degree of relationship between the Corallian Gasteropoda and those of the fossiliferous horizons which preceded the Corallian beds within the area. Tables of fossils may guide us to a certain extent, but owing to many causes, more especially to the binomial system of nomenclature, the mere names of fossils afford but little insight into their differences and affinities.

The earliest collectors amassed a heap of curios, and for a long time doubted their organic origin. The second stage of observation was influenced and obscured by certain prejudices, but the third stage witnessed the establishment of the principles of stratigraphical palæontology, though much affected by the prevailing belief—that every species, ancient and modern, was a distinct and separate creation. This belief still lingers in the minds of some, and the unequal value of specific names as a means of differentiation may perhaps tend to foster the idea by increasing the apparent imperfection of the geologic record. Our object, therefore, in dealing with the Corallian Gasteropoda should be, after a careful description of such forms as seem entitled to the denomination of species, to dwell especially upon their distribution and representatives or relatives in other districts or in other beds in the same district. This method may be of service in arriving at an understanding as to the physical conditions and life history of the period, without in any degree conflicting with the more important biological work of other authors.

(To be continued.)

II.—THE SUBDIVISIONS OF THE CHALK.

By A. J. JUKES-BROWNE, B.A., F.G.S.

[Read before the Geological Society of Norwich, Feb. 3rd, 1880; and communicated by permission of the Director-General of the Geological Survey.]

THE earliest attempt to describe the component beds of the English Chalk was made by W. Phillips in 1819: this is his well-known account of the cliffs between Dover and Folkestone, which is reproduced in Conybeare and Phillips' *Geology* (1822). He recognizes four divisions as follows:—

1. The Chalk, with numerous flints.
2. The Chalk, with few flints.
3. The Chalk, without flints.
4. The Grey Chalk or Chalk Marl.

Samuel Woodward published his *Geology of Norfolk* in 1833, and his classification is very similar, viz.—

1. Upper Chalk, with many flints.
2. Medial Chalk, with few flints.
3. Lower Chalk, without flints.
4. Chalk Marl.

The extent of ground occupied by each of these divisions is indicated in the geological map, but the boundary-lines are stated to be only approximately correct, and it is evident that they are so. It would therefore be difficult to say how far the divisions proposed by Phillips and Woodward are respectively identical, but it is obvious that the same basis of classification is adopted by both. The

arrangement may indeed be regarded as practically a division of the formation into three parts, viz. the Chalk without flints, including the Chalk Marl; the Chalk with few flints; and the Chalk with many flints.

Phillips was content with this terminology, but Woodward went much further, and gave greater distinctness to the divisions by indicating their extent on his map, by recording the fossils found in each, and by proposing a more convenient nomenclature.

Subsequent geologists, however, who described the Chalk in the South of England, Mantell, De la Beche, and Dixon, do not seem to have appreciated the truth conveyed in Woodward's nomenclature, and only recognized two divisions above the Chalk Marl, viz. a Lower Chalk without flints, and an Upper Chalk with flints. This classification, though apparently more simple, is not necessarily more natural, but being adopted by the majority of writers, it finally found its way into Manuals of Geology, and into the publications of the Geological Survey.

Between the Upper and the Lower Chalk, however, no clear line of separation was recognized until 1861, when Mr. Whitaker described a particular bed under the name of Chalk Rock, and indicated its occurrence at the top of the Lower Chalk in the counties of Wilts, Berks, Oxford, and Bucks. He acknowledged, moreover, the occasional presence of flints in the Lower Chalk, and proposed to regard this rock as forming a convenient line of division between the Lower and Upper Chalk.

Mr. C. B. Rose deserves mention as the only geologist who followed in Woodward's steps; he always maintained the expediency of adopting the arrangement into Lower, Medial, and Upper Chalk, and pointed out that in Norfolk certain fossils are characteristic of each division. Mr. Gunn also made a point of this in his *Geology of Norfolk* (1864).

Until 1870, however, very little was added to our knowledge of the distribution of organic remains in the Chalk. During that year Mr. Caleb Evans published a paper on "Some Sections of Chalk between Croydon and Oxted"; this was a contribution of much value, because the author had carefully collected the fossils from each set of beds, and was the first to perceive the possibility of a zonal classification for the English Chalk. He establishes six of these subdivisions or zones, and groups them under three headings, viz.—

1. The Chalk, with bands of flint.
2. The Chalk, with bands of Marl.
3. The Grey Chalk and Chalk Marl.

—thus reviving the older tripartite arrangement, supporting it by palæontological facts, and so placing it on a firmer basis.

