THE CHALK AREA OF NORTH-EAST SURREY.

By GEORGE WILLIAM YOUNG.

(*Read June 2nd, 1905.*)

ALTHOUGH one might consider that the last word had not been said about the Chalk formation as a whole, yet it might be fairly thought that if there was an area in the country which had been thoroughly explored and its structure accurately recorded, that area would be the Chalk of North-East Surrey.

But notwithstanding its nearness to London, the number of observers who have given their attention, and the frequency with which some of the best-known sections have been visited by this and other scientific societies, I venture to think that the facts I am about to lay before you will show that even in this area there is still work to be done.

When the first of the valuable series of papers on the White Chalk by Dr. Rowe appeared in our PROCEEDINGS my interest was aroused, and I looked forward with considerable anticipation to the publication of the last Volume of the Geological Survey Memoir on the Cretaceous formation, which was to deal with the Upper Chalk. With this volume I must confess I was somewhat disappointed. I fully admit that in many respects it is an admirable work. The labour entailed in its compilation must have been enormous. The wide area with which it deals; the valuable and detailed account of the microscopic structure of Chalk; the useful information and statistics it gives about the economic products and water supply; the exhaustive list of fossils and the bibliography given in the appendices; all testify to the great pains that have been bestowed upon it.

Yet when one turns to the chapter upon Surrey one cannot fail to be struck with the brevity of the description. This is fully admitted by Mr. Jukes-Browne himself, for he opens the chapter with the following paragraph: "No systematic exploration of the Upper Chalk of Surrey has yet been made, notwithstanding its proximity to the Metropolis, and the frequency of exposures in quarries and railway cuttings." He then refers to the well-known papers of Mr. Caleb Evans and Mr. Dibley, both valuable contributions, the former especially so, as Mr. Evans had the opportunity of examining a nearly complete section of the beds to which access is now impossible. It also shows that he, though writing in 1870, before Prof. Barrois had published his classic work, had fully grasped the importance of the zonal system of classification.

Soon after the publication of this memoir the discovery of *Marsupites testudinarius* in this area led me to a more careful examination of the district, and eventually to attempt a thorough and systematic zonal exploration so far as the limited time at my disposal would allow.

Taking the Ordnance Survey Map of 6 ins. to the mile as a basis, I noted every quarry and chalk pit marked, giving each a distinctive number. In this small area of about 100 sq. miles there are no less than 235 pits, of which I have visited 179 up to the present time. Many of these, of course, are no longer in use, some are completely overgrown with either turf or brushwood, while in others large trees, including such slow growers as the yew, show how long they have been abandoned. In 93 instances, however, I have found sufficient exposure and sufficient fossils to enable one to refer the chalk in the pits with considerable confidence to its proper zone.

The distribution of the pits is peculiar and of great interest. They are not scattered at random, but are much more numerous in certain localities, while in other large areas scarcely a pit can be found. They tend to occur in linear series which often coincide with contours of altitude, in some cases remarkably so; for instance, on the two adjacent sheets of Chipstead and Coulsdon there are 48 pits, 35 of which are within 20 ft. of the 500-ft. contour line.

Now a few words as to the mass of the Chalk before we consider the pits in detail. The area I have taken extends from Addington to Oxted on the East, to the gorge of the River Mole on the West. It is of course bounded by the Tertiary beds on the North and the Upper Greensand on the South.

The outcrop is about 7 miles wide on the East but rather less than 4 miles on the West.

We have here to do with the Northern limb of the Wealden anticline, but the dip is extremely low in the broader part of the area. For instance, the base of the Chalk at the Streatham boring is 819 ft. below O.D., while at White Hill, 11 miles south, it is 470 ft. above, a rise of 1,289 ft. in the 11 miles, which works out at an average dip of less than $1\frac{1}{3}$ deg., or 117 ft. per mile. The slope, however, varies in degree. Most of the diagrammatic sections of the London Basin give a very exaggerated idea of the dip. This is unfortunate, but, I am afraid, unavoidable, as in any ordinary sized text-book diagram the dip would not be appreciable if drawn to a true scale.

The slopes are—

		O.D.	Distance, Miles.	
Top of Chalk at	Stockwell	− 174	—	
Ditto	Streatham	− 196	3 =	fall of 7′ per mile.
Ditto	Waddon	+ 26	$3\frac{1}{2}$ =	rise of $63\frac{1}{2}$′ do.
Surface of ground,	Russell Hill	+ 342	2 =	„ 158′ do.
Ditto	White Hill	+ 762	$5\frac{1}{2}$ =	„ 77′ do.

The heights are, of course, measured from Ordnance Datum. It seems obvious that no other datum line should be used, but diagrams are occasionally met with in which the *surface* appears as a horizontal line and the depths are measured from that, producing extraordinary apparent flexures of the

strata under London. Nothing could be more misleading than such a method.

This disturbance of the beds, slight as it is, has resulted in the production of a number of small faults, running E. and W., as well as N. and S. Slickensides are numerous, showing in some cases vertical and in others horizontal shifting. This was pointed out by Evans, who found several instances of reversed dip in his line of section. That numerous faults occur under London is well known, inequalities of the top of the Chalk having been proved by many borings.

The thickness of the Chalk south of London seems a debateable matter. Mr. Jukes-Browne, in "The Building of the British Isles," p. 291, says "A consideration of the variations in the thickness of the Chalk, as proved by deep borings in the London Basin, shows that the Chalk is thinnest beneath or near London, and that it thickens *in every direction* from that centre."

With this Prof. Barrois seems to agree, but I venture to think in this respect both these eminent geologists are wrong, and that there is a distinct local thinning due S. of London. Mr. Jukes-Browne bases his conclusion on the fact that at various places around London well-borings have proved the Chalk to be thicker than under London itself, but he gives no boring on the South between East Horsley and Chatham, where it is 817 ft. and 682 ft. thick respectively, but these places are 45 miles apart. The average thickness under London is 650 ft., whereas on the South, at Streatham, it is but 623 ft., while at Caterham Waterworks it is only 369 ft. at the most, probably only 349 ft., as there is some doubt about the position of the base. These are the only two borings which go through the Chalk from top to bottom. Then again, as one goes south, the various Tertiary outliers and also the Clay-with-flints are found to lie on lower and lower zones of Chalk. For instance, at Warlingham (Tithe pit) the underlying Chalk is that of the zone of *Micraster cor-anguinum*, at Worms Heath that of *M. cor-testudinarium*, and at Willey Heath, a little north of the above-mentioned Caterham boring, that of *Holaster planus*. This goes to prove that a slight 'Wealden' anticline existed in Tertiary times from which a spur ran out northwards towards London, and that the main E. and W. movement took place later, when the Tertiary beds were affected as well.

Mr. Evans estimated the thickness at 515 ft., but this does not include the mile between the Tertiary border and his cutting No. 1. Allowing a proportionate amount, 80 ft., for that, it gives us a thickness at Croydon of 595 ft., which is about what we might expect on my theory.*

* Since the reading of the paper Mr. Whitaker has very kindly furnished me with the details of the new boring of East Surrey Waterworks at Purley. Here the Chalk is shown to be about 462 ft. thick. Adding 122 ft., the difference O.D. between top of Chalk in boring (213 ft.) and Russell Hill (342 ft.) close by, we get 584 ft. for the full thickness, another proof of the local thinning, while the discovery of Marsupites at Russell Hill proves that here the Chalk has suffered little, if any, post-Tertiary denudation.

It is usually considered that on the southern part of the area the Upper Chalk has been entirely removed, but I believe it covers the whole area (except where cut through by the valleys) and that the zone of *Holaster planus* forms the crest of the escarpment. If we take Mr. Evans's estimate of the thickness of the Lower Chalk at 190 ft. and the Middle Chalk at 75 ft. (and his figures have been generally accepted), together they amount to only 265 ft. and there is usually plenty of room for this everywhere along the escarpment. The fossils also bear out this view, for wherever we have found a pit at a high elevation it has proved to be not lower than *Holaster planus*-zone.

From the crest of the escarpment, which is usually over 700 ft. O.D., a tableland slopes gently down in a northerly direction, and is largely covered by clay-with-flints. This slope is cut into by a number of deeply incised valleys having the same general northerly course, that at first sight appear to be the result of ordinary stream-erosion. These valleys, however, are quite waterless, which fact, together with the steepness of their sides, has attracted much attention, and the matter is discussed at some length in the "Mem. Geol. Surv. Cretac. Rocks," vol. iii, p. 418 *et seq.* In their formation Mr. Jukes-Browne attributes considerable importance to the protection afforded by "clay-covers," but agrees (p. 424) with Mr. Clement Reid* that "Among the final stages of erosion the frozen condition of the ground during a part of the Glacial Period, and the consequent frequency of floods, as described by Mr. Reid, was no doubt largely contributive to the deep excavation of the terminal valleys in the Chalk districts."

To this theory the following objections may be urged :—

(1.) Granting that the ground may have been frozen and therefore impervious, and that the thaw in spring was sudden, it seems hardly likely that the gathering ground to the south was of sufficient extent to afford streams of the necessary power, because it must be remembered that most of these deep valleys are not cut back to the escarpment, so they have evidently not been beheaded by its recession, and therefore they can never have been longer than at present. The Devil's Dyke, near Brighton, which Mr. Reid attributes to this cause, is an "obsequent" valley trenching the escarpment only, and therefore its gathering ground must have been very small indeed.

(2) If they were due to that cause alone, sufficient time has elapsed since the passing away of Glacial conditions for the removal of such prominent features, considering that Chalk is so soft a rock.

(3) Dry and steep-sided valleys, (and even underground streams) are found in many limestone districts owing to the easy

* *Quart. Journ. Geol. Soc.*, vol. xliii, p. 364.

solubility of the limestone and the frequency of joints and fissures. The carboniferous limestone affords numerous examples.

(4) The theory supposes such valleys to be entirely post-glacial, but some chalk valleys are probably much older, *e.g.*, the remarkable V-shaped valley in the chalk near Portrush, in Antrim, which is filled with Tertiary basalt, and therefore undoubtedly pre-glacial.

