MEMOIRS.

Notes on Sponges.—1. *On* Hyalonema mirabilis, *Gray.* —2. *On* Aphrocallistes Bocagei, sp. nov.—3. *On a new* Genus *and species of* Deep Sea Sponge. By Ed. Perceval Wright, A.M., M.D., F.L.S., Professor of Botany, Dublin University. (Plates I, II, and III.)

1. *Hyalonema mirabilis*, Gray. (Plate III.)

So much is now known of a deep sea fauna that one is very apt to forget how little was known about it just eighteen months ago. It is quite true that here and there stray facts were to be met with that most distinctly showed that animal life was to be found at very great depths of the ocean, not to mention the important researches of Sir John and Sir James Ross, or of Dr. Wallich, there were also records of the occurrence of zoantharian corals, at depths of 300 to 400 fathoms, and of fishes taken at depths of 312 fathoms. Indeed, to collect all the scattered observations bearing on this subject would be a work requiring considerable research. But some way or other the true bearing and the extreme importance of all these facts were in a great measure, and by a great many, overlooked; and the fact that great depths act as no bar to the existence of animal life, however known to a few, and however much it should have been known to all, has only during the last year and a half been fully recognised.

Accustomed to dredge in what will be now considered the trifling depths of from 80 to 100 fathoms, I learnt with some surprise of the deep sea fishing for sharks at Setubal in depths of from 300 to 400 fathoms; and when my friend Professor Bocage, of Lisbon, told me of the discovery of quite recent specimens of *Hyalonema mirabilis* in these same depths, I had a great wish to go and investigate the fact for myself. The prevalent opinion, however, at the time about the discovery of the Hyalonema off the coast of Portugal was, that the specimens taken by the Setubal fishermen were stray

specimens thrown overboard from some vessel trading between Japan and Lisbon, and that it would be a perfectly hopeless task to look for living specimens off the west coast of Portugal; and one great friend of mine, whose opinion on the subject had very great weight with me, believed this so firmly that I yielded to his arguments on the point, and abandoned the idea of going to Setubal in the spring of 1868. This same friend has since, by suggesting the deep sea expeditions of 1868 and 1869, and by the amount of work that he has accomplished in connection with these expeditions, opened up to the student of nature quite a new world. It so happened, too, that at the very time that I was dredging up specimens of Hyalonema in the tranquil waters of Setubal he was dredging it, and a host of other glorious species in the more stormy seas of the north, for hearing again from Professor Bocage in July, 1868, that the Hyalonema had been actually taken *in situ*, I lost no time in going out to Lisbon in 1868, the time when the shark fishery season commenced. I have in another place[1] given a short account of my excursion in Portugal, and will only here refer to it for the purpose of stating my firm conviction that, though so many new and rare species have been taken by the several deep sea expeditions of the Swedish, British, and American Governments; yet I believe much more remains to be done, and I would suggest that the deep ground off Setubal is well worthy of investigation, as it lies within a distance of from ten to thirty miles of the shore; and as the sea there is, as a rule, peculiarly tranquil during the months of August and September, it would be possible to make a very thorough investigation of it without even the assistance, most valuable though such assistance be, of a man-of-war or a Government survey vessel. The present King of Portugal is in every way entitled to take his place in the ranks of science; and the national museum at Lisbon is already indebted to him for most important aid, and for many valuable collections; perhaps Professor Bocage might induce him to follow the example set by Britain, and persuade him to allow a Government survey vessel to spend a fortnight or three weeks on the ground I refer to; the collections that would surely be made would form a most desirable addition to the museum at Lisbon, as well as be most valuable for exchanges. It was my object on my return home to make a report on the structure of *Hyalonema mirabilis*, of which I had succeeded in taking living specimens, I had also every opportunity given me by Professor Bocage of studying the magnificent series of specimens preserved by

[1] 'Annals and Magazine of Natural History,' December, 1868.

