makes the comparison even more interesting. In order to be independent of our assumptions for p in the comparison of our results we shall compare $\bar{R}/p$ instead of $\bar{R}$. VAN HOOF's result is $\bar{R} = 25\ r_\odot \pm 2\ r_\odot$ (m.e.) which, as VAN HOOF takes $p = 1$, yields $\bar{R}/p = 17{\cdot}4 \pm 1{\cdot}4$ (m.e.) (unit 10^6 km).

This is in perfect agreement with the writer's result who found $\bar{R}/p = 18{\cdot}8 \pm 1{\cdot}6$ (m.e.) in the same unit. VAN HOOF's mean error is undoubtedly too small as the total weight of the colour-index curve used by him is only 1/9 of the total weight of the corresponding curve used by the writer. VAN HOOF's result is found to be represented correctly as: $\bar{R}/p = 17{\cdot}4 \pm 4$ (m.e.) in 10^6 km as unit.

The colour-index of a black body with infinite temperature, by *A. J. Wesselink*.

It is well known that the stars do not radiate exactly like black bodies [1]); moreover the theory does not expect them to do so [2]).

On the other hand, stellar radiation and the radiative properties of the stars may for many purposes be described with sufficient accuracy by formulae derived from Planck's law.

Consequently the convenient formulae, strictly valid for black bodies, have been used with considerable success in the formal description of the properties of stellar radiation; it seems even probable that astronomers will continue this practice for many years to come [3]).

Among other things it is therefore of interest to know the colour-index of a black body with infinite temperature on the conventional stellar scale of colour-indices. This quantity, $c\ (\infty)$, in a way, constitutes a limit to the colour-indices of the stars.

The magnitude of the surface-brightness of a black body, at a given wavelength, varies with the temperature according to the following formula, which is derived from Planck's law:

$$m = +\ 2\tfrac{1}{2} \log \left(e^{\ c_2/\lambda T} - 1\right) = f\ (\lambda T) \qquad (1)$$

With λ in μ and T in degrees Kelvin: $c_2 = 14350$.

The following two approximations to this formula, respectively valid for λT is comparatively low and high, are useful [4]):

$$m = +\ 2\tfrac{1}{2}\ (c_2/\lambda T) \log e \text{ or } m = +\ \frac{15580}{\lambda T} \qquad (2)$$

and $$m = +\ 2\tfrac{1}{2} \log c_2/\lambda T \qquad (3).$$

The colour-index of a black body, based on the wavelengths λ_1 and λ_2, according to (1) is, with a constant K which determines the zeropoint:

$$\text{colour-index} = f\ (\lambda_1 T) - f\ (\lambda_2 T) + K \qquad (4)$$

The corresponding formula based on (2) is:

$$\text{colour-index} = \frac{15580}{T}\left(\frac{1}{\lambda_1} - \frac{1}{\lambda_2}\right) + K \qquad (5)$$
(λT is low)

and the formula that follows from (3) is:

$$\text{colour-index} = -\ 2\tfrac{1}{2} \log \lambda_1/\lambda_2 + K \qquad (6)$$
(λT is high)

These formulae hold strictly for monochromatic light. However, both the eye and the photographic plate are sensitive over a range of wavelengths and the formulae may be used by substituting for λ an appropriate effective wavelength. By doing so a definite uncertainty is introduced because of the dependence of the effective wavelength on the colour of the star [1]). This effect is negligible in photovisual photometry. In the following we shall neglect the effects of the ill-defined wavelengths of visual and photographic photometries.

RUSSELL, DUGAN and STEWART in their well known textbook [2]), take $\lambda_1 = \mu{\cdot}425$ and $\lambda_2 = \mu{\cdot}529$, values that correspond to the effective wavelengths of respectively the photographic and visual Harvard magnitudes according to BRILL's investigation [3]).

They substitute $T = 6000°$ for the absolute temperature of the sun and a colour-index of $+\ ^{m}{\cdot}57$ also for the sun, in formula (5), which gives accurate results at this temperature and these wavelengths. The result is $K = -\ ^{m}{\cdot}64$. The corresponding formula for the colour-index of a black body on the conventional scale of colour-indices if the temperature is not too high is:

$$\text{colour-index} = \frac{7200}{T} - {}^{m}{\cdot}64 \ ^{4)} \qquad (7)$$

From this formula RUSSELL, DUGAN and STEWART conclude that the colour-index of a black body of infinite temperature is $-\ ^{m}{\cdot}64$ [5]). This conclusion is

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1) Compare for instance WESSELINK, *B.A.N.* **7**, 239 (1935).
2) B. LINDBLAD, *Uppsala Universitets Årsskrift*, No. 1, (1920).
E. A. MILNE, *Monthly Notices* **81**, p. 375 (1921).
A. S. EDDINGTON, *The internal constitution of the stars*, p. 324 (1926).
E. A. MILNE, *Hdb. d. Aph.* Bd. III/erste Hälfte, dritter Teil, p. 147 (1930).
A. UNSÖLD, *Physik der Sternatmosphären*, p. 104 (1937).
3) Compare in this connection the viewpoint of A. UNSÖLD: *Physik der Sternatmosphären*, p. 52.
4) These formulae correspond to WIEN's resp. RAYLEIGH-JEANS's approximations to Planck's law.

1) WESSELINK, *B.A.N.* **8**, 125 (1937).
2) *Astronomy* II, p. 733.
3) A. BRILL, *Hdb. der Aph.* V, erste Hälfte.
4) See *Astronomy* II, page 733 at the bottom.
5) *Astronomy* II, p. 734.

erroneous since (7) does not hold for high temperatures and the limit of (7) for $T = \infty$ therefore does not represent $c(\infty)$.

The correct result for $c(\infty)$ is obtained from (6):

$$c(\infty) = -2\tfrac{1}{2} \log \cdot 425/\cdot 529 - {}^{\mathrm{m}}\cdot 64$$
$$= +{}^{\mathrm{m}}\cdot 25 - {}^{\mathrm{m}}\cdot 64 = -{}^{\mathrm{m}}\cdot 39.$$

We will repeat this calculation using more modern data.

The colour-index of the sun according to KUIPER is $+{}^{\mathrm{m}}\cdot 53$ [1]) on the International system. We take for the effective wavelength of the International photographic system $\lambda_1 = {}^{\mu}\cdot 430$. For the effective wavelength of the International photovisual system we take $\lambda_2 = {}^{\mu}\cdot 540$ [2]). The sun's temperature is assumed to be 6000° as before.

We then find $K = -{}^{\mathrm{m}}\cdot 69$ and $c(\infty) = -{}^{\mathrm{m}}\cdot 44$.

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1) *Ap. J.* **88**, p. 432 (1938).

2) Communication by SEARES to HARTWIG, *Zs. f. Aph.* **17**, 205. I am indebted to Dr P. TH. OOSTERHOFF for this reference.

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