Annals and Magazine of Natural History

Series 5

ISSN: 0374-5481 (Print) (Online) Journal homepage: http://www.tandfonline.com/loi/tnah11

# XLVII.—On the flint nodules of the Trimmingham chalk

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**To cite this article:** W.J. Sollas M.A. F.R.S.E. F.G.S. (1880) XLVII.—On the flint nodules of the Trimmingham chalk , Annals and Magazine of Natural History, 6:35, 384-395, DOI: 10.1080/00222938009458956

**To link to this article:** http://dx.doi.org/10.1080/00222938009458956

Published online: 07 Oct 2009.

PLATE XVII.

*Fig.* 1. *Membranipora polita*, n. sp.
*Fig.* 2. *Membranipora pedunculata*, Manzoni.
*Fig.* 3. *Schizoporella sanguinea*, Norman, var.
*Fig.* 4. *Microporella fissa*, n. sp.
*Fig.* 5. *Porella rostrata*, n. sp. 5 *a*. Young cells showing the tridentate lower margin of the orifice.
*Fig.* 6. *Membranipora corbula*, n. sp.
*Fig.* 7. *Mucronella tubulosa*, n. sp.

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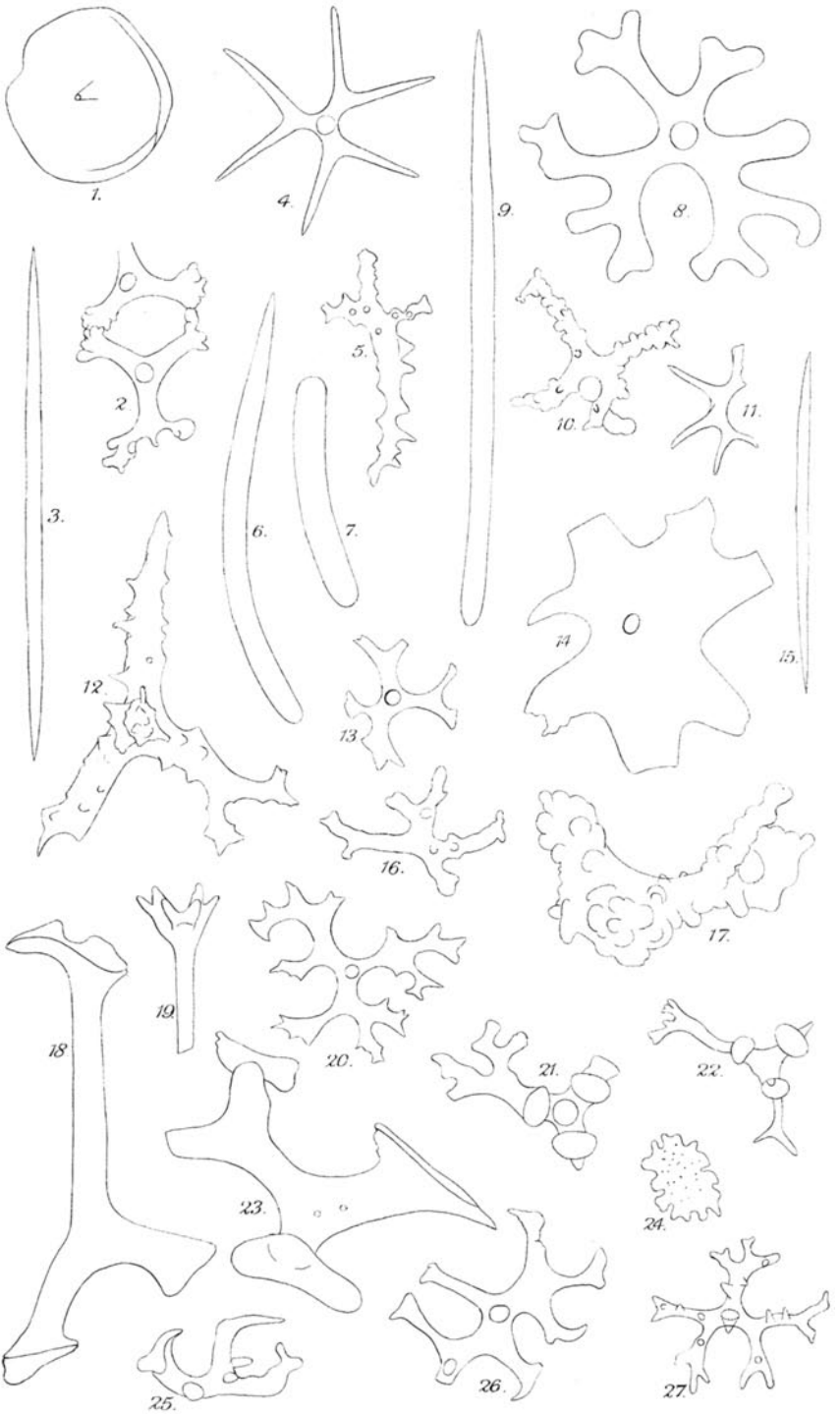
## XLVII.—*On the Flint Nodules of the Trimmingham Chalk.*

