29. *On the CRETACEOUS ROCKS of BEER HEAD and the adjacent CLIFF-SECTIONS, and on the RELATIVE HORIZONS therein of the WARMINSTER and BLACKDOWN FOSSILIFEROUS DEPOSITS.* By C. J. A. MEYER, Esq., F.G.S. (Read April 29, 1874.)

THE Cretaceous rocks which cap the higher ground over a considerable portion of the south-east of Devonshire, and from the partial destruction of which vast beds of gravel have accumulated over the same area, are exposed on the coast-line between Seaton and the west of Sidmouth in numerous fine cliff-sections. The strata thus exposed, while resembling in great measure the various corresponding deposits of other parts of England, possess at the same time a certain *facies* of their own which renders their correlation in part a matter of uncertainty. I purpose to offer in this paper a description of certain of these cliff-sections, to point out the various petrological and palæontological subdivisions of the strata therein exposed, and to leave to the consideration of others the chief point of interest which I have been as yet unable to determine, namely the age of the lowermost deposit.

This paper probably contains little which is not already to be found in the writings of previous observers. But so far as it is the result of independent observation, it may not be without its value.

Reference to Previous Descriptions.

The following papers, to some of which I shall have occasion to refer, are amongst the principal contributions to the literature of the subject:—

- DE LA BECHE, Sir H. T. (1822). "Remarks on the Geology of the South Coast of England," &c. Trans. Geol. Soc. ser. 2, vol. i. pp. 40 & 95.
- DE LA BECHE, Sir H. T. (1826). "On the Chalk and Sands beneath it (usually termed Greensand) in the vicinity of Lyme Regis," &c. Trans. Geol. Soc. ser. 2, vol. ii. p. 109.
- FITTON, Dr. W. H. (1836). "On the Strata between the Chalk and the Oxford Oolite in the South-east of England." Trans. Geol. Soc. ser. 2, vol. iv. p. 233 &c.
- DE LA BECHE, Sir H. T. (1839). Ordn. Surv. 'Report on the Geology of Cornwall, Devon, and West Somerset,' p. 237.
- GODWIN-AUSTEN, R. A. C. (1842). "On the Geology of the South-east of Devonshire." Trans. Geol. Soc. ser. 2, vol. vi. p. 433.
- HUTCHINSON, P. O. (1843). 'The Geology of Sidmouth and of South-eastern Devon.' 8vo. Sidmouth.
- RENEVIER, M. E. (1856). Bull. Soc. Vaudoise Sc. Nat. v. pp. 51, 52.
- WHITAKER, W. (1870). "On the Chalk of the Southern Part of Devon and Dorset." Quart. Journ. Geol. Soc. vol. xxvii. p. 93.

The Cretaceous rocks in their range westward from the Isle of Wight repose successively on the abraded surface of older and yet

older deposits. The Oolitic, the Liassic, the Triassic, and Old-Red-Sandstone strata support in turn the overlying Cretaceous series. In passing westward these Cretaceous rocks diminish steadily, yet at the same time unequally, in thickness. They change slightly, also, both in mineral character and in their fossil contents. From Lyme Regis westward to Axmouth, and from Beer Head again westwards to their last exposure on the coast at Peak Hill, near Sidmouth, the base of the series rises gradually higher in the cliff-sections.

In the face of this prevailing rise of the Cretaceous series to the westward, the Chalk-cliffs of Beer Head, the most westerly chalk promontory in England, owe their preservation in great measure to a local synclinal or trough-like arrangement of the strata.

Many writers on the geology of Devonshire have attributed the present trough-like arrangement of these strata to subsidence since their original deposition. It is not clear, however, that this view is correct; and it may, perhaps, be worth considering presently whether this seeming subsidence is not due in part to an original inequality of the ocean-bed. For the moment I must pass on to other matters.

I. *Cretaceous Rocks represented in the Cliff-Sections of South Devonshire.*

The Cretaceous rocks of the Beer-Head district include the following principal subdivisions:—

Upper Chalk (in part)?
Middle Chalk.
Lower Chalk.
Chalk Marl.
Chloritic Marl.
Upper Greensand.
Gault.
(?)

These broader and generally recognized divisions are split up naturally into many minor beds, either by variation in mineral composition or by the prevalence of a special fauna.

In describing these minor beds, or groups of strata, it may be most convenient to take them in their natural or ascending order, and for facility of reference to number them throughout consecutively.

Description of the minor Subdivisions of the Cretaceous Strata as seen in the Beer-Head and adjacent Sections (fig. 1).*

Bed 1.—Greenish sandy argillaceous strata. Including often, near its base, a grit-bed of minute subangular pebbles, or fragments of the underlying rocks.

Thickness variable, usually a few feet only: 3 ft. at White Cliff, $3\frac{1}{2}$ ft. at Dunscombe, $2\frac{1}{2}$ feet at Salcombe Hill.

Prevailing fossil—*Exogyra conica* (small var.).

* The sections here referred to as adjacent sections are:—those of White Cliff and Beer; the Southdown Undercliff, or landslip of 1789; the cliffs at Branscombe Mouth, Weston Mouth, Dunscombe, Salcombe, and Sidmouth.

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Fig. 1.—General Section. Scale 48 ft. to the inch.

Fossils :—

<i>Exogyra conica</i> , <i>Sow.</i> (small var.).....	Peak Hill.	Salcombe.	Weston.
<i>Vermicularia concava</i> , <i>Sow.</i>		Salcombe.	
<i>Arca carinata</i> , <i>Sow.</i>		White Cliff.	
<i>Trigonia</i> , sp.		Axmouth.	

This, the well-nigh universal base-bed of the Devon Cretaceous series, is, from its somewhat retentive character, usually the most difficult to examine *in situ*. It may be seen in part at White Cliff, and here and there along the cliffs from Branscombe westward to Peak Hill. It is present also, in much the same condition, at the base of the Blackdown strata at Punchey Down, near Collumpton, and again, further westward, at Haldon.

Bed 2.—Argillaceous sand, with abundance of green earth. Varies in colour from dark greyish to pale brownish green, apparently according to its condition of moisture. Fossiliferous semi-indurated nodules occur near the top of this bed at White Cliff and in places to the westward, and have much resemblance to the “Cowstones” of Lyme Regis.

Thickness variable: 15 ft. at White Cliff, 25 ft. at Dunscombe, 25 ft. at Salcombe Hill, 20 ft. at High Peak.

Fossils, in places, numerous.

