

EXPLANATION OF THE PLATES.

PLATES I. & II.

Illustrate a paper on the Geology of Southern Pembrokeshire, by H. T. De la Beche, Esq. Art. I. p. 1, &c. of the present volume.

PLATE I.

A map of Southern Pembrokeshire.

PLATE II.

Sections of various parts of the coast of Southern Pembrokeshire.

Fig. 1. Contortions of greywacké-strata in the proximity of trap, at the entrance of Druson Haven in St. Bride's Bay: vide pp. 6, 10, & 20.

Fig. 2. Coast-section from Broad Haven to Mill Haven in St. Bride's Bay: vide pp. 6, 7, 12, 15, & 18.

Fig. 3. Coast-section at West Angle, on the eastern side of the entrance to Milford Haven: vide page 16.

Fig. 4. Contorted strata of mountain-limestone, near Eligug Stack, on the southern coast of Pembrokeshire: vide p. 17.

Fig. 5. Vertical and contorted strata of limestone, resting upon highly inclined strata of old red sandstone, at Stackpole Quay: vide p. 17.

Fig. 6. Coast-section from Tenby to Sandersfoot, in Caermarthen Bay: see the description of the mountain-limestone at p. 15, and of the coal-measures at p. 18.

PLATES III. & IV.

Illustrate Mr. De la Beche's paper on the Lias of the coast in the vicinity of Lyme Regis. Art. II. p. 21, &c.*

* The relative position of the cliffs referred to in this paper is represented in Plate VIII. of Vol. I. (Second Series).

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PLATE III.

- Fig. 1.* An ideal section, representing the order of the strata in the vicinity of Lyme Regis : see p. 21.
- Fig. 2.* View of a remarkable fault, at the bottom of Pinhay Cliff, near Lyme Regis : see p. 24, 25.

PLATE IV.

Organic remains found in the lias near Lyme Regis : see p. 27, &c.

- Fig. 1.* A jaw, apparently of a fish : p. 27.
- Fig. 2.* A jaw, apparently of a fish, different from the last : p. 27.
- Fig. 3.* Imperfect remains of a crustaceous animal, from the cabinet of Miss Philpot of Lyme : p. 27.
- Fig. 4.* *Orthocera elongata* : see p. 28.
- Fig. 5.* Remains of an *Echinus*, from the lias-marl : see p. 28.
- Fig. 6.* Fossil wood : p. 29.
- Fig. 7.* Remains of a plant : p. 29.

PLATES V. & VI.

Illustrate Mr. Webster's paper on the Strata at Hastings. Art. III. p. 31 :—and on the Purbeck and Portland Beds. Art. IV. p. 37.&c.

PLATE V.

Elevation of the cliffs at Hastings in Sussex, from the White-rock on the west, to Cliff-end on the east. The ancient town of Hastings is situated between the West and East cliffs ; the greatest part of what lies between the West-cliff and the White-rock having been built lately. On the top of West-cliff are the ruins of the Castle.

Letters of reference, placed on the cliffs, point out the details given in the paper, p. 31, et seq. At the White-rock, the mamillated calciferous sandstone is on a level with the sea at *d* : it then rises, and is seen on the top of the cliff at *d*, under the Lime-kiln ; again at *g, g*, in East-cliff ; and at *f, f*, at Cliff-end. The sloping surface, partly covered with grass, under this, at *e, e*, is the dark-coloured shale (see p. 33). The perpendicular surface at East- and West-cliff, *h, h*, shows the soft sandstone, in which many caves are excavated for the fine white sand, of which the rock consists ; below this, is slate-clay and shale, *i, i*. At *k* in West-cliff, is seen the place where the latter bed was well exposed, in cutting down the cliff to build the Bazaar. *l, l*, in East-cliff is another bed of sandstone ; and below it, at *m, m*, are seen the lowest strata visible, consisting of sandstone and shale, with clay-iron-stone and carbonized vegetables.

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PLATE VI.

- Fig. 1.* represents a part of the White-rock at Hastings, where the concretionary masses of calciferous sandstone *b, b*, are to be seen *in situ*.
- Fig. 2.* exhibits some of these masses *a, a*, fallen down at East-cliff: *c* shows the appearance of the rocks when they are worn by the sea after falling.
- Fig. 5, 6, 7, 8, 9, 10, 11.* represent organic remains found at Hastings, and described in p. 35.
- Fig. 3.* Section of the strata in the N.-E. end, and upper part of the Isle of Portland, in illustration of Art. IV. p. 37.
- Fig. 4.* Fossil wood, the situation of which is represented in *fig. 3.*—on a larger scale.
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PLATES VII. VIII. & IX.

