

34.
Gustav
Kirchhoff.

flame which emits the two bright lines in its own spectrum destroys them (replacing them by two dark lines) in the spectrum of a ray of light which passes through the sodium flame.¹ Foucault had in 1849 already shown the direct reversal of the sodium line in the spectrum of the electric arc. These earlier anticipations remained partly unnoticed, partly unknown, or were looked upon as isolated cases, and it was reserved for Gustav Kirchhoff to put this remarkable property of emission and absorption of special colours by coloured flames into practical language, and express it in a general way. He wrote in 1859:² "I conclude that coloured flames in the spectra of which bright lines present themselves, so weaken rays of the colour of these lines, when such rays pass through them, that in place of the bright lines, dark ones appear as soon as there is brought behind the flame a source of light of sufficient intensity, in which these lines are otherwise wanting." And when he concluded further that the dark lines of the solar spectrum which are not evoked by the atmosphere of the earth, exist in consequence of the presence in the sun's atmosphere of those substances which in the spectrum of a flame produce bright lines at the same place, "he at once gave

¹ From this he inferred that the presence of sodium vapour in the atmosphere of the sun would explain by absorption the two dark lines in the solar spectrum. Lord Kelvin reports that in consequence of this observation of Stokes he regularly taught his Glasgow students that sodium must be in the sun's atmosphere. See the reprint of the correspondence on this subject in the 'Gesammelte Abhandlungen' of

Kirchhoff, 1882, p. 639, where it will also be seen that Sir W. Crookes claimed a similar anticipation for Miller in 1846. See also Sir W. Thomson's ninth Baltimore Lecture.

² See the translations of Foucault's and Kirchhoff's memoirs sent by Sir G. Stokes to the 'Philosophical Magazine' of March 1860, p. 194 sqq.