May be seen at White Cliff and in the cliff-sections between Branscombe and High Peak to the west of Sidmouth.

Fossils of bed 2:—

<i>Madrepora</i> (?)	Salcombe.	
<i>Bryozoa</i> (?)	Peak Hill.	
Silicified wood	”	
<i>Epiaster Murchisoniæ</i> , <i>Mant.</i>	Axmouth.	
<i>Hemipneustes Greenovii</i> , <i>Forbes</i>	”	Peak Hill. White Cliff.
<i>Fusus quadratus</i> , <i>Sow.</i>	Peak Hill.	
<i>Rostellaria Parkinsoni</i> , <i>Sow.</i>	”	
<i>Anomia</i> , sp.	”	
<i>Exogyra conica</i> , <i>Sow.</i>	”	Salcombe, &c.
— undata, <i>Sow.</i>	Axmouth.	
<i>Pecten Millerii</i> , <i>Sow.</i>	Peak Hill.	
— orbicularis (small var.)	”	White Cliff.
<i>Arca carinata</i> , <i>Sow.</i>	”	Axmouth.
<i>Cardium Hillanum</i> , <i>Sow.</i>	”	White Cliff.
<i>Cyprina cuneata</i> , <i>Sow.</i>	”	Salcombe.
<i>Inoceramus sulcatus</i> , <i>Sow.</i>	”	Axmouth.
<i>Lucina orbicularis</i> , <i>Sow.</i>	”	White Cliff.
<i>Mastra angulata</i> , <i>Sow.</i>	”	
<i>Nucula impressa</i> , <i>Sow.</i>	”	
— lineata, <i>Sow.</i>	”	
<i>Pectunculus umbonatus</i> , <i>Sow.</i>	Dunscombe.	White Cliff.
<i>Tellina striatula</i> , <i>Sow.</i>	Peak Hill.	
— (or <i>Psammobia</i>).....	”	
<i>Thetis major</i> , <i>Sow.</i>	”	
<i>Trigonia</i> (allied to <i>Coquandiana</i> , <i>D' Orb.</i>)	”	
— spectabilis, <i>Sow.</i>	White Cliff.	Beer Head.
—, sp.	Dunscombe.	Axmouth.
—, sp.	Axmouth.	
<i>Venus immersa</i> , <i>Sow.</i>	”	
<i>Vermicularia polygonalis</i> , <i>Sow.</i>	”	
— concava, <i>Sow.</i>	Salcombe.	Peak Hill.

At White Cliff these fossils occur only as casts and impressions in the indurated nodules. At Branscombe some of them are more perfect. At Peak Hill, where the condition of the bed is slightly different, many of the species occur precisely as at Blackdown, the shell itself having been replaced by chalcidony.

De La Beche* has recorded many other species as having been obtained from this bed at White Cliff; and he was also one of the first to point out their resemblance to the Blackdown fauna.

Bed 3.—Buff-coloured and greyish marly sands, with large, rounded, and spongiform concretions.

Thickness variable: 40 ft. at White Cliff, 30 ft. at Branscombe, 25 ft. at Dunscombe, 20 ft. at Salcombe.

Fossils scarce.

Fossils:—

<i>Exogyra conica</i> , Sow.	White Cliff.	
— <i>laevigata</i> , Sow.	„	Branscombe, &c.
<i>Pecten orbicularis</i> , Sow. (var.)	„	Axmouth.

This bed may be seen at White Cliff and in all the sections from Branscombe westward to High Peak.

Bed 4.—Light-coloured, yellowish, and slightly marly sands, with irregular concretions.

Thickness about 20 ft.: 25 ft. at White Cliff (?), 20 ft. at Beer Head, 25 ft. at Dunscombe.

Prevailing fossils—*Exogyra columba*, Lam., and *Janira quadricostata*, Sow.

A shingle-bed or layer of sandstone pebbles, mingled with the broken valves of *Pecten* and *Exogyra*, occurs in the upper part of these sands at White Cliff. Near Branscombe and at Weston Mouth the broken shells occur without the pebbles.

The White-Cliff section of this portion of the series gives, in descending order:—

(a) Argillaceous sand	1 foot.
(b) Dark, greyish, sandy clay, with pyrites.....	1½ „
(c) Greenish grey sand, crowded with sandstone-pebbles and broken shells	2 feet †.
(d) Sands with irregular concretions	20 „
Total.....	<u>25 feet.</u>

Fossils:—

<i>Exogyra columba</i> , Lam.	<i>Pecten elongatus</i> , Lam.
<i>Janira quadricostata</i> , Sow.	<i>Vermicularia umbonata</i> , Sow.
<i>Pecten orbicularis</i> , Sow.	

Bed 5.—Light-coloured sand, with chert in nodules or layers, usually more or less tabular.

Thickness variable: 25 ft. at White Cliff, 20 ft. at Beer Head, 20 ft. at Branscombe, 8 ft. at Weston Mouth, 7 ft. at Dunscombe.

* Trans. Geol. Soc. ser. 2. vol. ii. p. 114.

† This shingle-bed has been thought by some geologists to mark the upper limit of the Gault.

Characteristic fossils—*Exogyra columba*, Lam., and *Janira quadricostata*, Sow.

The diminution in the thickness of these strata to the westward is so considerable that I have thought it advisable to give the sections. They are, in descending order, as follows:—

		ft.	in.
White Cliff	{ Sand, with chert in layers	12	0
	{ Bed of sandstone-pebbles, with broken shells...	3	6
	{ Sand, with chert	7	0
Beer Head	{ Sand, with chert in layers	6	0
	{ Broken-shell bed	1	0
	{ Sand, with chert	11	0
Weston	{ Sand and chert (shattered)	6	0
	{ Broken shells	0	8
	{ Chert: an almost continuous layer.....	1	0
Dunscombe	Chert in sand (shattered).....	7	0

At Axmouth the chert and sand about it is crowded with sponge-spicules.

Bed 6.—Light-coloured sand (in places almost white) passing into sandstone.

Thickness variable: 1 ft. at White Cliff, 2 ft. 6 in. at Beer Head, 1 ft. at Branscombe, 6 in. at Weston.

Fossil—*Exogyra digitata*, Sow.

Bed 7.—Sandstone-pebbles, with fragments of large *Ostrea*.

Thickness 0 ft. at White Cliff, 2 ft. at Beer Head, 1 ft. at Branscombe, (?) at Weston.

Bed 8.—Buff-coloured-sand beds, irregular in structure, with zones of sandstone pebbles.

