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PHOTO-ELECTRIC MAGNITUDES AND COLOURS AT MAXIMUM BRIGHTNESS FOR 184 CEPHEIDS

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Photo-electric magnitudes in blue and yellow and colour-indices were observed for a large number of southern Cepheids with the Rockefeller astrograph of the Leiden station at Johannesburg. The observations were made through a Corning glass filter 5551 and a Schott GG 11 filter. As comparison stars one star in each of the 9 *E*-regions were used. Data about them are given in Tables 2, 3 and 4. The relation between the magnitudes derived in this paper and the Cape 1953 *S* system is given in section 5. The Cepheids were observed near phase of maximum brightness, but for some of them complete light- and colour curves were obtained. The programme is nearly complete down to the 12th magnitude and contains also some Cepheids in the northern hemisphere. The individual observations are given in Table 6. In the remarks to this table improved ephemerides are given. The observations are shown graphically in Figures 2, 3, 4, 5 and 6. Table 7 contains the observations of the Cepheids which were insufficiently observed to derive magnitudes and colours at maximum brightness. Sections 8 and 9 show comparisons of the new magnitudes and colours with those derived by other authors and with other photometric systems. In section 10 relations are derived between light-, colour-, radial-velocity amplitudes and periods. The relation between the range of the light-curves and the periods shows a large scatter and does not confirm EGGEN's classification of *A*, *B* and *C* type Cepheids. In section 11 the intrinsic colours of Cepheids are discussed. Figure 11 shows a plot of the observed colours at maximum against the logarithm of the periods. The relation adopted for the normal colours, expressed in the Cape *S* system, is:

$$SCI_{max.} = +.01 + .10 \log P.$$

The conversion of colour excess to total photographic absorption is discussed in section 12 and the period-luminosity relation in section 13.

Table 13 contains all the data required to study the spatial distribution for 184 Cepheids. This distribution is discussed in the last section 14. The *z* co-ordinates were computed relative to the galactic plane as derived by WESTERHOUT. On the basis of the light- and colour curves and the *z* co-ordinates 22 Cepheids were classified with more or less certainty as population II objects. They have been listed on page 123. The mean *z* co-ordinate for the Cepheids of population I was found to be $-23.9 \text{ pc} \pm 5.5 \text{ (m.e.)}$ and the mean dispersion around this value $\pm 65 \text{ pc}$. Using the radial velocities by STIBBS we derived a value of $+17.4 \text{ km/sec/kpc} \pm 2.1 \text{ (m.e.)}$ for OORT's constant *A*.

A remarkable difference was found in the relation between colour excess and distance for the Carina and Sagittarius regions. Figure 12 shows the projection on the galactic plane of the Cepheids of population I. This figure clearly shows indications of spiral structure. The most interesting feature is an accumulation of Cepheids in the general direction of the galactic centre at a distance of about 600 pc. This group seems to be a continuation of the Carina spiral arm and is definitely distinct from the Sagittarius arm, in which also many Cepheids occur, and which was derived by radio observations and from O associations.

In the years 1953, 1954, 1955 and 1956 photo-electric observations were made of a large number of southern Cepheids at the Leiden station in Johannesburg. The programme has in its main phases been a co-operative enterprise of the three authors. Dr WALRAVEN designed and constructed a special photometer and made the observations, together with Dr MULLER, in the year 1953 and also together they made some provisional reductions of these measurements. Dr MULLER has been responsible for the observations in the years 1954 and 1955 and together with the third author he completed the observations in 1956. The more extensive reductions were made in Leiden under the supervision of the third author; in the absence of the other authors he prepared the discussions in the later sections as well as the text of the paper.

1. The programme

Cepheid variables are stars of high intrinsic luminosity and even as apparently faint stars they can easily be identified by the characteristics of their light-variation. The absolute magnitude is related to the period according to the period-luminosity relation. The majority of the known Cepheids belongs to BAADE's population I and they are strongly concentrated towards the galactic plane. These properties make them a very suitable group of stars for an investigation of interstellar absorption near the galactic plane and of spiral structure in the neighbourhood of the sun up to distances of some kiloparsecs. The combination of photometric data with radial velocities and proper motions will provide valuable infor-

mation concerning the dynamical properties of the galactic system in a wide region around the Sun. Therefore it has been generally recognized for several years that accurate photometry of Cepheids is of fundamental importance.

Although for some individual Cepheids accurate and even multi-colour photometry has been performed, relatively little has been done so far in the line of a general photometry of galactic Cepheids. The most extensive investigations were published by EGGEN (1951) on photo-electric magnitudes and colours for 32 classical Cepheids and by BADALYAN (1956) on photographic magnitudes and colour-indices for 167 Cepheids. Both these investigations will be discussed later, but it should be remarked here that neither of them contains Cepheids in the southern parts of the Milky Way.

Therefore we decided to observe photo-electric magnitudes in blue and yellow for all the Cepheids in the southern hemisphere which are bright enough for the available equipment. We have considered the possibility to make measures in a third colour, namely in the ultraviolet. But as most of the Cepheids are considerably reddened by interstellar absorption, the response of the photometer in the ultraviolet would be much smaller than in the blue and the yellow, and therefore such measures could only be made successfully for the brighter Cepheids. Therefore we abandoned this idea, the more so, as the observations had to be made with a refractor and measures in three colours would therefore imply measures at three different settings of the focus.

The programme was restricted in one more respect. To obtain photometric data for about 200 Cepheids well distributed over all phases of the light-curves would be a tremendous task, even in the good climate of South Africa. Now it is a well known fact that the dispersion in the spectral types of Cepheids of different periods is smallest at the phase of maximum brightness (CODE, 1947) and as one of the main aims of the present investigation was the determination of colour-excesses, we decided to derive the magnitudes and colours for these Cepheids at maximum brightness. Due to the fact that several of the ephemerides proved to be out of phase, we obtained complete light-curves and colour curves for a number of stars.

A number of Cepheids in the northern hemisphere were put on the programme in order to facilitate a comparison of our results with investigations carried out in the north.

2. The equipment

The observations were made with one of the 40-cm Zeiss objectives of the Rockefeller Astrograph of the Leiden Southern Station. The telescope was equipped

with a photometer specially designed and constructed by Dr WALRAVEN for this Cepheid programme. As several of the Cepheids are situated in dense regions of the Milky Way the use of a very small diaphragm was indicated in order to avoid disturbing influence of faint stars on the measures of the variables. A small diaphragm has the further advantage that the influence of sky brightness is reduced, which is important when faint stars have to be measured. However, it also causes a difficulty when the observations are made with a refractor on account of the secondary spectrum of the objective. The diameter of the diaphragm was 30 seconds of arc or about half a millimetre. For the measures in blue light a Corning glass filter 5551 was used. The focal setting of the telescope was made in such a way that the best focus for the blue image lay in the plane of the diaphragm. According to the data of Table 1 and Figure 1 in OOSTERHOFF's article on "Photo-electric colours of southern early-type stars" (1951) the effective wavelength of these blue measures is estimated to be about $.424 \mu$. For the measures in yellow light a Schott GG 11 filter of 2 mm thickness was used¹). This filter was combined with a doublet lens, the main function of which consists in the flattening of the secondary spectrum in the yellow region of the spectrum and which reduces the focal length in yellow light to that for blue light, so that the focal setting of the telescope could remain unchanged during the observations. As the transmission curve of the Schott GG 11 filter is practically the same as that of the Corning 3385 filter, the effective wavelength of the yellow measures is about $.537 \mu$.

By means of a Fabry lens an image of the objective was formed on the cathode of an RCA photomultiplier of the type 1 P 21. As stars from the 4th to the 13th magnitude had to be measured it was necessary to make it possible to adjust the output of the amplifier over a wide range in order to obtain a reasonable deflection on the Brown recorder for faint and bright stars. A large difference in sensitivity could be obtained by the use of two different input resistances of 10 and 100 M Ω . Smaller steps in sensitivity were made possible by five different feed-back resistances, numbered from 1 to 5. For the very bright stars the voltage on the photomultiplier could be diminished in nine fixed steps. The differences in sensitivity obtained by various combinations of input- and feed-back resistances and of photo-multiplier voltages were determined from the star measures. As each observation consisted of two measures in blue and in yellow with two different sensitivities of the photo-

¹) In *B.A.N.* 12, 271 (No. 460), 1955, OOSTERHOFF erroneously stated that a Corning filter 3385 had been used for the measures in yellow light.

meter, the sensitivity ratios could be derived from a very large number of measures.

The ten logarithms of these ratios, all relative to the combination: 10 M Ω , feed-back resistance 5 and high voltage h 9, to which all measures were reduced later, were found to be:

TABLE 1

10 - 1	+ .732	h 9	.000
10 - 2	+ .553	h 6	+ .510
10 - 3	+ .363	h 5	+ .718
10 - 4	+ .154	h 4	+ .933
10 - 5	.000	h 3	+ 1.143
100 - 1	- .259	h 2	+ 1.379
100 - 2	- .438	h 1	+ 1.652
100 - 3	- .628		
100 - 4	- .836	NF	+ .997
100 - 5	- .991		

The last entry in this table gives the logarithm of the absorption by a neutral filter, which was used in 1953 and 1954 to reduce the recorder deflections for the brightest Cepheids. However it soon became clear that the filter used was not sufficiently neutral and that its absorption depends on the colour of the star, when used in combination with the blue filter. No such effect could be found when it was used in combination with the yellow filter. Consequently we have not used the blue measures made with this neutral filter. The values given in Table 1 were derived from the observations of all four years. When the reduction of the observations of the years 1953 and 1954 was made, slightly different values were used, but the differences were so small that it did not seem worthwhile to repeat the reduction with these improved values.

3. The observations

For each Cepheid an identification chart had been prepared and a list of times of maximum brightness, computed with the elements from the *General Catalogue of Variable Stars* and its supplements. One observation of a Cepheid consisted of two pairs of settings in blue and yellow light with different sensitivity of the amplifier. Only for the faintest stars the two pairs of settings were made both with the strongest amplification. Each of the four settings was preceded and followed by a measure of the sky brightness in the direct neighbourhood of the variable.

If accurate light- and colour curves of a variable star have to be determined the best results can be obtained by using a comparison star very near the variable and by making alternately measures of the variable and of this comparison star. In this way the influence of fluctuations in extinction can be considerably reduced. However half of the total observing time is then used for the comparison star.

In our programme the internal accuracy of the observations on light- and colour curves is not of primary importance. It is much more important that the observations of magnitudes and colours and the colour excesses derived below for stars in different parts of the southern hemisphere will be free of systematic errors depending on the position in the sky, the apparent brightness or the time at which the observations were made.

We decided not to use any comparison stars at all near the individual Cepheids. Instead we selected nine stars, one in each E -region at declination -45° , which have served as the only comparison stars for this programme.

The nine stars were the following:

TABLE 2

E -region	number	$Sp.$	SP_g	SP_v	SCI
1	21	G5	7.61	6.90	+ .71
2	10	F5	8.25	8.04	+ .21
3	38	K5	9.33	7.90:	+ 1.43:
4	24	F8	8.76	(8.53)	(+ .23)
5	33	K5	9.66	(7.96)	(+ 1.70)
6	22	F8	8.46	8.15	+ .31
7	40	K2	9.31	(7.84)	(+ 1.47)
8	21	F8	9.18	8.85	+ .33
9	31	K0	8.58:	7.16:	+ 1.42:

The numbers, spectral types, magnitudes and colours have been taken from *Cape Mimeogram* No. 3, 1953. During the nights when Cepheid observations were made two or three of these comparison stars were measured in rapid succession in intervals of two or three hours. During each such set of observations one of the comparison stars had a low and the other or the two others a high altitude.

4. The magnitudes of the comparison stars

If the brightness of the comparison stars in blue and yellow light in the system of the equipment used for the observations and without the influence of atmospheric extinction were known, each observation of a comparison star would yield a value of this atmospheric extinction at the time of the observation. As several measures of comparison stars during the course of a night were made, these would provide a fair information about the extinction and its variations, although interpolation is necessary for the intervals between the different sets of measures of the comparison stars.

Therefore the first problem was to derive the brightness in blue and yellow light of the comparison stars outside the Earth's atmosphere. During the whole reduction we have not used magnitudes or differences in magnitude, but we have worked with the logarithm of the deflections on the Brown recorder

records. Unless stated otherwise, all values given in this paper are therefore expressed in terms of $\log I_B$ and $\log I_Y$, which can be converted into magnitudes by multiplying with the factor -2.5 . It should be kept in mind that large positive values correspond with great brightness and that positive values of $(\log I_B - \log I_Y)$ correspond with a blue colour.

From the observations of the comparison stars, made practically simultaneously at about the same altitude, the differences in brightness in blue and yellow light could be derived. After a little smoothing the following values were found:

TABLE 3

Comparison stars in E-regions	$\Delta \log I_B$	$\Delta \log I_Y$
1 - 2	+ .272	+ .422
2 - 3	+ .422	- .046
3 - 4	- .235	+ .228
4 - 5	+ .367	- .183
5 - 6	- .481	+ .035
6 - 7	+ .336	- .097
7 - 8	- .072	+ .370
8 - 9	- .222	- .632
9 - 1	- .387	- .097

These differences having been derived, we next used the observations of pairs of comparison stars, made practically simultaneously but with widely different altitudes. For these observations we have the equations:

$$k_B = \frac{\Delta(\log I_B) - \Delta(\log I_B) \text{ obs.}}{\Delta \sec z} \quad \text{and}$$

$$k_Y = \frac{\Delta(\log I_Y) - \Delta(\log I_Y) \text{ obs.}}{\Delta \sec z}$$

in which k represents the zenithal extinction coefficient, $\Delta(\log I)$ the difference in brightness outside the atmosphere, for which the values given in the table can be used, and $\Delta(\log I) \text{ obs.}$ the difference in brightness as actually observed. For all the pairs of observations of comparison stars, taken in quick succession after each other and with a sufficiently large value of $\Delta \sec z$, the values of k for blue and yellow light were computed. With the aid of these k -values all $\log I_B$ and $\log I_Y$ values of the comparison stars were then reduced to "no atmosphere". These reduced values show a considerable dispersion, as could be expected from observations made in the city of Johannesburg, where the sky is often, especially in the winter season, spoilt by smoke and dust. The values of k , derived from two observations only, are easily affected by irregularities in the extinction and the errors in k , multiplied by a factor larger than one, are found back in the values of $\log I_B$ and $\log I_Y$ for "no atmosphere".

A superficial inspection of these reduced values made it clear that the brightness of the comparison stars, reduced to "no atmosphere", varies with time. A further investigation showed that this variation was practically the same for the blue and yellow measures. This effect is due to changes in the instrumental equipment, such as the accumulation of dust on the objective, the filters and other optical parts of the photometer, variations in the voltage of dry batteries and the like. During the four years in which the observations were made the optical parts have been cleaned and batteries have been changed a couple of times and each time the brightness of the comparison stars shows a discontinuity in such a sense that the deflections on the Brown recorder become larger after such an operation. For each comparison star average values of $\log I$ were computed for time intervals varying from one week to one month and these were smoothed in such a way that the differences between the comparison stars agreed with the values given in Table 3. The values of $\log I_B$ and $\log I_Y$ reduced to "no atmosphere" for 10 May 1953 were found to be:

TABLE 4

Comparison star in E-region	$\log I_B$	$\log I_Y$	$(O-C)_B$	$(O-C)_Y$
1	1.632	1.450	-.006	-.037
2	1.360	1.028	-.026	-.012
3	.938	1.074	-.010	-.003:
4	1.173	.846	-.009	(+.002)
5	.806	1.029	-.009	(-.019)
6	1.287	.994	-.015	.000
7	.951	1.091	-.005	(-.009)
8	1.023	.721	+.009	+.007
9	1.245	1.353	-.003:	-.019:

The zeropoint of these values depends on the unit in which the deflections on the Brown recorder have been expressed and is therefore arbitrary, but the same zeropoint has been used throughout for comparison stars and Cepheids.

For any other date a certain constant has to be added to or subtracted from all the values of Table 4 in order to obtain the brightness of the comparison stars reduced to "no atmosphere". The values of these constants are given in Table 5 for a number of dates. For other dates values can be derived by interpolation.

These figures are a direct measure of the sensitivity of the combination of objective, photometer and Brown recorder. In the further reduction all measures have been reduced to 10 May 1953. In other words all values of $\log I$ for the Cepheids given below are directly comparable with the values of Table 4 for the comparison stars, which define the photometric system of this paper.

In this connection it should be emphasized that the

TABLE 5

1953 10 May	.000	1955 24 Febr.	+.054
1953 2 July	-.100	1955 27 March	+.051
1953 23 July	-.131	1955 26 April	+.047
1953 13 Sept.	-.131	1955 25 May	+.040
1954 10 Febr.	-.133	1955 16 June	+.030
1954 1 April	-.133	1955 7 July	+.010
discontinuity		1955 8 Aug.	-.010
1954 2 April	-.001	1955 21 Sept.	-.037
1954 3 May	-.014	1956 1 Febr.	-.072
1954 22 May	-.024	1956 2 March	-.077
1954 11 June	-.040	1956 4 April	-.085
1954 1 July	-.058	1956 1 May	-.094
1954 23 July	-.080	1956 5 June	-.125
1954 6 Aug.	-.090	1956 5 July	-.160
1954 3 Sept.	-.103	discontinuity	
discontinuity		1956 6 July	+.074
		1956 13 July	+.039
		1956 26 July	.000
		1956 6 Aug.	-.024

comparison stars in the *E*-regions 1, 2 and 9 have been used a few times only and consequently the values of $\log I_B$ and $\log I_Y$ for these three stars are much less accurate than those for the remaining six comparison stars. The residuals ($O-C$) in Table 4 will be explained in the next section.

5. The photometric system

Although the photometric system of the measures in this paper has been defined, it will be useful to investigate its relation to other photometric systems in order to make possible a comparison of our results with those by other authors. The most accurate photometry of stars in the *E*-regions has been published in *Cape Mimeogram* No. 3 in 1953. As a number of six stars is too small to derive the relation between two photometric systems, observations on a larger number of stars in the *E*-regions 8 and 9 were made in 1953 in exactly the same way as for the Cepheids. A comparison between our measures of these stars with those from the Cape has been published already in *B.A.N.* 12, 271 (No. 260), 1955. The following relations were derived:

$$\log I_B = +4.6790 - .4046 SPg + .0056 SPv, \quad (1)$$

± 75 ± 24 ± 23 (m.e.)

$$\log I_Y = +4.2551 - .0157 SPg - .3838 SPv. \quad (2)$$

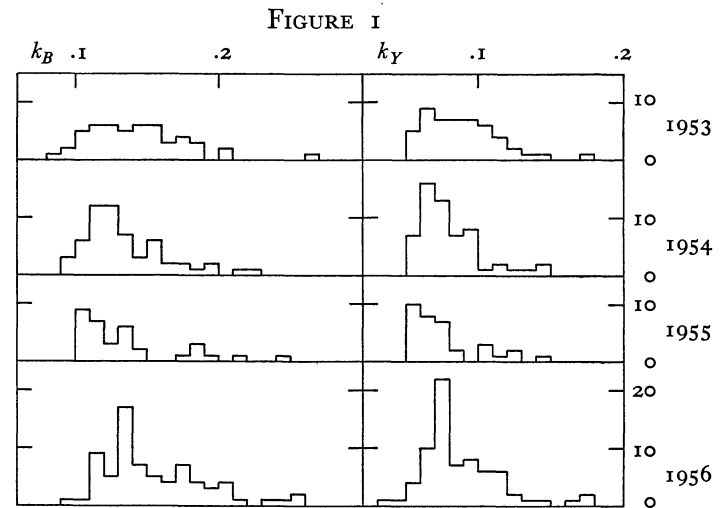
± 92 ± 30 ± 28 (m.e.)

If we apply these formulae to the values of SPg and SPv of Table 2 and if we compute the differences between the observed values of $\log I_B$ and $\log I_Y$, given in Table 4, and the values computed with the formulae, the residuals ($O-C$) are obtained, which are given in the fourth and fifth columns of Table 4. The residuals for the stars in regions 3 to 8 are satisfactorily small.

Comparisons with other photometric systems will be made in a later paragraph.

6. The coefficient of extinction

The extinction coefficient per unit air mass for blue and yellow light has been derived for each measure of a comparison star. For each night of observing we have therefore two or three determinations of the extinction at intervals of two or three hours. As has been said before, the sky at the Leiden Southern Station in Johannesburg is often very poor for photometric work and quite often work at the telescope had to be discontinued for some hours on account of smoke. It happened very often that the extinction was large in the beginning of the night and that it decreased in one or two hours time to normal values. This effect is mainly caused by smoke and it is clear that under such conditions the interpolated values of the extinction are rather uncertain. Frequency curves of the night averages of the extinction coefficients for blue and yellow light are shown in Figure 1. During the very best nights the values of these coefficients



Frequency distribution of the coefficient of atmospheric extinction in blue and yellow

are about .1 and .055 or .25 and .14 magnitudes respectively. During some very poor nights these values were as high as .24 and .16 or .6 and .4 magnitudes. The average values over all four years are .143 and .084 or .36 and .21 magnitudes.

7. The reduction of the measures of Cepheids

The measures of the Cepheids were first reduced to input resistance 10 MΩ, to feed-back resistance 5 and to high voltage h_9 with the aid of the data of Table 1. Then they were reduced to "no atmosphere" with the extinction coefficients derived by interpolation

for the time of observation. As each observation of a Cepheid consisted of two measures in blue and of two in yellow made with different amplification of the photometer, mean values were formed for the two

measures in blue and for those in yellow light. Finally the resulting values of $\log I_B$ and $\log I_Y$ were reduced to 10 May 1953 with the aid of Table 5. The individual observations have been listed in Tables 6 and 7.

TABLE 6

Name of Cepheid	J.D. hel. -2430000	phase	$\log I_Y$	$\Delta \log I$	$\log I_B$	Name of Cepheid	J.D. hel. -2430000	phase	$\log I_Y$	$\Delta \log I$	$\log I_B$
T Ant *	d 4562.210	.345	+ .358	+ .156	+ .514		d 5683.416	.551	+ 1.096	+ .043	+ 1.139
d ⁻¹	75.194	.546	+ .691:	+ .314	+ 1.005:		89.344	.521	+ 1.058	+ .028	+ 1.086
.169511	79.217	.228	+ .332:	+ .110:	+ .442:	FN Aql	4907.484	.671	+ .964	+ .047	+ 1.011
	4833.393	.313	+ .357	+ .127	+ .484	d ⁻¹	5315.463	.707	+ 1.003	+ .045	+ 1.048
	4906.324	.676	+ .616	+ .235	+ .851	.105486	63.304	.753	+ 1.019:	+ .055:	+ 1.074:
	17.275	.532	+ .684	+ .312	+ .996	64.300	.859	+ .994	+ .025	+ 1.019	
	5194.487	.523	+ .681	+ .321	+ 1.002	5647.432	.725	+ 1.003	+ .055	+ 1.058	
	5224.389	.591	+ .675	+ .311	+ .986	54.341	.454	+ .868	- .016	+ .852	
	5532.515	.822	+ .491	+ .205	+ .696	55.487	.575	+ .918	+ .014	+ .932	
	35.449	.319	+ .357	+ .137	+ .494	65.430	.624	+ .939	+ .025	+ .964	
	55.474	.714	+ .608	+ .246	+ .854	68.473	.945	+ .970	+ .006	+ .976	
	68.423	.909	+ .508	+ .186	+ .694	85.406	.731	+ .995	+ .042	+ 1.037	
	73.448	.761	+ .564	+ .228	+ .792	V396 Aql	4989.343	.136	+ .183	- .147	+ .036
	74.337	.911	+ .507	+ .178	+ .685	d ⁻¹	5328.392	.558	+ .446	+ .016	+ .462
	80.362	.933	+ .495	+ .182	+ .677	.136919	63.395	.351	+ .312:	- .058:	+ .254:
	95.350	.473	+ .591	+ .241	+ .832	64.277	.471	+ .468	+ .035	+ .503	
	5608.308	.670	+ .626	+ .265	+ .891	5612.533	.462	+ .454	+ .026	+ .480	
	09.335	.844	+ .523	+ .197	+ .720	26.494	.374	+ .334	- .028	+ .306	
	11.324	.181	+ .368	+ .137	+ .505	27.496	.511	+ .456	+ .024	+ .480	
	12.292	.345	+ .365	+ .161	+ .526	V493 Aql *	5612.438	.886	- .210	- .062	- .272
	16.294	.024	+ .472	+ .168	+ .640	d ⁻¹	.545	.922	- .218	- .072	- .290
	19.274	.529	+ .694:	+ .311:	+ 1.005:	.334950	23.462	.579	- .063	+ .030	
	20.265	.697	+ .612	+ .261	+ .873	24.596	.958	- .230	- .078	- .308	
	22.228	.029	+ .473	+ .163	+ .636	25.548	.277	- .270	- .040	- .310	
	23.310	.213	+ .372	+ .143	+ .515	26.441	.576	- .068	+ .040	- .028	
	24.217	.367	+ .393	+ .170	+ .563	27.487	.927	- .214	- .066	- .280	
	26.229	.708	+ .599	+ .246	+ .845	28.461	.253	- .268	- .042	- .310	
	27.220	.876	+ .522	+ .186	+ .708	29.565	.623	- .084	+ .027	- .057	
	29.240	.218	+ .362	+ .132	+ .494	30.516	.941	- .213	- .069	- .282	
	30.280	.394	+ .438	+ .201	+ .639	31.462	.258	- .264	- .061	- .325	
	31.262	.561	+ .682	+ .311	+ .993	36.494	.944	- .219	- .075	- .294	
	32.210	.722	+ .596	+ .242	+ .838	37.461	.268	- .258	- .042	- .300	
	34.200	.059	+ .438	+ .154	+ .592	38.482	.610	- .071	+ .034	- .037	
	36.205	.399	+ .454	+ .204	+ .658	39.517	.956	- .237	- .051	- .288	
	37.254	.577	+ .670	+ .301	+ .971	40.556	.304	- .225	- .036	- .261	
	38.235	.743	+ .610	+ .230	+ .840	41.483	.615	- .076	+ .032	- .044	
	39.192	.905	+ .480	+ .172	+ .652	42.543	.970	- .234	- .066	- .300	
	40.207	.077	+ .431	+ .151	+ .582	43.303	.244	- .272	- .048	- .320	
	41.200	.245	+ .378	+ .124	+ .502	46.486	.290	- .244	- .100	- .344	
	42.194	.414	+ .370?	+ .188?	+ .558?	52.366	.260	- .246	- .052	- .298	
	43.270	.596	+ .653	+ .302	+ .955	54.310	.911	- .203:	- .049:	- .252:	
	44.214	.756	+ .579	+ .225	+ .804	55.440	.290	- .254	- .041	- .295	
	47.195	.262	+ .358	+ .134	+ .492	.554	.328	- .190	- .029	- .219	
U Aql	4572.568	.006	+ 1.624	+ .088	+ 1.712	60.571	.008	- .246	- .057	- .303	
d ⁻¹	74.578	.292	+ 1.604	+ .019	+ 1.623	61.420	.293	- .268:	- .068:	- .336:	
.142372	4907.496	.690	+ 1.680	+ .091	+ 1.771	65.385	.621	- .076	+ .022	- .054	
	22.559	.835	+ 1.825	+ .163	+ 1.988	68.448	.647	- .066	+ .012	- .054	
	5302.500	.928	+ 1.779	+ .119	+ 1.898	69.422	.973	- .230	- .060	- .290	
	15.484	.776	+ 1.824	+ .155	+ 1.979	72.430	.980	- .238	- .044	- .282	
	70.320	.583	+ 1.554	+ .018	+ 1.572	81.363	.973	- .214	- .068	- .282	
SZ Aql	4980.408	.607	+ 1.086	+ .081	+ 1.167	82.336	.298	- .265	- .033	- .298	
d ⁻¹	5358.343	.659	+ 1.023	+ .026	+ 1.049	83.393	.652	- .064	+ .024	- .040	
.058350	5646.526	.475	+ .687	+ .150	+ .537	85.396	.323	- .220	- .044	- .264	
	47.398	.526	+ .712	- .125	+ .587	86.396	.658	- .084	+ .013	- .071	
	65.397	.576	+ 1.037	+ .057	+ 1.094	87.422	.002	- .228	- .066	- .294	
	81.375	.508	+ .700	- .124	+ .576	88.299	.296	- .222:	- .019:	- .241:	
TT Aql	4980.416	.091	+ 1.641	+ .116	+ 1.757	89.335	.643	- .066	+ .018	- .048	
d ⁻¹	5364.284	.000	+ 1.342	- .041	+ 1.301	91.298	.300	- .242	- .062	- .304	
.072703	65.316	.075	+ 1.617	+ .114	+ 1.731	92.343	.650	- .080	+ .016	- .064	
	5643.401	.292	+ 1.488	- .026	+ 1.462	V496 Aql	4989.355	.986	+ 1.216	+ .073	+ 1.289
	54.333	.087	+ 1.648	+ .118	+ 1.766	d ⁻¹	5302.491	.989	+ 1.223	+ .063	+ 1.286
	55.478	.170	+ 1.572	+ .048	+ 1.620	.146910	15.452	.893	+ 1.204	+ .053	
	68.464	.114	+ 1.632	+ .100	+ 1.732	5643.393	.071	+ 1.203	+ .051	+ 1.254	
	69.442	.185	+ 1.562	+ .050	+ 1.612	47.412	.661	+ 1.077	- .015	+ 1.062	
	83.410	.201	+ 1.570	+ .038	+ 1.608	54.324	.677	+ 1.074	- .003	+ 1.071	
						55.469	.845	+ 1.180	+ .042	+ 1.222	
FF Aql *	5358.304	.476	+ 2.128	+ .204	+ 2.332	69.431	.896	+ 1.198	+ .068	+ 1.266	
d ⁻¹	65.293	.039	+ 2.103	+ .201	+ 2.304	78.386	.212	+ 1.180	+ .014	+ 1.194	
.223667	70.308	.161	+ 2.161	+ .225	+ 2.386	83.404	.949	+ 1.238	+ .074	+ 1.312	
	5612.521	.336	+ 2.172	+ .232	+ 2.404	V600 Aql *	4989.366	.992	+ .133	- .210	- .077
	21.469	.337	+ 2.170	+ .226	+ 2.396	d ⁻¹	5315.474	.024	+ .114	- .211	- .097
	25.557	.251	+ 2.181:	+ .246:	+ 2.427:	.138092	59.264	.071	+ .105	- .194	
	26.482	.458	+ 2.136	+ .212	+ 2.348	5643.413	.310	+ .355	- .058	+ .297	
	29.555	.146	+ 2.144	+ .230	+ 2.374	52.387	.549	+ .304	- .120	+ .184	
FM Aql	5328.402	.487	+ .990	- .002	+ .988	54.350	.821	+ .200	- .170	+ .030	
d ⁻¹	59.255	.533	+ 1.060	+ .030	+ 1.090	55.497	.979	+ .138	- .202	- .064	
.163555	64.292	.357	+ .822	- .094	+ .728	60.584	.681	+ .252	- .113	+ .139	
	72.260	.660	+ 1.066	+ .014	+ 1.080	65.441	.352	+ .381	- .058	+ .323	
	5646.536	.519	+ 1.033	+ .008	+ 1.041	69.454	.906	+ .146	- .196	- .050	
	47.422	.664	+ 1.066	+ .018	+ 1.084	85.417	.111	+ .124	- .168	- .044	
	52.377	.475	+ .990	- .018	+ .972	86.409	.248	+ .292	- .088	+ .204	
	65.405	.605	+ 1.095	+ .041	+ 1.136	87.434	.389	+ .354	- .060	+ .294	
	78.434	.736	+ 1.044	- .016	+ 1.028	88.312	.510	+ .344	- .106	+ .238	