By W. J. SOLLAS, M.A., F.R.S.E., F.G.S., Professor of Geology in University College, Bristol.

[Plates XIX. & XX.]

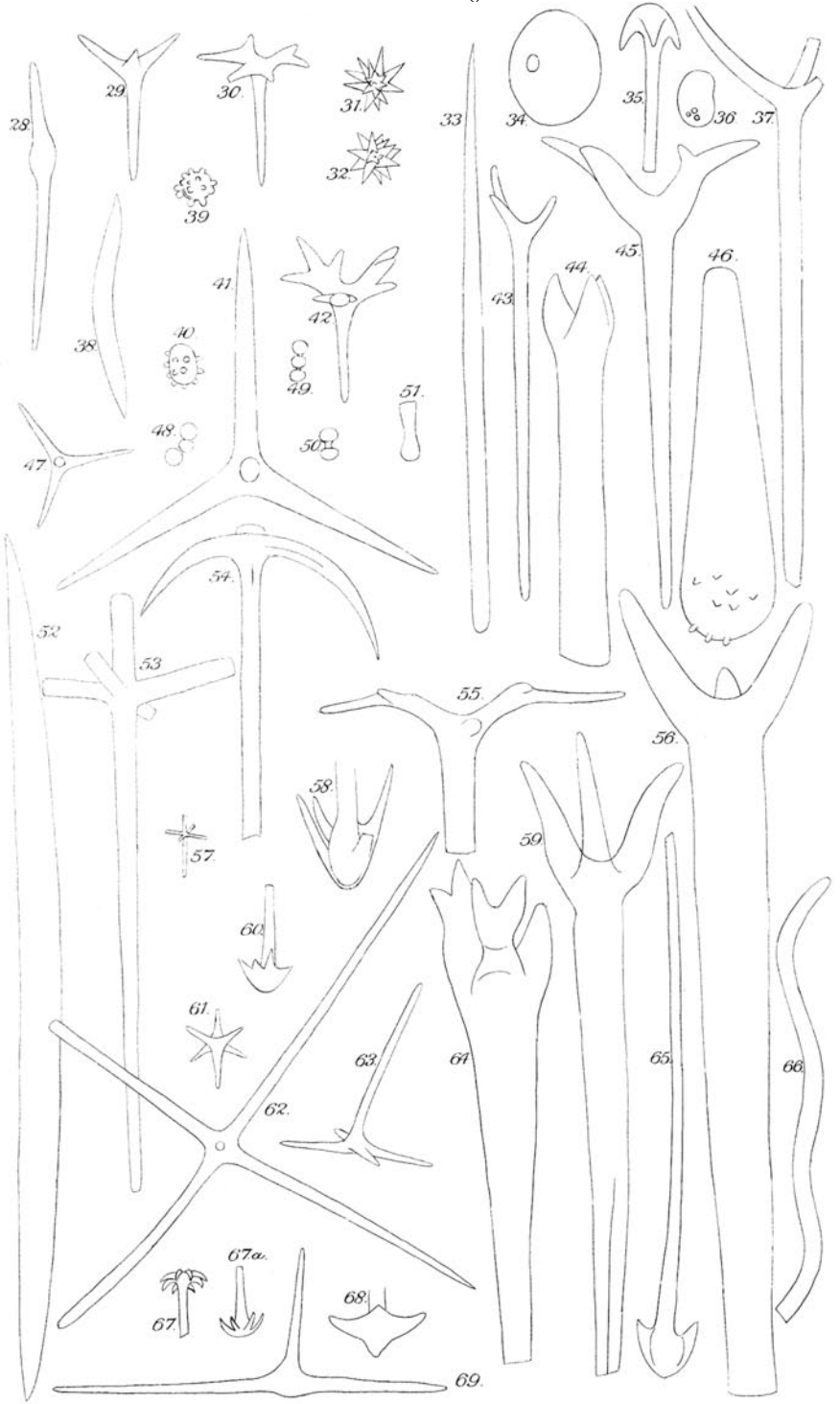
*Personal.*—In 1873 Mr. Jukes-Browne gave me some very interesting specimens of flint nodules which he had obtained from the chalk of Trimmingham, Norfolk. To the examination of these I devoted a great part of the summer of 1874, preparing some hundreds of drawings of the sponge-spicules which are associated with them. After a visit to the Trimmingham cliffs together, my friend Jukes-Browne and I arranged to write a joint paper on them, he undertaking their general geology and leaving the description of the flints to me. Jukes-Browne's paper was ready for publication a year or more ago; but mine seemed in danger of indefinite postponement, when I heard from Mr. G. Jennings Hinde, F.G.S., that he too was at work on the same or a very similar subject. This led me to embody my results in the following paper, which was read before section C of the British Association during its meeting at Swansea this summer. It will appear as an abstract in the Annual Report, and is given here in full as a sequel to Mr. Jukes-Browne's, which appeared in the 'Annals' of last month.