Thickness variable: 5 ft. at White Cliff, 10 ft. at Beer Head, (?) at Branscombe, 5 ft. at Weston Mouth, 2 ft. at Dunscombe.

Characteristic fossils—*Exogyra digitata*, Sow., and *Orbitolina concava*, Lam.

Fossils:—

<i>Orbitolina concava</i> , Lam.	Axmouth.	Weston.	Beer Head.
	Branscombe.		
<i>Exogyra digitata</i> , Sow.	Axmouth.	Weston.	Beer Head.
<i>Rhynchonella Schœnbaehi</i> , Dav.	Weston.		
Spines of <i>Cidaris</i>	Dunscombe.		

Bed 9.—Buff-coloured saccharine-looking sandstone, with fine green grains. Includes layers of quartzose grit.

Thickness variable: 5 ft. at White Cliff, 20 ft. at Beer Head, 15 ft. at Branscombe, 8 ft. at Weston, 4 ft. at Dunscombe.

Fossils:—

<i>Rhynchonella Schœnbaehi</i> , Dav.	Spines of <i>Cidaris</i> .
Ditto (fragments).	Small fish-teeth.

Bed 10.—Rubbly, yellowish, quartzose sands, in chalky paste.

Thickness variable: 6 ft. at White Cliff, 15 ft. at Beer Head, 10 ft. at Branscombe, 5 ft. at Weston Mouth, 4 ft. at Dunscombe.

Characteristic fossils—*Siphonia*, sp., *Nautilus lævigatus*, D'Orb.
Fossils :—

(Note.—Abbreviations as to localities :—Ax. = Axmouth, BH. = Beer Head,
Br. = Branscombe, D. = Dunscombe, WC. = White Cliff, W. = Weston.)

<i>Astrea</i> (?).....	D.
Bryozoa (several species)	D. BH.
<i>Siphonia</i> , sp.	D. Br. BH. Ax.
<i>Ananchytes subglobosus</i> , <i>Leske</i>	BH. Ax.
<i>Cottaldia Benettii</i> , <i>König</i>	BH.
<i>Discoidea subuculus</i> , <i>Klein</i>	D. BH.
<i>Echinoconus</i> (<i>Galerites</i>) <i>castaneus</i> , <i>Brongn.</i> (small var.) (?)	D.
<i>Pyrina ovulum</i> , <i>Ag.</i>	BH.
— <i>Prattii</i> , <i>Forbes</i>	BH.
<i>Salenia petalifera</i> , <i>Desm.</i>	BH.
<i>Ammonites Mantelli</i> , <i>Sow.</i>	Ax.
<i>Nautilus lævigatus</i> , <i>D'Orb.</i>	Ax. D.
<i>Fusus</i> , sp.	D.
<i>Pleurotomaria Mailleana</i> , <i>D'Orb.</i>	D.
<i>Pterocera</i> , sp.	D.
—, sp.	D.
<i>Rostellaria Mailleana</i> , <i>D'Orb.</i>	D.
<i>Trochus</i> , sp.	D.
<i>Turritella Bauga</i> , <i>D'Orb.</i>	D.
<i>Caprotina</i> , sp.	D.
<i>Gastrochæna</i> , sp.	D. BH.
<i>Inoceramus latus</i> , <i>Mant.</i>	BH. Ax.
<i>Opis</i> , sp.	D.
<i>Trigonia sulcataria</i> , <i>Lam.</i>	D.
— <i>tenuisulcata</i> , <i>Dujard.</i>	D. W.
—, sp.	D.
— <i>abrupta</i> , <i>Buch.</i>	D.
<i>Perna</i> (or <i>Avicula</i>) ?	D.
<i>Lima ornata</i> , <i>D'Orb.</i>	D.
— <i>semiornata</i> , <i>D'Orb.</i>	D.
— <i>semisulcata</i> , <i>Goldf.</i>	D.
<i>Janira quinquecostata</i> , <i>Sow.</i>	D.
<i>Mytilus striato-costatus</i> , <i>D'Orb.</i>	Ax.
<i>Ostrea</i> (allied to <i>O. Normaniana</i> , <i>D'Orb.</i>)	Ax. BH.
— <i>carinata</i> , <i>Sow.</i>	D.
— <i>diluviana</i> , <i>Linn.</i>	D. Ax.
<i>Pecten asper</i> , <i>Lam.</i>	D.
<i>Rhynchonella dimidiata</i> , <i>Sow.</i>	BH.
— <i>gallina</i> , <i>Brongn.</i>	WC.
— <i>convexa</i> , <i>Sow.</i>	D.
— <i>Schloenbachi</i> , <i>Dav.</i>	BH.
<i>Terebratella pectita</i> , <i>Sow.</i>	D. BH.

Bed 11.—Yellowish quartzose sand, with fine green grains, in a
chalky paste, semicrystalline.

Thickness variable: 2 ft. at White Cliff, 3 ft. at Beer Head, 2 ft.
at Branscombe, 6 in. at Weston Mouth, 2 ft. at Dunscombe.

Characteristic fossils—Crustacean (*Callianassa* ?), *Exogyra co-
lumba* (small var.), and *Terebratella pectita*, Sow.

Fossils :—

Crustacean (<i>Callianassa</i> ?	BH.
Bryozoa (many species)	D. BH.

<i>Ananchytes subglobosus, Leske</i>	D.
— <i>lævis, Deluc</i>	BH.
<i>Discoidea subuculus, Klein</i>	BH.
<i>Goniophorus lunulatus, Ag.</i>	D.
<i>Micraster, sp.</i>	BH.
<i>Pseudodiadema Michelinii, Ag.</i>	BH.
— <i>variolare, Brongn.</i>	BH.
<i>Trochus, sp.</i>	D.
<i>Caprotina, sp.</i>	D.
<i>Exogyra columba, Lam. (small var.)</i>	W.
<i>Lima, sp.</i>	D.
— <i>ornata, D'Orb.</i>	D.
<i>Janira quinquecostata, Sow.</i>	BH.
—, <i>sp.</i>	BH.
<i>Pecten rhotomagensis, D'Orb.</i>	D.
— <i>Puzosianus, Math.</i>	BH.
— <i>asper, Lam.</i>	BH.
<i>Trigonia, sp. (allied to T. sinuata, Park.)</i>	D.
<i>Rhynchonella dimidiata, Sow.</i>	D.
— <i>grasiana, D'Orb.</i>	D. BH.
— <i>Schlenbachii, Dav.</i>	BH.
<i>Terebratella pectita, Sow.</i>	D.
<i>Terebratula rugulosa, Morris</i>	D.