Illustrate Mr. Miller's paper on Belemnites. Art. V. p. 44. &c. :—and on the Genus Actinocamax. Art. VI. p. 63, &c.

PLATE VII.

- Fig. 1.* The conical chambered shell of the Belemnite taken out of the guard.—The figure represents the external slightly rugged shell, to which the laminæ of the guard adhere; also the probable depth of the outer chamber, with the aperture of the siphunculus: see p. 50, &c.
- Fig. 2.* Section to show the form of the siphunculus in the conic-chambered shell.
- Fig. 3.* Section to show the chambers, which are filled with calcareous spar.
- Fig. 4.* A magnified representation of the section of the siphunculus, showing its laminar structure, and its adhesion to the external conic shell.
- Fig. 5.* A magnified representation of the transverse septa in the chambered cone, showing their laminar structure, and their adhesion in common to the shell.
- Fig. 6.* Belemnites elongatus (see p. 60.), taken from two portions in Mr. Miller's collection, one of which, as here represented, shows the projecting of the chambered shell beyond the guard, and the depth of its outer chamber. The dotted line marks the space occupied by the cone.
- Fig. 7.* A longitudinal section of Belemnites elongatus, showing the laminar structure of the guard, and the chambered cone in part surrounded by its shell *in loco*: p. 60.
- Fig. 8.* A transverse section of B. elongatus, with a concave septum belonging to the chambered cone in the centre: p. 60.
- Fig. 9.* Belemnites abbreviatus: see p. 59.
- Fig. 10.* Transverse section of B. abbreviatus, with a concave septum in the centre, belonging to the chambered cone: p. 59.

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PLATE VIII.

- Fig. 1.* Belemnites longissimus : p. 60.
Fig. 2. Transverse section of the guard of the same : p. 60.
Fig. 3. Belemnites sulcatus : see p. 59.
Fig. 4. Transverse section of its guard, showing in the centre its nearly circular outline : p. 59.
Fig. 5. A variety of Belemnites sulcatus, showing the abbreviated laminæ as they form the longitudinal groove : p. 59.
Fig. 6. Belemnites aduncatus : p. 59.
Fig. 7. The apex of the same : p. 59.
Fig. 8. Transverse section of the guard : p. 59.
Fig. 9. Belemnites acutus : p. 60.
Figs. 10 & 11. Belemnites tripartitus ;—a front and back view : p. 60.
Fig. 12. Transverse section of *B. tripartitus*, showing the guard formed of three longitudinal portions : p. 60.
Fig. 13. Transverse section of *B. tripartitus*, near the apex of the guard : p. 60.
Figs. 14 & 15. Belemnites ellipticus, from Dundry : these two parts fit together : p. 60.
Fig. 16. Transverse section of *B. ellipticus* : p. 60.
Fig. 17. Belemnites ellipticus, var. α .
Fig. 18. Belemnites electrinus : p. 61.
Figs. 19 & 20. The two longitudinal portions, forming the guard of the Belemnites electrinus (see p. 61.) ; showing in the centre the canal formed by decomposition, and at the apex of *fig. 19* the mamillated and conical point,—separated from *fig. 20*,—in which last figure there has been left a corresponding cavity, which, when found separate, led to the erroneous notion of the Belemnite having two conic chambered shells.
Fig. 21. Outline of the impression of the blood-vessels on the guard of Belemnites electrinus : p. 61.
Fig. 22. Belemnites fusiformis : p. 61.

PLATE IX.

- Fig. 1.* Fragments of *B. electrinus* (p. 61), showing an induration formed in the canal resulting from decomposition, and exposed by the separating and falling out of a portion of the laminæ forming the guard.—This appearance occasioned the erroneous impression that the Belemnite had a canal extending from the siphunculus through the guard ; the projecting point being considered as having been formed in the siphunculus.
Fig. 2. Magnified representation of 2 nacrous laminæ, having crystalline spiculæ pro-

