19. *On a FOSSILIFEROUS BAND at the TOP of the LOWER GREENSAND near LEIGHTON BUZZARD (BEDFORDSHIRE).* By GEORGE WILLIAM LAMPLUGH, Esq., F.G.S., and JOHN FRANCIS WALKER, Esq., M.A., F.L.S., F.G.S. (Read February 4th, 1903.)

PART I.—GENERAL DESCRIPTION.

Introduction.

DURING an examination of the Lower Cretaceous outcrop in Bedfordshire by one of the writers in June 1902, he was delighted to find in the sands immediately below the base of the Gault-Clay, in the large sand-pits at Shenley Hill, $1\frac{1}{2}$ miles north-east of Leighton Buzzard, a richly-fossiliferous horizon which does not appear to have been hitherto noticed. Four separate visits were afterwards made by him to the locality, for the purpose of studying the section and collecting the fossils; but as these did not serve to exhaust the possibilities of the bed, the second author undertook to carry on the investigation, and for this purpose spent ten days on the ground in August. On the material thus jointly collected, along with further supplies since received from the quarrymen, the palæontological results given in this paper are based, while for the stratigraphical details of the sections, and for opinions expressed thereon, the first-named author is mainly responsible.

The nearest locality from which fossils have been previously recorded in the Lower Greensand of this part of England, lies between Great and Little Brickhill, 4 miles to the northward of Shenley Hill, where they were found abundantly in working a 'coprolite-bed' at the base of the Lower Greensand. The only other recorded occurrence of marine Lower Cretaceous fossils in Bedfordshire is at Potton, 19 miles to the north-eastward of Shenley Hill, where, in the workings of a pebbly 'coprolite-bed' which forms a band in the Greensands at a little distance above the base, numerous organic remains were discovered, but the majority were supposed to be derived from the underlying Jurassic rocks. The new locality is of especial interest in presenting the hitherto-unknown fauna of the highest part of the sandy deposits of the district. This fauna exhibits anomalous characters, which are without parallel in any other bed known to occur below the Gault in England. Indeed, if the stratigraphical evidence had been less definite, the fossil-band would probably have been classed on palæontological grounds with the Upper Greensand. For this reason the occurrence of the fossils is of more than local interest, and seems to deserve being brought under the notice of the Geological Society.

The lithological characters and stratigraphical relations of the fossil-band will be first described; and the palæontological evidence will be discussed afterwards.

Fig. 1.

Fig. 2.

Description of the Sections.

As already mentioned, the exposures occur in a series of large sand-pits on the southern slope of Shenley Hill. Their position is indicated on the sketch-map (fig. 1, p. 235). These pits are opened mainly for the purpose of obtaining a clean white quartz-sand, known as 'silver-sand,' which is highly valued for filter-beds and other purposes, and is sent out of the district in large quantities.

This material is dug in a group of contiguous pits (shown in the plan, fig. 2), among which the largest workings are known as 'Garside's Pit,' on the south-east; 'Rigby Harris's Pit,' continuous with the former on the west; and 'Chance's Pit,' in the adjoining field north of Garside's. These pits cover an aggregate area of 400 yards by 300; the sand is removed to an average depth of 15 feet, and the excavation partly refilled with the heavy capping of Drift and Gault-Clay, which has to be taken off before the valuable 'silver-sand' can be reached. At first sight the sands appeared to be unfossiliferous, and indeed looked most unpromising for fossils.¹ But, while traversing the spoil-heaps during our first visit to the place, some blocks of hard, horny-looking, gritty limestone arrested our attention, and these on further examination were found to contain fossils. Search was made in the pit-sections for the bed from which the blocks had come, and the band was soon identified in Rigby Harris's Pit, where the working-face revealed the bed in place, as shown in fig. 3 (p. 238).

This section represents the clearest development of the fossil-band in the pits; but the bed may be traced, with constant minor variation, from point to point, wherever the junction of the Gault and Lower Greensand is visible in the sides of the pits. In the southern portion of Garside's Pit, however, as the bed approaches its outcrop at the surface from beneath the Gault it becomes decomposed to an ochreous marl, wherein organic remains are scarcely recognizable; and it has also been slightly disturbed by glacial agencies, which have mingled parts of the thin covering of Gault with the Boulder-Clay. In Chance's Pit, where the overlying Gault is 6 feet thick, covered by 4 or 5 feet of Boulder-Clay, the ironstone-floors associated with the calcareous concretions are as well-marked as in the section figured on p. 238; and between them we found casts of fossils in decomposing ochreous material, but saw none of the hard limestone-masses in place at the time of our visits, as they were obscured by talus. Some fossils *in situ* were, however, dug out by the foreman of the pit in the presence of one of the authors. Large blocks of the fossiliferous rock were

¹ This discouraging aspect of the sands explains how it has happened that the fossils have remained so long undiscovered. The pits were visited in 1897 by the Geologists' Association, and are described in Proc. Geol. Assoc. vol. xv, p. 184. In this description it is observed that the junction of the Gault and Lower Greensand 'is marked by a nodular bed of ochreous clay and ironstone,' and that 'drift-wood was found' in the pits, 'but no other fossils were seen.'

abundant on the tip-heap of this pit; and we were assured by the quarrymen that the stone occurred in the same position as in the other pits. Some of this stone was richly streaked and

Fig. 3.—Section at the northern end of Rigby Harris's sand-pit, Shenley Hill.

Scale: 1 inch = 10 feet.

<p>Brown clayey soil, with small stones.
1 foot.</p> <p>A. Bluish-grey Boulder-Clay, composed of re-arranged Gault, speckled with small pieces of chalk, flint, iron-grit, and a few pebbles of quartzite, etc. 2 to 6 feet, merging downward into</p> <p>B. Gault: bluish-grey shaly clay in the upper part, and dark blue below; with a few small pyritous clay-stone-nodules just above the base.
4 to 7 feet.</p> <p>C. Irregular band of iron-grit, with smooth-worn wrinkled surface; usually dark liver-red, but in places crimson; occasionally split by ochreous partings and lenticles of coarse grit and iron-grit breccia.
1 to 3 inches.</p> <p>D. Ochreous or greenish-yellow loamy sand, grit, and breccia; replaced here and there by lenticles of pale</p> | <p>flesh-coloured or yellowish gritty limestone, full of fossils.
1 to 2 feet.</p> <p>E. Undulating iron-grit band, as a rule sharply defined, but in one place approaching the upper band and there becoming lenticular and confused 2 to 3 inches.</p> <p>F. Greyish greensand, moist and loamy, with clayey streaks and lenticles of pebbly grit 2 to 3 feet.</p> <p>G. Lenticles of dark-red and ochreous iron-grit, with small included nodules of sandy pyritous clay-stone; streaks of fullers' earth, dark clayey greensand, and ochreous loam below; forming a well-defined band capping the 'silver-sands.'
1 to 1½ feet.</p> <p>H. 'Silver-sands': clean white or iron-stained sand, strongly cross-bedded, with sporadic masses of ironstone sometimes containing traces of wood 10 to 15 feet seen.</p> |
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dappled with glauconite, but was otherwise exactly similar to that seen in the adjacent sections, and contained the same fossils. Most of these blocks have since been broken up at our instigation, and the fossils sent to one of the authors.

In all the sections there is a clear line of demarcation between the strongly current-bedded 'silver-sands' and the overlying more regularly-stratified loamy glauconitic sand, with its layers of iron-grit and fossiliferous concretions. This line of junction seems to form a definite floor, and to imply some degree of erosion and unconformity. Yet in a mass so irregularly-bedded as the Lower Greensand, such appearances are not unusual, and need not necessarily denote anything more than local erosion and re-arrangement.

The 'Silver-Sands.'

The silver-sands are sporadically indurated into irregular lumps and nodules of ironstone, in the larger of which traces of fossil wood, sometimes perforated by borers, may be occasionally detected¹; but with this exception our search in them for organic remains was unsuccessful. Lithologically they somewhat resemble the 'Sandringham Sands'² of Norfolk, but probably occupy a higher stratigraphical position. The 'Nine-acre Pit,' shown in fig. 2 (p. 236), is entirely in these sands; and there are numerous other extensive excavations at the same and lower horizons in the tract of Lower Greensand north and west of Shenley Hill, but in none could we find any trace of fossils except wood. There are also very fine sections in ballast-pits on both sides of the branch-railway immediately south of Leighton, showing 20 to 30 feet of strongly current-bedded buff and ochreous sands, coarsely gritty in texture, with very little ironstone; but these sands are capped by Drift, and their junction with the Gault is not at present seen, although it must be nearly reached. No trace of the fossiliferous band was found in these sections; nor in the old sand-pits at Egginton, 1½ miles east of Shenley Hill, which are also close to the boundary of the Gault.

A striking feature, both in the 'silver-sands' and in the overlying sand, is the high degree of rounding and polishing exhibited by the larger quartz-grains and lydites. This feature is indeed prevalent in many sandy deposits between the Kimmeridge Clay and the Upper Cretaceous in England; as, for example, in the Spilsby Sandstone of Lincolnshire, in the Sandringham Sands of Norfolk, in parts of the Folkestone Sands of Kent, and in the Ironsands of Western Sussex. It has been previously pointed out by one of us, that where beds possessing this peculiarity are present in the Lower Cretaceous Series, a great change is usually observable in the fauna above and below such beds wherever fossil evidence is available; and the conclusion has been drawn that sands of this character denote periods of slow deposition on a current-swept sea-floor, whereon the same detritus was drifted to and fro and frequently redistributed, without much addition of new material.³

¹ The specimen of '*Cycadoidea Yatesii* from Leighton Buzzard,' described by Mr. W. Carruthers in Geol. Mag. vol. iv (1867) p. 199, and mentioned by Morris (*ibid.* p. 457), may have been obtained from these sands.

² 'The Borders of the Wash' Mem. Geol. Surv. (1899) p. 17.

³ 'Summary of Progress for 1898' Mem. Geol. Surv. pp. 142-43.

By long-continued attrition under current-action, the sand-grains may eventually become nearly as well-polished, though not quite so well-rounded, as in desert blown-sands, to which this polishing has been considered (perhaps too exclusively) to be confined. The researches of Mr. A. R. Hunt upon the smoothly-rounded sands of the Skerries Shoal, off the coast of Devon, may be adduced as a modern illustration of this action.¹ It is especially noteworthy that phosphatic nodules are very frequently associated with these polished sands. Into this side-issue we do not propose to enter further at present, as the matter will be more conveniently discussed on some future occasion, in connection with the re-investigation of the fauna of the Lower-Greensand phosphate-beds.

