

ORDINARY MEETING, APRIL 4TH, 1871.

The Rev. THOMAS WILTSHIRE, M.A., F.G.S., &c., President, in the Chair.

The following Donations were announced :—

- “ Abstracts of Proceedings of the Geological Society,” from that Society.
- “ Journal of the London Institution,” from that Institution.
- “ On the Denudations of Norfolk,” by the Rev. Osmond Fisher, M.A., F.G.S., from the Author.
- “ On the Coprolite Pits of Cambridgeshire,” by the Rev. Osmond Fisher, M.A., F.G.S., from the Author.

The following were elected members of the Association :—

W. Phipson Beale, Esq., F.G.S., F.C.S.; William Henry Corfield, Esq., M.A., M.B., F.G.S., F.C.S., Fellow of Pembroke College, Oxford, Professor of Hygiene in University College, London; F. G. Hylton Price, Esq., F.R.G.S., M.A.I.; and Charles Westendarp, Esq.

The following Papers were read :—

1. On the English Crags and the Stratigraphical Divisions indicated by their Invertebrate Fauna.*

By ALFRED and ROBERT BELL.

For some years the divisions originally proposed for the Pliocene strata in England were accepted without question, but in process of time it began to be doubted whether the Norwich, or Fluvio-marine

* Since this paper was read, so much fresh information has been obtained from various sources in support of the propositions laid down, that I have found it necessary to revise and amplify it, incorporating in it the latest results obtained by my brother and myself. None of our views have been altered in this revised paper.—ALFRED BELL.

Crag could be considered as being newer than the adjacent Red Crags, which latter had never been found underlying it. From the first the superposition of the Red Crag upon the older Coralline was admitted to be an indisputable fact.

Still later, the peculiar sub-divisions or groups known as the Chillesford Sands and Clays were discovered by Mr. Prestwich, and, till the paper referred to below was read before the Geological Society of London, these divisions, *i.e.*, the Coralline, Red, and Norwich, or Fluvio-marine Crags, and the Chillesford Sands and Clays, were considered to be the horizons indicated both by the palæontological and physical phenomena. In this memoir, Mr. Prestwich has reduced the formations to two, the Lower being the Coralline Crag, and the Upper, or Red Crag, composed of all the strata hitherto grouped as the Red Crag, the Norwich Crag, and the Chillesford Series, the last-named forming the upper division. As regards the fauna, especially the Mollusca, many of the shells in the Red Crag were considered to be derived from the waste of the older Coralline ;—thus reducing the species of the Upper Crags to a greater homogeneity in *facies*.

Having carefully tabulated for some years past the fossils from different localities in this district, we were constrained to differ from the conclusions arrived at by the writer, as our results did not coincide with his ; and we proposed the following arrangement and nomenclature for the deposits in question, dissenting from the ordinary terms employed, as not being explicit enough, and being, moreover, calculated to mislead the enquirer, the colour not being confined to one group, nor the local conditions (fluvio-marine) to another.

We allotted the horizons, thus :—

Preglacial, or Chillesford Series, comprising the Chillesford Sands and Clays, and the Forest and Elephant Beds of the coast.

Upper Crag.—The Fluvio-marine of Norfolk and Suffolk, and such part of the Red Crag as will be hereafter indicated.

Middle.—The older Red Crag, including its extension into Essex ; and the

Lower, or Coralline Crag.

Our chief calculations were based upon the Mollusca, but not

exclusively. The annexed table gives the nett total of the organic remains at present known to us :—

SUMMARY.	Lower Crag.	Middle Crag.	Upper Crag.	Chillesford Crag.	Forest Bed.
Terrestrial Mammalia... ..	5	19	18	4	36
Marine Mammalia	4	24	3	2	3
Aves	1	...	1	...	...
Pisces	13	9 ^p	6	2	2
Insecta ... ..	...	...	...	...	2
Crustacea (Excl. Entom. & Cir.) ...	9	2	1	1	...
Entomostraca	18	4	...	...	...
Cirripedia	9	9	6	3	...
Annelida	12	4	3	2	...
Echinodermata	17	13	3	3	...
Land and Fresh Water Mollusca ...	...	3	27	11	36
Marine Gasteropoda and Solenoconcha	200	198	150	52	...
Opisthobranchiata	16	6	5	4	...
Pteropoda	1	...	...	...	...
Lamellibranchiata	169	149	96	74	...
Brachiopoda	5	1	3	...	...
Polyzoa	125	47	5	3	...
Cœlenterata	3	5	2	...	...
Spongida... ..	1	2	10	...	...
Foraminifera... ..	97	20	10	5	...
Plantæ	2	1	...	1	15
Total of each formation	707	516	339	167	94

Before entering upon the description of the Crag, we would remark that we were and are still of opinion "that a well defined variety, one easily recognisable, and accepted as a distinct species by the majority of naturalists, or even one that is the characteristic form in other seas or formations, is of as much value, both geologically and palæontologically, as a specific type." The necessity for this is easily seen. *Tellina Benedenii*, *T. obliqua*, and *T. prætenuis* have been considered as varieties of *T. calcarea*. All these precede the type in time, and are all extinct, but the latter is a plentiful form in Northern Seas of the present day. Under such circumstances to remove them from our lists (as being only varieties) would be manifestly unsafe. This is but one example. *Purpura tetragona* is another.

Another question that has been raised is, what species, and how many, are derived from the destruction of the older beds. In the Red Crag, amongst the shells, Mr. Wood considers 25, Mr. Prestwich 46, and Mr. Jeffreys 13 species to come into this class; but for ourselves we came to the conclusion that, while some individual speci-

mens might be extraneous, there was not sufficient evidence to justify the removal of an entire species from this formation*—but this point we shall dwell upon more at large hereafter.

The elevation of the sea bed in the southern part of the area (that which now constitutes the present German Ocean), resulted in the formation of a deep and quiet gulf, teeming with life, especially rich in shells and Echini, the deposits formed on the western side of this gulf now constituting the Coralline or Lower Crag, but between the life of this Crag sea and that of the earlier Diestien one a great difference obtained, indicating considerable changes, and a lapse of time during which many alterations took place, several genera of the more southern types disappearing, such as *Conus*, *Oliva*, *Pseudoliva*, and *Ancillaria*.

As defined by Mr. Charlesworth, the area (including outliers) of the Lower Crag extends from Aldborough to Tattingstone. How far eastward the gulf extended cannot be told, but from the absence of this formation in Belgium and Holland, and the direct superposition of the "Sables Gris" upon the Diestien Sands, it is probable that the line of the Belgian sea coast was more out to sea than it is at present.

The most prominent exposures of the Lower Crag are in the neighbourhoods of Aldborough and Orford, and in Sutton and Ramsholt parishes. Nearly all these deposits are slightly diversified in their fauna, according to the depths at which they were formed.

Like the succeeding horizon (Middle Crag), the base of this Crag consists of a layer of nodules or "box stones," coprolites, London Clay fossils, bones, teeth, and vertebræ of various animals,† terrestrial and marine, succeeded by bands of marly sands, containing large molluscs. These bands yield *Cassidaria*, *Pyrula*, *Voluta*, *Triton*, *Ovula*, *Buccinopsis*, *Panopæa*, *Ostrea*, *Cyprina*, *Cardita*, *Pecten (maximus)*, *Terebratula*, and others, also *Echinus Woodwardii*, *Balanus concavus*, and *Flabellum Woodii*, in tolerable abundance. Unfortunately they are seldom exposed. Next come sands containing the smaller Mollusca, as at Gedgrave. These are plentifully intermixed with small Polyzoa at Sutton. In Sudbourn Park, at Aldborough, and at Sutton, the upper members of the

* Except those derived from the Black Sands. See p. 190.

† Prestwich, "Quart. Journ. Geol. Soc.," Vol. xxvii., p. 117.

series consist of sands and broken shells, in some places consolidated into a close hard building stone, containing Echini and Crustacea.

The thickness of the entire series has been variously estimated from 40 feet (Wood) to 80 feet (Prestwich). Some of the beds in the memoir just cited appear to be concurrent, owing their difference in structure and contents to local conditions only.

Cetacean remains of large size are not uncommon in the Lower Crag, also teeth and ear bones, belonging to various species of sharks and other fishes, mostly gadoids.*

Whether the terrestrial Vertebrata found associated with them are of the same age is an open question; we cannot see any objection to their being considered so.† A land fauna there must have been, and the animal types must have approached very closely those which have been found. A slender limb bone of a small deer and another of a bird were obtained by Colonel Alexander, from Orford, and are unmistakably non-derived. It is a singular circumstance that while the greater number of the Echini, Corals, Polyzoa, and Entomostraca are extinct, more than half the shells and Cirripedia and the whole of the Crustacea called by Professor Huxley the Podophthalmia, are recent.

As bearing upon the depth of the Crag Sea, it may be noticed that most of the forms of the Mollusca which the recent deep-sea dredgings have proved to be living and not extinct as supposed, were only found at very great depths.

In descending order the several zones of the Lower Crag appear to be characterised by the following Echini:—

1. *Spatangus purpureus*.
2. *Temnechinini* of various species, *Echinus sphæra*, *Echinocyamus*, 2 sp.
3. *Spatangus regina*, *Brissus*, *Amphidetus*, and *Echinus Woodwardi*.

The Mollusca are very pure; we are not aware of a single species, which, like some of the Middle Crag forms, can be considered derived from an older bed, whether Diestien or Eocene. A few fossils of older date are occasionally found. We obtained a fine unrolled Neocomien Ammonite, six inches across, from Sudbourn Park, imbedded amongst the Polyzoa.

The original object of this paper was to show, that contrary to

* The presence of the whale barnacle (*Coronula barbata*) in the Middle Crag is sufficient to prove the Cetacea integral parts of that fauna, as it *only* lives embedded in the animal's skin.

† These remarks also apply to the Mammalian remains in the succeeding group.

the opinion held by many that the fauna of the Red Crag was indivisible, and that no difference could be substantiated in the layers of strata forming this deposit, and that of the adjacent Fluvio-marine Crag, it was *possible* to define very sharply the line of demarcation, and this we shall now endeavour to do, first dismissing the question of derivation.

In this section of the Crag many extraneous fossils occur, and they serve a very useful purpose. Amongst them may be stated to be the so called coprolites (nodules of phosphatic clay frequently enveloping an Eocene organism), the "box stones" of Diestien age, mammals, crustaceans, fishes, shells (a few), and other remains, both of Secondary and Tertiary (Eocene) age. Mixed with them are a few shells of the Belgian Black Sands, and five or six species of plants.*

The value of these remains in determining the horizons of the Crag is very great. They abound (except the Black Sand shells) in the Lower Crag, and also in the Middle, but in the Upper Crag they are rarely found. They also appear to have been chiefly deposited in deep water, the shallower deposit at Walton-on-the-Naze containing very few examples of this class. It is not, however, so much with these as with the fossils of the preceding Coralline Crag that the question has to do. It has been asserted, with very great force and probability, that as the soft rock of the Lower Crag was subjected to considerable erosion by the wash of the Red Crag sea, necessarily many of the remains imbedded therein must have passed into and become intermingled with those organisms that were then living in and on the sandy bottom of the sea and its shores. This argument is also supported by the worn appearance of the remains. The Walton-on-the-Naze deposit was considered for a long time as *the* typical undisturbed sea bed in which the fossils were undoubtedly native, the bivalves being frequently found in pairs, the univalves with the most delicate part, the apex (the first portion to go in any rolled specimen and frequently lost in the life time of the animal) uninjured. Colour, scarcity, and badness of condition are also suggested as indicative of derivative origin.

Accepting Walton-Naze as a typical deposit, we noticed first, that our lists contain altogether 170 shells from this locality, 116 being common to the older Crag. Secondly, that many species of

* The Middle Crag plants are given on the authority of Mr. Carruthers, of the British Museum.

bivalves occur double and *in situ*, not only at Walton, but also at Sutton, Foxhall, Waldringfield, Shottisham, Ramsholt, Bawdsey, and, indeed, nearly everywhere else, at various times, not in single specimens but in dozens, and even in hundreds.

The most striking testimony to the non-derivation of the Brachiopoda is in their situation. They are almost invariably, like many of their congeners of the present day, grouped around, or in the vicinity of large stones, to which they had probably been attached during life.

Again, many of the species differ in many points from their fellows in the Lower deposit. *Cardita senilis* loses much of its beauty of form in the higher Crag, being coarser in texture and build, and frequently much larger; and the *Terebratula* is an example of a variety which does not occur at all in the Lower Crag.

Perfection in the univalves is by no means confined to Walton. Many of the most beautiful specimens we have seen come from other localities, especially in the genera *Cassidaria*, *Pyrula*, *Cancellaria*, *Fusus*, *Emarginula*, *Scalaria*, and *Ovula*.

The worn condition of many specimens does not avail in a question of this kind. Nearly any sea coast will furnish such examples in plenty, and also many single valves. Broken and worn examples are still more plentiful in dredgings taken below low water mark. The peculiar nature of the matrix really has more to do with the condition of the shells than anything else, decortication being a common feature in these beds.

It would be reasonable to expect that if a fauna was in any part derived, the best evidence would be obtained where the faunas meet, that is to say, where the two deposits adjoin. We shall have occasion to notice presently a very striking example of this kind. We refer to the well-known outlier of Coralline Crag at Sutton, where we believe the whole question of the succession of the Craggs is to be wrought out. At present it will be sufficient to say that, neither in the pit in the Bullock-yard,* or in the pit on the opposite side of Coralline Crag Hill,† are to be found many of the commonest fossils of the Lower Crag, upon which the seas of a later time beat. Were the fossils of the Upper Craggs derived, here we ought to find good and sufficient evidence; but in the absence of such evidence we contend that the theory of derivation is untenable, as being based upon insufficient grounds.

* Prestwich, "Quart. Journ. Geol. Soc.," vol. xxvii. Pl. VI., Fig. I., Pit D.

† Idem, Pit G.

The stratification of the Crag in this horizon is exceedingly indefinite, false bedding and oblique lamination being the rule; horizontal layers seldom occurring. The false bedding is probably due to the many changes produced by local shifting currents and sand banks, and the oblique laminations may perhaps partially mark the slopes of the sea bottom.

The distribution of life in this sea was to all appearance similar to that in the present. If a great and wide reconstruction of the sea-bed had taken place, we should find that the organisms were much more intermixed than they appear to be. According to local conditions either of depth, soil, nature of feeding grounds, shelter, &c., so the distribution varies.