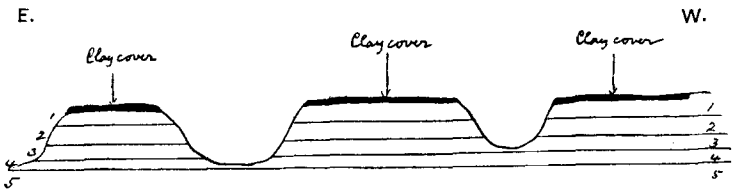
My own view is that these dry valleys are not valleys of corrasion at all, but are due to the simple dissolution of the chalk by surface water, the intervening ridges owing their existence to the protection of a clay capping. Without discussing the origin of the clay-with-flints and brick-earth, about which authorities differ, let us imagine a gently sloping tableland of chalk covered with an impervious clay. The course of the streams would be determined by inequalities of the ground and would have a general parallel direction. The channels would be then gradually deepened until the chalk was reached, when the water would begin to be absorbed by that porous rock. As the area of bare chalk increased, more and more water would be absorbed until a time came when all the water would disappear and the valley would become a dry one, except in very wet seasons. Such temporary streams are called "bournes," or in some districts "nail-bournes" or "winter bournes." The Caterham Valley furnished a notable instance of this in the early part of 1904.

Rain would continue to be shed off the impervious clay surface, but on reaching its margin would immediately sink into the chalk. How large a quantity of water is absorbed is shown by Mr. Baldwin Latham, who found that 11·18 in. passed through his percolation gauge at Croydon out of a total rainfall of 26 in. Rain-water, moreover, is a powerful solvent of chalk, the average temporary hardness being about 14 grains per gallon. The effect would be to remove large quantities of chalk in solution, resulting in a lowering of the surface, and so gradually a valley would be eaten out flanked by ridges protected with clay. These remaining at the original elevation of the whole surface serve as a measure of the amount of excavation. All these flanking ridges have this clay capping, which crops out at a similar elevation on each side of the valley. The difference of absorptive power of the two formations is most remarkable. In March of this year we traversed the clay-capped ridge between Coulsdon and Kenley, on which Welcomes Farm stands, and could hardly get across the fields for standing water. Directly we reached the chalk at the brow of the ridge the wet soil ceased, and the bottom of the valley was "as dry as a bone." As might be expected on this theory, the floor of these valleys is thickly covered with unrolled flints, among which many fossils can be found, and in places, as at Smitham Bottom, for instance, thick masses occur of what my friend Mr. F. J. Bennett calls "vertical" or "residual"

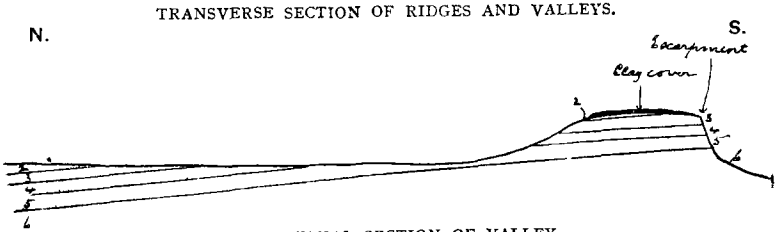
drift, consisting of "pellety" chalk, composed of small rounded grains of pure soft chalk, the evident result of this mode of weathering.

These clay-capped ridges also account for our finding so many chalk pits in linear contoured series as already mentioned, for in a great number of cases the pits lie at the brow of the ridge just below the clay-with-flints. In the list (p. 200) such pits are distinguished by an asterisk; they number 109. Most of these small pits have been opened by farmers to obtain chalk for marling the land ("Mem. Geol. Survey Cret.," vol. iii, p. 391), and as all the land requiring this treatment lies on high ground this position would naturally be the most convenient, the cost of transit being reduced to a minimum.

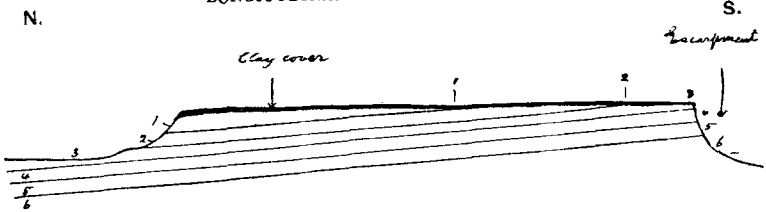
A study of the 1-in. Geological Map will show how intimately the area of the clay-with-flints is connected with the valley system, and the following sections further assist in explaining the connection:—



TRANSVERSE SECTION OF RIDGES AND VALLEYS.



LONGITUDINAL SECTION OF VALLEY.



LONGITUDINAL SECTION OF DIVIDING RIDGE.

1. Zone of *Micraster cor-anguinum.*
2. Zone of *Micraster cor-testudinarium.*
3. Zone of *Holaster planus.*
4. Zone of *Terebratulina gracilis.*
5. Zone of *Rhynchonella cuvieri.*
6. Grey Chalk.

It is most unfortunate that the Government continues to issue these maps on the *old* 1-inch Survey, which is now nearly a century old and quite out of date in many of its details, while the absence of contour-lines is a great drawback.

Another great hindrance in the path of the field worker is due to the chaotic condition of the nomenclature of the fossils. One would have thought that the natural difficulties of the subject were sufficient without the raising of artificial ones, and I was very glad to hear the severe remarks made on this subject by Dr. Smith Woodward in his Presidential Address of this year.

I am sure this confusion is doing harm to the science, not only by discouraging beginners, but by adding to the difficulties of those who have got beyond that stage; and I hope that the authorities will soon come to some agreement on the subject. I adopt the names used by Dr. Rowe in his Papers so as to ensure uniformity.

OUTCROP OF ZONES.

The Grey Chalk.

Zones of Holaster subglobosus and Actinocamax plenus.

These Zones are to be met with only in pits in the face of the escarpment of the North Downs. The quarries are numerous, and many of them are very large and well known, and of considerable commercial value, but I have not given them much attention because they are described with considerable detail in Vol. ii of the "Geol. Surv. Mem. Cret. Rocks."

The chalk is massive and clayey, yellow when dry, but distinctly grey and very sticky when wet, and the surface often becomes very dark on weathering. There are no flints, but nodules of Marcasite are very common.

The principal pits are Brockham (No. 212), Betchworth (No. 213), Reigate (No. 223), Merstham (No. 158), and Oxted (No. 153).

Zone of Rhynchonella cuvieri.

This occurs above the Grey Chalk all along the escarpment, and all the above-mentioned pits show it in their upper parts. Its occurrence N. of the escarpment at Public Hall pit, Caterham (No. 139) and possibly at Whyteleafe (No. 119) suggests that some of the dry coombes are cut down sufficiently deep as to expose it, but there are no pits exactly in the position to prove it. It is a hard, white, gritty chalk, somewhat lumpy, and weathers into small flaky pieces, so that it can be readily distinguished from the beds below. It contains very few flints.

Zone of Terebratulina gracilis.

This Zone is not always easy to separate from the one below, either lithologically or zoologically. It occurs in the highest parts of the large pits of the escarpment and forms the floor of the upper parts of most of the dry coombes. The chalk is not quite so hard or gritty and somewhat more marly than that of the preceding zone. Flints occur but are not plentiful. There are not many sections of this zone in Surrey, the best being Slines Oak (No. 127), Whyteleafe (No 119), Rose and Crown (No. 113), and Boxhurst (No. 209).

Zone of Holaster planus.

I have already said that I believe the crest of the North Downs is formed by this zone. Taking the pits from West to East we have Boxhurst pit (No. 209), 585 O.D., in the face of the scarp and 50 feet below its crest; at Hill-top pit (No 165), 720 O.D. at the very brow, we did not find the typical zone fossils, but the large size of the Terebratulæ found is suggestive of this zone; Willey Heath pit (No. 168), 650 O.D., half a mile north of the crest which is here (at Willey Farm), 730 O.D., affords an unmistakable fauna (see p. 215), and, lastly, Tillingdown pit (No. 140), one mile north of the crest, is at 600 O.D., being near to, and 100 feet above, the Public Hall pit in the *R. cuvieri*-zone. In all these cases there is sufficient height above the base of the chalk to allow of its occurrence, while it is even quite probable that the highest points of the Downs are patches of the zone of *Micraster cor-testudinarium*.

This and the two succeeding zones are exposed either at the bottom or on the flanks of all the valleys, where their position is determined by the distance from the escarpment and the relative height of the outcrop above sea-level.

At this horizon there is often a pronounced terrace which is possibly formed by the outcrop of the "chalk-rock," *e.g.*, below Chipstead cutting (No. 84), and between Waddington pit (No. 107) in *M. cor-testudinarium*-zone and In Wood Pit (No. 104) in *T. gracilis*-zone. The chalk is hard with numerous scattered flints, a large proportion of which are spongiform.

At the four pits first mentioned and also at Greathill Shaw (No. 128) it is covered directly by clay-with-flints.

Zone of M. cor-testudinarium.

This zone is almost entirely confined to the higher parts of the flanks of the valleys, and therefore its outcrop is a long narrow sinuous band following their slopes and outlines. In many places it reaches to the crest of the intervening ridges, and is then overlain directly by the clay-with-flints. The chalk is rather

yellow in colour, hard and somewhat gritty, with numerous flints, mostly scattered, and often spongiform. Fossils are plentiful, especially *Spondylus spinosus*, *Echinocorys vulgaris* var. *gibbus*, and *Micraster præcursor*, the varieties of which present a series of almost bewildering gradations in elaboration of ornament. Number of Sections 15. The most interesting pits are Stoats Nest (No. 95), Purley Station (No. 30), Chipstead cutting (No. 84), Woottonga (No. 122A), and Tithe Pit (No. 118).

Zone of Micraster cor-anguinum.

