The last two or three normal segments in Insects (that is, the 16th, 17th, and 18th) are frequently wanting.

In the above homological comparisons it is assumed that the three anterior normal segments present in a Crustacean are normally and potentially present in an Insect. This will be considered by many as the doubtful point in the above comparisons. But it is proved to be correct by the fact that these three segments are sense-bearing segments in Crustaceans, and the Insect fails in no sense belonging to the Crab. As stated on page 188 (Annals, *l. c.*), the absence of a jointed organ is no proof of the absence of the segments, unless it be true also that the corresponding sense is wanting.

If the constitution of the anterior part of the head in the Insect be still questioned, there is nevertheless good reason for making the mandibular segment in the Articulate type (as it adjoins the centre in embryonic development, from which progress goes on forward and backward) normally identical in all groups under that type; and hence from this segment, or No. 4 in the Crustacean series, on to No. 18, the parallelism between the Insect and Crustacean must be rightly given; consequently, if there is any doubt, it holds only with regard to Nos. 1, 2, and 3. The law of unity of structure under a type seems, however, to preclude even this chance for doubt.

Comparing the higher Decapods among Crustaceans and the higher Insects, the mean size or mass is about as 50 to 1. This ratio indicates approximately the amount of condensation in the Articulate structure connected with the elevation of grade from the typical Crustacean to the typical Insectean.

III.—*On Freshwater Rhizopoda of England and India; with Illustrations.* By H. J. Carter, F.R.S. &c.

[Plates I. & II.]

The object of this communication is to bring together descriptions and illustrations of the freshwater Rhizopoda which I have found in England since my return from India in 1862, and also to add some of those which from time to time came under my notice in the island of Bombay, in order that I may, to a certain extent, show what species are common to both localities, and also some of those which may be peculiar to Bombay, or at least may not yet have been described.

Further, I have drawn most of these on the same scale, and have added some of their varieties respectively, so that an idea may be thus gained of their sizes generally, as well as of some of their differences in point of shape; for, unless they are treated in this way, we shall never be able to get on without much confusion either in describing them or in distinguishing their species. Mere descriptions at this period of their history will not suffice, as those of Schlumberger testify (Ann. des Sc. Nat. t. iii. p. 254, 1845), especially where a single or only a few specimens of the species have been obtained, because numbers are required for comparison, to establish a species; and although a figure may not be absolutely necessary with a great number of specimens of the same species, it, for the same reason, becomes absolutely so with one or only a few of it. It is only by numbers that we can arrive at the typical form of the species, here as well as in the Rhizopoda generally, where those who are well acquainted with them know that the varieties are almost infinite.

Appended to the descriptions will also be found "Observations," in which any structural or physiological fact bearing on the species only, or in connexion with the Rhizopoda generally, that appeared to me deserving of notice, has been mentioned. This is particularly the case under *Difflugia compressa*, a new and interesting species, which has been found so abundantly that I have been able to make out almost as much about it as about *D. pyriformis*.

AMŒBA.

Amœba princeps, Ehr.

This species often occurs in Bombay as well as in Europe, and often with the villi on the posterior extremity, first pointed out by Dr. Wallich. I have given a description and illustrations of it (Annals, 1863, vol. xii. p. 30), chiefly for the purpose of pointing out the occasional presence in it of certain cells which appear to me to be reproductive elements; and have nothing more to add concerning it here, saving allusion to the corrections or altered views respecting the nucleus, which will be found at page 254 of the same volume.

Amœba quadrilineata, Cart. (Annals, 1856, vol. xviii. pl. 5. f. 3); *A. radiosa* (?), Duj. (*ibid.* figs. 10–16); and *A. verrucosa*, Ehr., Annals, 1857, vol. xx. pl. 1. fig. 12.

I have already figured these as they occur in Bombay. *A. radiosa* was only thus named provisionally; but since I have returned from India, and have seen Auerbach's paper on the *Amœbæ* (Zeitschrift für wissenschaftl. Zoologie, Dec. 31, 1855), which just preceded my own in publication, it seems evident to me that this species would be better termed *A. bilimbosa*, which Auerbach has figured as a new species.

Another *Amœba* to which I should allude here is that which I have delineated with the last-mentioned, and have also provisionally called *A. Gleichenii*? (figs. 5–8), showing its different stages from the active to the passive capsuled condition, as it affords the only instance that I have ever noticed of an *Amœba* becoming covered with a distinct, peculiar, brown, chitinous (?) capsule. It was observed at Bombay, just before the commencement of the "rainy monsoon," on the 13th of June 1855; and the figures in my journal are accompanied by the following remarks:—

"Took some water from a tank in the garden, which had become nearly dry, leaving the shallow pool which remained in it scattered over with patches of *Oscillatoria*, and the water rendered green by the presence of *Euglena*. Found this water nearly filled with large *Amœbæ*, which were very active and contained fresh green and brown or half-digested food; also a number of circular, colourless, semitransparent, apparently capsuled, refractive bodies, of different sizes, the largest $\frac{1}{2800}$th of an inch in diameter [these, at the time, I viewed as "ovules;" they may have been the "reproductive cells;" they could hardly have been starch-granules, from their circular form]; a large spherical nucleus containing a faintly marked nucleolus, a contracting vesicle, and granules. Having put some scores of these into a little clean water in a watch-glass, at 12 o'clock in the day, I found that the greater part of them, by 10 a.m. on the following day, had become respectively enclosed in a round, conical, rough, brown capsule, which was attached to the watch-glass by its point or by a short pedicle prolonged therefrom. Many others were seen in different stages between the most active and the entirely fixed and capsuled condition, as represented in the figures to which I have referred. It was remarkable to witness the increasing density of the pellicle, as indicated by the difficult and sudden way in which the sarcode every now and then burst through the surface of those individuals which, although uncapsuled and still transparent, were already fixed by their pedicle to the glass. Some of the largest of these *Amœbæ*, in a subround state, measure $\frac{1}{60}$th of an inch in diameter. In their most active condition they moved about by globular expansions; and in no instance did I observe any pointed ones. Perhaps this kind of polymorphism may have been induced by the thickening of the pellicle, and at another period the pseudopodia might have been pointed. The sides of the tank, which was excavated in trap-rock, were scattered over with dried masses of *Spongilla*, and the little water that was left in it bestrewn with their capsules."

I tried to repeat the experiment ust mentioned; but *Coleps*, the most destructive of all the Infusoria, became developed in the watch-glass, which appeared overnight to contain nothing but the *Amœbæ*, and the next morning presented absolutely nothing but *Coleps*. The "rains" then set in, filled the tank, and destroyed all trace of these *Amœbæ*, since which period I have never met with a similar occurrence.

Amœba monociliata, n. sp. Pl. II. fig. 19.

Polymorphic, charged with granules; possessing a single large cilium and villi on the posterior extremity.

Hab. Fresh water. Locomotion reptant.

