Across Central America. By J. W. Boddam Whetham. (London: Hurst and Blackett, 1877.)

THIS is a thoroughly readable and exceedingly instructive narrative, by a capable observer, of a journey through a country not often visited by travellers, and of which English readers probably know little or nothing. Mr. Whetham gives an interesting account of some of the wonderful ruins which exist in Central America, and we can commend his work to our readers as possessing both novelty and interest.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.*

The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.]

The Contractile Filaments of the Teasel

THE observations of my son Francis on the contractile filaments protruded from the glands of Dipsacus,[1] offer so new and remarkable a fact in the physiology of plants, that any confirmation of them is valuable. I hope therefore that you will publish the appended letter from Prof. Cohn, of Breslau, whom every one will allow to be one of the highest authorities in Europe on such a subject. Prof. Cohn's remarks were not intended for publication, but he has kindly allowed me to lay them before your readers.

Extract from Prof. Cohn's Letter:—

"Immediately after the receipt of your very kind letter of July 26 I went to fetch Dipsacus, several species of which grow in our Botanic Garden; and proceeding after your recommendations, I put transverse sections of the cup-like bases of young leaves, or the epidermis of these parts carefully removed from the green parenchyma, into distilled water. I thus had the pleasure of witnessing with my own eyes this most curious discovery. First I ascertained the anatomical structure of the pear-like glands which are rather elegant and remarkable. From the basal cell rises the stalk-cell, in the second story there are two cells, in the third four, and in the uppermost series eight cuneiform cells converging to the centre. But you may conceive how much I was surprised by seeing the filiform protuberances issuing from the apex of the glands; it was quite a perplexing spectacle. The filaments are, in their refrangibility, very like the pseudopodia of some Rhizopods (*e.g.*, Arcella or Difflugia). I followed their changes for some time, and remarked quite definitely, as I find described in the paper of Mr. Francis Darwin how the protuberances slowly lengthen out, crook themselves hooklike or winding, and get knobbed either at the summit or midway; I saw the knobs or beads glide down the thread, and at last be sucked into a globular mass adhering to the gland. I saw the protuberances always rise between the septa of two or more adjoining cells, but nearly as frequently between the *lateral* septa as on the apical centre. Generally there were many protuberances on the same gland, pressed forward out of different spots; sometimes I saw two diverging branches proceed from the same point like a pair of compasses, each behaving independently in its changes. But the most curious appearance in these protuberances was a constant waving undulation along their extension, sometimes slower and perceptible with difficulty, sometimes vigorous and quicker, but never ceasing; more delicate filaments appeared to me very like Vibrio, or the vibratory flagella of some Infusoria. Not finding a special description of the waving movements of the filaments in your son's paper, I asked some of my pupils if they saw anything remarkable in the filaments, without indicating what, but they all took the same impression as myself. The only facts I have not yet been able to witness of your son's discoveries are Figs. 6, 14, 15, and the moniliform contraction; nor have I yet found time to apply chemical reagents, of which your son has made such good use.

"Of course I am not able, after two days' inspection, to form a definite judgment about the true nature of the filiform protuberances. Putting aside the hypothesis of a parasitic Rhizopod, there are two probabilities which still balance in my mind, as clearly stated by your son. (1) The protuberances are secretions of some colloidal matter, absorbing water, but insoluble in it; the movements are physical (not vital ones), the elongation of the filaments depending upon the imbibition, their contraction on the withdrawal of water by different reagents. There are such substances, *e.g.*, *myeline*, which shows rather similar changes in water. Please also to repeat the experiments I performed at the meeting of the British Association last year. Into a cylindrical glass containing soluble silicate of alkali (Wasserglas), diluted with half its amount of water, put a small piece of crystallised chloride of iron; from the fragment there rises a hollow reddish tube growing upwards and moving very quickly, like an Enteromorpha. But if you put into the diluted silicate some *protochloride* of iron (the latter is usually in the form of a powder, but may easily be brought by gentle pressure or the fingers into crumb-like masses), then from the lumps there arise innumerable filaments, very delicate and transparent, very like the glass threads of Hyalonema, which rise in fascicules vertically till they reach the surface of the fluid.

"But I cannot deny that the general impression produced by Dipsacus does not contradict the hypothesis that the changes of the filaments are the vital phenomena of protoplasmic pseudopodia.

"A French biologist (whose name I cannot just now remember) has proved many years ago (I think in an early number of the *Bull. de la Soc. Bot. de France*) that the water in the cups of Dipsacus is not a simple collection of rain in a gutter, but a secretion of the leaf bases. If this be truly the case, it is quite probable that the glands may have a special adaptation for this purpose. Indeed, I should not hesitate to agree with the vital theory, if there were any analogy known in plants. But further study of the phenomenon and the repetition of the chemical reactions which your son has already indicated, will, I hope, in a short time enable me to form a more decided judgment in this perplexing dilemma.

"In the meantime I am happy to congratulate Mr. Francis Darwin and yourself on account of the extraordinary discovery he has made, and the truly scientific paper in which he has elaborated it, and which has added a series of quite unexpected facts to the physiology of plants."

In a subsequent letter, Prof. Cohn describes what appear to him as thinned points or pores in the cell wall of the glands from which the filaments seem to be protruded. He also mentions the very curious fact which he has discovered, that by adding iodine to the detached epidermis of the leaf cups of Dipsacus the whole fluid contents of the epidermis cells turn blue like diluted starch paste, although no starch grains are met with in any epidermis cell except in the stomata.[1] He adds that the basal cell of the gland becomes blue, while the rest of it and the excreted globules are stained yellow.

I may add that I have heard from Prof. Hoffmann, of Giessen, that he formerly observed contractile filament of a somewhat similar nature on the annulus of *Agaricus muscarius*. He has described them in the *Botanische Zeitung*, 1853, and figured them, *ibid.*, 1859, tab. xi. Fig. 17. CHARLES DARWIN

Down, Beckenham, August 15

[1] Abstract published in *Proc.* Roy. Soc., 1877, No. 179; published in full in *Quarterly Journal of Microscopical Science*, July, 1877.

[1] Prof. Cohn adds that the blue coloration of the epidermis by iodine occurs in the leaves of Ornithogalum.

Relations between Sun and Earth

PROF. BALFOUR STEWART in the last of his exceedingly interesting articles in NATURE (vol. xvi. p. 45) on the suspected relations between the sun and the earth, winds up with an appeal (which I should like to see promptly responded to by the Government here as well as at home) in favour of the establishment of some institution to keep a daily watch upon the luminary that is found to exercise such a marvellous control over terrestrial magnetism and meteorology. He also mentions incidentally the discovery by Dr. Hunter that the famines in Southern India have a period of recurrence which is nearly the same as that of sun-spot frequency. This is no doubt an exceedingly plausible hypothesis inasmuch as five out of the six years of drought mentioned by Dr. Hunter as preceding the years of famine