the apex, thence more abruptly narrowed, apex briefly and obtusely truncated; lateral carinæ sharp and smooth, surface faintly punctured towards the base, and covered besides with minute setiferous punctures, clothed with tawny pile, much spotted and patched with black, the apical region on each elytron being occupied by a large clear black spot margined with ashy. Body beneath ashy tawny. Legs blackish, with scant tawny clothing; tibiæ ringed with ashy; tarsi with the two basal joints grey.

♂ Coxæ and breast densely hairy, as also (in well-developed examples) the middle of the abdomen. Terminal abdominal segment with ventral plate sharply notched, dorsal moderately so. Fore and middle tarsi dilated and fringed with hairs.

Also found on the banks of the Cuparí. M. Bar has since met with it in the interior of French Guiana. The species, although having an elongated form of body like the *Colobotheæ*, does not offer the peculiar facies of that genus, owing to the different shape of the apex of the elytra.

[To be continued.]

III.—*Histological Researches on the Formation, Development, and Structure of the Vegetable Cell.* By Prof. H. Karsten.

[Continued from vol. xiii. p. 485, in which volume the Plate will be found.]

§ VIII.

Conditions of growth of *Spirogyra.*—Endogenous cell-tissue of the joint-cells, consisting of chlorophyll-vesicles and colourless secretion-cells.—Celluline present in the latter as well as in the mother cell, but consumed in the course of vegetation.

The species of the genus *Spirogyra* are usually adduced by the supporters of Mohl's theory of cell-development, together with *Cladophora glomerata,* as indubitable examples of cell-multiplication by constriction.

The difficulties attending the cultivation of these plants, together with the great delicacy and ready destructibility of the membranes of their endogenous cells, are without doubt the reason that hitherto, notwithstanding the very simple and regular structure of the plants, the presence of these cells has not been recognized; and still less has a complete knowledge of their course of development and of the production thereby of the septal walls been attained, as these cells, on account of the great sensibility of the plant to slight changes in the influences of external agents, can usually be observed directly in their growth only for short periods.

Moreover the *Spirogyræ*, like many, if not all, of their allies, are apparently incapable of assimilating pure inorganic matters alone: they appear to require for their nutrition soluble organic compounds.

If a *Spirogyra* be allowed to grow for a considerable time in pure water, free from organic compounds and from dead or dying organisms, and its joint-cells be measured from time to time, these are found to undergo an unusual increase in length, and sometimes a certain augmentation also in width. At the same time the circular bands of chlorophyll diverge and become more oblique; their extremities, which were situated in the vicinity of the septum, or even bent inwards towards its central point, are gradually removed more and more from the septum. These extrèmities, and at length the chlorophyll-bands in their whole length, lose their spiral direction and become almost straight. The number and size of their component vesicles appear at first to augment, but subsequently they decrease, and in the end completely vanish. The same happens also with the nucleus. The other contents of the joint-cells grow more transparent and hyaline.

But if a small quantity of the mucilaginous juices of the same species or of some other Conferva be added to the water wherein the starved *Spirogyra* is placed, a new vital energy manifests itself, and many or all the joints are found in a short time divided by a tranverse septum into two; or, at least, this fission-process is in operation (Pl. VII. figs. 58–61 exhibit this condition after the action of endosmotic fluids). This process is repeated again and again, when the necessary supply of nitrogenous organic matter is afforded. The spiral bands of chlorophyll in the joint-cells also pursue a less oblique direction, and are so closely approximated and compressed that it is difficult to follow their course.

Nevertheless it would seem that these plants can be submitted to starving only to a certain degree, and afterwards be capable of renewing the act of cell-formation—a process which is evidently completely arrested when azotized matters are absent from the water in which they grow. Under this latter condition no growth proceeds, save in the membranes of the already existing joint-cells, their interior becoming simultaneously deprived of all secretion-matters, and especially of such as are nitrogenous in character. The chlorophyll-bands, which are stretched out quite straight when all the endogenous cells are absorbed, take on a more and more crooked direction between the inner surface of the mother cell and the outer wall of the daughter cells in proportion as the latter, departing from an ellipsoidal, approximate to a spherical figure.

