

and probably in all the similar forms and situations in which it occurs in the lower *Confervæ*, &c.—is deposited around a nitrogenous nucleus. In *Hydrodictyon* the fact is very clear, that the central portion of the amylon-corpuscle is turned of a deep brown by iodine, or pink, by sulphuric acid and sugar (as was first pointed out to me by Mr. Huxley), and that at one time it exhibits no trace of starch in its composition, but that subsequently this nitrogenous nucleus becomes surrounded, not with an entire wall of starch, but apparently by a cup-shaped deposit of that substance in which the nucleus lies imbedded, or from which it projects on the external aspect. Further observation of this and analogous phenomena may perhaps in time lead to a more satisfactory explanation of the genesis of starch than can at present possibly be given. It does not, at all events, contradict the notion of the vesicular nature of the starch-grain, but rather, as it seems to me, tends to confirm it; for we have only to imagine the entire removal—as we may often witness the partial—of the central nucleus, when what remains, viz. the cup in which it was lodged, will very closely resemble some of the more open forms of starch-vesicles I have noticed in the paper.

On the Stellate Bodies occurring in the Cells of FRESH-WATER ALGÆ. By the Rev. WILLIAM SMITH, F.L.S.

THE third volume of the 'Transactions of the Microscopical Society,' containing, at p. 165, *et seq.*, two papers by G. Shadbolt, Esq., 'On the Sporangia of some of the Filamentous Fresh-water Algæ,' has just been placed in my hands.

The subject discussed in these papers having attracted my attention at various times, and being in possession of additional facts, some corroborative of Mr. Shadbolt's statements, and others which lead me to a conclusion widely different from that to which he has arrived, I have gladly embraced the opportunity, which the Society has accorded me, of bringing the following details under the attention of its members:—

The accurate observations of one of the earliest and most successful students of this department of botany, M. Vaucher, of Geneva, have established the correct nature of the oval body, formed by conjugation in the filamentous Algæ, which this author has shown to be a true spore, each such body, formed by the union of two cells, giving birth, upon germina-

tion, to a *single cell*, which subsequently, by the ordinary method of self-division, becomes elongated into a filament ('*Histoire des Conferves d'Eau douce*,' Geneva, 1803, p. 66, *et seq.*, Pl. IV. 5, V. 3, VI. 4). I have been able, by personal observation, fully to confirm the observations of M. Vaucher in reference to one species of the *Conjugatæ* ('*Ann. Nat. History*,' 2d S., vol. viii., p. 480), and have no hesitation in accepting the facts as of general import in reference to the entire family. I have alluded to the circumstance, not only as having a direct bearing upon the subject of this paper, but also that I may explain my reason for not employing the term "Sporangium" in reference to the bodies in question, it being evident that this designation is not applicable to a body which is in itself a *single germ*.

With regard to the stellate bodies to which your attention is now more particularly requested, their true character being for the present doubtful, it will be better to employ a designation which does not involve any reference to their nature, and has regard merely to their form, I shall therefore speak of them as *Asteridia*, their general appearance being that of circular, star-like bodies.

The presence of *asteridia* is by no means confined to the family of the *Conjugatæ*. I have frequently noticed them in the *Desmidiæ*, and occasionally in the *Diatomiceæ*, though in these tribes the presence of spinous processes is by no means a constant character. I have always found (and Mr. Shadbolt's experience seems to be confirmatory, *l. c.*, p. 166) that, if present in a gathering when first made, the numbers of *asteridia* rapidly increased when the *Algæ* were retained in vessels for future examination, and as more or less of change and decay almost invariably attends the attempt to preserve such organisms in a limited space, and removed from their natural habitats, I have hitherto regarded the presence of *asteridia* as indicative of disease, as being, in fact, a parasitic, perhaps a fungoid growth, consequent upon the degeneration of the cell-contents.

I am not prepared to put forward this as the true character of *asteridia*, but I am prepared to dispute a view of their nature which confounds them with the reproductive germs, and shall proceed briefly to state the reasons why such a character and function are altogether inadmissible.

It is well known that conjugation in the *Algæ* implies the union of the *entire* contents of two cells, which contents intermix and become condensed into the reproductive spore, and that this union is effected by the amalgamation of the contents of two contiguous cells in the same filament, or by the same

process occurring in two cells belonging to different filaments. The mode in which this amalgamation takes place is either by the breaking down of the walls at the contiguous extremities of the cells, as in the *Vesiculiferæ*, or by the production of connecting tubes, which form channels of communication between the conjugating cells, whether in the same or different filaments. These connecting tubes are shown in the drawings which accompany this paper, Pl. IX., fig. 2 *b*, fig. 4 *b*, &c.: and it is worthy of notice that, although one mode of effecting the union of the cells seems to be pretty general in the same *Alga*, it is by no means constant, as tubes connecting contiguous cells of the same filament, or uniting apposed cells of different filaments, will be found in connexion with the same species: an example is given in fig. 6.*

Now it will be seen by a reference to the figures I have given, and more particularly to figs. 4, 5, 6, which are drawn with the camera lucida from mounted specimens of *Zygnema quadratum* kindly supplied by Mr. Shadbolt himself, that the circumstances, as stated above, which accompany the process of conjugation, altogether negative the opinion that the *asteridia* are products of such a process, as the cells containing these bodies always contain with them a portion of the original endochrome or cell-contents, which must have been *entirely* absorbed had conjugation been effected. Nor are there, in any case, to be found the connecting tubes which are necessary to the process in the species we have selected. It is, therefore, evident that the *asteridia* are not modified or matured spores, as the cells containing them have not undergone the process necessary to the formation of the reproductive body.

