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these species occur in the Mediterranean), but the probability is too slight to permit the use of his name. As far as Brady's description of *O. challengeri* goes it is applicable to both *O setigera* and *O. pelagica*; but the absence of any reference to or figure of the outer-edge setæ of the basipodites of the swimming-feet prevents a definite conclusion being reached.

With regard to recent records of *O. plumifera* and *O. setigera*, we find in the 'Quarterly Bulletins of the International Council for the Investigation of the Sea' that *O. plumifera* occurs in the plankton lists of Denmark, Norway, Sweden, Holland, Germany, Russia, England, and Ireland. The Irish records, for which I am responsible, refer to the species described above as *O. atlantica*, as do likewise the records in the various papers in the 'Reports on the Sea and Inland Fisheries of Ireland.' The quarterly plankton lists of Scotland contain both *O. setigera* and, more rarely, *O. plumifera*, and Dr. T. Scott * has recorded *O. setigera* from the Firth of Forth and from off Shetland. It seems probable that some, at any rate, of these records refer to one or other of the species described above; and even if the points which I have relied on in separating the species should be regarded as of varietal rather than of specific rank, it is still incumbent on those who record the species for statistical purposes to indicate which variety is referred to.

LXIX.—*On Two new Genera of Recent Pharetronid Sponges.* By R. Kirkpatrick.

[Plates XIII.-XV.]

When looking through some material in a large bottle mostly containing pieces of *Stylaster sanguineus*, obtained by the 'Challenger' from a depth of 70 fathoms off Api, New Hebrides, I came across two specimens which at first sight looked like pieces of *Millepora*. A closer inspection, however, showed them to be Lithonine sponges, and of great interest, because the soft tissues have been fairly well preserved. The sponges belong to a new genus and species, which I propose to name *Minchinella* † *lamellosa*. A second new genus must be established to include certain sponges

* 'Ninth Ann. Rep. F. B. Scotland' (1891); 'Twentieth Ann. Rep. F. B. Scotland' (1902).

† Named in honour of Prof. E. A. Minchin, M.A., Professor of Protozoology in the University of London.

recently sent to me by Canon Norman. The specimens are in the form of small thin crusts on fragments of débris which formed part of an agglomerated mass of shells, calcareous algæ, worm-tubes, &c. brought up from 60 fathoms off Porto Santo Island, near Madeira. I propose to name the new genus and species *Merlia normani**, and to place them in a new subfamily, Merlinæ, next to the subfamily Lithoninæ.

I have to thank Dr. G. J. Hinde, F.R.S., for his kindness in lending me a section of *Petrostroma schulzei* Doderlein.

MINCHINELLA, gen. nov.

Lamellar Lithoninæ with pore-chimneys on one side and oscular chimneys on the other, each with a skeleton of monaxons, triradiates, and quadriradiates; main skeletal framework formed of large quadriradiates cemented together. Canal system leuconoid.

Minchinella lamellosa, sp. n.

The larger of the two specimens of this species (specimen A) is in the form of a thick, firm, flabelliform lamella, undulating slightly from side to side and expanding upwards from a narrow base of attachment 1·8 cm. long, which has evidently been broken off from the rocks; the margin of the lamella is thick and rounded. The specimen is 6·4 cm. wide, 5·1 cm. high, and 6·5 mm. thick. The colour in alcohol varies from pale buff to brown, but is almost white at the rim.

The surface of the sponge is incrusted with numerous small colonies and patches of Tunicates, Polyzoa, worm-tubes, barnacles, and other sponges.

The poral surface is beset with poral chimneys, those near the base and centre being longer and larger than the younger ones near the periphery, which gradually become flush with the surface; at the margin itself the dermal membrane forms a roof over branching furrows, and the pores are not segregated into areas, though at a later stage the pore-chimneys will grow up from the furrows.