him in alcohol in his museum. Finding, however, that Professor Wyville Thomson had taken a large number of specimens during his cruise in the "Lightning," and that he intended publishing a memoir on the genus, I contented myself with a simple record of its occurrence in a living state; of its mode of growth, viz. as Loven suggested, with its siliceous stem anchored in the mud, and with expressing my opinion that the stem was truly a part of the sponge-mass, and that the Polythoa was simply parasitic upon the stem. Nor do I here intend to do more than call attention to one or two peculiarities which it strikes me are to be met with in the specimens that I have examined from Portugal, and which do not seem to exist; at least, not exactly after the same fashion in the specimens taken in the "Lightning" and "Porcupine" expeditions. My knowledge of these latter is based upon a very casual examination of the specimens taken by Professor Wyville Thomson; and upon a more careful examination of a beautiful little specimen, about an inch and a half in length, most kindly given to me by Professor Thomson. And in these remarks I do not mean to anticipate at all the memoir on this genus which is so impatiently expected, but rather to state what I know about the differences between the specimens taken off Portugal, and those off the west coast of Great Britain and Ireland.

Some of the Setubal specimens are of very great size; the stems of several measuring nearly two feet in length. In one very perfect specimen the head consists of a large somewhat oval mass, about eight inches broad in its long diameter, and four inches across in its short diameter; it is cup-shaped, resembling somewhat the ordinary shape of a common toilet sponge, and, like it, it is hollow on the inner surface or on that portion where the "glass rope" ends. The outer surface has been somewhat worn off by either lying on the mud or from rough handling, and presents that appearance of wet brown paper that must be familiar to all who have examined specimens of Hyalonema with the sponge mass attached from Japan. On opening out the sponge, the interior concave surface appears to have remained uninjured, and here will be seen a delicate network of spicules and sarcode, lining the concavity and passing into the texture of the sponge. A number of irregular large openings (oscula) are also seen, and these are covered over with a delicate open sarcode network, the edges of the meshes of which are thickly lined by the spicules called 'spiculate cruciform spicules' by Dr. Bowerbank. These spicules are met with all through

the sponge, but almost always lining the cavities or hollow passages of the mass. They are likewise to be found as a lining all over the surface of the sponge, but in no place are they to be met with arranged in so regular a fashion as on the meshes of the network covering the oscula. From the peculiar way in which they are placed on the edges of the meshes, and from the fact that the barbs on the stem of the spicules all point in the one direction, it is possible that while it would be easy to glide over the slimy sarcode down into an osculum, return would be no easy task, as any solid body would be at once caught and retained by the barbs. From the manner in which the cruciform basal portion of these spicules is inserted in or attached to the sarcode, I make no doubt but that they are subject to being moved up and down and to and fro, and that on the contraction of an osculum, and on the consequent discharge of water from the oscular cavity, the spicules are pushed outwards and upwards, falling down again on the expansion of the osculum. In all the numerous writings on the structure of Hyalonema, I cannot find that the exact position of these spicules in the living sponge has been determined. I have, therefore, thought it advisable to give the accompanying illustration (Plate III), for which I am indebted to Mr. Lens Aldous. It represents one of the oscula removed from a specimen of *H. mirabilis* in the Lisbon Museum. The spiculate cruciform spicules which line the edges of the sarcode network are very easily displaced, and but comparatively few of them were on the specimen drawn by Mr. Aldous, but in a living state they line, packed in a close row, the edges of the sarcode mesh; they differ slightly from any of those figured by Dr. Bowerbank or Max Schultze. One other subject I should like here to allude to. The oscula of *H. mirabilis* being now discovered and described, and they being found to be just those that one would have expected and just in the position in which one would have looked for them, it scarcely requires my statement that I saw the little parasitic Polythoa in a living state on the siliceous axis of the Hyalonema, and that I watched them expand their tentacles, after the fashion of any other zoantharian, to prove that though they have mouths these mouths are their own, and not at the service directly or indirectly of the Hyalonema. Is it too much to expect to settle the last lingering doubt that may still exist in some minds as to the nature of these independent though parasitic organisms?

2. *Aphrocallistes Bocagei*, sp. nov. (Plate I.)

Sponge fistulous, erect, branching somewhat irregularly;

skeleton siliceo-fibrous, more or less symmetrically radial; radii short and stout on the outer surface, and somewhat longer and thinner on the inner surface of the skeleton, forming a series of hexagonal spaces, which are nearly all of the same dimensions, central umbo of the ray giving origin on its inner surface, often on both surfaces, to a long spine. These spines, generally long, sharp-pointed, sometimes knob-headed. Spicules, acerate; retentive verticillately spined; attenuated rectangulated hexradiate, and subfusiformi cylindrical entirely spinous. Main tube closed by an irregular siliceous network, which is deeply concave. Pores and dermal system unknown.

