Robt. Peter

OUTLINES OF ORYCTOLOGY. /1831/

AN INTRODUCTION

TO

THE STUDY OF

FOSSIL ORGANIC REMAINS;

ESPECIALLY OF THOSE

Found in the British Strata:

INTENDED TO AID THE STUDENT IN HIS INQUIRIES RESPECTING THE NATURE OF FOSSILS,

AND THEIR

CONNECTION WITH THE FORMATION OF THE EARTH.

With Illustrative Plates.

SECOND EDITION.

WITH THE AUTHOR'S LATEST CORRECTIONS.

BY JAMES PARKINSON,

Fellow of the Royal College of Surgeons, Member of the Geological Society of London, the Wernerian Society of Edinburgh, and of the Cæsarian Society of Moscow.

LONDON:

M. A. NATTALI, 24, TAVISTOCK-STREET, COVENT-GARDEN;

AND COMBE AND SON, LEICESTER.

M.DCCC.XXX.

teresting and important conjectures. Correct investigation is therefore demanded: a careful comparison of the respective characters of these substances must be made, and the various circumstances belonging to their present extraneous situations be endeavoured to be ascertained.

Zoophytes.—These substances, possessing an animal nature under forms approaching to those of vegetables, frequently occur in a mineralized state. The inquiries respecting them will, for obvious reasons, be first directed to those which are of the simplest forms and structure.

Sponge is, in its recent state, a polymorphous, soft, porous, flexible and elastic body, manifesting a small portion of irritability and vitality. It is composed of fibres of a peculiar substance disposed rather in a membranaceous form, blended with minute spiculæ of various figures; the whole connected in a variously formed network, and invested by a light gelatinous matter.

Count Marsilli, who had the most favourable opportunities of examining into the nature of this substance, was satisfied, although led to the belief of its being a vegetable, that he had many times observed a regular systole and diastole taking place in some of its more circular apertures. But neither M. Peron nor M. Bosc have been able to confirm these obervations*.

* The following remarks on the nature of this substance merit attention:—Although the animal nature of sponge is generally admitted, no circumstance which may serve to illustrate its history, and tend to dispose of it in its proper place in the system of nature, should be unnoticed. The following observations of Dr. Fyfe may indeed be considered as adducing very important evidence on this subject. Sir Humphrey Davy had procured iodine from several of the fuci and ulvæ, but not from the alkaline matter manufactured at Sicily, Spain, and the Roman states, nor did he find that the ashes of coral or of sponge appeared to contain it. From various experiments Dr. Fyfe was enabled to conclude that iodine was confined not only to the class cryptogamia, but to the marine pro-

With the hope of facilitating the distinction and arrangement of those sponges which may be discovered in a mineralized state, it has been thought advisable to give the following table of the divisions of sponges which have been adopted, and of the species which have been noticed, by M. Lamouroux†; adding those specific characters which appear to be most distinctive and most likely to be discoverable in the fossil specimens.

I. Sessile masses, simple or lobated, either covering or enveloping.

Species.

1. *S. communis* .....Large flattish masses, rather convex; pores large; crevices and grooves chiefly beneath.
2. — *lacinulosa* .....Surface finely porous, downy and jagged; edges ciliated.
3. — *sinuosa* .....Tissue fibrous and stiff; holes and crevices numerous and deep.

ductions of this class. Sponge being however considered to belong to the animal world, forms an apparent objection to this conclusion. But it must be remembered that Linnæus was inclined to regard sponge as a vegetable substance, and to place it in the class cryptogamia, subdivision algæ aquaticæ; but was doubtful of the correctness of this arrangement. "May not the fact," Dr. Fyfe observes, "that sponge contains iodine, be an argument in favour of the opinion of Linnæus, that this substance properly belongs to the vegetable world, class cryptogamia, from the plants of which iodine is obtained?"—*Account of some Experiments, made with the view of ascertaining the different Substances from which Iodine can be procured.* By Andrew Fyfe, M. D. *The Edinburgh Philosophical Journal, vol.* 1, *p.* 254.

† Histoire des Polypiers Coralligenes flexibles, &c. par J. V. F. Lamouroux, D. E. S. *Caen,* 1816.

Species.

4. *S. cavernosa* .....Stiff and hard; very cavernous; mammillated, and irregularly porous.
5. — *cariosa*.....Rudely shaped, and irregularly lobed; cavernous, and jagged as if eroded.
6. — *licheniformis*. ...Rather glomerated, and a little branchy; fibres very lax.
7. — *barba*.....Fibres shaggy and rather straight, resembling the beard of a goat.
8. — *fasciculata*.....Fibres in fasciculi, terminating in pencils at the surface.
9. — *lacera*.....Terminating in jagged, branchy lobes.
10. — *filamentosa*.....Formed of numerous bundles of distinct filaments.
11. — *favosa*.....Surface membranaceous; nearly covered with subangular, irregular cells.
12. — *cellulosa*.....Beset with subangular cells; interstial membranes full of pores.
13. — *septosa*.....With nearly erect lamellæ, decussating and forming irregular cells.
14. — *fenestrata* .....With reticulated fibres, in unequal and winding divisions.
15. — *crassiloba*.....Encrusting; deeply lobed; thick, erect, flattish, conoidal lobes.
16. — *tabula*.....Flat, oblong, nearly undivided; full of pores.
17. — *placenta* .....Obliquely circular; plano-convex; rigid; full of pores; radiated, in grooves, at the edges.
18. — *byssoides*.....Flat; formed of distinct fibres, and loosely cancellated.

Species.