The tallest chimneys are about 3 mm. in height and 1 mm. in diameter; they are curved, with the convexity towards the periphery; further, they are narrow at the waist, and expand towards the summit; at the upper end is the pore-area in form of a drum-like membrane with a fringe of fine monaxon bristles round the edge. The upper four-fifths of the chimney is easily broken off, leaving a circular hole slightly raised above the general surface.

* Named in honour of Canon Alfred Merle Norman, M.A., D.C.L., LL.D., F.R.S., F.Z.S.

The oscular surface is covered with numerous oscular bee-hive-shaped or cylindrical chimneys, with a very contracted orifice at the summit; the height is about 2 mm. Only a few remain intact, most having been knocked off or squashed inside the hard cylindrical bases, which rise up about ·5 mm. above the surface; the youngest oscules at the periphery lie along the course of grooves and are flush with the surface.

The smaller specimen (B) is in the form of an ear-shaped lamella with the poral surface on the concave side; the breadth is 3·5 cm., the height 3 cm., and thickness 5 mm.

The poral surface is covered with a soft, fleshy, ectosomal, umber-coloured layer, whence the low densely crowded pore-chimneys arise; the oscular surface is lighter in colour, and the ectosome is barely discernible excepting along certain peripheral grooves.

The outward appearance of *Minchinella* closely resembles that of species of the fossil Pharetronid genus *Rhaphidonema* Hinde (2. p. 97).

The fractured surface of the sponge is of a pale cream-colour, and, excepting for the larger incurrent and excurrent canals, homogeneous in aspect. Under a lens a fine reticulum can be made out; in a transparent vertical section the net-work is seen to be denser externally than at the centre.

The Canal System.—The canal system is well shown in stained vertical sections of decalcified sponge, and also by tracing out with a needle the course of the larger incurrent canals seen on the broken surface of a dried macerated fragment.

The oscules open below into wide excurrent canals, which give off a series of smaller canals; the latter, by branching and anastomosis, form a tubular network, often with quite regular rectangular meshes and with terminal blind branches. The tubular strands, but more especially the nodes, are beset with spheroidal flagellated chambers 32·5 μ in diameter. The breadth of the strands averages about 40 μ, and of the nodes 52 μ, but the soft tissues have been much contracted in preparation.

The collar cells are large, with a flattened body containing a very large nucleus nearly filling the cell.

Viewed in optical vertical section, the body of the cell is low, mound-shaped, resembling in this aspect Hexactinellid collar cells figured by Ijima (3 *a*. pl. v. figs. 40, 41); the base has a circular outline and the nucleus is always seen at the side of the cell. The collar forms a long slender funnel arising from a point situated a little excentrically. The flagellum is clearly visible outside the collar, but I could not trace it down inside. Prof. Minchin, to whom I showed the sections, considered that the collar cells had a "Leucosolenid" rather than a "Clathrinid" aspect; as he has pointed out, the flagellum arises from the terminally situated nucleus in *Leucosolenia*, but in *Clathrina* from a granule separated a long way from the basally situated nucleus. It may be mentioned here, too, that the sagittal spicules of *Minchinella* suggest Leucosolenid affinities. The dimensions of the collar cells are as follows:—total height 19 μ; collar 14·5 μ high; body of cell 4·5 μ; diameter of base 5·28 μ. The cells vary in size, the figured ones (Pl. XIII. fig. 8) being the largest.

In the spaces between the collar cells are the pore cells with funnel-shaped apertures, the narrow opening of the funnel being, as usual, external.

Skeleton.—On both surfaces of the sponge there is an ectosomal layer of more or less fusiform spined microxeas, longer and more slender on the oscular than on the poral surface. These spicules form a thick outer coat on the poral and oscular chimneys, and are described along with the other spicules of those structures. The skeleton of the poral and oscular chimneys is constructed of triradiates, quadriradiates, and monaxons. As a rule, there are several layers of triradiates, with the odd ray passing downwards and with the paired rays encircling the tube; the quadriradiates have the gastral ray projecting into the lumen of the chimneys, and the monaxons are arranged as an external pile with the axes vertical or oblique to the long axis of the tube; there is a fringe of bristle-like monaxons round the poral orifice. At the bases of the poral and oscular chimneys three-rayed and four-rayed spicules with thick spined rays become cemented together, but are not yet completely enveloped by that material. Lastly, there is the firm framework of quadriradiates completely enveloped in cement.