Habitat.—Cape de Verde Islands, in museum of Lisbon, in British Museum, London, and in my own collection (Sept., 1868) also off south-west coast of Ireland in deep water; Professor Thomson, "Porcupine" Expedition, 1869.

Dr. J. E. Gray established the genus Aphrocallistes in 1858 for a very beautiful sponge from Malacca ('Proc. Zool. Soc.,' London, 1858, p. 115, Pl. XI, Radiata), *A. beatrix*. Dr. Bowerbank having identified the *Iphiteon panicea* of Valencienne in the museum of the Jardin des Plantes, Paris, as belonging to the same genus as *A. beatrix* adopts Valenciennes's name. As, however there were never any descriptive characters of the genus Iphiteon published until 1869 (it was affixed to the specimen in the Paris Museum in 1800), and was described as Aphrocallistes in 1858, I have no hesitation in assigning the priority to Dr. Gray's name and in adopting it for those sponges, with a siliceo-fibrous skeleton in which the reticulations are symmetrical. It is true that by an accident Dr. Gray described the genus as having calcareous instead of siliceous spicules—an error which he afterwards corrected. But this mistake could not for a moment mislead when the rest of the diagnosis and the beautiful figure by Mr. Ford were taken into account; indeed, such a figure with a name attached would amount to a publication.

It is confessedly unsatisfactory to describe a sponge from a dead and bleached specimen; for if in any group of the animal kingdom, surely here we require all the assistance it is possible to have from an examination of all the structures of the organism. It is, therefore, not without an apology that I publish the above beautiful form as a new species. When examining the very interesting collection at the Museum of Lisbon in September, 1868, I discovered three or four specimens of this sponge, which I immediately regarded as a new species of this genus. Professor Bocage,

with his accustomed liberality, at once gave me the specimen figured on Plate I, and accorded me permission to describe it. In dedicating it to my friend I take this opportunity of thanking him for the many kindnesses which he showed me while in Portugal. The memory of a delightful Sunday spent with him at charming Cintra will ever remain with me. The museum under his care is one of the most interesting in Europe ; the more especially interesting on account of the fine collection of native species brought together by the persevering energy of Professor Bocage and his admirable assistant Sig. Capello. It is also rich in species from the Portuguese settlements abroad, and this sponge formed but one of a fine series of invertebrata from the Cape de Verd Islands.

The nearest ally of this species is undoubtedly *A. beatrix*, Gray, and it is quite possible when we know more about both forms, and when they have both been examined in a living state, that they may prove but varieties of the same species. This is is possible, but for the moment I think not probable. There is a certain regularity of form in the sponges which have a non-elastic siliceo-fibrous skeleton, which I venture to think will be found to be in a measure characteristic of the species. But apart even from this consideration, the areas forming the skeleton in *A. Bocagei* are much more regularly hexagonal than those in *A. beatrix*. The spines on the bosses are very much longer in the former than in the latter species; in it too the central cavity is larger. The reticulated network-like lid is much more radial in its composition than in *A. beatrix*. The bosses of the rays of the body-skeleton are often knobbed, and there is an apparent absence of porrecto multiradiate spicules so characteristic of *A. beatrix*. This fact I do not lay much stress upon, as it may arise from an error of observation. I have, however, met with these spicules in every specimen that I have examined of *A. beatrix*, and never in the many specimens examined of *A. Bocagei*. This latter, too, is a much more erect form than the former, and I should expect that when the sarcode layer of both species is known that the spicules of this layer may be somewhat different in both. I am indebted to Mr. Ford for the accompanying drawing which he made for me in January, 1869. Circumstances have prevented me from publishing a description of it sooner. Professor Wyville Thomson has kindly forwarded to me portions of this sponge taken in the recent cruise of H.M.S. "Porcupine." He informs me that it was dredged living off the south-west coast of Ireland at a great depth. The portion sent to me is a fragment of a dead specimen. But Professor Thomson

thinks that living specimens were met with, and that they are somewhere among the vast stores of good things collected during the expedition. Professor Alexander Agassiz also recognises Mr. Ford's drawing as that of a species taken by Count Pourtales in his last expedition, and informs me that all the sponges taken in the course of the coast survey expeditions of America have been forwarded to Professor Oscar Schmidt for description; perhaps, therefore, we may expect still another supplement to that most important and useful work "Die Spongien des Adriatischen Meeres." If so, I hope he will agree with me in considering this species a good one, and that from better specimens and with his great powers of drawing he will still further describe and illustrate it.