*The Flint Nodules.*—In form they vary greatly: some are flabellate, some irregularly conical; others consist of a somewhat ellipsoidal body seated on a short stalk, while many are irregular and amorphous. They consist of chalk and silex in various proportions; sometimes the chalk forms the greater part of a nodule, sometimes it is altogether absent. Between a nodule consisting of a solid mass of silex, black throughout, except on the surface, and one consisting chiefly of siliceous chalk there are any number of others forming a complete transitional series. Commonly the flint is traversed by a number of winding anastomosing passages, which are occu-




W.J.S. del.

Mintern Bros. lith



pied by chalk of a greyish-white colour, and often crammed with sponge-spicules, many of which are large enough to be visible to the naked eye. The trabeculæ of flint between the passages are white and porous exteriorly, where they lie in contact with the chalk; but on breaking them across they are found to consist within of ordinary black flint, with its characteristic greyish spots and patches.

In the more completely silicified nodules the middle consists of a core of solid flint, and chalk-filled passages exist only on the exterior. These finally disappear in the last stages of silicification; and the nodule then consists of compact flint throughout.

The exterior of most of the nodules is covered with a more or less extensive layer of flint, which may form a mere film enclosing the interlaced flint and chalk within, or may attain a thickness of an inch and become continuous with the trabeculæ of the interior; on the surface it is even, white, and porous, with no appearance of structure, indeed just like the surface of an ordinary chalk flint. In the completely silicified forms this layer is not present as a distinct structure, being represented merely by the exterior of the nodule.

To separate the chalk with its spicules from the flint, the nodules were placed in distilled water; the chalk becoming soft and semifluid, easily fell away from the flint, and with its contained spicules formed a thick sediment at the bottom of the water. To complete the separation, and to remove carbonate of lime, sufficient hydrochloric acid was next added: this dissolved the chalk; and an insoluble residue then remained behind, consisting of silicified coccoliths, Foraminifera, Entomostraca, Polyzoa, and echinoderm-spines, siliceous and glauconitic casts of Foraminifera, and sponge-spicules in great variety. This material was washed, dried, and mounted for microscopic investigation. As a medium for mounting, Canada balsam was, in most cases, found to be unsuited; it rendered the spicules too transparent for observation; and so glycerine jelly was substituted for it.

The flint, after it had shed its associated chalk, was also washed and dried. The parts from which the chalk had been removed showed a white porous surface, sometimes marked by a number of small circular pits, varying in size, many being between $\frac{1}{50}$ and $\frac{1}{100}$ inch in diameter, and recalling to mind the ostia of a sponge. No definite structure, however, could be detected in this layer.

Occasionally a broken fragment of a Lithistid or Dictyonine Hexactinellid sponge projects from it; and so one finds now and then a protruding fragment of a molluscan shell, or the

rostrum of a *Belemnitella*; but none of these included bodies have determined the general form of the nodule in which they occur. The surface of the passages in the flint bristles with large spicules having one end imbedded in the flint and the other projecting freely outwards; these spicules may serve to determine whether the chalk or the flint of the nodule occupies the place of the sponge which, we believe, determined by its existence the formation of the flint. If the chalk, then the points, if the flint the heads of the spicules should be seen projecting into the cavity. On examination one finds both heads and points projecting, but the heads least frequently, perhaps because they have been broken off. These observations go but a very little way towards proving any thing; by analogy with other flints, however, we should conclude that the chalk represents the original sponge; and so far as the position of the spicules in the nodules indicates any thing it is in this direction.