Dr. Barrois' work, published in 1875, and entitled "*Recherches sur le Terrain Crétacé Supérieur de l'Angleterre et de l'Irlande*," is now well known to all students of the Chalk, and has already been brought before the notice of this Society. I need only observe, therefore, that Dr. Barrois applies to the English Chalk the same zonal classification which has been so carefully worked out in France

by Professor Hébert and himself, and that these zones are arranged under the three great sections into which D'Orbigny had originally divided the French Chalk: viz. *Cenomanien*, *Turonien*, and *Senonien*. It is also clear that these divisions are to some extent correlative with the Lower, Middle, and Upper Chalk of Woodward and Rose.

The result, therefore, of the more careful and detailed observations that have recently been made is to set aside the old divisions depending on the proportions of flint nodules in the Chalk, and to introduce the new element of the zonal distribution of life. It consequently becomes necessary to re-consider the questions of primary subdivision and nomenclature; the latter is involved in the former, and before that can be determined, we must ascertain where the greater palæontological breaks in the series occur, whether they coincide with any beds of marked lithological character, and whether the natural division of the whole formation thus suggested is into two, or three parts.

As the survey of the Cambridgeshire Chalk by Mr. Penning and myself has thrown some light on the points above mentioned, I propose to give a short account of the zonal divisions which we have established in that county; for a full description of these beds and their fossil contents I must refer to the Memoir on the neighbourhood of Cambridge, which will shortly be published.

During the progress of this survey in 1875-77 we recognized the representatives of the two hard bands which had been described by Mr. Whitaker in more southern counties under the name of Chalk Rock and Totternhoe Stone; we furthermore discovered the existence of a third intermediate band of rock, to which we gave the name of the Melbourn Rock; and which proved to be of great stratigraphical importance. These three beds we succeeded in tracing across Cambridgeshire for a distance of about twenty-five miles, and have laid down lines on the Ordnance Map which give a sufficiently accurate indication of the course taken by each outcrop. The result of this is to divide the Chalk into four stages, which are as clearly defined as if they were subdivisions founded on difference of lithological character, like those of the Lower Greensand in the Wealden area.

Between these boundary-lines certain palæontological zones are recognizable, and the distribution of the fossil remains in these confirms the stratigraphical evidence as to the relative importance of the rock beds for the purposes of classification. The following is a brief account of these zonal divisions in Cambridgeshire (see Table on p. 257):—

1. *Cambridge Greensand*.—This is the homotaxial equivalent of what has elsewhere been called the Chloritic Marl, and should without doubt be regarded as the basement bed of the Chalk Marl.¹ This thin noduliferous layer has been so often described that it is hardly needful to give much description of it here; I will only remind you of the following facts,—that the nodules are enclosed in

¹ See Quart. Journ. Geol. Soc. vol. xxxi. p. 272; and GEOL. MAG. Decade II. Vol. IV. p. 350.

a matrix of glauconitic marl, which passes up into grey marly chalk, that four-fifths of the fossils found in it have been derived from the Gault, and that the fauna of the bed itself certainly belongs to that of the Chalk Marl.

2. *Chalk Marl or Zone of Rhynchonella Martini*.—This consists of hard greyish marl below, passing up into softer and more argillaceous bluish-grey marl; the whole being about 60 feet thick. It is not very fossiliferous, and only 20 species have yet been collected from it; 14 of these occur also in the Greensand at its base, but *Ammonites varians* and some other species appear for the first time in its upper beds. It is a remarkable fact that *Rhynchonella Martini* has never yet been detected in the Cambridge Greensand, where its place is taken by a variety of the allied species, *Rh. lineolata*; this latter does not seem to occur in the overlying marl, and is only known elsewhere in the Neocomian Clay of Speeton, and the Red Rock of Hunstanton. Another little Brachiopod, found abundantly in the Greensand and also in the Chalk Marl, is a minute variety of *Terebratulina striata*, recently named *T. triangularis* by Mr. Etheridge. This has hitherto been considered a variety of *T. gracilis*, and is in some respects an intermediate form between the two species. I believe the same variety occurs also in the Hunstanton rock.