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- jecting from them, and showing near the apex the accumulated nacrous matter, which on decomposition formed the canal.
- Fig. 3.* Illustrative views of fragments of *Belemnites electrinus* (see Pl. VIII. figs. 18, 19, 20.) as found in Prussia, their cylindrical form arising from wearing down by attrition before they were imbedded in the sands in that country.
- Fig. 4.* Pyritic cast of the chambered cone, showing the indentures formed by the decomposition of the siphunculus, which cavities have been erroneously considered as spiraculæ.
- Fig. 5.* Transverse section of *Belemnites fusiformis* : p. 61.
- Fig. 6.* *Belemnites minimus* : p. 62.
- Fig. 7.* Illustrative views of the manner in which the laminæ that form the guard of *Belemnites fusiformis* are arranged : p. 61.
- Fig. 8.* Siliceous infiltrations in a portion of the guard of *Belemnites ellipticus* : p. 60.
- Fig. 9.* Casts in the conic cavity formed by the dropping out of the chambered shell ; and in the grooves made by decomposition of a portion of the nacrous matter that cements the two longitudinal halves together, as also in the central canal formed by decomposition.—Casts of this description led to the theory that the supposed central canal, extending from the siphunculus through the guard, divided into two, which probably were nerves.
- Fig. 10.* *Belemnites minimus* (see p. 55 & p. 62.) corroded, and converted into silex. In the collection of Miss Benett, Norton-house, Wilts.
- Figs. 11, 12, 13.* Appearance of decomposition, which has acted on the apex of a Belemnite. This misled De Montford, when he formed his genera *Cetocis* and *Acamus*.
- Fig. 14.* *Sepia loligo* : see p. 57, &c.
- Fig. 15.* As MM. Cuvier and Lamarck agree with me in considering the inhabitant of the Belemnite to have been a *Sepia*, I venture here to represent a *Sepia* resembling *loligo*, but capable, on account of an abbreviated body, of insertion in the outer chamber, whilst its muscles clasped the Belemnite, denoted by dots.
- Fig. 16.* *Spirula fragilis* and its inhabitant : see p. 57.
- Fig. 17.* *Actinocamax verus* : see Art. VI. p. 64.
- Fig. 18.* Section of *A. verus*.
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PLATES X. XI. XII. & XIII.

Illustrate Mr. Lyell's paper on a recent Formation of Limestone in Forfarshire, &c. Art. VIII. p. 73.

PLATE X.

Fig. 1. represents a section of the strata of part of Forfarshire, from the Grampians on the north, to Dundee on the south, and shows the general structure of the country between the Grampians and the Firth of Tay : see p. 73.

This line of section (the course of which is expressed in the map, Plate XI.)

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passes through the Bakie Loch, showing that the recent deposits of marl in that lake rest upon the diluvium of Strathmore.

Fig. 2. represents a canoe, found in peat overlying this marl in the Loch of Kin-nordy,—a lake about 6 miles N.E. of the Bakie : see note, p. 87.—and for the deposits in that lake, p. 86.

Fig. 3. Supposed section of the deposits in the Bakie Loch : for a description of these, and of the organic remains contained in them, &c. see pp. 74, 76, 77, 79, 81, 83. and Appendix I.

PLATE XI.

A map of that part of Forfarshire, in which the principal deposits of shell-marl are situated ; showing that this marl is confined to the old red-sandstone formation, and the series of inferior gray, micaceous sandstone, shales, &c., with their associated trap-rocks : see p. 1 and 79.

PLATE XII.

Recent and fossilized Charæ ; from the Bakie Loch and other marl-lakes in the county of Forfar.

Fig. 1. a. Gyrogonite, or fossilized pericarpium of Chara, found in the tufaceous limestone or rock-marl of the Bakie Loch—of the natural size : p. 79, 91.

b. The same magnified 20 diameters, the upper end being placed downwards. It consists in general of the empty integument completely replaced by carbonate of lime : p. 92.

c. Lower end of ditto, to which the stem was attached : p. 92.

d. Upper end of ditto, to which the stigmata were attached.

e. Nut, sometimes found within the integument *b* ; but consisting of an unfossilized brown membrane : the end to which the stigmata were attached placed downward. The small fibres appended may be the styles ? p. 92.

f. represents the nut, within a portion of the fossilized integument : p. 92.

g. One of the spiral valves of *b*. These are easily separable in the Bakie Gyrogonite, as in those found in the ancient freshwater-formation : p. 92.

h. View of the interior of *d*.

i. Section of one of the valves of the integument, showing their quadrangular form : p. 91.

k. Fossilized branch of same Chara, natural size.

l. Fossilized stem of ditto, spirally striated. The striæ wind round in a contrary direction to those of the pericarpium.

m. Ditto magnified, showing it to be composed of a large tube surrounded by smaller tubes : p. 91.

Fig. 2. a. Pericarpium or seed-vessel of recent Chara hispida, from the Bakie Loch : of the natural size : see p. 92.

b. Integument of ditto, magnified 20 diameters, of the same species as that fossilized in Bakie (represented in *b. Fig. 1.*), but smaller, as being less ripe. Each of the five spiral valves turn rather more than twice round the circumference ; the whole together making between 10 and 11 rings : p. 91.

