

(or some equivalent arrangement) directed to the sun's centre, to record any changes which take place in the spectrum from, say, half an hour before to half an hour after totality, and during totality, *bien entendu*. The relative darkness or brightness of the lines should be recorded every ten seconds.

"This spectroscope should have moderate dispersion, large object-glasses for collimator and telescope, and with focal length such that two or three degrees round the sun should be taken in (*i.e.*, 1° or $1\frac{1}{2}^\circ$ from the sun's centre), and a large field. . . .

"To come to the details of the expedition to Ceylon; I am of opinion that it need not exceed the following numbers, as my Sicilian experience has taught me that we may depend upon much valuable help from the officers at the place of observation:—

"1 Telescope-Spectroscopic observer; 2 assistants.

"1 Photographer; 2 assistants. This duty perhaps may be entrusted to skilled Sappers.

"1 Spectroscopic observer; 1 assistant, or 8 in all.

"Among general observations, I would point out as being of extreme importance:

"a. Rays before, during, and after totality—their length, direction, and colour.

"b. Colours of the various layers of chromosphere, and of clouds and landscape. The order of these colours is of great importance.

"c. Dark rays or *rifts*; whether they change, and whether they extend to the dark moon, or stop short above the denser layers of the chromosphere.

"d. The colours of the corona between bright or dark rays.

"e. All changes in corona.

"f. Comparative brightness of rays and chromosphere and outer corona.

"In the above letter the nomenclature employed is the one I suggested in a recent lecture at the Royal Institution, namely:

"*Corona*, embracing the whole compound phenomenon outside the prominences (including rays and streamers), part of which is undoubtedly non-solar.

"*Chromosphere*, embracing the whole of the solar portion of corona, and all bright line regions outside the photosphere."

It is scarcely necessary to point out that the above deals with possibilities, rather than with desirabilities. We are convinced that a much larger party would do good work in Ceylon, but our scientific leaders are right in asking what our Government cannot refuse; and, moreover, we may hope that the magnificent stations in India on the Neilgherries, at considerable elevations, will be strongly garrisoned, as they can well be by the eminent observers now in India.

We trust that these efforts to procure fresh observations will meet with the largest measure of success, for certainly the question of the Sun's Corona is the scientific question of the day. Once settle what is the real nature of the sun's surroundings, and the path of work is open for the more distant stars. So long as our knowledge of the sun is clouded by contending hypotheses, we cannot hope for real progress.

For our part we do not doubt that the Government will act as admirably as they did last year in the same branch of research when the requirements of Science are properly laid before them; and if the elements are equally kind, we may hope for a large increase of our knowledge.

TYNDALL'S "HOURS OF EXERCISE IN THE ALPS"

Hours of Exercise in the Alps. By John Tyndall, LL.D., F.R.S. (London: Longmans.)

THIS volume is a collection of short articles which have already seen the light in various publications, and are here thrown together, as the author says, "partly to preserve to myself the memory of strong and joyous hours, and partly for the pleasure of those who find exhilaration in descriptions associated with mountain life." Accordingly we find in it accounts of exciting scrambles, such as the Lawinenthor and the Old Weisssthor, the first ascent of the Weisssthor, and the various assaults upon the Matterhorn, crowned at last with success. Of sadder interest are the story of the death of Benner, the professor's faithful guide, upon the Haut de Cry, contributed by one of the survivors; notices of the accidents on the Col de Géant and on the Matterhorn; and, hardly less in interest though with happier ending, the rescue of a porter from the jaws of a crevasse on the great Aletsch Glacier, and the author's own hairbreadth escape on the Piz Morteratsch. All these are described with his usual graphic power and intense appreciation of natural scenery; sometimes in the philosophic vein, when a glass of whisky gives "a flash of energy," and even a ham sandwich can only be regarded as a conditioned form of potential muscular force; or sometimes in the more jubilant mood, when we are shown the grave professor "delighting to roll himself in a bubbling pool in some mountain stream, and afterwards dance himself dry in the sunshine."

Together with these sunny memories of alps and cascades, snow-fields and glaciers, there are some chapters of a more distinct scientific import, to which, as most germane to the pages of NATURE, we shall confine our notice. The first of these—the twentieth in the volume—is on Alpine Sculpture. The professor, we need hardly say, is a strong "Erosionist," attributing the valleys to the sculpturing influences of water, frost, and ice, as opposed to those who regard them as the result of fissures in the earth's crust produced by strains during its upheaval. His summary of the evidence for "sculpture *v.* fracture" strikes us as particularly good, and, as it happens, we can bear testimony from personal experience to the accuracy of the facts cited. He shows that by a simple geometric calculation, the width of the fissures produced by the upheaval of a hundred miles of the earth's crust to a maximum height of four miles would bear a very small ratio to the width of the existing valleys; therefore that the most which can be claimed for fissures is that they have guided the action of meteoric forces, have, as it were, drawn the rough sketch on the stone which has directed the picks of Nature's quarrymen, and guided the chisels of her sculptors. He points out that in the most fissure-like of gorges, such as those of the Via Mala or Pfäfers, characteristic water-marks are visible from top to bottom. His description of the latter may be taken as a summary of the evidence in these and many other cases which he has quoted. "Here the traveller passes along the side of the chasm, midway between top and bottom. Whichever way he looks, backwards or forwards, upwards or downwards, towards the sky or towards the river, he meets everywhere the irresistible and impressive evidence that this wonderful fissure has been sawn through the mountain by the