The Brachiopoda are, as before mentioned, in groups larger or smaller, and vary in length from a quarter to three inches. The *Gastranæ* and *Myæ* are imbedded in sandy mud, siphonal ends uppermost; the *Pholades* and *Saxicavidæ* in their cells, as at Waldringfield and Foxhall;—at the Sutton pit G. (see Prestwich, op. cit.), the latter are free in the sand. It is not at all uncommon to find the cavities occupied by two or more individuals, as if when one animal had died another made use of the accommodation already provided for him. *Kellia*, *Tapes*, and *Modiolaria* are the genera mostly found in these appropriated tenements. The mussels and cockles are end up side by side, or closely packed in their several places, with the more solitary species interspersed amongst them. In this state are the Rock Oyster and *Pecten maximus* found. Very rarely the large *Panopæa* and *Lutraria* are obtained. Univalves are less gregarious, but even these are grouped, though perhaps irregularly; and it is remarkable that many forms are peculiar to different localities. *Purpura tetragona* is abundant at Walton, but less so elsewhere. *Fusus contrarius*, and *Fusus antiquus* each have their several haunts, and so it is with many other species.

Occasionally the shells are heaped up without order; broken univalves, parted bivalves, and comminuted fragments of all classes of the animal kingdom abounding. At Walton-Naze, Shottisham Creek, Ramsholt, and Butley, the shells are better preserved and more assorted. Walton particularly has its beds of *Pectunculus*, *Artemis*, *Mactra*, and another (rarely found) that may be called the *Actæon* and *Echinus* bed. These occur in the order given, the *Pectunculus* band being the lowest.

The area occupied by the Newer (*i. e.*, Middle and Upper) Crag is of considerable extent. In the south its outliers are at Walton-

Naze and Beaumont, in Essex, the main mass stretching from the north side of the Orwell to Tattingstone and Bentley; on the north it is more irregular, comprehending the beds known as the Fluvio-marine Crag of "Thorpe and Bramerton, Wangford Bulchamp and Thorpe near Aldborough" (Wood and Harmer).

This area is more or less three hundred square miles in extent, and it is a disputed question as to whether the strata in this district is one homogenous deposit, the organic changes in which are simply due to lapse of time and climatic changes; or if, on the other hand, two distinct periods are indicated either by their physical conditions or palæontological contents. We contend for the latter, but many far better known geologists than ourselves incline to the former view.

In working out this point, we adopted the following plan, viz., the keeping a record of the fauna yielded by certain pits and sections. These comprised Walton-on-the-Naze, Waldringfield, Sutton (Pits D and G of Mr. Prestwich's plan), Butley Neutral Farm pit, Butley Mill and the Chillesford Stack-yard pits, and others less persistently examined at Bentley, Bawdsey, Felixstow, Shottisham, Butley Abbey, and also other pits in the Norwich Fluvio-marine Crag localities, our collections embracing everything we could find. On collating these lists, we found that in the Red Crag two distinct groups were indicated—the older characterised by the great abundance of its coprolites, its mammalian fauna, the presence of London Clay fossils, and, above all, by the great number of forms held in common in this and the Lower Crag. At Walton-on-the-Naze alone, out of 170 shells 116 are common to the Coralline Crag, as just stated, and this is in a section which is generally allowed to be a typical one containing a typical fauna.

The Upper division is chiefly noticeable for the absence of the mammalian fauna (in its marine aspect), coprolites, box stones, and Eocene fossils, for the few species that are extinct, and for the great abundance of northern and Arctic forms, agreeing in this respect with the Fluvio-marine Crag, nearly every species of which (except some of the land and freshwater shells) is found in the Newer or Upper Red Crag.

We further found that each horizon had its aspects of deep and shallow water, and this appeared to us to explain much of the discrepancy in the faunas of the different localities. The deepest water of the older (our Middle) Crag sea was in the Waldringfield, Sutton, and Shottisham districts, and the shallowest at

Walton-on-the-Naze. Waldringfield and Sutton are distinguished by their *Terebratula* and corals, Shottisham by its fine shells and Polyzoa. Walton-Naze containing but few box stones, only a few worn Brachiopods (single valves), with a general absence of the deeper water forms.

In the Upper division occurred another Brachiopod (*Rhynchonella psittacea*), a small group of three specimens and an odd valve in close proximity to a large stone; *Fusus Largilliertii*, *F. Turtoni*, a very large *Natica* (? sp. indet), and a few Polyzoa and corals of the same species as in the lower group (*Flabellum* excepted), but of much smaller size.

The recent deep-sea dredgings have shown that deep-sea life is more persistent in time than that of shallow water. This is in favour of our argument, because the greatest number of forms common to the horizons of the Middle and Upper Crag, are found in the deep sea zones. The shallower deposits of Walton-Naze and Butley are widely apart in their fauna.

This appears very much in the Echini, most of the Walton species being extinct, while those of Butley are recent. Of the twelve species of Radiata two only are common to both horizons. A study of the lists at the end of this paper will shew the species proper to each division; and we need only notice here the peculiarity of facies connected with each division. Thus, the older indicates a warm and genial climate, similar to that of Southern Europe. *Ostrea cochlear*, *Lima inflata*, *Modiolaria*, *Petagnæ*, *Limopsis aurita*, *L. pygmæa*, *Chama gryphoides*, *Isocardia cor*, *Venus chione*, *Lucinopsis Lajonkairii*, *Tapes texturata*, and *Macra glauca*, amongst the bivalves, and *Cancellaria*, *Pyrula*, *Nassa prismatica*, *Pleurotoma lævigata*, *P. carinata*, *Mitra ebenus*, *Ovula*, *Vermetus glomeratus*, *V. triquetra*, *Dentalium rectum*, in the univalves, being good evidence in favour of this supposition.

In the newer horizon the characteristic shells are *Cardium Greenlandicum*, *Leda hyperborea*, *L. myalis*, *Acila Lyallii*, *Fusus Largilliertii*, *F. Turtoni*, *Pleurotoma bicarinata*, *Columbella avara*, *Amaura candida*, *Natica borealis*, *N. occlusa*, and others equally northern in their distribution.

The difference is equally apparent in species common to the two deposits. Though common to both, their distribution is very unequal. Many forms, such as *Murex tortuosus*, *Acila Cobboldæ*, *Leda lanceolata*, *Tellina lata*, &c., are abundant in the one horizon, and represented by individuals only in the other.

There does not appear to be any decided reasons why the mammalian fauna should be relegated to a greater antiquity than the beds in which they are found, and we do not think that any advantage is gained to science by raising the question, it being one that is practically unsolvable.

Before leaving this part of the subject, we would call attention to the fauna of the other side of the Crag Gulf. Between our own Coralline and Red Crag a great hiatus occurs in the faunas, but on referring to Nyst's list from the "Sables Gris" it will be seen that a number of species which we consider typical of the individual Craggs are associated together, and help to bridge over the interval. These sands may indicate a change in the sea bottom brought about in this way. Suppose that when the Lower (Coralline) Crag was being elevated the Belgian area was being depressed, till the relative positions of land and water were reversed. The "Sables Gris" being deposited in this depression, the slow re-submergence of the Coralline Crag would first permit the *Pholas* to form its crypts between high and low water mark, till, when deep enough, the Cetacea, so common in the oldest Red Crag, and the Belgian "Sables Jaunâtres," which overlie the "Sables Gris," would roam in and about the reefs and coast lines thus produced.

The Middle Crag was not traced by us further north than Hollesly and Butley Abbey, and generally speaking, is not seen to be overlaid by the Upper Crag, as before mentioned, and the great objection to the Norwich Crag being considered newer than the Red was chiefly owing to the fact that instances of superposition were unknown. We are still unable to speak authoritatively on this head, nevertheless an endeavour will presently be made to show that this super-position does obtain.

Returning to the structure of the Red Craggs at Walton and Waldringfield, the oldest or basal portion is a zone of nearly pure sand, containing double bivalves of species, some differing from those of the Coralline Crag, others agreeing. This at Waldringfield is succeeded by the coprolitic beds, with their various anomalous contents.

As in other parts of the Red Crag district, the matrix is composed of sands and clays, full of comminuted material, and largely coloured by hydrous peroxide. The presence of this staining principle is occasionally manifest in both the Coralline and Fluvio-marine Craggs, and is not unfrequently absent in the so-called Red

Crag, and this uncertainty has caused much of the perplexity in determining the age of some of the deposits.

In the Upper Crag the presence of fresh-water and estuarine conditions is indicated by the abundance of fresh-water and land animals and shells. The Norwich geologists have disinterred many species (see lists), amongst others, the common fox, otter, beaver, and water-rat, the pike, the common seal, a whale or two, and traces of birds. The fauna begins to alter at Butley, *Scrobicularia* coming in in abundance at Chillesford and Tunstall, becoming more marine again across the Iken ridge at Thorpe, and reverting to its estuarine state at Bramerton and further north.

It is on the shores of the Deben River that the changes in the fauna are most apparent, and the division of the Red Crag into two groups most clearly shown, and this we shall now refer to, using Mr. Prestwich's plan of the district round the elevation of Coralline Crag, termed by him Coralline Crag Hill. This point is selected for illustration chiefly because it is the only place we know of where the Lower, Middle, and Upper Crag are in apposition, and so well defined.

The central elevation or hill is composed of the upper beds of Coralline Crag, resting upon a wide-spreading base of the lower zones, with large shells and *Balani*, subtending from the face of the cliff to the River Deben, forming its bed wholly or partially, and extending for some distance on each side of the cliff. This elevation has an irregularly oval shape, with one end sloping obliquely to the river, and against it rests *two* separate and distinct sections of a Red Crag on the same level, but *not* connected by any intermediate patches.

On the side of the hill furthest from the river is the well-known pit in the Bullock Yard, the fossils of which agree with those of the adjacent pits on the same side of the hill. At the corner of the hill, and round the river face, are the fine sandy small shell and Echini beds. Next is a face of very hard indurated Coralline Crag, highly coloured, and cemented by an infiltration of iron. This contains large Echini, *Spaiangus* for the most part. Then follows another pit (G), and, lastly, a (now filled in) pit sunk into the Coralline Crag in search of the coprolite. In the paper so often referred to, these two Red Crag pits are treated as of one stage, but our own observations point to the contrary.

We have just stated that there are no indications that the two pits are of one age, except that they occur on the same level, Coralline

Crag, both in the face of the hill and from its base to the river, being the surface rock. This of itself would signify nothing, because, if the Red Crag had originally wrapped round the older islet, the same sea which gave the hill its present form might have scarped the whole face of the cliff, leaving these two pits as memorials of a former condition; yet, taken into connection with the life bearings of the separate pits, the conclusion appears to be obvious that they are of different ages.

To demonstrate this a short list of the fossils peculiar to each pit is given, excluding any of which even only single specimens have been found common to both. We may notice, however, one great peculiarity, viz., that in the one pit the *sinistral* form of *Fusus antiquus* is the rule, and the *dextral* form in the other. The older list includes a few of the fossils from the closely-adjoining Sutton coprolite pits, as well as from pit D. The difference between the faunas, as a whole, will be seen in the full lists at the end.

BULLOCK YARD PIT.

<i>Temnechinus turbinatus.</i>	<i>Fusus consociate.</i>
<i>Echinarachnius Woodii?</i>	„ <i>elegans.</i>
<i>Ostrea princeps.</i>	<i>Buccinum glaciale.</i>
<i>Pecten Westendorpianus.</i>	<i>Desmoulea conglobata.</i>
<i>Hinnites giganteus.</i>	<i>Pleurotoma intorta.</i>
<i>Limopsis aurita.</i>	<i>Natica cirriformis.</i>
<i>Chama gryphoides.</i>	„ <i>helicina.</i>
<i>Lucinopsis Lajonkairiana.</i>	<i>Trochus granosus.</i>
<i>Tellina Benedenii.</i>	<i>Emarginula crassa.</i>
<i>Donax politus.</i>	<i>Fissurella costaria.</i>
<i>Panopea faujasii.</i>	<i>Brocchia partim-sinuosa.</i>
<i>Glycimeris angusta.</i>	<i>Scaphander lignarius.</i>
<i>Pholas cylindrica.</i>	<i>Cryptangia Woodii.</i>
<i>Fusus alveolatus.</i>	<i>Flabellum Woodii</i> or <i>N. Sp.</i>

RIVER SIDE PIT (PIT G).

<i>Rhynchonella psittacea.</i>	<i>Pleurotoma arctica.</i>
<i>Fusus Largilliertii.</i>	<i>Natica duplicata (?)</i>
„ <i>Turtoni.</i>	„ <i>occlusa.</i>
<i>Buccinum ciliatum.</i>	„ <i>Greenlandica.</i>
<i>Pleurotoma exarata.</i>	„ <i>Alderi.</i>
„ <i>striolata.</i>	

A slight examination of these different lists will show that something more than an interval of space is required to account for the difference. It will be observed that while in the one case many of the organisms are either southern or extinct species, those in the other are northern or recent. Again, the matrices of the two pits seem to differ in the arrangement. In one, the oldest, the sand is

coarser, and comminution greater than in the other, which possesses the aspect of an undisturbed deposit, the layers being more or less horizontal with the fossils disposed in successive planes. It is perhaps unnecessary to notice the great difference in the size of the species common to both pits.

To the right of this last pit occurs, in the parish of Ramsholt, a very instructive section, which, as given by Mr. Prestwich, represents a cliff of Red Crag, resting upon and overlying which are newer beds, having at the bottom a seam of phosphatic nodules. This section, which shows the line of erosion (vide Fig. 6, p. 237, *op. cit.*) very strongly, appears to present an instance in which the newer Crag beds overlie the older. Further away still, in the cliffs of Bawdsey, the newer beds are apparently similarly disposed, the Phosphatic-bed occurring inland, but not to our knowledge in the cliff. The fossils belong to the higher zone, as far as can be gathered from Mr. Prestwich's lists and our own observations.

Our own opinion of the Coralline Hill beds is, that at the time when the Bullock Yard, Sutton, Shottisham, and Waldringfield Craggs were being deposited the trend of the Coralline Crag cliff was further westward than now, because in a field lying to the west of the hill, below the surface soil, the line of demarcation between the two Craggs is strongly marked, as if the Red Crag had been originally continuous from the Bullock Yard in this direction, being beyond the boundary line the surface rock, whilst between this line and the pit of newer Red Crag, only the Coralline Crag crops up.