3. *Totternhoe Stone*.—At the base of this division there appears to be a more or less continuous layer of green-coated calcareo-phosphatic nodules, which were first described by Prof. Hailstone in 1816.¹ The stone above is a compact grey sandy limestone, in beds about 2 or 3 feet thick, and having a total thickness of from 12 to 15 feet. The best exposure to be found in Cambridgeshire is at Burwell, where it is largely quarried for building stone, and where it has yielded a large number of fossils. There is a good collection of Burwell stone fossils in the Woodwardian, and the fauna now known is a large one, numbering from 80 to 90 species.

Mr. Etheridge has described several new forms, and two of these, *Lima echinata* and *Pecten fissicosta* are very characteristic of the horizon; many other fossils are much more common, such as *Rhynchonella Mantelliana*, *Kingena lima*, *Pecten opercularis* and *Lima globosa*, but these occur also in the beds above and below. Cephalopoda and Gasteropoda are here particularly abundant, *Ammonites varians* and *Am. cenomanensis* may be specially mentioned as frequently met with. *Holaster subglobosus* has not yet been found at Burwell, where *Hemiaster Morrisi*, appears to take its place, but the former has been found in the basement bed elsewhere.

4. *Zone of Holaster subglobosus*.—At Burwell the upper limit of the Totternhoe Stone is marked by a bed of hard sandy rock, known locally by the name of "bond," but elsewhere the line of division is not so clear; the chalk, however, quickly becomes less sandy, and of a yellowish or creamy-white colour, passing up into a tough but nearly pure white chalk. In this division the planes of bedding are very indistinct, and the mass splits along curved lines, which produce an appearance of irregular and lenticular bedding. Fossils

¹ Trans. Geol. Soc. vol. iii. p. 243.

are most abundant in its lower portion, which is everywhere characterized by the frequent occurrence of *Holaster subglobosus*. *Holaster trecensis*, *Discoidea cylindrica*, and *Ammonites rathomagensis* may also be mentioned as occurring in this zone, but most of the other fossils range up from the beds below. *Belemnites plenus* only occurs in the topmost bed.

So far we have found a continuous succession without any marked break either in the series of beds or of organic remains. All the fossils of the Chalk Marl range into the Totternhoe Stone, and the number of forms that are confined to the latter will probably be largely diminished by future explorations in the overlying zone, with which it is already known to have many species in common. The three subdivisions may, in fact, be regarded as forming a group of beds characterized by a fauna of one general type, and they are the exact equivalents of the Chalk Marl and Grey Chalk at Folkestone, as defined by Mr. F. G. H. Price.¹

Dr. Barrois has proposed a similar arrangement for this portion of the series in the South of England; he considers it as forming the "Assise du *Holaster subglobosus*," which he subdivides into four *niveaux* or subsidiary zones; the first is that usually called Chalk Marl, the second (*niveau de Am. varians*) corresponds roughly with our Totternhoe Stone,² the third is certainly co-ordinate with the greater part of our *Holaster subglobosus* zone, the upper portion of which may represent Barrois' fourth zone, that of *Belemnites plenus*.

This last zone has a greater development in France, and Dr. Barrois suggests that it has suffered considerable erosion in England, and observes that the basement bed of the Turonien frequently contains rolled fragments of Belemnite. In this he anticipates the conclusion to which I have been led by a study of the Cambridge section, for I have little doubt that at this point in the series there is a distinct stratigraphical and palæontological break, as will appear in the sequel, and is more fully discussed in the Geological Survey Memoir.

5. *Melbourn Rock*.—This rocky belt, or *niveau* as a French geologist would call it, is never more than ten feet thick, but it presents such marked and constant lithological characters as to deserve a distinct local denomination. Excellent sections of it being exposed in two quarries near Melbourn, between Cambridge and Royston, it has been named after that village. It consists of several thin courses of hard yellowish rocky chalk, separated by layers of greyish laminated marl or shale, generally containing numerous nodules or pebbles of hard chalk, to which small Oysters are frequently attached.

Besides this oyster, which is a variety of *Ostrea vesicularis*, crushed *Rhynchonellæ* and rolled *Belemnites* also occur, together with *Inoceramus labiatus* and Fish teeth, *Lamna*, *Otodus*, *Saurocephalus*, etc. A

¹ Quart. Journ. Geol. Soc. vol. xxviii. p. 445.

² While bearing testimony to the great value and general accuracy of Dr. Barrois' work, I am constrained to point out that he never correctly identified the position of the Totternhoe Stone, having first placed it too high, and afterwards too low in the series.

small round quartz pebble was also found in this stratum at the Shelford pits, near Cambridge.