3. *On a new Genus and Species of Sponge from the Deep Sea.* (Plate II).

In March, 1869, my friend Dr. Wallich, so well known by his botanical and zoological writings, as well as by his researches into the deep sea fauna, gave me a small portion of a minute sponge, of which three specimens had been brought up from the great depth of 1913 fathoms, with the request that I should describe it. I have to apologise to Dr. Wallich for letting the summer pass over without fulfilling the promise that I made to him. But there were two difficulties in my way. One was to have the most perfect of the three specimens discovered drawn. This specimen had been presented by Dr. Wallich along with a vast collection of Foraminifera, Polycystina, Diatomaceæ, and Desmidiaceæ, to the Royal Microscopical Society of London. The other difficulty was to find out where to place the species when described. My first difficulty has been surmounted—thanks to the Council of the Royal Microscopical Society and their assistant-secretary Mr. Reeves—by Mr. C. Stewart, F.L.S., of St. Thomas' Hospital, to whose friendship I am indebted for the accompanying very characteristic, faithful, and beautiful drawing. My second difficulty I am not so sure of having as yet clearly seen my way through. But to this I will allude more particularly a little further on. By the help of the enlarged figure on Plate II, and the following description, I hope this earliest discovered (October, 1860) of all the deep sea sponges will be easily recognised.

Wyvillethomsonia, gen. nov.

Sponge body subspherical, attached by a stem. In the summit of the sponge, *i.e.* the end farthest from the stem, there is one large osculum, which is fringed by long, delicate, biacerate spicules. The interior of the sponge body consists of several cavities which open into the osculum. The stem is prolonged through the body as an axis, and consists of numerous biacerate spicules somewhat more robust than those fringing the osculum, and mixed with these are a number of anchoring spicules (fusiformi-recurvo-ternate of Bowerbank), the recurved end being always directed to the point of attachment (which in this case is a small stone). The body is composed of a large number of spicules (furcated attenuato-patento-ternate of Dr. Bowerbank), the radii of the ternate spicules meeting each other as they lie on the surface of the sponge, form a remarkable loose network-like pattern; the long pointed process from the central boss projecting inwards towards the axis of the sponge.