TABLE 6 (continued)

Name of Cepheid	J.D. hel. -2430000	phase	$\log I_Y$	$\Delta \log I$	$\log I_B$	Name of Cepheid	J.D. hel. -2430000	phase	$\log I_Y$	$\Delta \log I$	$\log I_B$
η Aql	5302.531	.855	+2.861	+ .265	+3.126	Y Car *	4517.307	.098	+ .985	+ .261	+1.246
d^{-1}	15.495	.661	+2.674	+ .164	+2.838	d^{-1}	2.260	.185	+ .888	+ .224	+1.112
.139340	31.442	.883	+2.855	+ .263	+3.118	.274743	36.311	.320	+ .906	+ .212	+1.118
	48.329	.236	+2.682	+ .137	+2.819		78.219	.834	+1.071	+ .310	+1.381
	5652.406	.606	+2.598	+ .131	+2.729		85.211	.755	+1.016	+ .279	+1.295
	54.379	.881	+2.849	+ .264	+3.113		88.195	.574	+ .973	+ .262	+1.235
	60.596	.747	+2.806	+ .238	+3.044		4812.455	.188	+ .936	+ .232	+1.168
	61.443	.865	+2.838	+ .258	+3.096		47.306	.763	+1.152	+ .352	+1.504
	68.489	.847	+2.860	+ .281	+3.141		65.442	.746	+1.149	+ .349	+1.498
	81.384	.644	+2.632	+ .167	+2.799		95.369	.968	+ .969	+ .256	+1.225
	82.349	.779	+3.131?	+ .272?	+3.403?		4906.377	.993	+1.021	+ .255	+1.276
							20.315	.822	+1.014	+ .249	+1.263
							5251.355	.773	+1.142	+ .333	+1.475
							5309.230	.674	+1.035	+ .301	+1.336
RY Cma *	5187.357	.823	+1.095	+ .181	+1.276	SX Car	4520.392	.120	+ .768	+ .223	+ .991
d^{-1}	94.349	.318	+ .889	+ .080	+ .969	d^{-1}	34.323	.987	+ .666	+ .190	+ .856
.213755	5223.241	.494	+ .941	+ .140	+1.081	.205761	69.240	.171	+ .708	+ .187	+ .895
	24.279	.716	+1.141	+ .222	+1.363		4865.449	.120	+ .759	+ .225	+ .984
	5532.419	.582	+1.116	+ .212	+1.328		5224.430	.984	+ .664	+ .179	+ .843
	55.366	.487	+ .892	+ .139	+1.031		5535.507	.991	+ .680	+ .188	+ .868
	5612.214	.639	+1.167	+ .247	+1.414		55.485	.102	+ .782	+ .222	+1.004
							74.365	.987	+ .672	+ .182	+ .854
							5628.309	.086	+ .764	+ .226	+ .990
RZ Cma *	5187.373	.131	+ .353:	+ .058:	+ .411:	UW Car *	4517.299	.024	+ .640	+ .196	+ .836
d^{-1}	94.360	.773	+ .486	+ .131	+ .617	d^{-1}	22.265	.953	+ .513	+ .145	+ .658
.235019	5223.255	.564	+ .337	+ .080	+ .417	.187064	65.289	.001	+ .591	+ .169	+ .760
	24.291	.808	+ .474	+ .125	+ .599		4839.271	.253	+ .546	+ .119	+ .665
	5535.373	.918	+ .428	+ .088	+ .516		65.402	.142	+ .398	+ .162	+ .790
	47.412	.747	+ .500	+ .142	+ .642		86.332	.057	+ .642	+ .188	+ .830
	55.379	.620	+ .432	+ .119	+ .551		4924.260	.152	+ .609:	+ .124:	+ .733:
	68.340	.666	+ .479	+ .145	+ .624						
	73.330	.838	+ .454	+ .116	+ .570						
TV Cma *	4811.378	.097	+ .118:	+ .051:	+ .169:	UX Car *	4520.298	.591	+1.080	+ .342	+1.422
d^{-1}	5187.348	.590	+ .088	+ .067	+ .155	d^{-1}	31.340	.590	+1.111	+ .338	+1.449
.214096	94.337	.087	+ .123	+ .035	+ .158	.271573	35.339	.676	+1.035	+ .301	+1.336
	5224.265	.494	+ .066	+ .131	+ .131		64.260	.530	+1.135:	+ .293:	+1.428:
	5535.363	.099	+ .122	+ .030	+ .152		4835.474	.184	+ .798	+ .187	+ .985
	55.356	.379	+ .017	+ .053	+ .070		47.289	.393	+ .857	+ .224	+1.081
	67.308	.938	+ .194	+ .076	+ .270		67.364	.845	+ .933	+ .228	+1.161
	73.316	.225	+ .062:	+ .002:	+ .060:		85.394	.741	+ .982	+ .266	+1.248
	80.284	.716	+ .102	+ .055	+ .157		96.331	.711	+ .989	+ .276	+1.265
							5223.389	.531	+1.105	+ .344	+1.449
							82.222	.509	+1.047:	+ .321:	+1.368:
							85.227	.325	+ .788	+ .183	+ .971
TW Cma *	5532.429	.927	+ .468	+ .140	+ .608	UY Car *	4513.312	.129	+ .767	+ .245	+1.012
d^{-1}	35.363	.349	+ .454	+ .082	+ .536	d^{-1}	19.378	.223	+ .813	+ .247	+1.060
.142962	47.421	.070	+ .542	+ .166	+ .708	.180384	29.356	.023	+ .591	+ .151	+ .742
	55.393	.210	+ .472:	+ .094:	+ .566:		31.348	.383	+ .749	+ .193	+ .942
	73.335	.775	+ .305	+ .044	+ .349		36.302	.276	+ .787	+ .231	+1.018
	95.268	.911	+ .436	+ .126	+ .562		4890.392	.148	+ .792	+ .230	+1.022
	5627.193	.475	+ .402	+ .052	+ .454		96.339	.221	+ .799	+ .246	+1.045
							4907.273	.194	+ .812	+ .245	+1.057
							29.299	.167	+ .809	+ .253	+1.062
TW Cap *	5643.437	.616	+ .111	+ .268	+ .379	UZ Car *	4519.393	.338	+ .566	+ .214	+ .780
d^{-1}	55.541	.040	+ .160	+ .192	+ .032	d^{-1}	20.308	.514	+ .621	+ .203	+ .824
.035017	60.620	.218	+ .230	+ .246	+ .016	.192136	35.348	.404	+ .644	+ .231	+ .875
	61.454	.247	+ .169	+ .271	+ .102		4931.207	.462	+ .633:	+ .210:	+ .843:
	65.453	.387	+ .264	+ .398	+ .662		36.207	.423	+ .641:	+ .227:	+ .868:
	68.506	.494	+ .140:	+ .300:	+ .440:						
	69.494	.529	+ .108	+ .293	+ .401						
	86.436	.122	+ .223	+ .206	+ .017						
	87.466	.158	+ .236	+ .231	+ .005						
	88.348	.189	+ .190	+ .228	+ .038						
	89.355	.224	+ .180	+ .269	+ .089						
	91.309	.293	+ .044	+ .357	+ .401						
	92.354	.329	+ .215	+ .395	+ .610						
U Car *	4512.370	.428	+1.650	+ .103	+1.547	VY Car *	4512.358	.307	+1.443	+ .110	+1.553
d^{-1}	13.364	.454	+1.611	+ .121	+1.490	d^{-1}	13.322	.358	+1.395	+ .070	+1.465
.025802	17.407	.558	+1.546	+ .135	+1.411	.052812	29.367	.205	+1.593	+ .165	+1.668
	19.417	.610	+1.494	+ .124	+1.370		30.372	.258	+1.476	+ .144	+1.620
	20.350	.634	+1.485	+ .125	+1.360		65.298	.103	+1.187	+ .037	+1.224
	30.397	.893	+1.938	+ .142	+2.080		4869.440	.165	+1.468	+ .164	+1.632
	32.394	.945	+1.892	+ .101	+1.993		90.399	.272	+1.464	+ .109	+1.573
	61.306	.691	+1.499	+ .128	+1.371		4908.237	.214	+1.491:	+ .156:	+1.647:
	68.200	.869	+1.934:	+ .163:	+2.097:						
	73.296	.000	+1.839	+ .055	+1.804						
	75.244	.050	+1.806	+ .007	+1.813						
	78.244	.128	+1.766	+ .037	+1.789						
	80.230	.179	+1.774:	+ .036:	+1.738:						
	86.253	.335	+1.661	+ .125	+1.536						
	88.206	.385	+1.647	+ .120	+1.527						
	4834.418	.738	+1.629:	+ .005:	+1.624:						
	35.481	.765	+1.756	+ .073	+1.829						
	39.296	.864	+1.951								
	4913.257	.772	+1.801	+ .079	+1.880						
	14.322	.799	+1.899	+ .146	+2.045						
	17.351	.877	+1.919	+ .146	+2.065						
V Car *	4869.348	.159	+1.402	+ .209	+1.611	WZ Car *	4529.378	.865	+ .587:	+ .015:	+ .602:
d^{-1}	90.284	.286	+1.345	+ .185	+1.530	d^{-1}	30.381	.908	+ .614	+ .020	+ .594
.149334	4917.212	.307	+1.325:	+ .166:	+1.491:	.043464	72.236	.728	+ .716	+ .120	+ .836
	5611.298	.958	+1.261	+ .163	+1.424		74.243	.815	+ .681	+ .048	+ .729
	12.269	.103	+1.416	+ .227	+1.643		4847.314	.684	+ .745	+ .169	+ .914
	19.261	.147	+1.418	+ .216	+1.634		67.375	.556	+ .477	+ .043	+ .520
	37.247	.833	+1.180	+ .074	+1.254		69.455	.646	+ .769	+ .186	+ .955
	38.225	.979	+1.338	+ .142	+1.480		85.415	.340	+ .332	+ .129	+ .203
							86.403	.383	+ .328	+ .105	+ .223
							95.405	.774	+ .686	+ .072	+ .758
							96.350	.815	+ .647	+ .041	+ .688
							4907.284	.290	+ .354	+ .146	+ .268

TABLE 6 (continued)

Name of Cepheid	J.D. hel. -2430000	phase	$\log I_Y$	$\Delta \log I$	$\log I_B$	Name of Cepheid	J.D. hel. -2430000	phase	$\log I_Y$	$\Delta \log I$	$\log I_B$
	d						d				
	4914.315	.596	+ .754	+ .175	+ .929	CT Car	4517.318	.178	- .434	+ .067	- .367
	17.332	.727	+ .703	+ .096	+ .799	d ⁻¹	33.338	.065	- .693	- .151	- .844
	20.342	.858	+ .633	+ .002	+ .635	.055382	34.311	.119	- .655	- .013	- .668
	34.194	.460	+ .314	- .092	+ .222		35.362	.177	- .408	+ .033	- .375
XX Car *	4566.204	.538	- .123:	- .031:	- .154:		74.215	.329	- .517:	+ .002:	- .515:
d ⁻¹	72.276	.925	+ .694	+ .170	+ .864		5275.284	.156	- .486:	- .065:	- .551:
.063628	73.288	.989	+ .656	+ .123	+ .779		96.239	.316	- .544	- .004	- .548
	86.218	.812	+ .513	+ .087	+ .600		5567.408	.334	- .490	- .046	- .536
	4886.413	.913	+ .733	+ .192	+ .925		5636.221	.145	- .636:	- .008:	- .644:
	4917.343	.881	+ .770	+ .213	+ .983		37.270	.203	- .486:	+ .068:	- .418:
	18.302	.942	+ .695	+ .152	+ .847		38.252	.258	- .454	- .016	- .470
	34.211	.954	+ .685	+ .153	+ .838						
XY Car *	4513.385	.962	+ .614	+ .020	+ .634	CY Car *	4522.287	.096	+ .277	+ .099	+ .376
d ⁻¹	76.248	.017	+ .575	- .012	+ .563	d ⁻¹	4890.410	.390	+ .447	+ .161	+ .608
.080419	78.261	.179	+ .465	- .092	+ .373	.234416	4914.333	.998	+ .359	+ .069	+ .328
	87.188	.897	+ .633	+ .048	+ .681		5282.249	.244	+ .385:	+ .173:	+ .558:
	4834.430	.780	+ .723:	+ .135:	+ .858:		5303.249	.166	+ .318	+ .119	+ .437
	35.490	.865	+ .681	+ .085	+ .766		08.251	.339	+ .429	+ .184	+ .613
	47.323	.817	+ .691	+ .101	+ .792		5535.556	.623	+ .345	+ .105	+ .450
	85.424	.881	+ .654	+ .074	+ .728		68.449	.334	+ .470	+ .190	+ .660
	86.420	.961	+ .620	+ .032	+ .652		73.522	.523	+ .376	+ .130	+ .506
	5104.543	.740	+ .634	+ .077	+ .711		5611.400	.402	+ .414	+ .163	+ .577
	5567.453	.729	+ .611	+ .074	+ .685	DY Car *	4513.343	.476	- .297	+ .108	- .189
	5616.350	.661	+ .500	+ .013	+ .513	d ⁻¹	46.276	.521	- .181	+ .186	+ .005
	28.318	.624	+ .498	+ .006	+ .504	.213916	79.235	.572	- .127	+ .182	+ .055
	40.235	.582	+ .496	- .008	+ .488		4953.213	.572	- .165	+ .156	- .009
	41.226	.662	+ .525	+ .011	+ .536		5224.468	.597	- .140	+ .193	+ .053
							5253.263	.757	- .213	+ .116	- .097
YZ Car *	4561.281	.130	+ .898	+ .110	+ 1.008	ER Car *	4519.424	.514	+ 1.600	+ .236	+ 1.836
d ⁻¹	64.268	.295	+ .916:	+ .047:	+ .963:	d ⁻¹	33.364	.320	+ 1.451	+ .139	+ 1.590
.055057	73.264	.790	+ .600	- .059	+ .541	.129555	34.384	.452	+ 1.576	+ .224	+ 1.800
	75.288	.898	+ .615	- .038	+ .577		4834.438	.326	+ 1.465:	+ .153:	+ 1.618:
	76.221	.953	+ .640	- .013	+ .627		35.498	.463	+ 1.594	+ .218	+ 1.812
	78.205	.062	+ .722	+ .029	+ .751		90.419	.578	+ 1.616	+ .208	+ 1.824
	4834.410	.168	+ .942:	+ .159:	+ 1.101:		4943.268	.425	+ 1.535	+ .193	+ 1.728
	35.467	.226	+ .913	+ .147	+ 1.060		5253.303	.592	+ 1.618	+ .216	+ 1.834
	90.384	.250	+ .908	+ .104	+ 1.012		5555.534	.747	+ 1.566	+ .166	+ 1.732
	4907.265	.179	+ .939	+ .137	+ 1.076		5608.340	.588	+ 1.613	+ .213	+ 1.826
	43.244	.160	+ .924	+ .141	+ 1.065		16.359	.627	+ 1.562	+ .194	+ 1.756
							23.333	.531	+ 1.628	+ .238	+ 1.866
AQ Car *	4510.351	.702	+ .735	+ .117	+ .852		24.253	.650	+ 1.581	+ .192	+ 1.773
d ⁻¹	19.369	.625	+ .767	+ .146	+ .913	EY Car *	4517.330	.689	+ .096	+ .093	+ .189
.102365	29.347	.647	+ .760	+ .122	+ .882	d ⁻¹	20.317	.728	+ .206	+ .205	+ .411
	67.212	.523	+ .820:	+ .169:	+ .999:	.347703	32.368	.918	+ .221	+ .204	+ .425
	4930.207	.681	+ .731:	+ .108:	+ .839:		66.213	.686	+ .032:	+ .138:	+ .170:
	5308.228	.377	+ .744	+ .170	+ .914		72.212	.772	+ .161	+ .184	+ .345
	09.210	.477	+ .825	+ .179	+ 1.004		4917.322	.768	+ .200	+ .181	+ .381
	10.215	.580	+ .747	+ .130	+ .877		20.325	.812	+ .168	+ .188	+ .356
	5535.478	.639	+ .766	+ .126	+ .892		5256.310	.635	+ .080	+ .159	+ .239
	73.484	.530	+ .792	+ .163	+ .955		85.260	.701	+ .149	+ .177	+ .326
	5611.341	.405	+ .771	+ .181	+ .952		5567.421	.809	+ .246	+ .210	+ .456
	20.299	.322	+ .752	+ .171	+ .923		68.437	.162	+ .090	+ .145	+ .235
CC Car *	4534.352	.667	- .445	+ .102	- .343		73.511	.926	+ .207	+ .183	+ .295
d ⁻¹	35.371	.881	- .502	+ .037	- .465		5608.330	.033	+ .154	+ .168	+ .322
.210100	62.299	.539	- .654	- .013	- .667	FI Car	4569.252	.614	- .270	- .089	- .359
	67.267	.583	- .722 ²	+ .028 ²	- .694 ²	d ⁻¹	70.286	.691	- .341	- .129	- .470
	4925.252	.795	- .209 ²	- .075 ²	- .284 ²	.074326	5194.526	.088	- .504	- .270	- .774
	53.229	.673	- .293 ²	+ .437 ²	+ .164 ²		5223.400	.234	- .434	- .225	- .659
	5224.480	.663	- .440	+ .065	- .375		24.442	.312	- .479	- .184	- .663
	53.276	.713	- .418	+ .075	- .343		81.287	.537	- .284	- .082	- .366
	81.300	.601	- .478	+ .021	- .457		85.282	.834	- .356	- .163	- .519
	82.234	.797	- .505:	+ .029:	- .476:		5535.520	.433	- .413	- .151	- .564
	5535.539	.017	- .548	+ .002	- .546		74.374	.321	- .470:	- .196:	- .666:
	55.500	.211	- .620	- .045	- .665		5629.258	.400	- .425	- .123	- .548
	67.439	.719	- .418	+ .060	- .358		30.291	.477	- .401	- .125	- .526
	80.375	.437	- .638	- .058	- .696						
	95.385	.590	- .544	+ .017	- .527	FN Car *	4513.375	.232	- .398	+ .054	- .344
	5609.390	.533	- .616	- .012	- .628	d ⁻¹	46.290	.409	- .231	+ .122	- .109
	23.323	.460	- .631	- .032	- .663	.218070	74.257	.508	- .280	+ .070	- .210
	24.242	.653	- .451	+ .067	- .384		4839.303	.307	- .269	+ .065	- .204
	27.230	.281	- .620	- .038	- .658		67.383	.430	- .237	+ .114	- .123
	39.210	.798	- .477	+ .023	- .454		4917.365	.330	- .275	+ .112	- .163
	40.224	.011	- .549	- .002	- .551	FO Car	4529.405	.373	+ .053	- .002	+ .051
	41.215	.219	- .594	- .052	- .646	d ⁻¹	75.253	.800	- .155	- .091	- .246
CN Car *	4510.337	.390	+ .144	+ .136	+ .280	.096563	78.251	.090	- .074	- .023	- .097
d ⁻¹	35.289	.448	+ .090	+ .117	+ .207		80.237	.281	+ .068:	+ .056:	+ .124:
.202732	36.287	.651	+ .015	+ .027	+ .012		4943.256	.336	+ .076	+ .047	+ .123
	64.251	.320	+ .095:	+ .060:	+ .155:		5253.290	.273	+ .046	+ .045	+ .091
	4885.375	.422	+ .096	+ .122	+ .218		5308.262	.582	- .054	- .046	- .100
	4929.253	.317	+ .098	+ .112	+ .210	FR Car	4520.378	.783	+ .410	+ .080	+ .490
CR Car	4920.302	.041	- .286	+ .010	- .276	d ⁻¹	21.326	.871	+ .510	+ .131	+ .641
d ⁻¹	21.307	.144	- .338:	- .004:	- .342:	.093307	33.377	.996	+ .512	+ .089	+ .601
.102441	30.224	.057	- .272:	- .014:	- .286:		4865.468	.982	+ .508	+ .090	+ .598
	5281.249	.016	- .225:	+ .026:	- .199:		4918.312	.913	+ .509	+ .109	+ .618
	5308.239	.781	- .395	- .030	- .425		29.310	.939	+ .510	+ .104	+ .614
	09.219	.882	- .324	.000	- .324		5251.384	.991	+ .515	+ .089	+ .604
	5535.492	.061	- .264	+ .012	- .252		82.270	.873	+ .453	+ .104	+ .557
	73.500	.955	- .316	- .029	- .345		5315.219	.947	+ .493	+ .090	+ .583
	5611.369	.934	- .330	+ .002	- .328						
	24.231	.152	- .316	- .024	- .340						

TABLE 6 (continued)

Name of Cepheid	J.D. hel. -2430000	phase	log I_Y	Δ log I	log I_B	Name of Cepheid	J.D. hel. -2430000	phase	log I_Y	Δ log I	log I_B
GH Car * d ⁻¹ .174655	d					V Cen * d ⁻¹ .182018	d				
	4520.357	.503	+ .632	+ .141	+ .773		4513.442	.528	+ 1.595	+ .178	+ 1.773
	21.277	.664	+ .607	+ .131	+ .738		19.457	.623	+ 1.540	+ .148	+ 1.688
	88.219	.355	+ .632	+ .132	+ .764		29.470	.445	+ 1.658	+ .229	+ 1.887
	4834.445	.360	+ .648:	+ .162:	+ .810:		78.300	.333	+ 1.666	+ .247	+ 1.913
	35.505	.545	+ .640	+ .155	+ .795		4847.437	.321	+ 1.661:	+ .224:	+ 1.885:
	4921.346	.538	+ .634	+ .140	+ .774		69.497	.336	+ 1.665	+ .238	+ 1.903
	5555.545	.304	+ .605	+ .130	+ .735		86.528	.436	+ 1.628	+ .243	+ 1.871
	67.498	.391	+ .644	+ .148	+ .792		5281.360	.303	+ 1.652	+ .223	+ 1.875
	68.460	.559	+ .639	+ .135	+ .774		86.315	.204	+ 1.447	+ .126	+ 1.573
	80.388	.643	+ .614	+ .119	+ .733		5302.252	.105	+ 1.365	+ .053	+ 1.418
	5608.351	.527	+ .636	+ .142	+ .778						
	09.405	.711	+ .586	+ .115	+ .701						
	11.412	.061	+ .511	+ .087	+ .598						
GI Car * d ⁻¹ .225703	4512.382	.458	+ .991	+ .269	+ 1.260	TX Cen * d ⁻¹ .058501	4562.327	.901	- .086	- .357	- .443
	20.368	.261	+ .906	+ .215	+ 1.121		64.349	.019	- .174:	- .374:	- .548:
	21.286	.468	+ .984	+ .202	+ 1.246		68.305	.250	- .024	- .270	- .294
	30.405	.526	+ .998	+ .248	+ 1.246		69.379	.313	+ .017	- .213	- .196
	4835.513	.390	+ .960	+ .243	+ 1.203		70.361	.371	+ .300	- .076	+ .224
	67.395	.586	+ .973	+ .257	+ 1.230		72.336	.486	+ .223	- .145	+ .078
	5253.313	.689	+ .948	+ .225	+ 1.173		4929.414	.376	+ .287	- .078	+ .209
	5310.226	.534	+ .962	+ .242	+ 1.204		30.358	.431	+ .266	- .118	+ .148
	28.216	.594	+ .963	+ .239	+ 1.202		5251.485	.217	- .072	- .294	- .366
							81.402	.967	- .133	- .367	- .500
GX Car * d ⁻¹ .138957	4522.252	.399	+ .526	+ .096	+ .622	UZ Cen * d ⁻¹ .299907	4517.415	.804	+ .837	+ .256	+ 1.093
	23.270	.540	+ .664	+ .161	+ .825		74.269	.855	+ .843	+ .247	+ 1.090
	31.328	.660	+ .612	+ .102	+ .714		4834.477	.893	+ .909	+ .274	+ 1.183
	45.232	.592	+ .636	+ .141	+ .777		47.375	.762	+ .781	+ .227	+ 1.008
	4839.261	.449	+ .610	+ .129	+ .739		4907.331	.743	+ .896	+ .281	+ 1.177
GZ Car * d ⁻¹ .240451	4513.286	.224	+ .182	+ .111	+ .293	VW Cen * d ⁻¹ .066506	4561.346	.357	+ .009	- .193	- .184
	17.288	.186	+ .218	+ .138	+ .356		63.398	.493	+ .048	- .117	- .069
	21.249	.139	+ .169	+ .109	+ .278		67.318	.754	+ .344	+ .049	+ .393
	29.339	.084	+ .218	+ .127	+ .345		70.319	.954	+ .212	- .094	+ .118
	61.214	.748	+ .179	+ .093	+ .272		80.313	.618	+ .189	- .010	+ .179
	4812.445	.157	+ .182	+ .112	+ .294		4867.472	.716	+ .366	+ .063	+ .429
	69.403	.853	+ .188	+ .127	+ .315		69.485	.850	+ .267	- .031	+ .236
	86.321	.921	+ .213	+ .143	+ .356		98.442	.776	+ .286	- .018	+ .268
	95.331	.087	+ .268:	+ .130:	+ .398:		5302.242	.631	+ .244	+ .023	+ .267
	4917.294	.368	+ .123	+ .057	+ .180		03.302	.701	+ .350:	+ .062:	+ .412:
	19.306	.852	+ .173	+ .121	+ .294						
	24.250	.041	+ .233:	+ .146:	+ .379:						
	31.196	.711	+ .113:	+ .080:	+ .193:						
	43.210	.600	+ .122:	+ .083:	+ .205:						
HK Car * d ⁻¹ .149349	4529.412	.463	+ .239	+ .119	+ .358	XXX Cen * d ⁻¹ .091276	4517.476	.337	+ 1.227	+ .144	+ 1.371
	35.374	.354	+ .268	+ .133	+ .401		29.460	.431	+ 1.188	+ .106	+ 1.294
	68.211	.258	+ .217:	+ .111:	+ .328:		4847.426	.454	+ 1.170:	+ .074:	+ 1.244:
	4917.373	.405	+ .259	+ .102	+ .361		89.440	.289	+ 1.289	+ .190	+ 1.479
	24.314	.441	+ .243:	+ .108:	+ .351:		98.424	.109	+ 1.274?	+ .188?	+ 1.462?
IT Car * d ⁻¹ .132703	4546.300	.308	+ .986	+ .096	+ 1.082	AY Cen * d ⁻¹ .188333	4520.390	.339	+ .769	+ .102	+ .871
	4847.333	.256	+ .983	+ .072	+ 1.055		46.307	.220	+ .820	+ .150	+ .970
	4907.294	.213	+ .994	+ .082	+ 1.076		80.247	.612	+ .635:	+ .066:	+ .701:
	08.246	.339	+ .958	+ .055	+ 1.013		88.251	.119	+ .825	+ .157	+ .982
	14.344	.148	+ 1.012	+ .105	+ 1.117		4834.456	.488	+ .719:	+ .068:	+ .787:
	16.278	.405	+ .929	+ .060	+ .989		65.478	.330	+ .766	+ .107	+ .873
	24.324	.473	+ .915	+ .048	+ .963		4917.384	.106	+ .810	+ .157	+ .979
	30.292	.265	+ .990	+ .068	+ 1.058		5224.494	.945	+ .674	+ .075	+ .749
	5251.372	.873	+ 1.070	+ .141	+ 1.211		5309.240	.905	+ .626	+ .041	+ .667
	82.260	.972	+ .998	+ .102	+ 1.100		15.230	.033	+ .757	+ .128	+ .885
	5328.208	.069	+ 1.005	+ .107	+ 1.112						
	5567.506	.825	+ 1.072	+ .144	+ 1.216						
	73.532	.624	+ .994	+ .109	+ 1.103						
	74.383	.737	+ 1.062:	+ .130:	+ 1.192:						
	5611.421	.652	+ .996	+ .108	+ 1.104						
	20.309	.832	+ 1.072	+ .151	+ 1.223						
21.394	.976	+ 1.042	+ .117	+ 1.159							
I Car * d ⁻¹ .028136	4544.273	.858	+ 2.631	- .080	+ 2.551	AZ Cen * d ⁻¹ .311269	4521.337	.352	+ .737	+ .219	+ .956
	45.222	.884	+ 2.641	- .069	+ 2.572		33.387	.103	+ .820	+ .245	+ 1.065
	46.229	.913	+ 2.661	- .041	+ 2.620		78.272	.074	+ .812	+ .235	+ 1.047
	4833.404	.993	+ 2.762				4835.522	.148	+ .804	+ .241	+ 1.045
	34.371	.020	+ 2.809				90.429	.239	+ .768	+ .201	+ .969
	35.456	.050	+ 2.860				4925.209	.093	+ .800	+ .226	+ 1.026
	65.391	.893	+ 2.617				5188.545	.033	+ .831	+ .261	+ 1.092
	67.353	.948	+ 2.674				94.566	.907	+ .857	+ .267	+ 1.124
	69.392	.005	+ 2.782				5223.462	.902	+ .867	+ .271	+ 1.138
	4907.252	.070	+ 2.872				5573.542	.871	+ .865	+ .264	+ 1.129
	08.228	.098	+ 2.986:				5608.389	.718	+ .828	+ .256	+ 1.084
	13.241	.239	+ 2.892				11.430	.664	+ .788	+ .243	+ 1.031
	5302.216	.183	+ 2.905	+ .034	+ 2.939		30.322	.545	+ .750:	+ .202:	+ .952:
	224	.183	+ 2.911	+ .041	+ 2.952						
	03.216	.211	+ 2.863	+ .015	+ 2.878						
	5616.305	.020	+ 2.845	+ .031	+ 2.896						
	19.269	.104	+ 2.938	+ .086	+ 3.024						
	20.275	.132	+ 2.931	+ .091	+ 3.022						
22.256	.188	+ 2.914:	+ .048:	+ 2.962:							
56.238	.144	+ 2.930	+ .079	+ 3.009							
57.191	.171	+ 2.939	+ .065	+ 3.004							