19. *S. pulvinata*.....Smooth, like a cushion; rarely lobed.
20. — *carbonaria* .....Black and misshapen.
21. — *incrustans*.....Investing, with a thin crust.
22. — *agaracina*.....Compressed, lobed, reticulated; and externally covered with a downy substance.
23. — *cristata* .....Flat, with erect and delicate ridges growing in the shape of cocks' combs.
24. — *domuncula* .....Convex, smooth, slightly papillary, and very cellular.
25. — *globosa*.....Rounded, firm, and very cavernous; surface sprinkled with smooth papillæ.
26. — *macida*.....With white, crustaceous fibres, terminating in points.
27. — *panicea*.....Resembling, in its form, crum of bread; and composed of bundles of fine needle-like fibres, crossing each other.
28. — *papillaris*.....Crustaceous, tender, and soft, with perforated papillæ.
29. — *urens*.....Very brittle and soft, and interwoven with very minute spines.
30. — *acicularis* .....White, solid, porous and scabrous externally; with fibres in fasciculæ converging to the centre.

II. Subpediculated masses, contracted toward their base; simple or lobated.

31. *S. angulosa*.....Sides angular; various, unequal, and numerous foramina on the edges of the angles.

Species.

32. *S. pluriloba*.....Lobes erect and fissured; numerous small pores with interspersed round ones.

33. — *rimosa*.....Lobes erect, fibrous and rather woolly; surface hollowed out with longitudinal grooves.

34. — *penicillosa*.....Surface bristled with brushes of straight and hard fibres.

35. — *turgida*.....Substance fibrous; fibres loosely interwoven, and forming a terminating foramen.

36. — *bombycina*.....Ventricose; many lobes on the upper surface; fibres naked and lax; harsh and hispid at the surface.

37. — *flammula*.....Lobes erect, of an ovato-lanceolated form; fibres loose.

38. — *myrobolans*.....Mass oval, rather flat.

39. — *pes leonis*.....Pedicle short, sustaining a roundish, oval, soft and compressed mass; texture very porous.

40. — *anatipes*.....Entirely fibrous; longitudinal fibres stronger than the transverse ones; the meshes of the net-work elongated; pedicle hard and porous.

41. — *rubra*.....Reddish, depressed, subrotund, with elevated tubercles; pores of equal size.

42. — *peziza*.....Yellow and ramose; branches resembling the peziza.

43. — *nigra*.....Globose, smooth; black externally, internally of an ash colour.

III. Pediculated masses; flat, flabelliform; simple or lobated.

Species.

44. *S. plancella*.....Truncated oval form, flat; not thick; curved on one of its edges; tissue lightly encrusted, and finely porous.

45. — *pala*.....Spatuliform, openings round, on its upper margin.

46. — *flabelliformis* ...Fan-formed; elegantly reticulated, with superficial undulating stripes, decussating on the disk.

47. — *pluma*.....Finely fibrous; spread fan-like.

48. — *carduus*.....Open, like a fan; with lamellated wrinkles on both sides, and echinated with spines.

49. — *pannea*.....Flabelliform; with a cloth-like texture.

50. — *fissurata*.....Fan-formed; more or less lobated, and covered with small irregular crevices.

51. — *cancellaria*.....Low, flabelliform, and compressed; ramifications coalescent, disposed in a trellised form, and bristled on the edges.

52. — *lyrata*.....Erect, compressed, fan-formed lobes, with connected tubes; upper margin rounded and set with foramina.

53. — *deltoidea*.....Erect; truncated in the upper part; (frequently encrusted with vermiculæ on both sides.)

Species.

54. *S. sartaginula*.....Circular and smoothish; concave on one and convex on the other side; with small round foramina disposed nearly in rows.

55. — *appendiculata*...Subpediculated, oblong, spatuliform, with finger-formed appendices.

IV. Concave expanded masses; cup or funnel-formed.

56. *S. usitatissima*.....Turbinated; soft, tomentous, very jagged and porous.

57. — *tubulifera*.....With tubuliferous lobes.

58. — *stellifera* .....Cup-formed; with thickly set stelliform pores in the hollow part.

59. — *striata*.....Funnel-formed; with rough longitudinal striæ on the sides.

60. — *campana*.....Bell-formed; with lamelloso-reticulated sides.

61. — *turbinata*.....Turbinated; narrow and long; cavity echinated.

62. — *vasculum*.....Turbinated; surface smooth; edge woolly.

63. — *brassicaria* .....Expanded; subfoliaceous; lobes large; surface smooth.

64. — *cyathina* .....Cyathiform; with small, scattered, round openings.

65. — *Otaheitica*.....Cyathiform; slightly lobed, with longitudinal crevices.

66. — *costifera*.....Turbinated; with longitudinal ribs on the sides.

67. — *labellum* .....Labelliform, like slips of paper; striated with longitudinal thread-like risings.

Species.

68. *S. pocillum* .....Caliciform; with fine pores and clefts.
69. — *venosa*.....Open cyathiform; reticulated with vein-like white, distinct fibres.
70. — *sportella* .....Basket-formed; reticulated.
71. — *bursaria* .....Wedge-shaped; purse-like; connected in a fan-form.
72. — *bilamellata* .....Flabelliform; terminating in two ample straight, parallel lamellæ.
73. — *calix*.....Turbinated, stipitated; the substance thick and lax, internally rather gibbous.
74. — *ficiformis*.....Turbinated, apex open.
75. — *compressa*.....Forming a compressed cone, with longitudinal fissures internally.

V. Tubulous or fistulous masses, not expanding.

76. *S. lacunosa* .....Cylindrical; externally excavated by irregular and winding lacunæ.
77. — *tubæformis* .....Long simple tubes, tuberculated externally.
78. — *fistularis*.....Long, aggregated, simple tubes, gradually enlarging.
79. — *plicifera* .....Approaching to the infundibuliform; with external, tortuous anastamosing plicæ.
80. — *scrobiculata*.....Oblong top-form; with unequal furrows and roundish cells.
81. — *vaginalis*.....Oblong and tubular; the outer surface with rough, flattish tubercles.

Species.