Poral Spicules.—(1) Triradiates (Pl. XIV. fig. 4), with thick, slightly curved, gradually tapering, rather blunt-pointed rays; unpaired ray longer than the paired and curving backwards a little from the facial plane; angle between the paired rays 150°. Unpaired ray 156 μ long, 9·5 μ thick at base; paired ray 87 μ long.

(2) Quadriradiates (Pl. XIV. figs. 1, 2, 3), of the same general character as (1), but with longer basal rays; gastral ray 17 μ long, sharp-pointed, curved upwards. A different kind (Pl. XIV. fig. 3) has nearly equal basal rays, the odd one being spined, and a much longer gastral ray; these were found at the base of the soft part of the pore-chimney and near the outer wall of the tube, so that the gastral ray traversed nearly the whole thickness of the wall.

(3) Monaxons. Three kinds: (*a*) (Pl. XIV. fig. 7) forming a thick pile on the surface of the chimney, and arranged vertically to the long axis or pointing obliquely upwards; the spicules are straight, anisoactinate, thick and spined in proximal half, but tapering gradually to a fine, smooth, bayonet end, 87 μ long, 7·5 μ thick. (*b*) (Pl. XIV. fig. 8) a longer kind, straight, smooth or strongly spined, with distal bayonet end, 234 μ long, 3·8 μ thick, situated at upper end of pore-chimney. (*c*) Very slender fringe spicules (Pl. XIV. fig. 9), long, curved, and with very fine distal end.

(4) Tuning-forks (Pl. XIV. figs. 5, 6) in the hard basal part of the pore-chimney. The shaft is smooth and with a club-shaped proximal end, the length being 133 μ; the prongs are about 25 μ long; fig. 6 shows a rare kind with prongs widely apart; occasionally a fourth "ray" is present (fig. 5). These spicules are without definite orientation; sometimes the shaft points to the lumen of the poral or oscular tubes, sometimes the prongs; or, again, the spicules may lie parallel to the axis of the chimneys.

Oscular Spicules.—(1) triradiates (Pl. XIV. fig. 12) with unpaired ray longer than paired, tapering, and then slightly swelling to distal end, 104 μ long, 5 μ thick; paired ray curved, 49 μ long. Unpaired angle 150°. Another kind (fig. 13) with nearly equal rays, and a third kind (fig. 14) with the third ray much reduced and approaching in character what Dr. Hinde (2. p. 160) calls the *Corynella*-type in fossil Pharetrones.

(2) Quadriradiates (Pl. XIV. fig. 10), of the same general character as the oscular triradiates, but with relatively longer paired rays.

(3) Monaxons (Pl. XIV. fig. 16) forming a thick pile on the surface of the chimney, considerably thicker than in the case of the poral chimneys. These spicules are 200 μ long and only 5 μ thick, straight, finely spined in middle region, usually terminating distally in a bayonet point, but sometimes with a straight end.

(4) Tuning-forks (Pl. XIV. fig. 15).

The thick hard basal part of the poral and oscular tubes is composed of thick-rayed tri- and quadriradiates with pointed or sometimes rounded rays, cemented together, and with the gastral ray or odd ray pointing in to the lumen (Pl. XV. fig. 4). Figs. 5, 6, 7 show young separate tri- and quadriradiates, and fig. 8 a stout monaxon with thick spines; this latter kind also becomes cemented with the framework in this region.