TABLE 6 (continued)

Name of Cepheid	J.D. hel. -2430000	phase	$\log I_Y$	$\Delta \log I$	$\log I_B$	Name of Cepheid	J.D. hel. -2430000	phase	$\log I_Y$	$\Delta \log I$	$\log I_B$
	d						d				
IU Cen *	4569.357	.619	-.744	+.194	-.550		4920.354	.220	+.095	+.193	+.288
d ⁻¹	72.324	.513	-.692	+.248	-.444		21.356	.261	+.130	+.223	+.353
.301272	75.376	.433	-.828	+.329	-.499		24.336	.381	+.442	+.313	+.755
	4867.487	.438	-.769	+.299	-.470		5223.473	.493	+.417	+.270	+.687
	4947.283	.478	-.711	+.246	-.465		24.507	.535	+.390	+.242	+.632
	50.257	.374	-.967	+.285	-.682						
KK Cen *	4512.392	.467	-.105	+.088	-.017	V496 Cen *	4513.434	.185	+.384	+.098	+.482
d ⁻¹	13.393	.550	-.179	+.031	-.148	d ⁻¹	17.465	.096	+.400	+.089	+.489
.082100	4865.497	.457	-.150	+.075	-.075	.226033	22.345	.199	+.380	+.070	+.450
	90.440	.505	-.108	+.048	-.060		30.457	.033	+.340	+.054	+.394
	5194.580	.475	-.143	+.082	-.061		4867.459	.206	+.356	+.067	+.423
	5223.488	.848	-.381	-.112	-.493		4929.358	.198	+.378	+.064	+.442
	51.409	.141	-.499	-.126	-.625	AL CrA *	4563.554	.538	-.369	+.101	-.268
	81.314	.596	-.205	+.009	-.196	d ⁻¹	78.514	.415	-.320	+.154	-.166
	86.260	.002	-.499	-.161	-.660	.058625	79.470	.471	-.319	+.132	-.187
	5303.262	.398	-.308	-.028	-.336		5308.484	.210	-.474	+.247	-.227
KN Cen *	4561.366	.081	+.162	-.246	-.084		09.357	.261	-.440	+.264	-.176
d ⁻¹	67.331	.257	+.268	-.160	+.108		10.353	.319	-.389	+.193	-.196
.029395	69.341	.316	+.490	-.076	+.414		28.308	.372	-.345	+.190	-.155
	73.347	.434	+.464	-.109	+.355		5612.410	.028	-.674	+.117	-.557
	4947.260	.425	+.501	-.099	+.402		24.573	.741	-.751	+.035	-.716
	5251.473	.367	+.537	-.068	+.469		26.554	.857	-.729	-.015	-.744
	53.326	.422	+.512	-.101	+.411		27.418	.907	-.748	-.022	-.760
	86.293	.391	+.522	-.089	+.433		28.541	.973	-.714	+.088	-.626
MY Cen *	4568.284	.494	-.378	-.160	-.538		29.487	.029	-.659	+.151	-.508
d ⁻¹	72.295	.572	-.435	-.188	-.623		30.476	.087	-.617	+.196	-.421
.268918	75.356	.396	-.431	-.167	-.598		31.381	.140	-.548	+.218	-.330
	76.314	.653	-.522	-.207	-.729		34.465	.321	-.317	+.152	-.165
	4869.473	.489	-.406	-.130	-.536		36.440	.436	-.334	+.126	-.208
	4929.371	.597	-.448	-.194	-.542		37.434	.495	-.351	+.115	-.246
	5281.345	.249	-.624	-.266	-.890		38.466	.555	-.408	+.087	-.321
	85.320	.318	-.568	-.240	-.808		39.485	.615	-.402	+.042	-.420
	5303.288	.150	-.703	-.294	-.997		42.531	.793	-.772	-.022	-.794
OO Cen *	4530.467	.732	-.393	-.175	-.568		52.351	.369	-.343	+.163	-.180
d ⁻¹	4916.364	.692	-.381	-.218	-.590		57.461	.669	-.577	+.075	-.502
.077637	50.275	.325	-.622	-.355	-.977		67.498	.257	-.416	+.238	-.178
	52.281	.480	-.545	-.341	-.886	KQ CrA *	68.436	.312	-.354	+.218	-.136
	53.263	.556	-.438	-.272	-.710	d ⁻¹	4562.546	.826	-.677	+.071	-.606
	5328.237	.668	-.384	-.197	-.581	.032400	64.535	.891	-.559	+.230	-.329
	5573.568	.715	-.402	-.244	-.646		73.422	.179	-.511	+.071	-.440
	74.423	.781	-.410	-.361	-.771		74.425	.211	-.518	+.091	-.427
	5611.503	.660	-.326	-.212	-.538		76.445	.277	-.566	+.015	-.551
	23.344	.580	-.401	-.225	-.626		77.475	.310	-.617	+.084	-.533
V339 Cen *	4562.317	.908	+.663	-.081	+.582		78.485	.343	-.600	+.045	-.555
d ⁻¹	63.412	.024	+.613	-.074	+.539		5281.472	.120	-.513	+.132	-.381
.105628	67.373	.442	+.859	+.057	+.916		5308.441	.993	-.507	+.187	-.320
	68.296	.540	+.864	+.025	+.889		09.341	.023	-.617	+.185	-.432
	69.370	.653	+.802	-.003	+.799		10.288	.053	-.545	+.140	-.405
	76.325	.388	+.822	+.043	+.865		5567.571	.389	-.629	+.091	-.538
	4889.449	.463	+.876	+.067	+.943		5623.444	.200	-.568	+.099	-.469
	4917.455	.421	+.867	+.051	+.918		24.504	.234	-.566	+.107	-.459
V378 Cen *	4521.393	.984	+.802	+.071	+.873		26.532	.300	-.544	+.090	-.454
d ⁻¹	22.356	.133	+.924	+.130	+.1054		27.393	.328	-.534	+.044	-.490
.154816	29.453	.232	+.948	+.127	+.1075		28.497	.363	-.708	+.152	-.556
	72.305	.866	+.799	+.037	+.836		29.483	.395	-.759	+.035	-.724
	88.305	.343	+.905	+.111	+.1016		30.366	.424	-.664	+.016	-.648
	4916.356	.131	+.912	+.121	+.1033		31.356	.456	-.605	+.009	-.596
	30.346	.296	+.927	+.115	+.1042		34.444	.556	-.858	+.060	-.798
	36.273	.214	+.933	+.124	+.1057		36.417	.620	-.749	-.085	-.834
V381 Cen *	4520.456	.069	+.1264	+.249	+.1513		38.437	.685	-.1013	+.031	-.982
d ⁻¹	21.411	.257	+.1267	+.237	+.1504		39.462	.719	-.914	+.050	-.864
.196898	46.333	.164	+.1314	+.270	+.1584		52.328	.135	-.540	+.163	-.377
	4886.520	.146	+.1318	+.273	+.1591		55.427	.236	-.584	+.184	-.400
	4932.291	.158	+.1312	+.261	+.1573		64.227	.521	-.487	+.031	-.456
V419 Cen *	4585.243	.882	+.918	+.161	+.1079	V347 CrA *	68.424	.657	-.718	+.015	-.703
d ⁻¹	86.268	.068	+.1008	+.206	+.1214	d ⁻¹	4563.541	.319	-.655	+.184	-.471
.181426	87.206	.238	+.1017	+.220	+.1237	.065151	64.572	.386	-.752	+.207	-.545
	88.259	.429	+.971	+.187	+.1158		75.527	.100	-.749	+.202	-.547
	4865.487	.726	+.919	+.172	+.1091		4930.472	.225	-.653	+.192	-.461
	95.415	.156	+.1039	+.224	+.1263		5328.291	.143	-.643	+.215	-.428
	4906.408	.150	+.1003	+.205	+.1208		43.235	.117	-.658	+.225	-.433
	34.220	.196	+.1031	+.226	+.1257		5624.546	.445	-.775	+.133	-.642
V420 Cen *	4565.315	.845	+.229	+.178	+.407	R Cru *	4520.444	.943	+.1683	+.269	+.1952
d ⁻¹	85.247	.652	+.361	+.195	+.556	d ⁻¹	32.415	.998	+.1661	+.262	+.1923
.040489	87.213	.732	+.319	+.192	+.511	.171652	4847.392	.065	+.1653	+.238	+.1891
	88.269	.774	+.308	+.180	+.488		86.467	.772	+.1457	+.167	+.1624
	4834.468	.743	+.337	+.204	+.541		4916.338	.899	+.1674	+.281	+.1955
	35.533	.786	+.317	+.188	+.505		22.312	.925	+.1689	+.280	+.1969
	86.437	.847	+.256	+.169	+.419	S Cru	4587.270	.093	+.1486	+.115	+.1601
	95.424	.211	+.088	+.188	+.276	d ⁻¹	88.207	.312	+.1560	+.182	+.1742
	96.382	.250	+.111	+.222	+.333	.213219	4847.418	.562	+.1730	+.242	+.1972
	4914.355	.977	+.179	+.137	+.316		4907.362	.343	+.1652	+.228	+.1880
	16.288	.056	+.103	+.149	+.252		08.262	.535	+.1744	+.261	+.2005
	18.324	.138	+.094	+.158	+.252		31.291	.445	+.1768	+.283	+.2051
	19.369	.180	+.083	+.178	+.261		5282.325	.292	+.1541	+.169	+.1710
							5348.237	.346	+.1633	+.237	+.1870
							58.200	.470	+.1745	+.285	+.2030

TABLE 6 (continued)

Name of Cepheid	J.D. hel. -2430000	phase	log I_Y	Δ log I	log I_B	Name of Cepheid	J.D. hel. -2430000	phase	log I_Y	Δ log I	log I_B
T Cru *	d 4513.410	.318	+1.636	+ .151	+1.787	SU Cyg	d 5348.308	.795	+1.374	+ .233	+1.607
d ⁻¹	20.433	.361	+1.673	+ .184	+1.857	d ⁻¹	49.271	.046	+1.667	+ .360	+2.027
.148517	21.386	.503	+1.698	+ .192	+1.890	.260044	64.310	.957	+1.547	+ .295	+1.842
	34.412	.437	+1.718	+ .205	+1.923		65.324	.220	+1.567	+ .306	+1.873
	4925.352	.499	+1.717	+ .189	+1.906						
	31.231	.372	+1.682	+ .173	+1.855	TX Del *	5343.358	.506	+ .607	+ .240	+ .847
	5188.557	.589	+1.676	+ .162	+1.838	d ⁻¹	5643.447	.170	+ .497	+ .119	+ .616
	94.592	.485	+1.705	+ .184	+1.889	d ⁻¹	54.460	.956	+ .614	+ .202	+ .816
	5296.269	.586	+1.673	+ .151	+1.824	.162165	65.464	.740	+ .686	+ .274	+ .960
							68.513	.234	+ .465	+ .107	+ .572
X Cru *	4563.363	.661	+ .809	+ .037	+ .846		81.412	.326	+ .458	+ .108	+ .566
d ⁻¹	64.312	.814	+ .793	+ .050	+ .843		82.448	.494	+ .610	+ .236	+ .846
.160772	65.331	.977	+ .851	+ .097	+ .948		83.442	.655	+ .713	+ .295	+1.008
	4901.451	.016	+ .897	+ .109	+1.006		88.373	.455	+ .534	+ .186	+ .720
	06.436	.818	+ .773	+ .030	+ .803		89.366	.616	+ .658	+ .309	+ .967
	07.355	.965	+ .879	+ .098	+ .977						
	14.376	.094	+ .979	+ .142	+1.121	β Dor *	5547.232	.593	+2.650	+ .152	+2.802
	25.363	.860	+ .794	+ .042	+ .836	d ⁻¹	48.249	.697	+2.732	+ .184	+2.916
	5188.568	.176	+ .999	+ .167	+1.166	.101599	55.228	.406	+2.652	+ .100	+2.752
	5281.329	.090	+ .993	+ .150	+1.143		68.229	.726	+2.753	+ .203	+2.956
	82.311	.248	+ .944	+ .130	+1.074		69.228	.828	+2.802	+ .231	+3.033
	5308.316	.429	+ .897	+ .078	+ .975		73.236	.235	+2.767	+ .161	+2.928
							80.218	.945	+2.879	+ .263	+3.142
SU Cru *	4512.422	.224	+ .400	- .210	+ .190		5608.204	.788	+2.804	+ .225	+3.029
d ⁻¹	30.429	.626	+ .274	- .378	- .104		12.185	.192	+2.798	+ .184	+2.982
.077835	32.408	.780	+ .257	- .346	- .089						
	34.407	.936	+ .328	- .255	+ .073	W Gem	4785.314	.624	+1.486	+ .152	+1.638
	87.252	.049	+ .481	- .087	+ .394	d ⁻¹	5535.304	.386	+1.314	+ .020	+1.334
	4834.561	.298	+ .377	- .247	+ .130	.126350	55.319	.915	+1.520	+ .142	+1.662
	95.452	.038	+ .492	- .093	+ .399		68.289	.553	+1.392	+ .110	+1.502
	96.394	.111	+ .433	- .157	+ .276		73.281	.184	+1.417	+ .054	+1.471
	4921.387	.056	+ .492	- .090	+ .402		80.255	.065	+1.500	+ .112	+1.612
	22.306	.128	+ .436	- .158	+ .278		95.219	.956	+1.572	+ .168	+1.740
	34.235	.056	+ .494	- .094	+ .400						
	5331.231	.956	+ .331	- .248	+ .083	AP Her *	5315.435	.670	+ .092	+ .242	+ .334
	5626.247	.919	+ .276	- .288	- .012	d ⁻¹	58.296	.788	+ .019	+ .197	+ .216
	27.250	.997	+ .372	- .206	+ .166	.096073	5626.455	.550	+ .022	+ .261	+ .283
	39.226	.929	+ .310	- .291	+ .019		27.478	.649	+ .102	+ .260	+ .362
	40.247	.009	+ .405	- .181	+ .224		36.483	.514	- .030	+ .236	+ .206
	41.237	.086	+ .465	- .147	+ .318		37.447	.606	+ .086	+ .281	+ .367
							46.460	.472	+ .118	+ .212	+ .094
SV Cru	4512.403	.236	- .441	- .013	- .454		87.100	.407	+ .524	+ .095	+ .619
d ⁻¹	46.321	.078	- .563	- .065	- .628		88.281	.490	- .022	+ .221	+ .199
.142770	75.267	.211	- .469	- .004	- .473	BB Her *	5328.380	.719	+ .272	+ .114	+ .386
	76.289	.357	- .537	- .078	- .615	d ⁻¹	59.246	.830	+ .340	+ .136	+ .476
	4834.496	.221	- .453	- .044	- .497	.133196	64.266	.499	+ .080	- .017	+ .063
	4919.388	.341	- .527	- .053	- .580		65.284	.634	+ .182	+ .060	+ .242
	25.313	.187	- .464	- .011	- .475		5629.527	.830	+ .328	+ .142	+ .470
TY Cru *	4567.300	.566	- .723	- .035	- .758		30.527	.964	+ .282	+ .094	+ .376
d ⁻¹	76.297	.399	- .855	- .112	- .967		36.476	.756	+ .320	+ .133	+ .453
.200461	77.307	.572	- .770	- .051	- .821	RX Lib *	4562.374	.892	- .574	- .046	- .620
	4916.323	.531	- .772	- .065	- .837	d ⁻¹	4929.444	.607	- .425	+ .157	- .268
	5555.559	.673	- .807	- .127	- .934	.040087	30.403	.645	- .422	+ .156	- .266
	74.402	.450	- .744	- .082	- .826		31.309	.681	- .403	+ .122	- .281
	5629.274	.450	- .814	- .064	- .878		32.313	.722	- .416	+ .120	- .296
							5251.503	.517	- .478	+ .219	- .259
VW Cru *	4512.430	.086	+ .467	+ .011	+ .478		5302.267	.552	- .487	+ .178	- .309
d ⁻¹	13.425	.275	+ .476	- .020	+ .456		5555.601	.707	- .444	+ .094	- .350
.189939	45.260	.322	+ .459	- .026	+ .433		73.610	.429	- .586	+ .188	- .398
	85.258	.919	+ .281	- .101	+ .180		5608.440	.826	- .503	+ .068	- .435
	4929.345	.275	+ .477	- .018	+ .459		09.449	.866	- .520	+ .025	- .495
	34.286	.213	+ .494	+ .004	+ .498		11.524	.949	- .606	- .006	- .612
							12.386	.984	- .676	- .012	- .688
VX Cru *	4512.441	.492	- .628	- .249	- .877		22.352	.383	- .722	+ .140	- .582
d ⁻¹	17.445	.902	- .434	- .125	- .559		23.389	.425	- .665	+ .189	- .476
.081883	454	.903	- .404	- .132	- .536		24.278	.460	- .580	+ .200	- .380
	30.444	.966	- .290	- .083	- .373		26.338	.543	- .484	+ .176	- .308
	69.324	.150	- .474	- .151	- .625		27.278	.581	- .457	+ .173	- .284
	80.294	.048	- .364	- .141	- .505		28.355	.624	- .423	+ .167	- .256
	4896.405	.932	- .390	- .105	- .495		29.449	.668	- .415	+ .117	- .298
	5251.422	.002	- .325	- .094	- .419		30.350	.704	- .461	+ .118	- .343
							31.343	.744	- .429	+ .115	- .314
AD Cru *	4521.377	.637	- .031	+ .060	+ .029		34.236	.860	- .482	+ .082	- .400
d ⁻¹	34.398	.672	- .017	+ .048	+ .031		37.316	.983	- .592	+ .059	- .533
.156288	35.409	.830	- .085	- .017	+ .102		38.335	.024	- .677	+ .028	- .649
	4834.551	.582	- .042	+ .023	+ .019		39.243	.060	- .676	+ .026	- .650
	67.447	.724	- .055	+ .011	- .044		40.281	.102	- .706	+ .148	- .558
	4924.353	.617	- .076	- .020	- .096		41.278	.142	- .755	+ .021	- .734
	25.342	.772	- .073	+ .004	- .069		42.500	.191	- .786	+ .034	- .702
	31.276	.699	- .023	+ .010	- .013		57.225	.781	- .479	+ .059	- .420
	5224.521	.530	- .132	- .015	- .147		60.293	.904	- .558	- .017	- .575
	82.285	.558	- .130	+ .009	- .121						
	5308.276	.620	- .038	+ .040	+ .002	T Mon	4784.328	.078	+1.958	+ .144	+2.002
						d ⁻¹	85.304	.114	+1.996	+ .148	+2.144
AG Cru *	4563.328	.194	+1.132	+ .299	+1.431	.037012	5532.381	.764	+1.662	- .093	+1.569
d ⁻¹	75.303	.315	+1.065	+ .256	+1.321		35.296	.872	+1.628	- .078	+1.550
.260598	4847.399	.222	+1.155	+ .295	+1.450		47.265	.315	+1.829	+ .120	+1.949
	85.451	.139	+1.064	+ .271	+1.335		55.258	.611	+1.704	- .096	+1.608
	4901.435	.304	+1.080	+ .246	+1.326		67.266	.056	+1.888	+ .084	+1.972
	16.347	.190	+1.127	+ .301	+1.428		68.254	.092	+1.988	+ .146	+2.134
	20.394	.245	+1.119	+ .283	+1.402		75.234	.351	+1.870	+ .008	+1.878

TABLE 6 (continued)

Name of Cepheid	J.D. hel. -2430000	phase	log I _Y	Δ log I	log I _B	Name of Cepheid	J.D. hel. -2430000	phase	log I _Y	Δ log I	log I _B
SV Mon *	d						d				
	4784.307	.099	+ .855	-.050	+ .805		4585.276	.082	+1.742	+ .165	+1.907
	85.285	.164	+ .786:	-.069:	+ .717:		86.314	.189	+1.795	+ .178	+1.973
	.065652	.049	+ .894	-.040	+ .854		4867.573	.024	+1.729	+ .167	+1.896
	87.313	.557	+1.110	+ .191	+1.301		85.513	.863	+1.615	+ .097	+1.712
	5532.360	.210	+ .716	-.041	+ .675		86.554	.970	+1.688	+ .142	+1.830
	35.276	.402	+ .836	+ .016	+ .852		4917.498	.142	+1.760	+ .167	+1.927
	48.290	.256	+ .713:	-.091:	+ .622:	U Nor *	4562.357	.910	+ .620	-.176	+ .444
	55.249	.713	+1.094	+ .135	+1.229		63.434	.995	+ .547	-.235	+ .312
	67.248	.501	+ .874	+ .046	+ .920		72.348	.700	+ .789	-.066	+ .723
	68.246	.566	+1.140	+ .208	+1.348	d ⁻¹	73.361	.780	+ .712	-.117	+ .595
	73.254	.895	+ .998	+ .027	+1.025	.079106	74.304	.855	+ .661	-.169	+ .492
	80.238	.354	+ .794	-.018	+ .776		78.309	.172	+ .452	-.283	+ .169
	5612.201	.452	+ .872	+ .076	+ .948		4885.505	.473	+ .490	-.217	+ .273
TX Mon *	4812.305	.082	-.028	+ .074	+ .046		86.539	.555	+ .562	-.168	+ .394
	d ⁻¹	.447	-.252	-.039	-.311		4922.462	.396	+ .437	-.252	+ .185
	.114910	.738	-.056:	+ .083:	+ .027:		25.415	.630	+ .644	-.131	+ .513
	68.302	.854	-.083:	+ .061:	-.022:	RS Nor	4562.449	.101	+ .108	-.130	-.022
	74.255	.538	-.242	-.002	-.244		63.471	.266	+ .241	-.046	+ .195
	95.252	.950	-.018	+ .070	+ .052	d ⁻¹	64.400	.416	+ .343	+ .038	+ .381
	5609.215	.555	-.224	+ .002	-.222	.161339	65.440	.584	+ .326	-.021	+ .305
AC Mon	5532.409	.113	+ .110	-.066	+ .044		4905.554	.457	+ .386	+ .031	+ .417
	d ⁻¹	.477	+ .352	+ .081	+ .433		17.469	.380	+ .413	+ .039	+ .452
	.124740	.983	+ .188	-.030	+1.158		30.435	.471	+ .391	+ .034	+ .425
	68.322	.592	+ .299	+ .042	+ .341		43.289	.545	+ .350	+ .006	+ .356
	73.304	.214	+ .086	-.072	+ .014		5308.360	.445	+ .412	+ .043	+ .455
	74.269	.334	+ .192	+ .006	+ .198		63.262	.303	+ .285:	-.022:	+ .263:
	5609.231	.695	+ .351	+ .047	+ .398	SY Nor *	4562.395	.808	+ .322	-.111	+ .211
	16.211	.566	+ .321:	-.076:	+ .245:	d ⁻¹	63.444	.891	+ .386	-.091	+ .295
R Mus *	4573.312	.073	+1.630	+ .125	+1.755		65.404	.046	+ .497	-.030	+ .467
	d ⁻¹	.240	+1.556	+ .120	+1.676	.079083	67.386	.203	+ .597	-.016	+ .581
	.133158	.904	+1.651:	+ .147:	+1.798:		68.316	.276	+ .572	-.059	+ .513
	87.262	.831	+1.736	+ .190	+1.926		4906.529	.023	+ .461	-.038	+ .423
	4847.407	.471	+1.888	+ .300	+2.188		07.386	.091	+ .615	+ .010	+ .625
	85.460	.538	+1.854	+ .286	+2.140		19.444	.044	+ .490	-.036	+ .454
	86.474	.073	+1.782	+ .225	+2.007		20.465	.125	+ .656	+ .026	+ .682
	4907.342	.452	+1.881	+ .295	+2.176		21.431	.202	+ .609	-.023	+ .586
	08.256	.574	+1.839	+ .265	+2.104	TW Nor *	4563.462	.987	-.433	-.359	-.792
	5251.439	.271	+1.593	+ .136	+1.729		65.429	.170	-.329	-.295	-.624
	82.299	.380	+1.692	+ .213	+1.905	.092690	75.398	.094	-.360	-.313	-.673
	5349.211	.290	+1.597	+ .156	+1.753		76.360	.183	-.353	-.300	-.653
S Mus *	4563.316	.458	+1.863	+ .213	+2.076		77.384	.278	-.198:	-.244:	-.442:
	d ⁻¹	.698	+1.744	+ .125	+1.869		4889.464	.204	-.314:	-.279:	-.593:
	.103594	.909	+1.673	+ .119	+1.792		5302.298	.470	-.363	-.337	-.700
	80.275	.214	+1.873	+ .215	+2.088		10.247	.207	-.284	-.298	-.582
	88.286	.044	+1.734	+ .159	+1.893		65.223	.303	-.237	-.309	-.546
	4834.505	.536	+1.829:	+ .184:	+2.013:	UX Nor *	4567.452	.457	-.1099	+ .377	-.722
	90.456	.328	+1.863	+ .202	+2.065	d ⁻¹	69.452	.295	-.1522?	+ .360?	-.162?
	4929.334	.354	+1.868	+ .203	+2.071	.419152	74.372	.357	-.1069	+ .397	-.672
RT Mus *	4587.225	.426	+ .750	+ .221	+ .971		75.422	.797	-.1236	+ .190:	-.1042
	d ⁻¹	.548	+ .791	+ .230	+1.021		4916.415	.725	-.1178:	+ .190:	-.988:
	.324036	.726	+ .697	+ .167	+ .864		20.494	.435	-.1062	+ .338	-.724
	47.382	.601	+ .739	+ .204	+ .943		21.447	.834	-.1348:	+ .310:	-.1038:
	96.372	.534	+ .809	+ .230	+1.039		31.350	.985	-.1407:	+ .049:	-.1358:
	4905.425	.377	+ .628	+ .168	+ .796		5285.388	.381	-.1051	+ .405	-.646
	20.369	.703	+ .697	+ .166	+ .863	GU Nor *	4574.350	.819	+ .016	-.088	-.072
	21.377	.602	+ .753	+ .205	+ .958	d ⁻¹	75.410	.126	+ .204	+ .018	+ .222
	5223.501	.388	+ .653	+ .173	+ .826	.289619	78.351	.977	+ .155	+ .006	+ .161
	5309.251	.537	+ .773	+ .241	+1.014		4914.412	.307	+ .118	-.050	+ .068
TZ Mus	4519.427	.959	-.415	+ .028	-.387		17.490	.199	+ .173	-.003	+ .170
	d ⁻¹	.188	-.196?	-.221?	-.417?		20.474	.063	+ .223	+ .023	+ .246
	.202229	.047	-.307	+ .040	-.267	Y Oph *	4564.524	.628	+1.840	-.051	+1.789
	78.283	.862	-.386?	-.067?	-.453?		73.401	.146	+1.734	-.118	+1.616
	4867.435	.337	-.421	-.038	-.459	.058413	79.416	.497	+1.917:	-.012:	+1.905:
	86.456	.183	-.337	+ .003	-.334		85.351	.844	+1.777	-.114	+1.663
	95.438	.000	-.315	-.004	-.310		86.377	.904	+1.753	-.123	+1.630
	4916.304	.219	-.358	-.045	-.403		87.363	.962	+1.727	-.137	+1.590
	20.380	.044	-.298	+ .014	-.284		4901.628	.319	+1.792:	-.042:	+1.750:
	5285.300	.841	-.549	-.098	-.647		21.489	.479	+1.907	-.013	+1.894
	5315.243	.896	-.505	-.035	-.540		53.341	.340	+1.813	-.054	+1.759
UU Mus *	4519.442	.401	+ .320	+ .054	+ .374		89.228	.436	+1.891	-.018	+1.873
	d ⁻¹	.485	+ .504	+ .148	+ .652	BF Oph *	4585.322	.219	+1.244	+ .090	+1.344
	.085940	.565	+ .524	+ .142	+ .666	d ⁻¹	86.324	.465	+1.215	+ .110	+1.325
	4835.543	.567	+ .535	+ .136	+ .671	.245832	87.306	.707	+1.443	+ .239	+1.682
	4905.443	.574	+ .527	+ .108	+ .635		4901.560	.960	+1.307	+ .150	+1.457
	06.421	.658	+ .422	+ .053	+ .475		05.612	.956	+1.329	+ .141	+1.470
	29.324	.626	+ .459	+ .066	+ .525		16.431	.616	+1.422	+ .224	+1.646
S Nor *	4561.469	.642	+1.605	+ .033	+1.638		17.509	.881	+1.362	+ .160	+1.522
	d ⁻¹	.848	+1.634	+ .075	+1.709		41.204	.706	+1.446	+ .226	+1.672
	.102520	.943	+1.688	+ .129	+1.817	RS Ori *	4784.318	.257	+ .083	+ .173	+1.156
	67.434	.253	+1.789	+ .185	+1.974	d ⁻¹	85.297	.387	+1.009:	+ .163:	+1.172:
	69.440	.459	+1.683	+ .094	+1.777	.132152	5532.373	.114	+ .760	+ .052	+ .832
	72.393	.702	+1.550	+ .043	+1.593		35.284	.499	+ .944	+ .129	+1.073
	74.357	.983	+1.679	+ .138	+1.817		67.254	.724	+ .871	+ .046	+ .917
	77.452	.280	+1.766	+ .161	+1.927		73.262	.518	+ .957	+ .131	+1.088
	78.344	.372	+1.738	+ .123	+1.861		74.230	.646	+ .934	+ .104	+1.038
	79.326	.473	+1.667	+ .088	+1.755		80.246	.441	+1.004	+ .154	+1.158
	80.352	.578	+1.617	+ .047	+1.664						