82. *S. digitalis*.....With longish processes, slightly connected; the surface muricated and ragged.

83. — *bullata*.....Branched, tubulous; with inflated nodes, and terminating in points.

84. — *syphonoïdes*.....Tubes elongated in the form of a syphon.

85. — *colus*.....Erect, clavelliform, and tubular.

86. — *tubulosa*.....Full of tubes; branched, erect and slender at the end.

87. — *muricina*.....With subramose tubes, every where muricated with acute tubercles.

88. — *confederata*.....Formed of many connected tubes.

89. — *intestinalis*.....With many hollow, unequal lobes.

90. — *coronata*.....Minute, a tube crowned with radiating little spines.

91. — *tubularia*.....Sessile, compressed, porous; with longitudinal tubules.

92. — *ciliata*.....Conical, bending tube, becoming smaller upwards, and ciliated at the apex.

VI. Foliaceous masses; divided in flat, leaf-formed lobes.

93. *S. perfoliata*.....Plain stalk, with round foliaceous lobes, disposed spirally on the stalk.

94. — *pennatula*.....With erect, rounded, wedge-formed, foliaceous lobes, very porous.

95. — *cactiformis*.....Ramose; with flat, flabellated expansions, rounded or muriated at the summit, and small dispersed excavations on one face.

Species.

96. *S. crispata*.....With contorted, bubbly, suppellucid, curled, coalescent, expansions, of very fine fibrous texture.

97. — *basta*. (panache noir).—Black, fibrous, frondose-cristated; with separating convoluted folds of loosely connected fibres.

98. — *lamellaris*.....Sessile, frondose, with many soft, erect, and nearly parallel lamellæ, broadest in the upper part.

99. — *endivia* .....In soft spatuliform thin plates, wrinkled on their edges and surface.

100. — *urceolus* .....Green, obovate, narrow and ragged at the top.

101. — *mamifferis* .....Of different forms; cavernous, with conical bending tubes, with elevated tubular pores.

102. — *polyphilla*.....With pediculated fronds; with convoluted plaited lobes and longitudinal fibres.

103. — *pavonia* ..... With sub-proliferous, roundish fronds; with foramina on one side.

104. — *scariola*. .....With foraminated expansions, dividing in a multitude of plates, lobated, turned, and as it were crimped, in various directions.

105. — *heterogona* .....With expansions, so turned as to form imperfect tubes.

106. — *thiaroides*.....Many narrow erect lobes, emulating a muricated crown.

Species.

107. *S. xerampelina*....Ramose; with ovate incised fronds, with a tow-like incrustation.

108. — *juniperina*.....Ramose; fronds with the fibres arranged like a lattice work.

109. — *raphanus*.....Substance like tow, and porous; with ovate frond-like lobes, with longitudinal grooves and wrinkles on both sides

110. — *mesenterina*.....With broad lamellæ, plaited in winding forms.

111. — *leporina*.....Frondose; deeply fringed; dilating and sublobated towards the apex.

112. — *laciniata*.....Frondose; with many erect, aggregated, jagged, lyre-formed lamellæ.

113. — *frondifera*.....Slightly ramifying, with roundish, proliferous lobes, the limb fimbriated with curled fibres.

114. — *fimbriata*.....Slightly ramifying, with ovato-subrotund fronds, the limb fimbriated with curled fibres.

VII. Branched masses, phytoidal or dendroidal; the ramifications distinct.

115. *S. arborescens*.....Ramose; branches subcompressed; apex palmated; digitiform.

116. — *virgultosa*.....Branches roundish; with erect twigs, rather pointed.

117. — *longicuspis*.....Base, a trellisse formed of five or six meshes; whence rise from six to nine straight long branches, sometimes coalescing, forming thin digitations or long points.

Species.

118. *S. asparagus*.....Ramose, erect, many stems.

119. — *dichotoma*.....With erect, round, subulated dichotomous branches.

120. — *echidnea*.....With erect, rigid branches, all over muricated.

121. — *muricata*.....Thinly branched; substance like cork; branches cylindrical, and beset with obtuse shaggy tufts.

122. — *vulpina*.....With ramose lobes, rather latticed, with compressed papillæ.

123. — *spicalifera*.....Branches erect; with sub-cylindrical tubercles, muricated with spiculæ.

124. — *carlinoides*.....Thickly branched; angulated branches, with subspinous and membranaceous expansions.

125. — *amaranthina*....With compressed, divided and lobated branches, dilated upwards, and longitudinally striated.

126. — *strigillata*.....Flabelliform, flat branches, with echinated papillæ.

127. — *nervosa*.....Branched fan-like; nervous subreticulated branches.

128. — *rubispina*.....Branched fan-like; with divided branches, rather coalescent; echinated with pointed tubercles.

129. — *abietina*.....With stipitated, flat, incrusted branches, with acute papillæ terminating in threads.

130. — *elongata*.....Sub-ramose, with a few rather cylindrical branches; with very long naked and sub-reticulated fibres.

Species.

131. *S. selaginea*.....Compressed, ill-formed branches; with frequent spinous keel-like ridges.

132. — *aspericornis*....Rather round, elongated, and aculeated branches.

133. — *hispida*.....Ramose, ill-formed, hispid, with subulated jags.

134. — *serpentina*.....Round branches, the smaller contorted in various directions.

135. — *oculata*.....Compressed, roundish, with bifid and trifid ascending branches, with eye-like openings.

136. — *botellifera*.....With erect, tuberculated, grooved and ill-formed branches.

137. — *palmata*.....Branched and palmated; digitiform smaller branches, with forked terminations.

138. — *lanuginosa*.....Dichotomously branched, rather compressed previously to being divided; woolly, and formed of very fine naked fibres.

139. — *typhina*.....Ramose; with round, erect, woolly branches.

140. — *tupha*.....Ramose; with cylindrical obtuse omentiform branches.