Bed 12.—Compact, nodular, rubbly bed, with green grains and quartz grains, in a chalky paste.

Thickness variable: 1 ft. at White Cliff, 2 ft. at Beer Head, 2 ft. at Weston, 2½ ft. at Dunscombe.

Characteristic fossils—*Catopygus carinatus* and *Ammonites varians*.

The top of this bed usually presents an uneven surface at its junction with the next above, the junction of the two being also marked in places by a ferruginous line.

May be seen at White Cliff and in all sections from Beer Head westward to top of Dunscombe cliff.

Fossils:—

<i>Bryozoa (many species)</i>	D. BH. Ax.
<i>Scyphia (species)</i>	D. BH.
<i>Spongia (several species)</i>	D. BH. Ax.
[These are mostly coated with green matter, and more or less covered with <i>Serpulæ</i> and the attached valves of <i>Crania</i> and <i>Plicatula</i> .]	
<i>Ananchytes subglobosus, Leske</i>	BH. &c.
<i>Catopygus carinatus, Goldf.</i>	BH. &c.
<i>Discoidea subuculus, Klein</i>	BH. D.
<i>Echinoconus (Galerites) castaneus, Brongn.</i>	D.
<i>Nucleolites lacunosus, Goldf.</i>	D.
<i>Pyrina Desmoulinii, D'Arch.</i>	D.
— <i>Prattii, Forbes</i>	BH.
— <i>ovulum, Ag.</i>	BH.
<i>Salenia gibba, Ag.</i>	BH.
— <i>petalifera, Desm.</i>	BH.
<i>Spatangus bufo, Brongn.</i>	BH.
— <i>lævis, Deluc</i>	D.
<i>Ammonites Mantelli, Sow.</i>	Ax.
— <i>Coupei, Brongn.</i>	Ax.
— <i>variens, Sow.</i>	WC. D.
<i>Nautilus Largillartianus, D'Orb.</i>	Ax. D.
— <i>Fittoni, Sharpe</i>	Ax.
— <i>lævigatus, D'Orb.</i>	Ax.

<i>Scaphites æqualis</i> , Sow.	WC.
<i>Turritites costatus</i> , Lam.	D.
— <i>Bechei</i> , Sow.	Ax.
<i>Avellana cassis</i> , D'Orb.	D.
<i>Fusus</i> , sp.	D.
<i>Natica</i> , sp.	D.
<i>Neritopsis</i> , sp.	D.
<i>Pleurotomaria</i> , sp.	Ax.
— <i>perspectiva</i> , Sow.	Ax. D.
— <i>cassisi</i> , D'Orb.	Ax.
<i>Pterocera</i> , sp.	BH. D.
<i>Solarium ornatum</i> , Sow.	Ax.
<i>Trochus cirrus</i> , Woodw.	D.
<i>Cardium</i> (allied to <i>C. Hillanum</i> , Sow.)	WC.
— <i>Mailleanum</i> , D'Orb.	WC.
— (Unicardium) <i>ringmeriense</i> , Mant.	D.
<i>Lucina turoniensis</i> , D'Orb.	D.
<i>Trigonia abrupta</i> (?), Buch.	D.
— <i>crenulata</i> , (?) Lam.	D.
— <i>sulcataria</i> , Lam.	D.
— (allied to <i>T. sinuata</i> , Park.)	Ax.
<i>Anomia</i> , sp.	BH.
<i>Exogyra columba</i> , Lam. (small var.)	Br. W.
<i>Janira quinquecostata</i> , Sow.	D.
<i>Lima</i> (allied to <i>L. intermedia</i> , D'Orb.)	D.
—, sp.	Ax.
— <i>ornata</i> , D'Orb.	Ax.
—, sp.	Ax. D.
<i>Mytilus ligeriensis</i> , D'Orb.	Ax.
— <i>Guerangeri</i> , D'Orb.	D.
<i>Ostrea carinata</i> , Lam.	D.
— (allied to <i>O. normaniana</i> , D'Orb.)	WC.
<i>Pecten asper</i> , Lam.	BH. Ax. D.
<i>Crania cenomanensis</i> (?), D'Orb.	Ax. D.
<i>Megerlia lima</i> , Defr.	BH. D.
<i>Thecidium</i> , sp.	D. Br.
<i>Terebratella pectita</i> , Sow.	D.
<i>Trigonosemus incertus</i> , Dav.	BH. D.
<i>Terebratula ovata</i> , Sow.	BH.
— <i>rugulosa</i> , Morris	BH.
— <i>squamosa</i> , Mant.	D.
— <i>obesa</i> , Sow.	Ax.
<i>Rhynchonella dimidiata</i> , Sow.	BH. D.
— <i>convexa</i> , Sow.	BH. D.
— <i>Grasiana</i> , D'Orb.	BH.
— <i>Mantelliana</i> , Sow.	BH.
— <i>Wiestii</i> , Quen.	BH.
— <i>Schlœnbachi</i> , Dav.	WC.

Bed 13.—Greyish or brownish chalk, with green grains, quartz grains and *phosphatic nodules*.

Thickness variable: 4 ft. at White Cliff, 5 ft. at Beer Head, 4 ft. at Weston Mouth, 2½ ft. at Dunscombe.

Characteristic fossils—*Discoidea cylindrica*, Lam., and *Rhynchonella Mantelliana*, Sow.

May be seen at White Cliff and in sections from Beer Head westward to top of cliff east of Salcombe.

Fossils:—

Astrea (?) BH.