TABLE 6 (continued)

Name of Cepheid	J.D. hel. -2430000	phase	$\log I_Y$	$\Delta \log I$	$\log I_B$	Name of Cepheid	J.D. hel. -2430000	phase	$\log I_Y$	$\Delta \log I$	$\log I_B$
α Pav *	d						d				
d ⁻¹	5302.460	.026	+2.611	+ .262	+2.873	4530.213	.765	+ .144	+ .249	+ .393	
.110331	48.370	.091	+2.569	+ .235	+2.804	31.192	.952	+ .168	+ .168	+ .199	
	49.258	.189	+2.475	+ .176	+2.651	4834.268	.672	+ .172	+ .281	+ .453	
	65.301	.959	+2.665	+ .316	+2.981	35.345	.877	+ .087	+ .199	+ .286	
	70.291	.510	+2.380	+ .210	+2.590	39.228	.616	+ .080	+ .237	+ .317	
	72.268	.728	+2.582	+ .323	+2.905	40.236	.808	+ .108	+ .235	+ .343	
	5626.470	.774	+2.640	+ .353	+2.993	61.310	.822	+ .105	+ .222	+ .327	
	27.503	.888	+2.677	+ .337	+3.014	65.282	.578	+ .010	+ .200	+ .210	
	28.480	.996	+2.636	+ .280	+2.916	66.248	.762	+ .154	+ .260	+ .414	
	29.548	.114	+2.538	+ .220	+2.758	67.251	.953	+ .041	+ .170	+ .211	
	36.505	.881	+2.694	+ .342	+3.036						
X Pup *	4833.297	.193	+ .900	- .064	+ .836	WZ Pup *	4513.225	.710	+ .186	+ .221	+ .407
d ⁻¹	34.260	.230	+ .878	- .079	+ .799	d ⁻¹	19.255	.908	+ .107	+ .164	+ .271
.038523	35.237	.268	+ .845	- .097	+ .748	.198685	23.214	.695	+ .177	+ .227	+ .404
	65.262	.424	+ .737	- .154	+ .583	32.198	.480	+ .242	+ .263	+ .505	
	67.241	.501	+ .696	- .166	+ .530	4835.360	.714	+ .172	+ .175	+ .347	
	69.249	.578	+ .681	- .141	+ .540	65.290	.660	+ .195	+ .195	+ .390	
	4905.226	.964	+1.052:	+1.105:	+1.157:	67.272	.054	+ .027	+ .110	+ .137	
	06.212	.002	+ .986:	+ .096:	+1.082:	69.280	.453	+ .300	+ .276	+ .576	
	07.215	.041	+ .950	+ .030:	+ .980:	93.228	.211	- .044	+ .106	+ .062	
	5187.390	.834	+ .915	+ .086:	+1.001:	5256.248	.338	+ .280	+ .268	+ .535	
	88.374	.872	+1.097	+ .155	+1.252						
RS Pup *	4529.260	.436	+1.413	- .069	+1.344	AD Pup *	4519.244	.445	+ .532	+ .210	+ .742
d ⁻¹	30.239	.460	+1.492	- .018	+1.474	d ⁻¹	20.195	.515	+ .374:	+ .199:	+ .573:
.024162	31.205	.483	+1.560	+ .012	+1.572	.073562	.253	+ .519	+ .456:	+ .150:	
	32.214	.507	+1.628	+ .040	+1.668	31.184	.323	+ .244	+ .065	+ .309	
	33.215	.532	+1.635	+ .052	+1.687	32.178	.396	+ .474	+ .199	+ .673	
	34.197	.555	+1.637	+ .038	+1.675	4893.304	.548	+ .434	+ .132	+ .566	
	35.194	.579	+1.649	+ .037	+1.686	47.227	.572	+ .424	+ .109	+ .533	
	36.213	.604	+1.611	+ .004	+1.615						
	4866.271	.579	+1.666	+ .040	+1.706	AP Pup *	4847.256	.387	+1.408	+ .248	+1.656
	67.298	.604	+1.647	+ .012	+1.659	d ⁻¹	67.262	.322	+1.354	+ .211	+1.565
	69.340	.653	+1.595	- .097	+1.558	.196686	93.215	.427	+1.393	+ .255	
	4907.230	.568	+1.616	+ .022	+1.638	5188.430	.492	+1.380	+ .219	+1.599	
	08.216	.592	+1.621:	+ .019:	+1.640:	5223.323	.355	+1.381	+ .233	+1.614	
	13.216	.713	+1.616:	- .065:	+1.551:	5532.444	.154	+1.182	+ .094	+1.276	
						35.392	.734	+1.306	+ .149	+1.455	
ST Pup *	5532.394	.929	+ .288	+ .201	+ .489	5626.216	.598	+1.362	+ .184	+1.546	
d ⁻¹	35.316	.084	+ .112	+ .144	+ .256	29.224	.190	+1.192	+ .119	+1.311	
.052948	47.349	.721	+ .322	+ .248	+ .570	40.190	.346	+1.378	+ .199	+1.577	
	74.244	.145	+ .017	+ .142	+ .159						
	80.269	.464	+ .500	+ .389	+ .889	AT Pup	5535.422	.540	+1.128	+ .235	+1.363
	95.237	.257	+ .032	+ .205	+ .173	d ⁻¹	47.474	.349	+ .881	+ .081	+ .962
	5616.194	.366	+ .345:	+ .379:	+ .724:	.150041	73.401	.239	+ .914	+ .086	+1.000
	17.196	.419	+ .509:	+ .389:	+ .898:	74.316	.376	+ .882	+ .088	+ .970	
						80.324	.277	+ .898	+ .076	+ .974	
VW Pup *	4833.286	.905	- .417	+ .008	- .409	95.318	.527	+1.098	+ .224	+1.322	
d ⁻¹	85.227	.026	- .461:	+ .013:	- .448:	5608.295	.474	+ .990	+ .164	+1.154	
.233362	5223.270	.913	- .392	- .015	- .407	09.278	.622	+1.244	+ .290	+1.534	
	5555.402	.420	- .188	+ .105	- .083	12.236	.066	+1.007	+ .125	+1.132	
	67.320	.201	- .252	+ .050	- .202	16.231	.665	+1.212	+ .266	+1.478	
	73.346	.607	- .302	+ .034	- .268	22.234	.566	+1.210	+ .273	+1.483	
	74.292	.828	- .309	- .005	- .374	29.231	.615	+1.234	+ .292	+1.526	
	95.281	.726	- .364	+ .024	- .340	36.191	.660	+1.211	+ .267	+1.478	
	5609.242	.984	- .404	- .025	- .429	40.197	.261	+ .902	+ .075	+ .977	
	22.215	.011	- .391:	+ .006:	- .385:	41.192	.410	+ .928	+ .107	+1.035	
	24.193	.473	- .230	+ .076	- .154	44.206	.862	+1.096	+ .182	+1.273	
	27.205	.176	- .312	+ .030	- .282					+1.182	
VZ Pup *	4517.213	.008	+ .647	+ .191	+ .838	EK Pup *	4517.227	.174	- .002	+ .178	+ .176
d ⁻¹	19.232	.095	+ .616	+ .156	+ .772	d ⁻¹	33.190	.252	+ .011	+ .176	+ .187
.043170	20.183	.136	+ .532:	+1.106:	+ .638:	.380803	4812.389	.572	+ .026	+ .181	+ .207
	4865.274	.034	+ .648	+ .178	+ .826	35.257	.280	+ .052	+ .194	+ .246	
	86.210	.938	+ .228	- .032	- .196	69.269	.232	+ .040	+ .184	+ .224	
	5188.386	.983	+ .504	+ .109	+ .613	85.246	.316	+ .030:	+ .224:	+ .254:	
	5256.231	.911	+ .196	- .070	+ .126	95.226	.117	- .031	+ .151	+ .120	
						5223.291	.045	- .072	+ .139	+ .067	
WW Pup	4835.246	.475	+ .149	+ .215	+ .364	5547.462	.490	+ .060	+ .182	+ .242	
d ⁻¹	69.259	.641	+ .165	+ .195	+ .360	73.388	.363	+ .072	+ .203	+ .275	
.181268	85.237	.537	+ .191	+ .246	+ .437	5612.224	.152	- .015	+ .171	+ .156	
	5194.376	.574	+ .195	+ .225	+ .420						
	5547.450	.575	+ .186	+ .229	+ .415	S Sge	5302.541	.598	+2.151	+ .265	+2.416
	5555.411	.018	- .033	+ .087	+ .054	d ⁻¹	03.419	.703	+2.092	+ .217	+2.309
	67.338	.180	- .127	+ .045	- .082	.119301	28.412	.685	+2.113	+ .239	+2.352
	68.352	.364	- .120	+ .084	- .036	48.343	.063	+1.956	+ .115	+2.071	
	73.375	.275	- .160	+ .058	- .102	49.280	.174	+1.891	+ .094	+1.985	
	74.304	.443	+ .048	+ .167	+ .215	58.353	.257	+1.864	+ .085	+1.949	
	5624.203	.488	+ .186	+ .216	+ .402	63.313	.849	+2.127:	+ .223:	+2.350:	
	29.214	.396	- .060	+ .124	+ .064	64.319	.969	+2.000	+ .150	+2.150	
						5652.414	.339	+1.878	+ .100	+1.978	
WX Pup *	4513.205	.915	+ .575	+ .104	+ .679	54.422	.578	+2.150	+ .281	+2.431	
d ⁻¹	22.181	.919	+ .607	+ .110	+ .717	61.435	.415	+1.899	+ .144	+2.043	
.111875	23.184	.091	+ .702	+ .176	+ .878	69.468	.373	+1.868	+ .123	+1.991	
	33.202	.152	+ .708	+ .151	+ .859	78.440	.444	+1.950	+ .149	+1.099	
	4833.335	.953	+ .635:	+ .088:	+ .723:	87.442	.518	+2.046	+ .230	+2.276	
	5256.240	.042	+ .744:	+1.167:	+ .911:	88.321	.622	+2.197	+ .283	+2.480	
	5568.385	.844	+ .637	+ .133	+ .770						
	5632.196	.102	- .661?	- .053?	- .714?	U Sgr *	4585.408	.800	+1.607	+ .043	+1.650
						d ⁻¹	86.424	.951	+1.525	+ .003	+1.528
WY Pup *	4513.214	.528	- .092	+ .144	+ .052	.148253	87.404	.096	+1.461	- .029	+1.432
d ⁻¹	23.199	.430	- .148	+ .098	- .050	4901.680	.689	+1.608:	+ .086:	+1.694:	
.190447	29.203	.573	+ .013	+ .201	+ .214	06.648	.425	+1.661	+ .121	+1.782	
						07.474	.548	+1.695	+ .125	+1.820	
						14.455	.583	+1.680	+ .099	+1.779	
						47.439	.473	+1.729	+ .149	+1.878	
						53.492	.370	+1.580	+ .072	+1.652	

TABLE 6 (continued)

Name of Cepheid	J.D. hel. -2430000	phase	$\log I_Y$	$\Delta \log I$	$\log I_B$	Name of Cepheid	J.D. hel. -2430000	phase	$\log I_Y$	$\Delta \log I$	$\log I_B$
W Sgr *	d					BB Sgr *	d				
d ⁻¹	4564.547	.018	+2.501	+2.288	+2.789	d ⁻¹	4585.455	.895	+1.446	+0.092	+1.538
.131671	65.521	.147	+2.473	+2.248	+2.721	.150671	86.455	.046	+1.587	+0.179	+1.766
	67.535	.412	+2.356	+1.171	+2.527		87.442	.194	+1.555	+0.138	+1.693
	68.447	.532	+2.307	+1.154	+2.461		4925.546	.137	+1.574	+0.159	+1.733
	73.433	.188	+2.457	+2.338	+2.695		31.474	.030	+1.573	+0.163	+1.736
	75.475	.457	+2.335	+1.161	+2.496		5303.410	.070	+1.582	+0.160	+1.742
	77.464	.722	+2.219	+1.116	+2.335		49.320	.987	+1.533	+0.148	+1.681
	79.450	.981	+2.527	+1.290	+2.817		50.229	.124	+1.572:	+0.163:	+1.735:
	85.361	.759	+2.234	+1.122	+2.356		70.282	.146	+1.589	+0.154	+1.743
	86.389	.894	+2.372	+1.226	+2.598	V350 Sgr *	4585.432	.643	+1.412	+0.212	+1.624
	87.370	.024	+2.528	+1.315	+2.843	d ⁻¹	86.441	.838	+1.315	+0.140	+1.455
	4914.435	.089	+2.488			.194015	87.424	.029	+1.218	+0.090	+1.308
	21.497	.018	+2.532				4914.466	.480	+1.256	+0.139	+1.395
	29.458	.067	+2.517				25.535	.628	+1.406	+0.221	+1.627
	61.278	.256	+2.424				31.460	.777	+1.337	+0.156	+1.493
	89.238	.938	+2.420				88.344	.814	+1.315	+0.148	+1.463
X Sgr *	4564.469	.930	+2.523	+2.259	+2.782	V626 Sgr *	4562.535	.593	- .538	+0.191	- .347
d ⁻¹	86.364	.052	+2.465	+2.213	+2.678	d ⁻¹	64.562	.669	- .631	+0.138	- .493
.142608	87.352	.193	+2.400	+1.192	+2.592	.037390	73.444	.001	- .879	+0.276	- .603
	4885.531	.716	+2.501				74.438	.038	- .716	+0.285	- .431
	486.586	.866	+2.524				75.483	.077	- .598	+0.324	- .274
	4909.218	.502	+2.303				76.460	.114	- .488	+0.341	- .147
	5251.608	.921	+2.543	+1.251	+2.794		77.496	.153	- .431	+0.353	- .078
	85.421	.743	+2.546	+1.272	+2.818		4929.470	.313	- .518	+0.234	- .284
	5573.639	.846	+2.555	+1.264	+2.819		31.434	.386	- .485:	+0.209:	- .276
	5628.440	.661	+2.425	+1.225	+2.650		53.446	.209	- .402	+0.284	- .118
	43.353	.787	+2.561	+1.278	+2.839		79.371	.179	- .419	+0.332	- .087
	44.240	.914	+2.540	+1.244	+2.784		88.299	.512	- .522	+0.202	- .320
Y Sgr	4579.494	.214	+2.099	+1.229	+2.328		5611.539	.815	- .843	+0.137	- .706
d ⁻¹	85.398	.237	+2.075	+1.215	+2.290		23.476	.262	- .472	+0.259	- .213
.173210	86.415	.413	+1.989	+1.154	+2.143		24.517	.301	- .459	+0.241	- .218
	87.389	.582	+1.917	+1.112	+2.029		26.543	.376	- .474	+0.244	- .230
	4907.466	.022	+1.952				27.403	.409	- .522	+0.256	- .266
	14.444	.231	+2.054				28.510	.450	- .480	+0.210	- .270
	25.527	.151	+2.095				29.476	.486	- .530	+0.220	- .310
	47.431	.945	+1.884	+1.130	+2.014		30.465	.523	- .553	+0.227	- .326
	5358.245	.102	+2.105	+1.244	+2.349		31.368	.557	- .554	+0.196	- .358
	63.275	.973	+1.922:	+1.145:	+2.007:		34.456	.672	- .622	+0.146	- .476
	64.242	.140	+2.119	+1.251	+2.370		36.430	.746	- .740	+0.186	- .554
VY Sgr *	4567.557	.912	- .077	- .210	- .287		37.403	.782	- .717:	+0.162:	- .555:
d ⁻¹	68.455	.978	- .131	- .250	- .381		38.451	.822	- .757	+0.159	- .598
.073762	5623.510	.801	- .400	- .366	- .766		39.474	.860	- .804	+0.172	- .632
	24.559	.879	- .247:	- .297:	- .544:		40.524	.899	- .820	+0.192	- .628
	36.454	.756	- .406	- .350	- .756		41.452	.934	- .822	+0.217	- .605
	37.418	.827	- .382	- .326	- .708		42.518	.974	- .826:	+0.232:	- .594:
WZ Sgr *	4563.567	.856	+ .730?	- .134?	+ .596?		45.339	.341	- .505	+0.206	- .299
d ⁻¹	65.549	.947	+1.117	- .010	+1.107		60.555	.648	- .640:	+0.138:	- .502:
.045766	68.477	.081	+1.185:	+1.076:	+1.261:		72.419	.092	- .606	+0.273	- .333
	72.514	.266	+1.105	- .106	+ .999	V741 Sgr *	4572.529	.695	- .247	- .243	- .490
	73.488	.310	+1.087	- .133	+ .954	d ⁻¹	73.500	.760	- .248	- .251	- .499
	75.539	.404	+1.008	- .177	+ .831	.065980	4950.457	.631	- .159:	- .198:	- .357:
	79.480	.584	+ .890	- .215	+ .675		80.373	.605	- .219	- .215	- .434
	85.395	.855	+ .944	- .134	+ .810		5331.300	.759	- .225	- .252	- .477
	86.405	.901	+ .954	- .117	+ .837		43.254	.548	- .250	- .245	- .495
	4901.653	.329	+1.062:	- .122:	- .940:	RV Sco *	4564.437	.041	+1.417	+0.065	+1.482
	41.218	.140	+1.202	- .031	+1.171	d ⁻¹	79.342	.500	+1.462	+0.144	+1.606
	43.417	.240	+1.128	- .097	+1.031	.164980	80.383	.672	+1.566	+0.171	+1.737
	61.353	.061	+1.252	- .049	+1.301		4901.548	.657	+1.580	+0.184	+1.764
	5309.376	.989	+1.243	+0.047	+1.290		25.461	.603	+1.606	+0.205	+1.811
	10.366	.034	+1.252:	+1.061:	+1.313:		32.328	.735	+1.529	+0.143	+1.672
YZ Sgr	4585.445	.977	+1.379	+1.131	+1.510		5331.248	.549	+1.566	+0.189	+1.755
d ⁻¹	86.447	.082	+1.388	+1.137	+1.525		43.222	.525	+1.511	+0.157	+1.668
.104674	87.432	.185	+1.439	+1.155	+1.494	CQ Sco *	4565.483	.871	- .642	+0.137	- .505
	4914.474	.418	+1.316	+0.041	+1.357	d ⁻¹	67.522	.938	- .647	+0.130	- .517
	22.551	.263	+1.406	+1.118	+1.524	.032827	68.434	.968	- .636	+0.124	- .512
	31.467	.196	+1.449	+1.152	+1.601		70.439	.034	- .649	+0.112	- .537
	61.404	.330	+1.362	+0.094	+1.456		4961.283	.864	- .703:	+0.199:	- .504:
	80.398	.318	+1.364	+0.096	+1.460		5251.637	.395	- .978	- .079	- .1057
	88.353	.151	+1.416	+1.144	+1.560		81.454	.374	- .994	- .019	- .1013
	5331.432	.062	+1.391	+1.139	+1.530	KQ Sco *	4561.488	.995	+ .346	- .313	+ .033
	70.274	.128	+1.405	+1.133	+1.538	d ⁻¹	64.428	.098	+ .538	- .208	+ .330
AP Sgr *	4565.541	.671	+1.433	+1.131	+1.564	.034856	65.469	.134	+ .213?	+ .350?	+ .563?
d ⁻¹	73.481	.241	+1.617	+1.276	+1.893		67.480	.204	+ .465	- .267	+ .198
.197714	85.375	.593	+1.477	+1.152	+1.629		72.410	.376	+ .367	- .373	- .006
	86.397	.795	+1.401	+1.113	+1.514		87.296	.895	+ .192	- .397	- .205
	87.380	.989	+1.319	+0.092	+1.411		5251.585	.049	+ .465	- .230	+ .235
	4907.458	.273	+1.627	+1.275	+1.902		81.438	.090	+ .523	- .223	+ .300
	43.318	.363	+1.595	+1.250	+1.845		85.405	.228	+ .449	- .289	+ .160
	47.420	.174	+1.506	+1.218	+1.724		5308.372	.029	+ .409	- .262	+ .147
	53.484	.373	+1.590	+1.237	+1.827		09.284	.060	+ .486	- .232	+ .254
AY Sgr	4573.511	.162	+ .214	- .045	+ .169		10.262	.094	+ .516	- .216	+ .300
d ⁻¹	79.503	.074	+1.154	- .071	+ .083	V446 Sco *	4576.429	.905	-1.046:	+0.034:	-1.012:
.152216	4922.528	.288	+1.141	- .095	+ .046	d ⁻¹	78.438	.975	- .966:	+0.232:	- .734:
	29.486	.347	+1.106	- .122	- .016	.034941	79.435	.010	- .749	+0.191	- .558
	61.391	.203	+1.189	- .044	+ .145		4953.395	.077	- .843:	+0.193:	- .650:
	5302.401	.110	+1.212	- .045	+ .167		80.316	.017	- .731:	+0.199:	- .542:
	08.499	.038	+1.085	- .097	- .012						
	09.387	.174	+1.198	- .057	+ .141						

TABLE 6 (continued)

Name of Cepheid	J.D. hel. -2430000	phase	log I_Y	Δ log I	log I_B	Name of Cepheid	J.D. hel. -2430000	phase	log I_Y	Δ log I	log I_B
V470 Sco *	d 4563.517	.633	-.056	-.467	-.523	UZ Sct *	d 4567.573	.732	-.053	-.159	-.212
d ⁻¹	64.448	.691	-.070	-.463	-.533	d ⁻¹	68.522	.796	-.059	-.193	-.252
.061495	75.440	.367	-.059	-.397	-.456	.067811	79.520	.542	-.291	-.260	-.551
	76.403	.426	+.071	-.351	-.280		4950.477	.697	-.125	-.211	-.336
	77.462	.491	+.035	-.365	-.330		80.387	.725	-.073	-.172	-.245
	78.400	.549	+.005	-.396	-.391		5364.253	.755	-.050	-.182	-.232
	4950.345	.421	+.062	-.342	-.280		65.241	.822	-.063	-.215	-.278
	5308.386	.439	-.077	-.343	-.266		5612.482	.588	-.278	-.286	-.564
	72.246	.366	-.056	-.427	-.483		27.446	.603	-.271	-.273	-.544
							28.556	.678	-.202	-.236	-.438
V482 Sco *	4570.306	.396	+1.123:	+1.110:	+1.233:		29.500	.742	-.076	-.194	-.270
d ⁻¹	85.340	.709	+1.006	+0.044	+1.050		30.489	.809	-.062	-.204	-.266
.220858	86.333	.928	+.953	+0.040	+0.993		31.409	.871	-.123	-.244	-.367
	87.341	.151	+1.185	+1.174	+1.359	CK Sct *					
	4886.580	.240	+1.195	+1.176	+1.371	d ⁻¹	4574.493	.907	+.103	-.107	-.004
	4905.622	.446	+1.108	+1.107	+1.215	.134858	4989.307	.848	+.121	-.105	+.016
	31.365	.131	+1.157	+1.160	+1.317		5315.317	.813	+.106	-.116	-.010
	50.435	.343	+1.154	+1.138	+1.292		31.383	.980	+.095	-.137	-.042
							5623.554	.381	-.032	-.225	-.257
V500 Sco *	4562.477	.713	+.905	+.030	+.935		27.457	.908	+.099	-.118	-.019
d ⁻¹	63.527	.826	+.805	-.041	+.764		28.588	.060	+.071	-.163	-.092
.107335	64.476	.928	+.766	-.074	+.692		29.511	.185	+.029	-.174	-.145
	67.512	.254	+.628	-.109	+.519		30.499	.318	-.006	-.200	-.206
	70.423	.566	+.838	+.009	+.847		31.419	.442	-.072	-.214	-.286
	72.448	.784	+.821	-.026	+.795		36.466	.123	+.054	-.180	-.126
	4906.597	.650	+.876	+.030	+.906		39.496	.531	-.080	-.219	-.299
	07.418	.738	+.867	+.005	+.872		40.536	.671	-.014	-.162	-.176
	25.472	.676	+.901	+.030	+.931		41.474	.798	+.088	-.126	-.038
	43.305	.590	+.832	+.009	+.841	CM Sct *					
						d ⁻¹	4578.529	.894	-.046	-.008	-.054
V542 Sco *	4570.410	.887	-1.039	+.226	-.813	.255299	79.534	.150	-.155	-.086	-.241
d ⁻¹	72.433	.020	-.765	+.197	-.568		4950.495	.856	-.064	-.020	-.084
.065615	73.386	.083	-.820	+1.118	-.702		5315.383	.012	-.088	-.033	-.121
	4952.322	.947	-.839	+.258	-.581		31.420	.106	-.112	-.064	-.176
	53.324	.012	-.864:	+.241:	-.623:		43.283	.135	-.155	-.065	-.220
	5302.350	.914	-.899	+.250	-.649		868	.868	-.071	-.029	-.100
	03.367	.980	-.798	+.244	-.554		5612.509	.680	-.274:	-.106:	-.380:
							23.525	.680	-.074	-.024	-.098
							28.577	.970	-.190	-.078	-.268
							39.506	.760	-.101	-.035	-.136
							40.547	.026	-.101	-.035	-.136
V636 Sco *	4561.521	.146	+1.643	+.130	+1.773	CR Ser *	4565.530	.191	-.030	-.144	-.174
d ⁻¹	64.458	.578	+1.499	+.071	+1.570	.188629	75.498	.072	-.218	-.241	-.459
.147132	70.386	.774	+1.593	+1.144	+1.737		4925.490	.090	-.192	-.223	-.415
	85.330	.649	+1.507	+.081	+1.588		89.296	.126	-.135	-.203	-.338
	87.314	.941	+1.694	+1.193	+1.887		5302.383	.183	-.037	-.155	-.192
	4885.522	.817	+1.635	+1.163	+1.798		03.386	.372	+.024	-.141	-.117
	86.570	.971	+1.683	+1.179	+1.862		08.455	.329	+.040	-.107	-.067
	4901.666	.192	+1.595:	+1.135:	+1.730:		5625.534	.139	-.124	-.180	-.304
	06.543	.909	+1.699	+1.193	+1.892		26.421	.306	+.046	-.116	-.070
	07.407	.037	+1.659	+1.157	+1.816		31.396	.245	+.048	-.096	-.048
							41.463	.144	-.118	-.190:	-.308:
X Sct	4565.563	.540	+.451	+.099	+.550	ST Tau	4784.273	.921	+.893	+.103	+.996
d ⁻¹	73.521	.436	+.308	+.046	+.354	d ⁻¹	5164.314	.125	+.842	+.072	+.914
.238205	74.467	.661	+.377	+.077	+.454	.247879	87.257	.812	+.978	+.124	+1.102
	4905.646	.549	+.448	+.113	+.561		5548.261	.297	+.828	+.084	+.912
	22.541	.574	+.441	+.104	+.545		69.238	.497	+1.122	+.236	+1.358
	5308.512	.514	+.448	+.132	+.580		74.220	.732	+1.024	+.170	+1.194
	58.255	.393	+.163	-.025	+.138						
	63.284	.501	+.451:	+.110:	+.561:						
Y Sct *	4565.574	.482	+.517	-.125	+.392	SZ Tau *	5505.279	.190	+1.560	+.138	+1.698
d ⁻¹	73.532	.251	+.452	-.121	+.331	d ⁻¹	32.291	.768	+1.674	+.211	+1.885
.096698	74.479	.343	+.539	-.073	+.466	.317548	35.247	.707	+1.692	+.214	+1.906
	4905.660	.368	+.582	-.040	+.542		42.241	.928	+1.687:	+.193:	+1.880:
	06.617	.460	+.520	-.114	+.406		48.238	.832	+1.684	+.184	+1.868
	47.452	.409	+.567	-.071	+.496		74.208	.079	+1.624	+.174	+1.798
	88.313	.360	+.558	-.063	+.495						
Z Sct *	4570.504	.264	+.573	+.018	+.591	R TrA *	4562.344	.106	+1.570	+.200	+1.770
d ⁻¹	4906.628	.318	+.558	-.005	+.553	d ⁻¹	63.422	.424	+1.459	+.148	+1.607
.077511	31.449	.242	+.598	+.035	+.633	.295047	65.395	.006	+1.609	+.230	+1.839
	43.431	.170	+.574	+.053	+.627		77.341	.531	+1.499	+.184	+1.683
	5302.414	.995	+.370	-.079	+.291		79.291	.106	+1.589:	+.212:	+1.801:
	03.401	.072	+.495	-.056	+.349		85.284	.874	+1.687	+.264	+1.951
							86.294	.172	+1.551	+.179	+1.730
							87.283	.464	+1.488	+.161	+1.649
							88.320	.770	+1.695	+.289	+1.984
RU Sct *	5309.401	.516	+.322	-.275	+.047		4634.236	.317	+1.492	+.164	+1.656
d ⁻¹	10.379	.565	+.402	-.225	+.177		4907.374	.906	+1.679	+.264	+1.943
.050762	28.346	.477	+.319	-.288	+.031		20.444	.762	+1.608	+.290	+1.988
	31.395	.632	+.717	-.066	+.651		61.244	.800	+1.668	+.276	+1.944
	3626.432	.609	+.607	-.109	+.498		88.281	.777	+1.686	+.294	+1.980
	27.465	.661	+.711	-.079	+.632		5188.610	.884	+1.673	+.273	+1.946
	28.567	.717	+.650	-.116	+.534		5282.378	.550	+1.491	+.179	+1.670
	29.519	.766	+.612	-.137	+.475		86.345	.720	+1.669	+.267	+1.936
	30.507	.816	+.594	-.179	+.415		96.431	.696	+1.640	+.263	+1.903
SS Sct *	4585.419	.022	+1.052	+.161	+1.213	S TrA *	4562.431	.512	+1.807	+.291	+2.098
d ⁻¹	86.432	.298	+.942	+.089	+1.031	d ⁻¹	63.451	.673	+1.807	+.252	+2.039
.272390	87.415	.566	+.882	+.071	+.953	.158142	64.390	.822	+1.723	+.197	+1.920
	4988.336	.773	+.933	+.135	+1.068		65.415	.984	+1.654	+.166	+1.820
	89.332	.044	+1.037	+1.148	+1.185		67.397	.297	+1.535	+.127	+1.662
	5315.420	.867	+1.063	+1.166	+1.229		68.326	.444	+1.714	+.226	+1.940
	5624.585	.081	+1.020	+1.143	+1.163		69.416	.617	+1.812	+.288	+2.100
	27.470	.867	+1.050	+.168	+1.218		72.356	.082	+1.608	+.134	+1.742
	31.450	.951	+1.057	+.163	+1.220						