Loc. Bombay.

Obs.—I remember this specimen well. It stands figured in my journal for May 1855 under two forms, as represented in the plate, with no mention of the size, or anything more than has been above stated. In the presence of the flagelliform organ we seem to have perpetuated the one or two cilia with which the young or monadine forms of the Rhizopoda, so far as my knowledge extends, are generally provided, but which disappear as they grow older, leaving the more developed form inferior in point of locomotive organs to the less matured one. Whether the cilium of *A. monociliata* could be retracted or not I am not enabled to decide, because I never observed more than one specimen. But that we have an instance of this power in the Rhizopoda is seen, not only in the young of *Acineta* (which, on issuing from the parent, commence with cilia which finally become retracted and give place to capitate tentacula), but also in the division of the free or stemless species, where one half only puts forth cilia till its separation is thus completed, and then retracts them again, to be followed by tentacula, as in the young one—a fact which is well worth remembering, whether it bears upon the question of *A. monociliata* being able to retract its cilium or not, since it affords another instance of the extraordinary extemporizing power of the Rhizopoda, viz. that of being able to put forth vibratile cilia and retract them as the occasion may require—organs which, in the other Infusoria, when once developed, appear to be as unalterable in form as their motions seem to depend on fixed muscular machinery.

It is possible that this so-called species may be but a variety of *Podostoma filigerum*, Clap. et Lachm. (p. 441, pl. 21. figs. 4–6); but, as above stated, I never saw but one specimen, and this did not remain sufficiently long under observation to undergo more changes in form than those which I have figured.

Difflugia, Ehr.

Difflugia pyriformis, Perty (mihi).

A detailed description of this species will be found in the 'Annals' (ser. 3. vol. xii. p. 249), and I have nothing further to add to it here, except that certain bodies in the sarcode, which I supposed to be larger starch-granules, now appear to me to have been cells analogous to, if not homologous with, the "reproductive" ones described in *Amœba princeps*, which will presently be seen to exist also in *D. compressa*, n. sp.

The type form (perhaps) of the test of *D. pyriformis*, with its varieties—together with delineations of the animal, its nucleus in a spheruliferous condition, also in the effete state after the spherules have passed into the body, and, finally, their development in the watch-glass—will be found in Pl. I. figs. 1, 2, 3, & 4, illustrative of all that has been described in the paper to which I have alluded. It should be remembered, however, that, if (in fig. 1) the animal part had been shaded sufficiently deep to represent its normal green colour, it would be nearly black. Both the faint yellowish tint and the form of *D. oblonga*, Ehr. (tab. 9. fig. 2), seem identical with the generative stage of *D. pyriformis* that I have termed "colourless."

Difflugia compressa, n. sp. Pl. I. figs. 5 & 6.

Test lagenoid, compressed, circular posteriorly, elongated into a short neck, with even aperture anteriorly *; composed of hyaline grains of quartz-sand held together by a gelatinous (albuminous ?) substance; presenting a dark, undulating, collar-like mark at the junction of the neck with the body of the test. Animal composed of diaphane and sarcode, the latter charged with "moleculæ," "granules," portions of undigested food, starch-granules, yellow oil-globules, and small brown cells, which latter appear to impart to it its characteristic light-brown colour. Granules minute, colourless. Nucleus probably posterior, but not seen *in situ*; vesiculæ or contracting vesicles also probably posterior and marginal, as in *D. pyriformis*.

Hab. Heath-bog water. Abundant among conjugating confervoid Algæ and Desmidieæ. Progressing with the oral aperture downwards and the test erect. Locomotion and capture of food performed by obtuse digital prolongations of the body slowly projected from the aperture. The "brown cells" do not enter the pseudopodia.

Size. Length $\frac{1}{87}$th, greatest breadth of broad side $\frac{1}{110}$th, aperture $\frac{1}{332}$nd, greatest breadth of narrow side $\frac{1}{207}$th, aperture $\frac{1}{415}$th of an inch.

Loc. England; south coast of Devon, Budleigh-Salterton.

Observations. They were found in abundance about the middle of September, in company with conjugating confervoid Algæ, &c., as

* Of course, where the test is covered with grains of sand, the outer margin of the aperture must be rough; but where these grains are absent or scanty, the inner one is found to be smooth and even.

above stated, which formed a slimy layer over the surface of a drain adjoining a heath-bog. Out of upwards of 200 specimens, the largest average size was that above given. There is considerable variety of shape, even to that of a circular figure (*k*); but all have the characteristic compressed form (*c*) from which I have designated the species; all present a light brown colour, and most of the tests have that peculiar collar-like mark (*ff*) round the neck above mentioned. Neither the nucleus nor the vesiculæ could be seen *in situ*, on account of the opacity of the tests; and until one is found sufficiently transparent to admit of this, these points must remain undetermined. I did not meet with a single specimen of *D. pyriformis* among those of *D. compressa* where the latter so abounded, although they are both very plentiful at their respective localities in the same neighbourhood, and both in ditches draining the same heath-bog; but while *D. pyriformis* prevailed among dead leaves only, *D. compressa* was chiefly found in company only with the conjugating Algæ mentioned. Still I found specimens of *D. compressa* with *D. pyriformis*, and am now inclined to believe that those which I have considered to be *D. proteiformis*, Ehr., in my "Observations" on *D. pyriformis* (*l.c.* p. 250), were specimens of *D. compressa*, the compressed form of which would easily be mistaken for globularity; for, when passive, this species always rests on its broad surface, and its compressed form is not seen until it be turned over, or until the animal becomes active and assumes the erect position. Further, I am inclined to think that they must have been specimens of *D. compressa* because this species is so generally distributed throughout the same neighbourhood, and, lastly, because they did not present the "deep olive or greenish colour" which I now find (*ap.* Pritchard) is one of the characteristic features of *D. proteiformis*. It is true that the size of *D. proteiformis* is set down (*l. c.*) as much less than that of *D. pyriformis* and that of *D. acuminata*, Ehr.; but this matters little, and the characteristic form also of *D. proteiformis*, viz. "ovate subglobose," is so near that of *D. pyriformis*, that there remains no specific difference that I can now see, to disunite these so-called species. Thus, after all, *D. pyriformis*, Perty, may be but a larger and more elongated form of *D. proteiformis*, Ehr., in which case the original name should be retained for the typical form, whichever that may be.

On submitting *D. compressa* to pressure, and crushing the test in water under a glass cover, as stated in my paper on *D. pyriformis*, the animal part was found to consist of protoplasm charged with colourless moleculæ, small brown cells, yellow oil-globules, starch-granules, the nucleus, certain large cells which I shall provisionally term "*reproductive*," and portions of food in process of digestion. Thus there are no chlorophyll-cells as in *D. pyriformis,* but small brown cells, yellow oil-globules, and reproductive cells, all of which do not appear in the latter, unless, as above stated, I have mistaken the "reproductive cells" in *D. pyriformis* for large starch-granules, which the sequel will, I think, make probable. Let us now review these parts more in detail.

