In a letter to you last week Mr. W. H. Preece called attention to a sudden appearance of earth-currents on the 19th between 10.15 and 10.20 p.m. G.M.T., traces remaining until 10.50. A magnetic storm was in progress at the time, and had commenced shortly after 4 p.m. The declination magnet moved at first slightly towards the west; but the most rapid movement was towards the east, and commenced at 9.40, attaining its absolute minimum, or greatest E. elongation, at 10.9. It then returned as rapidly westward until 11 p.m., but the absolute westerly maximum was only reached at 6.50 the next morning. The whole range of the declination magnet was 53°.0.

The H.F. magnet was not much disturbed, but the chief irregularities occurred between 9.50 and 10.55.

The V.F. magnet showed more clearly the action of the disturbing force, with a maximum at 7.45 p.m., and a minimum at 3.40 the next morning. The V.F. magnet was tremulous between 10.0 and 10.40 p.m., with a slight minimum at 10.15.

S. J. PERRY

Stonyhurst Observatory, Whalley, January 29

THE magnetographs at this observatory registered a small magnetic disturbance during the evening and night of January 19, which lasted over an interval of time considerably greater than the earth-currents observed by Mr. Preece.

The magnets were tolerably quiescent until about 4.35 p.m. G.M.T., when the declinometer became disturbed, and the bifilar indicated a gradual diminution of horizontal force, vertical force at the same time increasing. The latter attained its maximum deviation from the average value at about 8.0 p.m., whilst the horizontal intensity indicated its lowest at the same time. The declination after slightly rising, however, continued to diminish, and between 9.30 and 10.15 p.m. it became reduced 20.7 minutes of arc. Between 10.15 and 11.0 it rapidly moved in the contrary direction 19°.0, after which it gradually rose to a position of maximum at 6.50 a.m. on the twentieth, when the needle stood about 10' to the westward of its normal position at that hour. From that point it gradually fell away, and after 11.45 a.m. it only oscillated slightly about its usual place.

The movement between 9.30 and 11 p.m. of the bifilar indicated an augmentation of intensity followed by an equally abrupt fall, whilst the vertical-force instrument showed that component of terrestrial magnetism to have been but slightly affected.

As is usual in such cases the abrupt disturbance, or as it is called from the aspect of the curves, the peak, under notice was repeated or echoed on several subsequent days.

On the 20th, about half an hour after midnight very faintly, on the 21st it was stronger, and occurred between 9.20 and 9.50 p.m. On the 22nd between 7.50 and 9.40 p.m., its extent then being 10', and finally on the 23rd, from 9.0 to 10.10 p.m., showing then about the same amount.

The daily weather charts for the 20th report bright aurora seen on the 19th in Scotland and Norway.

Kew Observatory, January 30

G. M. WHIPPLE

REFERRING to Mr. Preece's letter of the 24th inst., it may be interesting to note that in the Daily Weather Chart for the 20th inst. bright aurora is recorded as having appeared in North-West Europe on the evening of the 19th, the day when the earth-currents were observed.

J. PARNELL

Upper Clapton, January 30

Variations in the Sun's Heat

ALL lovers of science, and more especially those devoted to the study of atmospheric physics, must rejoice to learn that the Government of India has sanctioned Mr. Blanford's proposal to send a properly qualified observer with good instruments to Leh, for the purpose of directly measuring the sun's heating power from day to day.

Meanwhile, as we shall have to wait for another decade before it can be settled with any certainty, how much, and in what way the sun's heat varies, it may be as well to notice the latest and hitherto most valuable indirect evidence, furnished with respect to this question by India.

That country has long been regarded as exceptionally well placed for reflecting in its meteorological phenomena with comparatively little complexity the secular changes in solar radiation,

and the only drawback hitherto, has been the lack of good and continuous observations over a large area. This has now been remedied by the excellent organisation introduced by Mr. Blanford, by which the observations made at upwards of 100 regular observatories and more than 350 rainfall stations, are collected and discussed at one central office, and published in one volume. With these it is possible to arrive at average results, in which local variations are eliminated, and which may be accepted with confidence as representing the general conditions over the whole area. In a recent *Pioneer* Prof. Hill gives the following table of the abnormalities in the chief meteorological elements for the whole of India during the past few years, which, if indirect evidence is to be trusted, most decidedly favours the hypothesis Prof. Hill and myself have all along regarded as the best working hypothesis, viz. that the sun radiates *most* heat to the earth in the years of *fewest* spots.

Variations of certain Meteorological Elements from their mean Values

Year.	Excess temperature of black bulb thermometer.	Annual mean air temperature.	Mean pressure of water vapour.	Mean proportion of cloudy sky.	Mean annual rainfall.
				Tenths.	
1875	-.76	-.29	-.004	-.03	+3.66
1876	-.33	-.08	-.017	-.20	-4.37
1877	+.19	+.17	+.011	+.31	-2.97
1878	+.44	+.62	+.020	+.09	+5.66
1879	-.36	-.13	-.014	-.06	+1.97

Prof. Hill appends the following remarks to this table:—

"The radiation, as measured by a thermometer with a blackened bulb, rose gradually until 1878, and then fell off in intensity; the temperature of the air, which seems the next simplest and most direct effect of the sun's heat among those given in the table, also increased until 1878, and then diminished; the vapour tension and cloud—more remote effects—show a similar, but not so closely coincident variation, and finally, the rainfall, the most distant effect of all, appears to lag just about a year behind; for observations made before the commencement of Mr. Blanford's reports for all India indicate that there was a wave of heat in 1873-74, immediately preceding the cold period at the top of the table."