This has a broader outcrop than any other zone, occurring over most of the northern part of the area, and is apparently of considerable thickness. Where it forms the crest of the ridges it is usually covered by clay-with-flints, but for the most part it is bare except for a thin covering of soil and turf. The chalk is very white, soft, and absorbent, and breaks with a peculiar conchoidal fracture. Flints are very abundant, mostly in regular courses, generally nodular but with occasional thick tabular layers. Fossils are not so plentiful as in the zone below, and sometimes are very scarce. The most interesting pits are Sutton (No. 5), Haling (No. 29), Bishop's Pit (No. 58), and Addington Lodge (No. 23). Total number of Sections 40.

Zone of Marsupites testudinarius.

It has hitherto been considered that this zone is entirely absent in Surrey, no specimens of this fossil ever having been recorded from the county. In 1876 Prof. Barrois, judging principally by the lithological characters of the chalk, thought it might be present at Guildford. Dr. Hinde,* judging from the large size of the *Porosphæra globularis* he found at South Croydon, concluded, by a very sound piece of reasoning, that it had not long been removed by denudation. Mr. Jukes-Browne,† while suggesting that it might possibly be present in the western part of the county, records his opinion that it had most probably been denuded before the deposition of the Tertiaries. This emphasises the importance of the following:

DISCOVERY OF MARSUPITES IN SURREY.

On May 15th, 1904, soon after the publication of the *Survey Memoir*, two members of the Battersea Field Club, Messrs. Wright and Polkinghorne, were cycling up Russell Hill, near Purley, and, as often happens when going uphill, they got separated. Mr. Wright dismounted, and began to examine the chalk thrown out of a sewer-trench which was being made at

* *Journ. Roy. Micro. Soc.*, 1904, p. 1.
† *Mem. Geol. Survey Cret. Rocks*, vol. iii, p. 179, *et seq.*

that time. In a few moments he was surprised to find a *Marsupites*-plate. Further search resulted in the finding of more plates by both of them, Mr. Polkinghorne having by that time come up and joined in the search. They acquainted Mr. Dibley of their discovery, and he subsequently visited the spot with them and further plates were found, which were exhibited at the meeting of this Association on June 2nd, 1904. Then Dr. Hinde, hearing of this, and living in the neighbourhood, took up the search with great zest, and the result was a masterly paper by him which appeared in the *Geol. Mag.* for October, 1904. It is noteworthy that Mr. Wright had, as far back as 1901, found a plate of *Marsupites* in flint, but that being from surface soil, no importance was attached to it at the time. This discovery of *Marsupites* completely revolutionised our ideas of the Upper Beds in Surrey, because if the zone was present at Russell Hill, which is $1\frac{1}{2}$ miles from the Tertiary outcrop, and only 340 ft. above O.D., why should it not occur elsewhere? It was obvious that the pits near the Tertiaries should be carefully searched, and thus I came to compile my list of chalk pits and begin a systematic search. In this work I have had the advantage of the help of Mr. W. Wright and Mr. Walter Johnson, two men who, as the joint authors of "Neolithic Man in North-East Surrey," obtained an accurate topographical knowledge of the district whilst engaged on that work, and without whose encouragement both in the field and in the study this paper would not have been written.

This search was highly successful, for we have proved the presence of the *Marsupites*-zone at no less than twenty-two places, extending from Addington to Headley, a distance of 14 miles, and I fully believe that it was once an entirely continuous sheet over the whole northern part of the district. Going round the Tertiary border, the only place we have not been able to find it is between Carshalton and Sutton, but in this locality there are no pits in a favourable position, and the configuration of the ground is against its preservation. The *Marsupites* Chalk is soft and seems easily weathered, and as I do not suggest any great thickness for it, it is obvious that it may have been denuded in some places subsequently to the removal of the overlying Tertiaries. In most places where the Tertiary Beds form an escarpment with a pit close to the outcrop, there we have found proofs of its presence. For instance, at Beddington, where the Thanet Sand forms a tongue-shaped hill, The Dell pit (No. 11A) yields *Uintacrinus*, while in the pit (No. 50) at the tip of the similar ridge at Howell Hill, near Ewell, we found both *Marsupites* and *Uintacrinus* plates. Two other pits on the western flank of the same hill (Nos. 45 and 50) both yielded *Uintacrinus* plates.

The finding of *Marsupites* zone at a distance from the Tertiary border depends upon two things: 1st, the slope of the

surface, which, when it exceeds the angle of dip, may bring it in, in the form of outliers, probably in places from which the Tertiaries have not been very long removed; and 2nd, the presence of small faults, of which there are numerous indications.

The Chalk of this zone is very white and quite soft with very few flints. That of the *Uintacrinus* band has the same lenticular horizontal jointing which gives it the almost false-bedded appearance so noticeable in the Margate cliffs, while the beds of the *Marsupites* band are more evenly and more thickly bedded. Fossils are fairly plentiful and easily cleaned. Not only are the name-fossils found, but also the other species characteristic of this zone elsewhere. *Antinocamax verus* and *A. granulatus*, *Micraster cor-anguinum*, var. *rostratus*, the nipple-shaped head of *Bourgueticrinus*, while the two shape-variations of *Echinocorys* can be absolutely matched with those from Margate. The most interesting sections are Coombe Farm (No. 12), Ballards (No. 13), Great Woodcote (No. 26), Banstead Station Cutting (Nos. 38 and 39), Medical College (No. 49), Clay Lane, Headley (No. 189).

FOSSILS.

Many of the smaller pits are in bad condition for collecting from, being frequently partly filled with rubbish and the chalk covered with rain-wash, Protococcus, and mosses. In such cases specimens were, naturally, few. Every fossil recorded was found and its position noted by one or other of us. This is of the greatest importance in all zonal work, as a large pit may easily range into two or more zones. A list of the fossils found in certain representative pits is given on p. 215.

The next point of interest is the value of zonal collecting. When Dr. Rowe heard of the discovery of *Marsupites* he said "Search for *Uintacrinus*, if you have *Marsupites* you ought to find the *Uintacrinus* band below it." Out of the twenty-two exposures of this zone nineteen have afforded *Uintacrinus* and seven have yielded *Marsupites* as well, showing that we are at the junction of the two bands.

Uintacrinus is a splendid fossil for zoning purposes, especially in chalk pits. Although the test is easily broken, so easily that I despair of ever finding a specimen even remotely approaching completeness, yet each fragment of a plate can be easily recognised by the V-shaped notches on the inner surface. In pits which are small, dirty, or badly weathered, this is often one's only reliable guide. It is seldom to be found on the surface, but a few minutes' work breaking up the Chalk into fragments will generally reveal it if we are in the zone.

Following Dr. Rowe's example, I have not definitely zoned a pit on the evidence of the ossicles alone but always on the plates of the test.

One may fairly ask why *Marsupites* has not been found before if the zone has so large an exposure as I claim for it. The reasons are, I believe, firstly, that most of the work done in Surrey has been confined to the escarpment and only one cross line of section—the Caterham Valley. Mr. C. Evans, Mr. Dibley, and the Survey all deal with that district. The only other sections described in the *Memoir* are those at Stoats Nest (Coulsdon) and the Chipstead Cuttings, and even those are not far away. Secondly, search has been mostly confined to large quarries and lime-works, which for convenience of transport are naturally placed in the valleys, and therefore in the most unlikely position to find the higher beds.

As to the possibility of its occurrence west of the Mole, I hope to work that district in a similar way in the near future. As the zone occurs so near that valley as Ashtead and Headley there is a strong probability of its presence still farther west.

I have now to tender my hearty thanks to the following other gentlemen for their kind help in the preparation of this paper: to Messrs. E. T. Newton and H. A. Allen, of the Museum of Practical Geology, who have named some of the fossils; to Mr. W. D. Lang, of the British Museum (Natural History), who has carefully identified many of the Cyclostomatous Bryozoa; and above all to Dr. A. W. Rowe, who has named and zoned many of the specimens, whose advice and encouragement have been invaluable, and whose papers on the coast sections have stimulated me to essay this paper, which is an attempt to carry on inland the work that he has done so well on the coast.

A LIST OF CHALK PITS IN NORTH-EAST SURREY.

The heights are estimated from the nearest figures marked on 6-in. Map. The pits marked * are situated high up on the flanks of the valleys and just under the Clay-with-flints. In Marsupites zone, M. denotes Marsupites band; U. denotes Uintacrinus band.

No.	Height above O. D.	DESCRIPTION.	Grey Chalk. A	R. c. zone. B	T. g. zone. C	H. p. zone. D	M. c-t. zone. E	M. c-a. zone. F	M. zone. U.M.
		SHEET 13 S.E. (6-INCH)—CHEAM TO CARSHALTON.							
1	170	At Lower Cheam, adjoining cricket ground, disused, totally overgrown with large trees.	...	...	...	...	...	...	...
2	160	300 yards W. of No. 1, enclosed, disused, and overgrown (100 yards N. there is a "bourne-hole" in Love Lane)	...	...	...	...	...	...	...
3	170	Side of road entering Cheam, private, overgrown	...	...	...	...	...	...	...
4	190	Outside Cheam Station, overgrown, shallow	...	...	...	...	...	...	...
5	190	Near Sutton Station, on road to Carshalton. Very fine old and deep pit, but little worked now, recently bought by Sutton Water Co. Said to be the pit from which came the lime used in building St. Paul's Cathedral (see "Victoria History of Surrey"). Chalk white, hard, and chippy. Many bands of flint in regular courses, mostly nodular, also two strong tabulars. Cortex of flints, thick and rough, simulating fossils. At S.W. corner a diagonal tabular is seen cutting a vertical joint which it displaces about 3 ft.	...	...	...	...	...	F.	...
6	180	150 yards N. of bridge over railway crossing Carshalton Road. Small and completely overgrown	...	...	...	...	...	...	...
7	187	At above-mentioned crossing, about 12 ft. deep, fossils few, a thick (4-in.) tabular flint-band	...	...	...	...	...	F.	...
8	170–190	At Park Hill Cottage, Carshalton, a large pit now used as a garden, massive well-bedded chalk with many layers of nodular flints in regular courses, and one well-marked tabular. Chalk well-weathered but fossils scarce	...	...	...	...	...	F.	...
8a	220	Sewer cutting, near railway, quarter mile E.S.E. of No. 8, S. of Carshalton Park ...	...	...	...	...	...	F.	U.