TABLE 6 (continued)

Name of Cepheid	J.D. hel. -2430000	phase	log I_Y	Δ log I	log I_B	Name of Cepheid	J.D. hel. -2430000	phase	log I_Y	Δ log I	log I_B
XX Vel *	d 4532.357	.911	+ .154	+ .109	+ .263	CX Vel *	d 4521.206	.810	- .187	- .040	- .227
d ⁻¹	33.326	.050	+ .084	+ .061	+ .145	d ⁻¹	33.272	.739	- .275	- .068	- .343
.143173	73.275	.770	- .136	- .041	- .177	.159871	34.221	.890	- .163	- .032	- .195
	4839.279	.854	+ .046	+ .062	+ .108		35.236	.053	- .241	- .091	- .332
	95.378	.886	+ .111	+ .093	+ .204		4885.293	.017	- .223	- .081	- .304
	4917.306	.025	+ .094	+ .084	+ .178		90.307	.818	- .162:	- .042:	- .204:
	24.299	.027	+ .114	+ .075	+ .189		4921.216	.760	- .264:	- .098:	- .362:
							22.208	.918	- .158:	- .077:	- .235:
AE Vel *	4522.242	.937	+ .203	+ .021	+ .224	DD Vel	4532.281	.488	- .708	- .131	- .839
d ⁻¹	29.304	.927	+ .182	+ .009	+ .191	d ⁻¹	33.290	.564	- .664	- .172	- .836
.140182	31.316	.209	+ .250	- .009	+ .241	.075787	34.281	.640	- .609	- .074	- .683
	73.215	.082	+ .309:	+ .066:	+ .375:		35.257	.714	- .602	- .129	- .731
	4865.381	.039	+ .306	+ .070	+ .376		4890.331	.624	- .655:	- .068:	- .723:
	86.308	.972	+ .266	+ .050	+ .316		93.251	.845	- .659:	- .209:	- .868:
	95.319	.236	+ .189	- .005	+ .184		4918.251	.739	- .629:	- .167:	- .796:
	4922.270	.014	+ .305	+ .059	+ .364		20.237	.890	- .662:	- .183:	- .845:
							29.196	.569	- .691:	- .130:	- .821:
AH Vel	4519.277	.103	+ 2.018	+ .317	+ 2.335	DP Vel *	4510.295	.389	- .402	+ .002	- .400
d ⁻¹	23.258	.045	+ 1.991	+ .307	+ 2.298	d ⁻¹	31.297	.219	- .582	- .168	- .750
.236565	32.209	.162	+ 2.046	+ .327	+ 2.373	.182336	32.309	.403	- .337	- .044	- .381
	36.208	.108	+ 1.991	+ .317	+ 2.308		44.249	.580	- .393	- .046	- .429
	45.203	.236	+ 2.038	+ .320	+ 2.358		4895.281	.586	- .391	- .041	- .432
	4833.330	.397	+ 1.985	+ .284	+ 2.269		4921.257	.322	- .496:	- .028:	- .524:
	34.285	.623	+ 1.910	+ .261	+ 2.171		22.241	.502	- .382:	+ .004:	- .378:
	35.394	.885	+ 1.953	+ .260	+ 2.213		29.213	.773	- .522:	- .135:	- .657:
	47.244	.688	+ 1.923	+ .245	+ 2.168		5223.356	.406	- .360	- .012	- .372
	65.326	.966	+ 1.941	+ .271	+ 2.212		51.293	.500	- .335	- .015	- .350
	66.259	.187	+ 2.052	+ .328	+ 2.380	DR Vel *	4536.280	.026	+ .433	- .124	+ .309
	67.291	.431	+ 1.985	+ .283	+ 2.268	d ⁻¹	61.203	.252	+ .546:	- .074:	+ .472:
	69.295	.905	+ 1.922	+ .265	+ 2.187	.089286	4865.366	.409	+ .501	- .150	+ .351
	85.270	.684	+ 1.900	+ .246	+ 2.146		86.296	.278	+ .566	- .069	+ .497
	93.238	.569	+ 1.934	+ .262	+ 2.196		95.292	.081	+ .440	- .121	+ .319
	95.232	.041	+ 1.979	+ .285	+ 2.264		4917.248	.041	+ .445:	- .121:	+ .324:
	4908.208	.110	+ 1.994	+ .312	+ 2.306		29.225	.111	+ .454:	- .111:	+ .343:
	13.208	.293	+ 2.053:	+ .297:	+ 2.350:		30.195	.197	+ .570:	- .057:	+ .513:
	18.218	.478	+ 1.906:	+ .260:	+ 2.166:		5223.376	.374	+ .529	- .129	+ .400
AM Vel *	4533.236	.562	- 1.153	- .070	- 1.223		24.377	.464	+ .471	- .168	+ .303
d ⁻¹	34.209	.692	- .950:	- .045:	- 1.079:		56.295	.314	+ .567	- .090	+ .477
.132921	35.205	.824	- .911	+ .141	- .770		85.216	.896	+ .342	- .190	+ .152
	4834.315	.532	- 1.120:	+ .041:	- 1.079:		86.220	.985	+ .473	- .157	+ .256
	65.339	.706	- .949	+ .116	- .833	EX Vel *	4510.281	.788	- .235	- .088	- .323
	5535.434	.775	- .913	- .732	- .833	d ⁻¹	36.247	.750	- .277	- .081	- .358
	73.429	.826	- .910	- .130	- .780	.075558	65.233	.940	- .359	- .117	- .476
	5609.318	.596	- 1.180	- .084	- 1.264		73.201	.542	- .550:	- .137:	- .687:
							4893.273	.726	- .317	- .107	- .424
AP Vel *	4522.209	.180	+ .459	+ .190	+ .649		95.260	.876	- .240	- .125	- .365
d ⁻¹	31.225	.063	+ .350	+ .140	+ .490		4920.251	.764	- .215:	- .104:	- .319:
.319795	35.221	.341	+ .389	+ .146	+ .535		21.238	.839	- .239:	- .102:	- .361:
	4869.357	.196	+ .383	+ .151	+ .534		22.226	.914	- .261:	- .185:	- .446:
	85.280	.288	+ .398	+ .161	+ .559		5224.362	.742	- .287	- .097	- .384
	4919.255	.153	+ .277:	+ .076:	+ .353:		85.203	.339	- .546	- .238	- .784
	5194.435	.154	+ .227	+ .079	+ .306	EZ Vel *	4531.279	.208	- .561	- .136	- .697
	5223.339	.398	+ .264	+ .095	+ .359	d ⁻¹	32.292	.237	- .500	- .110	- .610
	56.282	.933	+ .092	- .005	+ .087	.028956	33.309	.266	- .493	- .122	- .615
AX Vel *	4519.268	.259	+ .921	+ .208	+ 1.129		34.289	.295	- .518	- .103	- .621
d ⁻¹	22.197	.388	+ .891	+ .229	+ 1.120		35.270	.323	- .523	- .157	- .680
.385518	29.229	.099	+ .911	+ .199	+ 1.110	FG Vel *	4517.277	.006	- .379	- .095	- .474
	4833.323	.333	+ .901	+ .185	+ 1.086	d ⁻¹	29.294	.868	- .384	- .074	- .458
	34.276	.701	+ .976	+ .247	+ 1.223	.154962	31.305	.180	- .416	- .167	- .583
	35.384	.128	+ .969	+ .221	+ 1.190		32.319	.337	- .488	- .203	- .691
	39.238	.613	+ 1.077	+ .290	+ 1.367		4895.308	.587	- .562	- .240	- .802
	47.237	.697	+ 1.059	+ .270	+ 1.329		4922.256	.763	- .530:	- .113:	- .643:
	61.322	.127	+ .938:	+ .205:	+ 1.143:		24.237	.070	- .446:	- .067:	- .513:
	67.284	.426	+ .897	+ .193	+ 1.093		29.235	.844	- .397:	- .125:	- .522:
	69.291	.199	+ .922	+ .196	+ 1.118		5253.244	.053	- .382	- .120	- .502
	85.263	.357	+ .856	+ .182	+ 1.038		5303.206	.795	- .466:	- .137:	- .603:
	89.270	.902	+ .930	+ .234	+ 1.164		10.194	.878	- .385:	- .086:	- .471:
	4907.224	.823	+ .933	+ .215	+ 1.148	W Vir *	5188.597	.352	+ .161	+ .285	+ .446
	14.226	.523	+ .940:	+ .218:	+ 1.158:	d ⁻¹	5308.331	.283	+ .016	+ .197	+ .213
	17.204	.671	+ 1.010:	+ .269:	+ 1.279:	.057887	09.261	.337	+ .069	+ .221	+ .290
	5194.424	.544	+ .949	+ .229	+ 1.178		5555.582	.596	+ .380	+ .246	+ .626
	5256.260	.383	+ .875	+ .190	+ 1.065		67.532	.288	+ .078	+ .239	+ .317
BG Vel *	4510.260	.435	+ 1.092?	+ .068?	+ 1.160?		5608.420	.655	+ .582?	+ .062?	+ .644?
d ⁻¹	17.266	.447	+ 1.286	+ .078	+ 1.364		09.435	.713	+ .404	+ .211	+ .615
.144434	29.275	.181	+ 1.116	- .010	+ 1.106		11.488	.832	+ .325	+ .168	+ .493
	30.266	.324	+ 1.225	+ .052	+ 1.277		12.350	.882	+ .287	+ .146	+ .433
	32.260	.612	+ 1.259	+ .038	+ 1.297		21.406	.406	+ .262	+ .284	+ .546
	4833.382	.105	+ 1.115	- .044	+ 1.071		22.333	.460	+ .424	+ .325	+ .749
	34.362	.246	+ 1.156:	+ .026:	+ 1.182:		23.358	.519	+ .638?	- .124?	+ .514?
	39.252	.953	+ 1.162	- .025	+ 1.137		24.262	.572	+ .419	+ .277	+ .696
	47.269	.110	+ 1.093	- .043	+ 1.050		26.318	.691	+ .420	+ .242	+ .662
	65.356	.723	+ 1.207	+ .011	+ 1.218		27.262	.745	+ .420	+ .231	+ .651
	67.344	.010	+ 1.126	- .034	+ 1.092		28.333	.807	+ .393	+ .219	+ .612
	69.378	.304	+ 1.208	+ .031	+ 1.239						
	85.302	.604	+ 1.238	+ .041	+ 1.279						
	90.317	.328	+ 1.226	+ .039	+ 1.265						
	95.252	.041	+ 1.114	- .038	+ 1.076						
	4901.306	.915	+ 1.156	- .026	+ 1.130						
	06.307	.638	+ 1.237	+ .022	+ 1.259						
	18.241	.361	+ 1.242:	+ .049:	+ 1.291:						
	19.265	.509	+ 1.281	+ .048	+ 1.329						
	21.227	.793	+ 1.187:	- .009:	+ 1.178:						

TABLE 6 (continued)

Name of Cepheid	J.D. hel. -2430000	phase	log I_Y	$\Delta \log I$	log I_B	Name of Cepheid	J.D. hel. -2430000	phase	log I_Y	$\Delta \log I$	log I_B
	d						d				
	5629.298	.863	+ .338	+ .198	+ .536	U Vul *	5302.515	.589	+ 1.534	+ .033	+ 1.567
	30.335	.923	+ .268	+ .169	+ .437		43.337	.697	+ 1.488	+ .034	+ 1.522
	31.280	.978	+ .192	+ .138	+ .330	d ⁻¹	5647.442	.755	+ 1.494	.000	+ 1.494
	32.302	.037	+ .160:	+ .018:	+ .178	.125146	52.396	.375	+ 1.307	-.087	+ 1.220
	34.218	.148	+ .029	+ .165	+ .194		54.429	.629	+ 1.562	+ .047	+ 1.609
	37.284	.325	+ .157	+ .283	+ .440		55.509	.764	+ 1.526	.000	+ 1.526
	41.249	.555	+ .392	+ .290	+ .682		61.428	.505	+ 1.420	-.013	+ 1.407
	52.251	.192	-.044	+ .143	+ .099		68.480	.388	+ 1.308	-.074	+ 1.234
	67.199	.057	+ .037	+ .111	+ .148		69.462	.510	+ 1.432	-.004	+ 1.428

RE MARKS

- T Ant Elements of max.: 2435619.31 + 5.8993 *E*. The counting of periods between HOFFMEISTER's epoch (*K.V.B.B.* Nr 27, 15) and the new epoch is slightly uncertain.
- FF Aql Elements of max.: 2435625.60 + 4.47093 *E*. The counting of periods between SELIVANOV's epoch (*Variable Stars* 5, 21) and the new epoch is uncertain.
- V 493 Aql This variable was discovered by OOSTERHOFF and published in *B.A.N.* 9, 385, star 16, 1943. No period could be derived from the few observations at that time, although it seemed rather certain that the decimal fraction of the reciprocal period was .33 and that the variable was an RR Lyrae-type star or a Cepheid. For a period of nearly three months in 1956 the star was observed at least once every clear night. These observations prove that the star is a Cepheid and that its period is very close to three days. A first trial yielded the reciprocal period d⁻¹.33394. The observations are clustered in three narrow groups in the light-curve: one group shortly after maximum, the second on the descending branch and the third at the bottom of the ascending branch. The provisional period was improved with the aid of the observations in the last group. The best elements for maximum brightness are now: 2435626.18 + 2.98553 *E*. The epoch of maximum is uncertain as no observations were made near maximum.
- V 600 Aql The elements of maximum, derived from KUROCHKIN's epoch (*Variable Stars* 6, 307) and the new epoch are: 2435665.44 + 7.24154 *E*. The counting of the number of periods elapsed between the two epochs is uncertain.
- RY CMa Combining the epoch given by SOLOVYEV (*General Catalogue of Variable Stars*, 1948) with the new epoch we derived the following elements of max.: 2435612.17 + 4.67825 *E*.
- RZ CMa Improved elements of max.: 2435547.30 + 4.25498 *E*.
- TV CMa Elements of max.: 2435567.16 + 4.6708 *E*. The number of periods elapsed between FLORYA's epoch (*Gen. Cat. Var. Stars*) and the new epoch could not be determined.
- TW CMa Elements of max.: 2435547.00 + 6.99485 *E*.
- TW Cap Cepheid of population II. Elements of max.: 2435664.8 + 28.5578 *E*.
- U Car Elements of max.: 2434528.2 + 38.7560 *E*. The epoch given by GAPOSCHKIN (*H.A.* 115, No. 5, 1946) does not fit these elements, but the still older observations by ROBERTS and by HERTZSPRUNG are in full agreement.
- V Car Improved elements of max.: 2435612.16 + 6.69638 *E*.
- Y Car The observations show a large dispersion and the light-curve is probably variable. Improved elements of max.: 2434847.28 + 3.639760 *E*.
- UW Car Elements of max.: 2434886.33 + 5.345773 *E*.
- UX Car Elements of max.: 2434531.22 + 3.682246 *E*.
- UY Car Elements of max.: 2434907.28 + 5.543726 *E*.
- UZ Car Elements of max.: 2434936.24 + 5.20466 *E*.
- VY Car According to GAPOSCHKIN (*H.A.* 115, No. 5) the period is variable and has steadily shortened. If we combine GAPOSCHKIN's epoch with those from SOHON (*B.A.N.* 3, 204), from the *General Catalogue of Variable Stars* and from the present observations, we obtain the following solution:
- | max. | <i>E</i> | <i>O-C</i> |
|------------|----------|------------|
| d | | d |
| 2410009.50 | 0 | -.08 |
| 2423937.66 | 734 | + .58 |
| 2429508.48 | 1028 | -.88 |
| 2434907.99 | 1313 | + .35 |
- and the elements:
max. = 2410009.58 + 18.990 *E* - .000021 *E*²
± 4 ± 3 (m.e.)
- This ephemeris is in good accord with the Harvard observations. The best linear elements for the present time are: max. = 2434907.99 + 18.9349 *E*.
- WW Car Elements of max.: 2434925.15 + 4.67681 *E*.
- WZ Car The period seems to be increasing. The best representation of all observations is given by the following elements of maximum:
2434914.86 + 23.0075 *E* + .000025 *E*².
- XX Car According to GAPOSCHKIN the period is variable. The best elements of maximum are at present:
2434917.03 + 15.71624 *E* - .0000034 *E*².
- XY Car ROBINSON's epoch (*H.A.* 90, 47, 1933) combined with the present observations yields the elements of maximum: 2434834.49 + 12.43483 *E*. However the epoch of maximum 2423074.034 given by GAPOSCHKIN (*H.A.* 115, No. 5) does not fit these elements.
- YZ Car According to Mrs PAYNE GAPOSCHKIN (*H.A.* 115, No. 6) the period is variable. Combination of the present observations with the old epochs from Miss LEAVITT (*H.C.* No. 170, 1912) and from SOHON (*B.A.N.* 3, 204, 1926) yields the following elements of maximum:
2434907.04 + 18.1631 *E* + .0000022 *E*².
- AQ Car Elements of maximum: 2435309.17 + 9.76896 *E*.
- CC Car Elements of maximum: 2435253.18 + 4.75965 *E*.

- CN Car Elements of maximum: $2434510.24 + 4.93261 E$.
- CY Car The epoch given in the *Gen. Cat. Var. Stars* corresponds with a point on the ascending branch and not with maximum. Elements of max.: $2435568.49 + 4.26593 E$.
- DY Car Elements of max.: $2435224.36 + 4.67473 E$.
- ER Car Elements of max.: $2435623.31 + 7.7187 E$.
- EY Car Dispersion of the observations is larger than normal. The light-curve may be variable. Elements of max.: $2435567.52 + 2.87601 E$.
- FN Car Elements of max.: $2434546.20 + 4.58569 E$.
- GH Car Elements of max.: $2435567.82 + 5.72557 E$.
- GI Car Elements of max.: $2434521.40 + 4.43061 E$.
- GX Car Elements of max.: $2434523.02 + 7.19646 E$.
- GZ Car Elements of max.: $2434924.27 + 4.15885 E$. The observations show a considerable dispersion. The light-curve is probably variable.
- HK Car Elements of max.: $2434535.35 + 6.69574 E$.
- IT Car Elements of max.: $2435567.45 + 7.5356 E$. The number of periods elapsed between HERTZSPRUNG's epoch 2424214.92 (*B.A.N.* 9, 63, star *w*) and the present epoch may be 1506 or 1507. It remains uncertain which of the two solutions is the correct one.
- I Car Elements of max.: $2435619.7 + 35.5412 E$.
- V Cen Elements of max.: $2434869.61 + 5.49397 E$.
- TX Cen Elements of max.: $2434570.31 + 17.0936 E$.
- UZ Cen The observations show an abnormal dispersion. The light-curve is probably variable. Elements of max.: $2435574.54 + 3.334369 E$.
- VW Cen Elements of max.: $2434867.11 + 15.03618 E$.
- XX Cen Elements of max.: $2435349.23 + 10.9558 E$.
- AY Cen Elements of max.: $2434545.96 + 5.30975 E$.
- AZ Cen Elements of max.: $2435223.36 + 3.21266 E$. The counting of periods between this new epoch and the old ones published by HERTZSPRUNG (*B.A.N.* 3, 111, star *u*) and DE JAGER (*B.A.N.* 10, 248) remains uncertain.
- IU Cen The phase-shift between light-curve and colour curve indicates that this Cepheid probably belongs to population II. Elements of max.: $2434572.29 + 3.31926 E$.
- KK Cen Elements of max.: $2434889.98 + 12.1803 E$.
- KN Cen Elements of max.: $2435247.63 + 34.019 E$.
- MY Cen Elements of max.: $2434869.40 + 3.71861 E$.
- OO Cen Elements of max.: $2435611.13 + 12.8805 E$.
- V 339 Cen Elements of max.: $2434890.45 + 9.4672 E$.
- V 378 Cen Elements of max.: $2434936.27 + 6.45930 E$.
- V 381 Cen Elements of max.: $2434932.29 + 5.07878 E$.
- V 419 Cen Elements of max.: $2434906.43 + 5.5119 E$. The counting of periods between O'CONNELL's epoch (*A.N.* 264, 141, 1937) and the new epoch is very uncertain.
- V 420 Cen This is a Cepheid of population II. The observations by MERGENTALER (*Lwow Contr.* No. 10, 14, 1939) and the present observations cannot be represented by a linear ephemeris. A satisfactory ephemeris seems to be:

$$\text{max.} = 2425350.67 + 24.7678 E - .000090 E^2.$$

$$\pm 54 \pm 14 \text{ (m.e.)}$$
- V 496 Cen Elements of max.: $2434517.60 + 4.42413 E$.
- AL CrA Cepheid of population II.
- KQ CrA Cepheid of population II. Elements of max.: $2435650.1 + 30.864 E$. The counting of periods between this epoch and Miss SWOPE's epoch (*H.A.* 109, No. 10, 1943) is somewhat uncertain.
- V 347 CrA This Cepheid probably belongs to population II. Elements of max.: $2435329.1 + 15.3489 E$.
- R Cru Elements of max.: $2434922.31 + 5.82575 E$.
- T Cru Elements of max.: $2434534.47 + 6.73322 E$.
- X Cru Elements of max.: $2435188.29 + 6.21997 E$.
- SU Cru Elements of max.: $2434934.12 + 12.8476 E$. The range of the colour curve is larger than the range of the light-curve in yellow light.
- TY Cru Elements of max.: $2434916.28 + 4.98851 E$.
- VW Cru Elements of max.: $2434902.45 + 5.26485 E$.
- VX Cru Elements of max.: $2434530.31 + 12.2126 E$.
- AD Cru Elements of max.: $2434931.01 + 6.39844 E$.
- AG Cru Elements of max.: $2434847.37 + 3.83733 E$.
- TX Del Elements of max.: $2435683.44 + 6.16654 E$. This Cepheid probably belongs to population II.
- β Dor Elements of max.: $2435580.7 + 9.842603 E$. The epoch of maximum is not very well determined.
- AP Her Elements of max.: $2435637.68 + 10.4088 E$. The star may belong to population II.
- BB Her Elements of max.: $2435636.81 + 7.50774 E$.
- RX Lib Elements of max.: $2435628.0 + 24.9459 E$. The star belongs to population II.
- SV Mon Elements of max.: $2435568.7 + 15.2318 E$.
- TX Mon Elements of max.: $2435595.42 + 8.7001 E$. The present light-curve shows two maxima of which the second in phase is slightly brighter than the first. The epoch given above corresponds with this highest maximum. The epochs given by DUBYAGO (*A.N.* 239, 15, 1930), OOSTERHOFF (*H.B.* No. 900) and VAN BUEREN (*Leiden Ann.* 20, stuk 5) probably correspond with another phase and therefore the period derived by KUKARKIN and PARENAGO (*Gen. Cat. Var. Stars*) has been retained here.
- R Mus Elements of max.: $2434847.38 + 7.50990 E$.
- S Mus The light-curve shows two equally high maxima, about P_{15} apart. The elements for the first maximum are: $2434580.62 + 9.65869 E$.
- RT Mus Elements of max.: $2434905.30 + 3.08608 E$.
- UU Mus Elements of max.: $2434835.12 + 11.63596 E$.
- S Nor Elements of max.: $2434586.39 + 9.75418 E$.
- U Nor Elements of max.: $2434572.38 + 12.64133 E$.
- SY Nor Elements of max.: $2434920.46 + 12.6449 E$.
- TW Nor The period is probably slightly variable. Elements of max.: $2425441.58 + 10.7837 E + .0000028 E^2.$

$$\pm 9 \pm 10 \text{ (m.e.)}$$
- UX Nor Elements of max.: $2434920.38 + 2.38577 E$. The range in blue light is large for a Cepheid of so short a period, namely about $1^m.6$. The variable probably belongs to population II. It also is remarkably blue.
- GU Nor Elements of max.: $2434920.47 + 3.45281 E$.
- Y Oph Elements of max.: $2434921.5 + 17.11946 E$.
- BF Oph Elements of max.: $2434941.08 + 4.06782 E$.
- RS Ori Elements of max.: $2435579.45 + 7.56704 E$.
- × Pav The period is strongly variable (see: PARENAGO, *Variable Stars* 6, 57, 1946). The best elements of maximum for the years 1955 and 1956 are:
 $2435636.17 + 9.0636 E$.
- X Pup Elements of max.: $2435188.76 + 25.9583 E$.
- RS Pup Elements of max.: $2434533.4 + 41.3876 E$.
- ST Pup Belongs probably to population II, as the colour curve is shifted relative to the light-curve. Elements of max.: $2435617.45 + 18.8864 E$.
- VW Pup Elements of max.: $2435554.86 + 4.28519 E$.
- VZ Pup Elements of max.: $2434864.90 + 23.1640 E$.
- WX Pup Elements of max.: $2435256.71 + 8.9385 E$.
- WY Pup Elements of max.: $2434834.39 + 5.25080 E$.