The body of the skeleton is formed of thick quadriradiates with rays united by cement into a firm reticulum with ovoid or sometimes rectangular meshes about ·19 × ·14 mm. in total diameter, the spaces being ·095 × ·057 mm., and the strands on an average ·047 mm. thick. The cement covers the whole spicule, which can be dimly discerned in the axes of the strands of the network; occasionally it is possible to observe definite orientation, all the odd (gastral) rays of spicules pointing in one direction.

The cement commonly shows a fibrillar structure, the fibrillæ radiating from axis to periphery of a strand and projecting more or less beyond the surface of a common matrix in which they are imbedded, thereby dulling the vitreous transparency.

In the axis of the strand of a mesh of the network can be seen the ghostly homogeneous ray of the quadriradiate, which is often provided with a few conical spines. I at first thought the fibres might be separate scleres, but the key to the structure of the cement was found by discovering places where the material was beginning to be laid down. In such places (Pl. XV. fig. 9) a thin film is seen spreading over the surface of a ray of a quadriradiate; at and near the edge of the film the surface is smooth, then granular; later the granules have become tubercles, which gradually increase in length till they resemble long slender cones like pointed stalagmite pillars on the floor of a cavern; still later the spaces between the pillars become filled in by the deposition of more matrix, and the nipple-like points of the conules project above the surface. Sometimes the cement is laid down in flakes, and these, too, are nipple-pointed at the periphery.

A structure showing radiating fibrillæ is present in many fossil Pharetron sponges. Zittel (7. p. 61, fig. 18, and 6. pl. xii. fig. 5) attributes appearances of this kind, in some instances, to the effect of mineral changes, and perhaps they may be; his fig. 88 (*l. c. supra*) is explained, "Fasern eines fossilen Kalkschwammes durch Kristallisation verändert"; but the investigation of the cement of the firm skeleton of *Minchinella*, and still more of *Merlia*, to be described below, leads me to think that the fibrillar appearances in the fossil Pharetrones above referred to may be due to the vital activity of the sponge.

One of the decalcified stained sections had some small fragments of the skeleton still remaining undissolved or only partially dissolved. Here it was possible to see the cells whose function it is to secrete the cement.

By way of analogy with the term "spongoblasts," the name given by F. E. Schulze to the spongin-secreting cells of horny sponges, I name the cement- or mortar-forming cells of calcareous sponges "telmatoblasts"*. They are unfortunately not well preserved in the present specimens. They form in places a compact layer of columnar cells, about 9 μ high, with prolongations at the distal ends (Pl. XIII. fig. 9); the base of the cells is closely applied to the outer walls of the tubular canals of the canal system. The contents of the cells are granular, but I was unable to make out the nucleus. The telmatoblasts are evidently modified branched collencytes; in parts where they had not become columnar and aggregated into a compact layer the cells were flattened and discrete, though at the same time joined by branched processes; in this condition a nucleus was visible. There could be little doubt that the latter cells were the same as the columnar cells, but in a different condition, because transitions could be traced, and both kinds formed deeply-stained patches in similar positions relatively to the skeletal strands.

In wholly undissolved skeletal strands the stain of the borax-carmine entered about halfway into the thickness of the same; in half-decalcified strands needles and pillars of the cement were seen separated by a clear space from the columnar telmatoblasts. In a rapidly decalcified stained section the meshes of the tubular network of canals had very strongly contracted, and had imprisoned the telmatoblasts, which likewise had become contracted almost to fine hyaline threads, from which the stain had disappeared excepting from a small point (? nucleus) about the middle of the length.

The central part of the summit of a mortar cell can here and there be seen embracing the point of a stalagmite (or stalactite).

I hope in the course of a few weeks to have some fresh properly preserved specimens of the sponge described below, and to be in a position to give a more detailed account of the nature of telmatoblasts.

Reproduction.—*Minchinella* is hermaphrodite. The embryos belong to the parenchymula type. Pl. XIII. fig. 10 shows one 128 μ in diameter, surrounded by a nutritive follicle formed of a single layer of large cuboidal blastomeres. The outer layer consists of a columnar epithelium, which surrounds a central mass of large cells. The wrinkling and shrinkage of the embryo is due to the mode of preparation.

