Remark on the photographic magnitudes by E. HERTZSPRUNG and by H. HAFFNER for stars in Praesepe, by *L. Binnendijk.*

In his article "Photographische Blau-Helligkeiten in der Praesepe" [1]) HAFFNER makes a comparison between his own photographic magnitudes, m_{4270}, and those derived by HERTZSPRUNG [2]). The differences, $m_{He}-m_{4270}$, are plotted against m_{4270} in his Figure 4, page 24. The magnitudes by BERNHEIMER for five stars, which HAFFNER added to this diagram, were omitted in the present note. The diagram indicates that there exists practically no color equation, which is in accordance with the fact that the effective wavelengths of both systems are very nearly equal. The values of λ_{eff} derived by HAFFNER are 424 $m\mu$ for the faint white stars and 430 $m\mu$ for the bright yellow stars. Those for HERTZSPRUNG's magnitudes may be taken from the work by OOSTERHOFF on h and χ Persei [3]), which is based on identical material. For B-type stars λ_{eff} was found to be 427 $m\mu$, for M-type stars 440 $m\mu$.

The relation shown in the diagram is evidently not a linear one. For the stars brighter than the twelfth magnitude a linear relation represents the observations satisfactorily, but the fainter stars deviate considerably. It is the purpose of the present note to investigate whether this feature is due to a change in the scale of the photometric system by HERTZSPRUNG or of that by HAFFNER.

Four plates taken with an objective grating, which gives a difference Δm of about two magnitudes between the central and the first order images, were measured in a Schilt photometer. The constant Δm was then expressed in the photometric system m_{4270} with the aid of the stars between the magnitudes 10 and 12 and also by means of the stars between the magnitudes 12 and 14. In the same way Δm was expressed in the system m_{He}. If the two values derived for Δm in one of the photometric systems are equal, we may conclude that the scale of this system is consistent from magnitude 10 to 14.

The plates, Eastman 40, were taken with the 32 cm refractor. The times of exposure and the position of the grating were as follows:

4264	90 min.	=
4294	10	=
4311	80	‖
4426	10	‖

For each plate the galvanometer readings were plotted against the magnitudes m_{4270}. Thus two reduction curves were obtained, one for the readings of the central images and the other for the first order images. The difference in magnitude between these two curves for a given value of the galvanometer reading yields the value of Δm. In this manner Δm was determined for the magnitude intervals 10 to 12 and 12 to 14. On the short exposure plates an additional determination could be made for the interval 8 to 10.

In the same way we derived Δm by means of HERTZSPRUNG's magnitudes for similar magnitude intervals taking into account that $m_{4270} = 12{\cdot}0$ corresponds with $m_{He} = 11{\cdot}6$.

The results are:

plate number	8^m—10^m		10^m—12^m		12^m—14^m	
	m_{He}	m_{4270}	m_{He}	m_{4270}	m_{He}	m_{4270}
4294	2·00	2·10	2·04	2·19		
4426	2·00	2·11	2·01	2·17		
4264			2·00	2·16	2·01	1·98
4311			2·03	2·19	2·07	2·04
mean	2·00	2·10	2·02	2·18	2·04	2·01

From these figures we conclude that the scale of HERTZSPRUNG's photometric system is consistent within the errors of observation over the interval observed and that the deviations from a linear relation in the diagram mentioned above are mainly due to the photometric system by HAFFNER.

I am indebted to Dr. P. TH. OOSTERHOFF for his advice.

[1]) *Veröffentl. Universitäts-Sternwarte Göttingen,* Nr. 54, 1937.
[2]) *A.N.*, **203**, 161, 1916; *A.N.*, **205**, 71, 1917.
[3]) *Annalen Leiden,* XVII, **1**, 1937.

Motions of RR Lyrae variables, by *J. H. Oort.*

The publication by JOY of the radial velocities of variable stars of the RR Lyrae type[1]) has increased the number of known velocities by 150 %. From these velocities the following value of the solar motion

[1]) *P.A.S.P.* **50**, 214 (1938).

