Letters to the Editor

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Spectrographic Observations of Infra-Red Lines in the Auroral Spectrum

THE importance of obtaining auroral spectra in the infra-red has long been recognised, and such investigations have formed part of my spectroscopic programme for the new auroral observatory at Tromsø. Preparations were made last summer and through Dr. Brücke and Dr. Laemann, of Berlin, I was recommended to use Agfa Infra-Red Plate 810 with a suitable

FIG. 1.

sensitiser. These plates were tested last autumn and found suitable. After having carried out some precision interferometer measurements of the wave-length of the auroral line 5577·35¹, spectrographic exposures of the aurora with infra-red plates of the kind mentioned were begun under the guidance of Mr. L. Harang.

During an auroral display on Feb. 4, two small glass spectrographs were in operation; each of them gave good spectrograms showing strong lines in the infra-red, and the well-known spectrum in the blue part. The strong green line is absent because the plate is very insensitive in that region.

The spectrogram (a) of Fig. 1 gives the strongest lines, and was taken with a broad slit. As the neon comparison spectrum is somewhat overexposed, it is to be expected that this plate will give a less accurate wave-length determination than the spectrogram (b) taken with a narrow slit. Our wave-length deter-

minations will therefore be based on the latter spectrogram.

The spectrum in the infra-red has the appearance of one strong and one weak narrow band with sharp edges towards long wave-lengths. They have very much the appearance of band sequences belonging to the first positive group of nitrogen.

On account of the small dispersion in this region (1400 Å./mm. on the original plate), wave-length determinations cannot claim any great accuracy. In order to estimate the possible error, we measured the strong lines 4208 and 3913, and we obtained the values 4207 and 3912 respectively. The average dispersion in this region is 122 Å./mm. and the error of Å. should correspond to 12 Å. in the region of the infra-red auroral lines.

The wave-lengths found for these two infra-red auroral lines are: $\lambda = 7883$ strong; $\lambda = 8095$ weak.

If the auroral line 5577 is to be identified with the oxygen line observed by McLennan, we should expect a number of oxygen lines to appear in the infra-red. The most prominent oxygen lines are the first principal triplet of the Runge-Paschen series (7772, 7774, 7775), the three triplets of the series of Kiess, one between 8233 and 8221, the second between 7952 and 7948, and the third between 7481 and 7476.

None of these oxygen lines can be identified with the two infra-red auroral lines.

Nitrogen shows a spectrum in the infra-red very similar to that of the auroral spectrum (Fig. 1 c), which belongs to the first positive group. For the wave-length of the strongest heads we find $\lambda = 7722$, and this cannot be identified with the strongest head of the auroral infra-red spectrum.

On account of the large intensity of the infra-red auroral lines, only oxygen and nitrogen can come into consideration. As they are not (O I) lines, they most likely must be referred to nitrogen. As the positive group appears fairly strongly in the auroral spectrum, it is to be expected on account of the mutual relation between the first and second positive group that the first positive group should also appear fairly strongly in the infra-red.

If we write the formula for the first positive group:

$$\nu = 10979 + 1718 \cdot 4n_1 - 14 \cdot 44n_1^2 - 1474 \cdot 4n_2 + 13 \cdot 98n_2^2,$$

then the strongest head in the infra-red auroral spectrum nearly coincides with lines of the first positive group corresponding to the following transitions:

n_1	n_2	λ
1	0	7885
7	7	7896
12	13	7863

The last transition can scarcely come into consideration.

In order to settle the question as to the exact interpretation of the infra-red auroral spectrum, we shall have to wait for more accurate determinations. Observations with a spectrograph of much larger dispersion are now in progress.

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Origin of the Coronal Lines

THE spectrum of neutral oxygen has been analysed by Runge, Paschen, Hopfield, McLennan, and especially by Frerichs.¹ The deep terms $^3P_{210} = 109837 \cdot 3$; $109679 \cdot 2$; $109610 \cdot 5$; $^1D_2 = 93970 \cdot 3$; $^1S_0 = 76045 \cdot 6$ account for the green and red lines in aurora and nebulae ($\lambda\lambda 5577$; 6300; 6364). Still, there are a few