At a later date the newer Crag-sea waters appear to have worn a channel between the Coralline cliff on one side, and the Ramsholt old Crag before referred to. In the latter instance the presence of the seam of coprolites at the base of the old cliff is easily accounted for; their weight would necessarily cause them to gravitate downwards.

Having raised these points, they are left for the consideration of those interested in the subject.

The newer Red Crag, or that which we termed the Upper Crag, embraces, as we think, the newer Red Crag just referred to, the Scrobicularian Crag at Chillesford and Tunstall, the Fluvio-marine Crag at Thorpe, Bulchamp, and Wangford in Suffolk, Thorpe and Bramerton in Norfolk.

In the distribution of the Fluvio-marine Craggs, as also of that of the Chillesford Series, we follow Messrs. Wood and Harmer for

various reasons, chiefly palæontological, with a slight reservation as to whether the Norfolk Thorpe, and Postwick beds are of the Chillesford or Fluvio-marine stage. A capital idea of the marine fauna of this horizon and its mode of occurrence can be gained by a visit to Butley Neutral Farm Pit, a short account of which may be found in the "Geological Magazine," vol. viii., p. 450, with a list of its fossils. At Butley Mill and Chillesford Stack-yard, it may also be well seen, and at Sudbourne Church Walks it is to be found below the Chillesford Sands. In this direction it rests upon a ridge of hard Coralline Crag (containing rare Crustacea and Echini, *Gonoplax angulatus* and *Echinus Lyellii*) to the north of which, at Thorpe, it loses its ferruginous colour, becoming white. In addition to the ordinary Fluvio-marine shells, Mr. Cavell, of Saxmundham, and myself, have obtained many of the species common at Butley, sufficient to establish the synchronism of the two deposits. Here many fragments of bones are in places mixed with the shells.

In a cutting by the side of the railroad leading to Aldborough, the members of the Geological Society of Norwich, in one of their excursions, traced the land and other shells of the Fluvio-marine Crag into a highly ferruginous deposit, *Helix hispida* amongst others.

North of this the stratification becomes exceedingly confused, the Crag either being denuded or covered with sands and clays of a later date. In the few places where it occurs the fauna is mostly alike, no very great changes taking place till the neighbourhood of Norwich is reached. Here, through the assiduous labours of the Norfolk geologists, our knowledge has been greatly enlarged, and the fauna much increased.

On the top of the Chalk cliffs, at Thorpe, occurs a layer of flints, locally known as the "Stone Bed." In this layer the bones and teeth of many mammals have been found, and, mixed with them, numerous shells, all of recent species. The Rev. John Gunn and others consider this Stone Bed to be anterior to the Crag, but, as in the case of the Red Crag mammals already spoken of, no sufficient evidence has been produced to make this a matter of certainty. The occurrence of bones at Thorpe in Suffolk, at Whitlingham, at Bramerton, and other places, militates against this conclusion.

In the Suffolk district the sudden appearance of *Scrobicularia* in profusion in the Red Crag demonstrates a rapid change of the conditions of sea-bottom. A similar circumstance obtains at Bramer-

ton, a fortunate discovery made by Mr. Reeves, of the Norwich Museum.

The limits of this paper do not allow of our dwelling upon this part of the subject; it will be sufficient to say, as already said, that the marine fauna of the Norwich, or Fluvio-marine Crag, assimilates that deposit to the upper part, as we have defined it, of the Suffolk Red Crag, and not to that of the lower; and with regard to the terrestrial fauna, whilst the Mammalia are somewhat similar to those of the older beds, the Mollusca are different. It is true that only one shell is known in the older Crag, occurring at Walton and Waldringfield, but that is an extinct or unknown form, while the whole of the newer land shells, whether at Butley, Bulchamp, Bramerton, or elsewhere, are recent species, mostly, if not all, British.

At the close of this stage a general subsidence took place over the East Anglian area, allowing the deposition of sands of varying thickness and colour. This sand may be seen at Walton-Naze, but is better displayed further north about Butley and Chillesford, and at Wangford, Bulchamp, and Bramerton, filling up eroded sands and hollows. Itself almost unfossiliferous, it invariably comes in and underlies the Chillesford shell-bearing sands, to which series it has been assigned.

Whether this assignment is correct or not is a matter of little moment, but the shelly sands have not yet been traced further south than the Chillesford pit. Between this pit and that at Butley Neutral Farm the unfossiliferous sands are to be seen coming to the surface in a run down pit on the side of a hill. A section of the Farm Pit is elsewhere given ("Geol. Mag.," op. cit.).

The Chillesford Sands do not present many new forms—a *Scalaria*, *Lucinopsis*, and *Echinus*—all living in the British Seas, appear for the first time. This statement does not harmonise with that by Mr. Prestwich, who remarks "that at this time colder currents from the north introduced new and more Arctic species of Mollusca."

In the absence of lists of species of the shells discovered in the colder areas of the deep seas round Britain, the fauna, judged by the lists given at the end of this paper, will be found to agree more nearly with that of the Norwegian coast about Drontheim than of a higher Arctic temperature, the fauna of which may be correlated more closely with the antecedent Upper Crag, and this, with the

vegetation of the Forest Bed, whose relations with the Chillesford Sands are not clearly made out at present, imply, I think, a warmer climate for these latter beds than for the earlier Upper Crag.

The Chillesford shelly sands have been found at Chillesford, Sudbourn Church, Easter, Aldeby, Bramerton,* and in the Bure Valley, and perhaps on the coast near Runton Gap. This last is doubtful, as we agree with Mr. Wood upon the whole in considering that the coast and other sands containing *Tellina Baltica* are of a later stage, the shell in question, together with its surroundings, marking a very different horizon.

But few mammals have been found in the Chillesford Sands, the *Mastodon* apparently reaching its terminal point at this stage. We say apparently, because traces of the Crag *Mastodon*, or else one of another species, have been met with higher up still in the Post Tertiary series of the East of England. Remains of Rodentia and Ruminantia have been met with, and also one or more species of Cetacea.

Superimposed upon these sands are clays, in which, at Chillesford brick pit, a whale 31 feet in length was found. In consequence of the uncertainty attending the correlation of this and similar clays elsewhere, it may be prudent to doubt whether they do not belong to a higher group, that of the Lower Boulder Clays (Wood and Harmer), and not to the Chillesford Series at all.

The Forest Bed, according to some authors, overlies, and according to others, underlies the Chillesford Clays, the reason of this being that authors are not agreed as to what the Chillesford Clay is.

The non-appearance of the *Mastodon* in the Forest Bed, and the abundance of remains not previously met with, seem to prove the superiority of the Forest Bed to the Chillesford Sands. May not the fact be that as the beds inosculate they were nearly co-existent, the submergence of the Forest Bed afterwards permitting the deposition of "the laminated clays" upon the late land surface.

The consideration of this, as of the distribution of the Fluvio-marine Crag in Norfolk, and the newer Chillesford Series, being beyond the scope of this paper, we now conclude, hoping to take up the latter subject at some future period.

No collected list of the Pliocene fossils of England has been published, and the following, compiled from the collections and lists of Messrs. Wood, Crowfoot, Dowson, Harmer, Norton, Fitch, Reeve,

* By Mr. J. E. Taylor, who first worked out the separation between the Upper and Lower shell-bearing sands at Bramerton, and elsewhere in Norfolk.

Canham, Reed, Gunn, Fisher, Prestwich, and our own and those of our brother, G. W. Bell (Polyzoa)—as well as of those in various museums and publications is, perhaps, the most perfect yet issued; and we hope it may be found as useful to others as it has been to ourselves.*

CATALOGUE OF SPECIES IN THE ENGLISH CRAGS.

LOWER CRAG.
(CORALLINE CRAG.)

MAMMALIA.

- Cervus*, *dicranoceros*, *Kaup*.
 " *sp.*
Mastodon *arvernensis*, *Croizet*.
 " *Borsoni*.
Rhinoceros *Schleirmacheri*, *Kaup*.
Balæna *emarginata*, *Owen*.
 " *gibbosa*, *Owen*.
Phocæna, *sp.*
Ziphius, *sp.*

AVES.

Leg bone of a Wader.

PISCES.

- Carcharodon* *megalodon*, *Ag*.
Lamna, *sp.*
Merlangus *virens*, *Flem.*
 " *pollachius*, *Flem.*
 " *vulgaris*, *Flem.*
Morrhua *vulgaris*, *Cuv.*
 " *lusca*, *L.*
 " *minutus*, *L.*
 " *aglaëfinus*, *L.*
Oxyrhina *xiphodon*, *Ag*.
Platax *Woodwardii*, *Ag*.
Raia *antiqua*, *Ag*.
Zygobatis *Woodwardii*, *Ag*.

CRUSTACEA.

- Atelecyclus* *heterodon*, *Leach*.
Cancer *pagurus*, *L.*
 " *maenas*, *L.*
Ebalia *Bryerii*, *Leach*.
Gonoplax *angulata*, *Leach*.
Maia *equinado*, *Leach*.
Pagurus *Bernhardus*, *L.*
Portunus *puber*, *L.*
 " *depurator*.

ENTOMOSTRACA.

- Bairdia* *subdeltoidea*, *Munst.*
Cythere *botellina*, *Jones*.
 " *ceratoptera*, *Bosq.*
 " *dictyosigma*, *Jones*.
 " *sublacunosa*, *Jones*.
 * *laqueata*, *Jones*.

- Cythere* *macropora*, *Bosq.*
 " *punctata*, *Munst.*
 " *retifastigiata*, *Jones*.
 " *sphaerulolineata*, *Jones*.
 * " *trachypora*, *Jones*.
 " *trigonula*, *Jones*.
 " *Woodiana*, *Jones*.
 " *senilis*, *Jones*.
Cytheridea *pinguis*, *Jones*.
Cytherideis *Ren*, *Jones*.
 * " *tuberculata*, *Jones*.
Loxococoncha *tamarindus*, *Jones*.

CIRRIPEDIA.

- Acasta* *undulata*, *Darw.*
Balanus *bisulcatus*, *Darw.*
 " *concavus*, *Bronn.*
 " *crenatus*, *Brug.*
 " *calceolus*, *Ellis*.
 " *inclusus*, *Darw.*
 " *spongicula*, *Brown.*
Pyrgoma *anglica*, *Sow.*
Scalpellum *magnum*, *Wood.*
Verruca *stromia*, *Müll.*

ANNELIDA.

- Ditrupe* *gadus*, *Mont.*
 " *subulata*, *Berk.*
Cyclogyra *multiplex*, *Wood.*
Spirorbis *heterostrophus*, *Mont.*
 " *carinatus*, *Mont.*
 " *granulatus*, *Mont.*
 " *nautiloides*, *Lam. (P)*
 " *sinistrorsus*, *Mont.*
 " *supraplana*, *Wood.*
Vermilia *vermicularis*, *L.*
 " *triquetra*, *L.*
 " *tricuspidata*, *Sow.*

ECHINODERMATA.

- Amphidetus* *cordatus*, *Penn.*
Brissus *Scillæ*, *Ag.*
Comatula *Brownii*, *E. Forb.*
 " *Ransomii*, *E. Forb.*
 " *Woodwardii*, *E. Forb.*
Echinocyamus *hispidulus*, *E. Forb.*
 " *oviformis*, *E. Forb.*
Echinus *Charlesworthii*, *E. Forb.*
 " *Woodwardii*, *Desor.*

* I have to express my thanks for the courtesy shown me by so many geological friends, without whose aid the lists would not have extended to their present length.—ALFRED BELL.

Echinus Lyellii, *E. Forb.*
 „ *melo*, *Lam.*
 „ *sphæra*, *Müll.*
Spatangus purpureus, *Müll.*
 „ *regina*, *E. Forb.*
Temnechinus excavatus, *Wood.*
 „ *melocactus*, *E. Forb.*
 „ *globosus*, *E. Forb.*
 GASTEROPODA.
Aclis ascaris, *Turt.*
 „ *Gulsonæ*, *Clark.*
 „ *supranitida*, *Wood.*
 „ *unica*, *Wood non Mont.*
 „ *Walleri*, *Jeffer.*
Adeorbis subcarinatus, *Mont.*
 „ *supranitidus*, *Wood.*
 „ *tricarinatus*, *Wood.*
 „ *pulchralis*, *Wood.*
Admete Reedi, *A. Bell.*
 „ *viridula*, *Fabr.*
Aporrhais pespelicani, *L.*
Brocchia sinuosa, *Broc.*
Buccinopsis Dalei, *Sow.*
 „ *pseudo-Dalei*, *Wood.*
Buccinum undatum, *L.*
Cæcum mammilatum, *Wood.*
 „ *trachæum*, *Wood.*
 „ *glabrum*, *Mont.*
Calyptrea Chinensis, *L.*
Cancellaria Bonelli, *Bellardi.*
 „ *contorta*, *Bast.*
 „ *mitræformis*, *Broc.*
 „ *subangulosa*, *Wood.*
 „ *varicosa*, *Broc.*
Capulus Hungaricus, *L.*
 „ *unguis*, *Sow.*
Cassidaria bicaenata, *Sow.*
Cerithium granosum, *Wood.*
 „ *tricinctum*, *Broc.*
 „ *trilineatum*, *Phil.*
 „ *perpulchrum*, *Wood.*
 „ *cribrarium*, *Wood.*
 „ *varicula*, *Wood.*
Cerithiopsis metaxa, *Della. Ch.*
 „ *tuberculare*, *Mont.*
Chemnitzia costaria, *Wood.*
 „ *densecostata*, *Phil.*
 „ *lactea*, *L.*
 „ *internodula*, *Wood.*
 „ *rufa*, *Phil.*
 „ *costellata*, *Wood.*
 „ *filosa*, *Wood.*
 „ *indistincta*, *Mont.*
 „ *rufescens*, *E. Forb.*
 „ *suturalis*, *Phil.* = *O. pupa*,
Crag Moll.
Chiton fascicularis, *L.*
 „ *Rissoi*, *Payr.*
 „ *Hanleyi*, *Bean.*
Columbella sulcata, *Sow.*
Conopleura crassa, *A. Bell.*
Cyclostrema sphæroidea, *Wood.*
Cyprea Europea, *Mont.*
 „ *avellana*, *Sow.*
 „ *retusa*, *Sow.*
 „ *affinis*, *Duj.*