The Iron-Grit Bands.

Additional proof of the slow rate of deposition is afforded by the floors of iron-grit, which are so strikingly developed immediately above and below the fossiliferous band at Shenley. Similar iron-stone occurs sporadically in nodules and irregular masses throughout the Lower Greensand of the Midland counties: its presence in the 'silver-sands' of the Shenley sections has already been noted, and it is plentiful also in the sand-pits at lower horizons between Leighton Buzzard and Woburn. In most cases it has clearly been formed subsequently to the period of accumulation of the sands, through the segregation of the iron-salts by percolating waters. Indeed, in some places the induration is probably still in progress. In a small opening south-east of Garside's Pit (shown in fig. 2, p. 236), where the sands crop out at the surface from beneath a thin wedge of Drift, there is at the top of the section a large mass of iron-grit, 2 to 5 feet thick, peculiarly hard and vitreous, and almost black in the middle of the blocks, in which apparently there has been some solution and redeposition of silica as well as of iron. This rock passes out downward, along planes of cross-bedding, into a bright orange-staining of the sands, and though these sands are very different in aspect from the white sands of adjacent sections, they are clearly part of the same mass. Here it is highly probable that the present position of the outcrop is responsible for the induration and staining.

The persistent undulating floors of iron-grit associated with the fossiliferous belt, however, though somewhat similar to the later concretions in appearance and composition, must have been formed very soon after the accumulation of the sands; for there is clear proof that they were in existence as rocky bands before the material now overlying them was deposited. Above the lower band are in places patches of coarse breccia, composed of flat fragments of iron-grit ranging up to 3 or 4 inches in diameter, more or less sub-angular, but with worn and polished surfaces, mixed with coarse quartz-grit and small 'lydite'-pebbles in a slightly-calcareous paste,

¹ 'The Evidence of the Skerries Shoal on the Wearing of Fine Sands by Waves' Trans. Devon. Assoc. Adv. Sci. vol. xix (1887) pp. 498-515.

among which brachiopods and other shells, with the tests converted into limonite and well-preserved, are sometimes embedded. From their size and character, it is clear that the larger fragments of this breccia cannot have been transported far. The iron-pan floor underlying these patches of breccia is polished and worn into little hollows, as though by the drifting of the overlying rubble and sand across it; and some large blocks on the tip-heap of Rigby Harris's Pit, apparently from this horizon, were encrusted on their worn irregular surfaces by adherent oysters and *Serpula*, clearly proving that the rock-band from which they came had constituted for a time the actual sea-floor.

It is scarcely likely that the sand could undergo cementation and induration at the surface immediately in contact with the sea-water. More probably the action took place at some little depth within the deposit, the hardened band being afterwards laid bare by currents of increased strength, which winnowed away all the loose material overlying it at this particular spot, until further erosion was checked by its presence. The fragments of iron-grit in the breccia, if not derived from portions of the same floor, may represent the remnants of impermanent masses which had formed at slightly higher levels and were let down piecemeal by the removal of their matrix. Obscure markings, suggestive of the almost obliterated casts of organisms, are frequently visible in this band of iron-grit; but it has yielded no fossil of which the nature could be definitely identified.

The persistent iron-pan floor which occurs above the fossiliferous belt and is directly overlain by the Gault-Clay, is of a character similar to that below the belt. It shows the same curiously-corrugated surface, and contains the same abundance of polished grit-grains. Indeed, the two occasionally come almost in contact with each other (as shown in fig. 3, p. 238), thus apparently marking off the intervening band into huge lenticles. During one of our visits to the section, the surface of the floor immediately underlying the Gault was freshly exposed in one part of the excavations over an area of several square yards, and exhibited a smooth-worn appearance, as though it had suffered attrition before the Gault-Clay was laid down upon it. The preservation of the fossiliferous limestone-lenticles is probably due to the protection afforded by these impervious iron-pan layers, which have shielded the bed between them from the solvent action of percolating waters.

The Lenticles of Fossiliferous Limestone.

The fossiliferous masses themselves present in their structure many points of interest. They vary from 2 or 3 to 10 feet or more in length, with a thickness never exceeding 2 feet and generally less. In the interior they are usually of very compact and horny texture, sometimes of a pale flesh-pink colour and sometimes yellowish, but they show every gradation between almost pure limestone and slightly calcareous grit. They are sprinkled through-

out, in varying abundance, with smooth shining grains of quartz, lydite, and dark iron-oxide; and occasionally with nests of coarse grit, bits of ironstone, and streaks of bright-green glauconite. At the exterior they are more predominantly gritty, softer, and of a yellow tint; and their surface is generally lumpy and nodular, being apparently studded with smaller concretions, resembling in this respect the limestone-masses in the 'Compound Nodular Band' at Speeton. They are generally more or less distinctly eroded at the upper surface, and sometimes perforated by borings filled in with dark greensand; therefore, like the iron-grit bands, they must have been sometimes actually uncovered on the sea-floor.

The smaller included concretions can often be recognized as the casts of shells, while in other cases they have a spongiform appearance. In general aspect these small nodules recall the 'coprolites' of Upware and Brickhill; but in composition they appear to be only sparingly phosphatic, and no phosphatized nodules like those of Potton, Upware, and Brickhill have been found. It is probable, however, that the small nodules may represent an early stage in the production of 'coprolites.' The same species of shells that occur in the condition of limonite in the patches of ironstone-breccia are found also in the calcitic state in the limestone and calcareous grit; and it is clear that the condition of preservation does not indicate any marked difference of age. Yet, although the limestone-lenticles occur only at one well-defined horizon (as shown in fig. 3, p. 238), we may notice a curious variation in their fossil contents, some blocks containing species in abundance which are rare or absent in other blocks, and almost every mass having its own faunistic individuality, although with certain species common to all. Thus, *Septifer lineatus* is very abundant in some blocks and absent from others; and so with most of the pectens and a few of the brachio-pods, though certain species of the last-mentioned, notably *Terebratula capillata*, are present in nearly every block. Owing to this peculiarity, it is certain that the lists of fossils given on pp. 262-63 are not exhaustive, and that as new portions of the deposit are quarried, additions might be made to our collections.¹

Taken in conjunction with the evidence already given for rearrangement and winnowing of the sands by current-action, this peculiar distribution of the fossils suggests that the limestone-masses have not been formed quite simultaneously, but that they probably represent shelly patches of the sea-floor where rapid consolidation took place at slightly different times, each locally-indurated patch in turn remaining fixed when the surrounding incoherent sand was swept away by the changeful currents. Under these circumstances the time-interval between the accretion of contiguous blocks may

¹ It is unlikely, however, that the fossils will be again procurable in such abundance as during our earlier visits; for at that time the limestone-blocks thrown aside during many years' working of the pits were available on the spoil-heaps, and most of these were broken up during our search. The quantity of this rock exposed in the actual working-faces of the pits at any time is comparatively limited.

have been of appreciable length ; and meanwhile the fauna of any particular portion of the sea-floor may to some extent have responded to the changing conditions.

Condition of the Fossils.

Despite the unmistakable evidence for strong current-action during the accumulation of the sands, we find with some surprise that the shells embedded in the limestone, although fragile, are in splendid preservation, and rarely show even the slightest trace of abrasion. The delicate ornamentation of the striated and pustulated brachiopods, and of the pectens and other lamellibranchs, is generally as fresh and sharp as the most fastidious palæontologist could desire. Both valves are nearly always present and in position ; and it is clear that the molluscs have flourished at the site where their shells now occur. In this respect the bed differs greatly from the Faringdon 'Sponge-Gravels' and from the Potton 'Phosphate-Bed,' in which nearly all the materials show signs of transportation ; but it somewhat resembles the fossiliferous beds at Brickhill and at Upware, where many of the delicate shells are similarly, though not quite so perfectly, preserved and at the same time associated with much current-drifted detritus. To explain this anomaly, we may suppose that the molluscs have lived in clusters on the sea-floor during intervals when the strength of the currents at this particular spot was abated ; and that a gritty calcareous mud was rapidly formed by the decay of the more perishable shells and other organisms, and thus provided a matrix which quickly became sufficiently consolidated to withstand the scouring action that recurred later when this spot was no longer sheltered from the sweep of the tides. That the calcareous cementing-matter has been mainly derived from this source is indicated by the differential state of preservation of the shells—those which were originally composed of calcite being beautifully preserved, while the species with shells of aragonite are scantily represented, and are generally in the form of casts. The classical researches of Dr. H. C. Sorby into the relative durability of fossils of aragonite and calcite, and their application by later workers to explain the selective preservation of organisms in limestone and other rocks, are too well-known to need more than a passing reference.

The presence of similar indurated calcareous masses in the 'Sponge-Gravels' of the 'Faringdon Pit' may here be recalled ; but there is this difference in the conditions, that at Faringdon the concretions are developed in a matrix which is still crowded with organisms and abundantly calcareous, while at Shenley the fossils are confined to the blocks.

General Characters of the Fossils.

With regard to the palæontological aspect of the fossils, brachiopods are by far the most numerous, both in species and in individuals ; next in abundance come the pectens, some of which are highly

ornamented and excellently preserved, but difficult to extract or clear from the matrix; the prettily-decorated mytiloid shell, *Septifer lineatus*, is also abundant in some of the lenticles, with its delicate markings intact. Large serrated spines of echinoderms occur scattered rather plentifully in most of the blocks, their characteristic oblique fracture being often visible on broken faces of the stone, although specimens could rarely be extracted in good condition; a few tests of echinoderms were also obtained, all referable to forms known in the Upper Greensand. Several fragments of carapaces of a crustacean were found, and have been identified as belonging to the genus *Plagiophthalmus*. Joints of a large round-stemmed crinoid, recalling the large *Bourgueticrinus* of the Red Chalk, were rather numerous in two or three of the blocks. *Serpula*, probably of two or three species; *Avicula*, not well preserved; a globose *Lima*; and some small irregular oysters; are present in most of the lenticles. Polyzoa, encrusting other fossils, are plentiful, but have not yet been worked out; ramose sponge-like bodies are also abundant, but sponges of the kind so plentiful at Faringdon and at Upware have not been found. Of the gasteropods which we obtained, some were in the condition of casts and none have as yet been specifically determined. A single fish-tooth, representing a species of *Scapanorhynchus*, is the only trace of vertebrate life that the bed has yielded to us.