141. — *fornicifera*.....With flat, small villous ramifications coalescing in a vaulted lattice.

142. — *semitubulosa*....With numerous cylindrical and tortuously divaricating branches, some tubular and pierced.

143. — *alicornis*.....With many stems; branches compressed and subdichotomous; the apices attenuated; the fibres minute.

Species.

144. *S. damæcornis* ....With compressed porous branches, with clefts on one side; apices palmated.

145. — *caudigera*.....With forked lobes; the last being very long and caudiform.

146. — *loricaris*.....Loose branches, like narrow straps; a little compressed, divided and irregularly curved.

147. — *cancellata*.....Ramose, flabellated, and incrusted; with round flexuous branches, forming, by coalescing, cancellæ; the surface finely reticulated.

148. — *stuposa*.....Ramose, round; towey and villous; short and obtuse branches.

149. — *linteiformis*.....In a rounded bush-like form; the branches rather narrow, jaggedly fringed, rough and sharp to the touch.

150. — *clathrus*.....Many branches, crowded together, and by coalescing forming cancellæ; the apices obtuse, and rather turgid.

151. — *coalita*.....Dilated base, inclosing other bodies; numerous roundish, compressed branches; fibres closely applied at the surface.

152. — *faveolaria*.....With elongated, sub-cylindrical, coalescent branches; the apices conical; the surface unequal; having little pits on the surface, and being rough on the edges.

153. — *macrodactyla*...With long round compressed finger-like processes.

Species.

154. *S. botryoides* .....With oblong, ovate lobules, apices hollow and open.

155. — *radiciformis* ....With tortuous, dichotomous branches, compressed at the apex.

156. — *prolifera*.....Palmated, with frequent divisions, and distinct finger-formed processes.

157. — *ossiformis* .....White, subramose; apex thickened and jagged.

158. — *membranosa* ....With cellular membranes, externally muricated.

159. — *fulva* .....Amorphous and subramose.

160. — *floribunda* .....Confluent, with ramose fasciculi; having a chaffy flosculent down, and being obtuse and thicker at the apex.

161. — *baccillaris* .....Erect, caulescent; with porous branches, applied to each other.

The existence of fossil sponge in the transition or in the mountain limestone has not been ascertained, or in the different beds of the lias formation; but the tenuity, in general, of its substance, and the nature of the matrices in which it has been sought, may perhaps occasion its concealment. Of its presence in the several oolitic beds, I have not been able to acquire any satisfactory information, except that in the Portland freestone I have seen semisphæroidal masses, about eighteen inches in diameter, divided into flattish, foliaceous, laciniated, erect lobes, and which appear to possess a spongeous structure. Specimens are sometimes found in the green sand formation, but not so frequently as may have been expected: the specimens which are most frequently found, are, I suspect, those which are adherent to the accompanying fossil shells.

The richest collection which is known of these fossils is, I believe, that of the gravel pits of the iron sand at Farringdon, where they are found mingled with the fossils of some of the early formations. Some of these specimens are of considerable size, and are in such excellent preservation as to allow, at least, of their arrangement under the more comprehensive divisions of the genus. Among the specimens are round and cavernous, resembling sp. globosa; pediculated, sub-pediculated, lobated and flabelliform, ramose, foliaceous, cyathiform, funnel and ficiform. In most of the specimens the structure and form of the substance are so obvious, as to raise the hope that the determining of their specific characters, and of their consequent arrangement by some zealous investigator of these interesting relics, may be expected.

Fossil remains of this substance are frequently found in the chalk, and most numerously perhaps in the lower series of this formation; but from the delicate texture of the membrane of the sponge, and from its cavities being filled by the chalk itself, there are no known means by which the fossil can be extricated from its matrix. Indeed, it frequently happens that these substances, agreeing as to colour with the chalk, would exist there undetected, but by the greater degree of hardness which it possesses, and by the asperities which it presents at the surface. They are sometimes pointed out by the strong tint which they derive from having sustained a ferruginous impregnation; and in these instances, although a sufficient separation from the surrounding chalk to allow the developement of the form cannot be obtained, yet, by their being carefully rubbed down to a smooth surface, something of this may be discovered, with, generally, a tolerable display of the internal structure.

The nodules of chalk flint frequently contain the silicified remains of sponge, and in a state which will allow

their form and structure to be much more easily traced than in the chalk itself. The most common forms in which these occur are oblong or nearly globular: and they are either imbedded in the chalk, or scattered on its surface, or in the neighbouring declivities. These may be frequently found on the Sussex Downs, the Gogmagog Hills of Cambridgeshire, and, indeed, on or about most of the chalk hills. These nodules appear to have been formed round fragments of sponge of different forms and structure, and to be more or less filled, according to the degree of decomposition and subsequent removal which the included substance had sustained after its inclusion. In some specimens, particularly among those of Wiltshire, which have been collected by the liberal encouragement of Miss Benett, a tuberous or ramified body, and, in some instances, two such bodies, are extended across the cavity of the flint, and covered over with a fine white powder of chalk and silex blended. These bodies appear to be casts in the cavities of sponge, the substance of which has passed away. In others the substance which had been included appears to have been broken down and removed, and its place occupied by chalk which has intruded in a pulverulent state; whilst in others the cavity alone remains. Oblong nodules, found on Stokenchurch Hill, and for some distance on the Oxfordshire side, very frequently exhibit specimens, which, on being broken, display the structure of the Zoophyte in great distinctness. In the chalk marl at the foot of the cliff at Beechey Head, are botryoidal and lamelliform masses, which, not only from their external forms, but the appearances yielded on their fracture, lead us to the recollection of the masses of fossil sponge at Farringdon, and which, in all probability, have been yielded by the chalk marl.

Fossil sponge of a very fine texture, and in a pulvinated form, is sometimes found investing the shells accumulated in the cliffs at Walton and Harwich.