An increase or a decrease in the number of bands of chlorophyll is not caused by the change of the nutrient fluids, although they are not quite constant in adjoining joints of the selfsame individual plant when in a normal state of nutrition; nay, even in the same joint-cell of *Spirogyra quinina,* one half is occupied by one and the other by two bands of chlorophyll.

The structure of these chlorophyll-bands, however, varies, as well as their disposition on the cell-wall. It is also dependent on the nature of the nutritive material and on the phase of development of the joint-cell, in the same way as the other organized contents of its interior.

The contents of the joint-cells of *Spirogyra* are commonly described as a fluid matter surrounded by spirally twisted bands of chlorophyll, to which, at the centre of the cell, a nucleus is suspended by means of mucous threads.

This interpretation of the structure of *Spyrogyra* labours under the same defects as the one heretofore entertained with respect to *Cladophora,* as a few experiments will prove.

In the joint-cells of *Spirogyra* we find, even with more distinctness than in those of *Cladophora,* secretion-cells of different sorts, some filled with colourless fluid occupying the central space of the cell, and others containing a greenish mucus deposited on the surface in the form of the so-called chlorophyll-bands.

The spiral bands, which are usually channelled, sometimes furnished with a median rib or keel and often with a dentate margin, are produced, according to Kützing (Phycologia Generalis, 1843, p. 275), by the laceration of a gonimic substance at first deposited on the tender growing cell in a homogeneous manner, the laceration being due to a rapid extension and growth of the cell.

Mohl (Vermischte Schriften, 1845) likewise attributes the spiral hands of *Spirogyra* to the division of formless chlorophyll composed of a delicate green jelly-like substance.

My first investigation (Wiegmann's Archiv, 1843) of the production of these chlorophyll-bands in the elongated extremities of the cells of *Spirogyra* led me to believe that they originated from cells the membranes of which became condensed around a mucoid yellowish mass, enclosing a nuclear vesicle, and that the cells so formed proceeded to elongate, whilst their mucoid contents acquired a green colour and arranged themselves with the existing spiral bands. The former part of this hypothesis is erroneous, partaking as it does of the erroneous views respecting cell-formation then prevailing. A year afterwards I pointed this out, and maintained then, as now, that the membrane did not form around the mucus, but was present from the first, investing the colourless and rather turbid mucus, which, as the cell-wall increased in thickness, acquired first a yellow and subsequently a green hue, a new vesicle in the mean time being developed in the centre of the cell.

Kützing's hypothesis receives support from, and was probably based upon those varieties in development in which the chlorophyll-bands are in close apposition and not very oblique in direction, as seen in figs. 69 and 70, representing the *Spirogyra orthospira*, Nägeli (?) (*S. majuscula*, Kützing ?). In these examples the recognition of the limits of the several bands, and of the untenability of this view; is difficult, but it may be attained by the observation of the further development.

On cutting through a joint-cell, as shown in figs. 70 and 72, and observing the contents as soon as possible after the water first begins to act upon them, we see, according to the phase of development of the joint-cell, the extrusion from the interior of a number of larger or smaller hyaline cells; the chlorophyll-bands usually break up into several elongated or spherical cells, which swell up more or less rapidly, display one or several very thick-walled starch-vesicles imbedded in the green mucoid contents, and, on fully emerging from the joint-cell into the water, suffer collapse. On the contrary, the mucoid mass which invests the hyaline cells resists the solvent action of the water.

Some of the colourless cells are usually very much larger than the rest, two or four such being, as a rule, present in each joint-cell, one or two lying on either side of the cell-nucleus. Betwixt these, surrounding the cell-nucleus, are placed the smaller and similar cells. These structures are, in rarer instances, found at the ends of the cells near the septum (fig. 72).

In those species in which the nuclear cell multiplies simultaneously with the formation of new joint-cells, as in *Spirogyra nitida*, *S. orthospira*, &c., only one of these non-nuclear endogenous cells is enlarged on either side of the cell-nucleus; whilst in those other species, where the nucleus is little developed, two such endogenous cells are mostly to be seen on either side of it.