An inspection of fig. 1 will also show the incorrectness of the conclusion to which Mr. Shadbolt has arrived, viz., that the *asteridia* are spores in a more advanced stage. We have here a portion of a filament of *Zygnema quininum*, in the cells of which the gradual formation of the *asteridia* may be distinctly traced. Cell *a* presents the ordinary and healthy appearance of the plant; in cell *b* degeneration has commenced, and a faint appearance of several aggregations of the cell-contents may be detected; these aggregations in cell *c* assume the character of perfect *asteridia*, which in cell *d* are no longer in contact with the endochrome, among which they have been generated. But in no case do we perceive any

* This fact throws some doubt upon the propriety of placing (as Kützing has done in his genus *Rhynchonema*, and Hassall in a sub-genus) species, which conjugate by tubes connecting contiguous cells, apart from those in which the conjugation takes place between cells in different filaments.

semblance of the process of conjugation, or of that mingling of the contents of different cells so essential to this function of vegetable life ; and instead of only one body, which is the invariable result of the conjugating process between two cells, we have each cell containing several *asteridia*, the number of which I have noticed to vary from two to six in a single cell.

Figs. 2 and 3, which are drawn from specimens supplied by R. Hodgson, Esq., exhibit phenomena which are equally irreconcilable with the hypothesis I controvert. These sketches represent portions of filaments of *Mesocarpus scalaris*. In this species the reproductive spore is lodged in the inflated tubes which connect the conjugating cells, while the *asteridia*, which were exceedingly numerous in the specimens I examined, were invariably contained in cells from which no connecting tubes had been projected. To the above considerations let me add the fact already referred to, viz. that germination has in several species of the *Conjugatae* been observed to take place in the oval or elliptical spore which results from the process of conjugation, without any previous change in the form of this body.

The figures, given in the plate which accompany Mr. Shadbolt's paper, bear out to their fullest extent the facts I have now stated, and might, indeed, have sufficed as illustrations of my views had I not been desirous of giving as many examples as possible of a singular, and far from common, monstrosity, in a curious and interesting class of plants ; but I cannot forbear calling attention more particularly to Mr. Shadbolt's fig. 4.

This drawing, which represents *Lyngbya floccosa* with *asteridia*, is surely sufficient to prove that such bodies have no essential connexion with the reproductive spore, for in this case there are no traces whatever of the conjugating process, and each cell, whether with or without *asteridia*, has its full proportion of endochrome, though in a disturbed and degenerate condition, the breaking down of the cell-walls in the neighbourhood of the *asteridia* being a further evidence of the diseased condition of the filament. On the whole, while I feel unable to assign a positive character to these singular parasites, I feel no difficulty in withholding from them the important office ascribed to them by the gentleman upon whose communication I have commented. The writer of that paper will allow me to thank him for the interest he has excited in a subject which has long caused me no little perplexity, and for the very lucid manner in which he has stated his opinions.

Lewes, Jan. 12, 1853.

NOTE.—Since the above was read before the Society, I have met with a brief notice of the Stellate Bodies, to which this paper refers, in a communication from Mr. G. H. K. Thwaites to the 'Annals of Natural History,' vol. xvii. p. 262, and dated March 19, 1846. It is satisfactory to find that the observations and conclusions of this eminent algologist coincide, as far as they extend, with mine. Mr. Thwaites asks whether the stellate bodies in the cells of *Mesocarpus scalaris* may not be an abnormal growth of the nucleus, or perhaps an internal parasite; describes them as formed from a small spherical cell, containing an oily-looking fluid; and states, as I have done, that they are not developed, in the manner of spores, at the expense of the endochrome of the cells which contain them.—W. S.

On the Presence of a FUNGUS and of Masses of CRYSTALLINE MATTER in the Interior of a living OAK TREE. By JOHN QUEKETT, Resident Conservator of the Museum and Professor of Histology to the Royal College of Surgeons of England. (Read January 26, 1853.)

IN the month of August of the past year I formed one of a pic-nic party to visit the well known King Oak, in Marlborough forest. The day was stormy at intervals, but there was little or no wind. Whilst we were all assembled under a large ornamental shed, erected for the convenience of visitors to this much-frequented spot, a sudden loud snapping noise was heard, which was followed by a still louder crash of broken timber. This we found was not occasioned (as we first imagined) by the fall of a lofty oak, but, as it subsequently turned out, of only a large limb. Our fears at the moment were greatly excited lest this fall might have been occasioned by one of the junior members of our party swinging on the limb, but it appeared that he had climbed into the interior of the King Oak, and, looking out of a hole, was the nearest spectator of the accident; his attention having been directed to it by the noise of the snapping of wood, and the crash produced by the fracture of the branches of numerous trees in the neighbourhood, upon which the limb in question fell.

As soon as our fears were allayed by knowing that our young friend was safe, some of the more venturesome of the party, myself amongst the rest, sallied forth to see what had happened. We found that the King Oak was uninjured, but that a tree about fifty yards from it, and of very large size,