A flint stone, found on the shore at Dawlish in Devonshire, bears decided marks of having derived its form from the siliceous impregnation of *sp. mammillaris.*

Several fossils of the tribe of Zoophytes having been noticed in a former work, which, although not possessing the decided characters of the genus, were still, with expressed doubt, placed among the Alcyonia; an attempt at a better classification of some of these bodies is here attempted.

The first of these, are those bodies which are distinguishable by bundles of tubuli passing through a spongeous substance, and which may be thus characterised.

Siphonia.—A fossil animal, with a polymorphous body, supported by a stem proceeding from a fusiform or ramose root-like pedicle; the original substance spongeous, and pierced by a bundle of tubes derived from the pedicle, passing through the stem, then ramifying and terminating on the surface of the body.

The various spongeoid fossils, bearing the forms of cups, funnels, fruits, &c. described by M. Guettard, as obtained from Verest, near Tours and Saumur, and at Montrichard, in Touraine, and by the Rev. J. Townsend, as found in the green sand of the Vale of Pewsey*, as well as those which are figured, Pl. ix. fig. 1, 4, 5, 7, 11, 12, 13; Pl. x. fig. 6 and 13, of the second volume of Organic Remains, &c. are of the same genus.

Since the publication of the last mentioned work, Mr. Webster made the discovery of those interesting fossils in the Isle of Wight, which from their long seeming stalks, and from their tulip-formed superior terminations, obtained

* The Character of Moses, &c. Pl. 1, fig. 1. Pl. 2, fig. 1, 2, 3. Pl. 3, fig. 1, 2, 3.

the name of tulip alcyonia*. These fossils decidedly agree in the characters which have been here assumed for this genus.

Soon after the discovery of these fossils, Miss Benett, whose exertions have much aided this department of natural history, favoured the Geological Society with a suite of drawings, and of fossil specimens of various forms, but decidedly of this genus, which had been found in the sand, chiefly in the neighbourhood of Warminster. This valuable collection is rendered extremely interesting, by the great variety of forms which these fossils have assumed; cylindrical, straight, ramified, round, oblong, ovoid, wide and narrow, short and long, cup or funnel-formed; elongated like a cucumber, as in Organic Remains, vol ii. Pl. 10. fig. 6; tulip-formed, exactly agreeing with those discovered by Mr. Webster, and assuming also the forms of *spongia turgida, sp: alcicornis et damicornis*, and indeed many other of those forms which sponge offers to our observation. Among the most interesting specimens are those which are lobated, and in which from two to five or six lobes, closely united together, are found upon one stem; and in one specimen, two stems arise from the same base, one of which terminates with three and the other with four lobes.

Flints are sometimes found of a roundish form, pierced internally with numerous tubules passing in every direction, and giving the idea of the flint having invested a small hispid leafless shrub. It is extremely probable that these fossils may have originated in a species of this genus, bearing this form, and having the tubuli thus radiating

* Geological Transactions, vol. ii. The importance of this discovery of Mr. Webster will be observed, when it is considered that the remains of this animal, known perhaps only in this formation, are found in considerable numbers in the Leith Hill of Surrey, in the green sand of Wiltshire, Devonshire, &c. and in the freestone of Portland.

through the spongeous part; the siliceous impregnation having solidified this part, and left the tubules unfilled.

It is not to be doubted that, when the specific distinctions of the several specimens belonging to this genus have been ascertained, the number of its species will be found to be very considerable*.

At Pl. 1, fig. 8, is represented a transverse section of one of the stems of a tulip-formed specimen, in which the bundle of tubules are shown; and at fig. 7, the superior extremity of the same fossil is given, with the numerous terminations of the tubuli. These may be also generally discovered on the sides of the depression or cavity which sometimes exists in the superior termination.

The existence of these animals appears to have been confined to that sea from whose waters the green sand formation was deposited; no traces of their remains being mentioned as found in the strata of any of the preceding or subsequent formations.

Animalisation has, in this genus, proceeded a degree beyond that in which it exists in sponge; since, added to the spongeous texture, is the bundle of tubes which has been here considered as yielding its generic distinction.

* From the account given by Miss Benett to the Geological Society, respecting these fossils, it appears, that they are found in the Valley or Common of Warminster, in the reddish yellow sand, at a depth seldom exceeding two feet, on the sides of the hills. At Whitburn, near Claythill, in the same neighbourhood, the green sand comes to the surface, and these fossils are found in it. At Boreham, on the east side of Warminster, the grey sand is uppermost, and there, but most rarely, are found fossils of the same kind. "These fossils," it is observed by Miss Benett, "appear to belong to the top of the sand formation, without regard to the sort of sand. The yellow sand appears to be the grand depot of them: in the green sand, large specimens predominate; but those of the grey sand are in a higher state of preservation." These fossils were discovered by Mr. George Warren, of Warminster, to whom Miss Benett states herself to be indebted for them.

In the fossils next to be examined, a different and more distinct kind of organisation is discoverable: tubes here exist also in considerable number, and are connected by transverse intercurrent tubules. The organisation existing in these animals seems to authorise their being placed in a distinct genus; and it is presumed that the designation which is here assumed for it will not be disapproved.

Mantellia.—An animal with a fusiform or ramose, root-like pedicle, a stem and body formed of tubuli, anastomosing in a basket-like texture, with openings on the internal surface.

The most common species of this genus is the fossil which has been described by Mr. Mantell, as a species of Alcyonium*. But whilst removing this fossil from the genus under which Mr. Mantell had placed it, it must be observed, in justice to this gentleman, that it had been stated by the present writer, that "although I shall in general speak of these bodies as alcyonia, I am aware that, when their histories have been elucidated by the inspection of more illustrative specimens, several of them may claim other designations†." In conformity with this opinion, Mr. Mantell chose to speak of this body as an alcyonium; his judgment, at the same time, directing him to do it with due reserve; he also "wishing it to be allowed only a temporary admission into this situation, till future discoveries shall point out more precisely its situation in the scale of animated nature."