Among the rarer fossils, the most important is the cast of portion of an ammonite in hard limestone, which led to close search being made for further examples, but without result. Although this specimen is scarcely adequate for specific identification, it shows sufficient of the shape and ornamentation of the original shell to prove that the species cannot be *Ammonites (Acanthoceras) mammillatus*, and also that it is unlikely to belong to any of the commoner Gault forms. It compares best with an ammonite collected by one of us from the Hythe Beds at Hythe, which is believed to be *Amn. (Acanthoceras) Milletianus*.¹

The only other trace of *Ammonites* that we found was a small smooth-worn fragment of a whorl in the condition of an ironstone-pebble, which was of similar aspect to the fragments so abundant at Potton and other places.

Two fragmentary specimens of small *Belemnites*, probably immature, were recently obtained from the quarrymen. One specimen is still embedded in its matrix of gritty limestone, and the other has a little of the same material still adherent to it; so that there can be no doubt of their occurrence in the band. Neither, however, is sufficiently perfect for identification; but they bear no resemblance to the species occurring at Faringdon (*Belemnites speetonensis*, Pav.),² nor to any of the allied forms occurring in the 'Zone of *B. brunsvicensis*' of Speeton; they compare more closely with *B. minimus*, var. *attenuatus* of the Red Chalk and Gault, or with a small

¹ 'Summary of Progress for 1897' Mem. Geol. Surv. p. 129.

² Geol. Mag. 1903, p. 32.

unnamed belemnite occasionally found in the Hythe Beds, which is probably the young of *B. Ewaldi*, von Stromb.

The whole assemblage is peculiar, both in the presence of an admixture of forms which have not before been found together in the same bed, and in the absence of species commonly associated with those which it includes. Thus, while the general facies is closely allied to that of the Upper Greensand, we note the absence of such characteristic Upper-Greensand species as *Terebratella pectita* and *Pecten asper*; while the biplicated *Terebratula* and the *Terebrirostra* which are present are distinct varieties of the Upper-Greensand forms. On the other hand, in comparing the fauna with that of other sandy deposits of Lower-Greensand age, we find a few points of resemblance but still greater differences, both in the presence of numerous species absent from these beds, and in the absence of others, like *Terebratula sella* and *Exogyra sinuata*, which are so generally prevalent in them.

Notes on the Correlation and Classification of the Fossiliferous Band.

Our chief purpose in this paper has been to place on record a description of the Shenley fossiliferous bed and its fauna, without attempting a final judgment on the difficult question of its stratigraphical classification, which can be more adequately discussed when the researches of one of us into the British Lower Cretaceous system as a whole have reached a more advanced stage. It seems desirable, however, to point out the general bearing of our present results upon this question.

From the preceding palæontological notes and subsequent fossilists, it will be seen that the new fauna, though including some elements that link it to previously-known fossiliferous horizons of the Lower Greensand of the South-Midland and South-Eastern counties of England, presents on the whole a still closer connexion with the fauna of the Upper Greensand.

Nevertheless, the bed is distinctly seen to underlie the Gault-Clay throughout the sections, and moreover there seems also to be strong evidence that this clay must represent the Lower Gault. During our investigation, the clay in the sand-pit sections was not in good condition for yielding organic remains, and the only fossils observed in it by us were *Belemnites minimus* (abundant); *Inoceramus concentricus*; a few other ill-preserved shells, which were not identified; and the tooth of a fish. But at a distance of only 1100 yards to the southward of the sand-pits there is a brickyard in the Gault, from which, in a band midway in the clay, Mr. Jukes-Browne records an adequate list of ammonites and other fossils, including such unmistakable Lower-Gault forms as *Ammonites interruptus* and *Amm. Beudanti*, along with others which occur also in the Upper Gault.¹

¹ 'The Cretaceous Rocks of Britain' vol. i, Mem. Geol. Surv. (1900) p. 285.

There is no reason to suspect any lateral change in the character of the Gault between the sand-pits and the brickyard; and indeed the presence of the worn surface on the iron-grit covering the sands: the sharp junction of this bed with the overlying clay: and the entirely-distinct facies of their faunas, render it almost inconceivable that there can be any lateral passage from clay to sand in this neighbourhood. We must therefore conclude that the overlying clay in the sand-pit sections represents Lower Gault, and that the fauna of the calcareous masses is of earlier date.

In its stratigraphical position and in its relations to the Gault above and to the sands below, the fossiliferous band at Shenley is closely analogous to the *Ammonites mammillatus*-bed at Folkestone. In the latter case, a fauna considered on questionable grounds to be of Upper Cretaceous age occurs in sands a few feet below the base of the Lower-Gault clays; its fossils, being mostly in the condition of phosphatized casts, are much less perfectly preserved than those of Shenley Hill. But a comparison of the respective faunas, curiously enough, lends little or no support to the correlation. As already stated, the single ammonite found at Shenley Hill is not *Ammonites mammillatus*; nor is it the second species of the bed at Folkestone, *Am. Beudanti*, var. *ligatus*¹; and, so far as we know at present, the only species which the beds have in common is *Pecten orbicularis*, a ubiquitous Cretaceous shell of no value in correlation.

The fossils of the *mammillatus*-bed show, indeed, much closer relationship with the Gault-fauna than do the Shenley fossils, which in their faunistic affinities seem to skip over the Gault and claim relationship with the Upper Greensand. On the whole, it appears probable that the Shenley fauna is somewhat older than that of the *mammillatus*-bed, and was separated by a longer time-interval from the beginning of Gault-conditions. Subsequent remarks touching the desirability of retaining the Shenley bed in the Lower Cretaceous system will apply, however, with almost equal force to the case of the zone of *Ammonites mammillatus*.

As to the relationship of the Shenley fauna with other fossiliferous horizons in the Lower Greensand, to which reference has been already made, it will be observed from the lists of fossils (pp. 262-63) that the bed has yielded a few species which occur also in the Faringdon 'Sponge-Gravels,' or at Brickhill, or Upware, or in the 'Bargate Beds' of Surrey. But the general assemblage at all these places, especially of the prevalent brachiopods, is entirely different from that at Shenley; and the absence of some of the commonest and most characteristic forms, along with the presence in abundance of others which are unknown at these places, make the difference of the fauna much more striking when the respective collections are examined than is apparent from the mere inspection of the fossil-lists. The lamellibranchs show a somewhat closer affinity to the

¹ 'The Cretaceous Rocks of Britain' vol. i, Mem. Geol. Surv. (1900) p. 443.

Lower-Greensand facies, especially in the case of the pectens; but the more thoroughly these fossils are studied, the more widely are they found to range and the more doubtful does their value in matters of correlation become. One of the Shenley pectens, for example, is stated by Mr. H. Woods, our chief authority on Cretaceous lamellibranchs, to present the distinguishing characteristics of *Pecten cinctus*, which has not hitherto been known to range higher than the Tealby Limestone or the lower part of the 'zone of *Belemnites brunsvicensis*.' But, as indicated in the list of fossils (p. 263), other Shenley lamellibranchs are known to range both above and below the horizon at which they are here found.

So far as we have been able to discover, the nearest approach to the Shenley fauna, more particularly as regards the brachiopods, is found in the fossils from the Tourtia of Belgium; and in this connection it is interesting to note that the Faringdon 'Sponge-Gravels' were at one time supposed to be of Upper-Greensand age, chiefly on account of the kinship of some of their brachiopods with those from the Tourtia.¹ Fortunately, one of us possesses a large series of the Belgian fossils, which has enabled us to compare the material in adequate quantity; and this comparison has shown that, while with some of the Shenley species there are minor differences such as are generally observable in forms from widely separated localities, the specific identity of many of the brachiopoda is unmistakable. These Tourtia-Beds (generally considered to be equivalent to the Upper Greensand of England) lie at the base of the Upper Cretaceous, where they mark a great unconformity, and apparently always rest directly upon a floor of Palæozoic rocks. Our discovery of a closely-corresponding fauna below the English Gault, by proving that many species supposed to be characteristic of the Upper Greensand were in existence before the deposition of the Gault, lends strong support to the more recent conclusions of M. H. Parent, that the Tourtia in different localities includes deposits ranging downward from the Albian into the upper part of the Aptian.²

The reason for the apparently-anomalous relations of the Shenley fauna is not far to seek. The deposits which represent the latest stages of the Lower Cretaceous system in England are of great irregularity, and only sparingly or sporadically fossiliferous; so that our knowledge of the life-history of the period after the deposition of the Atherfield Clay is scanty and imperfect. The accidental preservation of this fauna rich in brachiopods and other shells, at a higher horizon in the Lower Greensand than had previously yielded these fossils, has taught us that several species are of greater antiquity than had been supposed. The greater depth and muddy bottom of the Gault-sea were unfavourable to their continued

¹ T. Davidson, 'Monograph of the British Cretaceous Brachiopoda' Pal. Soc. vol. i (1852) p. 3.

² Ann. Soc. Géol. Nord, vol. xxi (1893) p. 205; see also discussion by A. J. Jukes-Browne in 'The Cretaceous Rocks of Britain' vol. i, Mem. Geol. Surv. (1900) p. 383.

existence in this place, and they disappeared; but were perpetuated in other places where the conditions were more suitable, and re-established themselves when the circumstances again became fitting. From the richness of the fauna both in species and individuals, it is unlikely that even at Shenley have we reached the lowest range of the so-called Upper Cretaceous forms; although, if it were possible to trace the fauna continuously downward, we should, of course, expect to find an increasing preponderance of exclusively Lower Cretaceous species.

The Lower Greensand of Central and Southern England, considered as a whole, forms a well-defined stratigraphical unit which has been classified as Lower Cretaceous ever since this division was established; and it seems to us to be undesirable to break up this classification, unless far stronger reasons are forthcoming than can be adduced in the present case. Setting other considerations aside, since the Shenley fossil-bed is lithologically part of the Lower Greensand, its fauna is entitled to be classed as Lower Cretaceous by priority of nomenclature, failing weightier cause for separating it therefrom.