1. Small brown cells (Pl. I. fig. 6 *b*). These are globular in form, filled with granular protoplasm, and about $\frac{1}{6000}$th of an inch in diameter, not near so numerous or so striking as the chlorophyll-cells in *D. pyriformis,* although they, with the yellow oil-globules, appear to give the light brown colour to the species.

2. Oil-globules (*c*). These are more striking than in *D. pyriformis,* from their constant presence, greater number, and bright amber-colour: they vary in size, and, under the application of a solution of iodine in iodide of potassium, lose their yellow colour, but only to become more brilliant and refractive.

3. Starch-granules (*d*) and nucleus (fig. 6). The same as in the green specimens of *D. pyriformis,* where the latter has become spheruliferous. The nucleus is also about the same size, (the $\frac{1}{461}$st part of an inch in diameter), but the spherules more marked and sometimes granuliferous. As the nucleus in all the specimens which I examined, and which were very numerous, was in the same condition, while in its original state it probably bore the usual appearance, viz. a circular discoid body (the nucleolus) attached to the inner surface of a larger translucent and spherical cell (the nucleus), it may be that this is the state in spring, and the former the autumnal one, indicative of the time of the year at which the animal generates.

4. Reproductive cells (*e, f*). These are certain cells of an oval or circular shape, filled with homogeneous contents, colourless, more or less refractive, and generally about $\frac{1}{2000}$th of an inch in diameter, but varying to twice this size or more, even in the same animal. They also vary in number, from ten to twenty or more, and have been seen frequently both with and without the presence of the nucleus in its spheruliferous condition. On the application of iodine, they, for the most part, assume a light amber colour, and sometimes present granuliferous contents (*f*), which distinguishes them at once from the starch-granule; but they also present occasionally a claret-colour, although never so deep or with such homogeneous contents as the starch-granule.

As before stated, I suspect that these cells also exist in *D. pyriformis,* and that I have mistaken them there for large starch-granules.

In no instance have I yet found the body of *D. compressa* charged with the "granuliferous cells" and the nucleus empty, as in the colourless specimens of *D. pyriformis*, although, as above mentioned, these cells have sometimes been seen to have arrived at the granuliferous stage in the nucleus. Then I have not found any indication here to direct me to this condition, as in *D. pyriformis*, where the absence of the green colour at once shows that the spherules of the nucleus have passed into the body of the animal. Probably it does take place here as well as in *D. pyriformis*; but this remains to be seen.

Still it is perhaps worth recording that in one specimen an abortive nucleus was found, in which there were not only a few of the spherules remaining, but starch-granules and yellow oil-globules also, such as occur in the body of the animal, showing that where the development of the spherules fails of its object, the elements of which they are composed may pass into other compounds. On the application of iodine to this nucleus, the remaining spherules assumed their usual amber tint, the starch-granules a deep claret one, and the yellow oil-globules lost their colour, as in the body of the animal under similar circumstances; while the contents of the nucleolus, which were homogeneous, also (as usual) received a claret tint which, although not so deep as that of the starch-granules, yet always, in this respect, indicates in these contents a more amylaceous composition than in those of the nuclear cavity.

Of what import are the "reproductive cells" of *D. compressa*, which appear to be homologous with those described in *Amœba princeps*?

It may be seen that, while I have described and figured certain granuliferous cells, &c., which occasionally accompany the reproductive cells in *Amœba princeps*, still I could never recognize in any of these a true nucleus (*l. c.* p. 42, pl. 3. fig. 1 *d, e*). But I have done so in *D. compressa*, and, as above stated, have seen the reproductive cells in company with a spheruliferous nucleus. However, I have observed and figured in *Amœba princeps* (fig. 5, *l. c.*) one of the reproductive cells twice the size of the others, which I have also interpreted as a yet undivided reproductive cell. On the other hand, Dr. Wallich (if we both refer to the same kind of bodies) states (Annals, ser. 3. vol. xii. p. 124) that he has seen, in his *A. villosa*, a nucleus among them; and, where these cells have been less numerous, "three distinct nuclei," of almost equal size. The latter, I think, must be what I have considered undivided reproductive cells—that is, under the view that these cells are multiplied by duplicative division, which, in the large ones mentioned, is a little retarded. But be that as it may, we have in *D. compressa* the spheruliferous nucleus and these reproductive cells together in the same animal; and I have already stated that the spherules of the nucleus, after passing into the body of *D. pyriformis*, ultimately appear in the watch-glass with ciliated polymorphic bodies, whereby we may fairly infer that the same changes take place in those of *D. compressa*. What, then, becomes of the "reproductive cells" in *D. compressa*? Now, assuming, as we have done, that the reproductive cells in *D. pyriformis* were mistaken for large starch-granules, and remembering also not only that the spherules were ciliated, but also that *Amœbæ* much larger in size were among the contents of the watch-glass (Pl. I. fig. 4 *a, b*), which were inferred to come from the colourless specimens of *D. pyriformis*, in which the spherules had passed into the body of the animal, is it not worthy of consideration whether the latter (that is, the *Amœbæ*) may not have come from the reproductive cells? and, therefore, whether the spherules of the nucleus may not bear the relation of spermatozoids to these reproductive cells? If so, too, in some instances, the granulation of the nucleus may take place in one, and the formation of the reproductive cells (from a larger subdivision of the nucleus) in another individual—thus rendering the species diœcious; while others may be both monœcious and diœcious. It would be easy for impregnation to take place in the body of the *Difflugia*, where both the spherules of the nucleus and the reproductive cells might come together in a preeminently plastic state for their union, although it be true that in many instances the procreative elements of other organisms eliminate themselves from the parent and get into the water before this act takes place: at the same time here it must occur quickly, or the formation of a pellicle over the surface of the protoplasm of the germ-cell or sperm-cell (which it does not appear to be in the power of either to control) inevitably defeats the process.

There is another question also which I have not yet been able to determine, viz. whether or not the chlorophyll-cells in *D. pyriformis* and the brown cells in *D. compressa* are not identical with those bodies in the *Amœbæ*, &c., which I have termed "granules" (Annals, ser. 3. vol. xii. p. 33 &c.). In the amœbous cell of *Spongilla* they are frequently of a bluish emerald-green colour under the microscope, and, in some instances, appear to impart the green colour to the mass. Again, in *Amœba princeps*, &c., they frequently pass into crystalloids; while I have seen and figured them also in the pseudopodia of *Difflugia tricuspis*, Cart. (Annals, ser. 2. vol. xviii. pl. 7. fig. 80), and in those of *Arcella vulgaris*, Ehr. Yet in those of *D. pyriformis* and *D. compressa* I have never seen anything but a dense number of fine granules, which look like those with which the sarcode is charged, and to which I have given the name of "moleculæ." Hence I have stated, in the description both of *D. pyriformis* and of *D. compressa,* that neither the chlorophyll-cells nor the brown cells enter the pseudopodia of either of these species respectively; at the same time that I might have erred in calling their contents granules instead of moleculæ, if the chlorophyll-cells and brown cells should hereafter prove to be homologous with the "granules". We shall find the latter particularly marked in *Euglypha compressa,* n. sp., and in *Cyphoderia margaritacea,* Schlum., where they are globular in the former and oblong in the latter (Pl. I. fig. 13 *k,* & Pl. II. fig. 18 *l*).