The specimen Pl. 1, fig. 9, reduced from vol. ii. Pl. 11, fig. 1, of Organic Remains, belongs to a species of this genus, and appears to have been part of a stem. In this

* Description of a fossil alcyonium from the chalk strata, near Lewes. Transactions of the Linnæan Society, vol. xi, 1815, Part 2, page 401.

† Organic Remains of a former World, vol. ii, page 89.

species, it will be observed, that the transverse anastomosing vessels are but few, and smaller than those which proceed in a perpendicular direction. In the specimen Pl. 1, fig. 10, reduced from Pl. 11, fig. 6, of Organic Remains, the characteristics of the genus are more decidedly shown, the intervening vessels are much more numerous, and approach nearly in thickness to those which they connect. In other specimens depicted in the work just referred to, the characters of other species may be perceived; thus in Organic Remains, vol. ii. Pl. 11, fig. 3, the anastomosing is formed by the oblique arrangement of the tubuli; and in fig. 7 of the same plate the same effect is produced by the very frequent ramifications and inosculations of the vessels. It is indeed extremely probable, from the appearance of numerous imperfect specimens, that the industrious collector will be enabled to place many more species under this genus.

The remains of this genus are almost all confined to the chalk; but in one or two specimens, appearances are observable which lead to the supposition that they may have been deposited in some part also of the chalk marl.

Alcyonites.—There are very few animals to which we can have access in their living state, whose nature and structure are so little understood as the alcyonium; and hence have arisen considerable difficulties when examining them in their fossil state. The definition and descriptions of M. Lamouroux, with the observations which he has made on their structure, are so likely to yield useful information in the examination of their fossil remains, that I feel no hesitation in introducing them.

"*Alcyonium.*—A polymorphous polype bearing animal, formed of a fleshy animated mass, sometimes inert, sometimes sensible, and filled with retractile polypi which expand on its surface. In the dry state this mass appears composed of fibres reticulated and interlaced at the centre, radiating

to the circumference, and covered with a firm cellular, coriaceous or cretaceous covering*."

The number of tentacula are said to vary in different species, but M. Lamouroux only examined the polypes of *Alcyonium lobatum*, and found them not to agree with those attributed by Dr. Solander and Dr. Spix to this species.

In the following catalogue, as in that of the sponges, the most obvious characters, and those which are most likely to be detected in the fossil, are particularised.

1. *Alcyonium arboreum.*—With papillary pores, disposed in lateral and terminal tuberosities.—*Gmelin*, p. 3810, n. 1.
2. *A. palmatum*.....With a simple stem, subramose, and papillous at the extremity.—*Marsilli*, Tab. xv. n. 74, 75.
3. — *lobatum*.....With a grey, tuberous crust; lobated; with numerous impressed pores.—
   1. *A. digitatum*, or dead man's toes of *Ellis*, Cor. Tab. xxxiii. a.. A. a.
   2. *A. exos*, Spinx, An. du Mus. Tom. xiii. Tab. xxxiii. fig. 8 to 14.
4. — *rubrum*. .....Red, soft, and encrusting; entirely covered with points or stars with eight rays.
5. — *cydonium*.....An oval or elliptical mass, convex above, concave beneath, irregularly grooved and notched; cells discoverable, if the skin is not injured.
6. — *massa*.....Irregularly shaped.
7. — *cidaris*. .....Fixed, globose, and hard; excavated by tortuous sinuses; terminal depression large; frequent, small, substellated openings. — *Donat. Adr.* p. 56, Tab ix.

* Histoire des Polypiers Coralligenes flexibles, &c. par J. V. F. Lamouroux, A. Caen, 1816, p. 317.

8. *A. vesparium.* ....Fixed, erect, large, ovato-oblong; apex, obtuse; internally cavernous; many minute openings.
9. — *incrustans.* ....Lobated; spongio-fibrous within; numerous small substellated pores.
10. — *serpens*.....Fleshy, tape-like; tortuously creeping; with wart-like prominences, with subradiated openings.
11. — *trigonum.* .....Carnous; cellular; subtrigonal; covered all over with small openings.
12. — *foratum.* .....Oblong; smoothish; surface subreticulated; foramina rather large and scattered. *Spongia?*
13. — *cribrarium.* ....Coriaceous; widely incrusting.
14. — *phalloïdes.* ....Pedicle short and thick, supporting wide tortuous lobated branches, heaped in a dense mass; small scattered oscula.
15. — *pyramidale.* ..Cylindrico-conical; red and fleshy within.
16. — *pulmonaria.* ..Pulpous; olive-coloured and livid; compressedly lobated; covered with very small stellated oscula. — *Ellis Cor.* p. 97, n. 1, Tab. xvii. b. B. C. D.
17. — *lyncurium* (Orange du mer).—Globose; fibrous; yellow; warted.—*Planc. Conch. Min.* 2, p. 44, app. 2, p. 114, n. 3; *Marsil.* p. 82, Tab. xiv. n. 72, 73.
18. — *alburnum*.....White; very branched; thin; subdivided; with tubular-terminal pores.
19. — *plicatum*.....Wide; rounded; lamelliform; with thick lamellæ windingly plaited; subcristated; with minute scattered foramina.