The spermatogonia are present in various stages of growth. An early stage in which there has been a division into two

* *τέλμα*, mortar.

nuclei, one of which is situated centrally and the other peripherally, is common. A later stage in which the peripheral spermatocyte has formed by division a mass, 18 μ in diameter, of spermatids is also common (Pl. XIII. fig. 11). One ripe cell has burst, liberating a cloud of spermatozoa. The head of a spermatozoon is oval, 2·7 μ long, at one focus homogeneous and refringent, but at another focus showing a very dark portion, whence the tail originates, and a clear terminal area (Pl. XIII. fig. 11 *a*).

Chemical Composition.—Dr. G. T. Prior of the Mineral Department applied Meigen's test by boiling some powdered skeleton in solution of nitrate of cobalt, and obtained the reaction for calcite. Accordingly the composition is similar to that of *Petrostroma schulzei* Doderlein.

Subfamily *Merlinæ*, nov.

Pharetronidæ in which the solid skeletal framework is constructed of vertical main beams of fibrillar cement, from each of which there radiate three vertical flanges to meet similar flanges from other columns so as to form cylindrical tubes; the latter are partitioned off by horizontal floors, a honeycomb-like structure resulting. Solid framework without axial core of spicules.

In the subfamily Lithoninæ the framework is constructed on the *béton armé* principle; in Merlinæ the *béton* is not *armé*, the axial stiffening of spicules being dispensed with.

Merlia, gen. nov.

Merlinæ encrusting; with the dermal membrane supported by tufts of slender tyles, and with rhaphides; tuning-fork spicules present.

Merlia normani, sp. n.

The specimens consist of four small dried pieces of rock material, each encrusted by a thin layer of the sponge. The rock-fragments formed part of an agglomerated mass of broken shells, worm-tubes, corallines, &c., about the size of a man's fist, obtained from 60 fms. off Porto Santo Island near Madeira, by Senhor Adolpho C. de Noronha, and given by him to Canon Norman, who entrusted the specimen to me to describe.

Two of the smaller pieces have been used up for vertical and horizontal sections.

The largest specimen forms a very thin crust 14 × 7 mm. in area, and with thin edges. The surface is covered with a cream-coloured membrane and has an extremely fine uniformly granular appearance. An oscule, just visible to the naked eye, is seen as a dark point near one end; two smaller oscules occur, but are not discernible without a lens.

Under a lens, the surface shows small polygonal areas, each bounded by 5–7 small tubercles; the latter push up the dermal membrane, which is sunk a little in the areas themselves. The largest oscule is oval, slightly raised, ·28 × ·15 mm. in its long and short diameters, and surrounded by nine tubercles; in fact, it resembles two smaller pore-areas run together. The pore-areas are about $\frac{1}{5}$ of a millimetre in diameter, and in several a single large pore was visible in the centre of the covering dermal membrane.

A vertical section shows a vertical series of honeycomb-like cells separated from each other by horizontal perforate floors (and ceilings) and by vertical imperforate walls. A vertical section, complete from base to surface, with four superposed "cells" was ·665 mm. thick.

The honeycomb cells are cylindrical, and the vertical section shows rectangular areas (150 μ long × 120 μ broad), just as the same section of a solid cylinder would; similarly the horizontal section shows circular areas.

The sponge is attached to the substratum on which it is growing by a thin floor of fibrillar cement. The vertical pillars, which are the main scaffolding, arise from this floor and pass up to the surface, where they end in the tuberculated knobs.

From each pillar there radiate out three wings, which meet similar wings from other pillars, a median raphe showing the line of junction. Accordingly each pillar has six sides, three concave ones forming segments of the cylinders they help to form, and three straight band-like edges forming the vertical edges of the wings. The direction of the fibrillæ marks off wings from opposing pillars, the fibrillæ radiating out more or less obliquely outwards and upwards from the central axis of a pillar to the raphe.