		SHEET 14 S.W.—CROYDON DISTRICT.											
9	180	S. of Duppas Hill, shallow, completely overgrown	...	...	...	...	...	...	...
10	220	In Coombe Lane, corner of Park Hill Road, close to water-tower. A large old pit, very small portion now accessible. Shows junction with Thanet Sand with typical "Bull head" bed of flints, 3 ft. below which is a very thick tabular layer	...	...	...	...	...	...	U.
11	300	Croham Lane Pit. Large pit, disused for fifteen years. Just under Tertiaries, chalk blocky, with many flints, in layers and scattered. Fossils few	...	...	...	...	...	F.	...
11A	120	The Dell, Beddington, very old, disused, not far from Tertiaries, badly weathered ...	...	...	...	...	...	...	U.
11B	225	Selsdon Road Station Pit, small, not marked on 6-in. Map. Chalk very white, but iron-stained, flints in courses, fossils few	...	...	...	...	...	F.	...
		SHEET 14 S.E.—ADDINGTON DISTRICT.											
12	291	Coombe Farm Pit, Shirley. Is in the narrow tongue of chalk (300 yards wi 'e) running E.N.E. between the Tertiaries of Addington Hills and the main mass. Chalk thickly bedded with many scattered flints	...	...	...	...	...	F.	U.
13	360	Ballard's Pit. South side of Addington Hills. Massive chalk with few flints	...	...	...	...	...	...	U.M.
14	350	At bottom of Addington Hill, overgrown	...	...	...	...	...	...	...
15	340	In Addington Park, not visited	...	...	...	...	...	...	...
16	290	At Addington Vicarage, full of trees, overgrown	...	...	...	...	...	...	...
17	329	Still's Pit, between Addington and Castle Hill Farm, half mile from Tertiaries, very small, disused	...	...	...	...	...	...	U.
18	237	At Kent Gate, a gravel pit, disused	...	...	...	...	...	...	...
19	290	Fox Hill Pit (in Kent), very massive beds with strong flint bands, fossils scarce ...	...	...	...	...	...	F.	...
		SHEET 20 N.E.—FARLEY DISTRICT.											
20	500	*Selsdon Park Pit. An old pit, hidden away in a wood, moss-grown, chalk massive ...	...	...	...	...	...	...	M.
20A	480	*Borough Farm Pit, Sanderstead, small pit not marked on 6-in. Map, much iron-staining	...	...	...	...	...	F.	...
21	480	*E. of Selsdon Park, overgrown with yew trees	...	...	...	...	...	...	...
21a	500	*W. of Moorcroft, Farley Green	...	...	...	...	...	...	...
22	500	*At Haggler's Dean	...	...	...	...	...	...	...
23	480	*Addington Lodge Pit, three-quarter mile S. of, and 150 ft. higher than No. 17, with more massive chalk and distinct bands of flints. As these bands are apparently horizontal there is possibly a fault between the two pits. Several large pipes ...	...	...	...	...	..	F.	...

No.	Height above O. D.	DESCRIPTION.	Grey Chalk. A	R. c. zone. B	T. g. zone. C	H. p. zone. D	M. c-t. zone. E	M. c-a. zone. F	M. zone. U.M.
24	500	*At "Lime Kiln," Farley Dean. Large old shallow pit, now a rabbit warren	...	...	...	...	...	...	...
25	500	*E. of Three-corner Grove	...	...	...	...	...	...	...
		SHEET NO. 20 N.W.—PURLEY DISTRICT.							
26	330	At Great Woodcote. Very interesting pit, nearly circular. A fault running N. and S. divides the pit into two nearly equal parts. We found *Marsupites* on the E. and *Uintacrinus* on the W. side of the fault	...	...	...	...	...	...	U.M.
27	360	Half mile S.E. of above, entirely built around, inaccessible...	...	...	...	...	...	...	...
28	330	Near Russell Hill. The sewer cutting where *Marsupites* was first found (see p. 196 also Dr. Hinde, *Geol. Mag.*, Oct., 1904). The lower part towards Beddington probably cuts down into the *M. cor-anguinum* zone. For fossils see p. 215	...	...	...	...	..	F.	U.M.
29	200 base	Haling Pit, Croydon. A large pit where Godwin-Austen's granite boulder was found. Chalk in regular courses, fossils not plentiful, but often well preserved	...	...	...	...	?	F.	...
30	270 base	Purley Station Pit, very large with several pipes. Chalk hard, fossils most numerous at North end. Found a *Micraster* of *H. planus*-zone type	...	...	...	?	E.	...	...
31	426	Purley Downs Golf-links Pit, very small, fossils few	...	...	...	...	...	F.	...
32	350	On Riddlesdown, now being filled up	...	...	...	...	...	...	...
33	273	At Riddlesdown Tea-gardens, very old, rubbly and dirty	...	...	...	...	...	...	...
34	290	N. of Kenley Station, very rubbly	...	...	...	...	...	...	...
		SHEET 19 N.E.—BANSTEAD DOWNS.							
35	340	600 yards W.S.W. of Sutton reservoir on Brighton Road, now used as a golf green ...	...	...	...	...	...	...	...
36	300	Belmont Station pit, now disused, partly built over, flints numerous	...	...	...	...	...	F.	..
37	400?	Banstead Railway Cutting, No. 1, portion E. of Reigate Road, runs N. and S. on a curve. A strong flint tabular rises from the base close to bridge and runs out at top of cutting farther N.	...	...	...	...	...	F.	...

38	400 base	Banstead Railway Cutting, No. 2, portion between Reigate Road and Banstead Station. In lower part flint layers numerous, some strong smooth-faced joints, much iron-stained. *Uintacrinus*-band at top. Line is being widened here. For fossils see p. 215	...	...	...	...	...	F.	U.
39	400?	Banstead Railway Cutting, No. 3, between Banstead Station and Schools	...	...	...	...	...	?	U.
40	420	Opposite Hundred Acres Asylum, now filled up	...	...	...	...	...	...	...
41	440	Fairlawn Pit, near Croydon Lane, considerably overgrown	...	...	...	...	...	...	U.
41*a*	...	Not marked on 6-in. Map, at Sheep Farm, S. of 41, very small	...	...	...	...	...	?	...
42	400	In field 400 yards W. of Oaks Corner, shallow, overgrown	...	...	...	...	...	...	...
43	330	At Little Woodcote, shallow but well weathered lenticular chalk, flints few. *Uintacrinus* plentiful	...	...	...	...	...	...	U.
43*a*	240	Sewer cutting at Wellfield	...	...	...	...	...	F.	...
44	430	Big Wood Pit, Woodcote Grove. Chalk white, with a strong flint nodular band, fused in places into a tabular. Fossils scarce	...	...	...	...	...	F.	...
44*a*	450	At Woodcote Grove, chalk similar to No. 43, but much moss-grown	...	...	...	...	...	...	?
		SHEET 19 N.W.—EPSOM AND EWELL.							
45	160	Nonsuch House Pit, Ewell. Very small but clean pit, close to Tertiaries. Very few flints, horizontal slickensides	...	...	...	...	...	...	U.
46	210	In Epsom Recreation Ground, small and turf-grown	...	...	...	...	...	...	...
47	200	Near Pit Place, Epsom, overgrown, full of trees	...	...	...	...	...	...	...
48	230	Near Pit Place, Epsom, overgrown with turf	...	...	...	...	...	...	...
49	280–330	Medical College Pit. A large pit, chalk of upper part (about 30 ft.) is soft with fauna characteristic of *Uintacrinus*-band, the lower part is harder and belongs to zone of *M. cor-anguinum*. Between them is a peculiar iron-stained clayey layer, probably washed in from surface. About 6 ft. below this is a regular layer of large flints. There is a smaller excavation in the floor of the pit which contains many *Echinoconus* and an *Echinocorys* of *M. cor-anguinum*-type. For fossils see p. 215	...	...	...	...	...	F.	U.
50	210	At S. end of Tertiary tongue at Howell Hill. A small, very old pit, much overgrown and full of elder trees. Small exposures at top of talus show soft chalk with *Marsupites* and *Uintacrinus*	...	...	...	...	...	...	U.M.
51	210	Priest Hill Pit, quarter mile S. of No. 50. A small pit, but fairly clean. Junction of M. and U. bands	...	...	...	...	...	...	U.M.

No.	Height above O. D.	DESCRIPTION.	Grey Chalk. A	R. c. zone. B	T. &. zone. C	H. p. zone. D	M. c-t. zone. E	M. c-a. zone. F	M. zone. U.M.
		SHEET 18 S.E.—LEATHERHEAD AND ASHTEAD.							
52	120	Rowhurst Erickyard on Tertiaries	...	...	...	...	...	...	...
53	190	N. of St. John's School, Leatherhead. Deep pits, now grassed over. Called "Old Gravel Pits" on 6-in. Map	...	...	...	...	...	...	...
54	240	At "The Marches," on main road. A wide shallow pit, chalk rather hard, fossils scarce. Flints in bands, some of enormous size	...	...	...	...	...	F.	...
55	200–240	Ashtead Rifle Range Pit. Large but very old pit, used as a miniature rifle range. Chalk soft but much covered with Protococcus and mosses, difficult to collect from. *M.* band at top, *U.* band at bottom; thickness about 40 feet	...	...	...	...	...	...	U.M.
56	290	In Chalk Lane, near Ashtead Church. Very small but interesting, about 8 ft. deep, both *Marsupites* and *Uintacrinus* found close together	...	...	...	...	...	...	U.M.
57	290	Quarter mile S.W. of No. 56, overgrown, full of large beech trees...	...	...	...	...	...	...	...
57A	350	Roman Road Pit, close to the Ermyn Street. Small, fossils not numerous	...	...	...	...	...	F.	...
		SHEET 19 S.W.—EPSOM DOWNS.							
58	280–330	Bishop's Pit, E. of Ashtead Park, corner of Headley Lane. A large pit, still in use. Close to Tertiaries. Fossils not plentiful, but occasionally well preserved. One well-marked flint nodular with three ill-defined ones above it, about 6 in. apart. Possibly there is a capping of *Marsupites*-zone here, as one specimen of the *sub-pyramidatus* variety of *Echinocorys* was found. There are also two peculiar masses of chalk débris shown in section	...	...	...	...	...	F.	?
59	350	Headley Lane Upper Pit, 300 yards S. of No. 58, at corner of side road. Large but shallow, chalk soft with powdery surface, fossils scarce	...	...	...	...	...	...	U.
60	330	Close to the Ermyn Street, half mile S.W. of Epsom Grand Stand, overgrown with trees	...	...	...	...	...	...	...
61	420	In Sheep Walk, S.W. of No Home Farm. Very small, badly weathered	...	...	...	...	...	F.	...
62	380	Target Pit, at Epsom Rifle Range, near Grand Stand. Small pit with band of very large flints near the top, chalk much jointed, slightly faulted with slickensides ...	...	...	...	...	...	F.	..