<i>Micrabacia coronula</i> , <i>Goldf.</i>	Br.
Bryozoa	BH.
Sponge-nodules (phosphatic).....	BH. Ax.
<i>Cidaris</i> (spines and plates).....	Br.
<i>Discoidea cylindrica</i> , <i>Lam.</i>	Ax.
— <i>subuculus</i> , <i>Klein</i>	Ax. Br. BH.
<i>Echinocyphus difficilis</i> , <i>Ag.</i>	BH.
<i>Pseudodiadema variolare</i> , <i>Brongn.</i>	BH.
<i>Belemnitella</i>	BH.
<i>Ammonites Mantelli</i> , <i>Sow.</i>	Ax. D.
— <i>rhodomagensis</i> , <i>Defr.</i>	Ax. BH.
— <i>navicularis</i> , <i>Sow.</i>	WC.
—, sp.	BH.
<i>Scaphites obliquus</i> , <i>Sow.</i>	Ax.
<i>Turritites tuberculatus</i> , <i>Bosc.</i>	BH.
— <i>Bechei</i>	Ax.
<i>Area Mailleana</i> , <i>D'Orb.</i>	BH.
<i>Lucina turoniensis</i> , <i>D'Orb.</i>	BH.
<i>Janira quinquecostata</i> , <i>Sow.</i>	Br.
<i>Plicatula spinosa</i> , <i>Mant.</i>	D.
— <i>ventricosa</i> , <i>Goldf.</i>	D.
— <i>hippuritarum</i> , <i>D'Orb.</i>	Br.
<i>Rhynchonella dimidiata</i> , <i>Sow.</i>	WC.
— <i>Grasiana</i> , <i>D'Orb.</i>	D.
— <i>Mantelliana</i> , <i>Sow.</i>	BH. D. WC.
<i>Terebratula ovata</i> , <i>Sow.</i>	BH. D.
<i>Megerlia lima</i> , <i>Defr.</i>	D.

Note.—Many of the fossils of this bed seem to have been deposited in the condition of casts; and some at least of these may have been derived from a partial wearing away of the Chloritic Marl.

Bed 14.—Hard nodular chalk, with fine quartz grains.

Thickness variable: 4 ft. at White Cliff, 5 ft. at Beer Head, 2½ ft. at Dunscombe.

May be seen at White Cliff, Beer, Beer Head, and sections westward to Dunscombe.

Fossils :—

<i>Discoidea subuculus</i> , <i>Leske</i>	BH. D.
<i>Cardiaster</i> (allied to <i>C. rostratus</i> , <i>Forbes</i>)	BH.
<i>Ammonites Mantelli</i> , <i>Sow.</i>	BH.
<i>Rhynchonella Mantelliana</i> , <i>Sow.</i>	Beer.
— <i>limbata</i> , var. <i>robusta</i> , <i>Tate</i>	Ax.

Bed 15.—Creamy white or yellowish sandy chalk, semicrystalline. (The Beer Stone of the Beer quarries.)

Thickness variable: 5 ft. at White Cliff, 10 ft. at Beer quarries, 6 ft. at Beer Head, 2 ft. at Dunscombe.

Characteristic fossil—*Inoceramus mytiloides*, *Sow.*

May be seen in part from White Cliff westward to Dunscombe.

Fossils :—

<i>Ananchytes subglobosus</i> , <i>Leske</i>	Br. BH.
<i>Discoidea subuculus</i> , <i>Klein</i>	Ax. BH.
<i>Echinoconus</i> (<i>Galerites</i>) <i>castaneus</i> , <i>Brongn.</i>	BH.
<i>Inoceramus mytiloides</i> , <i>Sow.</i>	BH. Beer.
<i>Lima simplex</i> , <i>D'Orb.</i>	Br.

Bed 16.—Hard, nodular, sandy chalk, without flints; semi-crystalline in structure. (The Bastard Freestone of the Beer quarries.)

Thickness variable: 8 ft. at White Cliff, 14 ft. at Beer quarries, 14 ft. at Beer Head, 3 ft. at Dunscombe.

Prevailing fossil—*Inoceramus mytiloides*, Sow.

May be seen in part at White Cliff, in the Beer quarries, and in face of cliffs to west of Beer Head. Passes out in top of cliff to east of Salcombe Mouth.

Fossils:—

<i>Ananchytes subglobosus</i> , <i>Leske</i>	BH.
<i>Cidaris</i> , sp.	BH.
<i>Discoidea subuculus</i> , <i>Klein</i>	BH. BQ.
<i>Echinocephus difficilis</i> , <i>Ag.</i>	BH.
<i>Echinoconus</i> (<i>Galerites</i>) <i>castaneus</i> , <i>Brongn.</i>	BH.
<i>Micraster cor-bovis</i> , <i>Forbes</i>	Ax.
<i>Salenia umbrella</i> , <i>Ag.</i>	BH.
<i>Inoceramus Brongniarti</i> , <i>Sow.</i>	Br.
— <i>mytiloides</i> , <i>Sow.</i>	Br. Ax.
<i>Rhynchonella plicatilis</i> , <i>Sow.</i> , var.....	Beer.
— <i>Cuvieri</i> , <i>Brongn.</i>	Beer.

Bed 17.—Marly and, in places, nodular chalk, with flints. Chalk veined with bands of pale grey or yellow. Flints finger-like, dispersed. At base a zone of large flints.

Thickness about 10 ft.

Characteristic fossils—*Inoceramus mytiloides*, Sow., and *Micraster cor-bovis*, Forbes.

This portion of the chalk with flints may be seen at White Cliff, Beer, Beer Head, Branscombe, and Weston. It passes out near the top of cliff to east of Dunscombe.

Fossils:—

<i>Ananchytes subglobosus</i> , <i>Leske</i>	BH.
<i>Cidaris</i> (allied to <i>C. clavigera</i> , <i>Mant.</i> , spines and portions of).....	Br.
<i>Discoidea subuculus</i> , <i>Klein</i>	BH.
<i>Echinoconus</i> (<i>Galerites</i>) <i>subrotundus</i> , <i>Mantell.</i> ...	Ax.
<i>Micraster cor-bovis</i> , <i>Forbes</i>	Ax.
<i>Pseudodiadema Michelin</i> , <i>Ag.</i>	Ax. BH.
<i>Salenia petalifera</i> , <i>Desm.</i>	BH.
<i>Encrinure</i> (portions of)	Br.
<i>Oreaster</i> (portions of)	Br.
<i>Inoceramus Brongniarti</i> , <i>Sow.</i>	Axm. Br.
— <i>mytiloides</i> , <i>Sow.</i>	Br.
<i>Rhynchonella Cuvieri</i> , <i>Brongn.</i>	W.
<i>Terebratulula semiglobosa</i> (var. <i>subundata</i>), <i>Sow.</i> ...	BH.

Bed 18.—Chalk with numerous flints, mostly in layers. Chalk more or less nodular.

Thickness about 40 ft.

Characteristic fossils—*Holaster planus*, *Mant.*, and *Inoceramus Brongniarti*, Sow.

Occupies a considerable part of sections at White Cliff, Beer, Beer

Head, and Branscombe. Passes out at top of cliff to east of Branscombe.