Now while there is no doubt, as Mr. Blanford has recently shown in the *Journal* of the Asiatic Society of Bengal, and elsewhere, that the temperature at the earth's surface is very decidedly influenced by rainfall and cloud, we see from this table that the year of highest temperature was actually that in which *most* rain fell, and Prof. Hill has found that the excesses of temperature and rainfall, though not strictly contemporaneous, were most decided in the *same* regions of the country. It is scarcely necessary perhaps to add that the actual sun-spot minimum occurred in the middle of 1878, in order to show the important bearing of these facts on our hypothesis.

Tunbridge Wells, January 24 E. DOUGLAS ARCHIBALD

Solar Observations

I INCLOSE two letters which I have recently received from Mr. W. A. Holland, chief officer of the ship *Sarah Bell*, and which I think will interest your readers. It is to be hoped that other observers, whether on land or sea, may have important information to communicate on the subject, which they may be induced to give you for publication.

WILLIAM THOMSON

The University, Glasgow, January 23

Havre, January 10, 1882, Ship "*Sarah Bell*"

SIR,—Being at Sea last November 22 and 23, and our position at noon being lat., 18° 58' S., long. 1° 53' W., and lat. 17° 32' S., long. 3° 39' W. respectively; and while observing the sun's meridian altitude, I noticed a very remarkable dark spot on the sun's disc; it was about one-third of the sun's diameter, and bearing south-east from ☉ centre. On the following day it appeared one-fourth of ☉ diameter, and of bearing west-north-west from centre; by putting down the proper shades of my sextant I could see it very distinctly. I called the captain's attention to the fact at the time, and he says he never saw such a phenomenon in his life; he is a gentleman who has spent his life at sea since the year 1840. Almost at the same time I read from the June number of *Good Words* for 1879 your very valuable article on Terrestrial Magnetism and the Mariner's Compass; but the latter part of the article treating on sun-spots caused me to take this bold step of addressing you, trusting I have not been

over-presumptuous in so doing. I have the honour to be, Sir, your most obedient and humble servant,

W. A. HOLLAND,
Chief Officer of Ship *Sarah Bell*
Havre, January 21, Ship "Sarah Bell"

SIR WILLIAM THOMSON,

DEAR SIR,—In reply to your very kind letter of the 18th, I am most confident and very careful in what I have already reported to you. With this exception, that I myself estimated the spot on the sun to be $\frac{1}{2}$ diam., but conferring with the captain he estimated it to be $\frac{1}{3}$ diam., it was purely an estimate of the eye. The first time I observed it I could scarcely believe my own eyes; I immediately and properly adjusted my sextant and observed the sun constantly through the day. The spot appeared to move from the sun's upper limb to the lower limb, and nearly through the sun's centre. The captain and myself most particularly noticed the spot both with and without our telescopes, and we feel quite sure there could not have been any mistake, as I have been in the habit of observing the sun's altitude at the least six times during the day at sea; I add the spot appeared quite black. Weather squally, with a very troubled and confused sea; barometer 29°·93 steady. Trusting my notes may be of some use to you, and that you will hear a more explicit account from other navigators.

W. A. HOLLAND,
Chief Officer *Sarah Bell*, Havre

On the Climate of North Northumberland as Regards its Fitness for Astronomical Observations

IN May, 1880, I became possessed of the telescope, observatory, and astronomical instruments belonging to the late Rev. Henry Cooper Key, M.A., F.R.A.S., and I erected the telescope and observatory at my vicarage at Alnwick, Northumberland. The instrument is a silver-on-glass reflector, the speculum being by Mr. Calver, of Chelmsford, of 18 $\frac{1}{4}$ inches aperture; as regards perfection of figure, I believe it cannot be excelled. As a specimen of the work it is capable of performing under the best conditions I may say that last November I measured γ^2 Andromedæ, the components of that exceedingly difficult double star being now separated by only 0"·28 according to the Washington observers. The weather, however, for observational purposes during the last six months of 1880 was so bad here, that I determined to keep a record, as far as possible, of every night in the year 1881, as regards its fitness for astronomical work, and this record I now lay before your readers. I may premise that no fault can be found with the situation of the observatory. It is 250 feet above sea-level, four miles from the sea, there are no mountains or streams sufficiently near to affect the definition, no collieries or manufactories in the immediate neighbourhood; and, if the definition be bad, no cause can be assigned for it but atmospheric disturbance. The following is the record for each month:—

January.—In this month there were 11 nights completely overcast; 4 partially overcast; and 16 clear. I opened the observatory on 5 nights, on 4 of which the definition was very bad, and on 1 bad. On 15 nights there was hard frost accompanied by deep snow.

