established.—We have constantly obtained from the cerebellar cortex a tonic *contraction* of either the triceps or biceps, or both together, if the "acerebral" tonus had not appeared.

H. *Synchronous Excitation of the Cerebellum and Cerebrum.*

Synchronous excitation of the cerebral area for the forelimb and the cerebellar focus has given so far, in cases where the cerebellum is definitely excitable, an addition to the tonus elicited previously from the cortex cerebri.

While such reinforcement seems to be the rule, we believe that the clonic *character* of the cortical impulses is adversely affected by the cerebellar activity.

Since Professor Sherrington's third note on "Reciprocal Innervation of Antagonistic Muscles" appeared, we have investigated the question of *reflex* inhibition of the "acerebral" tonus by the graphic method, to see how far the two effects are identical, and have obtained some instructive results, the full discussion of which, however, must be postponed, as the observations are incomplete. It is sufficient now to say that while we have confirmed Professor Sherrington's discovery that excitation of an afferent tract on the same (*i.e.*, in our experiments, *right*) side causes relaxation of the triceps and contraction of the biceps, we have also found that excitation of a *left* afferent tract causes relaxation of the biceps and contraction of the triceps, an interesting correspondence with the alternation we observed in the two halves of the cerebellum, and which is obviously related to the movement of progression.

"On the Action of Light on Diastase and its Biological Significance." By J. Reynolds Green, Sc.D., F.R.S., Professor of Botany to the Pharmaceutical Society of Great Britain. Received January 28,—Read February 25, 1897.

(Abstract.)

According to the observations of Brown and Morris,* the quantity of diastase in foliage leaves undergoes considerable variations during the twenty-four hours of the day, being greatest in the early morning and least in the evening, particularly after several hours' sunshine. During the past three years the author has carried out a series of experiments to ascertain whether the diminution in quantity is due to a destructive influence of the light upon the enzyme, similar to

* 'Jour. Chem. Soc.,' May, 1893.

that which several observers, especially Marshall Ward,* have noticed it to have upon the life of micro-organisms and other lowly forms of vegetation.

The method of investigation has been to expose various solutions containing diastase to the action of light for several hours, either that of the total spectrum or of selected portions of it, and after such exposure to test the hydrolysing power of the solutions upon a weak solution of soluble starch or upon a 1 per cent. starch paste. Controls have been carefully kept during each experiment, and so arranged that any difference shown in diastatic power has been clearly attributable to the illumination.

The diastatic solutions have been extract of malt; solution of diastase precipitated from such extract by alcohol; diluted human saliva freed from mucin; and extracts of foliage leaves. The solutions have been preserved by the addition of 0·2 per cent. of potassic cyanide.

The source of illumination has been either bright sunshine, diffused daylight, or the light from a powerful naked electric arc, access to the latter having been obtained through the kindness of Mr. Barker, the manager of the electric light works at Cambridge.

The diastatic power has been ascertained by titrating the results of the digestions with Fehling's fluid, combusting the filters with the precipitates, and weighing the resulting cupric oxide.

When all the rays of the spectrum were under investigation, the diastatic extracts were exposed to the light source either in quartz-fronted cells, or mixed with films of agar-agar, the former method giving the most satisfactory results.

From many repeated experiments it was found that exposure to the whole of the spectrum for several hours caused the destruction of from 20 to 60 per cent. of the diastase.

When the ultra-violet rays were cut off by the use of glass vessels, glass having been proved by many observers to be opaque to these rays, the effect was different. At first and for some time there was a very considerable increase in the diastase, but this was succeeded on a prolonged exposure, lasting several days, by a gradual and almost complete destruction of the enzyme.

By the use of a series of screens, arranged according to the directions of Landolt,† the visible spectrum was divided into five regions: *red*, extending from wave-length 720 $\mu\mu$ to 640 $\mu\mu$; *orange*, 640 $\mu\mu$ to 585 $\mu\mu$; *green*, 585 $\mu\mu$ to 500 $\mu\mu$; *blue*, 500 $\mu\mu$ to 430 $\mu\mu$; and *violet* beyond 430 $\mu\mu$, and these several bands were examined separately.

Details of the experiments are given in the complete paper. The results may be stated in percentages.