Finally, as regards the palæontological evidence, it is certain that the prevalent conception in this country of what constitutes a Lower Cretaceous fauna will require considerable modification. Because it happens that the closing stages of the Lower Cretaceous Period in the South and South-East of England are represented mainly by unfossiliferous sands; and that the initial stages of the same period are represented in the same region by beds of freshwater origin: it has come to pass that our ideas concerning the marine fauna proper to the Lower Cretaceous have been based upon the fauna of only a very limited portion of the period. Consequently we find that a large number of the fossils of the 'coprolite-beds' at or near the base of the Lower Greensand have been rejected as 'derivatives,' on account of their Jurassic aspect or mineral condition; while as regards the uppermost beds, forming the zone of *Ammonites mammillatus*, because these have yielded fossils that show Upper Cretaceous affinities, it is claimed that they cannot be retained in the Lower Cretaceous but must be classed with the Gault. Too often do we lose sight of the essentially-arbitrary character of the boundaries adopted for our stratigraphical divisions, which are for the most part based upon local conditions that can only have persisted over areas of limited extent. And it is certain that the more fully we become acquainted with the sequence of events, the more difficult will it be, either from the stratigraphical or from the palæontological standpoint, to maintain our preconceived ideas as to the methods to be adopted in determining the limits of our systems. If our present Lower Cretaceous system is to be maintained, we shall have to recognize towards its base certain life-forms as Lower Cretaceous which have been hitherto regarded as exclusively Jurassic, and toward its summit other life-forms as Lower Cretaceous which were originally supposed to belong exclusively to the Upper Cretaceous. Difficulties of similar character

are being even more acutely felt by stratigraphists in this and other countries in the separation of the Permian and Carboniferous systems on the one hand, and of the Trias and Permian on the other. And we must be prepared either to find place for ambiguous developments of the kind discussed in this paper within the boundaries of our established systems; or to create a series of 'buffer-states,' under the designation of 'passage-beds,' to protect our systems from ever coming into contact where the succession is complete and where there may be neither stratigraphical nor biological break.

In concluding this part of our paper we wish to render thanks to Mr. E. T. Newton, F.R.S., F.G.S., for his great assistance in determining the echinodermata and other fossils, and for first pointing out to us the Upper Cretaceous affinities and anomalous characters of the fauna. We are also indebted to Mr. H. Woods, M.A., F.G.S., for the care which he has so willingly bestowed on the determination of the lamellibranchs.

PART II.—DESCRIPTION OF THE BRACHIOPODA.

[PLATES XVI-XVIII.]

TEREBRATULA CAPILLATA, d'Archiac. (Pl. XVI, figs. 1 a-6.)

1842. *Spondylus undulatus*, Geinitz, 'Char. d. Sächs.-Böhm. Kreidegeb.' pt. iii, p. 82.
 1847. *Terebratula capillata*, d'Archiac, 'Fossiles du Tourtia' Mém. Soc. Géol. France, ser. 2, vol. ii, p. 323 & pl. xx, figs. 1-3.
 1852. *Terebratula capillata*, Davidson, 'Brit. Cret. Brachiop.' Monogr. Pal. Soc. p. 46 & pl. v, fig. 12.
 1868. *Terebratula capillata*, Schlenker, in Benecke's Geogn.-Paläont. Beiträge, vol. i, p. 454.
 1871. *Terebratula capillata*, Quenstedt, 'Brachiopoden' [Petrefactenkunde Deutschlands, pt. i, vol. ii.] p. 385 & pl. xlviii, figs. 75-76.
 1872. *Terebratula capillata*, Stoliczka, Pal. Indica, 'Cret. Fauna S. India' vol. iv, p. 23 & pl. vii, fig. 1.
 1872. *Terebratula capillata*, Geinitz, 'Elbthalgebirge' p. 154 & pl. xxxiv, fig. 12.
 1874. *Terebratula capillata*, Davidson, 'Brit. Cret. Brach.' Suppl. Monogr. Pal. Soc. p. 33 & pl. vii, fig. 2.
 1878. *Terebratula capillata*, Deicke, 'Die Brachiop. der Tourtia von Mülheim' p. 16 & (pl.) figs. 7 a-7 b.

Of this characteristic species we have collected at Shenley a large number of specimens in all stages of growth, and many remarkable abnormal forms. The test is beautifully preserved, showing the small, narrow, capiliform, waving striae intersected by concentric lines of growth. This species seems to be very variable in the convexity of the valves, in the relative length and width of the shell, and in the presence or absence of a wide fold at the front margin: all these varieties occur in the Tourtia of Belgium, as shown in a fine series sent by M. Piret, of Tournay. The globose specimens appear to be very similar to those found in the Red Chalk of Hunstanton (Norfolk), and at North Grimston (Yorkshire). Some of the specimens of *T. capillata* from Shenley so closely resemble those from Tournay in colour and in the composition of the matrix, that it would be impossible to separate them if they got mixed. D'Archiac

divided this species into minute varieties, which he distinguished by the letters *a* and *b*. We have found many other varieties which were not figured by him: if we compare the large wide forms with the more ovoid convex specimens, we find marked differences; but with the abundant material that we possess, we are able to connect together every variation of this species. *Terebratula capillata* is the characteristic fossil of the Shenley Bed: it occurs both in the calcareous and in the ferruginous part of the deposit, and also in the pink limestone.

The geographical range of *T. capillata* is very great. It has been found in the Tourtia of France, Belgium, also in Westphalia and near Dresden in Germany, and in Southern India. In England it occurs in the Red Chalk of Norfolk, Lincolnshire, and Yorkshire, and in the Aptian of Upware.

MEASUREMENTS OF *TEREBRATULA CAPILLATA* (IN MILLIMETRES).

	Length.	Breadth.	Thickness.	Apical angle.
A large, wide, flat specimen	35.0	33.5	16.50	100°
Specimen with wide fold	27.0	23.5	12.00	95°
Smaller specimen with wide fold...	19.5	17.5	8.50	91.5°
An ovoid globose specimen	21.0	18.5	12.50	92°
Young specimen	13.5	12.0	5.75	88°
Very young specimen	7.25	6.6	3.50	87.3°

A specimen of *T. capillata* from the Red Chalk of North Grimston (Yorkshire) yields the following measurements: length = 23.75 millimetres; breadth = 21 mm.; thickness = 14.25 mm.; and apical angle = 90°.

TEREBRATULA BIPPLICATA, Sow., var. *GIGANTEA*, nobis. (Pl. XVI, figs. 7 a-7 c.)

1812. *Terebratula biplicata*, J. Sowerby, 'Mineral Conch.' vol. i, p. 201 & pl. xc.
 1825. *Terebratula biplicata*, Sow. *ibid.* vol. v, p. 53 & pl. cccxxxvii, figs. 2-3.
 1847. *Terebratula Dutempleana*, A. d'Orbigny, 'Pal. Franç. Terr. Crét.' vol. iv, p. 93 & pl. dxi, figs. 1-8.
 1852. *Terebratula obesa*, Davidson, 'Brit. Cret. Brachiop.' Monogr. Pal. Soc. p. 53 & pl. v, figs. 13-16.
 1854. *Terebratula biplicata*, Davidson, *op. cit.* p. 55 & pl. vi, figs. 1-42.
 1868. *Terebratula biplicata*, Schlenbach, in Benecke's Geogn.-Paläont. Beiträge, vol. i, p. 433 & pl. xxi, figs. 1-3 & 6.
 1871. *Terebratula biplicata*, Quenstedt, 'Brachiop.' p. 381 & pl. xlviii, figs. 61-67.
 1872. *Terebratula biplicata*, Geinitz, 'Elbthalgebirge' p. 151 & pl. xxxiv, figs. 1-6.
 1872. *Terebratula biplicata*, var. *Dutempleana*, Stoliczka, Pal. Indica, 'Cret. Fauna S. India' vol. iv, p. 20 & pl. v, figs. 1-3.
 1874. *Terebratula biplicata*, Davidson, 'Brit. Cret. Brachiop.' Suppl. Monogr. Pal. Soc. p. 33 & pl. v, figs. 1-2.
 1878. *Terebratula biplicata*, Deicke, 'Die Brachiop. der Tourtia von Mülheim' p. 10 & (pl.) fig. 1.
 1900. *Terebratula biplicata*, Jukes-Browne, 'Gault & Upper Greensand of England' Mem. Geol. Surv. p. 58, fig. 24.

The large biplicated form which has been considered a giant variety of *Terebratula biplicata*, Sow. occurs in this bed. Davidson regarded it as a variety of *T. obesa*, but in his Supplement referred it to *T. biplicata*. For convenience, and to prevent confusion, we have given these specimens a varietal name, *gigantea*. The biggest specimen measures: in length, 74 millimetres; in breadth, 48 mm.; its greatest thickness = 38 mm.; and its apical angle = 43°

Some of the specimens of *Terebratula buplicata* var. *gigantea*, from Shenley, very closely resemble those from Warminster, having the large foramen and recurved beak. The plication of the front-margin varies in both localities, but some of the bigger Shenley specimens differ in having their sides more laterally compressed; some specimens from Warminster also show this.

TEREBRATULA BULPLICATA, var. *DUTEMPLEANA*. (Pl. XVII, figs. 1 *a* & 1 *b*.)

A specimen from Shenley appears to belong to this variety.

Dimensions:—length=34·25 millimetres; breadth=25 mm.; thickness=22 mm.; and the apical angle=61°.

The rarity of small buplicated *Terebratulae* is a noteworthy feature of this deposit.

TEREBRATULA DEPRESSA, Lam., var. *SHENLEYENSIS*, nobis. (Pl. XVII, figs. 2 *a*–3 *b*.)

1819. *Terebratula depressa*, Lamarck, 'Hist. Nat. des Anim. sans Vert.' vol. vi, pt. i, p. 249.
 1847. *Terebratula nerviensis*, d'Archiac, 'Fossiles du Tourtia' Mém. Soc. Géol. France, ser. 2, vol. ii, p. 313 & pl. xvii, figs. 2–10.
 1850. *Terebratula depressa*, Davidson, Ann. & Mag. Nat. Hist. ser. 2, vol. v, p. 435 & pl. xiii, fig. 15.
 1854. *Terebratula depressa*, Davidson, 'Brit. Cret. Brachiop.' Monogr. Pal. Soc. p. 70 & pl. ix, figs. 9–24.
 1863. *Terebratula depressa*, E. Ray Lankester, 'Geologist' vol. vi, p. 414 & pl. xxi, figs. 5–7.
 1864. *Terebratula depressa*, C. J. A. Meÿer, Geol. Mag. vol. i, p. 254 & pl. xi, figs. 15 *a*–15 *b*.
 1868. *Terebratula depressa*, J. F. Walker, Geol. Mag. vol. v, p. 403 & pl. xviii, figs. 2–2 *a*.
 1868. *Terebratula depressa*, Schloënbach, in Benecke's Geogn.-Paläont. Beiträge, vol. i, p. 447 & pl. xxi, figs. 9 *a*–9 *b*.
 1872. *Terebratula subdepressa*, Stoliczka, Pal. Indica, 'Cret. Fauna S. India' vol. iv, p. 16 & pl. iii, figs. 1–8.
 1874. *Terebratula depressa*, Davidson, 'Brit. Cret. Brachiop.' Suppl. Monogr. Pal. Soc. p. 40 & pl. iv, figs. 1–4.
 1878. *Terebratula depressa*, Deicke, 'Die Brachiop. der Tourtia von Mülheim' p. 14 & (pl.) figs. 4 *a*–4 *b*.