Star	l	b	r	$\mu_\alpha \cos\delta$	μ_δ	p.e.	rad. vel.	$\Pi-\Pi_\odot$	$\Theta-\Theta_\odot$	$Z-Z_\odot$	Π	Θ	Z	W	W′
SW Aqr	18°	−33°	1200	−″·054	−″·045	±″·003	− 5	−345	−173	+103	−355	+ 92	+110	383	398
XZ Cyg	55	+16	870	+ ·066	− ·025	± ·008	−160	+ 23	− 77	−322	+ 13	+188	−315	367	395
RV Cap	0	−36	1000	+ ·035	− ·118	± ·006	− 80	− 36	−537	−248	− 46	−272	−241	366	331
Ci 2018-9	312	+35	42·6	− ·989	−3·544		+304	−356	−694	−181	−366	−429	−174	590	555

may be derived: $S = 130$ km/sec ± 14 (p.e.) directed towards $A = 297°$, $D = +52°$, corresponding to $l = 53°$, $b = +12°$; the p.e. of each co-ordinate is approximately ±8°. No velocities were excluded. The motion found does not differ greatly from that computed by STRÖMBERG [1]) in 1925 from 26 velocities, viz. $S = 109$ km/sec, $A = 306°$, $D = +47°$, and its direction agrees well with that of the rotation of the galaxy ($l = 55°$). The absolute amount of the systematic velocity is, however, considerably smaller than the rotational velocity of the galactic system; probably, it is also smaller than the systematic velocity of the globular clusters, for which the most recent calculation, by EDMONDSON [2]), yields $S =$ 274 km/sec ±40 (p.e.). In this respect the cluster-type variables seem to differ from the clusters, and it is difficult, therefore, to think of all these variables as stars escaped from globular clusters.

The average residual motion is ±69 km/sec. There is a slight indication that the velocities in the direction perpendicular to the galactic plane are smaller than those parallel to it; the 22 stars above 60° latitude yield ±59 km/sec, the 19 stars below 30° latitude ±94 km/sec.

Some of the variables have very high space velocities with respect to the centre of the galactic system. Of the velocities which are established with some certainty the three highest are shown in the above table [3]).

The second and third columns show the galactic coordinates; the distances, under r, are based on the assumption that the median absolute magnitude is $0^M{\cdot}0$. The apparent magnitudes used for computing the distances were taken from the article by PRISCILLA FAIRFIELD BOK and CONSTANCE D. BOYD [4]), from which also the proper motions were taken. The columns $\Pi-\Pi_\odot$, $\Theta-\Theta_\odot$, $Z-Z_\odot$ indicate the components of the velocity relative to the sun, Π being in the direction opposite to the centre, i.e. towards $l =$ 145°, $b = 0°$, Θ in the direction of the rotation ($l = 55°$, $b = 0°$) and Z in the direction of the north pole of the galaxy. W is the space velocity. Π, Θ, Z, W are the velocities relative to the centre of the galactic system, found if the rotational velocity is assumed to be 250 km/sec, while W′ represents the space velocity found if the rotational velocity is assumed to be 300 km/sec.

The high velocities found seem to indicate that the velocity of escape from a point near the sun would be at least 400 km/sec. It is somewhat difficult to reconcile so high a value with a rotational velocity of only 250 km/sec, so that it appears likely from these data that the rotational velocity is at least of the order of 300 km/sec. On the other hand, the distribution of globular clusters, in combination with the rotation effects, seems to preclude a value considerably in excess of 300 km/sec, and this number may thus be taken as probably closely representing the true value.

The dwarf star Ci 2018–9 may possess a velocity which is still higher than those considered above. This is a wide double with Mount Wilson spectra G2 and K0 (Draper G0 and G5); the spectroscopic absolute magnitudes, $+4^M{\cdot}4$ and $+5^M{\cdot}7$, correspond to a parallax of ″·012. The trigonometric parallax is +″·035 ±·005 (p.e.). The velocities in the last line of the above table have been computed with a parallax of ″·0235 (the average of the trigonometric and spectroscopic values). The star would appear to deserve further study.

The computations described in the above note have been carried out by Mr. PELS.

[1]) *Ap. J.* **61**, 363 (1925); *Mt Wilson Contr.* No. 293.
[2]) *A. J.* **45**, 1 (1935).
[3]) RZ Cephei has not been included, because it is not unlikely that the high velocity found for this low-latitude star is spurious, and due to the neglect of the absorption.
[4]) *H.B.* No. 893 (1933).

ERRATA.

B.A.N. No. 214:
- page 96, first column, line 14 from top: for 5705·7308 read 5705·3151.
- page 96, second column, line 14 from top: for ·056 read ·096.
- page 96, sixth column, line 6 from bottom: for 609 ·2504 read 6097·2504.
- page 97, first column, line 39 from top: for 5705·7090 read 5705·2935.
- page 97, second column, line 39 from top: for ·744 read ·787.

B.A.N. No. 307, page 225, formula (63): for 5093″·376 in the expression for p_0 read 5039″·376.

B.A.N. No. 308, page 260, second column, line 4 from top, after IV, insert: and latitudes between 7° and 25°,.