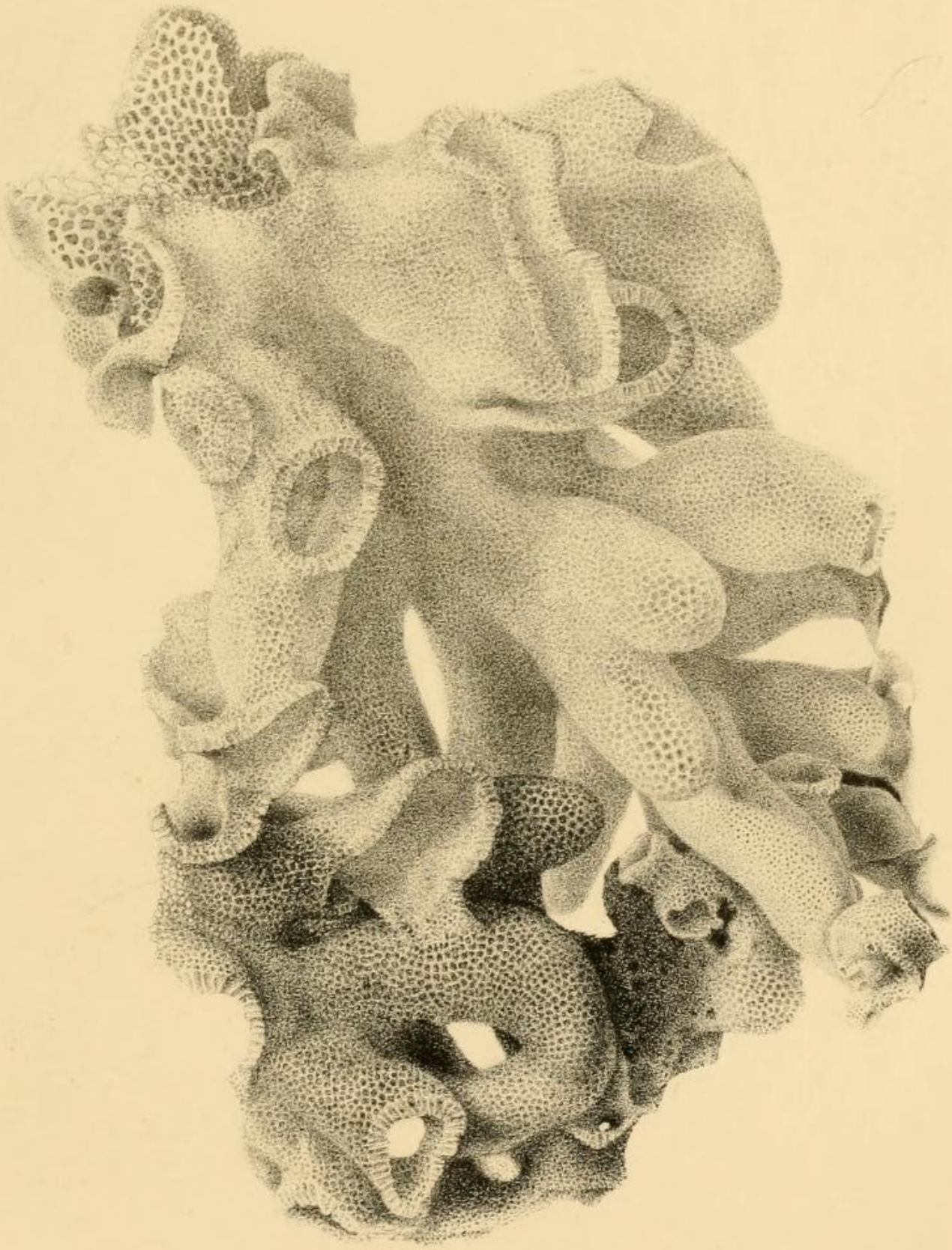
The whole of the body of the sponge and of the stem is covered by a thin sarcode layer which abounds in stellate spicules varying much in size. One remarkable spicule (bifurcated expando-ternate) seems to terminate the axis in the centre of the large osculum.

W. Wallichii, sp. nov. (Plate II, figs. 1 to 6.)

Habitat.—Dredged from a depth of 1913 fathoms, October, 1860, in lat. 58° 23′ N., long. 48° 50′ W., by Dr. Wallich, who was then Acting Naturalist to H.M.S. "Bulldog," Sir F. L. McClintock, R.N., commander.