TABLE 7 (continued)

Name of Cepheid	J.D. hel. -2430000	phase	$\log I_Y$	$\Delta \log I$	$\log I_B$	Name of Cepheid	J.D. hel. -2430000	phase	$\log I_Y$	$\Delta \log I$	$\log I_B$
	d						d				
IO Car	4513.355	.718	-.205	-.053	-.258		5681.422	.431	+.475	+.131	+.606
d ⁻¹	29.393	.897	-.226	-.046	-.272		82.457	.863	+.630	+.216	+.846
.073497	30.392	.970	-.198	+.009	-.189		83.452	.278	+.544	+.125	+.669
	72.247	.046	-.150	-.048	-.198		86.451	.529	+.492	+.140	+.632
BB Cen	4513.403	.095	+.234	+.121	+.355		87.477	.957	+.613	+.181	+.794
d ⁻¹	17.436	.104	+.253	+.135	+.388		88.382	.334	+.504	+.128	+.632
.250165	21.363	.087	+.231	+.129	+.360		89.372	.747	+.616	+.224	+.840
	30.420	.353	+.302	+.142	+.444	BN Pup	4835.373	.620	-.321:	+.494:	+.173:
	4885.436	.165	+.267	+.137	+.404	d ⁻¹	86.230	.340	-.365	+.506	+.141
IZ Cen	4567.283	.063	-.775:	-.195:	-.970:	.073132	4914.213	.386	-.368:	+.514:	+.146:
d ⁻¹	68.266	.230	-.808:	-.221:	-.1029:	CO Pup	4510.232	.610	-.151	+.157	+.006
.169699						d ⁻¹	13.235	.797	+.025	+.209	+.234
LV Cen	4568.250	.269	-.678	-.163	-.841	.062438	30.248	.860	+.061	+.151	+.212
d ⁻¹						d ⁻¹	44.201	.731	+.013	+.215	+.228
.201011						d ⁻¹	4833.344	.784	+.069	+.187	+.256
BE CrA	4574.532	.056	-1.077	+.420	-.657	d ⁻¹	34.295	.844	+.021:	+.207:	+.228:
d ⁻¹						d ⁻¹	35.417	.914	+.078	+.128	+.206
.299715						d ⁻¹	55.444	.871	+.027	+.201	+.228
EZ Cyg	4989.382	.904	-.029:	-.026:	-.055:	d ⁻¹	55.444	.871	+.071	+.089	+.160
d ⁻¹						d ⁻¹	68.398	.680	+.056	+.194	+.250
.085763						d ⁻¹	73.414	.993	-.046	+.039	-.007
GH Gyg	5363.323	.033	+.420:	+.054:	+.474:	d ⁻¹	74.325	.950	-.110	+.004	-.106
d ⁻¹	64.329	.162	+.389	+.027	+.416	d ⁻¹	80.349	.426	-.208	+.138	-.070
.127912						V383 Sgr	4572.544	.965	-.659	+.264	-.395
QT CrA	4567.542	.711	-.650	+.046	-.604	d ⁻¹	73.546	.026	-.613	+.232	-.381
d ⁻¹	72.467	.773	-.646	+.040	-.606	.060790	74.512	.085	-.637	+.244	-.393
.012635	77.508	.837	-.639	+.030	-.609	d ⁻¹	75.552	.148	-.656	+.206	-.450
	4919.610	.159	-.680	+.019:	-.661:	V532 Sgr	4578.468	.939	-1.034	+.029	-1.005
	52.403	.574	-.669	+.071	-.598	d ⁻¹	4980.336	.695	-.897:	-.095:	-.992:
	79.383	.915	-.639:	+.045:	-.594:	.029254	5302.367	.115	-.865	+.021	-.844
	89.258	.039	-.683:	+.042:	-.641:	d ⁻¹	5331.268	.961	-1.002:	-.022:	-1.024:
	5328.276	.323	-.644	+.067	-.577	V738 Sgr	4574.450	.427	-.430	-.083	-.513
	31.285	.361	-.639	+.065	-.574	d ⁻¹	75.513	.452	-.473	-.079	-.552
EK Del	5343.372	.718	-.513	+.407	-.106	.023047	77.519	.498	-.484:	-.102:	-.586:
d ⁻¹						d ⁻¹	78.499	.521	-.494	-.089	-.583
.488590						d ⁻¹	4953.461	.162	-.440	-.110	-.550
DX Gem	4812.293	.597	-.099	+.062	-.037	d ⁻¹	61.336	.344	-.609:	-.162:	-.771:
d ⁻¹	5555.309	.538	-.056	+.070	+.014	d ⁻¹	5308.469	.344	-.494	-.117	-.611
.318891	67.279	.355	-.002:	+.105:	+.103:	d ⁻¹	10.336	.387	-.518	-.160	-.678
	68.279	.674	-.110	+.090	-.020	V1077 Sgr	4568.555	.207	-.759	+.322	-.437
AL Lyr	5343.297	.546	-.446:	+.052:	-.394:	d ⁻¹					
d ⁻¹						.074467					
.077021						V507 Sco	4568.413	.191	-.999	+.150	-.849
CN Lyr	5310.393	.326	-.317:	+.305:	-.012:	d ⁻¹	69.475	.281	-.995	+.203	-.792
d ⁻¹	15.365	.455	-.225	+.348	+.123	.084754	70.382	.358	-.923	+.099	-.824
.428090	65.253	.811	-.314	+.296	-.018	V549 Sco	4578.418	.642	-1.274	+.258	-1.016
RV Mon	4574.328	.548	-.645	-.187	-.832	d ⁻¹	5308.399	.749	-1.227	+.197	-1.030
d ⁻¹	76.348	.611	-.659	-.203	-.862	.060423	09.323	.805	-1.150	+.165	-.985
.030944	77.369	.642	-.637	-.235	-.872	d ⁻¹	10.274	.863	-1.125	+.102	-1.023
	78.331	.672	-.618:	-.244:	-.862:	TY Sct	4568.536	.329	-.378	+.230	-.148
	4867.560	.622	-.707:	-.204:	-.911:	d ⁻¹	70.490	.506	-.372	+.220	-.152
	4930.420	.567	-.638	-.149	-.787	.090473	4988.324	.309	-.410:	+.244:	-.166:
	5251.528	.503	-.575	-.729	-.736	d ⁻¹	89.321	.399	-.394:	+.244:	-.150:
	81.421	.428	-.608	-.128	-.736	d ⁻¹	5331.408	.348	-.376	+.230	-.146
TZ Mon	4811.335	.712	-1.105:	+.336:	-.769:	d ⁻¹	43.270	.422	-.388	+.233	-.155
d ⁻¹	12.337	.846	-1.204:	+.409:	-.795:	CO Vel	4532.247	.052	-.870	-.159	-1.029
.134622						d ⁻¹	46.203	.316	-.642	-.140	-.782
BV Mon	4812.321	.487	-.244	+.050	-.194	.233891	4812.408	.579	-.779	-.333	-1.112
d ⁻¹	5547.384	.345	-.171	+.101	-.070	d ⁻¹	4914.241	.397	-.728:	-.223:	-.951:
.331750	55.339	.084	-.396	+.016	-.380	d ⁻¹	18.229	.329	-.674:	-.236:	-.910:
CS Mon	4812.279	.321	-.097	+.004	-.093	d ⁻¹	5555.455	.371	-.678	-.248	-.926
d ⁻¹	5547.274	.338	-.130	-.058	-.188	d ⁻¹	67.375	.159	-.602	-.178	-.780
.149684	55.273	.535	-.240	-.052	-.292	.051207	5609.293	.963	-.904	-.262	-1.166
	68.266	.480	-.204	-.038	-.242	CP Vel	4517.258	.030	-.789	-.196	-.985
EK Mon	5547.371	.654	-.206	-.061	-.267	d ⁻¹	36.232	.958	-.874	-.087	-.961
d ⁻¹	68.312	.945	-.248	-.046	-.294	d ⁻¹	4812.429	.025	-.815:	-.118:	-.933:
.252670	73.293	.204	-.048	+.050	+.002	.101617	4920.222	.978	-.766:	-.169:	-.935:
GR Nor	4567.422	.367	-.693:	-.019:	-.712:	d ⁻¹	21.198	.077	-.809:	-.142:	-.951:
d ⁻¹	69.428	.391	-.657	-.029	-.686	CY Vel	4513.267	.111	-.780	+.048	-.732
.510215	77.443	.480	-.715:	+.017:	-.698:	d ⁻¹	31.234	.031	-.913	+.031	-.882
	4922.485	.526	-.685	+.003	-.682	d ⁻¹	32.268	.084	-.797	+.039	-.758
	79.335	.531	-.692	+.016	-.676	d ⁻¹	33.281	.136	-.771	+.093	-.678
GZ Nor	4565.463	.025	-.891	+.033	-.858	d ⁻¹	34.259	.186	-.772	+.017	-.655
d ⁻¹	67.465	.081	-.965:	+.038:	-.927:	d ⁻¹	4885.318	.162	-.844	+.105	-.739
.027823	68.345	.105	-.996:	+.002:	-.994:	d ⁻¹	86.274	.211	-.777	+.072	-.705
	4921.472	.930	-.892:	+.018:	-.874:	d ⁻¹	4925.203	.205	-.698:	+.013:	-.685:
	25.442	.041	-.958:	-.021:	-.979:	d ⁻¹	5275.262	.130	-.775:	-.124:	-.899:
AU Peg	5348.370	.532	+.607	+.168	+.775	T Vul	5349.290	.997	+.2071	+.323	+.2394
d ⁻¹	64.352	.198	+.597	+.158	+.648	d ⁻¹	70.331	.741	+.1.846	+.215	+.2.061
.417049	5643.458	.599	+.490	+.150	+.728	.225450					
	54.469	.191	+.578	+.150	+.728	X Vul	4905.528	.265	+.707?	+.431?	+.1.138?
	61.464	.108	+.603	+.155	+.758	d ⁻¹	5348.356	.340	+.853	-.035	+.818
	68.521	.051	+.610	+.161	+.771	d ⁻¹	72.280	.126	+.660	-.121	+.546
						.158243					
						SV Vul	5343.343	.360	+.1.551	+.013	+.1.564
						d ⁻¹	48.317	.471	+.1.496	-.066	+.1.430
						.022151					

In the first column the name of the Cepheid is given and the value of the reciprocal period which has been used in the computation of the phases, given in the third column. The heliocentric Julian Day is given in the second column. The phases have been computed with the formula:

$$\text{phase} = P^{-1} (\text{J.D. hel.} - 2430000).$$

The reciprocal period used in this equation corresponds with a value of the period which was derived from the present observations in combination with old epochs. We did not try to determine the best value of the period from all available observations, but only to derive a period which can be safely used for extrapolation for a number of years. In the last three columns $\log I_Y$, $(\log I_B - \log I_Y)$ and $\log I_B$ are given. Figures marked with a colon are uncertain on account of a poor sky, a varying extinction, smoke and the like. Some figures followed by a question mark should probably be discarded altogether, as they do not agree at all with the other measures of the same variable. In some cases the wrong star may have been measured. It also has happened that a mistake was made in noting down the amplification of the photometer, which could not be overtaken. The faintest variables in Table 6 could often hardly be seen visually through the guiding telescope and it was difficult to keep these stars centred in the diaphragm. Discordant measures for these faint Cepheids are probably due therefore to inaccurate settings. At the end of Table 6 remarks are to be found about individual Cepheids marked with an asterisk behind their name.

$$P_{g_p} = 11.317 - 1.157 (\log I_B + \log I_Y) - 1.11 (\log I_B - \log I_Y),$$

$$\pm .033 \qquad \qquad \qquad \pm .26 \qquad \qquad \qquad (\text{m.e.}) \qquad (3)$$

$$P_{v_p} = 10.337 - 1.180 (\log I_B + \log I_Y) + .95 (\log I_B - \log I_Y).$$

$$\pm .024 \qquad \qquad \qquad \pm .19 \qquad \qquad \qquad (\text{m.e.}) \qquad (4)$$

This comparison is rather unsatisfactory in two respects.

TABLE 8

Var.	P_{g_p}	P_{v_p}	$\log I_B$	$\log I_Y$	$(O-C)_b$	$(O-C)_y$
	^m	^m			^m	^m
U Aql	6.68	5.99	2.000	1.835	-.02	+.02
SZ Aql	8.70	7.82	1.171	1.088	+.09	+.07
TT Aql	7.15	6.32	1.764	1.646	-.09	-.10
FM Aql	8.73	7.81	1.143	1.100	+.05	+.08
η Aql	3.94	3.44	3.161	2.878	-.08	-.04
SU Cyg	6.68	6.36	2.027	1.667	+.04	+.04
Y Oph	6.90	5.84	1.898	1.910	-.03	+.01
min.	7.70	6.34	1.572	1.715	+.03	+.02
S Sgr	5.79	5.23	2.464	2.182	+.16	+.11
min.	7.04	6.03	1.948	1.863	+.22	+.11
U Sgr	6.88	6.14	1.883	1.733	-.09	-.07
Y Sgr	5.82	5.27	2.364	2.113	-.04	-.02
WZ Sgr	8.03	7.18	1.332	1.262	-.21	-.16
V 350 Sgr	7.48	6.87	1.640	1.417	-.05	-.07
SS Sct	8.50	7.82	1.234	1.064	+.03	+.03
SZ Tau	6.93	6.30	1.897	1.687	-.01	-.01

In Table 7 the individual measures of those Cepheids have been tabulated for which the number of observations is too small to derive magnitudes and colour at the phase of maximum brightness. For some of the variables in this Table 7, like QT CrA, very little variation is found in the magnitudes and colour and it seems probable that the identification of these variables has not been correct. Table 7 has been given for the sake of completeness, but no use has been made in this paper of any of the measures from this table.

The colour curves and the yellow light-curves are shown for each variable in the Figures 2, 3, 4, 5 and 6. Uncertain observations have been indicated by open circles. For each variable the colour curve is at the top of the figure. The value of $\Delta \log I$ is indicated on the left-hand side of each figure, whereas the values of $\log I_Y$ are given on the right-hand side. In the abscissa tenths of phase have been indicated, zero phase with a long line and phase .5 with a somewhat shorter line.

8. A comparison with the magnitudes and colours derived by other authors

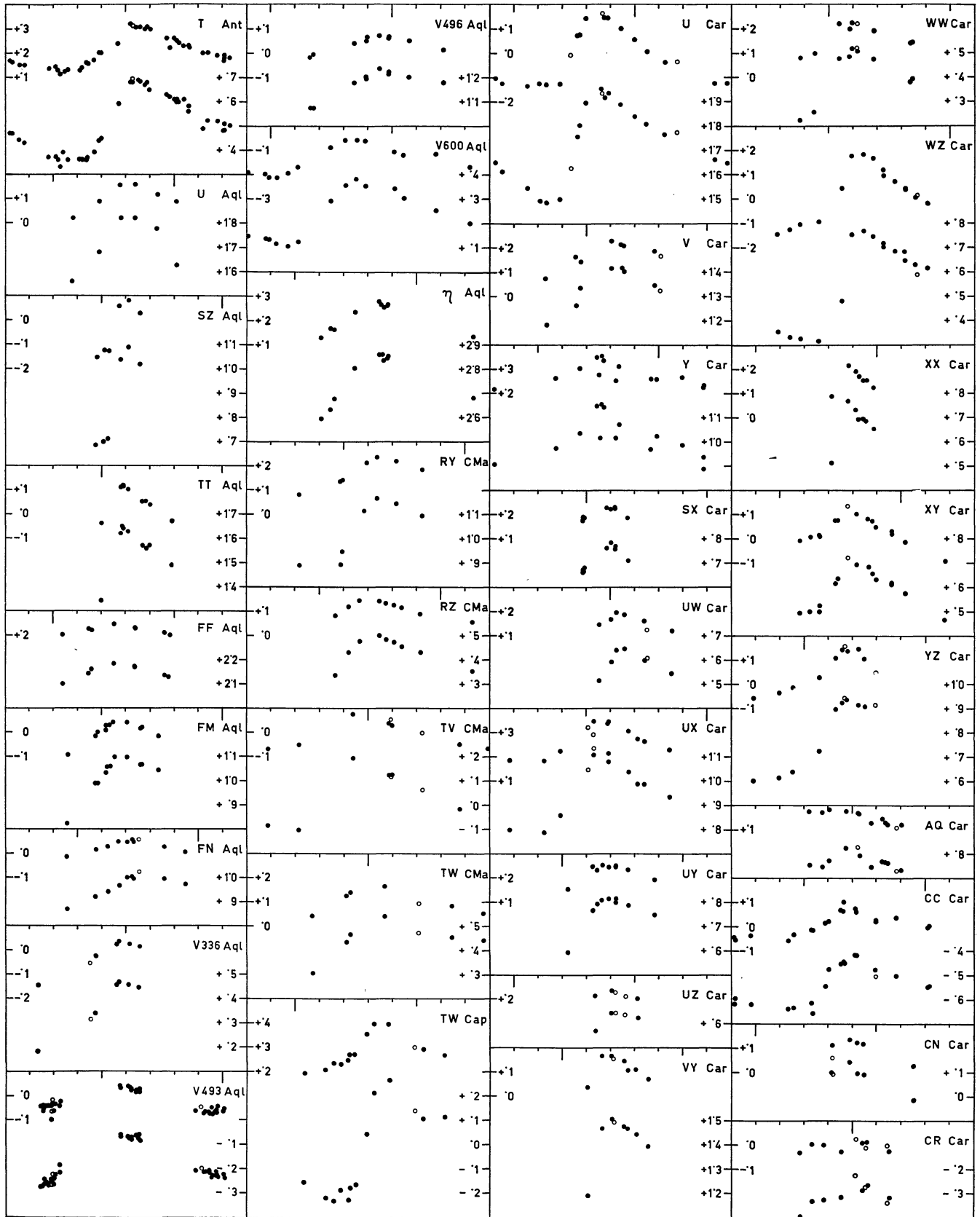
A. Comparison with EGGEN's magnitudes and colours of classical Cepheid variable stars (1951).

For fourteen Cepheids from EGGEN's article we derived $\log I_B$ and $\log I_Y$ values at maximum brightness and for two of these variables we have also values for minimum brightness. The data used for two least-squares solutions and the residuals $(O-C)$ have been collected in Table 8. The resulting equations are:

In the first place the residuals are rather large, the mean error of one equation of condition being $\pm .m111$ for the blue and $\pm .m082$ for the yellow magnitudes. It should be kept in mind, however, that for EGGEN's as well as for our own measures the values at maximum and at minimum light depend on interpolation between observations at neighbouring phases. In this respect it is interesting to notice that there exists a strong correlation between the residuals in blue and yellow light for the same star.

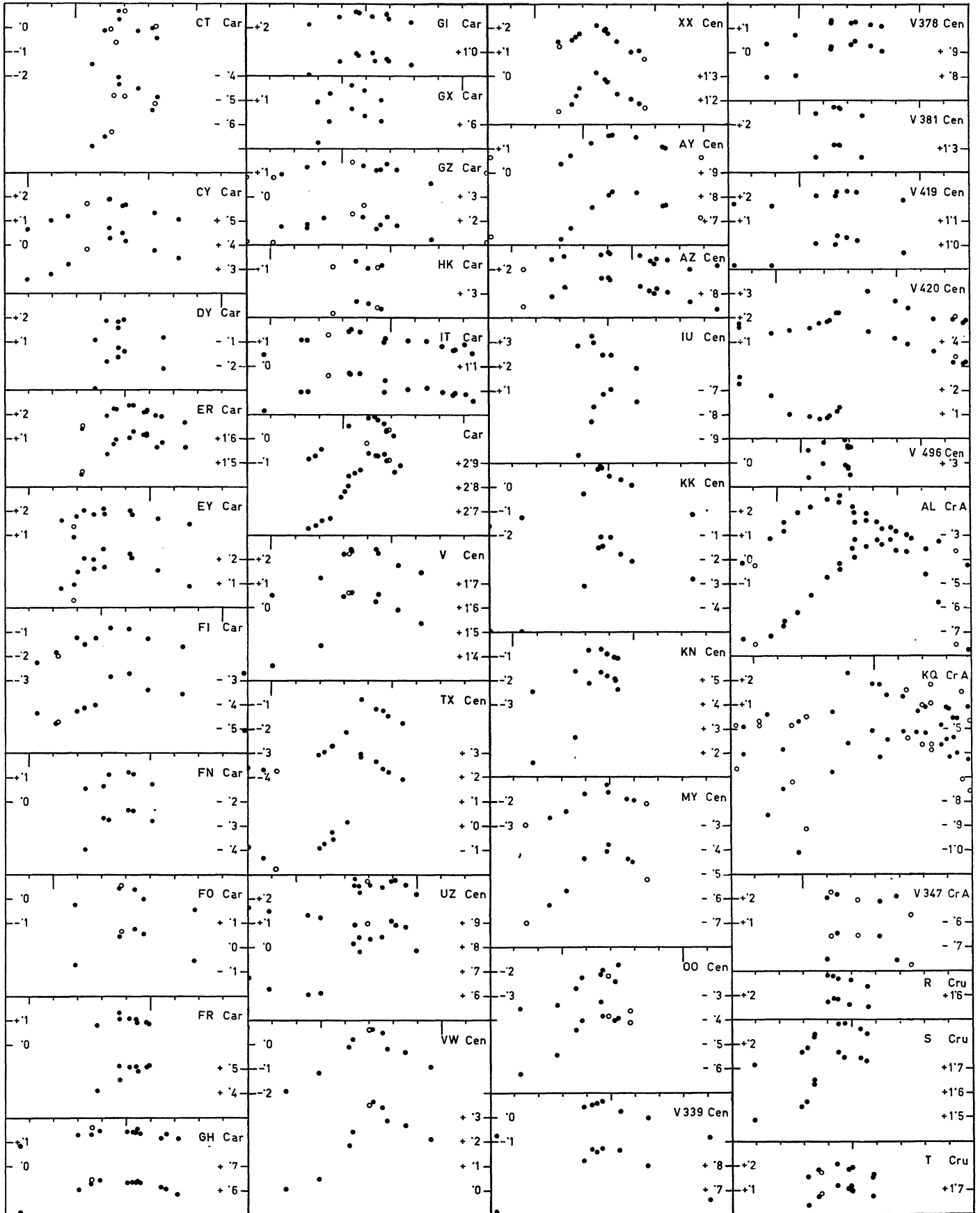
A far more serious matter is the discordance in the photometric scales. If the scales were the same, the coefficient of the second term in the above formulae would be -1.25 . Consequently EGGEN's scale differs by a factor $.925 \pm .026$ in the blue and by a factor $.944 \pm .019$ in the yellow from our scale. It is difficult to understand how such a large scale difference of nearly 6.5 percent can exist between two series of photo-electric measures. As our scale is in full agree-

FIGURE 2



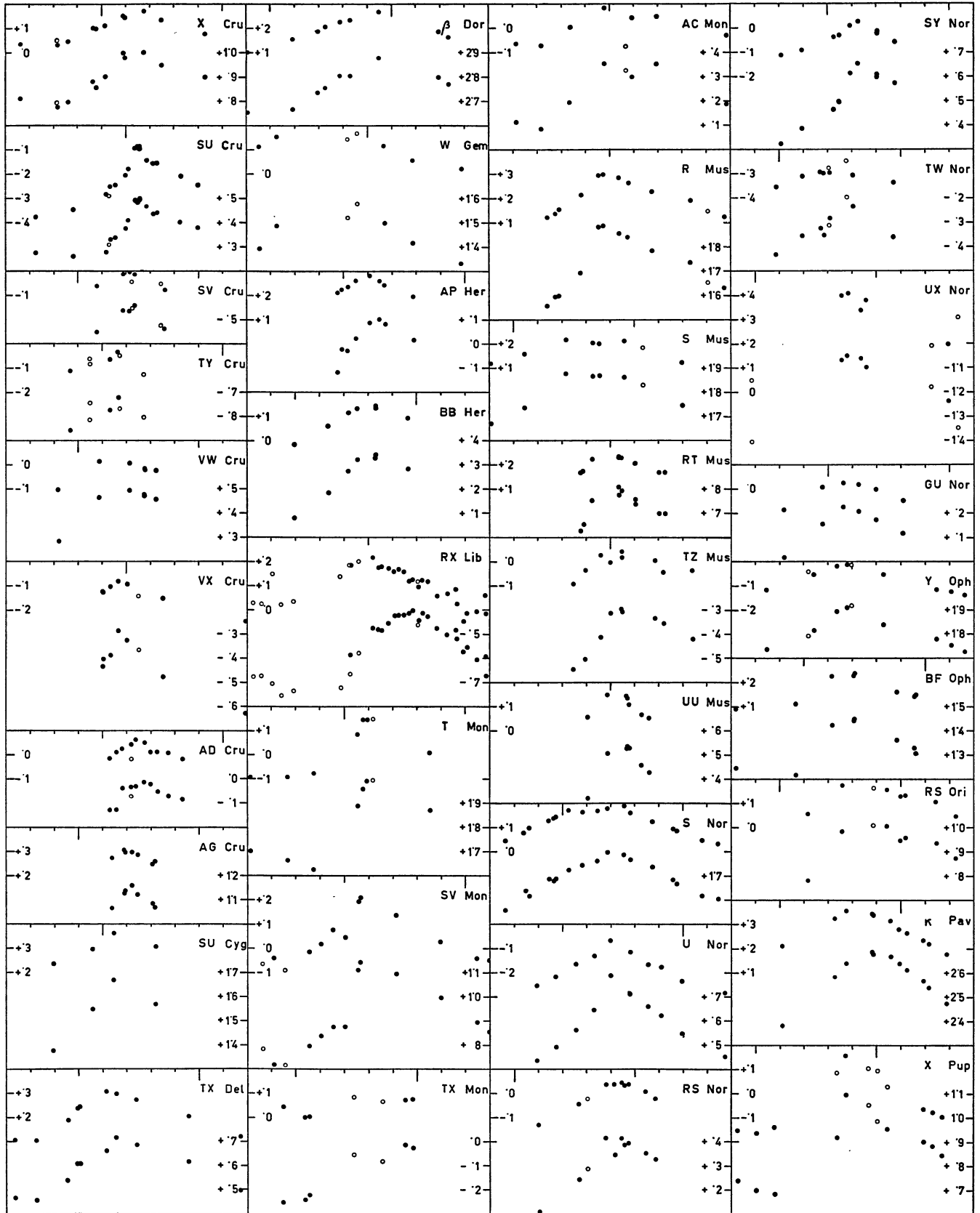
Colour curves and yellow light-curves of individual Cepheids

FIGURE 3



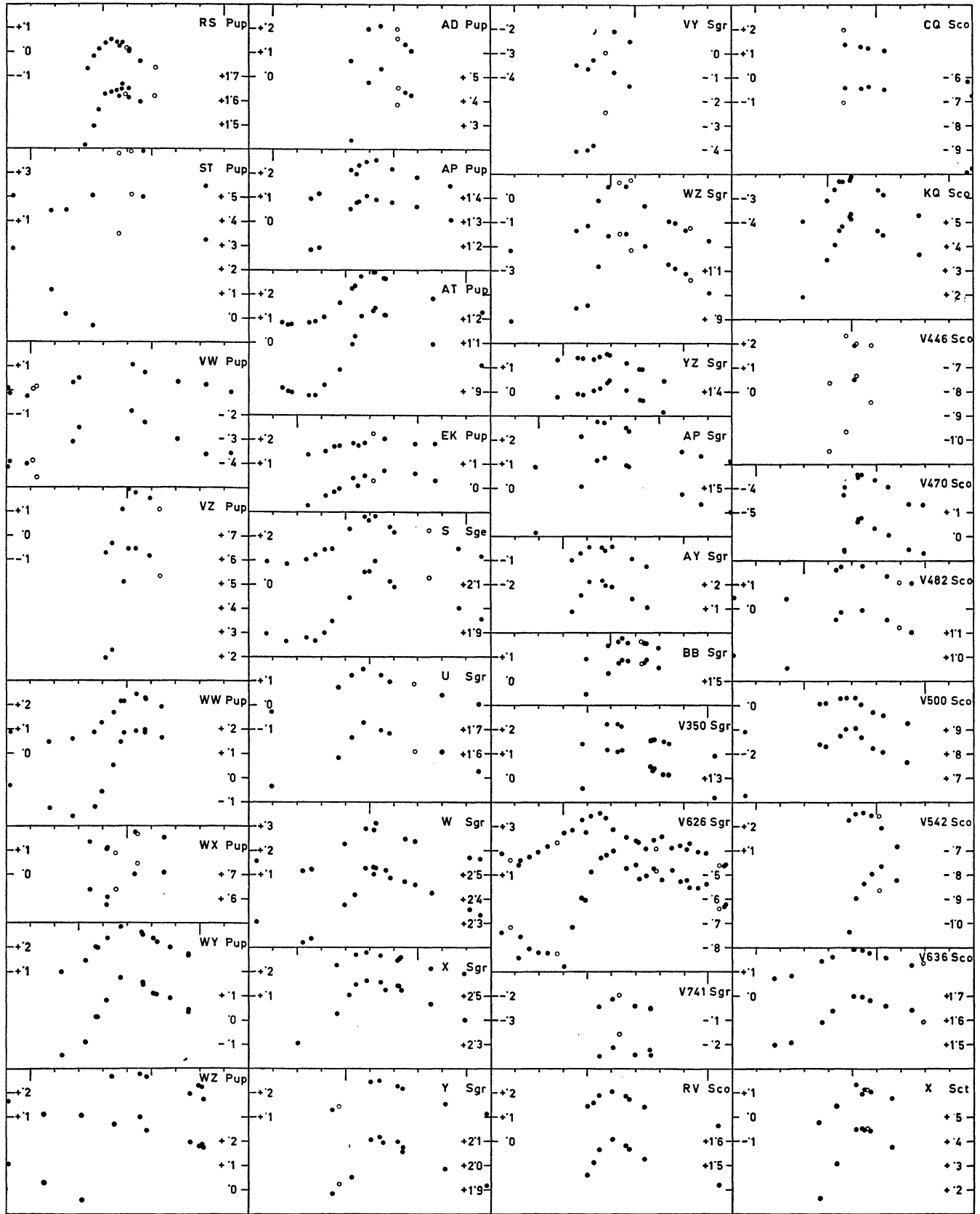
Colour curves and yellow light-curves of individual Cepheids

FIGURE 4



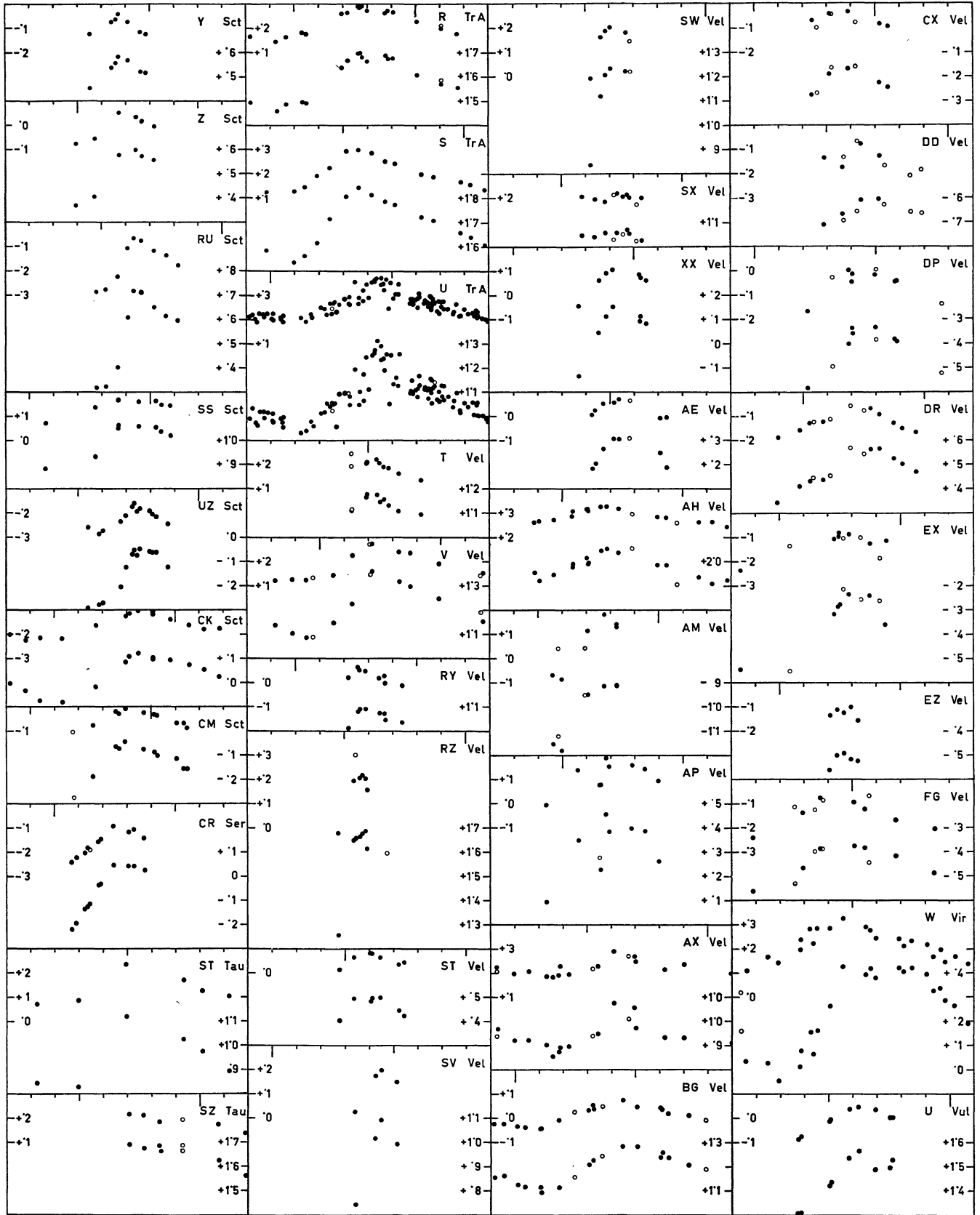
Colour curves and yellow light-curves of individual Cepheids

FIGURE 5



Colour curves and yellow light-curves of individual Cepheids

FIGURE 6



Colour curves and yellow light-curves of individual Cepheids

ment with that of the Cape 1953 *S* system and also with the scale of GASCOIGNE and EGGEN discussed in the next paragraph, we conclude that the scale factor derived here for EGGEN's observations is probably not correct.