The material that we have collected at Shenley is not sufficient for the investigation of this species. The specimens appear to have a shorter beak, and to be more triangular in shape than any of the varieties figured by Vicomte d'Archiac. Some forms closely resemble those figured as *Terebratula subdepressa* by Stoliczka in the 'Cretaceous Brachiopoda of Southern India.'

Dimensions:—length=47 millimetres; breadth=38 mm.; thickness=19·5; and the apical angle=68°. In another specimen the length=41 millimetres; breadth=29·5 mm.; thickness=15 mm.; and the apical angle=63°.

TEREBRATULA MOUTONIANA, d'Orb., var. (Pl. XVII, figs. 4 *a* & 4 *b*.)

1847. *Terebratula Moutoniana*, A. d'Orbigny, 'Pal. Franç. Terr. Crét.' p. 89 & pl. dx, figs. 1–5.
 1868. *Terebratula Moutoniana*, J. F. Walker, Geol. Mag. vol. v, p. 403 & pl. xviii, figs. 6 *a*–6 *b*.
 1872. *Terebratula Moutoniana*, Pictet [Matér. p. la Paléont. suisse] 'Terr. Crét. Ste. Croix' pt. v, p. 86 & pl. cciii, figs. 1–3.

1874. *Terebratula Moutoniana*, Davidson, 'Brit. Cret. Brachiop.' Suppl. Monogr. Pal. Soc. p. 42 & pl. iv, figs. 11-13.
 1883. *Terebratula Moutoniana*, var. *brickhillensis*, Keeping, 'Fossils & Pal. Affin. of Neocom. Deposits of Upware & Brickhill' [Sedgw. Prize Essay] p. 162.
 1884. *Terebratula Moutoniana*, var. *brickhillensis*, Davidson, 'Brit. Cret. Brachiop.' App. to Suppl. (vol. v) Monogr. Pal. Soc. p. 251 & pl. xviii, fig. 8.

This species varies considerably in different localities. The Shenley specimens seem to be intermediate between the Upware and Brickhill forms. The test is smooth, exhibiting faint traces of striæ; the front margin shows a wide fold, the centre of the smaller valve being convex; the larger valve is depressed towards the front. This species and its varieties occur in the Aptian of France and Switzerland, as stated by various authorities. We have some specimens from the Tourtia of Tournay (Belgium) which closely resemble some of the Shenley shells; these have been regarded as a variety of *Terebratula Robertsoni*, d'Archiac, but differ from his figure in having the smaller valve more globose, while the larger valve is slightly depressed towards the front margin.

Our specimens vary in the depth of the wide fold at the front margin, and in the relative length compared with the breadth; but we require more specimens before we can consider whether these should form a distinct variety.

The dimensions of a Shenley specimen are as follows:—length = 25 millimetres; breadth = 19 mm.; thickness = 11·75; and the apical angle = 72°.

TEREBRATULA BOUBEI, d'Archiac. (Pl. XVII, fig. 5.)

1847. *Terebratula Boubei*, d'Archiac, 'Fossiles du Tourtia' Mém. Soc. Géol. France, ser. 2, vol. ii, p. 320 & pl. xix, fig. 11.
 1864. *Terebratula Boubei* (?) C. J. A. Meyer, Geol. Mag. vol. i, p. 252 & pl. xii, figs. 5-7.

A *Terebratula* which occurs at Shenley appears to belong to this species. It is oval, elongated; the valves equally convex, showing lines of growth; surface smooth; beak elongated, slightly recurved, truncated by a circular foramen; the smaller valve shows a faint wide fold; the front margin is slightly angular, but in young specimens it is rounded.

Mr. Meyer stated that he found single valves in the pebbled around Godalming, in Surrey, which may belong to this species. *T. Boubei* occurs in the Tourtia, near Tournay (Belgium). This species is not mentioned in Von Decken's list of the brachiopoda which occur in the Tourtia of Westphalia.

Dimensions:—length = 24·5 millimetres; breadth = 16·2 mm.; thickness = 11 mm.; and the apical angle = 56°.

TEREBRATULA OVATA, Sowerby. (Pl. XVII, figs. 6 a & 6 b.)

1812. *Terebratula ovata*, J. Sowerby, 'Min. Conch.' vol. i, p. 46 & pl. xv, fig. 3.
 1847. *Terebratula lacrymosa*, A. d'Orbigny, 'Pal. Franç. Terr. Crét.' vol. iv, p. 99 & pl. dxii, figs. 6-11.
 1852. *Terebratula ovata*, Davidson, 'Brit. Cret. Brachiop.' Monogr. Pal. Soc. p. 47 & pl. iv, figs. 6-13.

1874. *Terebratulina ovata*, Davidson, 'Brit. Cret. Brachiop.' Suppl. Monogr. Pal. Soc. p. 32 & pl. ii, fig. 14.

1900. *Terebratulina ovata*, Jukes-Browne, 'Gault & Upper Greensand of England' Mem. Geol. Surv. p. 65, fig. 40.

We have collected a few shells from Shenley which appear to belong to this species. They have the lateral and frontal margins sharper than the Warminster specimens, but do not differ from them more than this species varies in that locality. *Terebratulina ovata* was well described and figured by Davidson; but unfortunately Sowerby figured a young specimen which does not show the characters of this species, and is one of the many instances in which the specimen first figured, the so-called 'type,' is not typical of the species.

The dimensions of a Shenley specimen are as follows:—length = 20 millimetres; breadth = 17 mm.; thickness = 9 mm.; and the apical angle = 90°.

T. ovata occurs in the Upper Greensand of Warminster and the Isle of Wight; in the Cenomanian of Devon, Somerset, and Dorset; and in France, in the Cenomanian near Havre.

TEREBRATULINA TRIANGULARIS, Etheridge. (Pl. XVII, fig. 7.)

1868. *Terebratulina rigida*, Schloenbach, in Benecke's Geogn.-Paläont. Beiträge, vol. i, p. 455.

1874. *Terebratulina rigida*, Davidson, 'Brit. Cret. Brachiop.' Suppl. Monogr. Pal. Soc. p. 32.

1881. *Terebratulina striata*, var. *triangularis*, Etheridge, Mem. Geol. Surv. 'Geol. of Neighb. of Cambridge' p. 148 & pl. iii, fig. 15.

1884. *Terebratulina triangularis*, Davidson, 'Brit. Cret. Brachiop.' App. to Suppl. (vol. v) Monogr. Pal. Soc. p. 245 & pl. xviii, fig. 3.

We have found at Shenley a few specimens of a small *Terebratulina*, which appear to resemble closely the form that occurs in the Greensand of Cambridge, and in the Red Chalk of Hunstanton and Speeton. It is also found in the Tourtia of Essen, and the Cenomanian of Havre (France). It appears doubtful whether this species is Sowerby's *T. rigida*, which was found in the Chalk near Norwich; but, as we are informed that a monograph is being prepared on the *Terebratuline* of Europe by Dr. Kitchin, we will not further discuss the synonymy of this species.

Dimensions:—length = 6·5 millimetres; breadth = 5·25 mm.; thickness = 2·5 mm.; and the apical angle = 66°.

ZEILLERIA CONVEXIFORMIS, nobis. (Pl. XVII, figs. 8 a–8 c.)

Shell ovoid, globose, longer than wide; valves almost equally convex; greatest thickness about one-third from the posterior end; lateral margins regularly curved; front-margin rounded. Shell-surface smooth, showing concentric lines of growth. Larger valve convex, especially towards the beak, which is short, incurved, and truncated by a medium-sized foramen; beak-ridges concave; deltidium shallow, in two pieces; hinge-line curved. Smaller valve convex, the greatest convexity being about one-third of the shell; a dark line shows the presence of a median septum, hence the shell had a long loop.

Dimensions:—length = 18·5 millimetres; breadth = 15 mm.; thickness = 11 mm.; and the apical angle = 92·5°.

This species somewhat resembles *Zeilleria Juddi*, Walker, in its ovoid shape, but it is a more regular ovoid globose form, and is not laterally depressed, its beak is also shorter, and the beak-ridges are less concave. Probably our species belongs to the subgenus *Ornithella*.

MAGAS (?) LATESTRIATA, nobis. (Pl. XVII, figs. 9 a–9 d.)

Shell circular; the larger valve is much more convex than the smaller valve; the greatest thickness is about the centre of the shell; the lateral margins are sharp and regularly curved; front margin rounded, non-plicated, and not thickened. Shell-surface slightly granular, and ornamented on both valves by fine radiating striæ which are wide apart and reach to the beak. The larger valve has its greatest thickness near the centre, and is regularly convex; the striæ are best developed towards the lateral margins of the shell. The beak is short, nearly straight, and truncated by a large circular foramen; and it is separated from the hinge-line by a deltidium in two pieces. The beak-ridges are concave; the hinge-line is slightly curved. The smaller valve is slightly convex, the greatest width being about one-third of the distance from the posterior margin. A dark line, extending to about one-third of the shell, shows that it had a long loop.

Dimensions:—length = 18·5 millimetres; breadth = 17·5 mm.; thickness = 9·75 mm.; and the apical angle = 76·5°.

We have not been able to examine the loop of this shell, but it probably belongs to the genus *Magas*. In shape it somewhat resembles the large rounded specimens of *Zeilleria tamarinda*; but it is easily recognized by the ornamentation of its shell-surface, by the less proportional convexity of the smaller valve, by the beak being straighter, by the beak-ridges forming a smaller area, and by the absence of a fold on the front margin.

MAGAS ORTHIFORMIS (d'Archiac). (Pl. XVII, figs. 10a, 10b, & 11.)

1847. *Terebratula orthiformis*, d'Archiac, 'Fossiles du Tourtia' Mém. Soc. Géol. France, ser. 2, vol. ii, p. 333 & pl. xxii, fig. 4.

1852. *Magas orthiformis*, Davidson, 'Brit. Cret. Brachiop.' Monogr. Pal. Soc. p. 22, note.

We have obtained several specimens which we refer to this species; they appear to be plentiful at Shenley, but are difficult to find, on account of their small size. D'Archiac states that the shell is sufficiently characterized by its form, which recalls that of *Orthis*. The hinge-line is nearly straight, from the extremities of which the shell describes three-quarters of a circle; the larger valve is more convex than the smaller one, and has a short beak forming an obtuse angle with the hinge-line; foramen triangular; deltidium in two pieces, which do not surround the foramen. The surface of the shell is covered with faint radiating striæ, with transverse lines

of growth; some specimens show a dark line on the smaller valve, indicating the presence of a septum; the front margin is sharp and circular, showing no fold.