Difflugia urceolata, n. sp. Pl. I. fig. 7.

Test ovo-globose, truncated anteriorly; aperture wide, even; margin everted, reflected; neck obsolete: composed of grains of hyaline quartz-sand. Animal colourless, hidden, with the exception of the pseudopodia, by the opacity of the test.

Hab. Heath-bog water. Progressing with the aperture downwards and the test erect. Locomotion performed by obtuse digital prolongations of the body slowly projected from the aperture.

Size. Length $\frac{1}{83}$rd, breadth $\frac{1}{92}$nd, aperture $\frac{1}{160}$th of an inch in diameter.

Loc. England; south coast of Devon, Budleigh-Salterton.

Obs. I have only seen one specimen of this species, and in this the animal was fortunately present and active. On crushing the test, no nucleus or starch-granules appeared, but a dozen cells (*c*), each of which was about $\frac{1}{1500}$th of an inch in diameter, and so much like the earlier or acapsular stage of the "reproductive cells" of *Amœba princeps* that little doubt could be entertained of their being of the same nature. There was nothing present, either to represent the chlorophyll-cells or brown cells of *D. pyriformis* and *D. compressa* respectively, unless a number of elongated, elliptical, colourless bodies, which I took to be the "granules," might have been thus considered (fig. 7 *d*).

Difflugia Bombayensis, n. sp. Pl. II. fig. 16.

Test ovo-globose, of a dark-brown colour, truncated anteriorly, aperture even; composed of grains of sand externally, which rest upon a cancellated structure formed of circles of large particles, in the areas of which are scattered a number of smaller ones. No part of the animal seen within the test, on account of its opacity. Pseudopodia numerous, digitiform, obtuse or forked at the extremity.

Hab. Fresh water.

Size. About $\frac{1}{200}$th of an inch long.

Loc. Island of Bombay.

Obs. Annexed to the figure of this in my journal is the following note (Sept. 1855):—"There are two *Difflugiæ* [in the island of Bombay], viz. one small, ovoid, almost colourless, and about $\frac{1}{300}$th of an inch in length; test covered with grains of quartz-sand, sometimes with particles or bodies of equal length laid side by side in regular arrangement, as in *Arcella aculeata*, Ehr. Conjugates like *Euglypha*; flesh shrinks up into a round form at the bottom of the test. [This is probably the species which I have called *D. tricuspis*, *l. c.* pl. 7. fig. 80.] The other much larger," &c. [This is the species last described.]

Attached to the figure of another ovo-globose specimen (in my journal), covered with hyaline grains of quartz, but not brown, is also this note (July 1855), viz.:—"A large *Difflugia*, with sandy test, translucent, and about $\frac{1}{40}$th of an inch long."

The last measurement probably equals that of any English species of *Difflugia*; and as the same shape is often figured in my Bombay journal, although of much smaller dimensions than this, it is probable that they all belong to the "ovo-globose" species of this locality, of which the maximum size is that just mentioned. The habitat is fresh water. If thought desirable, it might be named "*D. ovoglobosa*."

Difflugia elliptica, n. sp. Pl. I. fig. 26.

Test ovo-elliptic, compressed, pointed posteriorly, truncated anteriorly, with even aperture; composed of hyaline grains of quartz. No part of the animal seen but the pseudopodia, which were digitate and obtuse.

Hab. Fresh water.

Size. $\frac{1}{330}$th of an inch long, and $\frac{1}{415}$th transversely on the broad surface.

Loc. Island of Bombay.

Obs. I have only one specimen of this form figured. It differs from *D. compressa* in having the posterior part of the test pointed, and the anterior part without extended neck; hence I have designated it differently; but, as "one swallow does not make a summer," so one specimen is not enough to establish a species, and therefore the name may be considered provisional.

Difflugia peltigeracea, n. sp. Pl. I. fig. 12.

Test flask-shaped, transparent, with wide mouth and double inflation, viz. one in the body, and the other towards the aperture; composed of minute, irregular, polygonal scales in juxtaposition. Animal colourless; nucleus posterior.

Hab. Found about *Peltigera canina* (Dog-Lichen).

Size. Length $\frac{1}{217}$th, greatest breadth $\frac{1}{370}$th, aperture $\frac{1}{925}$th of an inch.

Loc. Tavistock, Devon.

Obs. Only two specimens of this Rhizopod were obtained—viz. one containing the animal in a passive state, and the other empty. They were found in the water which had been poured over some specimens of *Peltigera canina,* to moisten them; and these specimens had been brought from the neighbourhood of Tavistock. Figures of both tests are given to show that there is some little variety in their shape; and the small one is drawn upon the same scale as that of the *Difflugiæ* generally, to show its relative size. In the test containing the animal, the latter will be observed to be retracted, and, as usual under such circumstances, to have secreted a kind of fibrous structure, which is arranged transversely, in the form of a diaphragm, towards the aperture. Portions of undigested food are seen in the body; and the presence of two of these around the nucleus (one of which is posterior to it, in which position it never occurs in *Euglypha*) makes me call this Rhizopod, provisionally, a *Difflugia,* although the form of the pseudopodia can alone settle this question, which thus must be left for future observation to determine.

Difflugia spiralis, Bailey (mihi). Pl. I. fig. 9.

This species is also very common here. I never saw it in the island of Bombay. It is generally covered with grains of hyaline quartz, but still not unfrequently with minute, short, cylindrical, colourless filaments, arranged parallel to each other, although in a more or less tortuous manner (*d*). In Dr. Wallich's figure of this species, under the name of "*Difflugia proteiformis* (var. *septifera*" (Annals, ser. 3. vol. xi. pl. 10. fig. 12), the covering appears to consist of little subround bodies, of uniform shape; and in that of *D. acuminata,* Ehr., close by, it is observed (p. 453)—"the portion of the test around the aperture is built up entirely of chitinous pellets."

Difflugiæ ——? Pl. I. figs. 10, 11.

The tests of two other *Difflugiæ* (figs. 10 & 11) were both found in heath-bog water, with *D. urceolata,* the former empty, the latter containing the animal; but as these were the only specimens of this shape met with, I have merely inserted their figures for what they may hereafter prove worth.

Echinopyxis, Clap. et Lachm.

