The Spectra of Aurora and Corona

So much attention has been drawn to the correspondence between the spectrum of the corona and that of the aurora, as to lead one to suppose that they were almost identical; or, at least, that the principal auroral line was also seen in the corona. But even this is not at all the case. As the readers of NATURE are aware, the light of the aurora is almost monochromatic, giving a spectrum of one bright line in the yellowish green (wave-length about 557), and three or four very faint bands, which are more refrangible. These last are only occasionally visible, and indeed, Angström, in 1869, had seen them but once, and that momentarily. It is with one of these faint bands that the 1,474 corona line (wave length 531·6) is said to coincide, and not with the bright line (wave length 557), which is entirely absent in the corona spectrum. Two more of the auroral bands are near to the F and G hydrogen lines, which are visible in the corona, but it is yet doubtful whether they coincide. It is not impossible that a faint H spectrum may be produced in the aurora by the moisture of the air, but I incline to attribute them to the low temperature air spectrum mentioned in my letter of February 7, and which has bands in nearly the same positions. From the extreme faintness of the auroral bands, it is of course impossible to measure their positions with great accuracy.

Under these circumstances it would seem rather premature to lay great weight on the supposed coincidence, and much careful work must be done both on gas spectra and on that of the aurora before we can say with any confidence that these lines are not due to gases already known to us under different circumstances of temperature and density.

I subjoin a table, giving the approximate wave lengths of the lines observed in the auroral and coronal spectra.

Lines of Corona and Prominences.		Lines of Aurora.		Observers.
Description	Wave length	Description	Wav elength	
C Hydrogen	656			
		Bright line.	{630 640*	H. R. Procter and others.
D Sodium D_3	589			
			{556·7	Angström
		Bright line.	{557	Winlock
			{569†	Alvan Clarke, jun.
1474 line	531·6	band	{531	Winlock
			{532	Alvan Clarke, jun.
E	527			
		band	520	Winlock
b	517			
F Hydrogen	486	band	485	Alvan Clarke, jun.
		band	464	Winlock
G Hydrogen	435	band	434	Alvan Clarke, jun.

HENRY R. PROCTER

Royal College of Chemistry, March 28

The Aurora

THE splendid aurora which was visible here last night was probably seen in many other places, and from a comparison of data, perhaps the position of the luminous arch, which formed a conspicuous part of it as seen from here, may be made out.

At 10.30 it passed through the northern part of Corona, 12 Canum Venaticorum, and the head of Leo. At the time mentioned above, the whole of the light was a vivid green, but at about 10.40 red patches appeared, and at 10.45 rays shot up to a point situated about 4° S.S.W. of 12 Canum. The colour round this point was a most wonderfully dark blood red, and in many other parts of the heavens the same colour was seen, very different from the rosy light of last October.

About 11 clouds coming up covered the whole sky, and on their partially clearing away, the aurora was much decreased in brilliancy. The lurid red light reflected from the detached clouds which preceded the main body produced an exceedingly grand effect. The light was strong enough to read type of the size in which NATURE is printed.

On first observing the green parts with a spectroscope of one bisulphide prism, the only line distinctly visible was the green one; but by watching and opening the slit there came into view two bands at the more refrangible end, more sharply defined at the more refrangible side than at the other, and there also seemed to be a considerable continuous spectrum from the green line nearly to the least refrangible of the two bands.

In the red parts the red line was most brilliant, quite equal in intensity to the green one, and then even in the green light it was distinguishable with care and long watching.

York, April 10 T. H. WALLER

LAST evening, at about 9.50, my attention was called to a magnificent display of aurora borealis. A mass of light, composed of red and bluish-white streamers or rays, moved rapidly up from about W.S.W. to E.N.E., and the whole took the form of an arch overhanging for a short space of time the western horizon, while transverse waves of light, intensifying the lustre of the blue portions, and occasionally reaching almost to the zenith, rolled across the nebulous mass at intervals of about a second. Streamers projecting eastwards kept shooting out with great brilliancy, like sheet lightning, except that they were separated by a sharp line from the dark surrounding sky. Each flash made a fresh advance eastwards, like the skirmishers preceding an army, and a few bright crimson clouds alone kept nearly the same position throughout the display,—the finest of these was nearly in the S.W. At one time, when the flashes and waves had ceased, an umbrella-like radiation of red and white rays from the zenith attained great beauty. By five minutes past ten the sky had regained a more ordinary hue, but dull red clouds still remained, and in the west a white phosphorescence like early dawn. The night was calm and rather cold; the barometer 30·00 and steady. The wind had been gusty from E. in the afternoon. I had remarked during the daytime some very rare and beautiful modifications of cirrus and wave-cloud stretching from W.S.W. to E.N.E. (a direction coinciding with that of the aurora streamers), and crossed by bars at right angles to them at a lower elevation. The arrangement of these clouds showed that they were strongly acted on by electricity, as is generally, perhaps, the case with wave-cloud. May not vapours of this kind in a peculiar state produce the apparent polarisation of the sun's rays recorded by "J. W." in the *Times* of April 8? To-day, especially, between twelve and one o'clock, detached cumuli, driving rapidly from about E.S.E. and upper cirro-cumuli from E.N.E., have behaved in a manner quite unlike anything I have observed before. The only cirro-cumulus to be seen in the morning shot out branches in advancing and melted away between the branches, leaving a sort of skeleton of spine and ribs, which in their turn were dissipated. The cumulus motions were also unusual, for portions were suddenly arrested, remaining fixed, and then rose apparently and arranged themselves in bands more or less parallel until dissolved. The last phenomena only occurred, as far as I could see, below some whitish rays, extending across the sky from W.S.W. to E.N.E., parallel to the aurora streamers of last evening, and closely resembling the beams of light which often proceed from the sun when behind a cloud on a showery day. Either an aurora must be going on to-day, or the higher atmosphere is in a peculiar electrical state. The influence of these whitish bands on the clouds at a much lower level is at any rate remarkably powerful.

Wrexham, Denbighshire, April 10 F. R.

Solar Science at the pleasure of *Secret* Referees

IN the faithfully-recording columns of NATURE for March 30, at p. 434, is a much required abstract of Mr. Stone's important paper, recently communicated by him to the Royal Society, London, on the connection between terrestrial temperature and sun-spot phenomena. By comparing the curves of mean annual temperatures during the last thirty years (as observed, ready to his hand, by his indefatigable predecessor Sir Thomas Maclear) with another curve constructed on Wolf's observations of sun-spots, Mr. Stone has been enabled to deduce, almost immediately after arriving on his new scene of labour at the Cape of Good Hope, first, that there is an approximately decennial period of such temperature, and so similar to that of the sun-spots as to indicate more than a mere coincidence; and secondly, that the sun-spots are not to be looked on as the direct ages of thent temperature variation, but that either phenomenon results from some general change of solar energy.

As Mr. Stone expressly mentions "that he had not the slightest expectation, on first laying down the curves, of any sensible agreement resulting," I presume that he is not aware that upwards of a year ago I both sought the honour and experienced

* Seen on October 26 last year, but very rarely visible.

† Prof. Pickering considers this an error. My own measures give a wave length very slightly greater than those of Winlock and Angström.