In fig. 72, one of these large colourless cells has been destroyed in making the section through the uppermost joint-cell in the vicinity of the septum; but the second has been considerably extended, and the smaller hyaline cells, which originally occupied the centre of the joint-cell, have been displaced by it.

The water also acts similarly, although more gradually, upon the cell next to that which has been cut through, no doubt by penetrating through the exposed septum (figs. 71 and 72). In the corresponding cell (fig. 72) one of the two large colourless cells has protruded itself at each side of the joint near the septum from beneath the chlorophyll-bands, which previously concealed them; the chlorophyll-bands are accumulated in the middle of the joint-cell, and indeed broken up into distinct small cells containing starch and chlorophyll-vesicles.

In the next joint-cell beneath, still almost unchanged, the two colourless cells (vesicles) are seen to be scarcely more distended than in the normal condition; the cell-nucleus lies between them, surrounded by smaller hyaline colourless vesicles. The chlorophyll-bands are unchanged. A similar phase is shown in fig. 64, in *Spyrogyra princeps* (*S. nitida*, Kützing).

In *Spirogyra? orthospira*, the chlorophyll-bands are always more delicate than in most other *Spirogyræ*, and are, under similar conditions, more easily broken up into their component parts. In the other species, one of these bands not unfrequently continues entire, and, whilst more or less outstretched, swells up in a saccular form, the keel-shaped thickened portion spreads out, and the starch-corpuscles, that have heretofore appeared only to adhere to the chlorophyll-bands, are then seen to be contained within the interior of the cylindrical sac so produced.

These phenomena suggest the inference that the common envelope of the chlorophyll-layer of *S. orthospira* is very thin-walled and breaks down in water, whilst the enclosed vesicles and cells possess a membrane that can resist the destructive action of the water for a longer period, and by endosmosis undergo great expansion; that, on the other hand, in other species of *Spirogyra*, in *S. decimina*, *S. princeps*, *S. quinina*, &c., the secretion-cells are enclosed by a stronger and more resistant envelope united with the chlorophyll-sac. These bodies contained within the chlorophyll-sac undergo, like a tissue-cell, the most varied endogenous development: at first only chlorophyll-vesicles, but at length thick-walled starch-corpuscles, of which in many cases only the outer enlarged envelopes finally remain, are aggregated together in the sacs like Conferva joint-cells. This intimate study of the cycle of forms these chlorophyll-sacs of the species of *Spirogyra* pass through is a necessary preliminary investigation towards a thorough apprehension of the mode of development of joint-cells.

The membrane of the secondary joint-cell is not apparent in the example shown in fig. 72; it would seem to have swollen up and to have melted away in the water at the cut end; perhaps it was in that stage of chemical metamorphosis which precedes the thickening (lignification). In the specimen represented in fig. 70, it is seen contracted upon the enclosed cell-structures; the one small twin-cell still existing here is thus covered by the chlorophyll-sacs, and hangs as by a thread to the septum of the cell, where the primary cell-membrane is still adherent to the secondary.

If a vigorously growing *Spirogyra*, after the first operation of the diosmotic fluid has effected the complete separation of the secondary cells from the membrane of the primary, be laid in pure water, the secondary cells, with their contained tissue of cells, appear to regain their former position.

If the diosmotic fluid be allowed to effect a complete contraction of the secondary cells, and the surrounding liquid be then rapidly replaced by pure water, the secondary cells do not again expand (either from the entire exosmosis of their contents or from the rupture of their walls), but the non-nuclear daughter cells (vesicles) then break through the membrane of the secondary cell and progressively expand, the larger of them usually again entirely occupying the cavity of the mother cell, and proceed to form a septum at the middle by the juxtaposition of their walls.