Echinopyxis aculeata, Ehr. (sp.) Pl. I. fig. 8.

Common in the island of Bombay, as well as on the south coast of Devon, at Budleigh-Salterton. The largest specimens that I have seen in the latter locality measured about $\frac{1}{100}$th of an inch long, and about the same transversely in the broadest part, the anterior half being rather contracted, and the aperture large and circular, or slightly elongated transversely. The latter feature, together with the tendency of the aperture to an excentric or terminal position and the depression of the test anteriorly, while it is elevated behind, causes this Rhizopod to bear a similar relation to *Difflugia* that the pleurostomatal form of *Euglypha* (*Trinema acinus*, Duj., *Euglypha pleurostoma*, Cart.) bears to the latter genus; and when we observe that its test is formed of grains of hyaline quartz, and that the pseudopodia are digital and obtuse, the alliance is still greater. The spines then become the chief distinguishing character, out of which, according to Claparède and Lachmann (p. 447), delicate pseudopodal prolongations are projected. But even the spines vary greatly in number and position (*i*, *d*), while in some varieties they are altogether absent (*g*, *h*), as may be seen by the group of figures I have given of them, which, being all drawn upon the same scale, show not only their relative sizes to each other, but to those of the other *Difflugiæ*.

In the lateral view of the large specimen (*d*), I have endeavoured to give another variety in the disposition of the spines, and have figured on the test the regular arrangement of short straight filaments (*e*) which, at Bombay, I found occasionally substituted for the grains of quartz; while in other instances the test was composed of a mixture of both, and sometimes of the frustules of *Navicula pusilla* (mihi) only, with the endochrome still in them. Thus, as we have now seen, these animals avail themselves of much variety in the material of their covering, although grains of sand, and especially of colourless hyaline quartz, seem to be preferred.

Arcella, Ehr.

Arcella vulgaris, Ehr. Pl. II. fig. 14.

Among the figured specimens of this Rhizopod and its varieties are the largest that I have seen; and in the horizontal view of the depressed form will be observed the double nucleus, viz. one situated diametrically opposite the other. This occurs also in all the varieties; and I wonder that no allusion has been made to the circumstance by other authors who have written on this Rhizopod, especially since my figure illustrating the fact was published in 1856 (Annals, ser. 2. vol. xviii. pl. 7. fig. 79). I think that I have found specimens with only one nucleus, but certainly none with "twelve or fifteen," as stated by Auerbach and repeated by Claparède and Lachmann (p. 445). But I have figures of specimens, observed in the island of Bombay, containing even more than this number of what appear to me now to have been "reproductive cells" analogous to those which

I have described in *Amœba princeps*. In a figure of *A. vulgaris* which was active, there are twenty-one of these cells represented; and in another of the facetted variety (*A. angulosa*, Ehr.), which was passive, these cells are all gathered up into the body of the animal, which has thus assumed a compressed circular form corresponding with that of the interior of the test, and in this state much resembles the condition of *A. princeps* when the body, filled with reproductive cells, has become almost effete and barely forms more than a protective covering to them. (Annals, ser. 3. vol. xii. pl. 3. fig. 4). *Euglypha alveolata* is also represented in a similar state (Annals, ser. 2. vol. xviii. pl. 5. fig. 26). Hence I think it possible that the authors above mentioned may have mistaken these cells for nuclei; at the same time, the apparent areolation of the nucleus, which arises from the circular semi-opake nucleolus being much smaller than the more transparent nuclear cell, is at the same time as characteristic of the nucleus as it is distinctive of it from the "reproductive cell," which has no areolation. It is, however, possible, as I have inferred in *A. princeps*, that these cells may arise from a division of the nucleus; and this, if I am right in my conjecture, may have led to their having been called nuclei.

The depressed, arched, elevated, and facetted forms of *Arcella* respectively, one would have concluded, *à priori*, to have been all variations from one type form, if this had not been confirmed by Claparède and Lachmann (p. 446) through actual observation; and that type form one would further conclude to be *A. vulgaris*, if there were not room for doubt still left respecting the probable passage of the new test produced by the *variety* returning to the original form,—that is, if the sagacious observers just mentioned had not only established that all the varieties which they have mentioned may come from *A. vulgaris*, but also that these varieties never returned to it. Beyond this I have nothing to add to their excellent article on the subject, saving that, if the green colour of *A. viridis*, Perty, should depend upon the presence of chlorophyll-cells, then I think this should be considered a distinct species.

My figures are chiefly intended to bring the principal varieties together, for the purpose of showing their resemblance to each other, the identity in form of their pseudopodia with those of *Difflugia*, and their size relative to the other Rhizopoda which are illustrated with them. They all are as common in the island of Bombay as here on the south coast of Devon.

Arcella patens, Clap. et Lachm. (p. 446, pl. 22. fig. 7).

This species (very like Ehrenberg's *Pyxidicula operculata*, tab. x. fig. 1, and placed by this illustrious microscopist among the Diatomaceæ) stands figured in different parts of my journal since 1855, as it is found in the island of Bombay, and now copied into Plate II. fig. 15. Its diameter there does not exceed the $\frac{1}{1200}$th part of an inch, which is less than half the size of the species found near Berlin by Claparède and Lachmann; but, like that, the test is hemispherical, open below, and the nucleus and vesicula single; while, unlike it, the test of the Bombay specimens is light-brown or fawn-coloured. Portions of food were observed in it; and I think the pseudopodia were more pointed than those of *Arcella vulgaris*—thus more resembling those of *Amœba*. It was found abundantly in fresh water, creeping over filaments of *Spirogyra* and *Cladophora*. I have not yet met with it on the south coast of Devon.

One of the figures in my journal is subspherical, apparently in preparation for forming a new individual by duplicative division, and thus represents the new half a little less in size, and much lighter in colour, than the older one,—which not only makes it resemble the *Pyxidicula* (*c*) figured by Ehrenberg under a similar condition, but also the globular frustules of the chain-like Diatomaceæ (e. g. *Melosira*) when, under division, their hemispherical form is supplying the new half. I think, by and by, much alliance will be found to exist between the Rhizopoda and the Diatomaceæ.

Euglypha, Duj.

Euglypha compressa, n. sp. Pl. I. fig. 13.

Test ovate, compressed, convex, more or less expanded laterally, terminating in a sutural edge all round, except at the aperture, which is 10–12-denticulated; composed of elongated hexagonal scales in juxtaposition, except at the aperture, where their free ends are pointed; furnished with about twenty hairs or spines irregularly scattered along a little more than the posterior half of the sutural line. Animal occupying the whole of the test, except towards the centre, where it is constricted, and thus forms a line of demarcation between the anterior opake portion, which contains the food, and the posterior or transparent one, which contains the nucleus together with a great number of colourless cells. The latter, globular in figure, with strongly defined edge, appear to be the "granules." Vesicula in plurality, situated opposite the constricted portion of the body.