The floors (and ceilings) which exhibit fibrillar structure, show also five or more radial raphe lines where sections of flooring from each pillar are joined; in the centre of the floor is a circular hole, which may be reduced to a fine slit. Very fine concentric lines are seen on the floors.

A surface view (Pl. XV. fig. 13) shows well the tubercles each with three thick wings or bars radiating out below them, to meet similar bars.

The fused bar shows the median raphe and the opposing fibrillæ.

A very careful examination under all powers and lights failed to reveal any axial core of spicules, though often there were appearances strongly suggesting the presence of such objects; but on focussing, these ghosts were seen to be optical illusions.

Though there are no axial spicules present, there is justification for putting forward the theory that the sponge originally had a skeleton of quadriradiates joined and enveloped with cement; the spicules would be orientated with their odd ray in a vertical plane and basal rays in a horizontal plane. Each vertical pillar in the framework, as it now stands, is simply the point whence three wings radiate out, at angles of 120°.

The Lithoninæ may be compared to Chalinid Sponges, and the Merlinæ to Horny Sponges which have lost an axial core of spicules, which presumably they had, in many instances, formerly possessed. The latter analogy, however, is not quite perfect, because *Merlia* has proper spicules. These consist of tufts of long slender tyles which pass up obliquely from the floor of the uppermost "cells" to the membranous roof and spread out so as to support it. These spicules are 97 μ long, 1·7 μ thick; the heads being oval, and 5 μ long by 2 μ broad; they are slightly curved and taper to a sharp point. The rhaphides lie in the dermal membrane; they are 55 μ long, very slender and curving to a fine hair-like extremity. Microrhaphides slender, crescentic, 15 μ long, also lie in the dermal membrane, and are probably distinct spicules, and not broken off ends of the longer rhaphides.

Tuning-forks are only 52 μ long, the shaft being 32·5 μ and prongs 19·5 μ long.

The skeleton of *Merlia* is composed of calcite.

The occurrence of the radial fibrillar cement in the Lithoninæ and Merlinæ led me to hope that some light would be thrown on that extremely aberrant form *Astrosclera willeyana*, Lister (5. p. 459). A dried fragment of the macerated skeleton of *Astrosclera*, at first sight, looks not unlike a similar fragment of *Minchinella*. In each there is a firm porous skeletal reticulum, and in each the surface of the strands of the network present a finely punctate or granular appearance due to the projecting of the ends of fine fibrils above the general surface.

In *Astrosclera* the scleres are in the form of polyhedral blocks, which are formed in the interior of scleroblasts; and further the skeleton is made of aragonite.

The possibility has suggested itself to me that these scleres are of the nature of cement blocks, which have originally been deposited round an axial skeleton that has disappeared, and that the scleroblasts may be extremely modified enveloping telmatoblasts. I have no direct evidence to bring forward in support of this hypothesis, and there is much to say against it, but the investigation of the remarkable cement formation in Lithoninæ and Merlinæ affords, I think, some justification for the statement that a theory of this kind may be worth considering.

List of Lithoninæ *and* Merlinæ.

Subfam. LITHONINÆ, Doderlein.

1. *Petrostroma schulzei* Doderlein. Japan, 109–218 fms. (1. p. 15.)
2. *Plectroninia hindei* Kirkp. Funafuti, 50 fms. (4. p. 345.)
   A minute specimen provisionally placed in genus *Plectroninia*, Hinde (3. p. 51.), but doubtfully belonging there.
3. *Minchinella lamellosa* Kirkp. New Hebrides, 70 fms.

Subfam. MERLINÆ.

4. *Merlia normani* Kirkp. Porto Santo, 60 fms.

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EXPLANATION OF THE PLATES.

PLATE XIII.

Minchinella lamellosa, gen. et sp. n.

