

improved by a firmer grasp of scientific principles. The commercial statistics are, as might be expected, much fuller, better arranged, and more serviceable than those relating to physical geography; but we imagine that few members of the Imperial Institute, likely to make use of the book, are without the original records relating to their own department. The difficulty of proportion and perspective is rather seriously apparent in the treatment of India, which has to be passed over more lightly than the colonies, because equal detail would involve the sacrifice of much space. Thus the great internal trade of India is scarcely touched upon, and the wants and tastes of consumers in the ultimate Indian market, by whom imports are finally absorbed, are not laid before the British merchant.

Beneath Helvellyn's Shade. By Samuel Barber. (London: Elliot Stock, 1892.)

THIS book consists of notes and sketches in the Valley of Wythburn, and is brightly and attractively written. Perhaps the best chapters are those on clouds, the various forms of which have been carefully studied by the author. He has also many interesting remarks on various aspects of Cumberland scenery, on the customs of the people, and on antiquities. Occasionally, perhaps, Mr. Barber adopts too much the tone of a preacher, but his impressions and ideas are for the most part fresh and vivid. The book will especially please those who have themselves felt the charm of Wordsworth's country.

LETTERS TO THE EDITOR.

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Dr. Joule's Thermometers.

RESPECTING the question asked by Mr. Young (NATURE, vol. xlvii. p. 317), I am glad to have an opportunity of stating that shortly after Joule's death I obtained the sanction of his son to examine the scientific apparatus that were left in his house.

I found a number of thermometers, and amongst them the two chiefly used by Joule in his researches. These thermometers have been placed in my charge for the present. I have made careful comparisons of them with a standard of the "Bureau international des Poids et Mesures," and therefore indirectly with the air or hydrogen thermometer. A standard issued by the Technische Reichsanstalt has also been used as a check. I spent a good part of last winter on the work and am now only waiting for an opportunity to repeat some of the measurements. The results will be published in due course, and I think will prove of interest. As Joule compared his thermometers with one used by Rowland, we shall in this way have an indirect comparison of Rowland's air thermometer with those by which the Berlin and Paris standards have been independently fixed.

One question arises on which I should be glad to have some information, and I should be grateful to any of your readers who could help me. The glass of which Joule's thermometer is made does not behave like the English glass now in use; and it would be important to know the probable composition of glass used in England about the year 1840 for thermometric purposes. As my experiments are not concluded I do not wish to speak with too great a certainty; but I believe it will be found that if we could return to the glass of Joule's thermometer, we should have a substance as well and possibly even better adapted to the manufacture of thermometers than the modern Jena or French thermometer glass.

I am sorry I cannot give a very definite answer to Mr. Young's question. Joule does not, as far as I know, anywhere give the actual readings of the freezing point, but only its changes. Rowland, in quoting the comparison between Joule's thermo-

meter and his own, gives 22.62 as the actual reading of Joule's zero. I have not at the present moment access to Rowland's paper, and have no note of the date at which this comparison was made (either 1879 or 1880).

Such a formula as that given by Mr. Young can, however, only have a limited application. The zero of a thermometer depends on the temperature at which the thermometer has been kept previous to its immersion into ice, and with properly-annealed thermometers the secular changes are much smaller than the temporary ones. Last winter Joule's thermometer showed changes in zero from 23.51 to 23.00 on the arbitrary scale, the original temperatures varying from 7° to 30°.

All observations lead to the conclusion that the secular changes of a thermometer gradually vanish, so that the zero corresponding to any temperature approaches a limit. Mr. Young's formula would make the zero rise indefinitely.

ARTHUR SCHUSTER.

Dust Photographs and Breath Figures.

YOUR two correspondents on February 9 add interesting instances of these phenomena. I am sorry that one of my statements was not clear. In saying "Two cases have been reported to me where blinds with embossed letters have left a latent image on the window near which they lay," I meant to describe them as not in contact.

I have questioned my neighbour Dr. Earle again as to his case. The plate-glass window of an hotel in London has on the inside a screen of ground glass lying near but not touching: upon the latter are the words "Coffee Room" in clear unfrosted letters. One day as he was at breakfast the screen was taken away, but the words were left plainly visible on the window, and no washing would remove them. The other case is curiously similar, but each narrator was ignorant of the other's tale. A friend, Mr. Potter, asked me if I knew whether a house in which he was lodging had been an hotel, for on misty days they saw "Coffee Room" on one of the windows. I remembered the house had been an hotel two or three years previously, and there had been brown gauze blinds with gilt letters.

Mr. Thiselton-Dyer's observation appears not so much akin to these two as to the dust picture of a water-colour drawing of which I spoke in my former paper.

I look forward to seeing the effects at Canterbury.

Winchester College, February 13.

W. B. CROFT.

Fossil Plants as Tests of Climate.

MR. DE RANCE's note relating to the above subject in NATURE, p. 294, mentions that "Heer has determined a magnificent flora of more than 350 species from these northern tertiaries, and that he at once pointed out the absence of tropical and subtropical forms." My contention, founded on an attentive study of his determinations and of the original specimens in London and Dublin, and to some extent in Copenhagen, is that not fifty, or perhaps not the half of fifty, of these determinations are entitled to the smallest weight; and again that though at first he saw nothing subtropical in the flora, he subsequently declared the presence of palms, &c., upon utterly insufficient data. While, however, wishing to rid the "magnificent" flora of 300 or more useless and misleading encumbrances, I am far from wishing to depreciate the extraordinary significance and value of that which remains, and which clearly shows that in early Eocene times the coast of Greenland supported in certain places forests which included the redwood, the plane, and even the magnolia, associated with many more northern forms. This is consistent with the tropical vegetation existing during a part of the possibly contemporary lower tertiary period in the south of England. Both facts are sufficiently inexplicable, but there is no occasion to magnify the difficulties they present. As to the Greenland floras they have not been proved to contain any forest trees that might not, and which in fact do not, flourish in their modern representatives, when planted in certain favourable spots on the west coast of Ireland, and even of Scotland. We are not even obliged to assume that Greenland as a country was characterised by such vegetation, for this might be as erroneous as to regard Ireland or Scotland as countries generally characterised by forests of arbutus. The flora of a country is in fact most likely to be preserved in its most sheltered spots, in lake bottoms like parts of Killarney, or where small rivers quietly steal into the tidal waters of deeply recessed bays like those of Bantry and Kenmare, in forest pools like some in the Mount Stewarts' woods of Bute, and