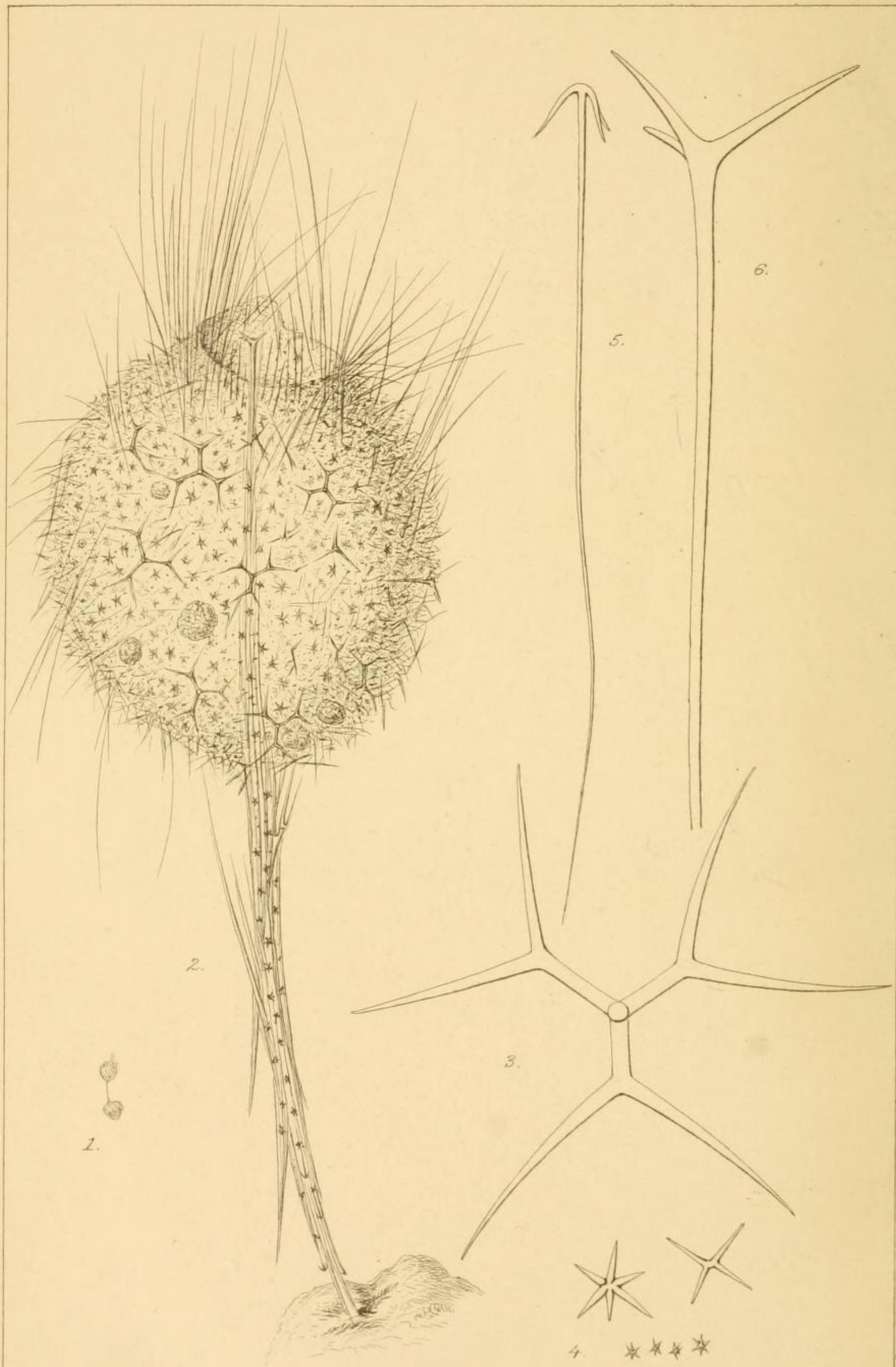
I name this genus and species after my friends Professor Wyville Thomson and Dr. Wallich. The name of Wallich has been long since employed in botany as a generic term, otherwise I should have employed it as such here. Those who may object to the length of my generic name I may remind of the precedent I have in Vaughanthomsonia. I could not commemorate two more original workers than Drs. Wallich and Thomson. There can be little doubt but that the three specimens dredged of this species are in a very young condition, but from what we know of sponges generally I think it is fair to assume that a mere question of size of specimen is of very little consequence in determining a species; indeed, once the sponge arrives at that stage of its existence that it forms all its characteristic spicules, neither the form of

these nor their general arrangement in the sponge structure is very much altered by growth; hence the diminutive size of the specimens examined by me, seeing that they appear complete in all their parts, is not a sufficient reason for this species remaining undescribed. At the next meeting (15th April, 1869) of the Dublin Microscopical Club, after Dr. Wallich had given me the small portions of the third specimen above referred to, I exhibited a series of the spicules, and stated it as my impression that the species belonged to the section of sponges with siliceo-fibrous skeleton and hexradiate spicules called Vitrea by Wyville Thomson. In this I was led astray by some siliceous network, like that met with in Aphrocallistes which was entangled by the body spicules of the little sponge, and I have now little hesitation in referring it to the Corticatæ of Oscar Schmidt, suggesting that its affinities are to the genus *Stellata*, Sdt. I do this for the following reasons: The number of stellate spicules in the outer sarcode layer, which on some portions of the sponge body are so tightly packed together as to form quite a hard layer of silex; the prevalence of the large furcate ternate spicules, which are certainly most important in the structure of the sponge mass—such spicules (No. 850—51 of Bowerbank) are to be met with in *Pachymatisma Listeri*, Bowk. MS. in *Stellata discophora*, Sdt., *S. Helleri*, Sdt., *S. mamillaris*, Sdt., and *S. mucronata*, Sdt. So far as I know these two forms of spicules are only met with in the same sponge when that sponge belongs to the division Corticatæ of O. Schmidt. The genus, however, cannot be easily confounded with any of those placed among the corticates. In some specimens of mud, taken from the same locality by Dr. Wallich, spicules (furcate ternate) occur seven eighths of an inch in length, proving the existence of some enormous specimens of some sponge of this group. Professor Wyville Thomson, who was present at the meeting of our Dublin Microscopical Club at which I exhibited this species, stated that he had taken this species, or at least one very closely allied to it, in the same ground that he had taken *Holtenia Carpenteri*, W. Thomson.



