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Another nebulous multiple star

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the continuous solar spectrum multiplied by 10^{-q} . In the application I take $q=2$, but the exact value is of small importance for my purpose. *) Hence the optical depth taken tangential to the solar surface is 10^{-q} . Now the line along which the optical depth is to be taken intersects the solar atmosphere at different heights. However it may easily be demonstrated (supposing an exponential decrease of density with height) that the optical depth may be computed by multiplying the product of mass absorption coefficient x and density ρ , both taken at the lowest point of the line, by a length l that is about equal to the distance along the line of the two points at which the product $x\rho$ is equal to the fraction $1/e$ of its value at the lowest point of the line. Introduce the indices m for the monochromatic spectrum and c for the continuous spectrum and let ρ_m and ρ_c be the densities at the solar limb for monochromatic light and for the continuous spectrum. Then:

$$x_m \rho_m l = 10^{-q}$$

$$x_c \rho_c l = x_c^\circ \rho_c^2 l = 10^{-q}$$

as x_c is proportional to ρ . Hence:

$$\left(\frac{\rho_m}{\rho_c}\right)^2 = \frac{10^{-q}}{l} \frac{x_c^\circ}{x_m^2}.$$

*) A more refined procedure consists in considering two values of q : one for the solar limb in the continuous spectrum and one for the chromospheric limb as determined by the measurement of arcs.

Take $\rho \sim e^{-\frac{mgh}{RT}}$, h being the height in the solar atmosphere, m the molecular weight, R the absolute gas constant, T the temperature, g the acceleration of gravity. Then

$$e^{-\frac{2mg}{RT}(h_m-h_c)} = \frac{10^{-q}}{l} \frac{x_c^\circ}{x_m^2}$$

or:

$$0.43 \frac{2mg}{RT} (h_m - h_c) = q + 2 \log x_m - \log x_c^\circ + \log l.$$

With $m = 20$, $T = 5000^\circ$; $\frac{mg}{RT} = 1.3 \times 10^{-6}$ and

$l = 10^9$ c. g. s. Hence:

$$h_m - h_c = 0.9 \times 10^6 [q + 2 \log x_m - \log x_c^\circ + \log l] = 140 \text{ km},$$

with $x_m = 10^7$ and $x_c^\circ = 10^{10}$ (EDDINGTON, *Int. Const.* p. 146, reduced to molecular weight 20 and effective nuclear charge 1).

Hence we see that a lower chromosphere of height about 140 KM. (only as regards order of magnitude) is to be expected from the gases that are in ordinary equilibrium in the solar atmosphere apart from the considerations that have been adduced above for the interpretation of the higher parts of the chromosphere.

Another nebulous multiple star, by *W. H. van den Bos*.

C. P. D. — $60^\circ 27' 32''$ at $11^h 10^m 8^s$, — $60^\circ 43'$ (1900) is given in the *S. D. C.* as a $2''$ pair, I 1132, with the following note:

'Centre of the curious nebula λ 3334. HERSCHEL remarks: a red 10th mag. star, the centre of an excessively condensed group of stars 15th to 18th mag. with nebulosity extending over $2'$ diameter. The centre when examined with powers 240 and 320 decidedly not a star, and the nebula around it all resolved.'

The $26\frac{1}{2}$ -inch shows the central star to be a close

double, B 1184, with many faint stars near. I have measured the following:

AB	$9.8 - 10.2$	98°	$0.6''$
AB, C	$9.2 - 11.3$	75	1.8
AB, D	$9.2 - 11.3$	259	2.7 (I 1132)
AB, E	$9.2 - 12.3$	351	3.5
AB, F	$9.2 - 11.8$	306	4.6

and made the following notes:

'The central double is red or at least decidedly reddish, though the spectral type is given as Oe in the Draper Catalogue. All stars nebulous; looks like

loose spiral, probably by accidental arrangement of the brighter stars. Extremely dense, mottled field of averted-vision stars, like background Great Cloud, with sprinkling of brighter stars but also nebulosity, the latter faint.'

On Franklin-Adams plate 3810, 1927 November 21, 30^m exposure, distinctly involved in nebulosity, like bridges between the stars. The group shows as a single star, but a grey image.

The reddish colour is interesting; remembering our recent experience with Nova Pictoris the possibility

of this being the wreck of a nova should not be overlooked. This object is totally different from the nebulous multiple B 719 at 7^h18^m.9, reported in *B. A. N.* 118, where the nebula is much brighter, in fact the most striking feature, fan-shaped like a comet, with the close pair as nucleus, and the spectral type Ma. The latter object more likely belongs to the same class as HUBBLE's variable nebula. According to a letter from Dr. VAN MAANEN it is intended to observe B 719 at Mount Wilson.