waters of the Tamina." The only points in Prof. Tyndall's description to which we a little demur are when he speaks of the traveller "passing along the chasm midway between top and bottom," the fact being that the well-known gallery is only a few yards above the Tamina; and where he quotes the gorge as an illustration of water-action upon limestone rock. It is true that the strata here are not crystalline, and they may be occasionally calcareous, but we should hardly venture to apply the name of limestone to the hard black shales or slates out of which the gorge itself is cut. Professor Tyndall also omits to call attention to the close connection between the direction of the principal joints and the form of the gorge. This is especially noteworthy at Pfäfers, where the chasm is not vertical, but inclined to the horizon at an angle of some 70°, the water having followed, as is its wont, the direction of least resistance, viz., one of the sets of joint planes. The gorges of the Pantenbrücke, the Aar above Im-Hof, with many others, might be quoted as instances of the same. We think, indeed, that in arguing against those who ascribe alpine sculpture mainly to fracture, the professor does not quite do justice to the influence which fissures, faults, and joints (which last may, in many cases, be connected with the others) exercise in directing the meteoric agents. These have not, indeed, fashioned the mountains, but they have obliged the sculpturing forces to work in certain directions, have been like the rails or the points which cause a locomotive to follow a particular course instead of wasting its power in wandering over the fields.

Further on in the chapter, Prof. Tyndall refers to his own favourite theory of glacier sculpture, with regard to which he expresses himself more guardedly than in the paper originally published in the *Philosophical Magazine* (vol. xxiv. p. 169). Still we cannot say that we are convinced by his arguments even in their modified form. No one, of course, would deny that a glacier can deepen its bed; the question is simply one of degree. With regard to this our space will allow us to do little more than express dissent, and indicate one or two points where, while not disputing Prof. Tyndall's facts, we cannot accept his inferences.

The silt which is brought down by a glacier stream cannot, we think, be taken as a measure of the abrasion exercised by the glacier; surely the greater part is derived from the stones crushed between the ice and rock; it is the grist from the glacier mill, rather than the detritus of the nether stone. We fail also to see how, unless under exceptional circumstances, a glacier can "do more than abrade." Granted that "rocks are not homogeneous, they are intersected by joints and places of weakness which divide them into virtually detached masses," we doubt if it follows that "a glacier is undoubtedly competent to root such masses bodily away." A heavy body sliding over such masses and in close contact with them, would, we think, be more likely to keep them in their place, and certainly rocks from which glaciers have retreated do not exhibit evidence of this kind of erosive action. We confess, therefore, to still regarding the effects of glaciers as comparatively superficial, and classing the ice ploughs of past ages as among the efforts of scientific imagination.

A considerable portion of the latter part of the volume

is devoted to a *résumé* of the "viscous" and "regelation" theories of glacier motion; a controversy which can hardly yet be regarded as concluded, seeing that the experiments of Mr. Mathews and Mr. Froude, to which Prof. Tyndall briefly alludes, appear likely to have a very important bearing upon the question of whether or not ice under any circumstances is a flexible or plastic substance to an appreciable extent.

Among the very miscellaneous scraps with which the volume terminates, is an account of the voyage to Algeria to observe the Eclipse. This, so far as its main purpose went, was a dismal failure, but remarks are introduced on the colour of the sea and sky, a subject already treated by the author in his "Glaciers of the Alps." During the voyage home a number of bottles of sea-water were secured from various stations, which were afterwards examined in London by passing through them a beam of electric light—the purity or impurity of the water is then shown by the less or greater amount of light which it scatters. Briefly, the result was that the dark blue water was very pure, the cobalt-blue rather less so, while the green tints denoted the presence of much suspended matter, and the yellowish green was very thick. A remarkable instance of this variety of colour which, if our memory serve us, he has not quoted, is in the Lakes of Thun and Brienz; the waters of the latter, which receives the silty streams of the Aar and the Lutschine, are distinctly green, while those of the former, into which no important glacier torrent directly enters, are of a beautiful blue.

In fine, though there is little new about the book, many of Prof. Tyndall's admirers will be glad to possess in a convenient form so many thoroughly characteristic papers, displaying at once his thoughtful mind and intense love of nature, as well as his great command over nervous and picturesque English.

T. G. BONNEY

OUR BOOK SHELF

The Natural History of Plants. By H. Baillon. Translated by Marcus M. Hartog. Vol. I. (London: L. Reeve and Co. 1871.)

HAVING noticed, on its publication, the first volume of Prof. Baillon's "*Histoire des Plantes*" (see *NATURE*, vol. i, p. 52) we need scarcely do more than call attention to the English edition which now lies before us. The translation, we may say at the outset, appears to us to be well done; the meaning of the original is, as far as we have observed, carefully preserved; and a better knowledge of his subject is shown by the translator than is always the case in English renderings of foreign scientific works. The co-ordination of the natural orders followed in the work is, as was mentioned in our notice of the original, novel; whether it will stand is a question on which we ought not, perhaps, to express an opinion until the plan is more fully developed. We could have wished that the author had given in this first volume some general sketch of his new system, with a defence of its peculiarities. So competent an authority as Prof. Baillon cannot have departed from the ordinary arrangement without cogent reasons, which we should have liked to have known. It is always a great advantage to English systematists to know the views of their fellow-workers on the Continent. We miss also the great assistance that is afforded to the systematist by a tabulated *clavis* of the genera belonging to each natural order. The amount of information con-