Dr. Barrois observed the occurrence of a yellow marly band at the top of the Cherry Hinton quarry, and calls it the zone of *Belemmites plena* in a remanié state.¹ I afterwards found that this was the basement bed of the rock so well exposed at Shelford and Melbourn, and that the overlying beds noted by Barrois, and referred to his zone of *Inoceramus labiatus*, were really part of the same rocky band, which I now regard as forming the base of the Turonien or Middle Chalk of Cambridgeshire.

It cannot be regarded as in any sense a palæontological zone, but rather as a line of demarcation between two distinct groups of strata, and separating two different fossil assemblages; nearly all the species found in the Lower Chalk have now disappeared, and only two or three cosmopolitan forms survived to reappear in the beds above, which contain an entirely new assemblage of Brachiopods and Echinoderms.

6. *Zone of Rhynchonella Cuvieri*.—The Chalk of this zone is not often quarried, but the exposures that do occur show it to be very evenly bedded, white, and rather hard; its thickness, including the Melbourn Rock at the base, is about 70 feet. Scattered flints are occasionally found in the upper part of the zone. Its characteristic fossils are *Inoceramus mytiloides* (= *labiatus*) and *Rhynchonella Cuvieri*; Echinoderms are rare, but *Galerites globulus*, *Cidaris hirudo*, and *C. dissimilis* have been found.

7. *Zone of Terebratulina gracilis*.—At the base of this division there are some layers of grey marl containing small Brachiopods, and some beds of hard compact chalk. Flints occur at certain horizons, but most of them are remarkably elongated and root-like, and are very different from the nodular flints of the Upper Chalk. *Terebratulina gracilis* is everywhere abundant, as is also *Galerites subrotundus*, and *Discoidea Dixoni* is occasionally found; most of the fossils in the zone below range up into this; its full thickness cannot be far short of 100 feet, but its upper limit has not been fixed with any certainty in Cambridgeshire.

8. *Zone of Holaster planus*.—The chalk of this zone is soft and white, and contains regular layers of black flints, some long and narrow, others large and nodular. Its thickness is probably 50 or 60 feet, and its fauna is quite different from that of the zone below; *Holaster planus* makes its appearance, together with a species of *Micraster* (? *breviporus*) and other forms that become common in the Upper Chalk, such as *Cidaris sceptrifera*, *Cyphosoma radiata* and *Spondylus spinosus*. Ventriculites too are especially abundant in this zone, and serve to distinguish it from the zone below.

9. *Chalk Rock*.—This is really the topmost bed of the zone above described,—the same *Holaster* and *Micraster* are found in it, together with many other fossils which appear to have a similar range, such as *Ammonites Prosperianus*. It is specially characterized by the occurrence of univalves, *Turbo gemmatus* being the commonest.

¹ Recherches sur Terr. Cret. Sup. p. 155.

Ventriculites are also abundant; and there is a new species of *Rhynchonella* (*R. reedensis*), which may be regarded as intermediate between *Rh. Cuvieri* and *Rh. plicatilis*.

The rock consists of hard yellowish semi-crystalline chalk or rather limestone, and there are sometimes two distinct beds separated by a band of soft pulverulent chalk. Its upper surface is clearly defined and occasionally presents the appearance of having suffered erosion. As it is traced northward, however, it appears to lose some of these distinctive characters, and to be represented by one or more layers of hard yellowish chalk, containing only a few of the characteristic fossils: it occurs with this facies in certain quarries along the high ground between Balsham and Newmarket.

10.—*Zone of Micraster cor-bovis*.—Above the Chalk Rock there is soft white chalk with many layers of flints. In this *Micraster*s are particularly abundant, and some of those found at Balsham are considered by Dr. Wright to belong to *M. cor-bovis*, Forbes, but they are associated with others which greatly resemble the form known as *cor-testudinarium*, and this is undoubtedly the zone in which Dr. Barrois finds the latter to be generally abundant.

The other fossils common here are *Ananchytes ovata*, *Cidaris sceptrifera*, *Spondylus spinosus*, *Rhynchonella plicatilis*, and *Terebratula semiglobosa*, var. *bulia* of Sowerby. Many of the last-mentioned are exceedingly like *T. carnea* of the Norwich Chalk, and they may be regarded as intermediate between *T. semiglobosa* and *T. carnea*, which is an interesting fact when their intermediate position in the geological series is also taken into account.

Beyond this zone our observations did not extend, and the remainder of the Upper Chalk in its extension through Essex is much obscured by the superjacent glacial deposits, but the succession of zones could probably be made out by working along some of the valleys.