B. Comparison with the magnitudes and colours derived by EGGEN, GASCOIGNE and BURR, published in the *Monthly Notices* (1957).

Dr GASCOIGNE has been so kind to provide me with

a copy of part of the typescript of this paper on magnitudes and colours of Cepheids in advance of publication. Disregarding some stars with uncertain measures we find in their list 33 Cepheids in common with ours and for 5 of these we have not only the photometric data for the phase of maximum, but also for minimum brightness. For a comparison between the two photometric systems we therefore have 38 equations of condition. The data used in the least-squares solutions have been collected in Table 9.

TABLE 9

Star	P_E	V_E	$\log I_B$	$\log I_Y$	$(O-C)_P$	$(O-C)_V$	Star	P_E	V_E	$\log I_B$	$\log I_Y$	$(O-C)_P$	$(O-C)_V$
U Aql	^m 6.73	^m 6.05	2.000	1.835	^m .00	^m +.04	min.	^m 7.74	^m 6.38	1.572	1.715	^m +.07	^m +.08
SZ Aql	8.72	7.84	1.171	1.088	.00	.00	x Pav	4.28	3.96	3.040	2.687	+.02	+.03
TT Aql	7.19	6.38	1.764	1.646	-.10	-.10	S Sge	5.76	5.25	2.464	2.182	+.12	+.09
FF Aql	5.74	5.17	2.424	2.182	+.02	+.01	min.	6.96	6.03	1.948	1.863	+.13	+.09
FM Aql	8.78	7.82	1.143	1.100	+.01	+.01	U Sgr	7.00	6.25	1.883	1.733	-.01	-.01
FN Aql	8.86	7.95	1.067	1.013	-.10	-.08	W Sgr	4.67	4.22	2.827	2.523	-.09	-.11
V 496 Aql	8.57	7.59	1.300	1.228	+.17	+.09	min.	5.90	5.00	2.335	2.219	.00	-.07
l Car	4.17	3.28	3.024	2.936	-.04	-.03	Y Sgr	5.90	5.37	2.364	2.113	+.03	+.04
VY Car	7.54	6.87	1.674	1.501	+.02	+.04	WZ Sgr	8.12	7.26	1.332	1.262	-.20	-.16
R Cru	6.84	6.40	1.966	1.687	-.01	+.02	YZ Sgr	7.57	6.83	1.599	1.444	-.13	-.14
T Cru	7.03	6.36	1.924	1.720	+.10	+.06	V 350 Sgr	7.50	6.90	1.640	1.417	-.12	-.14
SU Cyg	6.75	6.45	2.027	1.667	+.02	+.02	SS Sct	8.48	7.82	1.234	1.064	-.11	-.08
β Dor	3.85	3.39	3.157	2.890	-.10	-.04	SZ Tau	6.96	6.34	1.897	1.687	-.04	-.04
BB Her	10.41	9.72	.487	.342	+.01	+.05	T Vel	8.29	7.68	1.391	1.178	+.06	+.06
T Mon	6.39	5.60	2.144	1.996	+.02	-.02	V Vel	7.77	7.26	1.647	1.369	+.14	+.10
R Mus	6.36	5.94	2.186	1.886	+.04	+.05	min.	8.57	7.80	1.206	1.084	-.08	-.05
S Mus	6.49	5.90	2.098	1.879	-.02	-.01	RZ Vel	7.02	6.44	1.891	1.677	+.01	+.04
min.	7.26	6.42	1.786	1.672	+.03	+.01	SW Vel	8.21	7.55	1.437	1.237	+.10	+.07
Y Oph	6.98	5.91	1.898	1.910	+.06	+.09	AH Vel	5.86	5.47	2.374	2.046	-.01	-.03

The resulting equations are:

$$P_E = + 11.537 - 1.216 (\log I_B + \log I_Y) - .88 (\log I_B - \log I_Y), \quad (\text{m.e.}) \quad (5)$$

$$\pm .013 \quad \pm .14$$

$$V_E = + 10.510 - 1.227 (\log I_B + \log I_Y) + 1.25 (\log I_B - \log I_Y). \quad (\text{m.e.}) \quad (6)$$

$$\pm .012 \quad \pm .12$$

The coefficients of the second terms are larger than those found in the last paragraph in the comparison with EGGEN's magnitudes. But still they seem to be significantly smaller than the value 1.25 for equal scales. We now find the scale factors $.972 \pm .010$ for the blue and $.981 \pm .010$ for the yellow. We cannot decide here how this scale difference of about 2 percent has been caused. We understood that EGGEN has changed the photometric system of the magnitudes of the more northern Cepheids, published in *Ap.J.* **113**, 367, 1951, before they were added to the list of Cepheids in the publication by EGGEN, GASCOIGNE and BURR. However we do not know how this change in photometric system has been brought about, although the $(P, V)_E$ system has been described in detail by EGGEN (1955).

The mean error of one equation of condition was found to be $\pm^m.084$ for the blue and $\pm^m.073$ for the

yellow. As was remarked in the former paragraph, a part of these errors will be due to the uncertainty in the reading of maximum and minimum values.

Also in this case there exists a strong correlation between the residuals $(O-C)_P$ and $(O-C)_V$ in Table 9. This means that the errors in the colours are considerably smaller than the errors in the magnitudes. This could be expected as colour determinations are more differential in character than magnitude determinations for stars all over the sky.

As linear relation between $(P-V)_E$ and $(\log I_B - \log I_Y)$ we derived:

$$(P-V)_E = + 1.059 - 2.086 (\log I_B - \log I_Y), \quad (7)$$

$$\pm 51$$

the mean error of one equation of condition being $\pm^m.033$.

C. Comparison with the photographic magnitudes and colours by BADALYAN (1956).

BADALYAN has published median magnitudes and median colours for a large number of Cepheids. We have only 9 stars in common with his list, for which we have derived the photometric data for maximum and for minimum brightness from which median values can be computed. The data used in the least-squares solution have been collected in Table 10.

The resulting equation is:

$$m_{pg} = + 11.30 - 1.063 (\log I_B + \log I_Y) - .45 (\log I_B - \log I_Y) \pm .075 \pm 1.09 \quad (\text{m.e.}) \quad (8)$$

The mean error of one equation of condition is $\pm^m.34$. The scale factor deviates considerably from unity and is found to be: $.85 \pm .06$. Although these results are based on observations of 9 Cepheids only, they no doubt prove that BADALYAN's observations are inferior to the photo-electric observations. As BADALYAN has only three or four observations per Cepheid, his values for the median magnitudes and colours must be quite inaccurate.

We derived the following linear relation between his colour indices and our colours:

$$CI_{Bad} = + 1.03 - .83 (\log I_B - \log I_Y) \pm .60 \quad (9)$$

The mean error of the coefficient of the second term is so large that this equation has no practical meaning.

A comparison was also made between our measures and colour indices for maximum brightness by VASHAKIDZE (1953). For 35 Cepheids, common to both lists, the following relation was found:

$$CI_{Vash} = + .17 + .92 SCI, \pm .13 \pm .15 \text{ (m.e.)}$$

SCI representing our colour indices expressed in the Cape system. The mean error of one equation is $\pm^m.30$.

9. The relations with other photometric systems

In section 5 we have given the relations between $\log I_B$ and $\log I_Y$ and the blue and yellow magnitudes *SPg* and *SPv* of the Cape *S* system of 1953.

$$B = + 11.829 - 1.233 (\log I_B + \log I_Y) - 1.212 (\log I_B - \log I_Y), \pm .014 \pm .078 \quad (\text{m.e.}) \quad (10)$$

$$V = + 10.681 - 1.248 (\log I_B + \log I_Y) + 1.127 (\log I_B - \log I_Y), \pm .009 \pm .050 \quad (\text{m.e.}) \quad (11)$$

The scale factors are satisfactory, namely $.986 \pm .011$ for the blue and $.998 \pm .007$ for the yellow. The residuals (*O-C*) are shown in the little table above. The colours in the two photometric systems are

TABLE 10

Star	<i>m_{pg}</i>	<i>CI</i>	$\log I_B$	$\log I_Y$	(<i>O-C</i>)
	m	m			m
SV Mon	9.35	1.27	1.023	.944	+ .18
AC Mon	10.21	.80	.222	.219	- .62
Y Oph	7.55	1.10	1.735	1.812	- .01
VW Pup	11.82	.97	- .197	- .260	+ .07
WW Pup	11.12	.79	.173	.020	+ .10
S Sge	6.57	.81	2.206	2.022	- .15
AP Sgr	8.25	1.13	1.654	1.468	+ .36
V 482 Sco	8.63	.70	1.187	1.076	- .21
CK Sct	11.79	1.25	- .144	.020	+ .29

In order to obtain a relation with the photometric system of JOHNSON and MORGAN (1953) we have observed five stars from their list, namely:

Star	Sp.	<i>B</i>	<i>V</i>	<i>U</i>	(<i>O-C</i>) _{<i>B</i>}	(<i>O-C</i>) _{<i>V</i>}
		m	m	m	m	m
109 Vir	Ao V	3.74	3.75	3.71	- .014	.000
λ Ser	Go V	5.03	4.43	5.14	+ .005	- .012
CC 1017	K ₅ V	8.90	7.74	9.95	+ .002	+ .004
1 Peg A	K ₁ III	5.19	4.09	6.24	+ .036	+ .024
55 Peg	M ₂ III	6.06	4.50	7.87	- .027	- .014

We observed the following values of $\log I_B$ and $\log I_Y$:

	$\log I_B$	$\log I_Y$		$\log I_B$	$\log I_Y$
λ Ser	2.760	2.486	1 Peg A	2.705	2.642
	2.772	2.489		2.710	2.652
	2.753	2.484	mean	2.708	2.647
mean	2.762	2.486			
			55 Peg	2.326	2.475
				2.330	2.481
CC 1017	1.181	1.173	mean	2.328	2.478
	1.194	1.182			
	1.192	1.181			
mean	1.189	1.179	109 Vir	3.280	2.751

Least-squares solutions between the *B* and *V* values of JOHNSON and MORGAN against our own measures yield the equations:

related by the following equation:

$$B - V = + 1.215 - 2.29 (\log I_B - \log I_Y), \pm .014 \pm .05 \quad (\text{m.e.}) \quad (12)$$

The equations (10), (11) and (12) are based on five stars only and although the mean errors are quite small, an independent confirmation of these relations would be helpful.

STOY (1956) has derived the relationship between the Cape S system and the B and V magnitudes by JOHNSON and MORGAN. He gives the relations:

$$B = SPg - .07 SCI + .20, \quad (13)$$

$$V = SPv + .08 SCI - .06, \quad (14)$$

$$B - V = .85 SCI + .26. \quad (15)$$

We can derive these equations independently from a combination of our equations (1), (2), (10), (11) and (12). We then find:

$$B = .985 SPg + .00 SCI + .30, \quad (13')$$

$$V = .996 SPv + .09 SCI - .01, \quad (14')$$

$$B - V = .89 SCI + .24. \quad (15')$$

The agreement between the two sets of equations is not unsatisfactory, if one keeps in mind that we observed only five stars from JOHNSON and MORGAN and a small number of stars in the E -regions at widely separated times. The difference in the constant in the equation for B is due to the small difference in scale. There are no serious inconsistencies between the two sets of equations and our photometric system seems to be reasonably well defined by the equations (1) and (2) relative to the Cape S system and by (10), (11) and (12) relative to the photometric system by JOHNSON and MORGAN.

However there remains one serious discrepancy. Eliminating $(\log I_B - \log I_V)$ from the equations (7) and (12) we obtain the relation between the colours in the system of EGGEN and the colours from JOHNSON and MORGAN. The result is:

$$(P - V)_E = + .91 (B - V) - .048. \quad (16)$$

The mean error of the scale factor should be about $\pm .03$. In *A.J.* 60, 65, 1955, EGGEN derived the relation:

$$(P - V)_E = + 1.0376 (B - V) - .125 \quad (16')$$

$$\pm 12 \text{ (p.e.)}$$

with a scale factor much larger than in equation (16). However the relation between $(P - V)_E$ and $(B - V)$ is more complicated than is indicated by formula (16'). For the dwarfs, with $(B - V)$ between $+ 1.0$ and $+ 1.5$, EGGEN derived the equation:

$$(P - V)_E = + .84 (B - V) + .08. \quad (16'')$$

$$\pm 1 \text{ (p.e.)}$$

The question therefore arises what this relation would be for F-type supergiant stars, which are considerably reddened by interstellar absorption, as equation (7)

between $(P - V)_E$ and $(\log I_B - \log I_V)$ was derived for Cepheids only. As we have no other stars, but Cepheids, in common with EGGEN's $(P, V)_E$ system, this relation cannot be determined in any more detail.

10. Some relations between the photometric data and the periods

In Table 11 we have collected the Cepheids for which we made photometric observations at maximum as well as at minimum brightness. The values of $\log I$ have first been converted into magnitudes by means of the equations (1) and (2). From these magnitudes in the Cape S system the amplitudes of the light-curves in blue and yellow were derived and also the range of the colour curves. These amplitudes have been given in Table 11 under the headings A_{pg} , A_{pv} and A_{CI} . In the case of population I Cepheids the range in colour practically equals the difference between the range in blue and the range in yellow. For the Cepheids of population II this is not necessarily so, as these variables often show a considerable shift in phase between the blue and yellow light-curves.

Omitting uncertain measures, indicated by a colon, and also the Cepheids of population II, we derived the relations between the blue range and the yellow range and between the blue range and the range in colour. The following relations were found:

$$A_{pv} = .615 A_{pg} \quad \text{and} \quad A_{CI} = .396 A_{pg}.$$

$$\pm 23 \qquad \qquad \qquad \pm 35 \quad \text{(m.e.)}$$

The residuals from these two equations are shown in Table 11 under $(O - C)_1$ and $(O - C)_2$. The two relations are shown graphically in Figures 7 and 8. Stars with uncertain data have been indicated by small dots, Cepheids of population II by circles. In Figure 7 the circles lie systematically above the line representing the equation. In other words for these stars the range in yellow is larger than for ordinary Cepheids with the same range in blue. In Figure 8 the circles do not deviate systematically from the line representing the equation, but their dispersion seems to be larger than for ordinary Cepheids.

Next we have computed the relations between the logarithm of the period and the range in blue light, in yellow light and in colour. Using the same 28 Cepheids of population I as before, we found the relations:

$$\Delta SPg = A_{pg} = + .32 + .91 \log P,$$

$$\pm .20 \pm .22 \quad \text{(m.e.)}$$

$$\Delta SPv = A_{pv} = + .25 + .50 \log P,$$

$$\pm .13 \pm .14 \quad \text{(m.e.)}$$

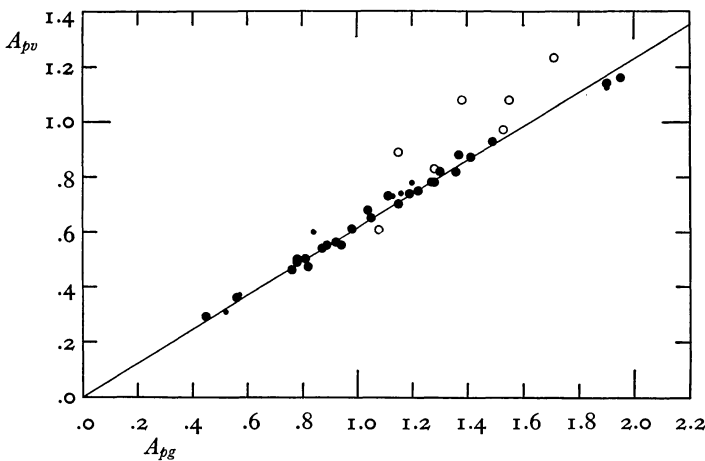
$$\Delta SCI = A_{CI} = + .05 + .44 \log P.$$

$$\pm .08 \pm .09 \quad \text{(m.e.)}$$

TABLE II

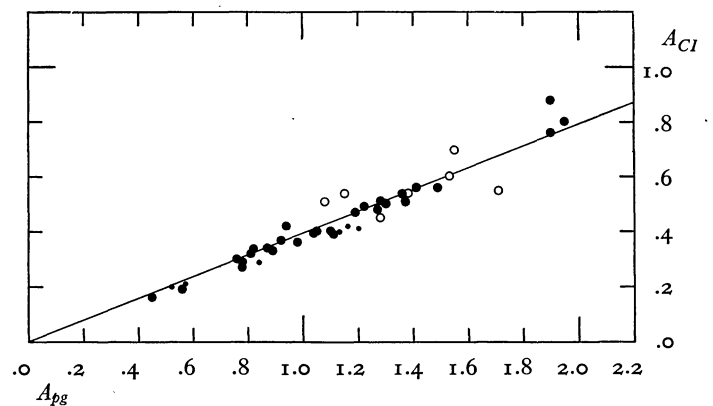
Var.	Pop. type	log P	A_{pg}	A_{pv}	A_{CI}	$(O-C)_1$	$(O-C)_2$	$(O-C)_{pg}$	$(O-C)_{pv}$	$(O-C)_{CI}$
T Ant	I	.771	1.30	.82	.50	+.02	-.01	+.28	+.18	+.11
V 493 Aql	I	.475	.84:	.60:	.29:					
V 600 Aql	I	.860	1.04	.68	.39	+.04	-.02	-.06	.00	-.04
TW Cap	II	1.456	1.71	1.23	.55					
U Car	I	1.588	1.95	1.16	.80	-.04	+.03	+.19	+.11	+.05
WZ Car	I	1.362	1.90	1.14	.88	-.03	+.13	+.34	+.21	+.23
YZ Car	I	1.259	1.36	.82	.54	-.02	.00	-.10	-.06	-.06
CC Car	I	.678	.87	.54	.34	.00	.00	-.07	-.05	-.01
GZ Car	I	.619	.52:	.31:	.20:					
TX Cen	I	1.233	1.90	1.14	.76	-.03	+.01	+.46	+.27	+.17
UZ Cen	I	.523	1.11	.73	.39	+.05	-.05	+.31	+.22	+.11
AZ Cen	I	.507	.56	.36	.19	+.02	-.03	-.22	-.15	-.09
V 419 Cen	I	.741	.45	.29	.16	+.01	-.02	-.54	-.33	-.22
V 420 Cen	II	1.394	1.28	.83	.45					
AL CrA	II	1.232	1.55	1.08	.70					
X Cru	I	.794	.89	.55	.33	.00	-.02	-.15	-.10	-.07
TX Del	II	.780	1.08	.61	.51					
RX Lib	II	1.397	1.15:	.89:	.54:					
SV Mon	I	1.183	1.90:	1.13:	.76:					
AC Mon	I	.904	1.05	.65	.40	.00	-.02	-.09	-.05	-.05
S Mus	I	.985	.78	.50	.27	+.02	-.04	-.44	-.24	-.21
S Nor	I	.989	.94	.55	.42	-.03	+.05	-.28	-.20	-.07
U Nor	I	1.102	1.49	.93	.56	+.01	-.03	+.17	+.13	+.02
Y Oph	I	1.234	.82	.47	.34	-.03	+.02	-.62	-.40	-.25
VW Pup	I	.632	1.13:	.73:	.40:					
WW Pup	I	.742	1.37	.88	.51	+.04	-.03	+.38	+.26	+.13
AT Pup	I	.825	1.41	.87	.56	.00	.00	+.34	+.21	+.15
S Sge	I	.923	1.28	.78	.51	-.01	.00	+.12	+.07	+.05
W Sgr	I	.881	1.22	.75	.49	.00	+.01	+.10	+.06	+.05
AP Sgr	I	.704	1.27	.78	.48	.00	-.02	+.31	+.18	+.12
V 626 Sgr	II	1.427	1.38	1.08	.54					
V 482 Sco	I	.656	.98	.61	.36	+.01	-.03	+.06	+.03	+.02
V 636 Sco	I	.832	.81	.50	.32	.00	.00	-.27	-.17	-.10
CK Sct	I	.870	.78	.49	.29	+.01	-.02	-.33	-.20	-.14
ST Tau	I	.606	1.16:	.74:	.42:					
R TrA	I	.530	.92	.56	.37	-.01	+.01	+.12	+.04	+.08
S TrA	I	.801	1.19	.74	.47	+.01	.00	+.14	+.09	+.07
U TrA	I	.410	1.20:	.78:	.41:					
V Vel	I	.641	1.10	.70	.40	+.02	-.04	+.20	+.13	+.07
AX Vel	I	.414	.57:	.37:	.21:					
BG Vel	I	.840	.76	.46	.30	-.01	.00	-.32	-.21	-.12
W Vir	II	1.237	1.53:	.97:	.60:					

FIGURE 7



Relation between blue and yellow amplitudes of the light-curves. Open circles represent population II Cepheids

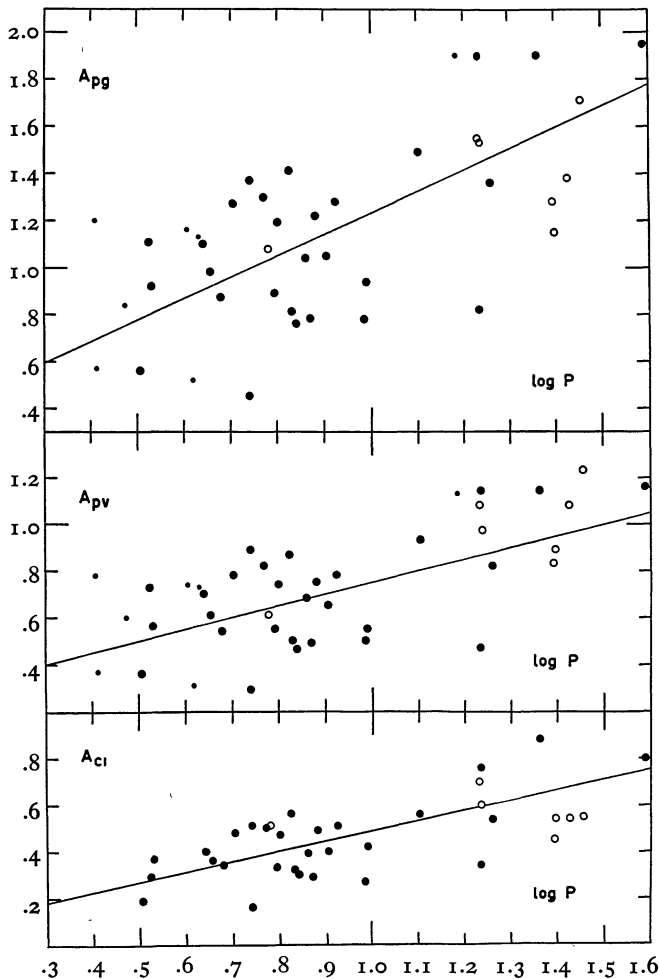
FIGURE 8



Relation between the amplitudes of the light-curves and of the colour curves. Open circles represent population II Cepheids

The mean error per star for these three equations was found to be $\pm^{m.30}$, $\pm^{m.19}$ and $\pm^{m.12}$ respectively. The three relations are shown in Figure 9. As before, Cepheids of population II have been indicated by circles and stars with uncertain measures by small dots. The residuals from the equations have been given in the last three columns of Table 11.

FIGURE 9



The relations between the amplitudes of the light-curves and of the colour curves and the logarithm of the periods. Open circles represent population II Cepheids

Although the range of the light-curves and of the colour curves increases systematically with increasing period, the scatter of the points in the three diagrams of Figure 9 is large. The upper diagram is comparable with the combination of Figures 25 and 36 of EGGEN's paper in *Ap. J.* **113**, 367, 1951. On the basis of these two figures EGGEN divided the Cepheids of population I in three types, *A*, *B* and *C*. According to EGGEN the *A*- and *B*-type Cepheids fall in his Figure 25 on two lines with equal slope and shifted vertically over about $^{m.14}$. According to him the

C-type Cepheids probably fall on two other lines, which again have the same slope. The star Y Oph was considered anomalous by EGGEN and not plotted in his figures. The position of Y Oph in our diagrams is also quite extreme, although V 419 Cen with a much shorter period shows a deviation of the same size.

It is clear from the three diagrams of Figure 9, that it would be extremely difficult and very artificial to represent the observations by three or more parallel lines. The only stars in common between EGGEN and us are S Sge and Y Oph, which are both considered as anomalous by EGGEN and therefore we can only guess at the reason why our diagrams do not confirm EGGEN's results. Although for some of the stars we observed, the magnitudes at maximum and minimum phase are not very certain on account of the small number of observations, it seems unlikely that the errors in our determination of the range of the light-curves could explain the observed dispersion in Figure 9. More observations will be required to settle this matter.

We further derived the relation between the range of the light-curves in blue and the range of the radial-velocity curves, indicated by A_{rad} . For the latter quantity we used the values published by JOY (1937) and by STIBBS (1955*b*), assigning a larger weight to the observations by STIBBS, as his radial-velocity curves have been more completely observed than those by JOY. The data used have been collected in

TABLE 12

Star	A_{pg}	A_{rad}	(O-C)
	^m		
T Ant	1.30	45	+ 3
U Car	1.95	52	- 8
UZ Cen	1.11	38	+ 1
AZ Cen	.56	19	- 2
V 419 Cen	.45	17	- 1
X Cru	.89	25	- 6
RX Lib	1.15:	29	- 9
SV Mon	1.90	66	+ 7
S Mus	.78	36	+ 9
S Nor	.94	35	+ 3
Y Oph	.82	19	-10
VW Pup	1.13:	41	+ 4
WW Pup	1.37	34	-10
S Sge	1.28	41	0
W Sgr	1.22	43	+ 3
AP Sgr	1.27	21	-20
V 482 Sco	.98	32	- 1
V 636 Sco	.81	29	+ 1
ST Tau	1.16:	38	0
R TrA	.92	34	+ 3
S TrA	1.19	41	+ 2
U TrA	1.20:	41	+ 2
V Vel	1.10	39	+ 3
AX Vel	.57:	27	+ 5
BG Vel	.76	30	+ 3
W Vir	1.53	67	+19

Table 12. A solution from all the stars of Table 12 yields the equation:

$$A_{rad} = + 5.7 + 27.9 A_{pg} \pm 4.8 \pm 4.2 \text{ (m.e.)}$$

Omitting the two population II Cepheids RX Lib and W Vir we find:

$$A_{rad} = + 8.0 + 25.3 A_{pg} \pm 4.1 \pm 3.7 \text{ (m.e.)}$$

If we use only the 15 stars for which STIBBS gave values of the radial-velocity range and for which the light-range is not uncertain, we derive:

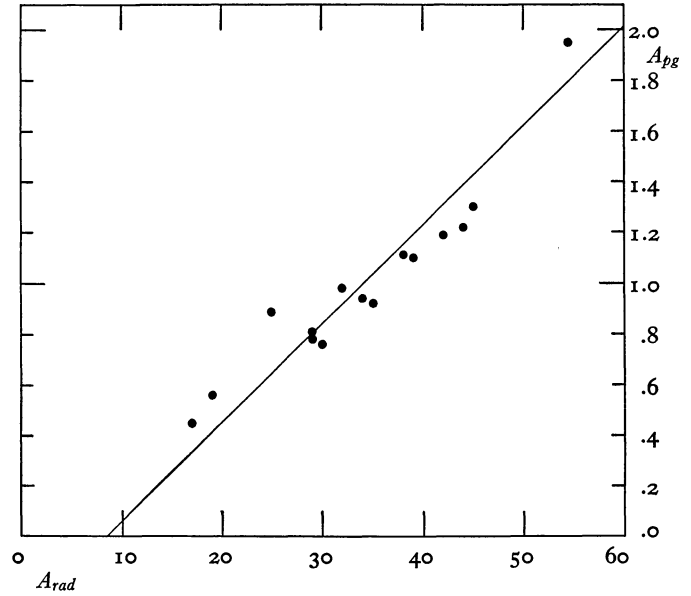
$$A_{rad} = + 8.5 + 25.6 A_{pg} \pm 2.8 \pm 2.6 \text{ (m.e.)}$$

This last relation is shown in Figure 10. Our coefficient is somewhat smaller than that derived by EGGEN for 9 stars, viz $+ 31.7 \pm 1.8$ (m.e.). The difference 6.1 ± 3.2 is twice its mean error. It is also smaller than the value derived by PARENAGO (1954), who gives 35.3. The difference however is caused mainly by the fact that in his formula, as in the formula by EGGEN, no constant term has been used.