Hab. Heath-bog water. Progression erect, or with the aperture downwards. Locomotion and capture of the food performed by pseudopodia, which are straight, attenuated, ray-like, and of variable length.

Size. Length $\frac{1}{217}$th, breadth $\frac{1}{246}$th, thickness in the middle $\frac{1}{569}$th, aperture $\frac{1}{925}$th, body-scales $\frac{1}{2114}$th long by $\frac{1}{3700}$th of an inch broad.

Loc. South coast of Devon, Budleigh-Salterton.

Obs. Of this Rhizopod I have only found two specimens, one a little broader and shorter than the other. It strictly agrees with *Euglypha alveolata,* as may be seen by my figure of the latter (Annals, ser. 2. vol. xviii. pl. 5. fig. 25), in the essential features of the genus, but differs from it specifically in its compressed form (after which it has been designated), its sutural edge, restriction of the hairs to this line, and in the figure of the scales.

Euglypha alveolata. Pl. II. fig. 17.

The accompanying figure of this species is to show that it may possess at least twelve hairs scattered over the posterior part of the test, or in a variable number down to their complete absence; also to show that the body-scales of the specimens here found are circular and overlap each other, giving the area an hexagonal form, and not an oval one, as that of the scales of the specimens found in the island of Bombay, to the illustration of which I have just referred; further, that the pointed ends of the scales around the aperture present serrated edges under a high power, that is, under a $\frac{1}{8}$th-of-an-inch object-glass.

Cyphoderia, Schlumberger (mihi)*.

Cyphoderia margaritacea, Schlum. Pl. II. fig. 18.

This, although extremely common here (south coast of Devon), I have never met with in the island of Bombay. It has been figured to show how far it agrees and how far it differs from *Euglypha.* The test varies in form occasionally by the presence of a diverticulum posteriorly, which is more or less extended, as in *Difflugia acuminata,* and which I have never seen in *Euglypha.* During progression, the test is inclined, corresponding with the oblique direction of the aperture, which, in all the testaceous Rhizopoda when in motion, is brought into parallelism with the plane on which they may be creeping, and thus determines the position of the test under these circumstances. The scales of the body are more or less regularly hexagonal and in juxtaposition, but not denticulated (as in *Euglypha*) at the aperture, which, in *Cyphoderia margaritacea,* presents a beaded edge, *c.* But it is not until we come to the pseudopodia that we find any very marked difference between this genus and *Euglypha,* and here only in their length, branched condition, the rapidity with which they are projected (more resembling those of *Trinema acinus,* Duj. = *Euglypha pleurostoma,* Cart.), and the peculiar

* See description *ap.* Pritchard, p. 557, ed. 1861.

manner in which they are suddenly retracted, with or without the prehension of a particle of food—the latter seemingly produced by the distending power which kept the semifluid sarcode in a ray-like form being suddenly withdrawn, when the sarcode, accumulating into a kind of drop at the end of the filament, incepts the particle of nourishment, and gradually, by amalgamative union, withdraws it and itself into the body of the animal.

Interiorly the body so strictly accords with that of *Euglypha* that I have assumed that the vesiculæ (which I have not yet seen in *Cyphoderia*) are in like manner situated opposite the constriction (for the convenience of emptying themselves there?), and therefore have provisionally placed them in this position in the figure. In the posterior translucent part, which contains the nucleus and "granules," the latter will be observed to be oblong or elliptical, and not globular as they are in *Euglypha compressa*.

The two figures of the test (*d, e*) on a smaller scale are given respectively, to show the acuminated variety, and for comparison in size with the rest of the figures.

Sometimes the animal, instead of extending back to the posterior extremity of the test, is attached, a little distance from it, to the upper limb by a digital prolongation, in which I have seen a contracting vesicle fill and discharge itself.

The largest specimens that I have met with have been about $\frac{1}{200}$th of an inch long, $\frac{1}{600}$th broad, the aperture $\frac{1}{1480}$th by $\frac{1}{2466}$th, and the scales $\frac{1}{16000}$th in diameter.

A marine species (specimen?) has been described by Prof. Schultze under the name of *Lagynis Baltica*, out of which he has made the genus *Lagynis* (Organ. der Polythal. p. 56, tabb. 7 & 8. fig. 1).

ACTINOPHRYS, Ehr.

Actinophrys paradoxa, n. sp. Pl. II. fig. 20.

Polymorphic; surface even, or furnished with capitate and actiniform tentacula, separately or together; capitate tentacula short, numerous, forming a villous surface over the body, retractile or extensile; actiniform tentacula few in number, long, radiated, and much larger than the rest. Incepts crude material for food. Neither nucleus nor contracting vesicle seen.

Hab. Common in the freshwater tanks of the island of Bombay, from April to June inclusive.

Size. About $\frac{1}{500}$th of an inch in diameter.

Obs. This species has been designated from its changeable form—viz. at one time appearing without any tentacula, and at another with one or both kinds present. Figs. *a, b, c* represent changes of form successively seen in the same individual; and *d* is assumed to be the same species, with the tentacula in a capitate form and of various lengths, the capitate portion not being so distinct in *b* and *c*, where these tentacula are but just put forth beyond the body. But that it incepts crude food, I should have considered it an *Acineta*. I have not seen this Rhizopod in England.

It is right, however, to add that the same form, and undergoing the changes above mentioned, once occurred in company with that peculiar cyst of *Acineta* which is surrounded by transverse circular ridges, out of one of which cysts I have (*p, m*) figured, *doubtfully*, its exit. But, be this as it may, the specimens contained no crude food, and were more or less densely charged with the granules so characteristic of *Acineta*. Can it be that this Rhizopod, after all, is an *Acineta* which both lives on suction through the capitate bulbous tentacula and on crude food, like *Actinophrys*, as the occasion may require?

Actinophrys Eichhornii, Ehr. Pl. II. fig. 21.

Of this Rhizopod I only met with two specimens in the island of Bombay, of the size given, in eight years, in different localitities and at a long interval of time, both in fresh water. The first had no pseudopodia, but presented the vesicula in plurality and in the forms given in the figure (*f, f*), as well as the cell (*g*) supposed to be the nucleus. Both specimens contained much crude food, and the last specimen seen was more or less scattered over with actiniform tentacula. In each instance, the body was filled with a parenchyma consisting of vacuoles suspended in granular sarcode. The vacuoles appeared to be spherical in their primary form (*c*), and each contained granules in active motion, while the granular sarcode alone was projected into the form of tentacula, which bore with them a covering of the plastic investing membrane, as represented in the drawing (*a, a*). The vesiculæ made their appearance between the surface of the parenchyma and the investing membrane, and, bursting through the latter, were followed by protrusion of the parenchyma, as shown at *e*. Each specimen was about $\frac{1}{50}$th of an inch in diameter; and that figured is drawn upon the same scale as most of the other delineations, viz. $\frac{1}{6}$th to $\frac{1}{830}$th part of an inch.