Fig. 1. *Minchinella lamellosa.* Specimen A. The type. Poral surface. Nat. size.
Fig. 2. The same; oscular surface. Nat. size.
Fig. 3. Smaller specimen, B; poral surface. Nat. size.
Fig. 4. Pore-chimneys of spec. A, × 3.
Fig. 5. Oscular chimneys of spec. A, × 3.
Fig. 6. Poral chimneys of spec. B, × 3.
Fig. 7. Excurrent canals with flagellated chambers (spec. B), × 90.
Fig. 8. Collar cells, × 880.
Fig. 9. Telmatoblasts (mortar cells), × 880.
Fig. 10. Embryo, section, × 125.

Fig. 11. Sperm ball, × 1100; 11 *a*, spermatozoa, × 1100.
Fig. 12. Firm skeletal network: *a*, axial spicule ray, × 90.
Fig. 13. Strand of network showing ray of quadriradiate surrounded by fibrillar cement: *a*, axial spicule ray; *b*, cement. × 525.

PLATE XIV.

Minchinella lamellosa.

Spicules, all magnified 525. Figs. 1–9 poral spicules; figs. 10–16 oscular spicules.

Fig. 1. Quadriradiate of poral chimney.
Fig. 2. A larger example of the same.
Fig. 3. Quadriradiate with long gastral and nearly equal basal rays; unpaired ray spined.
Fig. 4. Triradiate (poral).
Figs. 5, 6. Tuning-fork spicules; fig. 5 with extra prong.
Fig. 7. Monaxon from layer forming a pile on poral chimney.
Fig. 8. Longer slenderer monaxon from upper end of poral chimney.
Fig. 9. Spicule from fringe round upper end of poral chimney.
Fig. 10. Oscular quadriradiate.
Fig. 11. Ditto, with very short unpaired basal ray.
Fig. 12. Triradiate (oscular) with long unpaired ray swollen towards distal end.
Figs. 13, 14. Triradiates with medium and very short unpaired rays.
Fig. 15. Tuning-fork spicule.
Fig. 16. Monaxon, from layer forming a pile on surface of oscular chimney.

PLATE XV.

Minchinella lamellosa, figs. 1–9. *Merlia normani*, figs. 10–18.

Fig. 1. *M. lamellosa.* Upper end of poral chimney of specimen A, longitudinal section, × 90.
Fig. 2. Longitudinal section of upper end of oscule of specimen A, × 90.
Fig. 3. Transverse section of oscular chimney, × 90.
Fig. 4. Large quadriradiates and some triradiates slightly cemented, from base of poral chimney, and showing transition-stage to firm network forming body of sponge, × 150.
Figs. 5–7. Stages of young quadriradiates not yet cemented, × 525.
Fig. 8. Large monaxon, occurring in hard base of poral and oscular chimney, × 525.
Fig. 9. Strand of skeletal network showing development of incasing cement, firstly a thin carpet, then stalagmites, the latter finally immersed in cement matrix: *a*, axial spicule ray. × 525.
Fig. 10. *Merlia normani*, gen. et sp. n., incrusting rock: *o.*, oscules. Nat. size.
Fig. 11. Surface enlarged, showing a pore in membrane covering each polygonal area, × 45.
Fig. 12. Vertical section of a surface "honeycomb" cell, showing membranous roof supported by tufts of fine tyles, × 90.
Fig. 13. Surface of macerated skeleton, with a tuning-fork spicule on one of the floors: *a*, tubercle at end of vertical column; *b*, raphe; *c*, horizontal floor. × 90.
Fig. 14. Vertical section: *a*, vertical column; *b*, raphe; *c*, floor. × 90.
Fig. 15. Tyles, × 525.
Fig. 16. Rhaphides in dermal membrane, × 525.
Fig. 17. Slender curved micro-rhaphides in dermal membrane.
Fig. 18. Tuning-fork spicules, × 525.

Pitcher imp. Highley del et lith.

Pitcher imp. Highley del. et lith.

Pitcher imp.

Highley del. et lith.