absent	8.
Re-cemented fragmentary Chalk in chalk-paste	8.
Chalk, unaltered	+ 24.

The transported Thanet Sand did not everywhere form an even junction with the chalk-rubble. A broad tongue of the latter material, extruding up the dry valley, inclined into the higher bed, but did not present the pinching and other features observable in Coombe Rock sections at the Associated Portland Cement Manufacturers' Southfleet (Baker's Hole) pit.

Mr. E. E. S. Brown suggests the following sequence of processes :—" Solution of the chalk, shallow piping, a meander of the channel, and deposition of drift in the hollow."

Solution festooning at the top of Chalk-sections is fairly frequent in this locality, and at Stone Court, and is precisely similar to that seen at Birchington Cliffs.

Nearer Horns Cross, another sequence of processes may be deduced from the slopes.—" Wash from 100 foot Terrace Gravels, rapid sorting action accompanied by re-arrangement of constituents, fine loams being carried farthest."

The west face of the pit shows a prominent flint-band—here called the *Girdle Tier*—depressed northward by three step-faults (18, 6, and 36 inches respectively from south to north) in the course of a thirty yards stretch. The third displacement is preceded by an arched crumple, and has initiated oblique fissuring.

The Chalk below the Girdle Tier is of a much more massive or block-like character than that of the beds above.

As seen from Castle Lane, the Eocene outliers occupied by Swanscombe, Mounts, Darenth and Lord's Woods contrasted well with the open Chalk country, which is diversified only by dry valley systems.

Turning north along "Sandy Lane," members approached the London Road again. The Thames Sand Dredging Company's three pits—Howe Hill, Castle Cross, and the Crater (connected by tramways via Chalk tunne's)—are worked for the 100 foot Terrace Gravels, which in all three rest—with much piping—directly on the Chalk, and exactly conform to the Dartford Heath arrangement.—

1. UPPER DIVISION, fairly horizontal beds, gravels and loams alternately, sometimes inter-digitating, the loams thickening into stiff red brick-earths towards the surface.
2. LOWER DIVISION, current-bedded fine sands and gravels.

An hour was well spent at the Howe Hill pit examining the great accumulation of heavy *débris* strewn in lines on the floor. The following types were noted:—

- (a) Large composite flints resulting from the aggregation of both nodular and tabular flint by the deposition of an enveloping cement of secondary silica.
- (b) Flints extensively brecciated.
- (c) Ironstone-concretions, friable on weathering, with casts of Woolwich shells. Mr. Whitaker compared them with similar Woolwich concretions seen at C. H. Norris' North End pit, Erith. They also occur at Stone Court No. 3 pit.
- (d) Dense ironstones containing quartz grit, with a siliceous material, including quartz crystals, in cavities. (See Note p. 198.)
- (e) Iron-stained conglomerates with pebbles sufficiently rounded to suggest Blackheath origin.
- (f) Large sarsens, with siliceous puddingstone comparable with many of those observed at Bradenham and Walter's Ash on July 26, 1919. (See p. 192.)
- (g) A fine basaltic boulder, externally weathered, with usual excoriation, and rounding of corners. When broken, the weathered crust, typical basaltic jointing, and freshness of crystals confirmed its identification.

The President considered that other igneous rocks, smaller in size, should be found in a locality where so large a specimen occurred, and he hoped members would record all pebbles of igneous rocks discovered in the 100 foot Terrace Gravels, so that they could be sliced for petrological examination.

The origin of the chocolate-coloured dense ironstones with strings of small siliceous geodes was considered. Mr. A. C.

Young detected particles of flint scattered through some lumps, the President identified a groundmass of flint in another, and finally suggested that the rock had been originally flint, that partial replacement by iron had occurred, and that acid would dissolve out the iron, leaving a flinty residue. Such replacement was possible under bog-conditions.

Collectors had left only small fragments of the block of shelly London Clay basement bed noted here in 1914. The heavy flint-débris is frequently observed well distributed within a few feet of the Chalk floor; but whether the rest of the coarse constituents are similarly disposed has yet to be determined. Weathered septaria fragments can always be found here, while quartz pebbles have been gathered here in greater size and number than elsewhere in Stone Parish.

From Chalk near the tunnel, a *Cidarispine* was obtained by one of the party.

Both by Carlton Avenue and the City of London Mental Hospital, the plateau features produced by the 100 foot Terrace Gravels are very marked, contrasting well with the Chalk escarpment and the Thames Marshes below. Two dry valleys, one from Hungry-gut Farm and St. Mary's Home, and a narrower one through Stone Lodge Farm, break the continuity. These unite between the Stone Court "Old" and "New" pits, the resultant channel steadily falling towards the Stone Marshes, with a width of 150 yards at the 25 foot contour.

Little time was available for inspecting sections in the Dartford Heath Gravels west of Horns Cross. From Martin's pit* a small, much weathered basaltic specimen has been collected by the Director.

At the Tollgate pit, an important feature is the relatively large proportion of Lower Greensand (Hythe Beds) material.