Defrancia histrix, *Jan.*
 „ *linearis*, *Mont.*
 „ *reticulata*, *Ren.*
 „ *purpurea*, *Mont.*
 „ *Philberti*, *Mich.*
 „ *teres*, *Forbes.* = *Trophon*
paululum, *Wood.*
Emarginula crassa, *Sow.*
 „ *fissura*, *L.*
 „ *rosea*, *Bell.*
 „ *elongata*, *Phil.*
Erato lævis, *Don.*
 „ *Maugeriæ*, *Gray.*
Eulima subulata, *Mont.*
 „ *glabella*, *Wood.*
 „ *polita*, *L.*
Eulimella nitidissima, *Wood.*
Fissurella græca, *L.*
 „ *costaria*, *Bast.*
Fossarus costatus, *Broc.*
 „ = *Phasianema sulcata*,
Wood.
 „ *Japonicus*, *Adams.*
 „ *reticulata*, *Wood.*
Fusus alveolatus, *Sow.*
 „ *consociata*, *Wood.*
 „ *costifer*, *Wood.*
 „ *gracilis*, *Da Costa.*
 „ *gracilius*, *Wood.*
 „ *imperspicuum*, *Wood.*
Lamellaria perspicua, *L.*
Lepeta cæca, *Müll.*
Lacuna, *sp.*
Litiopa papillosa, *Wood.*
Margarita glauca, *Möll.*
 „ *maculata*, *Wood.*
 „ *trochoidea*, *Wood.*
Menestho Britannica, *A. Bell.*
Mitra ebenus, *Lam.*
 „ *plicifera*, *Wood.*
Murex aciculatus, *Lam.*
Nassa consociata, *Wood.*
 „ *granulata*, *Sow.*
 „ *incrassata*, *Strom.*
 „ *labiosa*, *Sow.*
 „ *prismatica*, *Broc.*
 „ *pygmæa*, *Lam.*
 „ *granifera*, *Duj.*
 „ *pulehella*, *A. Bell.*
 „ *densecostata*, *A. Bell.*
Natica catenoides, *Sow.*
 „ *cirriformis*, *Wood.*
 „ *proxima*, *Wood.*
 „ *millepunctata*, *Lam.*
 „ *helicina*, *Broc.* = *N. varians*,
Crag Moll.
Odostomia acuta, *Jeffer.*
 „ *concoidea*, *Broc.*
 „ *filosa*, *Wood.*
 „ *plicata*, *Mont.*
 „ *simillima*, *Wood.*
 „ *decussata*, *Mont.*
 „ *insculpta*, *Mont.*
 „ *obliqua*, *Alder.*
 „ *similis*, *Wood.*
Ovula spelta, *L.*
Piliscus commodus, *Midd.*

- Pleurotoma* *brachystoma*, Wood.
 „ *carinata*, Biv.
 „ *costata*, Don.
 „ *curtistoma*, A. Bell.
 „ *castanea*, Wood.
 „ *concinna*, Wood.
 „ *decussata*, Phil.
 „ *exilis*, A. Bell.
 „ *elegans*, Moll. = *Clavatulaplicifera*, Wood.
 „ *elegantula*, A. Bell.
 „ *galerita*, Phil. = *P. semicolon*, Crag Moll.
 „ *gracilior*, A. Bell.
 „ *mitrula*, Sow.
 „ *nebula*, Mont.
 „ *porrecta*, S. Wood.
 „ *notata*, A. Bell.
 „ *perpulchra*, Wood.
 „ *pannum*, Bast.
 „ *striolata*, Scac.
 „ *Tarentini*, Phil.
 „ *tenuistriata*, A. Bell. = *E. laevigata*, Wood.
 „ *volvula*, A. Bell.
Puncturella *Noachina*, L.
Pyramidella *plicosa*, Bronn. = *P. laeviuscula*, Wood.
Pyrula *cancellata*, Grat.
Ringicula *auriculata*, Men.
 „ *ventricosa*, Sow.
Rissoa *calathus*, F. and H.
 „ *concinna*, Wood.
 „ *confinis*, Wood.
 „ *crassistriata*, Wood.
 „ *curtirostata*, Wood. = *R. semicostata*, Crag Moll.
 „ *inconspicua*, Ald.
 „ *obsoleta*, Wood.
 „ *proxima*, Alder.
 „ *soluta*, Phil.
 „ *Stefanisi*, Jeff.
 „ *striata*, Mont.
 „ *supracostata*, Wood.
 „ *vitrea*, Mont. (?)
 „ *Zetlandica*, Mont.
Scalaria *clathratula*, Ad.
 „ *cancellata*, Broc.
 „ *fimbriosa*, Wood.
 „ *foliacea*, Sow.
 „ *frondosa*, Sow.
 „ *frondicula*, Wood.
 „ *hamulifera*, Wood.
 „ *subulata*, Nyst.
 „ *varicosa*, Lam.
 „ *obtusirostata*, Wood.
Scissurella *crispata*, Flem.
Sigaretus *excavatus*, Wood.
Terebra *inversa*, Nyst.
 „ *canalis*, Wood.
 „ *exilis*, A. Bell.
Trichotropis *borealis*, Sow.
Triton *heptagonum*, Wood non Brocchi.
Trochus *Adansonii*, Payr.
- Trochus* *Kickxii*, Nyst.
 „ *millegranus*, Wood non Phil.
 „ *multigranus*, Wood.
 „ *Montacuti*, W. Wood.
 „ *occidentalis*, Migh.
 „ *villicus*, Phil.
 „ *ziziphinus*, L.
 „ *conulus*, L.
 „ *ditropis*, Wood.
 „ *Duminyi*, Reg. = *Adeorbis striatus*, Wood.
 „ *obconicus*, Wood.
 „ *tricarinerus*, Wood.
 „ *bullatus*, Phil.
Trophon *muricatum*, Mont.
Triforis *adversum*, Mont.
 „ *perversum*, L.
Turritella *incrassata*, Sow.
 „ *planispira*, Wood.
Velutina *undata*, Smith. = *V. virgata*, Wood.
Vermetus *subcancellatus*, Biv. = *V. intortus*, Crag Moll.
Voluta *Lamberti*, Sow.
- SOLENOCONCHA.
Dentalium *dentalis*, L.
Dischides *Olivi* Scac.
- OPISTHOBRANCHIATA.
Actæon *tornatilis*, L.
 „ *levidensis*, Wood.
Bulla *utriculus*, Broc.
Cylichna *cylindracea*, Penn.
 „ *concinna*, Wood.
 „ *conuloidea*, Wood.
Philine *catena*, Mont.
 „ *quadrata*, Wood.
 „ *scabra*, Müll.
 „ *ventrosa*, Wood.
Scaphander *lignarius*, L.
 „ *librarius*, Loven.
Utriculus *nana*, Wood.
 „ *Lajonkairii*, Bast.
 „ *obtus*, Mont.
 „ *truncatulus*, Brug.
Volvula *acuminata*, Brug.
- PTEROPODA.
Cleodora *infundibulata*, Wood.
- LAMELLIBRANCHIATA.
Anomia *ephippium*, L.
 „ *striata*, Broc.
 „ *patelliformis*, L.
Arca *lactea*, L.
 „ *tetragona*, Poli.
 „ *nodulosa*, (?)
 „ *pectunculoides*, Scac.
Artemis *exoleta*, L.
 „ *incta*, Fult.
Astarte *Basterotii*, La Jonk.
 „ *Burtini*, La Jonk.
 „ *Galeottii*, Nyst. = *A. gracilis*, Wood non Münster.

* Will be shortly figured together with some other species, now recorded for the first time as Crag species.—A. B.

- Astarte incrassata*, Broc.
 „ *mutabilis*, Wood.
 „ *Omalii*, La Jonk.
 „ *triangularis*, Mont.
 „ *incerta*, Wood.
 „ *parvula*, Wood.
 „ *pusilla*, E. Forb. = *A. parva*, Wood.
 „ *pygmæa*, Münt.
Avicula hirundo, L.
Axinus flexuosus, Mont.
 „ *ferruginosus*, E. Forb.
Cardita corbis, Phil.
 „ *chamæformis*, Leathes.
 „ *scalaris*, Leathes.
 „ *sulcata*, Brug. = *C. senilis*, Lam. (part).
 „ *rudista*, Lam. = *C. senilis* (part).
 „ *orbicularis*, Leathes.
Cardium decorticatum, Wood. (*C. lævigatum*, Poli.)
 „ *edule*, L.
 „ *fasciatum*, Mont.
 „ *interruptum*, Wood.
 „ *elegantulum*, Moll.
 „ *Norvegicum*, Spengl.
Chama gryphoides, L.
Circe minima, Mont.
Cochlodesma præstene, Pult.
Corbula gibba, Olivi.
Crenella rhombea, Berk.
Cultellus tenuis, Phil.
Cyamium eximium, Wood.
Cypricardia lithophagella, Wood.
Cyprina Islandica, L.
 „ *rustica*, Sow.
Cytherea chione, L.
 „ *rudis*, Poli.
Diplodonta astartea, Nyst.
 „ *dilatata*, Wood.
 „ *rotundata*, Mont.
Donax trunculus, L.
 „ *vittatus*, Da Costa.
 „ *politus*, Poli.
Erycina Geoffroyi, Payr.
Erycinella ovalis, Conrad.
Galeomma compressa, Phil. = *Kellia* coarctata, Wood.
Gastrana laminosa, Sow.
Gastrochæna dubia, Penn.
Glycimeris angusta, Nyst.
Hinnites giganteus, Carpenter.
Isocardia cor, L.
Kellia ambigua, Nyst.
 „ *suborbicularis*, Mont.
 „ *cycladia*, Wood.
 „ *elliptica*, Wood.
 „ *pumila*, Wood.
Lasea rubra, Mont.
Leda pygmea, Münt.
 „ *semistriata*, Wood.
Lepton nitidum, Turt. = *L. depressum*, Crag Moll.
 „ *squamosum*, Mont.
 „ *Clarkæ*, Clark.
- Lima elliptica*, Jeffr.
 „ *hians*, Gmel.
 „ *nivea*, Ren.
 „ *Loscombii*, Sow.
 „ *inflata*, Chemn.
 „ *subauriculata*, Mont.
 „ *squamosa*, Lam. = *L. plicatula*, Wood.
Limopsis aurita, Lam.
 „ *pygmea*, Phil.
Lucina borealis, L.
 „ *crenulata*, Conr.
 „ *decorata*, Wood.
Lucinopsis Lajonkairii, Payr.
Lutraria elliptica, Lam.
 „ *oblonga*, Chemn.
Mactra arcuata, Sow.
 „ *stultorum*, L.
 „ *elliptica*, Brown.
 „ *subtruncata*, Da Costa.
 „ *artopta*, Wood.
Modiolaria costulata, Risso.
 „ *discors*, L.
 „ *marmorata*, E. Forb.
 „ *sericea*, Bronn.
Montacuta bidentata, Mont.
 „ *ferruginosa*, Mont.
 „ *substriata*, Mont.
 „ *donacina*, Wood.
 „ *truncata*, Wood.
 „ *ovata*, Jeffr.
Mya truncata, L.
Mytilus phaseolinus, Phil.
 „ *ungulatus*, L.
 „ *modiolus*, L.
Næara arctica, Sars.
 „ *cuspidata*, Olivi.
 „ *jugosa*, Wood.
Nucinella miliaris, Desh.
Nucula lævigata, J. Sow.
 „ *nucleus*, L.
 „ *tenuis*, Mont.
 „ *trigonula*, Wood.
Ostrea cochlear, Poli.
 „ *cristata*, Born.
 „ *edulis*, L.
 „ *princeps*, Wood.
Pandora obtusa, Leach.
Panopea fragilis, Nyst.
 „ *Faujasii*, Menard.
Pecten dubius, Broc.
 „ *maximus*, L.
 „ *opercularis*, L.
 „ *princeps*, Wood.
 „ *pusio*, L.
 „ *tigrinus*, Müll.
 „ *aratus*, Gmel.
 „ *Gerardii*, Nyst.
 „ *similis*, Laskey.
Pectunculus glycimeris, L.
 „ *insubricus*, Broc.
Pholadidea papyracea, Sol.
Pholadomya hesterna, Sow.
Pholas crispata, L.
 „ *cylindrica*, Sow.
Pinna rudis, L.

Poromya granulata, *Nyst.*
Psammobia costulata, *Turt.*
 " *Ferröensis*, *Chemn.*
 " *tellinella*, *Lam.*
 " *vespertina*, *Chemn.*
Saxicava arctica, *L.*
Solecurtus strigillatus.
Solen ensis, *L.*
 " *pellucidus*, *Penn.*
Sphaenia Binghami, *Turt.*
Syndosmya alba, *W. Wood.*
 " *prismatica*, *Mont.*
Tapes Virginea, *L.*
 " *var. Sarniensis*, *Turton.* = *T.*
 perovalis, *Wood.*
Tellina crassa, *Penn.*
 " *donacina*, *L.*
 " *obliqua*, *Sow.*
 " *balaustina*, *L.*
 " *compressa*, *Broc.* = *T. dona-*
 cilla, *Wood.*
Teredo Norvegica, *Spengl.*
Thracia convexa, *W. Wood (Prestwich).*
 " *inflata*, *Sow.*
 " *papyracea*, *Poli.*
 " *distorta*, *Mont.*
 " *pubescens*, *Pult.*
 " *ventricosa*, *Phil.*
Venus casina, *L.*
 " *fasciata*, *Don.*
 " *imbricata*, *Sow.*
 " *ovata*, *Penn.*
 " *dysera*, *Broc.*
Verticordia cardiiformis, *Wood.*
Woodia digitaria, *Gmel.*
 " *excurrentis*, *Wood.*

BRACHIOPODA.

Argiope cistellula, *S. Wood.*
Crania Atlantica, *King.*
Lingula Dumortieri, *Nyst.*
Terebratula grandis, *Blum.*
 " *caput serpentis*, *Flem.*

POLYZOA.

