

Astronomy. — “*On the magnitude equation of OSTHOFF’s estimates of star-colours*”. By EJNAR HERTZSPRUNG.

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In *Annalen van de Sterrewacht te Leiden* Vol. XIV, Part 1, p. 14; 1922 I have noticed an unexplained magnitude equation for the derived c_2/T values of stars of the spectral classes A0, A2, A3 and A5. Now the c_2/T values used i.e. depend for about 58 percent of the total weight on direct colour estimates. A redetermination of the magnitude equation of those estimates is therefore very desirable. The opportunity for this is given by the new catalogue of OSTHOFF (*Specola Astronomica Vaticana* Vol. VIII; 1916) extending his estimates with the 4 inch refractor one magnitude farther viz. to about 6^m. A card catalogue was made containing the hour of R. A., the degrees of declination, the spectrum of the new Draper Catalogue H.D. (taken from the Index Catalogue, *Spec. Astr. Vat.* IX; 1917), the magnitude to one tenth and the estimated colour. The cards were divided into groups according to spectrum. After some trial the subdivisions of spectral class were combined in the way as shown in Table 1. For each of the 6 combined groups corresponding values of mean magnitude and mean estimated colour are given. On the accompanying diagram the figures of Table 1 are represented graphically.

The most striking fact is, that the estimated colour does not, as hitherto adopted ¹⁾, increase continuously with decreasing apparent brightness but shows a maximum in the neighbourhood of 4^m or 5^m. Especially for the white stars the decrease in estimated colour between 5^m and 6^m is very marked. This is nothing more, than should be expected from the known peculiarities in colourconception by the human eye. If the spectrum of the sun is made to increase in intensity starting just below the limit of visibility, the blue and green portion will appear first, but without showing any colour, until by still greater intensity the colours green and blue are

¹⁾ A. Pannekoek, *Koninklijke Akademie van Wetenschappen te Amsterdam*, Proceedings of the Meeting of Saturday October 27, 1906, and E. HERTZSPRUNG, *Zeitschr. für wiss. Photographie* Bd. 5, 100; 1907.

seen. On the other hand the red end of the spectrum will appear red, as soon as it is perceived. By very great intensities the colours will again loose in saturation ¹⁾. The magnitude equation found for OSTHOFF'S colours is in accordance with these facts.

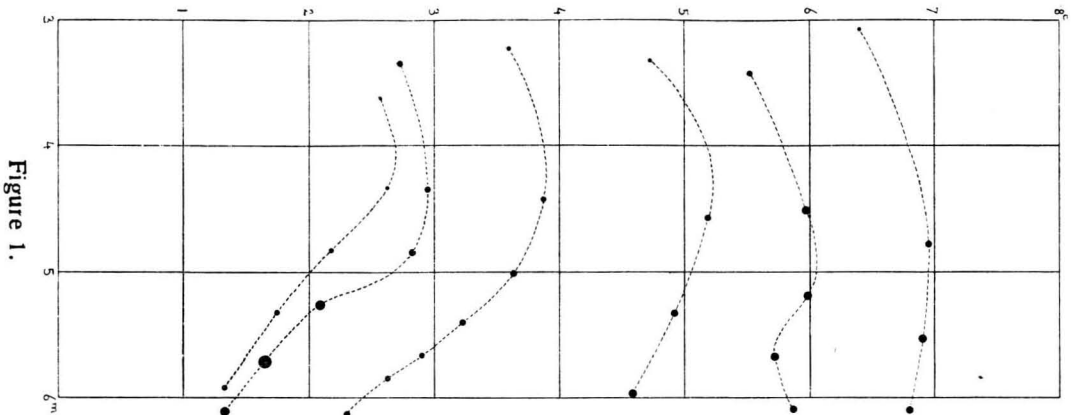


Figure 1.

TABLE I.

B3, B5			B8, B9, A0, A2, A3			A5, F0, F2, F5			F8, G0, G5			K0			K2, K5, M _a , M		
n	m	c	n	m	c	n	m	c	n	m	c	n	m	c	n	m	c
18	3.63	2.57	65	3.35	2.73	30	3.24	3.60	23	3.32	4.72	51	3.42	5.52	22	3.07	6.40
23	4.34	2.63	59	4.35	2.95	51	4.43	3.87	61	4.58	5.19	106	4.51	5.96	71	4.78	6.95
38	4.83	2.18	84	4.85	2.83	73	5.01	3.64	77	5.33	4.92	105	5.19	5.98	99	5.53	6.90
48	5.32	1.75	145	5.26	2.09	63	5.40	3.24	108	5.97	4.59	107	5.66	5.72	87	6.09	6.80
48	5.92	1.32	104	5.55	1.75	52	5.66	2.90				105	6.09	5.86			
			173	5.80	1.59	59	5.85	2.63									
			132	6.11	1.33	70	6.14	2.30									

¹⁾ E.g. the wire of the electric lamp behind the darkroom glass, only letting red light through, appears yellow.

The results obtained are able to clear up the discrepancies cited above from Leiden Ann. XIV. At the same time they form an instructive example of the unsafety of extrapolation, as just at about 5^m , which was the limit of brightness of the stars concerned in Leiden Ann. XIV, the magnitude equation of the estimated colour changes its character.

The above considerations rest on the assumption, that stars of the same spectrum do not show any systematic change of effective temperature with apparent magnitude. As long as we have no other reliable colour equivalents of these stars, this seems to be the most plausible supposition, which can be used.
