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On the motions of Praesepe and of the Hyades

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On the motions of Praesepe and of the Hyades, by *Ejnar Hertzsprung*.

In *A. N.* 4681, 196, 9; 1913 K. SCHWARZSCHILD has examined the question whether Praesepe shares the motion in space of the group of the Hyades. SCHWARZSCHILD concludes that under this assumption the annual proper motion of Praesepe in declination ought to be $-''009$ in stead of $-''018$ as given in the P. G. C. of Boss.

It is evident, that the correction of $+0''013 \cos \delta$ to the annual proper motions in declination of Boss, found by KAPTEYN (*B. A. N.* 14), is of the right order of magnitude to take away the discrepancy noted by SCHWARZSCHILD.

The corrected annual proper motion of Praesepe ($8^h33^m, +20^\circ$) is $-''0022$ in α and $-''018 + ''012 = -''006$ in δ or $''032$ in the direction $259^\circ0$, and of the group of the Hyades ($4^h20^m, +15^\circ6$) it is $''1088$ in the direction $98^\circ27$. Adopting the annual relative change in the apparent linear size of the group to be -00000105 (*A. N.* 5000, 209, 113; 1919) the coordinates of the apparent vertex of the group are found to be $\alpha = 91^\circ90$, $\delta = +10^\circ23$ (1900). To coincide with this the proper motion of Praesepe ought to be in the direction $259^\circ8$, while $259^\circ0$ is found. Thus KAPTEYN's correction to the proper motions of Boss causes the direction of the proper motion of Praesepe to agree with the assumption, that this group shares the motion of the Hyades.

The position given above for Praesepe is $36^\circ3$ and that of the Hyades $26^\circ7$ from the vertex. Adopting the parallax of the Hyades to be $''027$ (*A. N.* 5000) the parallax of Praesepe is calculated to be $027 \times 032 \operatorname{cosec} 36^\circ3 / 1088 \operatorname{cosec} 26^\circ7 = ''0060$ (*cf.* the various values discussed by W. H. VAN DEN BOS in *B. A. N.* 15).

Accordingly the distances from the Sun to the Hyades and to Praesepe are 37 and 167 parsecs respectively, while the distance between the two clusters is 152 parsecs, the apparent angular separation between them being 60° . The proportion between the two parallaxes $027/006 = 4.5$ is well in accordance with the relative apparent size of the two groups supposing them to be of equal real size. Thus each of the two clusters seen from the centre of the other would be about of the same apparent size as Praesepe seen from the sun. It may be recalled from *A. N.* 4952, 207, 96; 1918 that this size is practically the same as that derived by SHAPLEY for globular clusters, taking the differences in star density into account. It is tempting to consider the possibility that this agreement in size is not accidental. Besides the distribution of the stars in the Hyades is, as far as the evidence goes, similar to that in a globular cluster, there being more stars near to and far from

the centre of the group than according to a Maxwellian distribution. In fact, if the Hyades are divided into stripes of the breadth 10^m in α or $2\frac{1}{2}^\circ$ in δ , I find the following relative numbers using the 42 stars tabulated in *A. N.* 5000, 209, 114

limits of distance	}	0	10	20	30	40	50 ^m
from central line		or 0	2.5	5	7.5	10	12 ^{o.5}
rel. number of stars		53	14	10	5	2	

Dividing the first relative number 53 into two parts according to the intermediate limit 5^m in α or $1^\circ25$ in δ , the partial numbers are 38 and 15, showing the strong condensation towards the centre of the group.

If we consider the 6 most prominent known star-clusters, viz. the Ursa major group, the Hyades, the Plejades, Praesepe, χ Persei and h Persei, it is in this connection interesting to note that they are in general different from each other in statistical constitution. The Ursa major group consists of absolutely bright not very different stars of which a great proportion are spectroscopic binaries. There is a marked absence of faint members in this system. On the other hand the brightest stars of the Plejades are of spectrum *B* 5 with increasing number of members of class *A* and *F*. Further the two similar twin clusters χ and h Persei show a new feature, the brightest members being of the peculiar spectral subdivision *c* of ANTONIA C. MAURY. Finally the Hyades and Praesepe are again markedly different from the other clusters, but very similar to each other. They both, in addition to a main „normal” series of stars gradually changing in magnitude and colour, contain a small group of absolutely bright yellow so called „giant” stars entirely deviating from the rule.

It can thus be said that each system of one or two clusters is build up of stars of a kind characteristic for that system.

The following 3 isolated stars with a total observed motion similar to that of the Hyades may be mentioned.

Star	radial velocity		direction of p. m.		parallax	
	<i>O</i>	<i>C</i>	<i>O</i>	<i>C</i>	<i>O</i>	<i>C</i>
	km/s	km/s	°	°	"	"
Groombr 34.....	+ 3	+ 6	82.5	83.3	.281	.326
12 Canum Venat.	+ 1	- 1	284.8	282.8	.020	.024
α Aquilae.....	- 33	- 38	53.7	52.9	.200	.144