63	500	At angle of lane, 250 yards W. of Shelvershill plantation, completely overgrown ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
64	530	Near site of St. Leonards Chapel, very little chalk exposed, nearly filled with rubbish, but *Marsupites* found	...	...	...	...	...	...	...	...	...	...	...	...	...	...	M.
65	500	*At N.W. corner of Shelvershill plantation, completely overgrown...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
66	520	*At E. end of Shelvershill plantation, small pit about 15 ft. deep, disused, chalk hard and massive, with conchoidal fracture, flints numerous, but fossils scarce	...	...	...	...	...	...	...	...	...	...	...	...	...	F.	...
67	520	*At angle of lane, 250 yards S. of Shelvershill plantation, completely overgrown ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
68	500	300 yards N. of Tumble Beacon. Small pit, disused, but fair condition, chalk much jointed, with a layer of very large flints, fossils scarce	...	...	...	...	...	...	...	...	...	...	...	...	...	?	...
		SHEET 19 S.E.—BANSTEAD AND CHIPSTEAD.															
69	500	*100 yards N. of Green Lane. Thick undergrowth and trees	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
70	500	*N. of Highhurst Wood, Waterhouse Lane	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
71	500	*Kingswood Station small pit, a small exposure	...	...	...	...	...	...	...	...	...	...	...	...	...	F.	...
72	500	*Kingswood Station pit, W. of No. 71. Rather deep semi-circular pit, chalk very white, but much stained from surface soil, one very large pipe. Flints in regular bands, fossils rare	...	...	...	...	...	...	...	...	...	...	...	...	...	F.	...
73	500	*In Holly Lane, E. of Garratt's Hall	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
74	500	*One-sixth mile S.E. of No. 73	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
75	500	*Pit Barn Pit, one-sixth mile S.W. of No. 73. A small pit with a fine, clearly defined pipe	...	...	...	...	...	...	...	...	...	...	...	...	...	F.	...
76	500	*Read's Rest Pit, W. corner of Lunch Wood. A small exposure chalk similar to No. 75	...	...	...	...	...	...	...	...	...	...	...	...	...	F.	...
77	500	*Lunch Wood Pit, S. corner of Lunch Wood	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
78	480	*N. of The Shrubbery, Banstead Place...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
79	480	*S. of The Shrubbery, Banstead Place	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
80	500	*One-sixth mile N.W. of No. 81	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
81	500	*At Park Downs Cottages. Not now used, but clean surface; Chalk very white, fossils very scarce. A thick tabular is present with a nodular band 6 ft. above it	...	...	...	...	...	...	...	...	...	...	...	...	...	F.	...
82	500	*Above Long Plantation, Chipstead Bottom	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
83	370	Small cutting, N. of Chipstead Station. See "Memoir," vol. iii, p. 174	...	...	...	...	...	...	...	...	...	...	...	...	...	E.	...
84	380	Chipstead Cutting, S. of station. See "Memoir," vol. iii, p. 174. I differ from the Survey in placing this cutting (with the exception of a few feet at the S. end) in the zone of *M. cor-testudinarium*, as all the *Micrasters* we found were of the type of that zone. About 20 ft. below the floor of the cutting is a prominent terrace on the hill-side, possibly formed by the "Chalk-rock." For fossils see p. 215.	...	...	...	...	...	...	...	...	...	...	...	D.	E.	...	...

No.	Height above O. D.	DESCRIPTION.	Grey Chalk. A	R. c. zone. B	T. g. zone. C	H. p. zone. D	M. c-t. zone. E	M. c-a. zone. F	M. zone. U.M.
85	430	*In Hazelwood Lane. Small road-side pit about 50 ft. above this cutting; flints numerous, but fossils not so. Capped by clay-with-flints	...	...	...	...	E.	...	...
86	480	*Starrock Wood Pit. Chalk rather soft and white. Numerous flints, many of them peculiar, long, thin, and cylindrical. *Micrasters* of type of lower one-third of *M. cor-anguinum*-zone. This, with the two preceding sections, forms a fairly continuous vertical section of about 100 ft. in depth	...	...	...	...	...	F.	...
87	480	*At Starrock Shaw, overgrown with trees	...	...	...	...	...	...	...
88	480	*S. of Starrock Shaw, overgrown with trees	...	...	...	...	...	...	...
89	460	*At Portnall's Farm	...	...	...	...	...	...	...
90	470	*S. of Portnall's Farm	...	...	...	...	...	...	...
91	440	At Church Shaw, E. of Chipstead Church. Very old deep pit, with no road approach ("draw-pit" type), full of trees, including a large yew	...	...	...	...	...	...	...
92	500	*At Peterhole Shaws, E. of Brighton Road	...	...	...	...	...	...	...
		SHEET 20 S.W.—COULSDON DISTRICT.							
93	365	At Hooley Farm. Very small road-side section, fossils scarce, but an abundance of spongiform flints	...	...	...	D.	...	...	...
94	480	*N. of Woodplace Farm. Very old, full of trees	...	...	...	...	...	...	...
95	300–420	Stoat's Nest Pit, near Coulsdon Station. Very large pit, funnel-shaped. A series of cuttings about 5 ft. deep radiate from the narrow entrance, and in these cuttings *Micraster præcursor* of *M. cor-test.*-zone type is very abundant. The chalk is very hard and creamy in colour. Above the cuttings fossils are very scarce, and both nodular and tabular horizontal flint-bands are numerous and close together. See also "Memoir," vol. iii, p. 177.	...	...	...	...	E.	F.	...
96	450	*N. of Marlpit Lane	...	...	...	...	...	...	...
97	500	*S. of Marlpit Lane	...	...	...	...	...	...	...
98	491	At Farthingdown Cottages. Very old, surrounded by yews, a little chalk exposed but fossils very scarce	...	...	...	...	...	?	...

99	500	*One-sixth mile S. of Tollers Farm, old but rather large pit, with a ruined kiln. Chalk white and of medium hardness with nodular bands of flints	...	...	...	...	...		F.	...
100	480	*At Devil's Den Wood. Very small, overgrown and full of trees	...	...	...	...	...	...	...	...
101	500	*One-third mile E.S.E. of No. 99. Very old, overgrown and full of trees	...	...	...	...	...	...	...	...
102	470	*One-sixth mile E. of No. 100. Very small, overgrown and full of trees	...	...	...	...	...	...	...	...
103	500	*Half mile S.E. of No. 102. Very old, deep, overgrown and full of trees	...	...	...	...	...	...	...	...
104	375	In Wood Pit, in Old Lodge Lane. Very small road-side section, but with unexpectedly low zonal fauna	...	...	C.	...	...	...	...	...
105	500	*One-sixth mile E. of No. 104. In private ground, apparently overgrown with trees ...	...	...	...	...	...	...	...	...
106	490	*One-sixth mile N.E. of Welcomes Farm. In private ground, dirty and overgrown. No fossils	...	...	...	...	...	...	...	...
107	500	*Waddington Pit. Old, much overgrown, chalk hard and massive, in thick beds, scattered flints, some of large size	...	...	..	...	E.	...	...	...
107*a*	480	*N. of Taunton Farm. A small, old pit, recently re-dug. No fossils	...	...	...	...	...	...	...	...
108	500	*At Taunton Farm	...	...	...	...	...	...	...	...
109	500	*One-eighth mile N.W. of No. 110. Very old, quite overgrown	...	...	...	...	...	...	...	...
110	500	*One-eighth mile W. of Waterhouse Farm. Resembles No. 107. Many of the flints have a soft white outer cortex which peels off easily	...	...	...	...	E.	...	...	...
111	480	*Quarter mile N. of Kenley House. Old, overgrown with yews and elders	...	...	...	...	...	...	...	...
112	520	*One-eighth mile N. of Neville House. An old pit, but with workable exposure. Flints fairly numerous, many of them spongiform	...	...	...	D.	...	...	...	...
113	300–450	Rose and Crown Pit, Kenley, See "Memoir," Cret. Rocks, vol. ii, p. 387, vol iii, p. 173, Dibley, *Proc. Geol. Assoc.*, vol. xvi, p. 490	...	...	C.	D.	...	...	...	...
114	500	*150 yards N. of No. 113	...	...	...	...	...	...	...	...
115	500	*100 yards E. of No. 113...	...	...	...	...	...	...	...	...
116	500	*One-third mile S.E. of Kenley House...	...	...	...	...	...	...	...	...
117	400	*Near Joynson's Hill, very shallow and grassed over	...	...	...	...	...	...	...	...
		SHEET 20 S.E.—WARLINGHAM DISTRICT.								
118	525	*At Tithe Pit Shaw. A rather large pit, occasionally used. The lower part, 5 ft., is damp yellow chalk, rather gritty, fossils plentiful, *M. cor-testudinarium*-zone. Above this is a very white drier chalk with several bands of nodular flints, fossils rather few, *M. cor-anguinum*-zone. There is a small pipe of brilliant crimson brickearth. For fossils see p. 215	...	...	...	...	E.	F.	...