Alecto dilatans, *Thomp.*
 " *repens*, *Wood.*
Alveolaria semiovata, *Busk.*
Alysidota catena, *Wood.*
Biflustra delicatula, *Busk.*
Cellepora cespitosa, *Busk.*
 " *compressa*, *Busk.*
 " *coronopus*, *Wood.*
 " *dentata*, *Busk.*
 " *edax*, *Busk.*
 " *parasitica*, *Michel.*
 " *ramulosa*, *L.*
 " *tubigera*, *Busk.*
 " *scruposa*.
Crisia denticulata, *Lam.*
Cupularia canariensis, *Busk.*
 " *denticulata*, *Conr.*
 " *porosa*, *Busk.*
Defrancia rugosa, *Busk.*

Defrancia striatula, *Busk.*
Diastopora simplex, *Busk.*
Discoporella Grignonensis, *M. Edw.*
 " *hispidula*, *Johnst.*
Eschara cornuta, *Busk.*
 " *incisa*, *M. Edw.*
 " *monilifera*, *M. Edw.*
 " *pertusa*, *M. Edw.*
 " *porosa*, *M. Edw.*
 " *Sedgwickii*, *M. Edw.*
 " *sinuosa*, *Busk.*
 " *socialis*, *Busk.*
Fascicularia aurantia, *Busk.*
 " *tubipora*, *Busk.*
Flustra dubia, *Busk.*
Fungella infundibulata, *Busk.*
 " *multifida*, *Busk.*
 " *quadriceps*, *Busk.*
Hemeschara imbellis, *Busk.*
Heteropora clavata, *Goldf.*
 " *laevigata*, *D'Orb.*
 " *pustulosa*, *Busk.*
 " *reticulata*, *Busk.*
Heteroporella parasitica, *Busk.*
 " *radiata*, *Busk.*
Hippothoa abstersa, *Wood.*
 " *dentata*, *Wood.*
 " *patagonica*, *Busk.*
Hornera canaliculata, *Busk.*
 " *frondiculata*, *Lam.*
 " *hippolyta*, *Defr.*
 " *humilis*, *Busk.*
 " *infundibulata*, *Busk.*
 " *lunata*, *Busk.*
 " *pertusa*, *Busk.*
 " *reteporacea*, *M. Edw.*
 " *rhapis*, *Busk.*
 " *rhomboidalis*, *Busk.*
 " *striata*, *M. Edw.*
Idmonea delicatula, *Busk.*
 " *fenestrata*, *Busk.*
 " *intricaria*, *Busk.*
 " *punctata*, *D'Orb.*
Lepralia annulata (Prestwich.)
 " *ansata*, *Johnst.*
 " *biaperta*, *Michel.*
 " *bicornis*, *Busk.*
 " *Bowerbankiana*, *Busk.*
 " *Brongniartii*, *Aud.*
 " *ciliata*, *L.*
 " *Halmesiana*, *Busk.*
 " *hyalina*, *L.*
 " *innominata*, *Couch.*
 " *lobata*, *Busk.*
 " *Malusii*, *Aud.*
 " *mammillata*, *Wood.*
 " *Milneana*, *Busk.*
 " *megastoma*, *Wood.*
 " *Morrisiana?* (*Prestwich*)
 " *Pallasiana*, *Möll.*
 " *papillata*, *Busk.*
 " *Peachii*, *Johnst.*
 " *plagiopora*, *Busk.*
 " *punctata*, *Hass.*
 " *puncturata*, *Wood.*
 " *pyriformis*, *Wood.*

Lepralia *Reussiana*, *Busk*.
 „ *variolora*, *Johnst.*
 „ *ventricosa*, *Hass.*
 „ *violacea*, *Johnst.*
 „ *unicornis*, *Johnst.*
 „ *Woodiana*, *Busk*.
Lunulites *conica*, *DeFr.*
Membranipora *aperta*, *Busk*.
 „ *Andegavensis*, *Michel.*
 „ *bidens*, *Hagen.*
 „ *dubia*, *Busk.*
 „ *fissurata*, *Busk.*
 „ *holostoma*, *Wood.*
 „ *Lacroixii* (*Prestwich.*)
 „ *monostachys*, *Busk.*
 „ *oblonga*, *Busk.*
 „ *Oceanii*, *D'Orb.*
 „ *Pouilletti*, *And.*
 „ *rhynchota*, *Busk.*
 „ *Savartii*, *Aud.*
 „ *trifolia*, *Wood.*
 „ *tuberculata*, *Bosc.*
Melicerita *Charlesworthi*, *M. Edw.*
Mesenteripora *meandrina*, *Wood.*
Patinella *proliger*, *Busk.*
Pustulopora *clavata*, *Busk.*
 „ *palmata*, *Busk.*
 „ *subverticellata*, *Busk.*
Retepora *Beaniana*, *King.*
 „ *cellulosa*, *L.*
 „ *notopachys*, *Busk.*
 „ *simplex*, *Busk.*
Salicornaria *crassa*, *Wood.*
 „ *sinuosa*, *Hassall.*
Serupocellaria *seruposa*, *L.*
Tubulipora *flabellaris*, *Fabr.*
 „ *phalangea*, *Couch.*

CELENTERATA.

Cryptangia *Woodii*, *E. & H.*
Flabellum *Woodii*, *E. & H.*
Sphenotrochus *intermedius*, *Münst.*

SPONGIDA.

Alcyonium *circumvestiens*, *Wood.*

FORAMINIFERA.

Alveolina.
Amphistegina *vulgaris*, *D'Orb.*
Biloculina *elongata*, *D'Orb.*
 „ *ringens*, *Lam.*
 „ *depressa*, *D'Orb.*
Bolivina *punctuata*, *D'Orb.*
Bulimina *marginata*, *D'Orb.*
Calcarina *rarispin*, *D'Orb.*
Cassidulina *crassa*, *D'Orb.*
 „ *laevigata*, *D'Orb.*
 „ *oblonga*, *Reuss.*
Cornuspira *foliacea*, *Phil.*
 „ *involvens*, *Reuss.*
Cristellaria *cultrata*, *Mont.*
Dendritina *arbuscula*, *D'Orb.*
Dentalina *communis*, *D'Orb.*

Dentalina *obliqua*, *Lam.*
 „ *obliquestriata*, *Reuss.*
 „ *pauperata*, *D'Orb.*
Dimorphina *nodosaria*, *Reuss.*
 „ *tuberosa*, *D'Orb.*
Discorbina *Parisiensis*, *D'Orb.*
 „ *rosacea*, *D'Orb.*
Glandulina *laevigata*, *D'Orb.*
Globigerina *bulloides*, *D'Orb.*
Lagena *sulcata*, *Walker.*
 „ *apiculata*, *Reuss.*
 „ *globosa*, *Mont.*
 „ *gracillima*, *Seg.*
 „ *laevis*, *Mont.*
 „ *marginata*, *Mont.*
 „ *melo*, *D'Orb.*
 „ *ornata*, *Will.*
 „ *semistriata*, *D'Orb.*
 „ *striata*, *D'Orb.*
Marginulina *glabra*, *D'Orb.*
 „ *raphanus*, *D'Orb.*
Nodosaria *raphanus*, *L.*
 „ *raphanistrum*, *L.*
 „ *scalaris*, *Batsch.*
Nonionia *faba*, *F. & M.*
 „ *scapha*, *F. & M.*
Nummulina *planulata*, *Lam.*
Operculina *complanata*, *DeFr.*
Orbiculina *adunca*, *F. & M.*
 „ *compressa*, *D'Orb.*
Orbitoides *Faujasii*, *DeFr.*
Orbitolites *orbiculus*, *Försk.*
 „ *complanata*, *Carp.*
Ovulites *elongata*, *Lam.*
Planorbulina *Haidingeri*, *D'Orb.*
 „ *Mediterranensis*, *D'Orb.*
 „ *Ungeriana*, *D'Orb.*
Polymorphina *compressa*, *D'Orb.*
 „ *complanata*, *D'Orb.*
 „ *frondiformis*, *Wood.*
 „ *gibba*, *D'Orb.*
 „ *gutta*, *D'Orb.*
 „ *lactea*, *W. & J.*
 „ *problema*, *D'Orb.*
 „ *rugosa*, *D'Orb.*
 „ *Thouinii*, *D'Orb.*
 „ *tubulosa*, *D'Orb.*
 „ *variata*, *Jones.*
Polystomella *crispa*, *L.*
 „ *macella*, *F. & M.*
 „ *striato-punctata*, *F. & M.*
Pullenia *sphaeroides*, *D'Orb.*
Pulvulina *auricula*, *F. & M.*
 „ *elegans*, *D'Orb.*
 „ *pulchella*, *D'Orb.*
 „ *repanda*, *F. & M.*
Quinqueloculina *seminulum*, *L.*
 „ *Brongniartii*, *D'Orb.*
 „ *Ferussacci*, *D'Orb.*
 „ *pulchella*, *D'Orb.*
 „ *subrotunda*, *Mont.*
 „ *tenuis*, *Czyck.*
 „ *triangularis*, *D'Orb.*
Rotalia *Beccarii*, *L.*
 „ *orbicularis*, *D'Orb.*
Spirillina *vivipara*, *Ehr.*

Spirolina cylindracea, Lam.
Spiroloculina canaliculata, D'Orb.
 " *planulata*, Lam.
Textularia saggitula, DeFr.
 " *agglutinans*, D'Orb.
 " *gibbosa*, D'Orb.
 " *trochus*, D'Orb.
Tinoporus laevis, P. & J.
Triloculina oblonga, Mont.

Triloculina tricarinata, D'Orb.
Truncatulina lobatula, W. & J.
Verneuilina communis, D'Orb.
Vaginulina linearis, Mont.
Webbina hemisphaerica, Jones.

PLANTÆ.

Gorgonia, sp.
Nullipora, sp.

MIDDLE CRAG.
(OLDEST RED CRAG).

* Species so distinguished pass into the Upper Crag.

MAMMALIA.||

TERRESTRIAL.
Canis primigenius, Lank.
Castor veterior, Lank.
Cervus dicranoceros, Kaup.
 " *megaceros* (?) Harte.
Elephas meridionalis, Nesti. ?
 " *antiquus*, Falconer.
Equus plicidens, Owen.
Felis pardoides, Owen.
Hipparion.
Hippotherium gracile, Kaup.
**Hyæna antiqua*, Lank.
Mastodon arvernensis, Croizet.
 " *Borsoni*.
Pterodon.
Sus antiquus, Kaup.
 " *palæochærus*, Kaup.
 " *arvernensis*, Kaup.
Tapirus priscus, Kaup.
Rhinoceros Schleirmacheri, Kaup.
Ursus.
Vespertilio, sp.

MARINE.

Balæna affinis, Owen.
 " *definita*, Owen.
 " *emarginata*, Owen.
 " *gibbosa*, Owen.
Balænodon physaloides.
Balænoptera boops, Owen.
Choneziphius planirostris, Cuv.
 " *Packardi*, Lank.
Delphinus, sp.
Hoplocetis crassidens, Gerv.
Phocæna orcoides, Lank.
 " *uncidens*, Lank.
 " *orca* (?)
Physeter macrocephalus.
Squalodon Antwerpiense, Van Ben.
Tricheodon Huxleyi, Lank.
Ziphius angustus, Owen.
 " *compressus*, Huët.
 " *angulatus*, Owen.
 " *declivis*, Owen.
 " *gibbus*, Owen.
 " *planus*, Owen.
 " *undatus*, Owen.
 " *medilineatus*, Owen.

PISCES. §

Anarhicas lupus, L.
Carcharodon megalodon, Agr.
**Platax Woodwardii*, id.
**Raia antiqua*, Ag.
 " sp.
**Zygobatis Woodwardii*, Ag.

CRUSTACEA.

**Cancer pagurus*, L.
**Carcinas manas*, L.
 ENTOMOSTRACA.
Bairdia subdeltoides, Münst.
Cythere laqueata, Jones.
 " *trachypora*, Jones.
Cytherideis tuberculata, Jones.

CIRRIPEDIA.

Balanus concavus, Bronn.
 " *crenatus*, Brug.
 " *dolosus*, Darw.
 " *Hameri*, Asc.
 " *porcatus*, Da Costa.
 " *tintinnabulum*, L.
 " *inclusus*, Darw.
Coronula barbata, Darw.
Verruca stromia, Müll.

ANNELIDA.

**Ditrupa gadus*, Mont.
Serpula vermicularis, L.
 " *triquetra*, Mont.
Spirorbis carinatus, Mont.

ECHINODERMATA.

Echinarachinus Woodii.
Echinocyamus hispidulus, E. Forb.
 " *oviformis*, E. Forb.
 " *pusillus*, Müll.
 " *Suffolciensis*, Ag.
Echinus Henslovii, E. Forb.
 " *Nortonii*, A. Bell. (n. sp.)
 " *Woodwardi*, Desor.
**Spatangus purpureus*, Müll.
Temnechinus turbinatus, E. Forb.
 " *excavatus*, Wood.
Uraster rubens, Retz.
 " sp.

The names adopted are those given by Prof. Owen, and are chiefly those of Miocene species. Dr. Falconer, on the other hand, considers they may be assigned to Pliocene forms.

§ Teeth of *Lamna*, *Oxyrhina*, *Otodus*, &c., also occur. Age uncertain.

GASTEROPODA.

