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whereas the mean value of $m + 5 \log \mu$ of his stars was about $+ 7$ [1]). This is in rough agreement with the percentages of high velocities found above.

HERTZSPRUNG has also remarked that from the formula for the mean parallax of stars of determined proper motion and magnitude it is theoretically possible to obtain an estimate of the value of H at which half of the stars have high velocities, and also to get a general idea about the way in which this percentage changes with H, if account is taken of the known dispersion of the parallaxes in a $m + 5 \log \mu$ group. But the estimates made in this way differ so much from the numbers obtained in the present note that the procedure must be considered too rough for our purpose.

If we assume that for fainter magnitudes and smaller proper motions the percentages of high velocities will remain the same as those found for corresponding values of $m + 5 \log \mu$ from the brighter stars we find, for example, the following percentages for stars of the 11th magnitude (visual).

μ	n	$m + \log \mu$	p
″·020 to ″·040	34000	+ 3·1	21 %
40 „ 60	11400	+ 4·4	30
60 „ 80	4100	+ 5·2	39
80 „ 100	1900	+ 5·7	45
100 „ 200	2400	+ 6·6	57
≥ 200	550	+ 8·6	77

[1]) *Lick Bull.* No. 344, p. 22, 1922.

The total numbers of stars per 10000 square degrees, n, have been found from *Groningen Publications* No. 30, Table 19. Though the percentages in the first lines are probably somewhat too high on account of the decrease of star density at large distances it seems quite certain that in dealing with faint stars selected for proper motion we must take account of the fact that a very considerable proportion of the stars have high velocities, even if only the proper motions smaller than say 0″·020 annually have been omitted. For instance it seems that this fact should be taken into account when deriving the constants of the star streams from the distribution of such "restricted" proper motions. The assumption that we have to do with two streams, with Maxwellian distributions of velocities in each, certainly is not a fair approximation in this case.

Though considerable numbers of faint stars with large proper motions are known, I do not believe that they can be used with advantage for studying the character of the motions of high velocity stars, unless we know either the parallaxes or the radial velocities. For, by coincidence, the directions in which the high velocities move most frequently agree almost exactly with the directions of the motions of the "ordinary" star streams, *if looked at from the sun* (compare e.g. the diagram in *B. A. N.* No. 159, page 273). If considered from the sun as origin it is principally the absolute amount of the velocities, not the direction, which shows the characteristic difference between the stars of high and low velocity.

The motion of the sun with respect to the interstellar gas, by *J. H. Oort.*

One of the many interesting results obtained by J. S. PLASKETT and J. A. PEARCE in their recent article on the motions and distribution of instellar matter [1]) is the regularity with which the interstellar calcium shows the systematic motions which have been interpreted as effects of rotation of the greater galactic system. In any one area the average deviation from the expected velocity is of the order of ± 2 km/sec. This appears to be an additional argument in favour of the theory that there are no large scale irregularities, such as might have been associated with the "local cluster", in the gravitational field of the stellar system.

By the investigation mentioned it has been made sufficiently clear that the interstellar gas shows the same differential rotation as the stars. It seems important to find out also how closely the absolute velocity of rotation of the gas corresponds with that of the stars. On page 253 of their paper PLASKETT and PEARCE have made a solution for the motion of the sun with respect to the interstellar gas. They find the results indicated, together with their probable errors, in the following table.

[1]) *M. N.* **90**, 243, 1930.

	PLASKETT and PEARCE	Solution with $K = 0$ and $l_0 = 327°$	Solar motion from *Lick Publ.* Vol. 16
K	+ 0·55 ± 2·70 km/sec	—	
$V_{gal.}$	19·87 ± 2·40 „	17·7 ± 0·6 km/sec	18·3 ± 0·3 km/sec
L	25°·9 ± 11°·9	22° ± 2°·0	23° ± 1°·0
B	+ 3°·6 ± 11°·8	—	+ 21° ± 1°·0
$\bar{r}A$	7·30 ± 1·98 km/sec	5·7 ± 0·7 km/sec	
l_0	335°·1 ± 15°·5	—	

K is a systematic error in the velocities independent of the position of the star, $V_{gal.}$ is the solar velocity projected on the galactic plane, L and B indicate the galactic coordinates of the apex, (NEWCOMB's pole $12^h44^m·4$, ± 26°·8 (1900); longitudes counted from the ascending node of the galaxy), $\bar{r}A$ is the coefficient of the term $\bar{r}A \sin 2\,(l-l_0)$, where l_0 is the galactic longitude of the centre of rotation.