We now proceed to the determination of the spicules, commencing with those belonging to the Lithistidæ. It will be seen that the Lithistidæ are placed within the Tetractinellidæ as a suborder. This necessitates the formation of a new name for those Tetractinellidæ which are not Lithistids; and we propose to call them Choristidæ, since their spicules are separate and not locked together into a network. Thus, just as we have Dictyonine and Lyssakine Hexactinellidæ, so we can speak now of Lithistid and Choristid Tetractinellidæ.

## Tetractinellidæ.

### Lithistidæ.

#### *Tetracladina.*

*Discodermites cretaceus.* (Pl. XIX. fig. 1.)

*Dactylocalycites polydiscus*, Carter, Ann. & Mag. Nat. Hist. ser. 4, vol. vii. p. 122, pl. vii. figs. 3–5.

This spicule, with its nearly circular disciform head and conical shaft, and those of fig. 2, with their smooth cylindrical arms and botryoidal apophyses, precisely resemble the dermal spicule and skeletal corpuscle, respectively, of *Discodermia polydiscus*, Bocage; they may therefore be regarded as having belonged to that or a very closely allied sponge. To identify them specifically with it, in the absence of fuller information, would perhaps be going too far; and hence it may be preferable to ascribe them to a distinct species provisionally. As the recent *D. polydiscus* possesses a long acerate spicule, we may associate with the two forms already

mentioned that of fig. 3, merely, however, as an indication that such spicules are not absent from the deposit, and by no means as implying a belief that this particular one actually formed a part of the skeleton of *Discodermites cretaceus*.

*Rhagadinia Zitteli.* (Pl. XIX. fig. 8.)

Compare Zittel, *Cœloptychium*, Taf. vii. figs. 25, 26, 27, 30.

This spicule is selected for representation as the largest and most regular of a large number of similar forms. Its conical stalk is expanded above into three broad flattened branching arms, which lie in the same plane and form together a much divided disk. It closely resembles the dermal spicule of *Rhagadinia rimosa*, Rœm., from which it is distinguished by the simple edges of its arms, which have not the secondary or minor lobations of *R. rimosa*, and consequently do not present the same ragged appearance. In this respect it much more resembles the dermal spicule of *Rhacodiscula*, Zitt.

Fig. 10 may possibly be the skeletal corpuscle of this species, and fig. 15 the small acerate corresponding to that figured by Zittel from *R. rimosa*.

*Eurydiscites irregularis.* (Pl. XIX. fig. 14.)

This is one of a number of similar dermal spicules, distinguished by their large size and the coalescence of the arms into an irregularly lobate disk, generally less lobate than in the example here figured, which is an exceptionally regular form. They remind one, but for the presence of a stalk, of the disks of *Plinthosella* represented in Zittel's monograph.

These disks alone are not sufficient to characterize a genus; but they must have a name, and so we designate them provisionally *Eurydiscites irregularis*. Probably they will speedily be identified with the outer coating of some already described fossil genus; and then the necessity for our name will cease. If the genus should be related to *Plinthosella*, we might regard fig. 17 as representing a part of one of its skeletal corpuscles.

*Nanodiscites parvus.* (Pl. XIX. fig. 13.)

This is a dermal spicule, somewhat resembling that of *Theonella Pratti*, Bow. Its simple, asymmetrical, short branches give it a curious stunted appearance, which suggests the name *Nanodiscites*, from *νάνος*, a dwarf.

*Compsapsis cretacea.* (Pl. XIX. figs. 21 and 22.)

These skeletal corpuscles appear to approach more closely those of *Kaliapsis cidaris*, Bow., than any other form.

In the recent sponge the swollen part of the fourth arm is ornamented by fine longitudinal lobations, which are absent in the fossil fragments. The finely branched ends of the three other arms have disappeared in the fossil spicules as a consequence of fossilization. To indicate the alliance between the recent and the fossil forms, and, at the same time, to denote their difference, I have employed the word κομψὸς for κάλλος in the construction of the generic name.