In this case the same phenomena occur as mechanical effects which have been observed as the normal process of growth in the continuously developing daughter cells of *Œdogonium*. If the experiment be made with *Spirogyræ* in a state of vegetative repose, in which the endogenous cells are less developed and do not entirely fill the mother cell, then, during the exosmotic contraction of the secondary cell, its membrane is torn completely across in the middle of the two enclosed daughter cells, together with the portion of the chlorophyll-sac which is here situated.

Under such circumstances, moreover, the daughter cells, after the addition of the water, protrude from the spiral sac and those portions of the envelope of the mother cell that covered them, and proceed to expand in the manner described, constituting that condition which has hitherto been erroneously supposed to originate from fission of the secondary mother cells (figs. 78 & 79, from *S. quinina*).

These different diosmotic reactions exhibited by the several nested cells within a joint-cell are probably dependent on the different nature of their membranes, as indicated by their different degrees of thickness and firmness, and probably also on the varying quantity of their component elements, which are cognizable by no chemical distinctions.

Both the primary and secondary cells of a joint-cell, and also the non-nuclear transparent daughter cells, contain a material which is coloured blue like starch by an aqueous solution of iodine, after maceration not only with dilute solution of sulphuric acid or chloride of zinc, but also with a neutral solution of chloride of calcium. In this state it is commonly more or less slightly turbid, like finely divided starch. The contents of the primary cell are often to be seen, soon after the action of the aqueous solution of iodine, precipitated upon the membranes, upon the other cellular contents, and separated from the wall of the primary cell by a colourless hyaline fluid; but by-and-by the gummy-looking substance diffuses itself through the whole fluid intervening between those membranes.

The colourless and non-nuclear daughter cells (vesicles) seem to contain this substance, which is coloured blue by iodine, in the most concentrated form; they are always quite filled with it. Both in them and in the gum-like contents of the mother cell, coloured blue by iodine, we may distinguish, when chloride of calcium has been employed for maceration, delicate vesicles of about the size of the large starch-vesicles which occur in the chlorophyll-sac.

This existence of organized forms as the contents of endogenous cells is of great importance for the right understanding of the nature of this material, which is in some degree similar to cellulose; for, were these vesicles not present (and they are moreover not unfrequently to be distinguished without the preparation above described, particularly within the colourless daughter cells), we should be entitled to assume that the matter interposed between the primary and secondary mother cells was an adherent layer, swollen up and chemically modified by the corroding substances, upon the internal surface of the former or on the outer surface of the latter.

Moreover, if it were impossible to recognize the delicate membrane of the secondary cells within the limits of the contracted chlorophyll-sac &c. after the blue colour fades by the evaporation of the iodine, the blue-coloured mucilaginous mass between the chlorophyll-sac and the primary cell-membrane might be regarded as the membrane of the daughter cell modified in the same way, with some of the vesicles apparently adherent to the chlorophyll-band intermixed with it.

These circumstances favour the notion that these vesicles enveloped in the gummy substance, for which I propose the name *celluline,* outside the secondary cells, are the remains of the contents of the primary joint-cell.

It is probably to the larger or smaller quantity of these contents of the primary cell, as well as to this change in the condition of aggregation of the membrane of the secondary cell, that we must attribute the circumstance that the latter, during the action of diosmotic fluids, such as glycerine and chloride of calcium, often separates with difficulty from the membrane of the primary, and appears to be glued to this as if by a tenacious mucilage.

In many stages of development, however, the membrane of the secondary cell appears indeed to have lost its delicate though firm consistence. In such cases the chlorophyll-layer is found to be surrounded by a thick, almost gelatinous, but viscous layer, capable of being drawn out in threads, which it is often difficult to separate by endosmotic agents from the membrane of the primary cell. In this layer, which likewise exhibits the reaction of celluline, the contracting chlorophyll-sacs leave behind them the impression of their forms as furrow-like depressions (figs. 65 & 66).

This state of aggregation of the membrane of the secondary cell appeared to me to prevail especially among plants whose joint-cells were in process of multiplication.