20. *A. sinuosum.* .....Lamellated; lamina erect and thick; tortuously winding, like the folds of the brain, with numerous marginal openings. *Spongia?*
21. — *manus diaboli*...Polymorphous; perforated; with obtuse protuberances.
22. — *diffusum.* .....Very ramose; diffused and ill-formed.
23. — *sceptrum.* .....Long; cylindrical; obsoletely clavated.
24. — *ensiferum.*.....Long branches, rather flat and bent like a sabre.
25. — *junceum*.....Very long, roundish, but compressed, soft branches.
26. — *quercinum*.....Frondose; with flat, winding, lobate processes.
27. — *asbestinum*.....Stem reddish, nearly cylindrical, beset with oblong pores, set in quincunx order.
28. — *cranium*.....White; tuberous; set with *setæ*.
29. — *papillosum*.....Sessile; incrusting; and variously lobated and papillated, with spinous tubercles and echinulated interstices.
30. — *tuberosum.* .....Tuberous, yellowish; tops often subdivided; set with tubular pores.
31. — *ficus*.....Fig or pear-formed; tuberous; rather ovate; pulpy and livid. — *Marsil.* p. 87, Tab. xvi. n. 79.

M. Lamouroux observes that there is reason for believing that there exists in the Mediterranean two bodies of the same figure; the one belonging to sponge, the other to alcyonium. Solander considers that figured by Ellis to be sponge.

32. — *cylindricum*...White and round.

Lamarck considers this as only being a detached portion of a ramose alcyonium.

33. *A. radicatum.*—Substance homogeneous, like cork; with very small scattered pores; base divided by many clefts. No bark discoverable.

34. — *gelatinosum.*—Cylindrical or compressed, pellucid and watery within, irregularly compressed and branching.—*Planc.* ed. 2, p. 115, c. 29, Tab. X. A; *Ellis, Cor.* p. 102, n. 5, Tab. xxxii. fig. dD.

In Parkinson's Herbal, he considers it as a sponge; others have thought it an ulva or fucus.

35. — *papillosum.*—Incrusting; covered with large convex papillæ.—*Mars.* p. 86, Tab. xv. fig. 76–78.

36. — *distomum.*—Incrusting; with red scattered papillæ, each with two openings.

37. — *gorgonoides.*—Ash-coloured, flesh mixed with sand; radiated wart-like cells.—*Solander and Ellis*, p. 181, n. 8, Tab. ix. fig. 1, 2.

38. — *corniculatum.*—Four stellated pores surrounding a central papilla, with four erect terminal crescents.

39. — *stellatum.*—Terminations distinguished by two stellated cells.

40. — *fluviatile.*—Incrusting, polymorphous; set with pentagonal tubular pores.

The following compose the second section of the alcyonia of Lamarck, who distinguishes them from the former by the openings of the cellules not appearing on the dry specimen. M. Lamouroux considers them as doubtful, and perhaps as intermediate between the alcyonia and the sponges:

41. *A. compactum.*—Tuberous; globoso-pulvinate; surface smooth.

42. *A. medullare*.....Lamarck assumes for this species the synonymous alcyonium of *Ellis, Cor.* Tab. xvi. fig. D, d, D 1.

43. — *testudinarium*..Elliptical; rather flattened convex; spread, slightly reticulated, with many dorsal ridges, with slightly interrupted christæ.

44. — *orbiculatum*...Compressed, rounded, thick; surface rough, and very porous; unequal sized pores.

45. — *radiatum*.....Circular; upper surface concave, smooth, folds radiating to the margin; with about six conoidal tubercles; lower surface convex, radiated with fibrous costæ.

46. — *cuspidiferum*...Sessile; erect; hollow; slit upwards in many long, straight, sword-shaped lobes, surface very slightly porous.

47. — *granulosum*...Hemispherical; gelatinous; semi-pellucid; raggedly grooved underneath; surface granulated and wool-like.

48. — *putridosum*.....Ventricoso-globose; somewhat pear-shaped; thin at the edges and slightly reticulated; surface set with tubular openings.

49. — *purpureum*.....Of an intense purple; flattish, carnospongeous; surface smooth.

50. — *boletus*.....Substipated; clavated; internally, ramose fibres latticed with dilated lamellæ; surface incrusted, porous and tuberculated.

51. — *boletiforme*.....Sessile, simple, rounded; flat on one side, convex on the other; with small tubercle-formed risings sprinkled with small cells.

Although difficulties may attend the attempt to arrange, by these characters, substances so vaguely formed as the alcyonia, especially those which exist in a fossil state; yet it will be found that the above table will afford considerable advantage to the student of fossils. He will, by a comparison with the characters of the species as there given, and by attention to the following observations, gain a nearer approximation to the true character of the substance under examination, and will be frequently enabled to give to it a name and place.

Whilst endeavouring to make the required distinctions in fossils of this kind, difficulties must arise from the inability which is frequently found of ascertaining, in fossil specimens, the nature of their texture; it sometimes happening that no assistance can be yielded either by the form of the fossil or by the appearance of its surface. The ambiguity arising from the form depends on the fossils of this genus being sometimes found under the same specific forms which belong also to Spongites, Syphonites, and Mantellites: this is particularly the case with the cyathiform and fructiform species, which may be found in all these genera.

There are therefore four distinct genera under which fossils bearing the same general forms may be placed; and the characteristic marks of each genus will, in general, be found sufficiently evident on their surfaces to mark the situations which, in classification, each of them should hold.

If a cellular texture, such as would be formed by the irregular decussation of membranous substance, can alone be traced, without any appearance of tubuli, the place of the fossil would appear to be under the genus *sponge;* but if, in addition to the spongeous texture, straight or regularly divaricating simple tubuli should appear, its place would be under *syphonia.* If, whether spongeous texture appear or not, simple tubes are discovered connected laterally either by anastomosing or intercurrent tubules, the fossil may be

considered asbelonging to *Mantellia;* but should the more compact part of the fossil, or its porous surface, display the dwellings and evident labours of polypes, no doubt should be entertained of placing it among the species of *alcyonium.* This may be instanced, as has been just mentioned, in those fossils which bear the forms of fruit: in sponge, is *sp. ficiformis;* in syphonia, a correspondent form frequently occurs; in Mantellia, the fossil figured, Organic Remains, vol. ii. Pl. 11, fig. 3, may be instanced; and in *alcyonium,* is both *A. ficus* and *A. cydonium.*

Although M. Lamouroux has not thought proper to reject from the preceding table several bodies which have been considered as alcyonia, he is himself of opinion, that the number should be much diminished: considering those only as alcyonia which are evidently the production, and have been the habitation of polypes. He accounts for Lamarck having intermingled and confounded these animals, by his having too frequently judged of them from the dry specimens; but is of opinion that they may be readily distinguished either in their living or dead state.