Davidson remarks that he had seen the interior of a specimen from the Tourtia of Belgium, which showed that it belonged to the genus *Magas*. This species occurs in the Tourtia round Tournay, where it is rare and not well preserved. It is not given in Von Decken's list of the species which occur in the Tourtia of Essen (Westphalia).

The Shenley specimens of *Magas orthiformis* show slight variations in the relative convexity of the valves, and in the thickening of the front margin; some attain a larger size than the shell figured by Vicomte d'Archiac.

MEASUREMENTS OF *MAGAS ORTHIFORMIS* (IN MILLIMETRES).

	Length.	Breadth.	Thickness.	Apical angle.
A large specimen	12.50	12.00	7.5	108°
Medium specimen.....	8.75	10.25	4.0	95°
Small specimen.....	6.50	6.75	3.5	92°

TEREBRIOSTRA LYRA (Sowerby) var. *INCURVIROSTRUM*, nobis.
(Pl. XVIII, figs. 1 a-2 b.)

1816. *Lyra Meadi*, Cumberland MS.

1818. *Terebratula lyra*, J. Sowerby, 'Min. Conch.' vol. ii, p. 87 & pl. cxxxviii, fig. 2.

1847. *Terebrirostra lyra*, A. d'Orbigny, 'Pal. Franç. Terr. Crét.' vol. iv, p. 129 & pl. dxix, figs. 11-19.

1852. *Terebrirostra lyra*, Davidson, 'Brit. Cret. Brachiop.' Monogr. Pal. Soc. p. 32 & pl. iii, figs. 17-28.

1900. *Terebrirostra lyra*, Jukes-Browne, 'Gault & Upper Greensand of England' [Cret. Rocks of Britain, vol. i] Mem. Geol. Surv. p. 66.

This remarkable brachiopod has been often figured (see Davidson's 'British Cretaceous Brachiopoda' for list of authors).

Terebrirostra lyra occurs in the Upper Greensand of Horningsham near Warminster, and in various localities in Somerset and Dorset, and in the arenaceous Cenomanian of Devon. It is a rare fossil in the Cenomanian at Cape La Hève, near Havre (France).

We have found several specimens of a variety of this species at Shenley, but they are difficult to extract without breaking off the long beak. Our specimens differ from those figured by Davidson in having finer and more numerous ribs, also in having the long beak more incurved; but as they closely resemble the Havre *T. lyra*, we think it advisable only to consider them as a variety, for which we propose the name of *incurvirostrum*.

Some of our shells have finer ribs than the Havre variety, and are often more globose, but do not differ from it more than the latter does from the Warminster specimens; the Havre shells often show the remarkable incurved beak. Mr. Jukes-Browne states (*op. supra cit.* p. 66) that *Terebrirostra lyra* is rare, but characteristic of the Warminster beds.

Dimensions:—length of large valve=32 millimetres; length of smaller valve=19 mm.; breadth=12 mm.; thickness=7.5 mm.

In a smaller globose specimen the length of the large valve=22.5 mm.; length of smaller valve=13 mm.; breadth=8.5 mm.; thickness=9 mm.

TEREBRATELLA MENARDI, Lamarck, var. PTERYGOTOS, nobis. (Pl. XVIII, figs. 3 a-3 c.)

1819. *Terebratella Menardii*, Lamarck, 'Hist. Nat. des Anim. sans Vert.' vol. vi, pt. i, p. 256. See Davidson, Ann. & Mag. Nat. Hist. ser. 2, vol. v (1850) p. 445 & pl. xiv, fig. 50.
 1829. *Terebratula truncata*, J. Sowerby, 'Min. Conch.' vol. vi, p. 71 & pl. dxxxvii, fig. 3.
 1834. *Terebratula Menardi*, L. von Buch, 'Ueber Terebrateln' p. 78 & pl. iii, fig. 42.
 1839. *Terebratula Menardi*, L. von Buch, Mém. Soc. Géol. France, vol. iii, p. 184 & pl. xvii, fig. 6.
 1841. *Terebratula canaliculata*, Fr. A. Römer, 'Versteinerungen des Nord-deutschen Kreidegebirges' p. 41 & pl. vii, fig. 12.
 1847. *Terebratella Menardi*, A. d'Orbigny, 'Pal. Franç. Terr. Crét.' vol. iv, p. 118 & pl. dxvii, figs. 1-15.
 1852. *Terebratella Menardi*, Davidson, 'Brit. Cret. Brachiop.' Monogr. Pal. Soc. p. 24 & pl. iii, figs. 34-42.
 1868. *Terebratella Menardi*, Schläpach, in Bencke's Geogn.-Paläont. Beiträge, vol. i, p. 458 & pl. xxii, fig. 2.
 1872. *Terebratella Menardi*, Geinitz, 'Elbthalgebirge' p. 157 & pl. xxxvi, figs. 37-38.
 1874. *Terebratella Menardi*, Davidson, 'Brit. Cret. Brachiop.' Suppl. Monogr. Pal. Soc. p. 24 & pl. viii, fig. 14.
 1878. *Terebratella Menardi*, Deicke, 'Die Brachiop. der Tourtia von Mülheim' p. 18 & (pl.) fig. 9.
 1884. *Terebratella Menardi*, Davidson, 'Brit. Cret. Brachiop.' App. to Suppl. (vol. v) Monogr. Pal. Soc. p. 247 & pl. xviii, fig. 6.

We have found very few specimens of *Terebratella Menardi* var. at Shenley. They differ from the Faringdon shells in being larger and wider; the variety resembles some of the specimens from the Cenomanian of Le Mans (France), but differs from these by the wing-like expansion of the hinge-line. We have not sufficient material to determine whether it should be regarded as a distinct species. Davidson, in his Supplement to the 'British Cretaceous Brachiopoda,' states that the only difference that he can perceive between *T. truncata* and *T. Menardi* is that the Lamarckian species is rather longer and a little more transverse; its ribs are likewise somewhat sharper. Our shells are also remarkable for the great thickening of the front-margin.

Terebratella Menardi occurs in the Cenomanian of Devon and in the Chloritic Marl of Chardstock. In France it is found at several localities, especially at Le Mans in the Cenomanian. In Germany it occurs near Dresden, and at Essen (*T. canaliculata*, Römer). It occurs near Tournay (Belgium) in the Tourtia. We consider the Shenley form to be nearer the Tourtia specimens than to those from the Aptian of Faringdon. A single specimen of a variety of *T. Menardi* has been found at Upware; it also occurs at Brickhill.

Dimensions of a shell with thickened front-margin:—length=17 millimetres; breadth=18 mm.; thickness=10.5 mm.

TEREBRATELLA HERCYNICA (Schlœnbach). (Pl. XVIII, figs. 4 a-4 c.)

1867 [1868]. *Megerleia* (?) *hercynica*, Schlœnbach, in Benecke's Geogn.-Paläont. Beiträge, vol. i, p. 467 & pl. xxii, figs. 6-7.

1895. *Terebratella* (?) *hercynica*, Tiessen, 'Die Subhercynie Tourtia u. ihre Brach. &c.' Zeitschr. d. Deutsch. Geol. Gesellsch. vol. xlvii, p. 455.

The specimens figured by Schlœnbach of this species are internal casts from the Tourtia of Quedlinburg, in the Harz, where it appears to be very rare.

The shells that we have obtained from Shenley probably belong to this species, but they are longer in proportion to their width than the Quedlinburg specimens. The shell is longer than wide, of a triangular shape, being widest at the front-margin, tapering towards the beak; both valves are convex. The larger valve has three elevated angular folds, the space between them being deeply furrowed; on each side of the valve are three to five smaller folds, those near the lateral margin of the shell are often obscure; all these folds extend to the extremity of the beak, which is recurved and truncated by a small foramen. The smaller valve has four elevated angular folds; between these the valve is deeply sulcated. On each side of the shell are three or more smaller folds; the folds on both valves extend to the front-margin, and are covered by concentric imbrications. This character was observed by Schlœnbach, who was doubtful whether this form should be referred to the genus *Megerleia* or to *Terebratella*. This species may be a connecting-link between *Terebratella trifida* and *T. oblonga*.

We have obtained very few specimens of this form.

Dimensions:—length = 17 millimetres; breadth = 14 mm.; thickness = 13 mm.

KINGENA LIMA (Defrance).

1828. *Terebratula lima*, Defrance, 'Dict. des Sci. Nat.' vol. liii, p. 156.

1841. *Terebratula pectoralis*, Fr. A. Römer, 'Verstein. des Norddeutschen Kreidegebirges' p. 42 & pl. vii, fig. 19.

1847. *Terebratula lima*, A. d'Orbigny, 'Pal. Franç. Terr. Crét.' vol. iv, p. 98 & pl. dxii, figs. 1-5.

1847. *Terebratula spinulosa*, Morris, Ann. & Mag. Nat. Hist. vol. xx, p. 253 & pl. xviii, figs. 6 a-6 c.

1852. *Kingena lima*, Davidson, 'Brit. Cret. Brachiop.' Monogr. Pal. Soc. p. 42, pl. iv, figs. 15-28 & pl. v, figs. 1-4.

1868. *Megerleia lima*, Schlœnbach, in Benecke's Geogn.-Paläont. Beiträge, vol. i, p. 469 & pl. xxii, fig. 8.

1871. *Terebratula lima*, Quenstedt, 'Brachiopod.' p. 256 & pl. xlv, fig. 55.

1872. *Kingena lima*, Stoliczka, Pal. Indica, 'Cret. Fauna S. India' vol. iv, p. 27 & pl. vii, fig. 13.

1874. *Kingena lima*, Davidson, 'Brit. Cret. Brachiop.' Suppl. Monogr. Pal. Soc. p. 28.

1878. *Megerleia lima*, Deicke, 'Die Brachiop. der Tourtia von Mülheim' p. 20 & (pl.) figs. 12-15.

1900. *Kingena lima*, Jukes-Browne, 'Gault & Upper Greensand of England' [Cret. Rocks of Britain, vol. i] Mem. Geol. Surv. p. 60, &c.

We have not thought it necessary to give references to the various authors who have figured *Kingena lima* from the Chalk. This species has been recorded from the Upper Chalk to the Upper Neocomian, but it can be divided into several subspecies when adult specimens are examined.

The specimens of *Kingena lima* which occur at Shenley show the usual characters of the species—the short recurved beak truncated by a large circular foramen lying close to the umbo, the convexity of the valves, the granulations on the test of the shell. The dorsal valve shows a dark longitudinal line, indicating the presence of a septum. The smaller specimens resemble those from Warminster.