- Adeorbis subcarinata*, Mont.
 * *Admete viridula*, Fabr.
 " *Couthouyii*, Say.
 * *Aporrhais pespelicani*, L.
Brocchia partim-sinuosa, Wood.
 " *incerta*, A. Bell.
 * *Buccinopsis Dalei*, Sow.
Buccinum glaciale, Chemn.
 " *undatum*, L.
Cæcum mamillatum, Wood.
 * *Calyptrea Chinense*, L.
Cancellaria avara, Say.
 " *scalaroides*, Wood.
 " *varicosa*, Broc.
 " *mitræformis*, Broc.
 * *Capulus hungaricus*, L.
 " *militaris*, Wood, non Mont.
 " *unguis*, Sow.
 * *Cassidaria bicatenata*, Sow.
 (var.) *Canhami*, A. Bell.
Cerithiopsis metaxa, Della Ch.
 * *Cerithium granosum*, Wood.
 " *perpulchrum*, Wood.
 " *reticulatum*, Da. Costa.
 " *tricinatum*, Broc.
 " *trilineatum*, Phil.
 " *variculosum*, Nyst.
Chemnitzia costaria, Wood.
 " *densecostata*, Phil.
 " *lactea*, L.
 " *internodula*, Wood.
 " *suturalis*, Phil.
 " *plicatula*, Broc.
 * *Columbella sulcata*, Sow.
 " *abbreviata*, A. Bell.
 " *Borsoni*, Bell.
Conopleura Maravignæ, Biv. (Jeffreys).
 * *Cypræa avellana*, Sow.
 " *Dertonensis*, Michel.
 " *Europea*, Mont.
 " *retusa*, Sow.
Defrancia cancellata, Sow.
 " *linearis*, Mont.
 " *histris*, Jan.
 " *Leufroyi*, Mich. = Clav.
 " *Boothii*, Crag Moll.
 " *Philberti*, Mich.
 " *reticulata*, Ren.
Desmoulea conglobata, Broc.
Emarginula crassa, Sow.
 " *fissura*, L.
 * *Erato levis*, Don.
 " *Maugeriæ*, Gray.
Eulima distorta, Desh.
 " *glabella*, Wood.
 " *polita*, L.
 " *subulata*, Wood.
Eulimella acicula, Phil.
 * *Fissurella græca*, L.
 " *costaria*, Bast.
 * *Fusus altus*, Wood.
 " *alveolatum*, Sow.
 " *Americanus*, A. Bell.
 " *antiquus*, L.
 * *Fusus contrarius*, L.
 " *cordatus*, A. Bell.
 " *consociata*, Wood.
 " *costifer*, Sow.
 " *crispus*, Borson. (?)
 " *despectus*, L.
 " *elegans*, Charlesw.
 " *gracilis*, Da. Costa.
 " *Islandicus*, Chemn.
 " *Norvegicus*, Chemn.
 " *Sarsii*, Jeffr.
 " *Jeffreysius*, Fischer.
 * *Hydrobia ulva*, Penn.
Lachesis, n. sp.
Lacuna crassior, Mont.
 * *Littorina suboperta*, Wood.
 " *littorea*, L.
 * *Lepeta cæca*, Müll.
Melampus myosotis, Drap.
 " *pyramidalis*, Sow.
Menestho Jeffreysii, A. Bell.
Mitra ebenus, Lam.
 " *fusiformis*, Broc.
 * *Murex tortuosus*, Sow.
 " *insculpta*, Duj.
 * *Nassa ascanias*, Brug.
 " *consociata*, Wood.
 " *elegans*, Leathes.
 " *granulata*, Sow.
 " *labiosa*, Sow.
 " *monensis*, E. Forb.
 " *musiva*, Broc. (?)
 " *prismatica*, Broc.
 " *propinqua*, Sow.
 " *reticosa*, Sow.
 " *pulchella*, A. Bell.
 * *Natica affinis*, Gmel.
 " *catena*, Da Costa.
 " *catenoides*, Wood.
 " *cirriformis*, Wood.
 " *duplicata*, Say.
 " *Guillelmini*, Wood, non Payr.
 " *Islandica*, Gmel.
 " *hemiclaus*, Sow.
 " *millepunctata*, Lam.
 " *var. tigrina*, Phil.
 " *helicina*, Broc.
 " *herculea*, Midd.
 " *proxima* (?) Wood.
 " *sordida*, Phil.
Odostomia acuta, Jeffr.
 " *conoidea*, Broc.
 " *plicata*, Mont.
 " *unidentata*, Mont.
 * *Ovula spelta*, L.
 * *Paludestrina pendula*, Wood.
 " *terebellata*, Nyst.
 * (?) *Patella vulgata*, L.
Piliscus commodus, Midd.
 * *Pleurotoma Bertrandii*, Payr.
 " *carinata*, Biv.
 " *contigua*, Broc.
 " *costata*, Don.
 " *decussata*, Phil.
 " *elegans*, Müll.
 " *intorta*, Broc.

- Pleurotoma gracile ? *Phil.*
 " galerita, *Phil.*
 " harpularia, *Couthouy.*
 " lævigata, *Phil.*
 * " mitrula, *Wood.*
 " nebula, *Mont.*
 " oblonga, *Ren. (?)*
 " perpulchra, *Wood.*
 * " pyramidalis, *Strom.*
 * " rufa, *Mont.*
 " septangularis, *Mont.*
 " Trevellyana, *Turt.*
 * " turricula, *Mont.*
 " tenuistriata, *A. Bell.*
 " Arctica, *Adams.*
 *Purpura lapillus, *L.*
 " tetragona, *Wood.*
 *Pyramidella plicosa, *Duj.*
 Pyrgula acclinis, *Wood.*
 " cancellata, *Grat.*
 Ranella anglica, *A. Bell.*
 *Ringicula auriculata, *Men.*
 " ventricosa, *Sow.*
 *Rissoa curtica, *Wood.*
 * " pulchella, *Wood*, non *Phil.*
 " Stefanisi, *Jeffer.*
 " Zetlandica, *Mont.*
 *Scaligeria clathrata, *Ad.*
 " communis, *Lam.*
 " fimbriosa, *Wood.*
 " foliacea, *Sow.*
 * " Greenlandica, *Chemn.*
 " subulata, *Nyst.*
 " varicosa, *Lam.*
 " pseudo-scalaris, *Broc.*
 " Trevellyana, *Leach.*
 *Tectura virginea, *Müll.*
 Terebra canalis, *Wood.*
 * " inversa, *Nyst.*
 Trichotropis borealis, *B. & S.*
 Triforis adversum, *Mont.*
 *Trochus Adansonii, *Payr.*
 " bullatus, *Phil.*
 * " cinerarius, *L.*
 * " cineroides, *Sow.*
 " granosus, *Sow.*
 * " granulatus, *Born.*
 " Kickxii, *Nyst.*
 " millegranus, *Phil.*
 * " multigranus, *Wood.*
 * " Montacuti, *W. Wood.*
 * " occidentalis, *Mighels.*
 * " subexcavatus, *Wood.*
 * " tumidus, *Mont.*
 * ? " villicus, *Phil.*
 " ziziphinus, *L.*
 *Trophon Barvicensis, *Johnst.*
 " clathratus, *Müll.*
 " muricatum, *Mont.*
 " scalariforme, *Gould.*
 *Turritella communis, *Risso.*
 * " incrassata, *Sow.*
 " subangulata, *Broc.*
 *Vermetus subcancellatus, *Biv.*
 " glomeratus,
 " triquetus, *Biv.*
 *Voluta Lamberti, *Sow.*

SOLENOCONCHA.

- *Dentalium dentalis, *L.*
 " rectum, *Gmel.*
 " abyssorum, *Sars* (fide *Jeffreys*).

OPISTHOBRANCHIATA.

- Actæon Noë, *Sow.*
 * " tornatilis, *L.*
 * " subulata, *Wood.*
 * ? Actæon Etheridgii, *A. Bell.*
 *Cylichna cylindracea, *Penn.*
 Scaphander lignarius.

LAMELLIBRANCHIATA.

- Amphidesma deaurata, *Turton.* = *Mac-*
tra deaurata, Crag Moll.
 *Anomia ephippium, *L.*
 * " patelliformis, *L.*
 " striata, *Broc.*
 *Arca lactea, *L.*
 * " tetragona, *Poli.*
 *Artemis exoleta, *L.*
 * (?) " lincta, *Pult.*
 *Astarte Basterotii, *La Jonk.*
 * " Burtini, *La Jonk.*
 * " compressa, *Mont.*
 " crebrilibrata, *Wood.*
 " Galeotti, *Nyst.*
 " incrassata, *Broc.*
 " mutabilis, *Wood.*
 * " obliquata, *Sow.*
 * " Omalii, *La Jonk.*
 *† " sulcata, *Da. Costa.*
 " triangularis, *Mont.*
 *Cardita chamaeformis, *Leathes.*
 * " corbis, *Phil.*
 " orbicularis, *Leathes.*
 * " scalaris, *Leathes.*
 * " rudista, *Lam.* = *C. senilis*
 (part).
 *Cardium angustatum, *Sow.*
 * " decorticatum, *Wood.*
 * " echinatum, *L.*
 * " edule, *L.*
 * " interruptum, *Wood.*
 * " nodosum, *Turt. (?)*
 " nosodulum, *Turt.*
 * " Parkinsoni, *Sow.*
 * " venustum, *Wood.*
 Chama gryphoides, *Lam.*
 Circe minima, *Mont.*
 Cochloidesma complanata, *Wood.*
 *Corbula gibba, *Olivi.*
 *Corbulomya complanata, *Sow.*
 Cultellus tenuis, *Phil.*
 *Cyprina Islandica, *L.*
 * (?) " rustica, *Sow.*
 Cytherea chione, *L.*
 " rudis, *Poli.*
 *Diplodonta astartea, *Nyst.*
 " dilatata, *Wood.*
 " rotundata, *Mont.*
 * (?) Donax trunculus, *L.*
 * " vittatus, *Da Costa.*
 " politus, *Poli.*

Erycinella ovalis, *Conr.*
Erycina Geoffroyi, *Payr.*
 " *ovata*, *Phil.* = *Abra obovalis*,
 Wood.
 * *Gastrana laminosa*, *Sow.*
Gastrochæna dubia, *Penn.*
Glycimeris angusta, *Nyst.*
 * *Hinnites gigantea*, *Carp.*
Isocardia cor, *L.*
 * *Kellia ambigua*, *Nyst.*
 " *suborbicularis*, *Mont.*
 * *Leda lanceolata*, *Sow.*
 " *minuta*, *Müll.*
 * " *myalis*, *Couth.*
 " *pygmea*, *Munst.*
Lima inflata, *Chemn.*
 " *Loscombi*, *Sow.*
Limopsis aurita, *Broc.*
 " *pygmæa*, *Phil.*
 * *Loripes divaricatus*, *L.*
 * *Lucina borealis*, *L.*
Lucinopsis Lajonkairii, *Payr.*
Lutraria elliptica, *Lam.*
 * *Mactra arcuata*, *Sow.*
 " *constricta*, *Wood.*
 " *glauca*, *Born.*
 " *solidissima*, *Chem.* = *M. pro-*
 crassa, *Wood.*
 " *stultorum*, *L.*
 " *solida*, *L.*
 " *elliptica*, *Brown.*
 " *truncata*.
 " *subtruncata*, *Da Costa.*
Modiolaria costulata, *Risso.*
 " *marmorata*, *E. Forb.*
 " *Petagnæ*, *Scac.*
Montacuta bidentata, *Mont.*
 " *ovata*, *Jeffer.*
 * *Mya arenaria*, *L.*
 * *Mya truncata*, *L.*
 * *Mytilus edulis*, *L.*
 " *hesperianus*, *Lam.*
 " *modiolus*, *L.*
 " *phaseolina*, *Phil.*
 " *barbata*, *L.*
 * *Nucula Cobboldiæ*, *Sow.*
 " *lævigata*, *Sow.*
 " *nucleus*, *L.*
 " *tenuis*, *Mont.*
 " *radiata*, *Hanley.*
Ostrea cochlear, *Poli.*
 " *edulis*, *L.*
 " *princeps*, *Wood.*
Pandora obtusa, *Leach.*
 " *rostrata*, *Lam.*
Panopea faujasii, *Men.*
 " (*var.*) *Rudolphii*, *Eichw.*
 " *fragilis*, *Nyst.*
 * *Pecten dubius*, *Broc.*
 " *princeps*, *Sow.*
 " *Maximus*, *L.*
 " *opercularis*, *L.*
 " *var. Audouinii*, *Payr.*
 " *gracilis*, *Wood.*

* *Pecten pusio*, *L.*
 " *tigrinus*, *Penn.*
 " *Westendorpianus*, *Nyst.*
 " *septemradiatus*, *Müll.*
 * *Pectunculus glycimeris*, *L.*
 pilosus, *L.*
Pholadidea papyracea, *Sol.*
 * *Pholas crispata*, *L.*
 " *cylindrica*, *Sow.*
 " *dactylus*, *L.*
 " *parva*, *Penn.*
 * *Pinna rudis*, *L.*
Psammobia Ferroënsis, *Chemn.*
 * *Saxicava arctica*, *L.*
 Norvegica, *Spengl.*
 * *Scrobicularia piperita*, *Gmel.*
 * *Serripes Greenlandicus.*
Solecurtus antiquatus, *Penn.*
 * *Solen ensis*, *L.*
 " *siliqua*, *L. var. gladiolus*, *Gray.*
 " *pellucidus*, *Penn.*
 * *Syndosmya alba*, *W. Wood.*
 * *Tapes texturata*, *Lam.*
 " *pullastra*, *W. Wood.*
 " *virginea*, *L.*
Tellina Benedenii, *Nyst.*
 " *crassa*, *Penn.*
 " *calcareæ*, *Chemn.*
 " *obliqua*, *Sow.*
 " *pratensis*, *Leathes.*
Teredo Norvegica, *Spengl.*
Thracia inflata, *Sow.*
 " *papyracea*, *Poli.*
Venerupis irus, *L.*
Venus casina, *L.*
 " *fasciata*, *Don.*
 " *imbricata*, *Sow.*
 " *ovata*, *Penn.*
Woodia digitaria, *L.*

BRACHIOPODA.

* *Terebratula grandis*, *Blum.*

LAND AND FRESH WATER
MOLLUSCA.

Helix ryssa, *Wood.*
 * *Paludina parilis*, *Wood.*
 * *Corbicula fluminalis*, *Müll.*

POLYZOA.

Alecto dilitans, *Thomp.*
 " *repens*, *Wood.*
Alveolaria semiovata, *Busk.*
Alysidota labrosa, *Busk.*
Bifustra delicatula, *Busk.*
Cellepora parasitica, *Michel.*
 " *scruposa*, *Busk. (?)*
 " *cespitosa*, *Busk.*
 " *compressa*, *Busk.*
 " *edax*, *Busk.*
Diastopora simplex, *Busk.*

Discoporella grignonensis, *M. Edw.*

„ *hispidula*, *Johnst.*

Eschara monilifera, *M. Edw.*

„ *porosa*, *M. Edw.*

„ *Sedgwicki*, *M. Edw.*

„ *sinuosa*, *Busk.*

Fascicularia aurantia, *M. Edw.*

„ *tubipora*, *Busk.*

Hemeschara imbellis, *Busk.*

Heteropora pustulosa, *Busk.*

Heteroporella radiata, *Busk.*

Hippothoa abstersa, *Wood.*

Hornera frondiculata, *Lamz.*

„ *infundibulata*, *Busk.*

„ *rhomboidalis*, *Busk.*

„ *striata*, *M. Edw.*

Lepralia ansata, *Johnst.*

„ *infundibulata*, *Busk.*

„ *lobata*, *Busk.*

„ *Peachii*, *Johnst.*

„ *puncturata*, *Wood.*

„ *violacea*, *Johnst.*

Lunulites conica, *Defr.*

Melicerita Charlesworthii, *M. Edw.*

Membranipora dubia, *Busk.*

„ *monostachys*, *Busk.*

„ *oblonga*, *Busk.*

„ *Pouillettii*, *Aud.*

„ *Savartii*, *Aud.*

„ *trifoliata*, *Wood.*

„ *tuberculata*, *Bosc.*

Reptomulticava macropora, *D'Orb.*

Salicornaria crassa, *Wood.*

„ *sinuosa*, *Hass.*

Tubulipora phalangea, *Couch.*

„ *flabellaris*, *Fabr.*

CeLENTERATA.

