

of copper sulphate and of sodium chloride, but found no electrification. The present experiments lead to the conclusion that evaporation of fused sodium does not give electrification, such as could be detected by the method used, unless oxidation is going on.

February 15, 1900.

The LORD LISTER, F.R.C.S., D.C.L., President, in the Chair.

A List of the Presents received was laid on the table, and thanks ordered for them.

The following Papers were read:—

- I. "The Genesis and Development of the Wall and Connecting Threads in the Plant Cell. Preliminary Communication." By WALTER GARDINER, F.R.S.
- II. "Photography of Sound-waves and the Kinematographic Demonstration of the Evolutions of Reflected Wave-fronts." By R. W. WOOD. Communicated by C. V. BOYS, F.R.S.

"The Genesis and Development of the Wall and Connecting Threads in the Plant Cell. Preliminary Communication." By WALTER GARDINER, M.A., F.R.S., Fellow and Bursar of Clare College, Cambridge. Received February 1,—Read February 15, 1900.

In the course of my investigations in connection with the forthcoming paper on "The Histology of the Cell Wall with special Reference to the Mode of Connection of Cells,"* certain observations and conclusions concerning the origin and development of the wall-threads and cell-wall have come to light which seem to be of sufficient interest to warrant my bringing them to the notice of the Society without delay.

1. *Origin and Development of the "Wall Connecting Threads."*

The "connecting threads" are found to arise from the median nodes of the fibres of the achromatic spindle. The nodes are either (*a*) all continued as connecting threads, *e.g.*, the endosperm cells of *Tamus*

* 'Roy. Soc. Proc.,' vol. 62, 1897. (Preliminary Communication.)

communis; (b) in part continued, and in part overlaid by superposed lamellæ of cellulose membrane, e.g., the endosperm cells of *Lilium Martagon*; or, (c) all overlaid, e.g., the pollen mother-cells and pollen grains of *Helleborus foetidus*.

2. Origin and Development of the Cell Wall.

(a) *Origin*.—Seeing that spindle fibre nodes (apparently intact) can be recognised in a mature wall of considerable thickness, there would seem little doubt that the existing views with regard to the genesis of the cell plate and first formed cell wall cannot be entirely correct.

I am inclined to believe that the cell plate arises not directly from the spindle fibres, in the manner described by Strasburger and others, but rather indirectly; that is to say, that although it is possibly provided by or even proceeds from the fibres in question, yet it exhibits a certain structural distinction, in that it is pierced by the persistent nodes of the spindle fibres, and is not merged into their substance.

The cell plate would appear to consist of cytoplasm, and cytoplasm, moreover, practically identical with the ordinary cytoplasm of the cell, and from it is secreted the first formed cell wall as an equatorial membrane traversed by the nodes of the achromatin spindle fibres.

(b) *Development*.—There are grounds for regarding the primary cell wall as different in genesis and character from the secondary formations which succeed it and arise from the general cytoplasm. In any case, the wall rapidly grows in thickness as layer after layer of cellulose is deposited. In the course of my work certain observations were made, which appeared to throw some light on the structure and genesis of the wall thus produced. It was found that many walls, and especially mucilaginous walls, when strongly swollen and stained, after passing through the stage of stratification, became resolved into numberless and often well-defined spherical droplets or spherules which not unfrequently exhibit a markedly high refraction, and are embedded in a hyaline and possibly mucilaginous ground-substance or matrix.

I am of opinion that these spheroidal droplets represent swollen granules or spherules, which are practically homologous with the droplets or the drops (and I am disposed to think with the droplets) described by myself and Ito in our paper "On the Structure of the Mucilage-secreting Cells of *Blechnum occidentale*, L., and *Osmunda regalis*, L.," published in 1887 in the August number of the 'Annals of Botany'; and I believe that the phenomena in the two cases of internal mucilage there described, were in essence, instances of internal wall formation, or, in other words, that the formation of the cell wall takes place in a similar way. Moreover, the "mucilage" described by us, both gave the reactions of cellulose, and also exhibited the formation of a firm, clear, and stratified membrane.

In the above paper we compared the droplets of *Blechnum occidentale* with the granules or spherules described by Langley as occurring in certain gland cells, *e.g.*, the mucous cells of the sub-maxillary gland of the dog; and I am still of opinion that such a comparison was a pertinent one, and not entirely without significance in the case of the plant cell wall also.

I am disposed to regard the cell wall as fundamentally of the nature of a mucous or, rather, mucilage secretion; the droplet or spherules (shall I call them provisionally "*teichosomes*"?) being composed of a substance which, when more hydrated, passes as "a mucilage," and when less hydrated functions as "a cellulose." The spherules are embedded in the "ground substance," and possibly the remains of even a protoplasmic framework (which may undergo mucilaginous change) is also present.

I regard stratification as the necessary accompaniment of the rhythmic periods of activity and rest of the secreting protoplasm; and as to the method of secretion, it is *external* and not internal, as in the mucilage cells described by Gardiner and Ito.

The changes incident upon lignification and the like I have always regarded as induced by secondary secretion or post-formation chemical change.

I may add that I see little in the above view of the structure of the cell wall which militates against the facts which we have at our disposal, either with regard to the properties of the cell wall or to the phenomena associated with growth in thickness or in surface.

I am aware that much remains to be done before the above views are placed on a proper basis, but I have great hopes that this is only a matter of time and of further detailed research.

February 22, 1900.

The LORD LISTER, F.R.C.S., D.C.L., President, in the Chair.

A List of the Presents received was laid on the table, and thanks ordered for them.

The following Papers were read:—

- I. "Preliminary Note on the Spectrum of the Corona. Part 2."
By Sir NORMAN LOCKYER, K.C.B., F.R.S.
- II. "On the Structure of Coccospheres and the Origin of Cocoliths."
By Dr. H. H. DIXON. Communicated by Professor J. JOLY, F.R.S.