Fig. 22 (whose body was only $\frac{1}{600}$th of an inch in diameter, but contained vacuoles similar to those of *A. Eichhornii*, was in the same basin with and was probably only a small specimen of it) presented on different parts of its actiniform tentacula little globules, apparently of the substance of which the investing membrane is composed. In the same basin was also an *Actinophrys* in which all the tentacula radiated from one point of the body (*Plagiophrys sphærica*, Clap. et Lachm. p. 454?), and also many specimens of *A. oculata*, Stein (mihi), in aggregated masses of nine or more individuals held together by their united sarcodes, in the midst of which were spaces containing large cells of homogeneous, semiopake, colourless matter, like those of the marine species figured by Stein: but of this gregarious form I hope to write more hereafter.

Figs. 23 & 24 represent yet two more species (or, perhaps, varieties) of *A. Eichhornii*. In both, the plastic investing membrane is seen to be carried out in an arachnoid form beyond the body; but in fig. 23 only was the nucleus and a portion of crude food observed; while in the two specimens of fig. 24 seen (one with and the other without the arachnoid expansion) there was nothing, according to my notes, but colourless granules. Hence this, with the capitate tentacula, makes it look like *Acineta*; but its general appearance, and the probability that the hastiform extremities of the tentacula are merely accumulations of the plastic investing membrane, incline me to the side of *Actinophrys*.

Acanthocystis, nov. gen.

Acanthocystis turfacea, n. sp. Pl. II. fig. 25.

This species is described at p. 263 of the 'Annals' (ser. 3. vol. xii.) and fully illustrated in Pl. II. fig. 25, &c., while a detailed account of the illustrations will be found in the 'Explanation' to the plate. I have nothing more to add here to my description, except that, if *A. viridis*, Ehr., be *A. brevicirrhis*, Perty, coloured by chlorophyll, as suspected by Claparède and Lachmann (p. 452), then the description of the latter given at p. 450 makes it also very like *Acanthocystis turfacea*; but the two descriptions will be found to be by no means identical.

EXPLANATION OF THE PLATES.

N.B. The *tests* in Plate I. figs. 1, 5, 7–11, 12*g*, 13*f*, 14 *a, g, i, l, m*, and 26, and in Pl. II. figs. 15 *g*, 16, 17, 18 *d, e*, and fig. 21, are all drawn upon the scale of $\frac{1}{6}$th to $\frac{1}{850}$th of an inch, in order that their relative sizes may be seen.

All the figures are, of course, more or less diagrammatic, for the purpose of description; but nature has been departed from as little as possible.

Plate I.

Fig. 1. *Difflugia pyriformis*, Perty (mihi), magnified: *a*, test; *b*, grains of hyaline quartz; *c*, pseudopodia; *d*, diaphane; *e*, dentiform attachments of the same to the test; *f*, sarcode; *g*, chlorophyll-cells; *h*, food; *i*, nucleus; *k, k*, vesiculæ or contracting vesicles; *l*, acuminated variety of test; *m*, pyriform variety.

Fig. 2. The same, spheruliferous nucleus of: *a*, nucleolus; *b*, imaginary section of the same; *c*, central cavity; *d*, layer of nuclear protoplasm bearing the spherules; *e*, nucleolus, with layer of granules and central cavity; *f*, chlorophyll-cells; *g*, starch-granules. All these figures are greatly magnified.

Fig. 3. The same, effete nucleus of the colourless specimens, after the spherules have passed into the body of the animal: *a*, flocculent matter, the remains of the nuclear protoplasm in which the spherules were suspended; *b*, nucleus, with layer of granules and central cavity still remaining; *c*, granuliferous cells (originally the spherules of the nucleus, which have now passed into the *body* of the animal) undergoing multiplication by duplicative division; *d*, starch-granules. All greatly magnified.

Fig. 4. The same: *a*, granuliferous cells after they have passed from the animal into the watch-glass, now become ciliated; *b*, small *Amœbæ* which also appear in the watch-glass. All greatly magnified.

Fig. 5. *Difflugia compressa*, n. sp., magnified: *a*, broad side of test; *b*, grains of hyaline quartz-sand; *c*, narrow side; *d*, grains of quartz on the same; *e, e*, pseudopodia; *f,f*, dark collar-like mark at the base of the neck of the test; *g, h, i, k*, dotted lines showing respectively varieties in the form of the test; *l*, aperture of the circular variety. It should be remembered that the grains of quartz, &c., are only partially delineated over the test, to save trouble in the engraving.

Fig. 6. The same, spheruliferous nucleus of; the spherules more or less granuliferous: *a*, nucleolus; *b*, brown cells; *c*, *yellow* oil-globules; *d*, starch-granules; *e*, reproductive cells; *f*, one under the effect of iodine, showing that it is granuliferous, and not homogeneous like the starch-granule under the same circumstances. All greatly magnified.

Fig. 7. *Difflugia urceolata*, n. sp., magnified: *a*, grains of quartz; *b*, pseudopodia; *c*, reproductive cells; *d*, oblong colourless cells or bodies (the "granules"?). The two latter much more magnified than the test.

Fig. 8. *Difflugia aculeata*, Ehr.; magnified under surface: *a*, grains of hyaline quartz; *b*, aperture; *c, c*, spines; *d*, lateral view of the same, showing a different arrangement of the spines; *e*, minute pieces of straight filaments, sometimes substituted by the animal for grains of sand; *f*, pseudopodia; *g*, oblong variety, without spines—under surface; *h*, lateral view of the same; *i*, circular variety, with spines all round.

Fig. 9. *Difflugia spiralis*, Bailey (mihi); magnified lateral view: *a*, test; *b*, grains of hyaline quartz; *c*, posterior view; *d*, short filaments arranged parallel to each other, but in a tortuous form, substituted for grains of quartz.

Fig. 10. *Difflugia* ——? magnified. Test empty; animal not seen.

Fig. 11. *Difflugia* ——? magnified; colourless: *a*, pseudopodia.

Fig. 12. *Difflugia peltigeracea*, n. sp. (provisionally so named), magnified; scale $\frac{1}{12}$th to $\frac{1}{3700}$th of an inch: *a*, test; *b*, form of scales; *c*, body of animal in a passive state; *d*, nucleus; *e, e, e*, portions of food; *f*, fibrous matter forming a kind of diaphragm; *g*, another form of the same on the scale of $\frac{1}{6}$th to $\frac{1}{830}$th of an inch (for comparison in size with the rest of the tests on this scale).

Fig. 13. *Euglypha compressa*, n. sp., magnified; scale $\frac{1}{12}$th to $\frac{1}{3700}$th of an inch: *a*, broad side of test; *b*, scales near aperture; *c*, the same, a little further back; *d*, spines; *e*, narrow side; *f*, broad side, on the scale of $\frac{1}{6}$th to $\frac{1}{830}$th of an inch (for comparison) *g*, pseudopodia; *h*, body of the animal; *i*, nucleus and nucleolus; *k*, "granules," (?) *globular* in shape; *l*, *l*, vesiculæ *in situ*.

