On the difference in photographic gradation for stars of different colour

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On the difference in photographic gradation for stars of different colour, by *Ejnar Hertzsprung.*

About 120 plates of bright stars taken intrafocal with the photographic refractor ($a = 33$ cm, $f = 524$ cm) of this observatory, using a grating placed in front of the objective, offer the opportunity to test the question, whether stars of different colour show different photographic gradation. I selected 288 pairs of stars of similar brightness but of different colour, and compared the apparent difference in magnitude between the central image and the diffraction images of the first order. The mean square of the differences in c_2/T was $4{\cdot}12 = (\pm 2{\cdot}03)^2$ for one pair. The mean proportion between the gradations of two stars differing 1 in c_2/T was found to be $1{\cdot}0032 \pm {\cdot}0019$ (m. e.) the yellower star showing the steepest gradation. For stars differing by 1 mag. in colour index the corresponding proportion is

$$1{\cdot}0052 \pm .0030 \text{ (m. e.)},$$

or practically unity. It is, at least in this case, rather improbable that the difference in gradation between stars of spectral classes A and K should exceed 1 per cent.

On another occasion (*A. N.* 4972, **208**, 51; 1919) using the $U\,V$ Zeisstriplet of Potsdam I found the same proportion (for $\Delta\,(m_{pg} - m_v) = 1$) to be

$$1{\cdot}023 \pm {\cdot}005 \text{ (m. e.)}.$$

The difference between the two results ·018 ± ·006 is rather large, but the effective wavelength of the intrafocal images of the $U\,V$ triplet is about 150 Å less than in usual photographic instruments (*cf. A. N.* 5000, **209**, 119; 1919) and this may account for the difference found, because according to FRANK E. ROSS (*Ap. J.* **52**, 89; 1920, Fig. 2) the gradation coefficient γ is nearly constant between the wavelengths 440 and 480 $\mu\mu$, while it falls off markedly from 440 to 420 $\mu\mu$.

Remark on the effective temperature of ϛ Ursae majoris, by *Ejnar Hertzsprung.*

In *Comptes rendus* **174**, 669; 1922 CHARLES NORDMANN and LE MORVAN announce that there is no sensible difference in effective temperature between the two stars ϛ and ι Ursae majoris, the Harvard spectra being $F8$ and $A5$ respectively. By comparison with a third star NORDMANN and LE MORVAN conclude that ϛ Ursae majoris is whiter than would be expected from its spectrum while ι Ursae maj. is normal.

This result however is in contradiction with the mean colour aequivalents I have collected in *Annalen van de Sterrewacht te Leiden* **14** part 1; 1922. The mean values of c_2/T are there found to be $2{\cdot}40 \pm {\cdot}09$ (m. e.) and $2{\cdot}00 \pm {\cdot}09$ for ϛ and ι Ursae maj. respectively. A comparison between the visual magnitudes of Potsdam and photographic ones determined here in Leiden yields further the values c_2/T $2{\cdot}33 \pm {\cdot}18$ and $1{\cdot}77 \pm {\cdot}18$, or in the general mean $2{\cdot}38 \pm {\cdot}08$ (m. e.) and $1{\cdot}96 \pm {\cdot}08$ respectively for the two stars.

I thus conclude that both stars are of normal colour according to their spectra and the value of c_2/T is $\cdot 42 \pm \cdot 12$ (m. e.) greater for ϛ than for ι Ursae majoris.