The *Spirogyra dubia* (Kützing), represented in fig. 62, had been immersed for some time in carbonic-acid water, when the membranes of the secondary cells contracted by the action of a watery solution of iodine, but appeared altered, almost corroded, and in many cells ruptured at the ends during the contraction, by which means the endogenous cells (*a*) were enabled to escape from them. These cells contained a great abundance of the above-described celluline, which acquires a red colour by treatment with glycerine and iodine, and, in the course of the further growth of the plants in water containing carbonic acid, appears to be absorbed.

In those specimens of *Spirogyra* which have grown for a long time in pure water destitute of nitrogenous compounds, the delicate membrane of the secondary cell is completely contracted with much facility by the action of a dilute solution of chloride of calcium, and is seen to contain no endogenous cells except the chlorophyll-sacs. Moreover no celluline is discoverable, although the chlorophyll-sac still usually contains the well-known large starch-vesicles.

The membranes of the several cells are not coloured blue by the reagents above mentioned; and I observed a cellulose reaction in them, as well as in those of *Cladophora*, occasionally only, and as the exception, and then without being able to detect the circumstances upon which this condition of the cell-membrane depended.

It follows distinctly, from what has been stated, that the hypothesis that the joint-cells of *Spirogyra* are filled with a tissue of endogenous cells is perfectly well founded; for mere vacuoles in a mucilaginous material would not at one time enlarge and at another contract by diosmotic agency, nor would they possess special contents, and in these again contain cellular structures.

With respect to the nature of the two sorts of cells existing within the joint-cells of *Spirogyra*, and also with respect to their relative position, there is an analogy with the cells of *Cladophora*; in these latter, however, the distinction is less marked.

In the case of *Spirogyra* no transitional forms are discoverable betwixt the central colourless cells and the peripheral cells or vesicles filled with chlorophyll and aggregated into or contained in a sac. Moreover these two kinds of secretion-cells are met with in all the other Confervaceæ and Desmidieæ, and it is upon their disposition in the mother cells that the peculiar marking of these organisms, which frequently serves for characterizing the genera and species, depends.

But further, these two varieties of secretion-cells occur not only in the tissue-cells of these simple plants, but also in the complex tissue of higher plants, where they take part in the assimilation of nutrient matter derived from without—the one variety, frequently colourless, containing hydrocarbons, the other, usually coloured, filled with nitrogenous compounds.

§ IX.

The structure and development of the nucleus (nuclear cell): its multiplication by endogenous cells.—Circulation of the cell-juices between the secretion-cells from the walls of the mother cell to the nucleus.

Particular attention has always been devoted to the cell-nucleus in the centre of the joint-cell of *Spirogyra,* and in this case, as elsewhere, a particular function in the multiplication of the cell has been ascribed to it.

The production of the cell-nucleus, which, in general, like that of the cell itself, is referred to the division of preexisting nuclei and to their new formation from the contents of the mother cell, and which is supposed constantly to precede the production of the membrane of the developed cells (whether this takes place by constriction of the wall of the mother cell or by free-cell formation in the cell-juice), is ascribed, in the case of *Spirogyra,* to the division of the preexistent nucleus of the mother cell.

As regards the notion of the division of the cell-nucleus, in the first place, the same error prevails in this as with respect to cell-multiplication itself. The existing nucleus is divided neither by the sudden appearance of a delicate membrane stretched across the radius of the nucleus nor by folds growing inwards from its membrane, but by the production of new cells by the side of its endogenous cell, the nucleolus, which under these circumstances itself contains a nucleolar corpuscle, and thus becomes the nucleus of the nuclear cell.

Soon after the first appearance of the daughter cells produced in the lentiform or discoid cell-nucleus, these are found at the side of the original cell-nucleus, arranged in correspondence with the transverse diameter of the joint-cell. In the next stages of development they take up a position in accordance with the longitudinal axis of the cell within the nuclear cell, which has now become globular. A glance at figs. 81 & 83–85 will render this condition quite clear. These are nuclear cells of *Spirogyra nitida*, Kg., such as often occur in cultivated examples of this species, with their membranes distended by the action of water containing carbonic acid.