No dermal spicules have been seen which could be considered strikingly similar to *K. cidaris*. Fig. 24 is a curious, finely tuberculated little disk; but it has no shaft, and cannot be referred here.

### *Megamorina.*

*Podapsis cretacea* and *parva*.
(Pl. XIX. figs. 18 and 23, 25 and 26.)

Carter, on Fossil Sponge-spicules, *loc. cit.* p. 118, pl. x. figs.; Wright, Irish Cret. Microzoa, Belfast Nat. Field-Club, ser. 2, vol. i. pl. iii. figs. 2 and 3.

Figs. 18 and 23, 25 and 26 represent the skeletal corpuscles of a Lithistid evidently allied to *Lyidium torquila*, Sdt. They appear to be much too small to be referred to any of Zittel's species of Megamorina from the chalk; and we provisionally give them a distinct name, the curious foot-like shape of the articular surface at the end of their simple unbranched rays suggesting the term *Podapsis*. They differ themselves widely in size; and the larger forms appear to be also simpler than the smaller; so that we may distinguish them as species, the larger as *P. cretacea*, the smaller as *P. parva*. In Zittel's *Doryderma* (*D. dichotoma*, Phil.) a bifurcated trifid spicule is present, somewhat similar to that of fig. 19, which we place here for comparison.

Carter, who was the first to identify Megamorine corpuscles in the fossil state, says of those he found in the Haldon Greensand:—"many . . . are almost facsimiles of Schmidt's figures of *Lyidium torquila*, obtained by M. de Pourtales in 270 fathoms off the island of Cuba (Atlant. Spong. Fauna, p. 84)."

### *Rhizomorina.*

*Corallistes cretaceus*. (Pl. XIX. fig. 4.)

Carter, Fossil Sponge-spicules, *loc. cit.*; Zittel, *Cœloptychium*, Taf. vi.; Wright, Irish Cret. Microzoa, *loc. cit.*

This trifid spicule with bifid arms is a very common form; it is probably derived from the dermal skeleton of some

Lithistid, though *Thenea muricata* and *Stelletta discophora*, as well as other sponges, contain very similar forms. Amongst recent Lithistids we find it in *Corallistes microtuberculatus* and *C. Bowerbankii*, among fossil forms in *Callopegma* and *Turonia*, *Pachinion* and *Scytalia*. The dermal spicule of *Pachinion* and *Scytalia* differs, however, in possessing shorter and less slender arms; while the dermal spicules of the other two genera, though much more like our forms, are associated with Tetracladine skeletal corpuscles, and these are scarcely plentiful enough in our deposit to account for the large number of dermal spicules which occur in it. On the other hand, Rhizomorine corpuscles are more abundant, and, considering their resemblance to the corpuscles of *Corallistes*, may very well have been associated with dermal spicules similar to those which are known to exist in this genus. Thus one may group the dermal spicule Pl. XIX. fig. 4 with the skeletal corpuscles of figs. 5 and 12. The characters of such a group would approach those of *Scytalia*; and so we might venture to add to it the uniaxial forms Pl. XIX. figs. 7 and 9, which resemble those figured by Zittel as occurring in *Scytalia turbinata*, and which are common in the flint nodules.

Fig. 6 should probably not be included here, as it is much more likely to have belonged to some Echinonematous sponge. There are many spicules in the flints similar to fig. 6, but much more abruptly bent; and I fancy they must have belonged to a sponge like *Dictyocylindrus*.

### *Macandrewites Vicaryi.* (Pl. XIX. fig. 20.)

*Dactylocalycites Vicaryi*, Carter, Fossil Sponge-spicules, *loc. cit.* pl. vii. figs. 1, 2, 6; Zittel, *Cœloptychium*, Taf. vii. fig. 31?

This form is remarkably similar to the dermal spicule of *Macandrewia clavatella*, O. S., a slight difference in size (this being the larger) chiefly distinguishing them. The skeletal corpuscle shown in fig. 16 is likewise similar to that of *Macandrewia*; and we place the two together under the name of *Macandrewites Vicaryi*.

### Corallistites? (Pl. XIX. fig. 27.)

This is a trifid spicule with branching arms, tuberculated on the upper surface and prolonged into a long shaft below. It differs apparently from the dermal spicule of *Corallistes nolitangere* in bearing tubercles on the upper surface of its rays; but in other respects it is very similar.

**Choristidæ.**

*Pachastrellites fusifer.* (Pl. XX. fig. 28.)