G. H. Ford. lith. W. West. imp.

Aphrocallistes bocagei sp nov.



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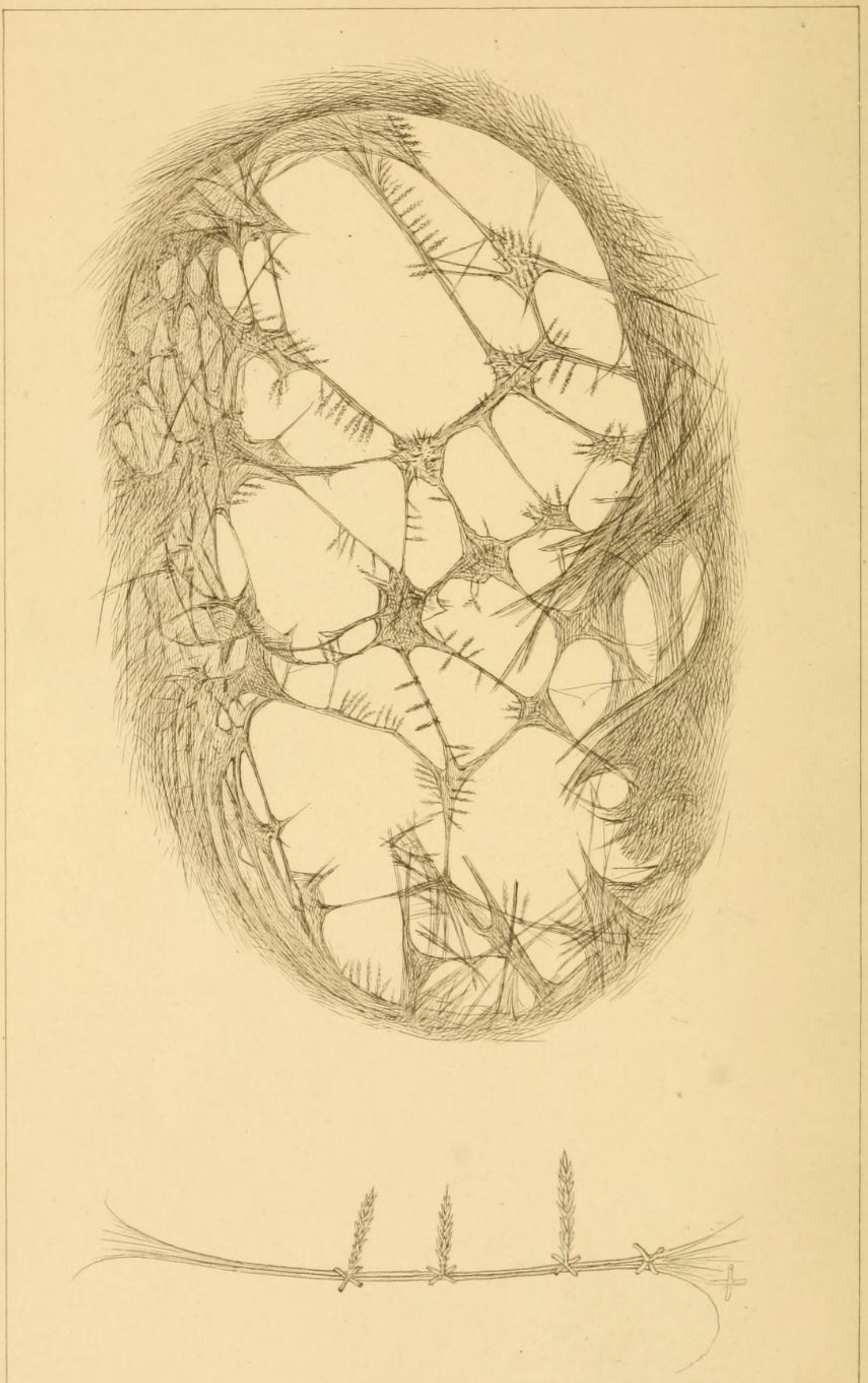

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Hyalonema mirabilis Gray (osculum.)