Fig. 84 shows very distinctly that the new cell-nuclei, which here contain no nucleoli, are enveloped by the outer membrane of the cell-system produced by the development of the cell-nucleus.

In fig. 85 these two new cells (the daughter cells of the entire cell-system) are still more expanded within their mother cell, so that they surround the nuclear cell lying between them, and enclose it with their contiguous membranes (as also in fig. 81).

The nuclear cell, however, still exists uninjured between them, as in fig. 84 (and fig. 83 shows another similar state of development seen from the side), although its absorption now generally begins, and at the same time a secondary cell is produced in each of the daughter cells. The daughter cells, distended by carbonic-acid water, here represented contain as yet no cellular structures, such as are ordinarily present in normally developed cells at this stage of development.

In fig. 81 a normal case is represented; a cell-nucleus is situated in the daughter cell on the wall directed towards the centre of the new joint-cell, as is the rule in *Spirogyra*, and therefore on the side opposite to the original cell-nucleus.

This cell-nucleus of the young daughter cell usually appears, in its earliest grades of development, in the form of a spherical accumulation of mucilage. In this mucilage, however, in other cases, a vesicle may be seen imbedded, and, a little later, one or rarely several nucleoli may be detected.

That the external membrane of the cell-nucleus (which, as already stated, is frequently seen, in some *Spirogyræ*, to be composed of several endogenous cells, and therefore developed into a complete cell-system) may attain, just as in *Œdogonium*, to the full size of the mother cell is shown by states such as that represented in fig. 80, which are met with occasionally, although rarely, in cultivated plants of *Spirogyra*. (Fig. 80 is drawn from a specimen which had lain for some time in carbonic-acid water; and this certainly assisted somewhat in the distention of the cell-membrane, as it also caused the primary membrane of the joint-cell to become particularly prominent.)

Not unfrequently, in a disproportionately long cell, two cell-nuclei occur in the position usually occupied by them when the septum is half or completely lignified, although there is no trace of any such structure. In the middle between these two nuclei the third nucleus, belonging to the system of the mother cell, frequently occurs, all three enclosed within the very long and apparently nearly gelatinous membrane of their common mother cell (the original cell-nucleus), which is distinctly recognizable in a nearly round form in the conditions represented in figs. 83 & 84. This elongated nuclear cell, with its three nuclei, is also apparently attached by mucoid filaments.

This occurrence of several nuclei is to be explained by the deficiency of nitrogenous compounds in the water furnishing their nourishment, as appears from the phenomena of the development of the septum, to be referred to immediately.

In the so-called mucoid filaments which are so distinctly recognizable in many *Spirogyræ,* as for example *S. princeps* (*nitida* and *jugalis,* Kg.), I have observed a movement proceeding slowly from the periphery towards the central nucleus, and this in individuals which had been lying for a short time in water containing carbonic acid, and also in the extremities of strongly vegetating plants.

The mucoid filaments are therefore not solidified cords of plasma, excrescences from the membrane of the secondary cell, a framework for the support of the cell-nucleus floating in the middle of the cell, but a mucilaginous granular fluid, the true cell-juice, the fluid contents of the cell, in and from which the other cellular structures, both the nucleus and the vesicles containing secretion-materials, are developed.

These fluid cell-contents certainly occupy the smallest part of the cavity of the cell, which is almost completely filled by the above-described colourless vesicles (p. 27) (fig. 72), so that they are limited, in the form of a fluid intercellular matter, to the spaces left between them by the latter in cells engaged in rapid vegetation.

Schleiden saw this movement of the cell-juice in the extremities of *Spirogyræ,* and supposed that the same took place in the mucoid filaments, in which it was subsequently observed by Nägeli; Kützing, on the contrary, threw doubt upon it in both cases.

The cause of this circulation of the juice of many vegetable cells is very probably to be found in the concurrent lively but chemically different assimilative energy of the membranes of these tissue-cells and of the secretion-cells (the so-called vacuoles) contained in them.