Fossils :—

<i>Holaster planus</i> , <i>Mant.</i>	BH.
<i>Inoceramus Brongniarti</i> , <i>Sow.</i>	BH.
<i>Ostrea vesicularis</i> , <i>Lam.</i>	BH.
<i>Terebratula semiglobosa</i> , <i>Sow.</i>	WC.
<i>Rhynchonella Cuvieri</i> , <i>Brongn.</i>	BH.

Bed 19.—Hard chalk without flints.

Thickness about 15 ft.

Characteristic fossil—*Inoceramus Cuvieri*, *Sow.*

A greyish marly-looking band, of about 3 ft. thickness, occurs above the middle of this bed. Occupies part of cliffs at White Cliff, Beer, and Beer Head. Runs out near top of cliff to east of Branscombe Mouth.

Fossils :—

<i>Discoidea</i> (allied to <i>D. minima</i> , <i>Ag.</i>)	BH.
<i>Inoceramus Cuvieri</i> , <i>Sow.</i>	WC.
<i>Spondylus</i> , <i>sp.</i>	B.
<i>Terebratulina gracilis</i> , <i>Schloth.</i>	B. BH.
— <i>Martiniana</i> , <i>D'Orb.</i>	BH.
— <i>striata</i> , <i>Wahl.</i>	BH.
<i>Rhynchonella plicatilis</i> , <i>Sow.</i>	BH.

Bed 20.—White chalk with numerous flints.

Thickness about 60 ft. at Beer Head.

Characteristic fossils—*Galerites albo-galerus*, *Lam.*; *Micraster cor-anguinum*, *Gmel.*; *Terebratula carnea*, *Sow.*

Occupies upper part of cliffs about Beer and part of Beer Head.

Fossils :—

<i>Galerites albo-galerus</i> , <i>Lam.</i>	WC.
<i>Micraster cor-anguinum</i> , <i>Gmel.</i>	BH.
<i>Spondylus spinosus</i> , <i>Sow.</i>	WC.
<i>Ostrea</i>	WC.
<i>Crania ignabergensis</i> , <i>Retz.</i>	WC.
<i>Terebratula carnea</i> , <i>Sow.</i>	WC.
<i>Terebratulina gracilis</i> , <i>Schloth.</i>	WC. BH.
— <i>striata</i> , <i>Wahl.</i>	WC.

In the foregoing description many minor details, including purely local variations in the mineral condition of the deposits, have been necessarily omitted. The lists of fossils, also, include such species only as I have observed *in situ* in the beds described. These lists are consequently incomplete, and in some cases, as I am well aware, do not include one half the species obtainable.

II. Classification of the Deposits.

In attempting to classify these various deposits one meets with considerable difficulty. There is in the first place no well-marked base-line to the Devon Cretaceous system, the lowest beds, both lithologically and palæontologically, answering almost equally well

to Upper Greensand, Gault, or Lower Greensand. Then, again, the upper limit of the series is almost equally ill-defined.

Subject therefore to correction as to the age, or precise geological horizon, of the highest and lowest deposits, the grouping of the beds enumerated in the previous pages should probably be as follows:—

Beds 1 to 3 may represent collectively either Gault, or Gault and Lower Greensand (in part). They represent also, without question, the so-called “Greensand” of Blackdown.

Beds 4 to 9 inclusive are clearly Upper Greensand.

Beds 10 to 12, although attaining in the Beer-Head district a most unusual thickness, must be referred collectively to the so-called “Chloritic Marl” of the Isle of Wight.

These beds (10 to 12), in their mineral character especially, have much in common with the higher beds of the Greensand of Warminster. They include, also, amongst their fossils the greater portion of those usually quoted as Warminster species. There is little doubt, therefore, that the fossiliferous portion of the so-called “Upper Greensand” of Warminster is, properly speaking, “Chloritic Marl” instead of “Upper Greensand” as usually stated. And this point is of some importance.

Bed 13 represents the base-bed of the Chalk Marl, or that part of the Chalk Marl which, in so many localities, contains lumps and nodules of phosphatic matter.

In most of the Devon sections, as, indeed, in numerous other localities, beds 12 and 13 are distinctly separated. That is to say, the Chalk Marl (bed 13) rests on an uneven surface of the Chloritic Marl (bed 12). This, again, is a fact of much importance in its bearing on cretaceous geology, and one to which I propose to refer again in a separate paper.

Beds 14 to 17 represent apparently the Chalk Marl (in part) and the Lower Chalk (in part) of our more eastern counties. It is impossible, however, to say with certainty how much belongs to either.

Beds 18 and 19, as shown by their fossils, fall in, I think, undoubtedly between the Lower and the Upper Chalk, and are so placed, provisionally, in Table II.

Bed 20 is possibly Upper Chalk (in part). I cannot vouch, however, for its exact horizon.

III. *Relation of the Cretaceous Rocks of the Beer-Head district to those of certain other localities.*

This paper being intended simply as a general description, I have not thought it necessary to encumber it with special sections. In the absence of such sections, however, it may be as well to trace out briefly the relations of the more variable strata of the district under consideration to those of better-known localities. And here arises, once again, the question of the age of the lower deposits.

The age of the beds 1 to 3, which form the lower and most

argillaceous portion of the Devon Cretaceous strata, has been at various times very variously estimated.

Sir Henry de la Beche in 1826 * and again in 1839 † appears to have classified these strata with the Upper Greensand.

Dr. Fitton in 1836 ‡ makes them Lower Greensand.

Mr. Godwin-Austen in 1842 § described them as possibly "a sandy condition of the Gault."

In 1863 ||, and again in 1866 ¶, I attempted to show, partly on palæontological, partly on stratigraphical evidence, that these strata belonged to the top of the Lower Greensand rather than to the Gault or Upper Greensand. It is fair to say, however, that the palæontological evidence then chiefly relied on has proved far from trustworthy.

Mr. Etheridge, to whose opinion as a palæontologist every one may well bow submissively, places these beds on the horizon of the Gault, mainly, I believe, on the evidence of the Black-Ven section. At the present moment I am almost prepared to agree to his opinion. The sandy-argillaceous strata near the base of the Black-Ven section contain unquestionably a large number of Gault fossils; and there is full evidence of the continuance of similar strata to the westward; but, still, are these strata entirely Gault?

True Gault, such as one knows so well in the Isle of Wight, is to be seen near Punfield, in Swanage Bay, where it is underlain by a considerable thickness of the Lower Greensand. It is traceable as Gault along the coast-line as far westward as Mewps Bay. At Lulworth Cove it is to be seen no longer as Gault, which, in its argillaceous condition, has either thinned out or given place to dark greenish sandy strata with zones of large concretionary nodules.