This fusiform acerate, with its ovate swelling in the middle, resembles the spicule figured by Schmidt (Taf. vi. fig. 5, Atlant. Spong.) from *Pachastrella connectens.*

A similar form occurs in *Papyrula candida*, O. S., and in some Hexactinellids. That it did not belong to a Hexactinellid appears to be shown by the fact that the canal, which frequently occurs in a much enlarged state, never presents a sexradiate cross within the central bulb. It is true that this test is not quite so decisive as one could wish, especially as the canal is altered by enlargement, expanding within the bulb concentric with its surface. On the whole, however, it appears probable that this spicule should be placed with the Pachastrellidæ; and we may provisionally associate with it the trifid spicule (fig. 29), and perhaps the bent acerate (fig. 38).

*Pachastrellites globiger.* (Pl. XX. fig. 39.)

Fig. 39 is a tubercular globate spicule very similar to that figured by Carter as occurring in his *P. geodoides* ('Annals,' ser. 4, vol. xviii. pl. xiv. fig. 23).

Fig. 40 is similar, but differs in the somewhat more regular size and disposition of its tubercles. They may have been associated with the form fig. 30, and perhaps with spicules like figs. 29 and 38 as well.

*Tethylites cretaceus.* (Pl. XX. figs. 31, 32.)

Wright, Irish Cret. Microzoa, *loc. cit.* sphærostellate spicule.

These two spicules are undistinguishable from the stellates of *Tethya lyncurium*; and figs. 33 and 51 represent acuate spicules like those of *T. lyncurium*. Zittel has already given the name *Tethyopsis* to a form which he considers related to *Tetilla*, Sdt. As it appears to me that *Donatia* cannot be allowed to replace *Tethya* in our nomenclature, I cannot call my form *Donatites*, and so form its generic name from *Tethya* with the termination "*lites*."

*Triphyllactis elegans.* (Pl. XX. fig. 42.)

This trifid spicule with broad trifurcate arms, inclined from the shaft as much upwards as outwards, vasiform, is unlike any known recent or fossil form. It varies from $\frac{1}{200}$ to $\frac{1}{140}$ inch in the length of its rays. Schmidt has lately figured (Spong. d. Meerbusen v. Mexico, 1880, Taf. ix. fig. 4) some spicules which agree in the essential character of having trifid arms;

but in general form these appear to be different. He gives them as coming from a *Pachastrella*-like sponge; ours probably are also derived from a Pachastrellid genus.

*Dercitites haldonensis*, Carter.
(Pl. XX. figs. 41 & 47.)

Carter, Fossil Spicules, *loc. cit.* pl. x. fig. 71.

These, as Carter has pointed out in speaking of the similar spicules from Haldon, are essentially similar to the quadriradiate spicules in *Dercitus Bucklandi*, Bow. They cannot, however, with certainty be referred to this genus, since O. Schmidt has discovered similar spicules in a Lithistid sponge, *Collectella avita* (Mex. Spong. Taf. v. fig. 1, p. 86).

*Geodites cretaceus.* (Pl. XX. fig. 34.)

*Geodites haldonensis* (in part), Carter, Fossil Spicules, *loc. cit.* pl. x. figs. 59, 62, 69.

This is evidently the globate of a Geodine sponge. It has lost all trace of tubercles and internal structure, owing to changes produced by mineralization; but the hilum is still clearly shown.

Such globates are abundant in the deposit, varying in diameter from $\frac{1}{87}$ to $\frac{1}{350}$ inch; it is possible that they may belong to more than one species.

The largest forms are bigger than those of *G. Macandrewi*, in which they attain the largest size known amongst recent sponges. It is, however, with the globates of *G. Macandrewi* that these fossil forms best agree; and the trifid spicule with bifid rays of fig. 43, and the similar but also *Stelletta*-like form of fig. 55 are both so similar in character to the corresponding spicules of *G. Macandrewi*, that we may, with great plausibility, associate them with the globate, while the forms shown in figs. 35 and 43 are sufficiently similar to the anchors with projecting and recurved rays occurring in this sponge to go in the same grouping.

Thus figs. 34, 35, 36, 37, 43, and 45 may be regarded as having probably been derived from one species of sponge, to which we may give the name *Geodites cretaceus*.