In the recent alcyonia, the polypes or their cells may be always seen on taking them out of the sea; but nothing similar is discoverable in sponges. In the alcyonia not only is that pulsatory motion observable which is attributed to sponge, but, in those alcyons which are ramified, the branches are sometimes seen to be curved and afterwards straightened again. This is particularly observable in *A. lobatum.* The difference between the two animals is also apparent on the examination of the dried specimens. On a section, either transverse or vertical, being made of dried sponge, no difference of substance is discoverable; from the centre to the circumference is the same organization: but on making a section in any direction through the centre of the dried alcyonium, a structure more or less fibrous, and a substance more or less grooved, will be seen

passing from the centre to the circumference; and on the surface will be found a distinct skin or bark-like covering, with numerous foramina, some of which are hardly perceptible. These foramina appear to be the openings of the radiating fibres, or tubes rather, and in some species are very evident.

To endeavour to trace the fossil remains of alcyonia to the strata in which they were originally infixed, has hitherto been accompanied with but little success: this has been partly owing to the incorrect accounts which have been given, respecting these and similar substances, by the earlier writers on fossils; and partly to the difficulty of discovering these fossils when imbedded in stone, in the more obvious characters of which they are likely to participate, and thereby become more difficult of detection.

The fructiform figures which the spongeoid fossils so frequently possess, had obtained for them, to a late period, the names of those fruits which it was thought they most nearly resembled: and even when, in a former work, the present writer removed these substances from the vegetable kingdom, he was still unable to discover in them such characters as would allow him to decide which specimen should be considered as sponge, and which as alcyonium. It is a remarkable circumstance, and not easy of explanation, that, after numerous eager examinations with powerful glasses, he has never seen, to his knowledge, the characteristic radiating or decussating fibres of the internal part of the alcyonium. In the fossils represented, Organic Remains, vol. ii. Pl. 11, fig. 4 and 8, where the appearance of a cortical substance led to the belief that these substances are of alcyonic structure, and although the specimen, fig. 4, in particular, possesses such a degree of transparency as allows the discovery of organic structure, in that part which is connected with its cortical covering, no appearance of fibres can be discovered.

But the establishment of the genus *syphonia*, it is hoped, will considerably assist in the required arrangement of this class of fossils: the obvious tubular structure in the fossils of this genus will readily enable the student to effect their separation from those of spongia and alcyonium: and, in consequence of this abstraction, it will in future be only required to determine to which of these two genera the remaining ambiguous fossils of this class are to be attached; or failing in this, to endeavour to detect in them the characters of some undescribed genus.

With respect to the ascertaining of the stratum, or even the formation, to which the alcyonic fossils belong, little more than negative information can be given. It does not appear that they exist among the *syphonia* in the green sand; none having been spoken of as existing in the rich mines of Warminster, in the Portland freestone, or in the Black-down hills of Devonshire.

Some fossils, which have been considered as belonging to this genus, have possessed appearances which led to the suspicion that they had been imbedded in some of the strata of oolitic formation; but no positive evidence has been adduced of their having been found in such situations; nor do any statements appear to have been made of their remains having been detected in any of the subjacent formations of lyas, mountain limestone, &c.

It is from the examination of the matrix of some fossils apparently of this genus that the conjecture is offered that the chalk marle is the stratum to which the alcyonia more peculiarly belong.

Tethia.—A tuberous, subglobose polipifer; fibrous within; the fibres rather fasciculated; divaricating or radiating from the centre to the periphery, and glued together by a small portion of pulpy matter; cells in a cortical crust disposed to fall off.

The characteristic difference of this genus, and by which it is proposed to separate it from alcyonium, is the diverging, radiating, internal fibres, being collected in fasciculæ.

From the description of this genus and of some of its species, there does not appear to be any reason for supposing that it may not be as susceptible of those changes on which petrifaction depends, as some of the species of alcyonia are known to be. Fossils indeed, resembling in form *tethya lyncurium*, (Orange du Mer) figured by Marsilli, Donati, and Esper, are not infrequent among the assumed fossil remains of alcyonia.

Geodia.—A free, carnose, tuberiform polypifer, hollow and empty, and firm and hard when dry; the outer surface being all over porous; and has on the side a separate circular area, pierced with large pores.

This animal is perhaps described only by Lamarck, who had seen but one specimen of it, which he purchased at the sale of the cabinet of M. Turgot, Governor of Guiana: nothing has been stated respecting its existence in a fossil state.

Palythoa.—M. Lamouroux has very properly formed a genus for the reception of two animals which Solander had placed among the alcyoniums, but which differ from that genus in manifesting more complexity of organization; the cavities, which are distinct, are divided by longitudinal lamellæ, being each appropriated to a single polype.

Palythoa.—A polypifer, flat, covered with numerous, cylindrical, united mammillæ, of more than a centimetre in height, with isolated cavities or cellules, almost longitudinally chambered, and each containing a single polype.—*Lam.*

Sp. 1. *P. mammillosa.*—The polypiferous cellules with a stellated opening.—Sol. and Ellis, p. 179, n. 5, Tab. i. fig. 4, 6.

2. — *ocellata.*—Rugous mammillæ; opening stellated and radiated.—Sol. and Ellis, p. 180, n. 6, Tab. i. fig. 6.

A sketch of this species in its recent state, from Ellis, is given Plate i. fig. 14.

K.