The following is a summary of the principal facts concerning the Cambridgeshire Chalk.

1. That the zones of life are similar to those established elsewhere, and have been actually traced over a considerable area.

2. That there are two breaks of more or less importance, marked by the occurrence of the hard rocky beds which are termed the Melbourn Rock and the Chalk Rock.

3. That a middle division of the Chalk is thus marked off, and that its establishment is confirmed by the palæontological evidence.

Many facts in support of the last conclusion are given in the memoir before referred to, and though complete data for a comparison of the three faunas do not yet exist, yet it is quite possible to form an approximate estimate. In making such calculations it is best to consider the Invertebrata only; of these about 80 species have been obtained from the Lower Chalk near Cambridge, and no less than 70 of them appear to have died out before or during the deposition of the Melbourn Rock, only 10 of them having yet been found in the Middle Chalk. Further explorations may result in the discovery of a few more lingerers in the higher beds, but this will

not alter the inference which the numbers clearly indicate, viz. that a very important break occurs in the succession of life at this time. Moreover, similar calculations based on the lists of fossils found in other areas by Caleb Evans, Dr. Barrois and F. G. H. Price, strongly confirm this conclusion, for in no case are more than three of the recorded species common to the two assemblages.

The great difference between the two faunas is well illustrated by the amount of specific and even generic change exhibited in certain classes of animals, such as the Echinodermata; thus out of 20 species recorded by these authors as occurring in the Lower Chalk, only *Goniaster mosaicus* and two species of *Cidaris* range up into the Middle Division, whence about an equal number of species have been obtained. The genera *Peltastes*, *Pseudodiadema*, *Echinocyphus* and *Hemiaster* do not appear in the newer fauna, while *Cyphosoma*, *Galerites* and *Micraster* are absent from the older.

The Ammonites again are represented by different species in these two divisions of the Chalk, only one (*Am. Lewesiensis*) being yet known as occurring above and below the thin band of marl which separates the Turonian from the Cenomanien in the South of England.

It is clear, therefore, that a distinct palæontological break occurs at the horizon above indicated, and that a large number of species became extinct or migrated to other areas. Now such a result may be produced either by a sudden change in the conditions of existence, or by a gradual change effected during a period of time that was unfavourable to deposition. As far as we can tell, the conditions of existence do not seem to have changed very greatly or very suddenly, for the beds of chalk above and below this horizon are not very dissimilar in lithological character, and the differences are hardly sufficient to have caused much alteration in the forms of life: they are not in fact so great as the differences presented by the lower and upper portions of the inferior division itself. We cannot but conclude, therefore, that the break between the two formations marks the lapse of a considerable period of time.

It only remains for me to indicate how far these divisions are likely to be similarly developed in Norfolk; in *limine* I should observe that in proceeding from Cambridge to Norfolk it is probable that we pass from one area of deposition to another; at any rate, the conditions which prevailed in the latter during the earlier stages of the formation were very different from those which obtained in the London Basin. Until therefore we know more of the manner in which one facies of the Lower Chalk passes into the other, no attempted correlation can be more than suggestive, and I only offer the following remarks as a kind of commentary on the record of facts and fossils given by Dr. Barrois (*op. cit.* p. 156, *et seq.*).

In the Hunstanton section it is clear that the zones of the great *assise à Holaster subglobosus* have very diminutive representatives, and I doubt whether the term Chalk Marl is applicable to any of them. There is some probability in Dr. Barrois' suggestion that the "Sponge bed" is the analogue of the so-called Chloritic Marl,

because it clearly forms the basement bed of the Lower Chalk. Between this, however, and the overlying bed of grey sandy stone there is a clear line of separation, and the latter is perhaps more likely to be the attenuated representative of the Totternhoe Stone, than of the Chalk Marl. The occurrence of *Ammonites rathomagensis*, *Pecten Beaveri*, *Discoidea cylindrica*, and *Epiaster crassissimus* is at any rate suggestive of a higher horizon than that which is generally characterized by *Plocoscyphia mæandrina*, with which they are here associated.

The succeeding beds, E., F., G., of Barrois, are doubtless homotaxial with the zone of *Holaster subglobosus* when used in its more limited sense, and as I have already defined it.

The remaining 12 or 15 feet at the top of the cliff at Hunstanton are referred by Barrois to his zone *à Belemnites plenus*. This, however, is a somewhat ambiguous term, because he uses it also for the marly layer at Cherry Hinton, which is really the base of the Melbourn Rock, and above the true zone of *Bel. plenus*. It was with the latter, which has a greater development in the north of France, that Barrois probably intended to compare this portion of the Norfolk Chalk.