The galactic component of the solar velocity with respect to the stars in general, as found from a very homogeneous material in *Lick Publication*, Vol. **16**, p. XXXVII (peculiar velocities higher than 60 km/sec were excluded) is 18·3 km/sec towards 23° galactic longitude and agrees with PLASKETT and PEARCE's value. But the uncertainty in the values derived from the calcium clouds is considerable. It is mainly caused by the fact that only a few southern stars can be reached from Victoria and that, accordingly, the K term and the solar velocity cannot well be separated. According to a personal remark by Professor PLASKETT there is sufficient reason to believe a priori that there can be no significant systematic error in the Ca cloud velocities, though these have been determined from two spectral lines only. Accordingly a new solution was made at Leiden, in which no constant K was introduced. In order further to increase as much as possible the weight of the new solution I have assumed l_0 to be equal to 327° instead of introducing it as an unknown. The solution has been confined to those of PLASKETT and PEARCE's groups which were less than 20° from the galactic circle, and only the solar velocity parallel to the galactic plane was determined. Two further groups were excluded, viz. No. 12 containing h and χ Persei and No. 18 containing O type stars, both for the reason that they are considerably more distant than the other groups and will therefore have a systematic rotational velocity differing very much from the average of the other groups. Altogether 5 groups with a total of 25 stars were excluded. The remaining groups, containing 235 velocities, were given weights proportional to the square roots of the numbers of stars, as a compromise between equal weights and the theoretical weights proportional to the numbers of stars.

The results, with their probable errors, are shown in the third column of the above table. It will be seen that the probable errors of $V_{gal.}$ and L have become 4 and 6 times smaller respectively. The new values have weights about comparable to the first solution made by CAMPBELL and MOORE from the stars brighter than $5^m·5$ [1]), in which solution various areas were combined with equal weights. The probable errors of their second solution, in which the areas were weighted proportionally to the number of stars, are about twice as small. These latter values have been quoted in the table.

From a comparison of the last two columns of the above table it may be concluded that the motion of the centre of gravity of the bright stars in general, excluding high velocities, coincides with the motion of the calcium clouds within 1 km/sec, at least as far as the components parallel to the galactic plane are concerned. Considering that the total rotational velocity is of the order of 300 km/sec the agreement is certainly remarkably close.

This is not, I believe, a simple confirmation of a result which was to be expected beforehand. If, for the moment, we consider the agreement from the point of view of the stars only it is certainly a matter of some surprise that the motion of the interstellar gas, which does not partake of the star streams, coincides so accurately with that of the centre of gravity of the two unequal streams into which the bright stars can be divided (stream I, according to EDDINGTON, containing about 1·5 times as many stars as stream II).

Longitude of the centre of rotation. In the course of a discussion of PLASKETT and PEARCE's paper the following solution was made of this longitude, which

[1]) *Lick Publ.*, **16**, p. XXXVII.

I communicate as it may perhaps be of use to others. I used the average residual velocities of stars and calcium clouds in the group with strongest intensities of interstellar lines (intensity 8·0 to 9·5) which will give the most accurate determinations of l_0. Unknowns were l_0, $\bar{r}A$ and K, giving the following values:

Stars	Calcium clouds
$l_0 = 330^\circ.1 \pm 2^\circ.6$ (p. e.)	$l_0 = 329^\circ.3 \pm 4^\circ.3$ (p. e.)
$\bar{r}A = 26.0 \pm 2.2$ km/sec (p. e.)	$\bar{r}A = 12.4 \pm 1.7$ km/sec (p. e.)
$K = +0.9 \pm 1.6$ „ „	$K = -2.2 \pm 1.2$ „ „

The values of l_0, which have considerable weight, agree sufficiently well with previous determinations.