That the latter are true cells, and not mere water-filled cavities of the mucilaginous cell-juice, I have already endeavoured to prove by their development (De Cella vitali, 1843, pp. 30–34; Bot. Zeit. 1843, p. 457, and 1849, p. 361), and have here demonstrated, I think, as regards those occurring in the Confervæ.

The evident function of these cells, which are constantly engaged in a brisk exchange of materials and in rapid development, is the conversion into new and higher organic compounds, both of the material secreted inwards by the assimilating membrane of the tissue-cells to which they belong, and of that mechanically admitted from the surrounding medium by this imbibitory and diosmotic membrane. In favour of this supposition is the fact that the different vesicles which are enclosed within a single cell contain very diverse materials, usually all quite different from the fluid contents of the cell.

I have already called attention to this circumstance in my memoir 'De Cella vitali' with reference to the development of those vesicles which contain colouring-matter, starch, oil, &c., the cellular nature of which, however, is generally recognized.

But why should the vesicles which contain colourless matters, partly in aqueous solution (sugar, mucilage, dextrine?, celluline, &c.), be regarded as something different from cells? Their membrane has physical properties similar to those of recognized cell-membranes; its development is the same; and it increases in size in the same manner, a mutual relation of its proper augmenting substance to its contents being recognizable.

We are not justified in giving the name of a cell only to those elementary organs whose membrane in a certain state of development exhibits the reaction of cellulose, as indeed is proved by the Confervæ just referred to, even if we leave out of consideration the cells of the animal organism. The idea of the cell is anatomical, and is to be deduced from the mode of development of the organization, and not from the chemical nature of the material of which its membrane is composed.

The transitory cells contained in the tissue-cells undoubtedly serve for the elaboration of all the constituents of the cell-juice (*their* intercellular substance), which they are capable of assimilating; and when they have fulfilled this task, they are themselves in turn liquefied and used as nutriment by other neighbouring similar organizations, or even by the membrane of their mother cell. This product of the solution of these secretion-cells is also carried out from the cell by exosmose (?), and conducted, in the general nutritive fluid, which imbues the intercellular spaces, the outermost membranes in process of resorption, and the intercellular substance of the tissue-cells which is produced from this, into distant parts of the organism, to serve there for the formation and development of new elementary organs.

When we see all these various simple organizations engaged in rapid development and progressive growth at the expense of the fluid cell-contents, we are led to the supposition that, under such conditions, this cell-juice cannot be of exactly the same nature in the different regions of the cell, but that the fluid occupying the periphery of the cell-cavity, and secreted by the assimilative cell-membranes, will be physically and chemically different from that surrounding the vesicles which assimilate the nitrogenous compounds, and, again, that it will be differently constituted in the vicinity of those which appropriate compounds rich in carbon.

It is only by this supposition that a movement of the cell-juice appears to be explicable. This is the movement which was discovered by Corti in 1774, and which we must still regard as wonderful so long as we do not recognize the true nature of the cell-contents, but believe that the cell-juice separates into a denser and a thinner portion, that the latter is diffused through the former in the shape of drops, and that the denser mucilaginous fluid circulates between the watery drops without mixing with them! This would be to transfer to the cell Grew's notion of the structure of the tissue of plants, which, after the lapse of 200 years, has fortunately been overthrown.

There is, however, no doubt that the mucoid filaments by which the nucleus appears to be suspended are the fluid and frequently granularly mucilaginous contents of the tissue-cell, moving gently among colourless, non-nucleated cells. The form of these filaments is therefore equally variable with that of the cells themselves. With the increasing enlargement of the two daughter cells produced in the cell-nucleus, or of the two large colourless secretion-cells from the ends of the cell towards its middle point, this system of filaments changes continually, and thus indicates the changes which are taking place in the otherwise recognizable cells of which they occupy the interspaces.

[To be continued.]

IV.—*Descriptions of Seven new Species of East-Indian Spiders received from the* Rev. O. P. Cambridge. By John Blackwall, F.L.S.

Tribe Octonoculina.

Family Lycosidæ.

Genus Sphasus, Walck.

Sphasus lepidus.

Length of the female ⅓rd of an inch; length of the cephalo-