

there was really a convergence or whether the beams were parallel, and the convergence an effect of perspective, can only be decided if some approximative measures of the distance of the streamers be ascertained. It appears to have been at a greater distance from the earth than is usually attributed to aurora borealis, having been seen in different parts of Europe and I believe in America. Doubtless the comparison of these observations will give some parallax or approximation to measurement of the distance. I remember about seven or eight years ago seeing an aurora at Chester, where the flashes appeared close to the observer, so that gleams of light continuous with the streamers could be seen between the houses of the town and myself, like the portions of a rainbow intervening between terrestrial objects and the observer. I tried then to ascertain if there was any reflection or other cause of optical illusion, but could not see it as other than a real effect; I seemed, so to speak, to be in the aurora. The effect on the 25th was very different, and gave me the idea of great distance.

The light was sufficient to enable me to tell the time by my watch easily, but not to read newspaper print.

Between half-past six and seven o'clock it faded away, and at from half-past seven to ten had become an ordinary white aurora, confined to the northern portion of the heavens.

115, Harley Street, Nov. 2

W. R. GROVE

ON the evening of the 24th ult. the aurora was most beautifully seen here, and if you have space for it, I will add a further spectroscopic observation to those you have already recorded. I found no continuous spectrum, but two of the lines described by your other correspondent.

1. A line in the light green, much reminding one of the line from the larger nebulae, but more brilliant and with a peculiar flickering in it. This line was well seen in all parts of the sky, but was specially bright in the auroral patches of silver light.

2. A line in the red, very much like the lithium line, but rather more dusky. This line was only well seen in the rosy patches of the aurora, but could be faintly traced wherever the rose tint at all extended.

When the display of rose-coloured light was at its height, the spectrum from the most vividly coloured portion gave the red line very distinct, while the green line still remained bright by its side. I am quite inclined to agree with your correspondent, T. F., in the conjecture that both these lines are due to hydrogen, though (probably through difference in temperature or pressure) they do not quite agree with the lines of that gas as taken from the discharge in a vacuum tube.

The spectroscope was one of Mr. Browning's small direct-vision 5-prism instruments adapted for star purposes.

It may be worthy of note that the belts of Jupiter are highly coloured at the present time. The equatorial zone is of a distinct dark ochre colour, deepening to red brown as it approaches the lower edge (in an inverting telescope); two thin belts above are slate purple, and a darker belt below is of a deep purple, with a faint trace of rose colour.

The planet was thus seen on Nov. 2, at 9 p.m., not far above the horizon, and in bright moonlight, in a 8½ Browning's silvered spectrum with achromatic eye-pieces—144, 305, and 450; best I think with 144.

Guildford, Nov. 5

J. R. CAPRON

#### Clouds

I do not think Prof. Poey's "New Classification of Clouds," published in NATURE of Sept. 8th, does much to advance science. I see no use in any classification of clouds, unless it is based on their mode of formation, and, so far as I see, there are but three ways in which it is possible for clouds to be formed. These are:—

1. The cooling of a mass of air *in situ* by radiation. This forms stratus.

2. The cooling of a mass of air by diminished pressure when it flows in an ascending column. This forms cumulus. A modification of this process is when (according to Espy) sudden expansion takes place above, so as to diminish the pressure through the entire height of a column of air, and, in consequence of the cold due to the diminution of pressure, to produce condensation of vapour throughout the column. This is Espy's explanation of waterspouts.

3. The cooling of a mass of air by coming into contact with a cooler mass of air than itself. This forms cirrus.

Of course these three modes of formation may be modified and combined in endless ways. To mention one of the simplest: A cloud which has begun to form as a cirrus or cumulus, may become a centre from which heat is radiated, and thus go on forming as a stratus.

It is in the highest degree unphilosophical to reject stratus as a species of cloud on the ground that it is "not a cloud properly so called, but a mist or hoar frost." A cloud and a mist do not differ fundamentally.

Prof. Poey is, however, right in saying that cumulus is not a distinct species of cloud. It is only a cloud which (in consequence, I believe, of the loss of electrical tension) has begun to run together into raindrops.

JOSEPH JOHN MURPHY  
Old Forge, Dunmurry, Co. Antrim

#### Extreme Seasons

A GREAT deal of speculation has been indulged in to account for the extreme seasons that have prevailed over so large a part of the northern hemisphere during the last few months. In this country, as we are subject to extreme seasons, more particularly as regards the rainfall, the subject is one of peculiar interest. In a paper read before the California Academy of Sciences in February on the subject of our extreme seasons, I brought forward a number of observations to show that these were due to broad polar and equatorial currents occupying large portions of the earth's surface continuously, and without much perpendicular or horizontal disturbance, except at the borders where the currents meet. The facts I then brought forward showed that from October to the middle of February a northerly current prevails over this portion of the American continent, extending from one to two hundred miles to the westward of San Francisco to the eastern edge of the Mississippi valley, whilst a southerly current prevails over the eastern side of the continent as far as the Atlantic. The southerly current to the westward extends uninterruptedly across the whole breadth of the Pacific to the coast of Japan. This same distribution of air currents without much perpendicular or horizontal mixing has apparently continued during the summer, and accounts, I think, satisfactorily for the extreme heat that has marked the continental climates over so large a part of the northern hemisphere. Nor is it surprising that the summer temperature on the continents should be so universally hot, as a horizontal wind, either from the north or from the south, blowing over the land in summer must necessarily be a hot wind. That there is no cosmical cause for this elevated temperature is proved by the extremely low summer temperature prevailing over the Pacific between this place and Japan. The mean temperature, as ascertained by observations made on board the mail steamships between here and Japan was, for Nov. 1869, 70°·2, for January, 62°·9, for May, 1870, 61°·9, for July, 65°·7, giving a mean of 2°·7 less for May and July than for January and February. The difference in favour of the winter temperature would be still more marked were the coast temperatures eliminated, as they perhaps should be; as these were much above the mean in summer and below the mean in winter. As to the causes that lead to the peculiar distribution of the air currents in certain seasons, I have not the slightest idea, but I think that, admitting the fact, it affords a satisfactory explanation of anomalous temperatures both in winter and summer.

San Francisco, California, Sept. 4

JAMES BLAKE

#### Cyclones

CYCLONES are commonly regarded as exceptional phenomena of the atmospheric circulation; and we see in text-books statements as to the seasons of the year at which they are most apt to occur, descriptions of the premonitory signs which herald their approach, and directions to aid ships in avoiding the most dangerous portions of the storm-field. In short, each cyclone is regarded as an exceptional fact, an isolated burst of fury from the old storm-god Hurakan.

The writer has lived all his life on the great highway of cyclones, at Charleston, South Carolina; and from the observations of many years, has been led to conclude that this commonly received view embraces only those cyclones which, on account of their rotatory violence, really do threaten destruction on land and sea; and that consequently it overlooks a most important series of phenomena, which, though they do not so forcibly arrest attention, are even perhaps more significant in a scientific point of view. Though *destructive cyclones* or hurricanes are