transverse, while occasionally a sieve-plate may be seen in a lateral wall near the end of a segment. The segments are very variable in length, some being equal to about six cambiform cells while others do not exceed the length of one of these.

A radial section through the peripheral sclerenchymatous band, already referred to (along line *AB*), just where it passes out into the sclerotic sheath, shows about two rows of cambial cells, then from seven to nine sieve-tubes with their companion-cells. These abut directly on the crushed protophloëm-band (*cr*) of the cortical bundle. When a radial section is made through the wood, as the latter projects into the phloëm-mass, there seems to be a larger number of cambiform elements here, and the number of sieve-tubes is often reduced to four or five.

In the part of the section between the bundle and the phloëm can be seen first, a number of large parenchymatous cells, then sometimes a band of sclerotic cells, or of fibres, and occasionally narrow bands of crushed elements. These bands also pass in a very interrupted line round the bundle-ring between the cortical bundles.

In the phloëm itself can be seen a mass of parenchyma with one to four sieve-tubes. Their course here is far more regular than it appears to be in tangential section.

Sections were cut at points between the cortical bundles, but it was not found that sieve-tubes in the normal phloëm were more numerous here than opposite the cortical bundles.

It thus appears that the greater part of the sieve-tube system of the stem is located in the cortical bundles. This fact makes the structure and development of these bundles still more interesting.

J. LLOYD WILLIAMS.

Royal College of Science, London.

THE INFLUENCE OF LIGHT ON DIASTASE[1].—It was shown by Brown and Morris in their researches on the physiology of foliage-leaves that the amount of diastase that can be extracted from foliage-leaves varies considerably in the course of twenty-four hours, being greatest after a period of darkness and relatively less after long illumination.

Marshall Ward has shown again that the solar rays exercise a very

[1] Abstract of a paper read before the British Association at Oxford, August 1894.

destructive influence on certain enzymes that are excreted by various bacteria.

From a consideration of these two facts it seems possible that light may be destructive to the ordinary enzymes of the differentiated vegetable organisms. Some experiments have been made by the writer on this point, and though these are very far from complete the results obtained so far seem to have sufficient interest for them to be communicated to the British Association.

Diastase being an enzyme which is easy of extraction and capable of easy quantitative estimation, has been the one selected. It has been prepared for the experiments from ordinary malt. A series of experiments has also been carried out on saliva.

The mode of experiment has been to prepare some extract of malt by infusing the ground grains with water or salt solution, and to expose half of the quantity to strong light, either solar or electric, for varying times. Then measured quantities of the exposed and of the unexposed halves have been allowed to act upon thin starch-paste (1%) at the temperature of digestion, at about 40° C. or at the laboratory temperature. During the action its progress has been tested from time to time by adding a drop of each digestion to a drop of iodine and noting the resulting colour. When digestion has been well advanced, both tubes have been boiled with excess of Fehling's fluid and the resulting precipitate collected, washed, combusted in a platinum crucible and weighed as Cu O.

The extracts have been kept free from bacteria by using ·2 per cent. KCy as an antiseptic.

The preliminary experiments were made with an ordinary fairly strong extract of malt. Details of three are subjoined.

Experiment 1. Fairly strong malt extract, half exposed in white glass test-tube to sunlight during two days. The other half exposed to same rays, but covered with opaque screen.

Afterwards both tested with starch-paste. When digestion had proceeded for seventeen minutes at temperature 20° C. it was completed in the control-tube, but was incomplete in the one containing the extract that had been exposed to light.

Experiment 2. Weaker extract, exposed to diffused light during five days, receiving during that time about twelve to fifteen hours sunshine.

Subsequent conditions as in experiment 1. The digestion was

completed in thirty-five minutes in the control-tube, but was then incomplete in the other.

Experiment 3. Similar extract. Both exposed to diffused light for eleven days; one tube covered with opaque screen: the two tubes side by side in a beaker of water to ensure uniformity of temperature. After this exposure both allowed to act separately on starch as before. Titrated with Fehling's fluid after forty-five minutes digestion at 40° C.

The digestion with the extract kept in the dark gave a reduction of ·23 gm.; that with extract exposed to light gave only reduction of ·092 gm. Cu O. The quantity of extract alone used in both cases reduced ·083 gm. Cu O. Deducting this from each, D reduced ·147, L only ·009 gm. Cu O; showing a great impairment of the diastase.

The next set of experiments was made using the light from a strong electric arc-lamp. The solutions of the enzyme were prepared by precipitating the diastase from the extract of malt by means of 30 per cent. alcohol. The precipitate was rapidly collected by filtering under pressure, and was dissolved in ·2 per cent solution of K Cy. When rapidly done, this process yielded a nearly colourless solution, which had great diastatic power and which was free from sugar and contained a mere trace of proteid matter.

The first experiments were made by suspending a glass cell in which the extract was contained at a distance of two feet from the arc-lamp, keeping a control quantity in the dark.

Contrary to expectation, the diastase was found to be increased in amount by the exposure; in one case from twenty-nine to thirty-two; in another from three to four. Spectroscopic examination of the glass showed that it cut off a large proportion of the violet end of the spectrum.

Experiments were then made, avoiding the use of glass, employing either agar films, in which the enzyme was suspended, or quartz cells containing the fluid extracts.

The light was found under these conditions to retard the action, as in the case of the solar rays of the first set of experiments.

With the agar films the result was D : L : : 4 : 1.

With the quartz cell it was D : L : : 12 : 5.

The beam of light was thus found to have two effects. The rays of the violet end of the spectrum were markedly prejudicial, those of the red end were on the whole beneficial.

Similar results were yielded with saliva.

To confirm this, an experiment was made exposing some extract to the light in a quartz cell, and simultaneously some of the same in a glass cell, keeping a third quantity in darkness. The results were :— D gave a reduction of ·052, G one of ·055, and Q one of ·037 gm. Cu O.

Q was retarded in the proportion of 52 : 37; G was accelerated in that of 55 : 52.

The colouring matter of the barley-grain was by further experiments shown to have a certain power of protecting the diastase from the deleterious action of the violet rays, whether it was dissolved in the extracts used, or whether it was used separately as a screen placed before the cells in which the exposure to the electric arc was made. The screen in the latter case was contained in a quartz cell superposed upon the quartz cell containing the extract.

The results of the experiments so far point to the following conclusions :—

1. Light, whether solar or electric, exercises a destructive effect upon diastase.

2. The deleterious influence is confined to the rays of the violet end of the spectrum, the others being slightly favourable instead of destructive.

3. The colouring matter of the barley-husk acts as a screen preserving the diastase from the destructive effect of light.

The destructive influence continues after the exposure to light is discontinued, the exposed solution getting weaker and weaker till it had no diastatic property. The part of the solution kept in darkness maintained its diastatic power unimpaired for more than a month, by which time the exposed part, kept in darkness after its period of exposure, possessed no power to act upon starch.

J. REYNOLDS GREEN, London.

NUCLEOLI AND CENTROSOMES.—It may be of interest to state briefly here the results of some studies on these structures carried on during the past winter in Prof. Strasburger's laboratory at Bonn. A somewhat fuller account, with a plate, has been published elsewhere[1].

Although the occurrence of nucleolar substance in the cytoplasm has been observed by earlier writers, little significance has been

[1] Berichte der Deutschen bot. Gesellsch., Bd. XII, Heft 5, pp. 108–117.