The opportunity may be taken to add here a few words on fossil globate spicules in general. They were first discovered by Carter, and described in his paper on fossil sponge-spicules before quoted. Zittel* figured them in connexion with *Cœloptychium*; and his specimens are of great interest as presenting the various stages of dissolution which may be observed in

* Zittel, *Cœloptychium.*

the deciduous globates of recent *Geodia*, and in globates which have been treated with caustic potash*. Though Carter was the first to announce the discovery of fossil globates, they had been previously described by Blake†, who, however, regarded them as Foraminifera, owing to those he examined having undergone complete calcification. These interesting pseudomorphs, which occur in the Coralline Oolite, were named by Blake *Renulina Sorbyana*. Mr. Hudleston, who, with Blake, is our great English authority on the Coral-rag, was kind enough to place in my hands a thin slice of the North-Grimstone rag, and some siliceous matter which had been left behind on dissolving a fragment of that rock. In the latter, remains of trifid spicules and globates were readily seen; in the former, characteristic sections of *Renulina*, agreeing in form and size with the siliceous globates of the insoluble residue, were as clearly evident. A good illustration of these sections as seen in a slice of Grimston rag, magnified 100 diameters, is given by Sorby ‡. Most of the globates of *Renulina*, or, as we may now say, *Geodites Sorbyanus*, have been completely transformed into calcite; others have undergone secondary silicification. The amount of silica set free during their transformation into calcite must have been very great, as will appear from the following statement by Sorby §; he says :—"The Perna bed in Dorsetshire, and also certain beds in Yorkshire, are remarkably rich in the small reniform shells named by Mr. Blake *Renulina*, which constitute as large a part of the bulk of the rock as the Foraminifera do in all but a very few exceptional specimens of chalk."

Hudleston‖ has since clearly recognized the nature of *Renulina*; but Blake¶ appears to dispute it.

*Rhopaloconus tuberculatus*. (Pl. XX. fig. 46.)

This spicule has the form of a cone with rounded ends; its surface is covered all over by regularly disposed tent-like tubercles. It varies in length from $\frac{1}{100}$ to $\frac{1}{20}$ inch.

*Pachæna Hindi*. (Pl. XX. figs. 44, 52, 56, 64, and 69.)

There is a similarity of facies about these large thick spicules which leads one to group them together; we have

* Sollas, "Action of Caustic Potash," Annals, ser. 4, vol. xx. pl. ix. figs. 8–11.

† Blake, 'Monthly Microscopical Journal,' 1876, vol. xv. p. 262.

‡ Presidential Address, London Geol. Soc. vol. xxxv. pl. vi. fig. 1, p. 70 (sep. copy).

§ *Loc. cit.* p. 51.

‖ Proc. Geol. Assoc. vol. v. p. 443.

¶ *Ibid.* p. 266.

no reason for supposing that they belong to a *Geodia*, though they might very well be derived from some not distantly related sponge, in which case the large conical spicule which we have named *Rhopaloconus* may have filled the same place in it as the globates in *Geodia*. Perhaps fig. 54 should be associated with this group.

SCOLIORHAPHIS? (Pl. XX. fig. 66.)

This undulating uniaxial spicule may be derived from a *Scoliorhaphis*.

HEXACTINELLIDA.

*DICTYONINA.*

Separate octahedral knots, and fragments of Euretid network, occur pretty frequently in the flints. Numerous sexradiate spicules are also found, and may very possibly have been derived from the dermis, roots, and other parts of the Dictyonine sponges, which are indicated by the fragments of network.

Fig. 69 is a form resembling one of the commonest spicules in *Euplectella*.

Figs. 58, 60, and 65 are evidently anchoring-spicules, the two latter terminating in a four-rayed, the first in a double-rayed, head. In fig. 60 the four rays are all on one side of the head. The shafts are smooth and not spined. Fig. 68 is also apparently an anchoring spicule.

Fig. 62 is possibly part of a spicule which when complete resembled those which Carter describes as forming a fringe to the edges of the tubes in *Myliusia Grayi*.

Fig. 63 is probably a dermal spicule.

Figs. 57 and 61 are small spicules of indefinite nature.

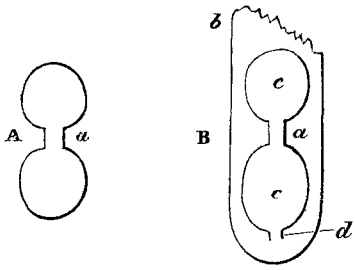
Figs. 67 and 67*a*, the end probably of one of the small rotulate spicules of a Hexactinellid.