February.—The nights were: Completely overcast, 22; partially overcast, 6. The definition was on 4 very bad, on 1 bad, and on 1 fair.

March.—Completely overcast, 24; partially overcast, 7. The definition was on 1 very bad, on 1 bad, and on 3 fair. On 2 nights hard frost prevented observations.

April.—Completely overcast, 25; partially overcast, 3; clear, 2. The definition was on 2 very bad, and on 2 nights wind, and on 1 snow prevented observations.

May.—Completely overcast, 10; partially overcast, 9; clear, 12. Definition on 15 nights was very bad, on 1 bad, and on 4 fair. One of the partially clouded nights was too cloudy for observations.

June.—Completely overcast, 14; partially overcast, 2; clear, 14. Definition was on 5 very bad. I was away from home on 9, and engaged on 2 nights.

July.—Completely overcast, 26; partially overcast, 1; clear, 4. Definition was on 1 very bad, on 3 bad, and on 1 I was away from home.

August.—Completely overcast, 25; partially overcast, 3; clear, 3. Definition was on 1 very bad, wind or cloud prevented observations on 4 nights, and on 1 I was away from home.

September.—Completely overcast, 25; partially overcast, 4;

clear, 1. Definition was on 4 very bad, and on 1 of the partially clouded nights there was too much cloud for observations.

October.—Completely overcast, 19; partially overcast, 6; clear, 6. Definition was on 4 very bad, on 1 very fine, wind prevented observations on 4 nights, and on 3 I was away from home.

November.—Completely overcast, 13; partially overcast, 5; clear, 12. Definition was on 7 very bad, on 2 bad, on 2 fair, and on 1 very fine. Wind prevented observations on 5 nights.

December.—Completely overcast, 15; partially overcast, 1; clear, 15. Definition was on 6 very bad, and on 4 fair. Wind prevented observations on 3 nights, on 2 I was away from home, and on 1 engaged.

The summary for the year is as follows:—229 nights were completely overcast; 51 were partially so (but of these 4 were too cloudy for observations); and 85 were clear. Thus 132 nights ought to have been available for observations. Of these the definition on 54 was very bad, on 9 bad, on 14 fair, and on 2 very fine. Wind prevented observations on 16 nights, frost and snow combined on 15, on 2 frost alone, and on 1 snow alone. On 16 I was absent from home, and on 3 engaged. Total, 132.

I need hardly point out to your readers that the above record is a somewhat melancholy one for the astronomical observer. Ours is a cloudy sky; but in addition to the great amount of cloud, the atmosphere here is almost perpetually in a state of violent disturbance, so that difficult and delicate telescopic work can very rarely indeed be attempted. Last year there were only two occasions on which I found the definition really fine, and on those it only continued so for a short while. When the stars are visible, they are, as a rule, when looked at through the telescope, seen to be flaring, flashing, fluttering, jumping, twirling, or waving—anything in short rather than remaining steady. This is clearly owing to atmospheric perturbation, because on some very rare occasions the images are still, and the definition is superb. I have not been in the habit of using a telescope for a sufficient length of time to say whether last year was an exceptionally bad one for the North of England, but from what I have heard and read, as well as from nine years' residence here, I am afraid it was not. Perhaps others of your readers can throw a little light on this point.

JEVON J. MUSCHAMP PERRY
St. Paul's Vicarage, Alnwick, January 4

Primitive Traditions as to the Pleiades

MY conclusions as to the Pleiades having been believed to be in early ages the centre of the universe, were not in any way based upon the singular name *Alcyone* for the principal star in that group. I can hardly account for my having so long forgotten the meaning of that name, and its connection with the belief I had found vestiges of, as to the Pleiades being the centre of all things. It is probable that at first I regarded its significance as a mere accident, as Dr. Tylor evidently does, and dismissed it from my mind. The best proof of the widespread traces of the belief in question is to be found in the fact that even since this correspondence took place I have met among the Berbers of Morocco a name for Alcyone, which has precisely the same meaning, and which they tell me, was given to that star because Paradise is in them, and they are the centre of all things. I have also found that the idea, which, as I stated in my last letter, I have for many years entertained, that those stars were observed by means of openings or passages in temples in early ages, is manifestly well founded.

I find that in the Sahara there are temples or ancient mosques, in which the year is still regulated in this way, there being a tube from the top of the building, very small above and larger below, through which the southing of those stars is observed. I have this not only from natives of the Sahara, but also from a European here who has often heard of the system, though he did not know which were the stars that were observed.

Even the Moors have a vestige of the practice in the singular belief that those stars "rest on the top of the mosques." In the feast of tabernacles, too, which is to be found in the Sahara as well as in far-distant quarters of the globe, the Berber tribes build their temporary tents with a hole at the top, so that the young men who are being instructed may see the Pleiades passing overhead. The Jews here have the same custom, and endeavour to explain it by a curious legend as to Jonah's journey to Nineveh. They forget apparently that Moses wrote a good many years before Jonah was swallowed by the whale.