Dimensions of a large specimen:—length=17 millimetres: breadth=15 mm.; thickness=17 mm.

KINGENA ARENOSA (d'Archiac).

1847. *Terebratulæ arenosa*, d'Archiac. 'Fossiles du Tourtia' Mém. Soc. Géol. France, ser. 2, vol. ii, p. 324 & pl. xxi, figs. 1-3.

We have collected at Shenley several specimens of this species; they vary in the relative convexity of the larger and smaller valves, as stated by Vicomte d'Archiac. The shell-surface shows lines of growth, and the characteristic well-developed granulations. The smaller valve shows the dark line, indicating the median septum.

The largest specimen that we have from Shenley measures in length, 17 millimetres; in breadth, 15 mm.; and in thickness, 10·5 mm.

KINGENA NEWTONII, nobis. (Pl. XVIII, figs. 5 a-6 c.)

Shell elongated pentagonal, the length exceeding the breadth. The greatest breadth occurs about the middle of the shell, whence it curves towards the nearly straight, wide front-margin; the greatest thickness is about the centre of the shell. The shell-surface is granular, exhibits faint radiating striae, and shows concentric lines of growth. The larger valve is considerably more convex than the smaller one; it has its maximum thickness about the centre, from which it slopes in all directions towards the margin of the shell; the lateral margin is curved from the greatest width of the valve towards the front-margin, which is nearly straight, only showing a very slight curve; the curve is rounded towards the beak. The beak is short, recurved, and truncated by a moderate-sized foramen; the beak-ridges are concave. The deltidium is wide and shallow, and is in two pieces; this is difficult to observe in many specimens, owing to the friable condition of the shell near the beak. The smaller valve is much less convex than the larger valve; the greatest thickness is near the centre of the shell, from which it is laterally compressed towards the front-margin; the greatest width occurs at about one-third of the length of the shell from the posterior end, whence it curves towards the nearly straight front-margin, giving an irregular pentagonal shape to the valve; the hinge-line is slightly curved. There is a dark line, indicating the presence of a median septum, and showing that the species had a long loop.

The smaller specimen, which is probably the young of the species, has the same irregular pentagonal shape, straight front-margin, shell-structure, and apical angle; but the smaller valve is less laterally depressed, the beak is less recurved, and the deltidium

is more conspicuous. We have observed that in most species of *Terebratulidæ* the younger shells have the beak generally straighter than it is in the mature specimens.

MEASUREMENTS OF *KINGENA NEWTONII* (IN MILLIMETRES).

	Length.	Breadth.	Thickness.	Apical angle.
A large specimen	26.0	21.5	14.5	95.5°
A smaller specimen ...	21.5	17.5	11.5	95.5°

Deslongchamps and others consider the granular surface as characteristic of the genus *Kingena*; therefore we have placed our shell in that genus, although we have not been able to examine the loop.

This species is easily distinguished from the other Cretaceous *Kingena* by its peculiar shape and large size. There are two large species of *Kingena* figured by Stoliczka, in his monograph on the Brachiopoda in the Cretaceous Fauna of Southern India—a circular form, *K. asperulina*, and an ovoid form, *K. shalanurensis*; these cannot be confounded with our species. The *Terebratula pectoralis* of Roemer is a more regular pentagonal shell, the hinge-line is straighter, and it is not depressed towards the lateral margins.

We have much pleasure in naming this species after Mr. E. T. Newton, F.R.S., who has kindly assisted us in determining the fossils which occur in this deposit.

RHYNCHONELLA GRASIANA, d'Orbigny.

1847. *Rhynchonella Grasiana*, A. d'Orbigny, 'Pal. Franç. Terr. Crét.' vol. iv, p. 38 & pl. cccxcvii, figs. 7-10.
 1854. *Rhynchonella Grasiana*, Davidson, 'Brit. Cret. Brachiop.' Monogr. Pal. Soc. p. 96 & pl. xii, figs. 17-19.
 1868. *Rhynchonella Grasana*, Schlenbach, in Benecke's Geogn.-Paläont. Beiträge, vol. i, p. 496 & pl. xxiii, figs. 8-9.
 1872. *Rhynchonella Grasiana*, Pictet, Matér. p. la Paléont. suisse, 'Terr. Crét. Ste. Croix' pt. v, p. 46 & pl. cc, figs. 6-9.
 1872. *Rhynchonella Grasiana*, Geinitz, 'Elbthalgebirge' p. 165 & pl. xxxvi, figs. 31-34.
 1874. *Rhynchonella Grasiana*, Davidson, 'Brit. Cret. Brachiop.' Suppl. Monogr. Pal. Soc. p. 57.
 1878. *Rhynchonella Grasana*, Deicke, 'Brachiop. der Tourtia von Mülheim' p. 26 & (pl.) figs. 20-21.
 1900. *Rhynchonella Grasiana*, Jukes-Browne, 'Gault & Upper Greensand of England' Mem. Geol. Surv. p. 65, fig. 43.

The *Rhynchonellæ* found at Shenley which we consider to belong to this species have finer plaits than are exhibited by those which occur at Warminster. Some of the larger specimens seem to connect this species with *Rh. nuciformis*, Sow., the plaits being rounded at the front-margin. Schlenbach states that *Rh. Grasiana* from the Harz attains the dimensions of 20 millimetres (our biggest specimens measure 18 mm.), and he also remarks that this species is very like *Rh. nuciformis*.

Sowerby figures ('Min. Conch.' pl. dii, fig. 3) a coarse-ribbed shell as *Terebratula nuciformis*, which shows no details whereby the species can be recognized.

Rhynchonella Grasiana occurs at Warminster in the Upper Greensand, and in Dorset, and is common in the arenaceous Cenomanian

of Devon. In France it occurs in the Cenomanian of Havre; the shells there are more finely-ribbed than the English shells, and are nearer to our Shenley specimens. It is found in the Tourtia of Essen (Westphalia) and at Dresden, and in the Upper Gault of Ste. Croix (Switzerland).

RHYNCHONELLA GRASIANA, var. *SHENLEYENSIS*, nobis. (Pl. XVIII, figs. 9 a-9 c.)

We will assign to our larger specimens the varietal name of *shenleyensis*; they are wider in proportion to their length. When more specimens have been collected they may have to be separated, and described as a new species.

Dimensions:—length = 13.5 millimetres; breadth = 18.5 mm.; thickness = 10.5 mm.; and the apical angle = 108°.

RHYNCHONELLA LINEOLATA (Phillips).

1829. *Terebratula lineolata*, Phillips, 'Geol. Yorks.' vol. i, p. 173 & pl. ii, fig. 27.
1850. *Terebratula Jugleri*, Geinitz, 'Das Quadersandsteingebirge in Deutschland' p. 208.

1851. *Rhynchonella lineolata*, Davidson, 'Brit. Cret. Brachiop.' Monogr. Pal. Soc. p. 98 & pl. xii, figs. 6-10.

1863. *Rhynchonella lineolata*, W. A. Ooster, 'Brach. Foss. des Alpes Suisses' [Pétrif. remarq. des Alpes suisses] p. 55 & pl. xix, figs. 1-4.

1868. *Rhynchonella* cf. *lineolata*, Schlenker, in Benecke's Geogn.-Paläont. Beiträge, vol. i, p. 493 & pl. xxiii, fig. 4.

1872. *Rhynchonella lineolata*, Pictet, Matér. p. la Paléont. suisse, 'Terr. Crét. Ste. Croix' pt. v, p. 48 & pl. cc, fig. 14.

1872. *Rhynchonella lineolata*, Geinitz, 'Elbthalgebirge' p. 167 & pl. xxxvi, fig. 36.

1874. *Rhynchonella lineolata*, Davidson, 'Brit. Cret. Brachiop.' Suppl. Monogr. Pal. Soc. p. 59; var. *Carteri*, *ibid.* p. 60.

1900. *Rhynchonella lineolata*, Jukes-Browne, 'Gault & Upper Greensand of England' Mem. Geol. Surv. p. 314.

Most of the specimens figured in the memoirs quoted above appear to belong to *Rhynchonella lineolata*, var. *Carteri*, Dav. This species is very variable, as may be seen from Davidson's figures; but they all show that the test is ornamented by numerous fine radiating striae, which near the front of the shell are grouped so as to form plaits at the front-margin, varying in number and in breadth.

Our specimens closely resemble those found in the Greensand of Cambridge, and show the same variations. *Rh. lineolata*, var. *Carteri* occurs in the Greensand of Cambridge, the Red Chalk of Hunstanton (Norfolk), and at Speeton (Yorkshire).

On the Continent this species occurs in the Tourtia of Essen (Westphalia) and at Dresden; also in the Gault of Morteau (Switzerland). Davidson states that he has found it at Drap, near Nice (France), in the Upper Neocomian.

RHYNCHONELLA LINEOLATA (?) var. *MIRABILIS*, nobis. (Pl. XVIII, figs. 7 a-7 c.)

We have obtained a remarkable specimen from Shenley, which may be an extreme variety of this species. It differs from any *Rhynchonella* that we have seen.

The shell shows the same striae as *Rh. lineolata*; its larger valve has a very wide fold in the centre, which shows an angular

indentation at the front-margin, caused by the apex of the central fold of the smaller valve; on each side of the central wide fold is a narrow fold. Beak short, recurved; foramen of a moderate size: beak-ridges well defined, leaving a flattened area between them and the hinge-line; the smaller valve is divided by a fold into three nearly equal parts.

Dimensions:—length = 11 millimetres; breadth = 17 mm.; thickness = 8 mm.

RYNCHONELLA LEIGHTONENSIS, nobis. (Pl. XVIII, figs. 8 a–8 d.)

Shell triangular in outline, globose, length and breadth nearly equal, strongly compressed laterally towards the beak; the greatest thickness is about one-third distant from the posterior end; the greatest breadth is at nearly the centre of the shell; each side of the front-margin rises by a gradual curve to about a third of the width of the shell, from which it is nearly straight, forming a central wide fold. The shell is covered by a multitude of fine, well-developed plaits, which extend to the extremities of the beak on both valves. The larger valve has its greatest width near the centre, from which a broad deep central sulcus extends to the front-margin, forming a wide fold; the valve slopes with a slight curve towards the beak, which is short and moderately incurved; the beak-ridges are rounded; there is a wide pseudo-area; the foramen is moderately large, and bounded by the deltidial plates. The smaller valve is very globose, having its greatest thickness about the middle; the beak of the smaller valve is broad and tumid, and is compressed towards the posterior part of the lateral margin. There is no elevation corresponding to the deep sulcus of the larger valve by which the centre of the front-margin is widely indented.