These beds contain Gault fossils in abundance, and (what is well worthy of notice) pass upwards insensibly into Upper Greensand, and downwards into ferruginous sands of the Lower Greensand.

In the altered condition of the Gault as present at Lulworth, one finds, therefore, an approach already to the condition of the so-called Gault as seen at Black Ven. And there is no doubt whatever that Gault in such condition is present both at Black Ven and in the sections to the westward. But is this all? I think it possible that Lower Greensand, which, as we have seen at Lulworth, actually accompanies the Gault to its extinction as a clay-bed; may form a part also of the still doubtful strata to the westward. As to the correctness of this supposition, it is only fair to say I have no evidence whatever.

The Upper Greensand proper of the Beer-Head district (beds 4 to 9 in Table II.) exhibits to some extent a purely local development. The zones of sandstone pebbles or "shingle-beds" described by Mr. Godwin-Austen in 1842 **, for instance, and which form so marked

* Trans. Geol. Soc. ser. 2, vol. ii.

† Ord. Surv. Report, p. 237.

‡ Trans. Geol. Soc. ser. 2, vol. iv. p. 233.

§ *Ibid.* vol. vi. p. 449.

|| Geologist, vol. vi. p. 50.

¶ Geol. Mag. vol. iii. p. 13.

** Trans. Geol. Soc. ser. 2, vol. vi. p. 449.

a feature in the Beer-Head and other sections, are in great measure local. The recurrence of these shingle-beds throughout the several sections in the district, and their limitation to distinct and definite horizons, would seem, however, to indicate some special periods of disturbance. It is at least worth notice that the horizon of one of them is marked as far eastward as Lulworth by a layer of phosphatic nodules. These pebbles, in the Devon sections, are formed entirely of sandstone, and, as long since also suggested by Mr. Godwin-Austen *, would seem to have resulted from the destruction of Portland strata.

The sand-beds 6 and 8 of the Branscombe and Weston sections are also in so far peculiar to the Devon Upper Greensand, that they are scarcely represented either at Lulworth or in the Isle of Wight. It would appear, however, that both these beds exist to the westward, *Orbitolina concava*, Lam., and *Exogyra digitata*, Sow., their characteristic and common fossils, being present in the Haldon Hills †, in the Irish Greensand ‡, and, I believe, also in the greensand of Normandy.

The Chert-beds of the Devon "Upper Greensand," although greatly varying in thickness, are traceable continuously from the Dunscombe Cliffs to the Isle of Wight. From the Blackdown Hills they have been in great part denuded.

The Chloritic Marl of the Beer-Head section is remarkable (as already stated) on account of its unusual development, the beds 10 to 12 of Table II., which from their fauna and mineral character certainly represent the chloritic marl, having in the Beer-Head under-cliff a thickness collectively of not less than 20 feet. It is true that this thickness is exceptional, and that the beds diminish rapidly to the east and west of the Beer basin. Yet their presence in such local force is worth notice as illustrating the variable character of this division.

Judging from appearances, the Chloritic Marl of many of our coast-sections would seem to have been a deposit of slow accumulation. Indeed one may observe in it, in places, an almost entire change of fossils within the thickness of only a few inches. Such being the case, an occasional thickening of the strata, as at Beer Head, and possibly at Warminster, is far from unlikely.

In tracing these beds eastward, the threefold subdivision of the strata, as seen between Beer Head and Branscombe, becomes less and less apparent. It may be seen, however, although somewhat obscurely, in Pinhay Cliffs near Lyme Regis, at White Nore in the Isle of Purbeck, and more clearly in cliffs just east of Punfield Cove. At Chard and Chardstock the threefold subdivision of the strata has been well described by Mr. Davidson (Mon. Pal. Soc. vol. viii. p. 114), the beds IV., V., and VI. of the section therein given answering extremely well to beds 10, 11, 12 of the Beer-Head strata. Curiously enough, this section of Mr. Davidson's appears to have been taken by many continental geologists as a measure of the whole of the English Upper Greensand.

* Proc. Geol. Soc. vol. iv. p. 197. † Trans. Geol. Soc. ser. 2. vol. vi. p. 452.

‡ Quart. Journ. Geol. Soc. vol. xxi. p. 35.

The base-bed of the Chalk Marl (bed 13) with its phosphatic nodules, which is fairly represented in the Beer-Head district, is also traceable more or less continuously to the eastward. Sometimes, indeed, it *almost* merges into the Chloritic Marl; yet even then it is always traceable. Its upper bed, however (bed 14), and the succeeding representatives of the Lower and Upper Chalk (beds 15 to 20) are, on account of their local peculiarities of structure, far from easy to correlate with the thicker masses to the eastward. This difficulty of correlation is also increased considerably by the present ambiguity of the terms Upper and Lower Chalk. The term Upper Chalk, in its ordinary, text-book acceptance, appears hitherto to have signified chalk with flints. And this acceptance of the term would have been perhaps as good as any other if flints occurred only above a given horizon. That such is not the case is sufficiently evident. The chalk of Yorkshire, for example, contains flints on a lower geological horizon than that of Sussex or of Hampshire. Now it is evident, as shown by its fossils, that the chalk of the Dorset and Devon sections contains flints at an exceptionally low geological horizon. Mr. Whitaker, in a recent communication to the Geological Society (Quart. Journ. Geol. Soc. vol. xxvii.) has pointed out this fact very clearly where (pp. 95 & 96) he refers to the presence of flints in the Chalk Marl itself. It is clear, therefore, that the beds above the Chalk Marl in the Devon sections are, from their exceptional character, exceedingly difficult to correlate with their true equivalents to the eastward.

Taking bed 13 as the true base-bed of the Chalk Marl, bed 14 must at the least be added to that division.

Beds 15 and 16, which include the Beer Stone, will then fall in the Lower Chalk. And in this point I fully agree with Mr. Whitaker. But I believe the lower part of the chalk with flints (beds 17 and part of 18) of the Beer section to be also Lower Chalk, as compared with that of Surrey and the Isle of Wight, and that, as above stated, the flints are here below their ordinary level*. It is bed 17 which caps the cliffs to east and west of Branscombe, and which, by a partial thinning-out of the intermediate strata, is brought down in places so nearly on the Upper Greensand.

The succeeding portions of the chalk of the Beer district (beds 18-20) I have had too little opportunity of studying to describe with confidence. I may say, however, that the zones of fossils are fairly marked, and that these appear to indicate the presence of a considerable portion of the higher chalk.

