for a short period in the dark room, on developing the latter a reversed negative (or *phosphogram* as I prefer to call it) of the original picture is permanently produced. If the picture consists (as in my case) of a vista of smoke-stained chimney-pots, the slated roofs and stuccoed walls of adjacent houses, the negative, under favourable circumstances, will show considerable traces of natural colours. In the case of phosphorescent calcium sulphide, which glows with a beautiful purple violet light, it is not difficult to understand why it acts on the gelatine film so readily as it does. Both the phosphorescent rays and the most active photo-chemical rays belong (as is well known) to the most refrangible rays of the solar spectrum; that the one should thus react on the other is not surprising.

If, instead of using the colourless calcium sulphide, as above described, we stain the mixture with an alcoholic solution of rosanilin acetate before applying it to the glass plate, on exposure to daylight it glows with a deeper intensity, and it still acts, although with less vigour, on a photographic film. M. Verneuil (*Comptes rendus*, civ. 501), and M. Becquerel (*ibid.*, 551), have investigated the causes of phosphorescence in calcium sulphide from a chemical standpoint, and the latter has shown that the colour of the light may be changed to a bright green by the admixture of a trace of lithium carbonate or of potassium persulphide, and to an orange-yellow by the addition of manganese peroxide. The green phosphorescence acts feebly, the orange-yellow scarcely at all, upon the ordinary gelatine film. The bromo-iodide plates are clearly only imperfectly responsive to coloured rays. To attempt coloured photography with the present dry plates is eminently unsatisfactory. By staining the film some makers have succeeded in increasing the sensitiveness of the plate to the less refrangible red rays, but my own experience leads me to conjecture that the green and green-yellow rays are quite as difficult to intercept by our modern plates as the deep-red, if they are not more so.

Brighton, March 28. W. AINSLIE HOLLIS.

Neo-Lamarckism and Darwinism.

UNDER the above heading (NATURE, March 26, p. 490) Prof. Henslow gives some criticisms of my paper on the Alpine flora, which seem to show that, for the sake of brevity, I unintentionally rendered my views obscure to him and possibly to others who share his opinions. It is therefore fortunate that he should have stated his difficulties, in order that I may try to explain what it was I intended, taking the various points in succession.

(1) I wrote "dwarfing may be—doubtless often is—the direct result of environment, as lack of nourishment." This, I believe, is strictly true as regards individual plants, and I do not think it affects the argument that dwarfing may also be due to other causes. Certainly, insufficient nutriment may cause extreme dwarfing altogether apart from cold: for instance, I very well remember some minute but flowering specimens of *Matricaria*, only an inch or so high, found by Mr. J. W. Horsley in a dry place near Chiswick, where the normal fully-developed form of the plant is abundant.

And if dwarfing is the result of cold, how is it explained that plants on different soils at the same altitude vary so much in this respect? Thus, along Swift Creek, in Colorado, *Mertensia sibirica*, which grows in very damp ground and in the rich vegetable deposits on the immediate banks of the creek, is large, tall, and rank, with broad leaves; while a species of the same genus, growing close by on the more exposed, dry, and more barren prairie land, is very much smaller, more compact, and with narrow leaves. Again, at the same place, *Oxytropis lamberti*, when growing in the damper ground by the creek, is tall, rank, and has white or very pale flowers; while on the adjoining prairie the same species is low, depressed, altogether smaller, and with crimson flowers, which turn purple in drying for the herbarium.

I did not say, and certainly would not say, that dwarfing was always the result of bad or insufficient nourishment; but neither is it always or normally the direct result of cold.

(2) When dwarfed varieties or forms have been produced by environmental conditions or otherwise, it is natural enough that they should tend to revert to the original type when removed again to the original conditions. Nevertheless, true Alpine dwarfed *species* do retain their characters when grown at low altitudes artificially. Florists' catalogues are full of allusions to dwarf varieties and species, most of which are very constant. As I write, I can see a clump of *Scilla sibirica* out of the window, and certainly it appears to me to have the true characters of the species, and the long cultivation which this species has undergone has not changed it into a large and more diffuse species like *Scilla nutans*. Minute species of *Narcissus*, *Gentiana*, and *Silene*, which come from mountain regions, may surely be grown in England without starting up and simulating the large temperate-region forms of those genera. I don't mean to say that dwarfing, like other specific characters, may not become changed or lost in time if the circumstances are favourable, or the utility of the peculiarity ceases, but I think it will be generally admitted that low stature, as a specific character, often proves as constant and hereditary as other specific characters.

(3) Surely it is not necessary to demonstrate that tall plants would be likely to be injured by the winds on Alpine summits? The trees at timber-line in Colorado would, I should think, convince anybody of this. Those which are exposed frequently bear branches only on the side towards the valley, the others having succumbed at an early stage to the violence of the winds. The trees at their highest limit are shorn off almost as if with a knife, so that, going down the slope, one does not meet with a full-sized tree until the topmost branches are able to obtain some shelter from the tree above it; so that, although the trees grow to timber-line, they do not raise their summits above it. Also, one may find some old stumps, perhaps fifty yards above the present timber-line, on the Sangre de Cristo Range, showing that, for some reason, trees which formerly grew there have since succumbed.

(4) I have not myself made any experiments to test the additional warmth that might be derived from close proximity to the ground, but I think the point is well established. The rocks and the surface of the ground would surely retain a certain amount of heat, and beds of vegetable tissue, such as peat, do not readily cool. Thus, Mr. E. J. Lowe relates (*Conchologist*, 1891, p. 4) that, in the great frost of 1860–61, the River Trent was frozen over; but a drain, cut through a bed of organic soil, though only a foot wide, and containing less than 12 inches in depth of water, remained unfrozen.

(5) As to "partial shelter": is it not clear that dwarfed plants, which grow close to the ground, and often between rocks or under projecting ledges (as in the manner of Alpine plants), will be partially sheltered, and thereby advantaged?

(6) Of course, I do not suppose that plants *know* anything about the coming season! Only this, those plants which naturally grew quickly and through rapid metabolism came to early maturity, would survive, while those which did not do so would perish. It is a simple example of natural selection. Various weeds and other wild plants, notably *Cleome integrifolia*, are in Colorado often accidentally sown as seeds dropped from hay, and thus appear round human habitations some hundreds of feet above their proper altitude. They grow and flourish, and duly flower, but they cannot mature their seeds in time, and hence never perpetuate themselves at these altitudes. The Indian corn, *Zea mais*, varies considerably in its period for maturing. It can be grown in England, but does not sufficiently often mature to be a paying crop. In America, the quickly-maturing varieties can be grown at greater altitudes and latitudes than the others. Given such variation, is it not obvious that natural selection would preserve the more rapidly-maturing kinds where the summer was short? Let anyone take varieties of Indian corn differing in the period of maturing, and grow them at the extreme altitude at which this species can be cultivated, and it will not take a botanist to predict the success of the one and the failure of the other.

T. D. A. COCKERELL.

The Whirling Ring and Disk.

I REGRET that the interjection of a paradoxical rider to my proposition regarding a whirling ring should have had the effect of embedding in a storm of protest Prof. Ewing's interesting point concerning a disk. Let me do the best I can to set matters straight and clear.

First, it is plain that my rider concerning a cable was not well worded, and whereas it is quite true that a weightless steel girdle round the earth would be broken by its whirling tension, it would have been better to avoid any appeal to flotation as a practical means of securing weightlessness. The simplest plan is to abandon the cable illustration alto-