## *Emission Lines on the Absorption Bands of* H *and* K.

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In *Monthly Notices*, **87**, 350, I recorded the presence of an emission line in the solar spectrum near K, having the approximate wave-length 3934·80 I.A., or 3934·94 on Rowland's scale. I now find that this line was observed thirty years ago by L. E. Jewell, who gives the wave-length 3934·954. Jewell at first thought the line might be a ghost of the reversal of K, but finally concluded that "there is no question whatever as to the chromospheric origin of the line" (*Astrophysical Journal*, **8**, 119, 1898).

The bright line is only found close to the limb of the Sun, and cannot be traced over the disc more than about one-twentieth of the solar radius. In some recent photographs obtained under the best atmospheric conditions, with the slit of the spectrograph so nearly tangent to the limb that the overlap would not exceed 5″, three other bright lines have been detected. In these plates the 3934 line stands out very clearly, whilst a less conspicuous emission line is found on the other side of K nearly twice the distance from its centre. In addition, in the H region there appears to be a strong emission line bordering the iron line λ3969·270 on the red side, and a very faint emission line on the other side of H, and further from its centre. This is difficult to detect on the brighter background except on plates that have been given exactly the right exposure, and which have not overlapped the limb too much. It is sufficiently distinct on one or two of my plates to allow of fairly accurate measurement.

The approximate positions of the four emission lines on my plates, and of the centres of H and K, as given in the recently published Revision of Rowland's "Preliminary Table," are as follows :—

| Line. | λ I.A. | Intensity. |
|---|---|---|
| Emission 1 | 3931·54 | 0 |
| K | 3933·684 | 1000 |
| Emission 2 | 3934·80 | 2 |
| Emission 3 | 3967·04 | 0 |
| H | 3968·494 | 700 |
| Emission 4 | 3969·40 | 3 |

The wave-lengths of the calcium lines presumably refer to the centres of $H_2$ and $K_2$ as observed at the centre of the Sun's disc, whilst the wave-lengths of the emission lines are derived from solar iron lines in the limb spectra. These values are subject to a small positive correction for limb-effect, which would, however, not amount to more than two or three thousandths of an angstrom.

According to the Revised Table of Rowland, an absorption line occurs at 3931·590, intensity 1, but marked as doubtful. This is almost coincident with the emission line No. 1, but does not exist in any of my spectra, either of the limb or of the centre of the disc. Also near

H a line is given at 3967·057, attributed to $Ce^+$, intensity 0, practically coincident with emission line No. 3. This line also I fail to find in any of my spectra. Lastly, a line at 3969·407, coinciding with the emission line No. 4, does appear as a very faint absorption line in one of my spectra of the centre of the disc.

The $H_2$ and $K_2$ lines of $Ca^+$ are themselves emission lines near the limb, and it is curious that each should be accompanied by an emission line on either side of it, the one on the more refrangible side in each case being further from the centre of the *Ca* line, and the other closer in on the deeper shading of the *Ca* band. But the relative distances are not the same in the two cases, as will be seen from the measures of wave-length.

It appears that the combined effect of the general absorption of the continuous spectrum near the limb and the dark bands forming the wings of H and K determine the emissive character of the lines. Yet absorption lines are also found superposed on the bands, even on the darker parts of the shading. It is remarkable that the emission does not extend into the upper chromosphere, and it cannot be traced in my plates beyond the limits of the photosphere. Evidently it originates above the densest layer of calcium gas, and yet at a low level in the reversing layer.

These lines should show strongly in spectra of the narrow cusp taken just before or after total eclipse, but high dispersion would be required to separate them from H and K.

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