about six miles ' (Phil. Trans. R.S., vol. clxviii. p. 289 : quoted on p. 308 of Darwin's 'Coral Reefs,' third edition). Here he evidently refers to the shallow water extending on all sides to the 100-fathom line, where there is about that depth a sudden fall. The fact is, such a character belongs to a large number of oceanic islands, whether surrounded by fringing reefs or no reefs whatever, and is due to quite other causes than reef-building."

June 14.   H. B. G.

The Fireball of May 29, 1889.

THE fireball which I mentioned in NATURE of June 13 (p. 150) as having been seen at Leeds on May 29, was also observed at Belfast by Mr. I. W. Ward, who recorded the latter part of its course as from Vega to α Cygni.

Comparing this path with that assigned by Mr. D. Booth at Leeds, I find the radiant point at $214\frac{1}{2}° - 7°$, which was in azimuth 11° (west of south), and altitude $28\frac{1}{2}°$ at the time (10h. 45m.) of observation.

When first seen at Leeds the fireball was situated over a point in the Irish Sea, in lat. 53° 58′ N., long. 5° 22′ W., and its height was sixty-one miles. At its disappearance it was six miles west-south-west of Stranraer on the coast of Wigtown, Scotland, at a height of twenty-five miles. The earth point was ten miles west of Troon, Ayrshire. The real length of path traversed was seventy-five miles, and the velocity eight and a third miles per second deduced from the estimated time of flight (nine seconds) at Leeds.

The radiant point at $214\frac{1}{2}° - 7°$ in Libra is situated near the earth's anti-apex, and the motion of the fireball would therefore be extremely slow, as it must have overtaken the earth in her orbit. It is curious that several doubly-observed meteors which have made their apparitions in the spring months have given the same radiant point. Thus the large fireball of May 12, 1878, seen in Scotland and the north of England had a radiant at 214° – 7° (Prof. A. S. Herschel). The conspicuous meteor of April 21, 1889, observed by Prof. Herschel at Croydon and the writer at Bristol, had a radiant at 218° – 5°. The vernal months appear to furnish us with a long-enduring shower from this special region of the zodiac.   W. F. DENNING.

Bristol, June 15.

Meteor.

ABOUT 11.30 p.m. on the night of June 13, the sky being partially covered with fleecy clouds slowly drifting from the south-west, so that the full moon was frequently obscured, a shooting-star appeared in the north, at an elevation of about 50° to 60°, and descended obliquely towards the east. It was as bright as a star of the first magnitude, and was visible during a slightly zigzag flight of some 30°, leaving no trail. But the remarkable thing was that the sky in that quarter was pretty closely covered with the slowly-moving fleecy clouds, so that no fixed stars were visible. The meteor, therefore, must have been below the clouds, at least in the latter part of its course.

Birstal Hill, Leicester.   F. T. MOTT.

Stationary Dust-Whirl.

YESTERDAY morning, at 9.30, I was fortunate in witnessing a stationary dust-whirl, about a hundred yards from where I stood, on a dust-covered highway lying due east and west. The morning was warm, 67°·5 in the shade, barometer at 30·06, and the sky clear, excepting a few isolated cumulus patches. The air was still, the wind-vane indicating north-west. The appearance of the whirl presented a resemblance to a fountain of water playing, only the base was broader than the upper part, which was perfectly columnar. It remained, for nearly five minutes, absolutely stationary, then suddenly ceased, recommencing for a few seconds, on a much smaller scale, some ten yards westwards. Its height, when at its best, would be about 25 feet, and its diameter, midway, 2 feet. I could not correctly ascertain the spiral motions of the whirl, but judged the outer spiral to move from right to left, and upwards. The wind jumped round into the north-east shortly afterwards, with clear sky, and the barometer steadily rising. No others were seen during the day.   J. LOVEL.

Driffield, June 17.

Bunsen's Photometer.

IF we place the "grease-spot" screen between two sources of light, situated at A and B, whose intensities are I and I′ re-

spectively, and if C be the position of the screen for which the spot disappears when viewed from the side towards A, and C′ the corresponding position when viewed from the other side, it is usual to say : Take the mean of AC and AC′, and the mean of BC and BC′; the squares of the means will be approximately proportional to the intensities.

The relation
$$\frac{I}{I'} = \frac{AC \cdot AC'}{BC \cdot BC'}$$
is more exact, as may be shown by the following :—

Let a be the fraction of the light falling on unit area of the spot from A which reaches the eye, and b the corresponding fraction for the dry part ; and let c and d be the respective fractions of the light falling on the other side of the paper, which, after passing through, reach the eye. Then, since the spot and the dry part in the position C are equally bright when viewed from the side towards A, we have, equating the light per unit area from the two parts—

$$\frac{I}{AC^2}a + \frac{I'}{BC^2}c = \frac{I}{AC^2}b + \frac{I'}{BC^2}d,$$

or
$$\frac{I}{AC^2}(a - b) = \frac{I'}{BC^2}(d - c) \quad . \quad . \quad . \quad . \quad (1)$$

If C′ be the position of the screen for which the parts appear equally bright, as seen from the other side, we have—

$$\frac{I}{AC'^2}c + \frac{I'}{BC'^2}a = \frac{I}{AC'^2}d + \frac{I'}{BC'^2}b,$$

or
$$\frac{I'}{BC'^2}(a - b) = \frac{I}{AC'^2}(d - c) \quad . \quad . \quad . \quad . \quad (2)$$

From (1) and (2)—
$$\frac{I}{I'} = \frac{AC \cdot AC'}{BC \cdot BC'}.$$

If $a + c = b + d$, we see that C and C′ must coincide. This condition implies that the light lost is the same for the spot and for its surroundings.

In the method of using the photometer, in which the two lights to be compared are balanced successively against a third light, and the spot in both cases is viewed from the same side, the inequality of the portions of light lost by the two parts does not disturb the result.   D. M. LEWIS.

University College, Bangor, June 6.

THE TUTICORIN PEARL FISHERY.

AFTER an interval of more than twenty-seven years, the pearl-oyster (*Avicula fucata*, Gould) has produced pearls off the Madras coast of the Gulf of Manaar, in sufficient quantities to be worth the expense of fishing. The last fishery of the Tuticorin banks took place in the years 1860-62, and resulted in a net profit to Government of Rs. 3,79,297 (£37,929 at par). In olden times, when Tuticorin was in the possession of the Portuguese and Dutch, the fishery used to be carried on much more frequently than it is at the present day, and a difficult problem, which remains to be solved, is, What are the causes of the decline of the pearl fishery, and how can the Tuticorin banks be made to yield a more frequent harvest? Whether the baneful influence of the Mollusca known locally as *sooram* and *killikoy* (Modiota sp., and Avicula sp.), the ravages of the file-fishes (Balistes) and Rays (Trygon, &c.), poaching, or currents, are responsible for the non-production of an abundant crop of adult pearl-producing oysters during more than a quarter of a century, it would be impossible to decide until our knowledge of the conditions under which the pearl-oysters breed, develop, and live, is more precise than it is at present.

Superstition, as of old, still clings to the native divers ; and I read, in a recent issue of the *Times of Ceylon*, that "at present there are said to be 150 boats, with their full complement of men, all waiting at Kilakarai in readiness