No.	Height above O. D.	DESCRIPTION.	Grey Chalk. A	R. c. zone. B	T. g. zone. C	H. p. zone. D	M. c-t. zone. E	M. c-a. zone. F	M. zone. U.M.
119	350–450	Whyteleafe Pit. See "Memoir," vol. ii, p. 387, Dibley, *Proc. Geol. Assoc.*, vol. xvi, p. 490. Very large pit, upper part inaccessible; middle part, rather hard creamy chalk, massive, no flints; lower part, whiter, but otherwise similar. For fossils see p. 215...	...	?	C.	D.	...	...	...
120	530	In the foundations of a house being built overlooking No. 119 numerous *Echinocorys vulgaris* var. *gibbus*, identified by Dr. Rowe as typical shape of *M. cor-testudinarium*-zone	...	...	...	...	E.	...	...
121	520	*One-third mile S.E. of No. 119, at Highlands. Entirely overgrown with trees	...	...	...	...	...	...	...
121*a*	560	*Quarter mile E of Hamsey Green Farm	...	...	...	...	...	...	...
122	560	Quarter mile E. of No. 118. Marked "Old Quarry" on 6-in Map. Is a brickfield. Bricks are of a very bright red. No chalk to be seen	...	...	...	...	...	...	...
122*a*	570	*Woottonga Pit in Bughill Lane, at W. end of Hallelu plantation. Not marked on 6-in. Map. Chalk massive and very hard. For fossils see p. 215.	...	...	...	...	E.	...	...
123	530	*N. of Mount Hopper	...	...	...	...	...	...	...
123*a*	550	*N. of Crow's Wood	...	...	...	...	...	...	...
124	600	Brickfield W. of Blanchman's Farm	...	...	...	...	...	...	...
125	600	*Hallelu Pit, 200 yards S. of Blanchman's Farm, E. end of Hallelu Plantation. Very small, chalk moderately soft, a few very large flints	...	...	...	...	E.	...	...
126	600	*"Inglenook" Pit, quarter mile E. of No. 125. Small and disused but interesting. I have given it this name because the roots of a very large beech overhang, making a cave of respectable size, quite rainproof, evidently used by gipsies who have broken a hole through the roof to let out smoke. Chalk and fossils resemble those in No. 122*a*	...	...	...	...	E.	...	...
127	540	Slines Oaks Lower Pit, near pumping station. Of fair size, still in use. Chalk hard, very few flints. Into this pit there is a great wash of the red Blackheath pebble beds from Worms Heath	...	...	C.	...	...	...	...
127*a*	720	Slines Oaks Upper Pit, about 180 ft. above the lower one, near Nore Hill Pond. Is being worked for the Blackheath pebbles, but the chalk shows in large pinnacles ...	...	...	...	...	E.	...	...

128	530	*Greathill Shaw Pit, near Midgeley Shaw. Small old pit, no section but large rubbly talus, with many fossils, evidently junction of T. g. and H. p. zones. A marked terrace a little above suggests "Chalk Rock," and above that comes clay-with-flints ...	...	...	C.	D.	...	...	...
129	575	*In Ledgers Park, opposite footpath to Chelsham Church	...	...	...	...	...	...	...
129*a*	600	*In Ledgers Park, one-sixth mile S. of No. 129	...	...	...	...	...	...	...

(*Nos.* 130 *to* 138 *on Sheet* 28 *N.W. outside the district.*)

SHEET 27 N.E.—WOLDINGHAM DISTRICT.

139	480–520	At back of Public Hall, Caterham. See "Memoir," vol. iii, p. 385, disused, no flints, fossils common on talus, chalk hard and gritty. For fossils see p. 215...	...	B.	...	...	...	...	...
140	600	*Tillingdown Pit, quarter mile E. of No. 139. Disused, now being used as a dust shoot, a small exposure	...	...	...	D.	...	...	...
141	550–650	Godstone Quarries. A large series of excavations in the face of the escarpment, not now worked for chalk and very little for firestone (Up. Greensand) which latter is done by tunnelling. Chalk is much obscured, but scattered fossils can be collected on the talus	A.	B.	C.	...	...	...	...
142	620	*In Marden Park, quarter mile N.E. of South Lodge. Very old, disused, rubble only ...	...	...	...	...	...	...	...
143	730	*One-sixth mile W. of Woldingham Church	...	...	...	...	...	...	...
144	780	Close to Chaldons Farm, "Gravel" pit	...	...	...	...	...	...	...
145	600–700	Under Hogtrough Lane. Disused, rubbly talus	...	...	...	...	...	...	...
146	700	*One-sixth mile N. of Nether Court. Small, very old, but with fossils on talus	...	...	C.	...	...	...	...
147	780	One-third mile N.N.E. of No. 145. Small, planted with trees, in private grounds ...	...	...	...	...	...	...	...
148	580	One-eighth mile S.E. of No. 147. No exposure, grass-grown talus	...	...	...	...	...	...	...
149	820	*At S.E. corner of Wistler's Wood. Quite overgrown with trees	...	...	...	...	...	...	...
150	810	W. of Greenhill Shaw, marked "Old Quarry" on 6-in. map, is merely a deep conical *hole* about 40 feet across, now full of trees. As there is no sloping roadway to it, Mr. W. Johnson considers it to be an old draw-pit of the nature of a dene-hole ...	...	...	...	...	...	...	...
151	850	Quarter mile W. of Flinthouse Farm } Two gravel pits in isolated patches of Blackheath pebble-beds, on the highest ground in the neighbourhood, and on the crest of the North Downs	...	...	...	...	...	...	...
152	850	Quarter mile N. of Flinthouse Farm }							

No.	Height above O. D.	DESCRIPTION.	Grey Chalk. A	R. c. zone. B	T. g. zone. C	H. p. zone. D	M. c-t. zone. E	M. c-a. zone. F	M. zone. U.M.
153	600–800	Oxted Chalk Pits. See "Memoir," vol. ii, pp. 53, 385. Very large pits, lower part consists of typical grey chalk with but few fossils, the *Act. plenus* marl can be traced about half way up the main face with the *R. cuvieri* beds above it. One of the spoil heaps from this zone yielded many fossils	A.	B.	?	...	...	...	...
154	580	Quarter mile S.E. of No. 153. No exposure, grass-grown talus	...	...	...	...	...	...	...
		SHEET 27 N.W.—CATERHAM DISTRICT.							
155	500	*Quarter mile W. of The Gullet	...	...	...	...	...	...	...
156	500	*One-eighth mile S.W. of Grasscuts Shaw	...	...	...	...	...	...	...
157	600	*One-sixth mile S. of Alderstead Farm. Very old, overgrown with trees	...	...	...	...	...	...	...
158	370–490	Merstham Lime Works. See "Memoir," vol. ii, pp. 53, 385. Very large	A.	B.	...	...	...	...	...
159	500	*Ditches Lane Pit, one quarter mile N. of Chaldon Church. Fairly large, not much used; fossils few; flints numerous; many spongiform	...	...	...	...	E.	...	...
160	500	*Quarter mile S.W. of No. 159. Very old, overgrown with trees and bushes	...	...	...	...	...	...	...
161	490	*150 yards W. of No. 160. Very old, overgrown with trees and bushes	...	...	...	...	...	...	...
162	500	*One-eighth mile N. of No. 161. Very old, overgrown with trees and bushes	...	...	...	...	...	...	...
163	610	*S. of Tollsworth Farm, at W. end of Pilgrim's Lane. Large, old shallow pit, very small exposure at brow of escarpment overlooking Merstham	...	...	C.	...	...	...	...
164	650	*In Pilgrims Lane, at Little Willey. Very old, deep pit, overgrown with trees	...	...	...	...	...	...	...
165	720	*In Pilgrims Lane, at Hill Top House. Small, at crest of escarpment, chalk very hard, flints few	...	...	...	?	...	...	...
166	730	*In Pilgrims Lane, near Willey Farm, two pits, both overgrown	...	...	...	...	...	...	...
167	710	One-eighth mile S. of Willey Farm. Very old, deep, overgrown with trees	...	...	...	...	...	...	...
168	660	*Willey Heath Brickfield. Chalk exposed under clay-with-flints, which occurs in numerous pipes so close together as to be only separated by pinnacles of chalk. *H. planus* and *Pentacrinus* found. For fossils see p. 215...	...	...	...	D.	...	...	...

169	550	*Opposite Gasworks, Caterham Asylum. Now filled up with rubbish	...	...	...	...	...	...	...
170	735	"Gravel" pits at Caterham Waterworks. Large pits in outlier of Blackheath pebble-beds	...	...	...	...	...	...	...
		SHEET 26 N.E.—MERSTHAM AND KINGSWOOD DISTRICT.							
171	500	*Smugglers' Pit, Hogden Bottom, totally overgrown with trees	...	...	...	...	...	...	...
172	500	*S.W. of Beechen Copse. Old shallow pit overgrown with trees	...	...	...	...	...	...	...
173	500	*In Grub Wood. Full of trees	...	...	...	...	...	...	...
174	520	*On Reigate Road, one-third mile N. of Lower Kingswood Church. Deep pit, full of large trees	...	...	...	...	...	...	...
175	585	On Reigate Road, quarter mile S.E. of Lower Kingswood Church. Gravel pit. ...	...	...	...	...	...	...	...
176	500	*N. of Well House, Hogden Bottom, overgrown with trees	...	...	...	...	...	...	...
177	500	*S. of Well House, Hogden Bottom, overgrown with trees	...	...	...	...	...	...	...
178	500	*In Longcroft Shaw. Old, but large exposure, fossils scarce, chalk massive	...	...	...	...	...	F.	...
179	500	*Quarter mile E. of Mugswell. Very old and full of trees. A little chalk exposed, very few fossils	...	...	...	...	...	?	...
180	500	*Quarter mile W. of Prior's Field School, overgrown with trees	...	...	...	...	...	...	...
181	440–480	In Markedge Lane, Gatton. Small quarry still in use, on S. side of escarpment in a small obsequent coombe. The lower part, about 7 ft., is in Grey Chalk, mostly covered with talus, and with no fossils worth recording. The upper 30 ft. is in *R. cuvieri*-zone, and the usual fossils are fairly plentiful. One fine example of *Ammonites peramplus* (20 in. diam.)	A.	B.	...	...	...	...	...
182	500	*Quarter mile N. of Coldroast Farm. Overgrown with trees	...	...	...	...	...	...	...
183	530	*Quarter mile S.W. of Coldroast Farm. Overgrown with trees	...	...	...	...	...	...	...
184	560	*At Furzefield Shaw, Ashtead Hill. Obscured by trees and talus	...	...	...	...	...	...	...
185	400	At Marling Glen, Merstham. Very old deep pit, covered by talus	...	...	...	...	...	...	...
186	430	Yew Tree Pit, corner of Chipstead Church lane and Brighton Road. Very old, shallow but long pit planted with a double row of yew trees. Small exposure with scattered flints	...	...	...	...	E.	...	...
187	500	*N. of Netherne Wood	...	...	...	...	...	...	...
188	530	*S. of Netherne Wood	...	...	...	...	...	...	...