[*Casts of Foraminifera.*

Zittel, *Cœloptychium*, Taf. v. figs. 11, 12, and 17.

Fig. 50 looks like a new form of spicule, for which one might find a name meaning "dumb-bell form;" as a sponge-spicule, indeed, we find it regarded in Zittel's monograph on *Cœloptychium*. The occurrence of similar forms, but possessing three globular swellings instead of only two (fig. 49), and these not always in a straight line (fig. 48), naturally suggests doubts as to its spicular character, and leads one rather to see a resemblance to Foraminifera, such as the *Nodosarina*. Nor can there be any doubt that they are simply

siliceous casts of Foraminifera, after the following observations by Carter. In a letter, dated June 16, 1875, he writes, "....the dumb-bell form you pointed out to me has almost close to it the original kind of test (silicified) from which it appears to have come, thus:—




"Correctly drawn to the same scale, viz. $\frac{1}{12}$ to $\frac{1}{1800}$ inch.

"A is the dumb-bell or cast of the chambers (*e*) of the organism; *a*, the cast of the tube which connected the chambers.

"B is the silicified foraminifer, *b* the test, *c c* the chambers. A little tube seems to have been prolonged from one chamber (*d*), and may have been connected with another chamber or cast. Thus the dumb-bell is a cast of a couple of chambers of a Foraminifer connected by the intervening tube."]

In concluding this description of the various kinds of spicules I would add that in the majority of cases I regard the identifications and generic groupings proposed as provisional only. It is with many misgivings that I have made many of them; and nothing but the fact that I had undertaken the task of classification would have induced me to continue what I have felt at times to be a hopeless endeavour. Some kind of order, however, has been evolved out of chaos, though probably not that which would result if, by any process of magic, the spicules could be restored to their proper places in the structure of their original owners.

Many forms of spicules remain undescribed; those here represented have been derived from two or three small flints only. Of the rich sediments which remain from some twenty or thirty other specimens I have made no use in this paper; they remain for future observation, and are at the disposal of any one who would care to examine them.

*Mineral Condition of the Spicules.*—The spicules are white and opaque when viewed in air by reflected light; in water or other media they are highly transparent, but without the

smooth surface and glassy lustre of fresh spicules; the surface, indeed, differs very much as that of ground from polished glass. That they have exchanged the colloid for the crystalline state is clearly shown by the elevation which has taken place in their refractive index and by the colours which they give with polarized light. The effects of solution are visible in little hemispherical pits which have been eaten in over the surface (fig. 46), and by the irregular outline of some of the fusiform spicules, which appear in optical section as though irregularly scolloped. The canals of many are enlarged, but obliterated in the majority, probably as a result of secondary silicification. To secondary silicification we may also refer the tuberculation of some of the forms. Occasionally dendrites of iron pyrites are seen shooting through the substance of the spicules, the first stage of a replacement which is found completed in spicules from other deposits.

*Probable depth of the Sea.*—The sponges which furnished the spicules lived on a sea-floor probably somewhere between 100 and 400 fathoms deep. The Lithistidæ, which have furnished so large a proportion of the spicules, have been dredged from depths varying between 75 and 374 fathoms. *Lyidium torquilla*, which so closely resembles the fossil *Podapsis*, was obtained from a depth of 270 fathoms. Of other sponges the recent *Pachastrella geodoides*, which our *P. globiger* resembles, was dredged from 292 fathoms, and *Geodia Macandrewi*, which is represented by the fossil *G. cretaceus*, from 100 to 270 fathoms.

[To be continued.]

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## XLVIII.—*Additional Observations on the* Antipatharia.

By H. J. Carter, F.R.S. &c.

By reference to the footnote at page 304 of the last number of the 'Annals,' it will be seen that I had not then read Lacaze-Duthiers's memoirs "Sur les Antipathaires" (in the 'Annales des Sciences Naturelles, Zoologie,' tomes ii. and iv. pp. 169 and 1 of 1864 and 1865 respectively) at the time that I finished my short article on the Antipatharia, chiefly questioning the nature of the polyp (viz. whether Hydroid or Actinoid?), and stating, at page 302, that MM. Milne-Edwards and Jules Haime, in 1857, had summed up our knowledge on this point in the following way, viz.:—

"Jusqu'ici on n'a pas étudié l'anatomie de ces animaux, et on