* 'Phil. Trans.,' B, vol. 185, 1895.

† 'Ber. d. Deut. Chem. Gesell.,' 1894, p. 2892.

The infra-red, red, orange, and blue regions gave increases of 10·8, 53·5, 4·75, and 20·8 per cent.; the green a diminution of 15·7 per cent. The violet gave also a marked diminution, but it was not measured, as no satisfactory screen, allowing only the violet rays to pass, could be devised. The paper is illustrated by a curve showing these effects.

The effects of the illumination were found to be progressive, the increase or diminution of the diastase continuing after the solutions were removed from the access of the several rays.

The deleterious rays were found to be absorbed by the solution, the absorption being effected partly by the diastase itself, whether boiled or unboiled, and partly by the proteids present in the extracts. After removal of the latter by boiling and filtration, the solution was still opaque to the rays.

The screening influence of proteids was examined separately, by adding small quantities of egg-albumin to the extracts. The latter was found to be protective, the degree of protection being however, only roughly proportional to the amount of albumin present.

The colouring matter of the barley grain was also ascertained to act as a screen for the deleterious rays.

The living leaf was also examined by the same method as the extracts, and the diastase in it was found to undergo a similar destruction under the influence of the light.

It was found impossible to investigate the possible protective influence of chlorophyll in the leaf, as all the solvents of the latter proved to be opaque to the ultra-violet rays. They confirmed, however, the view that the violet rays, and possibly the green, have a destructive effect upon the enzyme.

The experiments lead to the conclusion that there exists in the leaf and in the various extracts examined a certain amount of zymogen which is converted by the infra-red and the red, orange, and blue rays into active diastase. This conclusion is supported by experiments, detailed in the paper, upon the effect of keeping the solutions for several days at a temperature of 38° C. A curve of the effect of this exposure is given in the paper.

The violet and ultra-violet rays, on the other hand, cause a destruction of the diastase, or at least such a change in the configuration of its molecule that it is unable to effect the hydrolysis of starch.

Three other conclusions of some importance have resulted from the experiments:—

1. That the enzyme is not located in the chlorophyll grain, but in the protoplasm of the cell.

2. That the suggestion of Pick* and Johow† that the red colour-

* 'Bot. Central.,' vol. 16, pp. 9—12.

† 'Pringsheim's Jahrb.,' vol. 15, p. 299.

ing of certain leaves is a material help to the translocation of starch in them is probably sound, as such colouring matters screen off the rays which destroy the diastase.

3. That there exists in plants a power of absorbing and utilising the radiant energy of light, sometimes to a considerable extent, without the presence of a chlorophyll apparatus.

The last conclusion appears to be of very far-reaching importance, supplementing other observations already published by Engelmann,* Winogradski,† Speschnew, and other observers, none of whom, however, have indicated such utilisation of the rays of the visible spectrum.

"Fragmentation in *Lineus gesserensis*." By ALEX. BROWN, M.B., B.Sc., M.A., Lecturer in Zoology, and Senior Assistant in the Natural History Department, University of Aberdeen. Communicated by Professor MCINTOSH, F.R.S. Received February 1,—Read February 25, 1897.

(Abstract.)

The following results are deducible from the investigations described in the paper:—

1. The zones of fission in *Lineus gesserensis* coincide with the transverse markings observable externally at definite intervals on its body.

2. The process of fission in all cases proceeds from *within outwards*, *i.e.*, from the digestive canal towards the cutaneous tissues.

3. The process of fission is a process of solution, and that, too, through the agency of the digestive fluids of the alimentary tract.

4. The solution of the tissues of the body-wall at the zones of fission is preceded in those regions by circular outgrowths of intestinal epithelium together with the formation of corresponding external grooves.

5. In the plane passing through any zone of fission, there is distinct evidence of the exertion of continuous pressure in opposite directions, or pressure exerted outwards through the intestinal outgrowth is met by pressure exerted inwards in the same plane through the body-wall.

6. As the result of these opposing forces, atrophy, disintegration and disappearance of the outermost cells of the intestinal outgrowth take place. Thus the layers of the body-wall are brought into con-

* 'Bot. Zeit.,' 1888.

† 'Ann. de l'Institut Pasteur,' 1890—1891.