The Hunstanton section is therefore cut off at a very interesting point, just before the top of the Lower Chalk is reached. Dr. Barrois, however, indicates the outcrop of the overlying zone at Sherborne in these words—"To the north of the village, in the higher part of the quarries, I recognized the hard nodular bed which occurs throughout England towards the base of the zone of *Inoceramus labiatus*." Can this be the Melbourn Rock? is the comment immediately suggested by this description. The nodular chalk to which Barrois refers as occurring throughout (the south of) England is probably rather above the base of the zone, but it would be very interesting to determine whether the Sherborne bed may not be the actual representative of the Melbourn Rock, because it would then supply the desideratum of a base-line for the middle division of the Chalk in Norfolk.

It is very probable that the hard chalk of Sherborne with *Inoceramus labiatus* and *Rhynchonella Cuvieri* formed part of Woodward's "Lower or Hard Chalk," and that his Medial Chalk was merely intended to signify that portion which contains a few flints, and is intermediate between that without any and that with many flints. The localities given by Woodward appear to be chiefly along a line which would correspond with the outcrop of Barrois' zone of *Holaster planus*; a zone which seems to have a considerable thickness in Norfolk, and to contain grey instead of black flints. Now, however, it has become necessary that the Medial Chalk should receive a more strict definition, and it seems desirable to extend the application of the term rather beyond its original scope, so as to bring the Norfolk divisions into correspondence with those now proposed for the rest of England.

I would therefore suggest that Norfolk geologists should take every opportunity of searching for the representatives of the two

rock-beds which are so conspicuous in Cambridgeshire. I have already indicated where the Melbourn Rock may possibly be found; but whether the Chalk Rock is continued northward, with the same characters that it exhibits near Royston and Saffron Walden, is perhaps more doubtful. Still it is quite possible that certain yellowish nodular layers will be found at the top of the *Holaster planus* zone, as is the case near Newmarket, and that these may be taken as the line of division between the Middle and Upper Chalk. There is, indeed, every reason to expect that the higher zones of the formation will eventually be satisfactorily correlated throughout England, France, and Belgium, since the conditions under which they were deposited were certainly more uniform than those which prevailed during the earlier part of the Cretaceous period.

In conclusion I would remind you that the credit of first proposing the tripartite division of the Chalk belongs to the Norfolk geologist—Samuel Woodward. He marked out the broad outlines of what I have little hesitation in calling the true and natural classification, and drew up separate lists of the fossils found in each division. It is astonishing that English geologists should not have pursued the study of the formation on the lines suggested by these early writers, especially as a similar system was being adopted and developed in France; so that it has actually remained for French geologists to demonstrate the applicability of this system to the Chalk of our own country. Much however still remains to be done in completing our knowledge of faunas of the different zones, and every one who makes a collection of fossils from any part of the Chalk, and is careful to record the exact zone and quarry where each specimen was obtained, will be rendering valuable assistance.

CLASSIFICATION OF THE CHALK.

S. Woodward, 1833. Norfolk.	W. Whitaker, 1865. Bedford and Bucks.	Caleb Evans, 1870-77. Kent and Surrey.	Jukes-Browne, 1880. Cambridgeshire.	
Upper Chalk.	White Chalk with flints. Chalk Rock.	Riddlesdown Beds.	Zone of <i>Micraster cor-bovis</i> . Chalk Rock. Zone of <i>Holaster planus</i> . Zone of <i>Terebratulina gracilis</i> . Zone of <i>Rhynchonella Cuvieri</i> . Melbourn Rock. Zone of <i>Holaster subglobosus</i> . Totternhoe Stone. Zone of <i>Rhynchonella Martini</i> = Chalk Marl. Cambridge Greensand.	Upper Chalk Middle Chalk Lower Chalk
Medial Chalk with few flints.	White chalk with thin layers of grey marl, and a few flints in upper part.	{ Kenley Beds. Whiteleaf Beds Upper Marden Park Beds.		
Lower Chalk without flints.	Hard bedded chalk with thin marly layers. Blocky chalk with curved and irregular bedding. Totternhoe Stone. Totternhoe Marl. Chloritic Marl?	Lower Marden Park Beds. Oxstead Beds.		Lower Chalk
Chalk Marl.				
Red Chalk.				