In the Hillhouse pit, members gathered such derived material as Woolwich *Ostrea*, London Clay septaria, and serpula casts.

A fairly regular rift-like cavity, revealed in the course of gravel excavation, had been left for members to see. Similar hollows have been experienced at Howe Hill pit, when an escape of fine free-running sand from retaining walls of stiff red loam has startled the digger by offering no resistance to his pick or pitcher (crowbar).

Members walked around Stone Court No. 3 pit, at the west side of Cotton Lane, noting the following sequence:—

	Feet.
Pebbly soil	1 to 2
Current-bedded Dartford Heath gravel	15
Thanet Sand, thickness irregular through piping into Chalk	up to 8

*Small fire-pits, hearth-sites, etc., occasionally yield broken pottery here.

Bullhead flints*, etc.

Chalk (*M. coranguinum*-zone).

All three pits (Old, New and No. 3 respectively from east to west), worked by the Stone Court Co., are situated on the Chalk escarpment, overlooking the Thames alluvial flats, and, through being cut back to approximately 127 O.D., have exposed the 100 foot Terrace Gravels. Like No. 3 pit, the "New" pit immediately east shows a few feet of Thanet Sand.

A descent was made to the Stone Court mineral line, here lying between Cotton Lane and the North Kent Railway. The channel continuation from the united dry valleys had here effected a "wash-out" in the Chalk-beds, with deposition of 50 foot Terrace-material, gravels resembling Thames ballast being overlain by loamy brick-earth. The cleanest section—near the retaining wall—gave the following succession:—

	Feet.
Loamy brick-earth	6
Gravel, resembling Thames ballast	12
Finer material, partly obscured by talus	5

West of this, thin partings of coarse sand with small pebbles emphasised the current bedding of this 50 foot Terrace-material, especially where sweeping against Chalk-beds recalled the banking of Crayford brick-earths against the old river-cliff as seen at C. H. Norris' pit, North End, Erith.

Gravels at the Orange Tree pit, Wilmington, and Joyce Green pits, Dartford, with re-cemented Chalk rubble at the Dartford Cement Works cutting, will also afford useful comparisons with the sections along the Stone Court mineral line.

Such a "wash-out" in Chalk-beds, however, sharply defined originally, could not retain the clean-cut features of those through coal-seams. The open joints and porous nature of the marginal Chalk-beds would promote free circulation of water, cumulative solution, and reduction at all points around each individual chalk-block, producing a rubble of chalk-fragments embedded in a chalk-paste, the constituents becoming smaller as distance from the unaltered beds increased. The nodular flints would lose none of their irregularity, but would only become disarranged and tumbled during the general foundering of the Chalk-strata affected.

In consequence we have (1) 50 foot Terrace-material filling a wash-out, bounded east and west by (2) an indefinite width of fragmentary chalk-rubble, still accumulating from (3) unaltered Chalk beyond.

The walk across Stone Marshes (Thames Alluvium), through cement factories, and along the Thames Wall introduced members to an area which at present is well worthy of attention. Pile-

*See R. H. Chandler's Appendix to the Report of the 1914 Excursion. Samples of the Thanet Sand from this pit have been elutriated by H. A. Baker, M.Sc., F.G.S.

driving through the alluvium about the site of the Kent Cement Company's works should furnish useful information.

After tea at the Avenue Tea Rooms, Greenhithe, the President thanked the Director on behalf of the members for a varied and interesting excursion. He repeated his appeal that all igneous specimens found in the 100 foot Terrace Gravels should be reported, as they seemed likely to have a highly important bearing on the question of the relation between the Terrace- and glacial-beds.

The party left Greenhithe by the 7.2. p.m. train.

Mr. F. J. Epps acted as Excursion Secretary.

NOTE ON DENSE IRONSTONES (d, p. 195) BY L. DUDLEY STAMP,
M.Sc., F.G.S.

Mr. Priest has kindly furnished me with a specimen for investigation of the curious ferruginous rock mentioned in the foregoing report.

The rock consists of dark brown flinty portions, from one millimetre to several centimetres in diameter, imperfectly distinguishable from a lighter brown, softer and more powdery matrix. The numerous cracks in the rock are largely filled with crystalline silica, the position of which at once suggests its secondary origin.

The examination of thin slices under the microscope has demonstrated the presence of numerous clastic grains of quartz, somewhat angular and irregularly arranged in a dark brown, almost opaque matrix, which is practically indistinguishable from limonite. There are very numerous cracks and cavities filled with chalcedonic silica, which appears also to pass into the limonitic matrix and is clearly secondary.

The rock is evidently a limonitic concretion (from a sandy bed) which has been irregularly silicified. Although such silicification is common, it is so sporadic that it is quite impossible to assume the derivation of these blocks from any definite horizon.

REFERENCES.

- Ordnance Survey Map, 6in., Kent, Sheet 9, N.E.
 Geological Survey, Special Map of the London District, Sheet 4.
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