On comparing the Devon cretaceous system with that of the north-east of Ireland as described by Mr. Ralph Tate (Quart. Journ. Geol. Soc. vol. xxi. p. 15), one can hardly resist the supposition that the two series were originally connected. There is at the same time, however, so marked a difference in the distribution of their respective faunas, that one must question either their former actual connexion or the horizons at present assigned to the Irish strata.

* *Vide* a paper on the Surrey Chalk, by Caleb Evans, Esq., F.G.S. (Proc. Geologists' Association for 1870).

These cretaceous rocks of Ireland have been referred by Mr. Tate to two formations—"the Hibernian Greensand, and the Upper Chalk," the term "Hibernian Greensand" being applied to the cretaceous beds underlying the Upper Chalk of Ireland.

The Hibernian series, says Mr. Tate, "forms three lithological zones, each with its own suite of organic remains." For their full description, however, I must refer the reader to the original paper.

Now, of these three zones, the lowest, or "Glaconitic Sands" of Tate, apparently represents to some extent the beds 1 to 3 of the Devon sections.

The succeeding "grey marls and sandstones with chert" clearly represent the true Upper Greensand, in part (beds 4 & 5), of the Devon sections.

The "chloritic sands and sandstones" forming the upper part of the Hibernian Greensand would seem by some of their fossils to represent the beds immediately beneath the Chloritic Marl (beds 6 to 9) of the Devon sections. They contain, however, apparently a singular mixture of species, and are consequently not easy to correlate. And the same must be said, I think, with respect to the so-called Upper Chalk.

IV. *Conclusion.*

Taken as a whole, then, and in spite of the as yet doubtful age of the lowest and highest deposits, the Beer-Head and contiguous sections of the Devon Cretaceous strata present collectively a highly important section. One may observe here, as probably nowhere else in one continuous section, the true relation of the fossiliferous Blackdown strata to those of Warminster, and, what is at least almost equally important, the relation of both of these beds to that of the true Upper Greensand of the Isle of Wight.

The "Blackdown beds" in these sections underlie most clearly the true Upper Greensand, and hold (apparently) the *position* of the Gault or of the Gault and Upper Neocomian in part.

The "Warminster beds," on the contrary, are seen to cap the Upper Greensand, and are therefore in reality Chloritic Marl.

If, then, the above should prove to be a correct reading of these Devon sections, it cannot but affect to some extent the use of the term Upper Greensand; and I submit that such term should be applied exclusively, as far as possible, to beds between the Gault and the Chloritic Marl, and that the Chloritic Marl should be considered a distinct division.

TABLE I.—*Showing the Distribution and Range of the Fossils enumerated in this Paper.*

Note. + denotes that a species is abundant, — that it is less abundant, and o that it is rare.

[illegible]

BEER HEAD AND THE ADJACENT CLIFF-SECTIONS.

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[illegible]

BEER HEAD AND THE ADJACENT CLIFF-SECTIONS.

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[illegible]

TABLE I. (continued).

	? Gault.		Upper Greensand.							Chlor. Marl		Chalk Marl.		Chalk.						
	Blackdown beds.									= Warminster beds.				Lower. Middle. Up- per.						
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.
CERHALOPODA.																				
Ammonites Coupei, Brongn.																				
— Mantelli, Sow.																				
— navicularis, Sow.																				
— rhotomagensis, Deffr.																				
— varians, Sow.																				
— , sp.																				
Belemnitella																				
Nautilus Fittoni, Sharpe																				
— Largillartianus, D'Orb.																				
— lavigatus, D'Orb.																				
Scaphites equalis, Sow.																				
— obliquus, Sow.																				
Turritiles Bechei, Sow.																				
— costatus, Lam.																				
— tuberculatus, Rosc.																				
CRUSTACEA.																				
Callianassa ?																				
PISCES.																				
Lamna, sp. (teeth of)																				

TABLE II.—*Illustrating the Succession of the Cretaceous Strata near Beer Head, Devon.*

Divisions.	No. of Bed.	Minor Divisions.	Approximate Thickness.	Zones of Fossils.
Chalk.	Upper (P.)	20. White chalk, with flints	ft. 70	Micraster cor-anguinum.
		19. Chalk, without flints	15	Terebratula carnea. Inoceramus Cuvieri.
	Middle.	18. Hard chalk, with flints in layers.	40	Terebratula semiglobosa. Inoceramus Brongniarti.
		17. Marly chalk. Flints finger-like, dispersed.	10	Holaster planus. Inoceramus mytiloides. Micraster cor-bovis.
	Lower.	16. Nodular sandy chalk, without flints; semicrystalline.	14	Rhynchonella Cuvieri.
		15. Cream-coloured sandy chalk; semicrystalline.	10	Inoceramus mytiloides.
	Chalk Marl.	14. Hard nodular chalk, with quartz grains.	5	Discoidea subuculus.
13. Greyish nodular chalk, with quartz grains, green grains, and <i>Phosphatic Nodules</i> .		5	Ammonites Mantelli. Discoidea cylindrica. Rhynchonella Mantelliana.	
Chloritic Marl. (Warminster beds.)	12. Compact nodular bed, with green grains and quartz grains in a chalky paste.	2	Ammonites rhotomagensis. Scaphites æqualis. Holaster subglobosus. Catopygus carinatus.	
	11. Yellowish quartzose grit in a chalky paste.	3	Rhynchonella dimidiata. Terebratula pectita. Exogyra columba (small var.).	
	10. Rubbly, yellowish, quartzose grit in a chalky paste.	15	Siphonia. Nautilus lævigatus. Discoidea subuculus.	
Gault. (Black-down beds.)	Upper Greensand.	9. Buff-coloured sandstone and grit-beds, with fine green grains.	20	Orbitolina concava. Exogyra digitata, Sow.
		8. Buff-coloured sands	10	
		7. Shingle-bed of sandstone-pebbles.	2	Exogyra digitata, Sow.
		6. Light-coloured sand and sandstone.	2½	
		5. Chert-beds, in light-coloured sand.	20	Exogyra columba. Janira quadricostata.
		4. Yellowish marly sands, with irregular concretions.	20	Exogyra columba. Janira quadricostata. Pecten orbicularis.
		3. Greyish marly sand, with nodular concretions.	30	Exogyra conica. " lævigata.
		2. Sands, with green earth (argillaceous).	25	Blackdown fauna. Inoceramus sulcatus, Sow.
		1. Greenish-grey sands and grit-bed.	3½	Exogyra conica (small var.).