No.	Height above O. D.	DESCRIPTION.	Grey Chalk. A	R. c. zone. B	T. g. zone. C	H. p. zone. D	M. c-t. zone. E	M. c-a. zone. F	M. zone. U.M.
		SHEET 26 N.W.—HEADLEY AND WALTON HEATH.							
189	500	In Clay Lane, W. of Oyster Hill, Headley. A large pit about 30 ft. deep, in good condition for working, close to Tertiary outlier. Massive blocky chalk, well bedded, flints few. One persistent thin horizontal tabular flint band with layer of yellow chalk just beneath it with numerous fossils. Fossils throughout plentiful and well preserved. For list see p. 215. The whole is in *Marsupites*-band	...	...	...	...	...	...	M.
190	550	250 yards S.W. of Headley Church Full of trees, no exposure	...	...	...	...	...	...	...
191	530	*In Hurst Road, Walton-on-the-Hill. Much overgrown, but with a small exposure ...	...	...	...	...	...	F.	...
192	540	*In Epsom Lane, 300 yards N.W. of No. 191. Very small and badly weathered... ...	...	...	...	...	...	...	...
193	525	*300 yards W. of Dowding Castle. Very old, partly enclosed as orchard. Near Tertiary outlier of Walton-on-the-Hill and at the head of Pleistocene valley of Hogden Bottom	...	...	...	...	...	...	...
194	500	*Hogden Bottom Pit, near Kingswood School. Small pit capped by brickearth with Pleistocene fossils. Nodular flint bands, chalk very white with conchoidal fracture. Now enlarged and Pleistocene nearly all cut away (May, 1905). For fossils see p. 215	...	...	...	...	...	F.	...
195	570	*W. of Reigate Road, 1 mile S. of No. 194. Inaccessible, in centre of thick larch wood	...	...	...	...	...	...	...
		SHEET 25 N.E.—MICKLEHAM DISTRICT. (*Nos.* 196, 197, 198 *W. of R. Mole.*)							
199	175	Behind Mickleham Rectory, overgrown, full of trees	...	...	...	...	...	...	...
200	275	In Highland Park, overgrown, full of trees	...	...	...	...	...	...	...
201	370	Near Highlands Farm, overgrown, full of trees	...	...	...	...	...	...	...
		SHEET 25 S.E.—BOX HILL DISTRICT. (*Nos.* 202 *to* 206 *W. of R. Mole*)							
207	200	N. of Burford Bridge Hotel	...	...	...	...	...	...	...
208	500	*Near Swiss Cottage, Box Hill	...	...	...	...	...	...	...

209	585	*Boxhurst Pit, in Box Hill Road, about 50 ft. below top of Box Hill, overlooking Deepdene. Small but interesting. Junction of H. p. and T. g. zones. *T. gracilis* numerous. *H. planus* and *M. leskei* also found. For fossils see p. 215	...	...	C.	D.	...	...	...
210	700	*On Brockham Hill, overgrown with trees	...	...	...	...	...	...	...
211	400	In White Road, S. of Duke's Plantation	...	...	...	...	...	...	...
		SHEET 26 S.W.—BETCHWORTH DISTRICT.							
212	400–550	Brockham Lime Works. See "Memoir," vol. ii, p. 55	A.	?	...	...	...	...	...
213	400–575	Betchworth Lime Works. See "Memoir," vol. ii, pp. 55, 386, 387	A.	B.	C.	...	...	...	...
214	400–500	Buckland Lime Works	...	...	...	...	...	...	...
215	600	At Round Wood	...	...	...	...	...	...	...
216	480	At Colley Hill, near Reigate	...	...	...	...	...	...	...
217	400–500	Colley Pits	...	...	...	...	...	...	...
		SHEET 26 S.E.							
218	700	*At Margery Hall Farm	...	...	...	...	...	...	...
219	720	*Quarter mile S.W. of No. 218. Large pit in thick wood, overgrown	...	...	...	...	...	...	...
220	740	*One-sixth mile S.E. of No. 219. Small and shallow, overgrown	...	...	..	...	...	...	...
221	400	On Colley Hill, W. of Reigate Hill	...	...	...	...	...	...	...
222	500–600	On Colley Hill, one-sixth mile E. of No. 221. Large, bare and rubbly, in escarpment...	...	...	...	...	...	...	...
223	500–700	Farrington's Pits, Reigate Hill. Very large. See "Memoir," vol. ii, pp. 55, 385 ...	A.	B	...	...	...	...	...
224	400	In Beech Road, S. of No. 223	...	...	...	...	...	...	...
225	740	*E. of Margery Hall. In thick wood, overgrown	...	...	...	...	...	...	...
226	685	*Blackhorse Pit, at top of Reigate Hill. Small exposure, no fossils	...	...	...	...	...	...	...
227	500–600	Old Pits between Reigate Hill and Wray Lane. Rubbly talus only	...	...	...	...	...	...	...
228	550	In Gatton Park, in Wray Lane, near No. 227	...	...	...	...	...	...	...

No.	Height above O. D.	DESCRIPTION.	Grey Chalk. A	R. c. zone. B	T. g. zone. C	H. p. zone. D	M. c-t. zone. E	M. c-a. zone. F	M. zone. U.M.
229	500–550	In Gatton Park, N.W. corner of Nut Wood	...	...	...	...	...	...	...
230	400	In Gatton Park, near The Burpit	...	...	...	...	...	...	...
231	450	In Gatton Park, S. of Nutwood Lodge	...	...	...	...	...	...	...
232	280	In Battlebridge Lane, S. Merstham. Not chalk but Lower Greensand	...	...	...	...	...	...	...
		SHEET 27 S.W.—BLETCHINGLEY DISTRICT.							
233	700	At War Coppice	...	...	...	...	...	...	...
234	600	S. of Gravelly Hill. Very deep, full of large trees	...	...	...	...	...	...	...
235	700	S. of Gravelly Hill, quarter mile E. of No. 234. Old. Fossils very scarce (on talus only)	...	...	?	...	...	...	...
		SHEET 27 S.E.—GODSTONE AND OXTED.							
236	600	Nixon's Pit, S.W. of Hanging Wood	...	...	...	...	...	...	...
237	600	At top of Tandridge Hill Lane...	...	...	...	...	...	...	...

LIST OF FOSSILS FROM CERTAIN SELECTED PITS.

	Public Hall, Caterham.	Whyteleafe.	Boxhurst.	Willey Heath.	Chipstead, South Cutting.	Woottonga.	Tithe Pit.	Hogden Bottom.	Medical College.	Banstead Cutting.	Russell Hill.	Clay Lane, Headley.
Number of Pit ...	139	119	209	168	84	122A	118	194	49	38. 39	28	189
Zone	*R. c.*	*H. p.* *T. g.*	*H. p.* *T. g.*	*H. p.*	*M. c-t.* *H. p.*	*M. c-t.*	*M. c-a.* *M. c-t.*	*M. c-a.*	*M. t.* *M. c-a.*	*M. t.* *M. c-a.*	*M. t.*	*M. t.*
Siphonia königi	...	...	...	...	...	...	...	...	...	×	...	...
Plinthosella squamata	...	×	×	...	...	...	...	...	×	...	×	×
Ventriculites impressus	...	...	...	...	×	×	...	...	...	...	×	...
Pharetospongia strahani	...	...	...	...	...	...	...	...	...	×	...	...
Porosphæra globularis	...	...	...	...	×	...	×	...	×	×	×	×
Porosphæra nuciformis	...	...	...	...	...	...	...	...	×	...	×	...
Porosphæra pileolus	...	...	...	...	...	...	...	...	×	...	×	...
Porosphæra patelliformis	...	...	...	...	...	...	...	×	...	...	...	...
Porosphæra arrecta	...	...	...	...	...	...	...	...	...	...	×	...
Hydrozoa	...	...	...	...	×	...	×	...	...	...	...	...
Spinopora dixoni	...	...	...	...	...	...	...	...	×	...	×	...
Hydractinia	...	...	...	...	×	...	×	...	...	...	...	...
Coral	...	...	...	×	...	...	...	...	...	...	...	×
Parasmilia centralis	...	×	...	...	...	...	...	...	...	...	×	...
Bourgueticrinus	...	...	...	...	...	...	...	...	×	×	×	...
Bourgueticrinus nipple head	...	...	...	...	...	...	...	...	×	×	×	...
Pentacrinus	...	...	...	×	...	...	...	...	...	...	...	...
Marsupites testudinarius	...	...	...	...	...	...	...	...	...	...	×	×
Uintacrinus	...	...	...	...	...	...	...	...	×	×	×	...
Asteroidea	...	...	...	...	...	...	×	...	×	×	×	×