Balanophyllia calyculus, *Wood.*

Cryptangia Woodii, *M. Edw.*

Flabellum. (? n. sp.)

Sphaerotrochus intermedius, *Münst.*

Solenastrea Prestwichii, *Dunc.*

FORAMINIFERA.

Biloculina elongata, *D'Orb.*

„ *ringens*, *Lam.*

Calcarina rarispina, *D'Orb.*

Discorbina Parisiensis, *D'Orb.*

Lagena marginata, *W. & J.*

„ *sulcata*, *Mont.*

Nonionina faba, *F. & M.*

„ *scapha*, *F. & M.*

Polymorphina complanata, *D'Orb.*

„ *gibba*, *D'Orb.*

„ *lactea*, *W. & J.*

Polystomella crispa, *L.*

Polystomella striato punctata, *F. & M.*

Pullenia sphaeroides, *D'Orb.*

Quinqueloculina seminulum, *L.*

Rotalia Beccarii, *L.*

Textularia sagittula.

Truncatulina lobatula, *W. & J.*

„ *refulgens*, *Montf.*

Uvigerina irregularis, *Brady.*

PLANTÆ.

Woods of three species of Angiospermous Dicotyledons, one Conifer, and two palms.

UPPER CRAG.

* These occur also in the Norwich or Fluvio-marine Crag. † Only found in the same. No Mammals are recorded from the purely marine beds of this age.

** Species common to the Middle and Norwich Crag only.

MAMMALIA.

TERRESTRIAL.

Arvicola amphibius, *Desm.*

„ *campestris*.

Bos.

Bison priscus.

Canis vulpes, *L.*

Castor fiber, *L.*

„ *trogotherium*, *Cuv.*

Cervus ardeus.

„ *Falconeri*, *Dawk.*

Elephas meridionalis, *Nesti.*

Equus caballus, *L.*

„ *plicidens* (?) *Owen.*

Felis catus, *L.*

Felis pardoides, *Owen.*

Hyæna antiqua, *Lank.*

Hipparion, *sp.*

Lepus cuniculus, *L.*

Lutra vulgaris.

Mastodon arvernensis, *Croizet.*

Ursus, *sp.*

MARINE.

Balæna, 2 sp.

Phoca vitulina, *L.*

AVES.

Various bones, *sp. indet.*

PISCES.

† *Esox lucius*.

Lamna, *sp.*

Merlangus pollachius, *Cuv.*

Morrhua vulgaris, *Cuv.*

* *Platex Woodwardi*, *Ag.*

- **Raia antiqua*, Ag.
 „ sp.

CRUSTACEA.

- Cancer pagurus*, L.
Carcinus mænas, L.

CIRRIPEDIA.

- **Balanus crenatus*, Brug.
 * „ *dolosus*, Darw.
 * „ *Hameri*, Asc.
 * „ *porcatus*, Da Costa.
 „ *tintinnabulum*, L.

ANNELIDA.

- Ditropa gadus*, Mont.
Sabellaria conchilega, Pall.

ECHINODERMATA.

- **Echinocyamus pusillus*, Müll.
Spatangus purpureus, Müll.
Toxopneustes Drobachiensis, Müll.

GASTEROPODA.

- **Admete viridula*, Fabr.
Amaura candida, Müll.
 **Aporrhais pespelicani*, L.
 **Buccinum ciliatum*, Fabr.
 * „ *Greenlandicum*, Chemn.
 * „ *undatum*, L.
 **Buccinopsis Dalei*, Sow.
 **Calyptrea Chinense*, L.
Cancellaria varicosa, Broc.
 **Capulus Hungaricus*, L.
 „ *militaris*, Wood, non Mont.
 „ *unguis*, Sow.
 **Cassidaria bicatenata*, Sow.
 **Cerithiopsis tuberculare*, Mont.
Cerithium granosum, Wood.
 „ *reticulatum*, Da Costa.
 * „ *tricinctum*, Broc.
 „ *variculosum*, Nyst.
Chiton, sp.
Columbella abbreviata, A. Bell.
 * „ *sulcata*, Sow.
 „ *Borsoni*, Bellardi.
Conopleura crassa (?) A. Bell.
 „ *elegans* (?) Scac.
 **Cypræa avellana*, Sow.
 * „ *Europea*, Mont.
 „ *retusa*, Sow.
 **Defrancia linearis*, Mont.
 „ *reticulata*, Ren.
 „ *purpurea*, Mont.
Emarginula fissura, L.
Erato laevis, Don.
 „ *Maugeriae*, Gray.
 ***Eulima polita*, L.
 **Fissurella græca*, L.
Fusus altum, Wood.
 „ *antiquus*, L.
 „ *contrarius*, L.
 „ *cordatus*, A. Bell.

- Fusus costifer*, Sow.
 „ *despectus*, L.
 „ *gracilis*, Da Costa.
 ** „ *Norvegicus*, Chemn.
 „ *Largillierii*, Fisch.
Fusus Sarsii, Jeffr.
 „ *Turtoni*, Bean.
 ***Hydrobia ulva*, Penn.
 „ *ventrosa*, Mont.
Lachesis, n. sp.
 **Lacuna crassior*, Mont.
 * „ *divaricata*, Fabr.
Lepeta cæca, Müll.
 **Littorina littorea*, L.
 * „ *rudis*, Maton.
 „ *suboperta*, Wood.
 * „ *tenebrosa*, Mont.
 ***Melampus myosotis*, Drap.
 **Murex erinaceus*, L.
 * „ *tortuosus*, Sow.
Nassa ascanias, Brug.
 „ *elegans*, Leathes.
 „ *granulata*, Sow.
 * „ *incrassata*, Strom.
 „ *labiosa*, Sow.
 „ *monensis*, E. Forb.
 * „ *propinqua*, Sow.
 „ *pygmæa*, Lam.
 * „ *reticosa*, Sow.
 „ *variabilis*, Phil.
 **Natica affinis*, Gmel.
 * „ *borealis*, Gray.
 * „ *Alderii*, E. Forb.
 * „ *catena*, Da Costa.
 * „ *catenoides*, Wood.
 * „ *Greenlandicus*, Beck.
 * „ *hemicleusa*, Sow.
 * „ *Islandica*, Gmel.
 * „ *multipunctata*, Wood.
 „ *Montagui*, E. Forb.
 „ *occlusa*, Wood.
 ***Melampus myosotis*, Drap.
 * „ *pyramidalis*, Sow.
 * „ *fusiformis*, Wood.
 ***Odostomia conoidea*, Broc.
 ***Chemnitzia lactea*, L.
 „ *communis*, Risso.
 * „ *internodula*, Wood.
 „ *plicatula*, Broc.
 **Ovula spelta*, L.
 „ *Adriatica*, Sow.
Paludestrina pendula, Wood.
Patella vulgata, L.
 **Pleurotoma bicarinata*, Couth.
 „ *Bertrandi*, Payr.
 „ *contigua*, Broc.
 „ *costata*, Don.
 * „ *exarata*, Möll.
 * „ *harpularia*, Couth.
 * „ *mitrula*, Sow.
 * „ *nobilis* (?) Möll.
 † „ *pyramidalis*, Strom.
 „ *pygmæum*, Phil. (?)
 „ *rufa*, Mont.
 „ *striolata*, Scac.
 „ *galerita*, Phil.

- †*Pleurotoma Trevelyana*, *Turt.*
 * „ *turricula*, *Mont.*
 „ *violacea*, *Mighels.*
 „ *volvula*, *A. Bell.*
 **Purpura lapillus*, *L.*
 „ *tetragona*, *Sow.*
Ringicula auriculata, *Men.*
 „ *ventricosa*, *Sow.*
Rissoa confinis, *Wood.*
 * „ *pulehella*, *Wood non Phil.*
 * „ *curticosta*, *Wood.*
 **Scalaria clathratula*, *Mont.*
 * „ *foliacea*, *Sow.*
 * „ *Greenlandica*, *Chemn.*
 „ *subulata*, *Nyst.*
 „ *varicosa*, *Lam.*
 (*) „ *Trevelyana*, *Leach.*
 **Tectura virginea*, *Müll.*
 „ *parvula*, *Wood.*
Terebra inversa, *Nyst.*
Trochus Adansonii, *Payr.*
 „ *cinerarius*, *L.*
 „ *cineroides*, *Wood.*
 * „ *granulatus*, *Born.*
 „ *Kickxii*, *Nyst.*
 „ *multigranus*, *Wood.*
 „ *Montacuti*, *W. Wood.*
 „ *occidentalis*, *Migh.*
 „ *subexcavatus*, *Wood.*
 * „ *tumidus*, *Mont.*
 „ *villicus*, *Phil.*
 „ *zizyphinus*, *L.*
 †(*Margarita*) *Greenlandicus*, *Chemn.*
 **Turritella communis*, *Risso.*
 „ *incrassata*, *Sow.*
 * „ *planispira*, *Wood.*
 **Trophon Barvicense*, *Johnst.*
 „ *clathratum*, *Müll.*
 „ *muricatum*, *Mont.*
 * „ *scalariforme*, *Gould.*
 †*Velutina lævigata*, *Penn.*
 † „ *lanigera*, *Möll.*
 † „ *zonata*, *Gould.*
Vermetus subcancellatus, *Biv.*
 **Voluta Lamberti*, *Sow.*

SOLENOCONCHA.

Dentalium dentalis, *L.*

OPISTHOBRANCHIATA.

- **Actæon tornatilis*, *L.*
 „ *subulata*, *Wood.*
 †*Cylichna alba*, *Brown.*
 „ *cylindracea*, *Penn.*
 **Utriculus obtusus*, *Mont.*

LAMELLIBRANCHIATA.

- **Anomia ephippium*, *L.*
 * „ *patelliformis*, *L.*
 „ *Arca lactea*, *L.*
 „ *tetragona*, *Poli.*
 †*Astarte borealis*, *Chemn.*
 * „ *Burtinii*, *La Jonk.*
 * „ *compressa*, *Mont.*
 † „ *elliptica*, *Brown.*
 * „ *gracilis*, *Munst.*

- Astarte Galeottii*, *Nyst.*
 * „ *Omali*, *La Jonk.*
 „ *obliquata*, *Sow.*
 „ *sulcata*, *Da Costa.*
 **Cardita corbis*, *Phil.*
 * „ *scalaris*, *Leathes.*
 * „ *senilis*, *Lam.*
 **Cardium angustatum*, *Sow.*
 „ *decorticatum*, *Wood.*
 „ *echinatum*, *L.*
 * „ *edule*, *L.*
 „ *interruptum*, *Wood.*
 „ *Nodosum*, *Turt.*
 „ *Parkinsonii*, *Sow.*
 „ *venustum*, *Wood.*
 **Corbula gibba*, *Olivi.*
Corbulomya complanata, *Sow.*
 **Cyprina Islandica*, *L.*
 „ *rustica*, *Sow.*
 **Diplodonta astartea*, *Nyst.*
 „ *dilatata*, *Wood.*
 * „ *rotundata*, *Mont.*
Donax vittatus, *Da Costa.*
 „ *trunculus*, *L.*
Erycina ovata, *Phil.*
Gastrana laminosa, *Sow.*
Gastrochæna dubia, *Penn.*
 **Glycimeris angusta*, *Nyst.*
 ***Hinnites giganteus*, *Carp.*
 **Leda lanceolata*, *Sow.*
 * „ *myalis*, *Couth.*
 * „ *hyperborea*, *Lou.*
 ** „ *semistriata*, *Wood.*
 **Loripes divaricatus*, *L.*
 **Lucina borealis*, *L.*
 **Mactra arcuata*, *Sow.*
 * „ *constricta*, *Wood.*
 * „ *stultorum*, *L.*
 * „ *solida*, *L.*
 * „ *elliptica*, *L.*
 * „ *subtruncata*, *Da Costa.*
 **Mya arenaria*, *L.*
 * „ *truncata*, *L.*
 **Mytilus edulis*, *L.*
 * „ *modiolus*, *L.*
 **Nucula Cobboldiæ*, *Sow.*
 * „ *Lyallii*, *Baird.*
 * „ *lævigata*, *Sbz.*
 * „ *nucleus*, *L.*
 * „ *tenuis*, *Mont.*
 **Ostrea edulis*, *L.*
Pecten dubius, *Broc.*
 ** „ *Gerardii*, *Nyst.*
 ** „ *princeps*, *Sow.*
 * „ *maximus*, *L.*
 * „ *opercularis*, *L.*
 * „ *var. Audouinii*, *Payr.*
 „ *pusio*, *L.*
 * „ *tigrinus*, *Müll.*
 **Pectunculus glycimeris*, *L.*
 †*Pholas candida*, *L.*
 * „ *crispata*, *L.*
Pinna rudis, *L.*
 **Saxicava arctica*, *L.*
 „ *Norvegica*, *Spengl.*
Scacchia elliptica, *Phil.*

- **Serobicularia piperita*, *Gmel.*
 **Serripes Greenlandicus*, *Chemn.*
 **Solen siliqua*, *L.*
 **Syndosmya alba*, *W. Wood.*
 †*Tapes aureus*, *Gmel.*
 ** „ *texturata*, *Lam.*
 ** „ *virginea*, *L.*
 **Tellina calcarea*, *Chemn.*
 ** „ *crassa*, *Penn.*
 ** „ *donacina*, *L.*
 † „ *fabula*, *Gron.*
 * „ *obliqua*, *Sow.*
 * „ *prætenius*, *Leathes.*
 ****Thracia inflata*, *Sow.*
 * „ *papyracea*, *Poli.*
 **Venus fasciata*, *Don.*
 * „ *ovata*, *Penn.*
 **Artemis exoleta*, *L.*
 ** „ *lincta*, *Pult.*
 **Cytherea rudis*, *Poli.*
 **Woodia digitaria*, *L.*

BRACHIOPODA.