Fig. 26. *Difflugia elliptica*, n. sp., provisionally so named: *a*, broad side of test; *b*, posterior extremity viewed from above, showing its compressed form; *c*, pseudopodia. Indian specimen.

Plate II.

Fig. 14. *Arcella vulgaris*, Ehr., magnified: *a*, test; *b*, form of plates; *c*, aperture; *d*, animal attached to the test by dentiform processes; *e*, *e*, the two nuclei situated opposite each other; *f*, vesiculæ in great plurality; *g*, lateral view; *h*, form of pseudopodia; *i*, lateral view of more elevated variety; *k*, pseudopodia; *l*, horizontal view of facetted variety; *m*, lateral view of the same.

Fig. 15. *Arcella patens*, Clap. & Lachm. (mihi), magnified: *a*, under surface of test; *b*, body of animal; *c*, nucleus; *d*, vesicula; *e*, upper view; *f*, lateral view; *g*, size of test on the scale of $\frac{1}{6}$th to $\frac{1}{830}$th of an inch (for comparison).

Fig. 16. *Difflugia Bombayensis*, n. sp., magnified: *a*, grains of quartz; *b*, cancellated structure of the test beneath, in circles; *c*, pseudopodia.

Fig. 17. *Euglypha alveolata*, Duj., magnified; furnished with twelve hairs: *a*, form and arrangement of body-scales, more magnified; *b*, serrated edges of apertural scales, as seen under $\frac{1}{8}$th-inch focus. *Loc.* South-east coast of Devon.

Fig. 18. *Cyphoderia margaritacea* (Schlumberger), magnified, on the scale of $\frac{1}{12}$th to $\frac{1}{3700}$th of an inch: *a*, test; *b*, form of scales; *c*, beaded form of apertural margin; *d*, test less magnified, viz. on a scale of $\frac{1}{6}$th to $\frac{1}{830}$th of an inch (for comparison); *e*, ditto, acuminated variety; *f*, *f*, pseudopodia, more or less branched; *g*, *h*, forms under retraction, the latter incepting a particle of food at its extremity; *i*, body of the animal, containing fragments of nutritious matter in progress of digestion; *k*, nucleus, surrounded by *l* oblong "granules" (?); *m*, vesiculæ opposite the constriction of the body, situated as in *Euglypha* (assumed position).

Fig. 19. *Amœba monociliata*, n. sp., magnified; under two different forms: *a*, cilium; *b*, villous appendage on posterior extremity.

Fig. 20. *Actinophrys paradoxa*, n. sp., magnified: *a*, simple form; *b*, the same, covered with capitate tentacula, the capitate portion not visible, probably from their shortness and evenness in length; *c*, ditto, with both capitate and actiniform tentacula; *d*, ditto, with the capitate portion now become visible, and these tentacula of different lengths. The figures *a*, *b*, *c* represent changes witnessed successively in the same individual; *d* represents another individual, assumed to be of the same species, with the capitate cilia fully developed: this is the commonest form, perhaps because most easily recognized.

Fig. 21. *Actinophrys Eichhornii*, Ehr., magnified; scale $\frac{1}{6}$th to $\frac{1}{830}$th of an inch (for comparison): *a*, *a*, investing membrane seen extending up the actiniform tentacula, also covering the contracting vesicles; *b*, vacuoles with which the body is densely charged; *c*, the same, more magnified, showing the granules within their interior, which are so remarkable for their active motion (probably owing to that of the protoplasm in which they may be suspended); *d*, actiniform tentacula, formed of the granular protoplasm of the parenchyma *only*, but sheathed apparently throughout with the investing membrane (I did not see any of the vacuoles in the granular protoplasm of even the largest tentacula); *e* represents a portion of the parenchyma which appears to protrude after rupture of a contracting vesicle (thus apparently showing that the fluid contents of this organ are expelled externally); *f, f,* vesiculæ or contracting vesicles; *g*, nucleus? *h*, bodies like the "reproductive cells;" *i*, portions of food in process of digestion, among which is a rotiferous animalcule; *k*, a tentaculum, truncated in the drawing only. N.B. The body has not been filled up with the vacuolar parenchyma, nor have the actiniform tentacula been scattered over it, as in nature, to save trouble in the drawing, &c.

Fig. 22. The same, magnified small specimen of (?), with the actiniform tentacula bearing little pellets of the investing membrane (?).

Fig. 23. The same; another specimen (?), where the investing membrane is carried out by the tentacula into an arachnoid form; the body presenting the nucleus and a portion of crude food.

Fig. 24. The same; another specimen (?), where the investing membrane has not only been carried out into an arachnoid form, but apparently has also assumed a hastate form at the ends of the tentacula respectively.

Figs. 22–24 are drawn upon no scale, but in body may be set down as about $\frac{1}{500}$th or $\frac{1}{600}$th of an inch in diameter respectively.

Fig. 25. *Acanthocystis turfacea*, n. sp. et gen., magnified; on the scale of $\frac{1}{12}$th to $\frac{1}{3700}$th of an inch: *a*, body; *b*, minute, curved, fusiform spicules covering the capsule; *c, c, c,* forked spines; *d, d, d,* tentacula, granuliferous; *e*, nucleus; *f*, vesicula discharging itself; *g*, chlorophyll-cells; *h*, starch-granules; *i*, a spine, more magnified; *k*, proximal or discoid end; *l*, distal or forked end; *m*, more magnified representation of a fusiform spicule.

IV.—*On the Animal and Affinities of* Fenella; *with a List of the Species found in the Seas of Japan.* By Arthur Adams, F.L.S. &c.

In the 'Annals' for 1860 I described some exquisitely sculptured little shells under the common appellation of *Dunkeria*, a form of Pyramidellidæ separated by P. P. Carpenter from *Turbonilla* on account of their convex whorls. At Takano-Sima, on the East coast of Niphon, I afterwards discovered the animal of my genus *Fenella* (by mistake printed *Finella* in the 'Annals' for 1860), and found it to possess all the characters of a Rissoid. A comparison of my *Dunkeriæ* and *Fenella pupoides* has convinced me that they all belong to the same Rissoid group.

The species I examined was the original type, *Fenella pupoides*, A. Ad. It occurred in tolerable abundance on a sandy-mud bottom, in 2 fathoms water, at Takano-Sima. The head is broad, dilated, and flattened; the muzzle large, long, annular, and of a pale brown colour, edged with white. The tentacles are small, filiform, wide apart, and of an opake-white colour. The eyes are small, black, and sessile, in the centre of white spaces on the sides of the head, behind the bases of the tentacles. The foot is