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- c.* Nut within ditto, the end to which the stigmata were attached placed downwards: p. 91.
 - d.* Inferior part of the nut *c*: p. 91.
 - e.* Superior of ditto: p. 91.
 - f.* Stem and branches of recent *C. hispida*.
 - g.* Ditto magnified.
 - h.* Section of the stem; the smaller tubes are irregular in number: see p. 91.
- Fig. 3.* *a.* Pericarpium of recent *Chara vulgaris*; from the Bakie Loch. The stems only of this species have been found fossilized in the rock-marl: p. 93.
- b.* Ditto, magnified 20 diameters: p. 93.
 - c.* Nut within the integument *b*, the end to which the stigmata were attached placed downwards: p. 93.
 - d.* End of the nut *c*, to which the stem was attached: p. 93.
 - e.* End of ditto, to which the stigmata were attached.
 - f.* Stem and branch of *C. vulgaris*, natural size.
 - g.* Stem and branches of ditto magnified 8 diameters.
- Fig. 4.* *a.* Pericarpium of a species of *Chara* found in many of the marl-lakes of Forfarshire, but not in the Bakie (p. 93.), the *C. flexilis* of Dr. Hooker's *Flora Scotica*.
- b.* Ditto magnified, and attached to the branch. The spiral valves of the integument turn each about $2\frac{1}{2}$ times round the circumference, the whole forming about 13 rings, which exceed the number in *C. hispida* and *vulgaris*, p. 93: the septa mentioned p. 91, are seen through the transparent stem.
 - c.* Nut within ditto.
 - d.* Branch of *C. flexilis*, natural size.
- Fig. 5.* represents a species of *Helicteres*, from the West Indies, of the natural size; —introduced as a subject of comparison, with the integument and nut of the pericarpium of *Chara*: p. 91.

PLATE XIII.

- Fig. 1.* *Chara Medicaginula*, magnified 20 diameters, from the lower freshwater formation at Gurnet-bay in the Isle of Wight.
- Fig. 2.* *a.* The same, natural size.
- b.* Section of the same, magnified 20 diameters, exhibiting the nut inclosed within the integument.
 - c.* Part of one of the spiral valves, magnified.
- Figs. 3, 4, 5.* *Chara Medicaginula* from the Isle of Wight, magnified 20 diameters. In these three specimens the number of the ribs or striæ on the nut varies from 5 to 7. Whether they should in consequence be referred to three distinct species, the present state of botanical knowledge concerning the fructification of this tribe of plants is not sufficiently advanced to determine. The nut in *figs. 3* and *4* is perhaps partially, and that in *fig. 5* much distorted: p. 93.
- Fig. 6.* Stem of *Chara Medicaginula*, found accompanying the preceding. It is strictly analogous to the stem of *C. hispida*: see Pl. XII.

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Figs. 7 & 8. Pericarpium of *C. tuberculata*, a new species of Gyrogonite discovered in the lower freshwater formation at White-cliff Bay, Isle of Wight. The spiral valves form constantly nine rings.—For a description of this, and of the strata in which it occurs, see p. 94.

PLATES XIV. & XV.

Illustrate Mr. Murchison's paper on the Geology of a part of Sussex, Hants, and Surrey. Art. IX. p. 97.

PLATE XIV.

Geological map of the north-western part of Sussex, and the adjoining parts of Hants and Surrey; reduced from the Ordnance Map; with a section.

PLATE XV.

Bones of saurian animals from the Iron-sand.

Figs. 1 to 7, from the N.E. of Loxwood: see pp. 104, 105.

Figs. 8 and 9, from Headfoldwood-common.

Fig. 1. A caudal vertebra.

2. A lumbar vertebra.

3. One of the *first* caudal vertebræ.

4. Sacrum.

5. Portion of a rib.

6. Two caudal vertebræ ankylosed together.

7. False rib; or branch of the os hyoides.

8. Vertebra found with the great femur.

9. The great femur: see p. 104.

PLATE XVI.

Detailed sections of the chalk, and sands beneath the chalk, on the coasts of Dorset and Devon, in illustration of a paper by H. T. De la Beche, Esq. Art. X. p. 109.

Fig. 1. Section to the west of Lyme Regis, Dorset: vide pp. 110—115.

Fig. 2. Section at White-cliff, to the east of Beer, Devon: vide pp. 115, 116.

Fig. 3. The same as *Fig. 2*, with some variation in the sands immediately below the chalk.

Fig. 4. Section, showing the position of the Beer-stone in Branscombe-cliffs, to the west of Beer-head: vide pp. 116, 117.

PLATE XVII.

Map of the vales of Kingsclere and Ham, to the south of Newbury, and section across the vale of Kingsclere; in illustration of a paper by the Rev. Dr. Buckland on the Formation of Valleys, &c. Art. XI. p. 119.