The Flash-spectrum.

GENTLEMEN,—

In the discussion on Mr. Mitchell's paper on the Flash-spectrum, read at the Royal Astronomical Society on March 14th and reported in your April number, Mr. Fowler mentions a method adopted by me of "attempting to reconcile the two sets of lines (*i. e.* those of the flash and Fraunhofer spectra) by a process of averaging their intensities." This he regards as objectionable on the ground that it suppresses some lines of abnormal intensity in the flash-spectrum to which he attaches a special significance, these lines "in the case of such an element as iron being almost invariably lines which are brighter in the spark than in the arc spectrum."

In my eclipse spectra of 1898 there are 85 lines in the region more refrangible than *h* which have been ascribed to iron; of these 11 may reasonably be considered to be abnormally bright, and nearly an equal number abnormally faint, when compared with their corresponding absorption-lines. The lines of normal intensity, that is those which are in agreement with the dark lines, amount to 73 per cent. of the whole number. In the case of the element titanium, 80 per cent. of the lines are of normal intensity.

It is not therefore a question of "attempting to reconcile" the bright-line and dark-line spectra, which are practically alike for each element, and the differences are largely accounted for when we take into consideration the lines which have a double or multiple origin. For instance, when an iron line falls within a few tenths of a unit of a line of an element relatively strong in the flash by reason of its wide diffusion, such as Sc, Ti, Cr, &c., then the bright line will be unduly strong in relation to the dark line. Of the eleven abnormally strong iron lines mentioned, six can almost certainly be accounted for in this way.

Now as to the supposed relation between the abnormal flash-spectrum lines and the lines which are stronger in the spark than the arc. Only two of the eleven abnormal iron lines of my spectra fall within the limits of the table published by Sir Norman Lockyer* of the enhanced lines of iron, but neither of these are enhanced lines. However, a fair comparison cannot be made with my spectra of 1898, because they do not give good values of wave-length or intensity in the visible region of the spectrum, where the spark-lines have been more particularly studied. But the more recent photographs obtained in 1900 give reliable values for this region, and the results of these, which are in very good agreement with Sir Norman Lockyer's determinations from his Indian spectra and with Professor Frost's results, cannot be said to bear out Mr. Fowler's statements, from which one would infer that the region of the flash is not the seat of the Fraunhofer absorption lines.

Comparing the iron lines with the table of enhanced lines, I find 21 out of 35 are present in the flash; but of these 14 are of normal

* P. R. S. vol. lxv.

intensity, leaving 7 only which are unduly strong in the flash. Of these, the most striking examples are the lines at 4584, 4924, and 5018, to which may be added the *ex* corona line at 5317, which is outside the limit of my spectra.

On the other hand, there are at least four abnormal flash-lines (omitting those which seem accounted for by other elements interfering) which are not enhanced lines. Taking the iron spectrum as a whole, the intensities agree in the main with the dark-line intensities, and, according to my more recent results, some of the exceptional lines coincide with a few of the enhanced spark-lines.

Yours faithfully,

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Kenley, Surrey,
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