- Argiope cistellula*, *Wood.*
 **Rhynchonella psittacea*, *Chemn.*
Terebratula grandis, *Blum.*

LAND AND FRESHWATER MOLLUSCA.

- Ancylus lacustris*, *L.*
 †*Bithynia tentaculata*, *L.*
 †*Carychium minimum*, *Müll.*
 †*Helix arbustorum*, *L.*
 † „ *concinna*, *Jeffer.*
 * „ *hispidula*, *L.*
 * „ *pulchella*, *Müll.*
 **Limæus palustris*, *Müll.*
 „ var. *Holbollii*, *Müll.*
 * „ *peregra*, *Müll.*
 * „ *truncatula*, *Müll.*
 „ *stagnalis* ? *L.*
 ***Paludina parilis*, *Wood.*

MAMMALIA.

- Arvicola amphibia*, *Desm.*
Mastodon arvernensis, *Croizet.*
Cervus.
Elephas.
Balæna, 2 spec.

PISCES.

Otolites, vertebræ (2 sp.), &c.

CRUSTACEA.

Claws.

CIRRIPEDIA.

- Balanus balanoides* (?)
 „ *crenatus*, *Brug.*
 „ *porcatus.*

POLYZOA.

- Cellepora compressa*, *Busk.*
Eschara sinuosa, *Busk.*
Fungella multifida, *Busk.*
Hornera infundibulata, *Busk.*
Lunulites conica, *DeFr.*

CELENTERATA.

- Balanophyllia calyculus*, *Wood.*
Sphænotrochus intermedius, *Münst.*

SPONGIDA.

- Clione celata*, *Grant.*

FORAMINIFERA.

- Bulimina aculeata*, *D'Orb.*
Discorbina rosacea, *D'Orb.*
Globigerina bulloides, *D'Orb.*
Nodosaria raphanus, *L.*
Polymorphina compressa, *D'Orb.*
Polystomella crispa, *L.*
 „ *striato-punctata*, *F. & M.*
Pulvulina Karstenii, *Reuss.*
Rotalia Beccarii, *L.*
Truncatulina lobatula, *W. & J.*

- Planorbis albus*, *Müll.*
 * „ *complanatus*, *L.*
 „ *corneus*, *L.*
 „ *spiroboris*, *Müll.*
 **Pupa muscorum*, *L.*
 †*Vertigo edentula*, *Jeffer. (P)*
 †*Succinea oblonga*, *Drap.*
 „ *putris*, *L.*
 †*Valvata cristata*, *Müll.*
 † „ *piscinalis*, *Müll.*
 ***Corbicula fluminalis*, *Müll.*
 †*Pisidium amnicum*, *Müll.*
 „ var. *sulcatum*, *Sow.*
 †*Sphærium corneum*, *L.*

CHILLESFORD SERIES.

ANNELIDA.

- Serpula vermicularis*, *L.*
Sabellaria conchilega, *Pall.*

ECHINODERMATA.

- Echinus lividus*, *Müll.*
Echinocyamus pusillus, *Müll.*
Spatangus purpureus, *Müll.*

GASTEROPODA.

- Admete viridula*, *Fabr.*
Buccinum Greenlandicum, *Chemn.*
 „ *undatum*, *L.*
Buccinopsis Dalei, *Sow.*
Calyptrea Chinense, *L.*
Capulus Hungaricus, *L.*

Cerithium tricinatum, Broc.
Chemnitzia internodula, Wood.
Defrancia linearis, Mont.
Fusus antiquus, L.
(Trophon) muricatum, Mont.
Hydrobia ulva, Penn.
Lacuna divaricata, Fabr.
Littorina littorea, L.
 " *rudis, Mont.*
Melampus pyramidalis, Sow.
Nassa labiosa, Sow.
 " *incrassata, Strom.*
 " *propinqua, Sow.*
 " *reticosa, Sow.*
Natica Alderi, E. Forb.
 " *affinis, Gmel.*
 " *borealis, Gray.*
 " *catena, Da Costa.*
 " *catenoides, Sow.*
 " *Islandica, Gmel.*
 " *hemictausa, Sow.*
 " *millepunctata, Wood.*
 " *occlusa, Wood.*
 " *Spitzbergensis, A. Bell. (M.S.)*
Odostomia.
Pleurotoma elegans, Möll. (f)
 " *exarata, Möll.*
 " *harpularia, Möll.*
 " *nobilis, Möll.*
 " *Trevelyana, Turt.*
 " *turricula, Mont.*
Purpura lapillus, L.
 " *tetragona, Wood.*
Ringicula auriculata, Men.
 " *ventricosa, Sow.*
Rissoa Stefanisi, Jeffr.
 " *striata, Ad.*
Scalaria pseudoscalaris, Broc.
 " *foliacea, Sow.*
 " *Greenlandica, Chemn.*
 " *Trevelyana, Leach. (?)*
 " *Turtonis, Leach.*
Trochus tumidus, Mont.
Turritella communis, Risso.
 " *incrassata, Sow.*
Voluta Lamberti, Sow.

 OPISTHOBRANCHIATA.
Actæon tornatilis, L.
 " *subulata, Wood.*
Utriculus obtusus, Mont.
 " *truncatulus, Brug.*

 LAMELLIBRANCHIATA.

Anomia ephippium, L.
 " *patelliformis, L.*
 " *striata, Broc.*
Astarte borealis, Chemn.
 " *compressa, Mont.*
 " *sulcata, Da Costa.*
Axinus flexuosa, Mont.
Cardita analis, Phil.
 " *chamaeformis, Leathes.*
 " *scalaris, Leathes.*
Cardium edule, L.
 " *fasciatum, Mont.*

Cardium nodosum, Turt.
 " *elegantulum, Möll.*
Circe minima, Mont.
Cochlodesma complanata, Wood.
 " *prætenue, Pult.*
Corbula gibba, Olivi.
Cyprina Islandica, L.
Diplodonta rotundata, Mont.
Donax vittatus, Da Costa.
Erycina ovata, Phil.
Kellia ambigua, Nyst.
Leda hyperborea, Lov.
 " *lanceolata, Sow.*
 " *myalis, Couth.*
 " *pygmea, Münster.*
Lepton nitidum, Turt.
Loripes divaricatus, L.
Lucina borealis, L.
Lucinopsis undata, Penn.
Maetra arcuata, Sow.
 " *elliptica, Br.*
 " *solida, L.*
 " *subtruncata, Da Costa.*
Modiolaria discors, L.
 " *marmorata, E. Forb.*
Montacuta bidentata, Mont.
 " *ferruginosa, Mont.*
 " *substriata, Mont.*
Mya arenaria, L.
 " *truncata, L.*
Mytilus edulis, L.
 " *modiolus, L.*
Nucula Cobboldiæ, Sow.
 " *nucleus, L.*
 " *tenuis, Mont.*
Ostræa edulis, L.
Panopæa fragilis, Nyst.
Pecten Gerardi, Nyst.
 " *opercularis, L.*
 " *pusio, L.*
 " *princeps, Sow.*
 " *tigrinus, Mull.*
Pectunculus glycymeris, L.
Pinna rudis (f), L.
Saxicava arctica, L.
 " *Norvegica, Spengl.*
Scrobicularia piperita, Gmel.
Serripes Greenlandicus, Chemn.
Solen ensis, L.
 " *pellucida, Penn.*
 " *siliqua, L.*
Syndosmya alba, W. Wood.
 " *prismatica, Mont.*
Tellina calcarea, Chemn.
 " *crassa, Penn.*
 " *donacina, L.*
 " *fabula, Gron.*
 " *obliqua, Sow.*
 " *prætenuis, Leathes.*
Thracia papyracea, Poli.
 " *var. villosiuscula, McG.*
Venus ovata, Penn.

BRACHIOPODA.

Rhynchonella psittacea, Gmel.

POLYZOA.

Alveolaria semiovata, *Busk*.
Membranipora monostachys, *Busk*.
Salicornaria sinuosa, *Hassall*.

SPONGIDA.

Clione celata, *Grant*.

FORAMINIFERA.

Bulimina elegans, *D'Orb*.
Polystomella crispa, *L*.
 „ *striato-punctata*, *F. & M*.
Polymorphina lactea, *W. & J*.
Rotalia Beccarii, *L*.
Truncatulina lobatula, *W. & J*.

LAND AND FRESHWATER MOLLUSCA.

Helix arbustorum, *L*.
 „ *hispida*, *L*.
Linnaeus pereger, *Müll*.
 „ *truncatulus*, *Müll*.
 „ *palustris*, *Müll*.
Paludina parilis, *Wood*.

Planorbis complanatus, *L*.
Valvata piscinalis, *Müll*.
Corbicula fluminalis, *Müll*.
Pisidium amnicum, *Müll*.
Sphaerium corneum, *L*.

FOREST BED.

MAMMALIA.

Arvicola amphibia, *Desm*.
Asinus fossilis, *Owen*.
Bison priscus, *Owen*.
Bos primigenius, *Blum*.
Castor fiber, *L*.
 „ *trogotherium*, *Cuv*.
Cervus ardeus, *Falc*. (†)
 „ *bovoides*, *Gunn*.
 „ *Capreolus* ? *L*.
 „ *megaceros*, *Harte*.
 „ *elaphus*, *L*.
 „ *Sedgwickii*, *Gunn*.
 „ *Poligniacus*.
 „ *Gunni* (†) *
Elephas antiquus, *Falc*.
 „ *var. priscus*, *Goldf*.
 „ *meridionalis*, *Neste*.
 „ *leptodon*, *Gunn* (*M. S.*)
 „ *giganteus*, *G. (M. S.)*
Equus caballus, *L*.
Hippopotamus major, *Desm*.
Hyæna spelæa, *Geoffr*.
Ovis vel Capra.
Machairodus latidens.
Monoceros monodon, *L*.
Mus musculus, *L*.
Mygale moschata, *Pall*.
Rhinoceros megarhinus, *De Christol*.
 „ *etruscus*, *Falc*.
 (*Sciurus* sp. †)
Sorex fodiens, *Gmel*.
 „ *remifer*, *Geoff*.
Sus arvernensis.
Talpa Europæa, *L*.
Ursus arvernensis, *C. & J*.
 „ *spelæus*, *Goldf*.
 „ *etruscus*.
Balaena, two sp.
Trichecus rosmarus, *L*.

AVES.

Bones, sp. indet.

PISCES.

Esox lucius, *L*.
Perca fluviatilis, *L*.

INSECTA.

Donacia linearis.
 „ (several sp. indet).
Oiceoptoma dispar.

GASTEROPODA.

Ancylus fluviatilis, *Müll*.
 „ *lacustris*, *L*.
Bithynia tentaculata, *L*.
Carychium minimum, *Müll*.
Helix arbustorum, *L*.
 „ *concinna*, *Jeffr*.
 „ *hispida*, *L*.
 „ *nemoralis*, *L*.
Limax agrestis, *Müll*.
Limnaea palustris, *Müll*.
 „ *pereger*, *Müll*.
 „ *stagnalis*, *Müll*.
Paludina contracta, *Müll*.
Physa fontinalis, *Müll*.
Planorbis albus, *Müll*.
 „ *complanatus*, *L*.
 „ *corneus*, *L*.
 „ *nautilus*.
 „ *nitidus*.
Succinea oblonga, *Drap*.
 „ *putris*, *L*.
Valvata piscinalis, *Müll*.
 „ *var. antiqua*, *Sow*.
 „ *cristata*, *Müll*.
Zus lubrica, *Müll*.

* The terminal portion of an antler so named is in the King Collection, Museum of Practical Geology.

† Indicated by the bitten fir cones. No remains of the animal are known.

LAMELLIBRANCHIATA.

Anodonta cygnea, *L.*
 " *anatina*, *L.*
Pisidium amnicum, *Müll.*
 " *var. sulcatum*, *Sow.*
 " *fontinale*, *Drap.*
 " *Henslowiana*, *Shepp.*
 " *nitidum*, *Jenyns.*
Sphaerium corneum, *L.*
 " *rivicola*, *Leach.*
Unio littoralis, *Lam.*
 " *pictorum*, *L.*

PLANTÆ.

Alnus glutinosa, *Gärtn.*

Ceratophyllum demersum, *Smith.*
Corylus avellana, *L.*
Menyanthes trifoliata, *L.*
Nuphar lutea, *Smith.*
Nymphaea alba, *L.*
Osmunda regalis, *L.*
Potamogeton lucens, *L.*
Pinus abies, *L.*
 " *sylvestris*, *L.*
Prunus spinosus.
Quercus—
Salix, *sp.*
Taxus baccatus, *L.*
Ulmus, *sp.*
 Also Rhizomes and fronds of Ferns.

We have to thank the Rev. J. Gunn, M.A., F.G.S., for kindly revising the lists of the Vertebrata of the Forest Bed, thus ensuring their correctness.

The *Monoceros* (Narwhal) came from the sands immediately overlying the Forest Bed; we have, however, thought it advisable to leave it in the list.

Elephas leptodon and *E. giganteus* are founded upon some molar teeth and immense bones not yet described.

Cervus bovides is founded upon one of the most remarkable fossils yet discovered in this ancient cemetery, *i.e.*, "a large antler"—"first supposed to have belonged to an ox, but subsequently proved to be that of a deer."

NOTE BY ALFRED BELL.

The foregoing lists by no means exhaust the faunas of the various deposits. I had hoped to have added to them the species that will shortly be described in the Palæontographical Society's twenty-fifth volume, but the delay in publication renders this impossible. I have also notes of many species still undescribed, including Echini, Molluscs, and Polyzoa, and I would especially recommend any collector not to throw away anything, even a fragment, without first ascertaining what it is. A fauna can be determined only by patient examination, and I do not know any pleasure in collecting that gives greater zest to a student than in finding out that a deposit already well worked, still yields fresh novelties. Fresh sections are very likely to produce these, as I have found by experience, and the sections of five years ago had very often a fauna different from what they have at present.

If any of the members of the Geologists' Association are in possession of any forms that may be undescribed, I beg the favour of seeing them, for I find in most collections something new when the geologist has collected for himself; and I am desirous of completing, as far as possible, the record of the organic remains contained in the English Crag.

2. On South African Diamonds. By Professor JAMES TENNANT, F.G.S., F.C.S., F.R.G.S., &c.

(The publication of this Paper is deferred.)