	Public Hall, Caterham.	Whyteleafe.	Boxhurst.	Willey Heath.	Chipstead, South Cutting.	Woottonga.	Tithe Pit.	Hogden Bottom.	Medical College.	Banstead Cutting.	Russell Hill.	Clay Lane, Headley.
Number of Pit ...	139	119	209	168	84	122A	118	194	49	38. 39	28	189
Zone	*R. c.*	*H. p.* *T. g.*	*H. p.* *T. g.*	*H. p.*	*M. c-t.* *H. p.*	*M. c-t.*	*M. c-a.* *M. c-t.*	*M. c-a.*	*M. t.* *M. c-a.*	*M. t.* *M. c-a.*	*M. t.*	*M. t.*
Cidaris sceptrifera	...	...	...	...	×	×	...	...	×	...	×	...
Cidaris clavigera	...	...	...	?	...	...	×	×	...	×	...	...
Cidaris perornata...	...	...	...	...	...	...	×	×	...	...	...	...
Cidaris hirudo	...	...	...	...	...	...	...	...	×	×	×	×
Cyphosoma königi	...	...	...	...	...	...	...	...	...	×	×	...
Cyphosoma corallare	...	...	...	...	...	...	...	×	...	...	...	...
Cyphosoma radiatum	...	×	...	...	×	...	...	...	...	...	...	...
Salenia geometrica	...	...	...	...	...	...	...	...	...	×	...	...
Echinocorys vulgaris (sub-*pyramidatus*) ...	...	...	...	...	...	...	...	...	×	×	×	×
Echinocorys vulgaris (tall dome)	...	...	...	...	...	...	...	...	...	×	×	×
Echinocorys vulgaris (large dome)	...	...	...	...	...	...	×	×	...	×	...	...
Echinocorys vulgaris (gibbous)	...	...	...	...	×	×	×	...	...	...	...	...
Echinoconus conicus	...	...	...	...	...	...	...	×	×	×	×	...
Echinoconus conicus, var. *tumidus*	...	...	...	...	...	...	...	×	...	×	×	...
Echinoconus sub-rotundus	×	×	...	...	...	...	...	...	...	...	...	...
Discoidea dixoni	×	...	...	...	...	...	...	...	...	...	...	...
Micraster cor-anguinum	...	...	...	...	...	...	...	×	×	×	...	×
Micraster cor-anguinum, var. *rostratus*	...	...	...	...	...	...	...	...	...	...	×	×
Micraster præcursor, M. c-a. type	...	...	...	...	...	...	×	...	...	...	...	...
Micraster præcursor, M. c-t. type	...	...	...	...	×	×	×	...	...	...	...	...
Micraster præcursor, ditto, var. *cor-testudinarium* ...	...	...	...	...	×	...	×	...	...	...	...	...
Micraster præcursor, H. p. type	...	...	...	...	×	...	...	...	...	...	...	...

Micraster leskei ...	...	...	...	...	...	...	×	...	...	...	...	...	...	...	...	...
Micraster cor-bovis	...	...	...	...	...	×	...	×	...	...	...	...	...	...	...	...
Hemiaster minimus	...	...	...	...	×	...	...	...	...	...	...	...	...	...	...	...
Holaster planus ...	...	...	...	...	...	...	×	×	...	...	...	...	...	...	...	...
Holaster placenta ...	...	...	...	...	...	...	...	...	...	...	×	...	...	...	...	...
Serpula sp. ...	...	...	...	...	...	...	...	...	...	...	...	...	×	...	×	...
Serpula ampullacea	...	...	...	...	...	...	...	...	×	×	×	...	...	...	...	...
Serpula fluctuata ...	...	...	...	...	...	...	...	...	×	...	...	...	...	...	...	...
Serpula gordialis ...	...	...	...	...	...	...	...	...	...	...	×	...	...	...	...	...
Serpula ilium ...	...	...	...	...	...	...	...	...	×	...	...	...	...	...	...	...
Serpula macropus ...	...	...	...	...	...	...	...	...	×	...	...	...	...	...	...	...
Serpula plana ...	...	...	...	...	...	...	...	...	×	×	×	...	...	...	...	×
Serpula plexus ...	...	...	...	...	...	...	...	...	...	...	×	...	...	...	...	...
Serpula turbinella...	...	...	...	...	...	...	...	...	...	...	×	...	...	×	...	...
Terebella	...	...	...	...	...	...	...	...	...	...	...	×	...	...	×	...
Bryozoa	...	...	...	...	...	×	...	...	...	...	...	×	...	...	...	...
Stomatopora sp. ...	...	...	...	...	...	...	...	...	×	...	...	...	×	×	×	...
Stomatopora granulata	...	...	...	...	...	...	...	...	...	...	×	...	...	...	...	×
Stomatopora gracilis	...	...	...	...	...	...	...	...	×	×	×	...	...	...	...	×
Stomatopora spicea	...	...	...	...	...	...	...	...	×	...	...	...	...	...	...	...
Stomatopora ramea	...	...	...	...	...	...	...	...	×	...	...	...	...	...	...	...
Proboscina ramosa	...	...	...	...	...	...	...	...	×	×	×	...	...	...	...	...
Proboscina cornucopiæ	...	...	...	...	...	...	...	...	...	×	×	...	...	...	...	...
Proboscina anomala	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	×
Proboscina elevata	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	×
Proboscina dilatata	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	×
Berenicea sp. ...	...	...	...	...	...	...	...	...	×	...	...	...	×	×	...	...
Berenicea gracilis...	...	...	...	...	...	...	...	...	×	...	×	...	...	...	...	...
Berenicea phlyctænosa	...	...	...	...	...	...	...	...	...	×	×	...	...	...	...	...
Berenicea papillosa	...	...	...	...	...	...	...	...	...	×	×	...	...	...	...	...
Berenicea regularis	...	...	...	...	...	...	...	...	×	...	...	...	...	...	...	×
Idmonea alipes ...	...	...	...	...	...	...	...	...	...	...	×	...	...	×	...	×
Idmonea cristata ...	...	...	...	...	...	...	...	...	...	...	×	...	...	...	...	...
Membranipora ...	...	...	...	...	...	...	...	...	×	...	×	...	×	×	×	...

	Public Hall, Caterham.	Whyteleafe.	Boxhurst.	Willey Heath.	Chipstead, South Cutting.	Woottonga.	Tithe Pit.	Hogden Bottom.	Medical College.	Banstead Cutting.	Russell Hill.	Clay Lane, Headley.
Number of Pit ...	139	119	209	168	84	122A	118	194	49	38. 39	28	189
Zone	*R. c.*	*H. p.* *T. g.*	*H. p.* *T. g.*	*H. p.*	*M. c-t.* *H. p.*	*M. c-t.*	*M. c-a.* *M. c-t.*	*M. c-a.*	*M. t.* *M. c-a.*	*M. t.* *M. c-a.*	*M. t*	*M. t.*
Homolostega	...	...	...	...	×	...	×	...	...	...	...	...
Eschara rimosa	...	...	...	...	...	...	...	...	...	×	...	×
Actinopora disticha	...	...	...	...	...	...	...	...	...	...	...	×
Actinopora compl'anata	...	...	...	...	...	...	×	...	...	...	...	...
Crania egnabergensis	...	...	...	...	×	...	...	...	...	...	...	...
Thecidea wetherelli	...	...	...	...	...	...	...	...	...	×	...	×
Kingena lima	...	...	...	...	...	...	...	...	...	×	...	..
Terebratulina striata	×	...	...	...	...	...	×	...	...	...	×	...
Terebratulina gracilis	...	×	×	×	...	...	...	...	...	...	...	...
Terebratula semiglobosa	×	×	...	×	×	×	×	×	...	...	...	...
Terebratula carnea	...	×	×	...	×	×	×	...	...	...	...	...
Rhynchonella limbata	...	...	...	...	×	×	×	...	...	...	...	...
Rhynchonella reedensis	...	...	...	×	...	...	×	×	...	×	...	...
Rhynchonella cuvieri	×	...	×	×	...	...	...	...	...	...	...	...
Rhynchonella plicatilis	×	...	...	×	...	...	×	...	...	×	×	...
Janira quinquecostatus	...	×	×	...	...	...	×	...	×	...	×	...
Spondylus spinosus	...	×	×	×	×	...	...	×	×	×	×	...
Spondylus dutempleanus	...	...	...	...	...	×	...	...	?	...	...	...
Spondylus latus	...	...	...	...	×	...	×	×	×	×	×	×
Lima sp.	...	...	...	...	...	×	...	...	...	×	...	...
Lima hoperi	...	×	...	...	...	...	×	×	...	...	...	...
Lima granosa	...	...	...	...	...	...	...	...	...	×	...	...

Ostræa sp. ...	...	...	...	...	...	...	...	×	...	×	...	...	×	×	...	×
Ostræa vesicularis	...	...	...	...	...	...	...	...	...	...	...	...	...	...	×	...
Ostræa hippopodium	...	...	...	...	...	×	×	...	×	...	...	...	...	×	...	...
Ostræa wegmanniana	...	...	...	...	...	...	...	...	...	...	...	...	...	×	×	...
Ostræa lateralis ...	...	...	...	...	...	...	...	...	...	...	...	...	...	×	×	...
Plicatula sigillina ...	...	...	...	...	...	...	...	...	...	...	×	...	...	×	...	...
Inoceramus sp. ...	...	...	...	...	...	...	...	...	...	...	×	...	...	×	×	×
Inoceramus mytiloides	...	...	...	...	×	×	...	...	...	...	...	...	...	...	...	...
Actinocamax granulatus ...	...	...	...	...	...	...	...	...	...	...	...	...	×	...	?	×
Antinocamax verus	...	...	...	...	...	...	...	...	...	...	...	...	×	...	×	...
Scalpellum maximum	...	...	...	...	...	...	...	...	...	...	...	...	...	...	×	...
Fish scales ...	...	...	...	...	...	...	...	...	...	×	×	×	×	...	×	...
Sharks' teeth ...	...	...	...	...	...	...	...	...	...	...	...	...	...	×	...	...
Enchodus	...	...	...	...	...	×	...	...	...	...	...	...	...	...	...	...
Corax falcatus ...	...	...	...	...	...	×	...	×	...	...	...	...	...	...	...	...

MAP OF NORTH-EAST SURREY, SHOWING POSITION OF PRINCIPAL CHALK PITS.

Scale ⅝ inch to a mile. Reproduced, by permission of the Controller of H.M. Stationery Office, from the new 1-inch Ordnance Survey.