Dimensions:—length = 19 millimetres; breadth = 18.5 mm.; thickness = 13.5 mm.; and the apical angle = 95°.

By its peculiar form this species is easily distinguished from other Cretaceous species. We have obtained recently several young specimens of it.

RYNCHONELLA DIMIDIATA, Sow.

We have several young shells, but have not obtained a sufficient number of adult specimens to investigate properly this species.

RYNCHONELLA LATISSIMA, Sow.

Some specimens may belong to this species.

RYNCHONELLA ANTIDICHOTOMA, Bur.

We have found only one perfect *Rhynchonella* which may belong to this species, and a very broad specimen which may be a variety of it.

We have many *Terebratulæ*, often represented by single specimens, which we are unable, for want of material, to assign to their several species. Some of these are probably new forms.

**LIST OF FOSSILS, EXCLUSIVE OF BRACHIOPODA, FROM THE BAND AT THE
TOP OF THE LOWER GREENSAND AT SHENLEY HILL.**

	LOWER CRETACEOUS.							UPPER CRETACEOUS.					
c. = common. v.c. = very common. r. = rare. v.r. = very rare.	Hythe.	Potton.	Brickhill.	Upware.	Faringdon.	Surrey.	Specton.	Lincolnshire.	Gault.	Red Chalk.	Up.Greensand.	Warminster.	White Chalk.
PISCES.													
v.r. <i>Scapanorhynchus subulatus</i> (?) Ag.	...	...	...	...	...	...	...	...	...	...	..	..	..
CEPHALOPODA.													
v.r. <i>Ammonites</i> sp. (see text, p. 244).													
v.r. <i>Belemnites</i> sp. (see text, p. 244).													
GASTEROPODA.													
v.r. <i>Aporrhais</i> sp.													
r. <i>Natica</i> sp.													
v.r. <i>Trochus</i> sp.													
r. <i>Turbo</i> sp.													
LAMELLIBRANCHIATA.													
c. <i>Avicula</i> sp. indet.													
r. <i>Cyprina</i> sp.													
c. <i>Exogyra</i> (small sp.).													
c. <i>Janira quinquecostata</i> , Sow.	*						*			*	*	*	*
r. <i>Lima</i> sp. indet. (but cf. <i>faringdonensis</i> , Sharp)	...		*		*						*	*	*
r. — sp. (resembling <i>globosa</i> , Sow., of the Lower Chalk)	...		*		*						..	..	..
r. <i>Modiola</i> sp. (cf. <i>ligeriensis</i> , D'Orb.) .	1										*	*	..
c. <i>Ostrea</i> sp.													
r. <i>Pecten</i> (<i>Camponectes</i>) <i>cinctus</i> ? Sow. .							*	*	*		*	*	*
v.c. — (<i>Synclonema</i>) <i>orbicularis</i> , Sow.	*						*	*	*		*	*	*
c. — (<i>Chlamys</i>) <i>Robinaldinus</i> , D'Orb.	*	*		..			..	*	*	*	*	*	*
r. — sp. (cf. <i>subacutus</i> , Lam., & cf. <i>urgonensis</i> , De Lor.)						*	*	*		*	*	*	*
r. — sp.											?		
r. — sp.													
v.c. <i>Septifer lineatus</i> , Sow.	*					*				*		*	*
v.r. <i>Spondylus Rømeri</i> (?) Desh.	1		*										
[For the Brachio-poda see preceding List.]													
ECHINODERMATA.													
v.r. <i>Cardiaster latissimus</i> , Ag.												*	..
— sp. (not <i>C. Benstedii</i>).													
v.r. <i>Catopygus columbarius</i> , Lam.												*	*
c. <i>Cidaris</i> (spines like <i>C. Bowerbankii</i>)												*	*
v.r. <i>Echinobrissus lacunosus</i> , Goldf.												*	*
v.r. <i>Pyrina levis</i> , Ag.												*	*
CRUSTACEA.													
v.r. <i>Plagiophthalmus</i> (<i>Prosopon</i>) sp.													
ANNELIDA.													
c. <i>Serpula</i> indet.													

¹ 'Perna-Bed' of Atherfield.

² Atherfield Clay.

SUMMARY.

1. This paper describes a newly-discovered fossiliferous band at the top of the Lower Greensand, overlain by the Gault, in the sand-pits at Shenley Hill, near Leighton Buzzard (Bedfordshire).

2. The fossils of this band present a facies different from that of any previously-known fossiliferous horizon of the Lower Greensand, and show closer affinities with the fauna of the Upper Greensand than have hitherto been recognized in any deposit below the Gault. The brachiopods are closely allied to those contained in the Tourtia of Belgium.

3. The fossiliferous bed is rather sharply marked off from the underlying unfossiliferous 'silver-sands,' but is still more sharply marked off from the overlying Gault. Stratigraphically it forms part of the Lower Greensand, and cannot, without violence to the accepted classification of the deposits, be considered to belong to the Gault.

4. The fossils constitute a newer Lower Cretaceous fauna than has yet been recognized as such in England. Several species, hitherto supposed to be confined to the Selbornian, are now shown to have been in existence before the deposition of the Gault.

5. The lithological characters of the bed indicate a sea-bottom of moderate depth, swept by powerful currents; and the conditions were thus similar to those which persisted in the neighbourhood throughout Lower-Greensand times. The overlying Gault shows a change to more tranquil waters, probably of greater depth.

6. The brachiopoda, which are the most abundant fossils, are fully described, and representative specimens figured. These include several species or well-marked varieties regarded as new, together with others not hitherto recorded in England.

EXPLANATION OF PLATES XVI-XVIII.

[All the specimens are figured of the natural size, except where otherwise stated. They have been presented by the Authors to the Museum of the Geological Society of London.]

PLATE XVI.

Figs. 1 a, 1 b, & 1 c. *Terebratula capillata*, d'Archiac. This Shenley specimen agrees with d'Archiac's type.

2 a & 2 b. *Terebratula capillata*, d'Archiac. A specimen with a wide fold.

3 a & 3 b. *Terebratula capillata*, d'Archiac. A smaller specimen, with a wide fold.

4 a, 4 b, & 4 c. *Terebratula capillata*, d'Archiac. An ovoid globose specimen.

5 a & 5 b. *Terebratula capillata*, d'Archiac. A young specimen.

Fig. 6. *Terebratula capillata*, d'Archiac. A very young specimen.

Figs. 7 a, 7 b, & 7 c. *Terebratula biplicata*, var. *gigantea*, nobis. This is the largest specimen that we have obtained from Shenley.

PLATE XVII.

Figs. 1 a & 1 b. *Terebratula biplicata*, var. *Dutempleana*, d'Orb.

2 a & 2 b. *Terebratula depressa*, var. *shenleyensis*, nobis.

3 a & 3 b. *Terebratula depressa*, var. *shenleyensis*. A smaller specimen.

4 a & 4 b. *Terebratula Moutoniana*, d'Orbigny, var.

- Fig. 5. *Terebratula Boubei*, d'Archiac.
 Figs. 6 a & 6 b. *Terebratula ovata*, Sowerby.
 Fig. 7. *Terebratulina triangularis*, Etheridge.
 Figs. 8 a, 8 b, & 8 c. *Zeilleria convexiformis*, nobis.
 9 a, 9 b, 9 c, & 9 d. *Magas (?) latestriata*, nobis.
 10 a & 10 b. *Magas orthiformis* (d'Archiac).
 Fig. 11. *Magas orthiformis*. A large round variety.

PLATE XVIII.

- Figs. 1 a & 1 b. *Terebrirostra lyra*, var. *incurvirostrum*, nobis.
 2 a & 2 b. *Terebrirostra lyra*, var. *incurvirostrum*, nobis. A smaller, curved specimen.
 3 a, 3 b, & 3 c. *Terebratella Menardi*, Lamarck, var. *pterygotos*, nobis.
 4 a, 4 b, & 4 c. *Terebratella hercynica* (Schloenbach).
 5 a, 5 b, 5 c, & 5 d. *Kingena Newtonii*, nobis. Fig. 5 e is an enlargement of a portion of the shell, to show its granular surface.
 6 a & 6 b. *Kingena Newtonii*, nobis. Younger specimens. Fig. 6 c (see explanation of fig. 5 e).
 7 a, 7 b, & 7 c. *Rhynchonella lineata (?)* var. *mirabilis*, nobis.
 8 a, 8 b, 8 c, & 8 d. *Rhynchonella leightonensis*, nobis.
 9 a, 9 b, & 9 c. *Rhynchonella Grasiana*, var. *shenleyensis*, nobis.

DISCUSSION.

Prof. SEELEY said that he had had the advantage of seeing Mr. Walker's collection of fossils from this interesting locality. It reminded him, in its general affinities, of the Faringdon fauna as described by R. A. C. Godwin-Austen, among which were some fossils previously known only from higher horizons. In this deposit the presence of *Cardiaster* and *Catopygus*, of *Terebrirostra lyra*, *Terebratula capillata*, *T. biplicata*, and many other species, suggested the horizon of the Upper Greensand; though the brachiopods differed as varieties from those hitherto known. But these fossils were associated with some Lower-Greensand types, such as *Terebratella Menardi*, and those also differed from the forms found in the Hythe Beds of Kent. There were affinities which linked the fauna with the other areas north of the Weald, rather than with those to the south; but the cause of the mixture of faunas was not at present explained. He would have preferred to limit the term Lower Greensand to the southern deposit between the Weald-Clay and the Gault, and to use Godwin-Austen's term Neocomian for these northern beds, which extend from the Gault to a geological horizon much older than the Weald. This fauna was a distinct addition to the palæontology of a rock which includes diverse assemblages of fossils in its principal outcrops.

Mr. LAMPLUGH, on his own behalf and on that of his absent colleague, thanked the Fellows for the reception accorded to their paper, and Prof. Seeley for his kind appreciation of the work. He thought that the term Neocomian should not be applied in the broad sense desired by Prof. Seeley, as it was restricted in France to one stage only of the Lower Cretaceous.

F.H. Michael del. et lith.

Mintern Bros. imp.

TEREBRATULA CAPILLATA
& T. BIPLICATA VAR. GIGANTEA, NOV.

F.H. Michael del. et lith.

TEREBRATULA, MAGAS, ETC.

Mintern Bros. imp.

F.H. Michael del. et lith..

Mintern Bros. imp.

TEREBRIROSTRA, TEREBRATELLA,
KINGENA, & RHYNCHONELLA.