11. The colours of the Cepheids at maximum brightness

From the measures given in Table 5 and with the aid of the Figures 2, 3, 4, 5 and 6 we derived the extreme

FIGURE 10



Relation between the amplitudes of the light-curves and of the radial-velocity curves

values of $\log I_B$, $\log I_Y$ and $(\log I_B - \log I_Y)$ for all the Cepheids. For most of them only values at maximum could be determined. The results have been given in Table 13. In this table the name of the variable is followed by the logarithm of the period

TABLE 13

Name	$\log P$	l	b	$\log I_B$	$\log I_Y$	C	SPg	SPv	SCI	Δm_{pg}	E	r	z
T Ant	.771	232.5	+ 11.8	1.006 .487	.690 .356	.316 .123	m 9.20 10.50	m 8.91 9.73	m .29 .79	1.30*	.20	3.15	+ 640
U Aql	.847	358.7	- 13.1	2.000	1.835	.165	6.71	6.03	.68	1.15*	.59	.55	- 110
SZ "	1.234	3.4	- 3.9	1.171	1.088	.083	8.78	7.89	.89	1.87*	.76	1.79	- 84
TT "	1.138	3.7	- 4.5	1.764	1.646	.118	7.29	6.50	.80	1.77*	.68	.91	- 56
FF "	.650	16.9	+ 5.0	2.424	2.182	.242	5.65	5.17	.48	.48*	.40	.33	+ 34
FM "	.786	12.0	- .5	1.143	1.100	.043	8.85	7.86	.99	1.05*	.90	.82	+ 7
FN "	.977	6.2	- 4.6	1.067	1.013	.054	9.04	8.08	.97	1.03*	.86	1.11	- 68
V 336 "	.864	1.9	- 3.5	.496	.464	.032	10.47	9.45	1.02	1.20	.92	1.81	- 78
V 493 "	.475	.7	- 3.0	.018:	-.030:	.048:	11.67:	10.69:	.98:	.84*	.92:	2.20	- 76
				-.320:	-.273:	-.065:	12.51:	11.29:	1.27:				
V 496 "	.833	356.1	- 8.6	1.300	1.228	.072	8.46	7.54	.92	.48*	.83	.70	- 90
V 600 "	.860	11.6	- 3.9	.324	.380	-.056	10.90	9.65	1.25	1.04*	1.15	1.50	- 80
				-.094	.105	-.210	11.94	10.33	1.64				
η "	.856	8.7	- 14.4	3.161:	2.878:	.283:	3.80:	3.43:	.38:	1.20*	.28:	.24	- 56
RY CMa	.670	193.8	+ 1.6	1.418	1.170	.248	8.17	7.70	.47	1.42	.39	1.23	+ 15
RZ "	.629	198.9	+ .2	.651	.504	.147	10.09	9.36	.73	1.00	.66	1.85	- 20
TV "	.669	194.9	- 1.1	.290:	.210:	.080:	10.99:	10.09:	.90:	.88	.82:	2.23	- 74
TW "	.845	196.8	+ 1.3	.760:	.570:	.190:	9.81:	9.20:	.62:	1.50	.53:	2.46	+ 25
TW Cap	1.456	357.2	- 26.0	.675	.273	.402	10.03	9.97	.07	1.71*	-.09	6.43	- 2700
				-.011	-.228	.190	11.74	11.20	.62				

TABLE 13 (continued)

Name	log P	l	b	log I_B	log I_Y	C	SPg	SPv	SCI	Δm_{pg}	E	r	z
U Car	1.588	256.8	+ .1	2.135	1.955	.180	6.37	5.73	.64	1.95*	.47	1.34	+ 15
V "	.826	242.7	- 11.9	1.350	1.480	-.130	8.32	6.89	1.44				
Y "	.561	253.4	- .2	1.409	1.090	.319	8.19	7.91	.28	.46	.21	1.48	+ 8
SX "	.687	254.4	+ 1.4	1.024	.790	.234	9.15	8.65	.50	.84	.42	1.85	+ 63
UW "	.728	253.2	- 1.7	.838	.642	.196	9.62	9.02	.60	.71	.52	2.04	- 40
UX "	.566	252.5	+ .3	1.453	1.108	.345	8.08	7.87	.22	1.08	.15	1.56	+ 21
UY "	.744	254.8	- 3.2	1.060	.810	.250	9.06	8.61	.46	.99	.38	2.01	- 92
UZ "	.716	254.9	- 2.3	.874	.644	.230	9.53	9.02	.51	.91	.43	2.25	- 66
VY "	1.278	254.3	+ 1.3	1.674	1.501	.173	7.52	6.87	.66	1.59*	.54	1.39	+ 45
WW "	.670	255.9	+ .1	.733	.514	.219	9.88	9.34	.54	1.09	.46	2.40	+ 26
WZ "	1.362	256.9	- 1.1	.971	.775	.196	9.29	8.69	.60	1.90*	.45	4.21	- 42
XX "	1.196	258.8	- 4.8	.208	.309	-.146	11.19	9.83	1.48				
XY "	1.095	259.0	- 3.9	.998	.780	.218	9.22	8.68	.54	2.22	.41	3.31	- 250
YZ "	1.259	253.2	- 1.3	.846	.723	.123	9.60	8.81	.79	1.35	.67	2.32	- 130
AQ "	.990	253.4	- 3.1	1.085	.935	.150	9.00	8.28	.72	1.36*	.58	2.40	- 32
CC "	.678	256.9	- 1.4	.540	.600	-.060	10.36	9.10	1.26				
CN "	.693	251.2	- 1.1	1.007	.820	.187	9.19	8.57	.62	.51	.51	2.21	- 100
CR "	.990	253.3	- .3	-.337	-.420	.083	12.56	11.67	.89	.87*	.81	4.66	- 45
CT "	1.257	255.3	- 2.7	-.687	-.640	-.050	13.43	12.21	1.23				
CY "	.630	257.2	- .8	.272	.133	.139	11.04	10.29	.75	.79	.67	2.99	- 35
DY "	.670	256.5	- .9	-.258	-.270	.012	12.36	11.29	1.07	.50	.96	4.59	+ 20
ER "	.887	257.8	+ 1.4	-.378	-.430	.052	12.66	11.69	.97	.54	.83	8.87	- 330
EY "	.459	255.7	- 2.1	.640	.450	.190	10.11	9.50	.62	.70	.55	2.23	- 10
FI "	1.129	255.5	+ .8	-.138	-.185	.185	11.60	10.97	.63	.83	.55	4.59	- 27
FN "	.661	257.3	- .1	1.856	1.620	.236	7.07	6.58	.50	.44	.40	.90	+ 33
FO "	1.015	258.2	- 2.1	.443	.235	.208	10.61	10.04	.57	.40	.51	2.51	- 64
FR "	1.030	258.8	+ .6	-.340	-.260	-.080	12.56	11.25	1.31	1.30	1.19	2.30	+ 53
GH "	.758	258.6	- .3	-.100	-.225	.125	11.97	11.18	.78	.90	.70	4.23	+ 36
GI "	.646	258.0	+ 2.6	.128	.078	.050	11.39	10.42	.98	.60	.87	3.50	- 91
GX "	.857	249.2	- 2.8	.615	.515	.110	10.17	9.33	.82	.70	.71	2.63	+ 54
GZ "	.619	252.4	- 1.8	.800	.650	.150	9.71	9.00	.72	.38	.63	1.84	+ 12
HK "	.826	257.8	- .5	1.252	.991	.261	8.58	8.15	.43	.45	.36	1.51	+ 83
IT "	.877	259.2	- 1.1	.842	.674	.168	9.61	8.94	.67	1.50	.57	2.13	- 90
l "	1.551	250.7	- 6.8	.369	.230	.139	10.79	10.05	.75	.52*	.68	2.24	- 52
V Cen	.740	284.2	+ 2.8	.163	.103	.060	11.31	10.36	.95				
TX "	1.233	282.9	- 1.2	.398	.268	.130	10.72	9.95	.77	.50	.68	2.90	+ 7
UZ "	.523	262.6	- 1.1	1.217	1.072	.145	8.67	7.94	.73	.40	.63	1.28	- 11
VW "	1.177	275.2	- 2.0	3.024	2.936	.090	4.14	3.27	.87	1.21*	.70	.27	- 30
XX "	1.040	277.3	+ 4.1	1.920	1.668	.252	6.91	6.46	.46	1.09	.38	.74	+ 49
AY "	.725	260.3	+ .3	.218	.295	-.077	11.16	9.86	1.30	1.90*	1.17	2.77	- 7
AZ "	.507	260.5	- .3	-.542	-.170	-.372	13.06	11.00	2.06				
IU "	.521	281.1	+ 4.1	1.178	.900	.278	8.77	8.38	.39	1.11*	.33	1.65	- 9
KK "	1.086	262.0	+ 2.5	.731	.605	.126	9.88	9.11	.78				
KN "	1.532	275.4	- 2.6	.438	.369	.069	10.62	9.69	.93	.99	.80	3.31	- 60
MY "	.570	273.0	+ .8	1.527	1.317	.210	7.89	7.33	.56	1.09	.45	1.41	+ 130
OO "	1.110	274.6	- 1.0	.997	.834	.163	9.22	8.54	.69	1.00	.61	1.47	+ 26
V 339 "	.976	281.1	- 1.1	1.137	.867	.270	8.87	8.47	.41	.56*	.35	1.46	+ 10
V 378 "	.800	273.8	- .1	.915	.720	.195	9.43	8.83	.60				
V 381 "	.706	278.6	+ 3.8	.450	.690	.305	12.85	12.36	.32	1.30	.26	5.65	+ 500
V 419 "	.741	259.8	+ 4.2	-.040	-.120	-.080	11.82	10.92	.90	1.00	.78	5.35	+ 310
V 420 "	1.394	258.8	+ 13.2	.479	.541	-.062	10.51	9.25	1.26	1.30	1.10	2.92	- 81
V 496 "	.646	272.1	+ 1.6	.527	.385	-.142	13.03	11.56	1.47	1.30	1.40	2.04	+ 60
V 399 "	.976	281.1	- 1.1	-.506	-.333	-.173	12.97	11.42	1.55	1.90	1.43	3.30	- 2
V 378 "	.800	273.8	- .1	.937	.875	.062	9.37	8.42	.94	1.02	.83	1.41	- 1
V 381 "	.706	278.6	+ 3.8	1.069	.941	.128	9.04	8.27	.78	.26	.69	1.27	+ 19
V 419 "	.741	259.8	+ 4.2	1.583	1.315	.268	7.75	7.34	.42	.76	.34	1.13	+ 96
V 420 "	1.394	258.8	+ 13.2	1.252	1.031	.221	8.58	8.05	.54	.45*	.46	1.24	+ 110
V 496 "	.646	272.1	+ 1.6	1.072	.913	.159	9.03	8.34	.70				
V 399 "	.976	281.1	- 1.1	.762	.444	.318	9.81	9.53	.29	1.28*	.14	3.96	+ 945
V 378 "	.800	273.8	- .1	.252	.084	.142	11.09	10.36	.74				
V 381 "	.706	278.6	+ 3.8	.505	.405	.100	10.45	9.60	.85	1.00	.78	1.82	+ 80

TABLE 13 (continued)

Name	log P	l	b	log I_B	log I_Y	C	SP_g	SP_v	SCI	Δm_{pg}	E	r	z
AL CrA	1.232	323.5	- 10.8	-.162	-.325	.250	12.13	11.44	.46	1.55*	.33	7.76	- 1260
				-.785	-.765	-.020	13.68	12.52	1.16				
KQ „	1.480	319.9	- 9.1	-.340:	-.510:	.220:	12.57:	11.89:	-.54:	1.50	-.38:	11.32	- 1520
V 347 „	1.186	321.3	- 11.2	-.428:	-.640:	.218:	12.79:	12.23:	-.54:	1.40	-.41:	8.51	- 1440
R Cru	.765	267.3	+ .8	1.966	1.687	.279	6.79	6.41	-.39	1.26*	.30	.87	+ 25
S „	.671	271.1	+ 4.1	2.046	1.762	.284	6.59	6.23	-.37	.71	.29	.70	+ 61
T „	.828	267.2	+ .2	1.924	1.720	.204	6.90	6.32	-.58	.70*	.49	.62	+ 10
X „	.794	270.1	+ 3.5	1.167	1.004	.163	8.79	8.11	.69	.89*	.60	1.25	+ 94
				.811	.778	.033	9.68	8.66	1.02				
SU „	1.109	266.9	- .9	.401	.492	-.091	10.70	9.37	1.34	1.40	1.22	1.61	- 2
SV „	.845	264.5	- .6	-.457	-.452	-.005	12.86	11.74	1.12	1.70	1.03	4.49	+ 14
TY „	.698	265.5	- .4	-.776:	-.736:	-.040:	13.66:	12.45:	1.21	.70	1.13	4.76	+ 33
VW „	.721	268.6	- 1.0	.525	.502	.023	10.40	9.35	1.04	1.00	.96	1.43	- 3
VX „	1.087	268.6	+ 1.3	-.373	-.290	-.083	12.64	11.33	1.32	1.50	1.20	3.96	+ 150
AD „	.806	266.2	+ .3	.027	-.021	.048	11.65	10.66	.98	.80	.89	3.09	+ 55
AG „	.584	269.4	+ 2.8	1.442	1.141	.301	8.11	7.78	-.33	.85	.26	1.35	+ 85
SU Cyg	.585	32.4	+ 1.4	2.027	1.667	.360	6.64	6.47	.18	.86*	.11	.87	+ 29
TX Del	.790	19.1	- 25.5	1.010	.712	.305	9.19	8.86	-.32	1.08*	.23	1.45	- 610
				.575	.460	.106	10.27	9.47	.83				
β Dor	.993	238.5	- 32.3	3.157	2.890	.267	3.81	3.40	-.42	1.07*	.31	.25	- 130
W Gem	.898	165.1	+ 4.9	1.755:	1.575:	.180:	7.32:	6.68:	.64:	1.00	-.54:	.81	+ 50
AP Her	1.017	14.7	+ 6.1	.368	.100	.280	10.80	10.38	-.38	1.17	.27	3.52	+ 430
BB „	.875	11.0	+ 5.4	.487	.342	.145	10.50	9.77	.73	1.10*	.63	2.97	+ 330
RX Lib	1.397	316.2	+ 25.5	-.268	-.412	.204	12.39	11.65	-.58	1.15*	.43	7.94	+ 3590
				-.730:	-.770:	-.005:	13.54:	12.54:	1.12:				
T Mon	1.432	171.3	- 1.1	2.144	1.996	.148	6.34	5.63	.72	1.42*	.57	.86	- 35
SV „	1.183	171.5	- 2.2	1.403:	1.175:	.228:	8.20:	7.69:	-.52:	1.90*	.39:	2.39	- 140
				.643	.713	-.070	10.10	8.82	1.28				
TX „	.940	181.9	+ .7	.068:	-.014:	.082:	11.54:	10.65:	.89:	.70	.79:	3.96	- 31
AC „	.904	189.4	- .4	.433	.352	.081	10.63	9.74	.90	1.05*	.80	2.41	- 61
				.011	.086	-.075	11.68	10.39	1.30				
R Mus	.876	269.6	- 6.9	2.186	1.886	.300	6.24	5.92	-.33	1.25*	.23	.82	- 86
S „	.985	267.1	- 7.8	2.098	1.879	.219	6.46	5.93	-.54	.78*	.43	.64	- 78
				1.786	1.672	.114	7.24	6.43	.81				
RT „	.489	264.1	- 5.4	1.053	.807	.246	9.08	8.61	-.47	.98	.41	1.50	- 120
TZ „	.694	264.2	- 3.2	-.265	-.298	.033	12.38	11.36	1.02	.90	.94	3.60	- 150
UU „	1.066	264.4	- 3.4	.710	.547	.163	9.94	9.26	.69	1.26	.57	3.09	- 140
S Nor	.989	295.3	- 6.3	1.970	1.788	.182	6.78	6.15	.64	.94*	.53	.66	- 58
				1.593	1.563	.018	7.72	6.70	1.06				
U „	1.102	293.3	- 1.0	.720	.788	-.068	9.91	8.63	1.28	1.49*	1.16	1.27	+ 5
				.120	.408	-.288	11.40	9.56	1.84				
RS „	.792	296.7	- 2.1	.448	.405	.043	10.59	9.60	.99	1.30	.90	1.84	- 27
SY „	1.102	295.2	- 1.6	.682	.656	.026	10.00	8.97	1.04	1.80	.92	1.88	- 10
TW „	1.033	298.1	- .6	-.517	-.237	-.280	13.00	11.17	1.82	1.60	1.71	1.94	+ 22
UX „	.378	296.9	- 6.5	-.665:	-1.060:	.395:	13.39:	13.30:	.09:	1.40	.04:	8.95	- 800
GU „	.538	298.2	- 2.6	.246	.222	.024	11.10	10.05	1.04	.50	.98	1.59	- 39
Y Oph	1.234	348.3	+ 8.6	1.898	1.910	-.012	6.95	5.83	1.13	.82*	1.00	.41	+ 71
				1.572	1.715	-.143	7.77	6.30	1.47				
BF „	.609	324.8	+ 7.2	1.690	1.450	.240	7.48	7.00	-.49	1.14	.42	.80	+ 120
RS Ori	.879	164.2	+ 1.8	1.230:	1.035:	.195:	8.64:	8.04:	.60:	1.33	.50:	1.56	+ 14
\times Pav	.957	295.4	- 26.3	3.040	2.687	.361	4.11	3.92	.18	1.25*	.07	.42	- 180

TABLE 13 (continued)

Name	log P	<i>l</i>	<i>b</i>	log <i>I_B</i>	log <i>I_Y</i>	<i>C</i>	<i>SPg</i>	<i>SPv</i>	<i>SCI</i>	Δm_{pg}	<i>E</i>	<i>r</i>	<i>z</i>
X Pup	1.414	203.8	+ .4	1.263	1.104	.159	8.55	7.86	.70	2.00	.55	2.51	- 11
RS "	1.617	220.2	+ .7	1.705	1.655	.050	7.44	6.47	.98	1.76*	.81	1.24	+ 9
ST "	1.276	214.2	- 15.5	.903	.512	.391	9.46	9.37	.10	1.40	-.04	3.96	- 1090
VW "	.632	203.1	+ .6	.030:	-.110:	.140:	11.64:	10.90:	.74:	1.13*	.67:	3.91	- 7
VZ "	1.365	211.1	- 3.0	-.424	-.410	-.014	12.77	11.63	1.14	1.14	2.17	.47	4.39
WW "	.742	205.1	+ 2.1	.844	.654	.190	9.60	8.99	.62	2.17	.47	4.39	+ 120
WX "	.951	209.2	- .3	-.102	-.160	.048	11.97	11.01	.98	1.00	.52:	2.34	- 33
WY "	.720	209.5	+ 3.8	.909:	.726:	.183:	9.44:	8.81:	.63:	1.20	.29	4.55	+ 260
WZ "	.701	209.6	+ 4.5	.460	.175	.285	10.57	10.20	.37	1.20	.29	4.55	+ 260
AD "	1.133	209.6	+ 1.1	.575	.300	.275	10.28	9.88	.40	.90	.32	3.73	+ 250
AP "	.706	223.1	- 4.9	.750	.534	.216	9.84	9.29	.55	2.00	.43	4.00	+ 36
AT "	.825	222.0	- .8	1.652	1.401	.251	7.58	7.13	.46	1.10	.38	.98	- 87
EK "	.419	208.5	+ .2	1.530	1.235	.295	7.89	7.55	.35	1.41*	.26	1.67	- 29
S Sge	.923	22.6	- 7.4	.962	.879	.074	9.30	8.42	.91	1.28*	.28	.58	- 67
U Sgr	.829	341.4	- 5.9	1.948	1.863	.085	6.83	5.95	.89	1.07*	.63	.57	- 46
W "	.881	328.5	- 5.4	2.827	2.523	.304	4.64	4.32	.32	1.22*	.22	.40	- 28
X "	.846	328.9	- 1.2	2.335	2.219	.116	5.86	5.07	.81	1.04*	.30	.32	+ 1
Y "	.761	340.5	- 3.6	2.838	2.560	.278	4.61	4.23	.39	1.04*	.30	.32	+ 1
VY "	1.132	337.8	- 2.5	2.364	2.113	.251	5.80	5.34	.46	1.11*	.37	.47	- 18
WZ "	1.339	339.8	- 2.9	2.300	2.105	.251	5.80	5.34	.46	1.11*	.37	.47	- 18
YZ "	.980	345.4	- 8.6	-.258	-.065	-.193	12.35	10.75	1.60	2.10	1.48	2.33	- 48
AP "	.704	335.8	- 3.9	1.332	1.262	.070	8.38	7.46	.92	1.76*	.78	1.54	- 39
AY "	.818	340.9	- 3.9	1.599	1.444	.155	7.71	7.01	.71	1.10*	.60	.93	- 120
BB "	.822	342.3	- 10.5	1.907	1.628	.279	6.94	6.56	.39	1.27*	.31	.88	- 38
V 350 "	.712	341.4	- 9.4	1.400	1.308	.092	8.21	7.34	.87	1.07*	.63	.57	- 46
V 626 "	1.427	324.8	- 8.6	1.180	1.220	-.040	11.26	10.05	1.21	1.50	1.12	1.80	- 79
V 741 "	1.181	330.6	- 8.5	1.761	1.589	.172	7.30	6.65	.66	.80	.57	.71	- 110
RV Sco	.783	318.1	+ 4.3	1.640	1.417	.223	7.61	7.08	.53	1.00*	.45	.92	- 130
CQ "	1.484	318.2	- 8.0	-.078	-.410	.350	11.92	11.66	.20	1.38*	.05	12.76	- 1590
KQ "	1.458	308.1	- 1.9	-.632	-.840	.140	13.30	12.74	.74	1.07*	.63	.57	- 46
V 446 "	1.457	322.7	- 7.4	1.400	1.308	.092	8.21	7.34	.87	1.07*	.63	.57	- 46
V 470 "	1.201	317.5	- 1.0	1.180	1.220	-.040	11.26	10.05	1.21	1.50	1.12	1.80	- 79
V 482 "	.656	322.9	- 1.2	1.589	1.444	.155	7.71	7.01	.71	1.10*	.60	.93	- 120
V 500 "	.969	326.7	- 2.8	1.907	1.628	.279	6.94	6.56	.39	1.27*	.31	.88	- 38
V 542 "	1.183	317.0	- 8.1	1.400	1.308	.092	8.21	7.34	.87	1.07*	.63	.57	- 46
V 636 "	.832	311.1	- 6.4	1.589	1.444	.155	7.71	7.01	.71	1.10*	.60	.93	- 120
X Sct	.623	346.7	- 3.1	1.907	1.628	.279	6.94	6.56	.39	1.27*	.31	.88	- 38
Y "	1.015	351.6	- 2.4	1.589	1.444	.155	7.71	7.01	.71	1.10*	.60	.93	- 120
Z "	1.116	354.5	- 2.3	1.589	1.444	.155	7.71	7.01	.71	1.10*	.60	.93	- 120
RU "	1.294	355.9	- 1.2	1.589	1.444	.155	7.71	7.01	.71	1.10*	.60	.93	- 120
SS "	.565	352.9	- 3.2	1.589	1.444	.155	7.71	7.01	.71	1.10*	.60	.93	- 120
UZ "	1.169	346.9	- 3.0	1.589	1.444	.155	7.71	7.01	.71	1.10*	.60	.93	- 120
CK "	.870	354.0	- 1.9	1.589	1.444	.155	7.71	7.01	.71	1.10*	.60	.93	- 120
CM "	.593	354.8	- 1.9	1.589	1.444	.155	7.71	7.01	.71	1.10*	.60	.93	- 120
CR Ser	.724	343.9	+ 1.3	1.589	1.444	.155	7.71	7.01	.71	1.10*	.60	.93	- 120
ST Tau	.606	160.9	- 6.6	1.589	1.444	.155	7.71	7.01	.71	1.10*	.60	.93	- 120
SZ "	.498	147.4	- 17.3	1.589	1.444	.155	7.71	7.01	.71	1.10*	.60	.93	- 120

TABLE 13 (continued)

Name	log P	l	b	log I_B	log I_Y	C	SPg	SPv	SCI	Δm_{pg}	E	r	z
R TrA	.530	284.5	— 8.4	1.984	1.692	.292	6.75	6.40	.35	.92*	.29	.67	— 85
S „	.801	289.6	— 9.0	1.614	1.464	.150	7.67	6.96	.72				
U „	.410	290.7	— 8.9	2.139	1.839	.300	6.36	6.04	.33	1.19*	.24	.80	— 110
				1.662	1.535	.119	7.55	6.78	.80				
				1.630:	1.270:	.360:	7.64:	7.47	.18:	1.20*	.13:	1.27	— 170
				1.150:	.950:	.200:	8.84:	8.25:	.59:				
T Vel	.667	233.2	— 3.2	1.391	1.178	.213	8.23	7.68	.56	.93*	.48	1.08	— 59
V „	.641	244.2	— 3.8	1.647	1.369	.278	7.59	7.21	.39	1.10*	.32	1.07	— 66
				1.206	1.084	.122	8.69	7.91	.79				
RY „	1.449	250.3	+ 1.7	1.153	1.095	.058	8.82	7.87	.95	1.21	.80	1.98	+ 73
RZ „	1.310	230.5	— 1.2	1.891	1.677	.214	6.98	6.43	.55	2.00*	.41	1.51	— 34
ST „	.768	236.4	— 4.2	.594	.504	.090	10.23	9.36	.87	.95	.78	1.85	— 130
SV „	1.149	253.8	+ 2.5	1.296	1.096	.200	8.47	7.88	.59	2.02	.47	2.03	+ 110
SW „	1.371	233.8	— 2.3	1.437	1.237	.200	8.12	7.53	.59	2.00*	.44	2.58	— 110
SX „	.980	233.2	— 1.6	1.277	1.062	.215	8.52	7.97	.55	.90	.44	1.80	— 48
XX „	.844	252.6	+ 2.1	.280	.163	.117	11.01	10.21	.80	.98	.71	3.21	+ 150
AE „	.853	243.8	— .2	.378	.308	.070	10.77	9.84	.92	1.10	.82	2.42	+ 1
AH „	.626	230.0	— 6.3	2.374	2.046	.328	5.77	5.52	.26	.48*	.19	.49	— 54
AM „	.876	233.2	— 3.6	— .732:	— .907:	.175:	13.55:	12.90:	.65:	1.00:	.55:	13.81	— 870
AP „	.495	230.6	— .7	.560:	.400:	.160:	10.31:	9.62:	.69:	1.00:	.63:	1.88	— 24
AX „	.414	230.8	— 7.0	1.285:	1.020:	.265:	8.50:	8.08:	.42:	.57*	.37:	1.11	— 140
				1.055:	.870:	.185:	9.07:	8.45:	.63:				
BG „	.840	239.5	— 2.1	1.364	1.288	.076	8.30	7.39	.91	.76*	.82	.71	— 24
				1.059	1.102	— .043	9.06	7.85	1.21				
CX „	.796	240.0	— 2.9	— .171	— .147	— .024	12.14	10.97	1.17	.90	1.08	1.65	— 78
DD „	1.122	239.2	— .9	— .685	— .600	— .080	13.43	12.10	1.31	1.00	1.19	6.05	— 78
DP „	.739	243.1	— 1.0	— .344	— .340	— .004	12.57	11.46	1.11	1.20	1.03	3.55	— 41
DR „	1.049	240.9	+ 1.8	.517	.581	— .064	10.41	9.15	1.27	.70	1.16	1.45	+ 50
EX „	1.122	241.7	— 1.8	— .311	— .228	— .083	12.49	11.17	1.32	1.10	1.20	3.86	— 110
EZ „	1.538	242.6	— 1.9	— .592	— .490	— .102	13.19	11.82	1.37	1.80	1.21	8.43	— 190
FG „	.810	243.1	— .4	— .449	— .374	— .075	12.83	11.54	1.30	.70	1.21	3.19	— 7
W Vir	1.237	289.4	+ 57.6	.747:	.432:	.313:	9.85:	9.56:	.30:	1.53*	.17:	3.50	+ 2990
				.135:	— .035:	.080:	11.38:	10.53:	.90:				
U Vul	.903	23.8	— 1.5	1.609	1.562	.047	7.68	6.70	.98	1.10	.88	.56	— 8

The next two columns give the galactic co-ordinates according to OHLSSON's Tables (1932). In column 5 and 6 the extreme values of log I_B and log I_Y have been tabulated. Values for minimum brightness have been entered on the line below those for maximum. Uncertain values have been marked by a colon. The colour C in the 7th column is the extreme value of (log I_B — log I_Y). In the case that the blue and yellow light-curves are shifted in phase relative to each other, the value of C does not equal the difference between the extreme values of log I_B and log I_Y . In columns 8, 9 and 10 magnitudes and colour index in the Cape S system are given, as derived with the formulae (1) and (2) from the values of columns 5, 6 and 7. The remaining columns will be explained below.

The colours at maximum brightness have been plotted in Figure 11 against the logarithm of the period.

Cepheids of population I have been indicated by

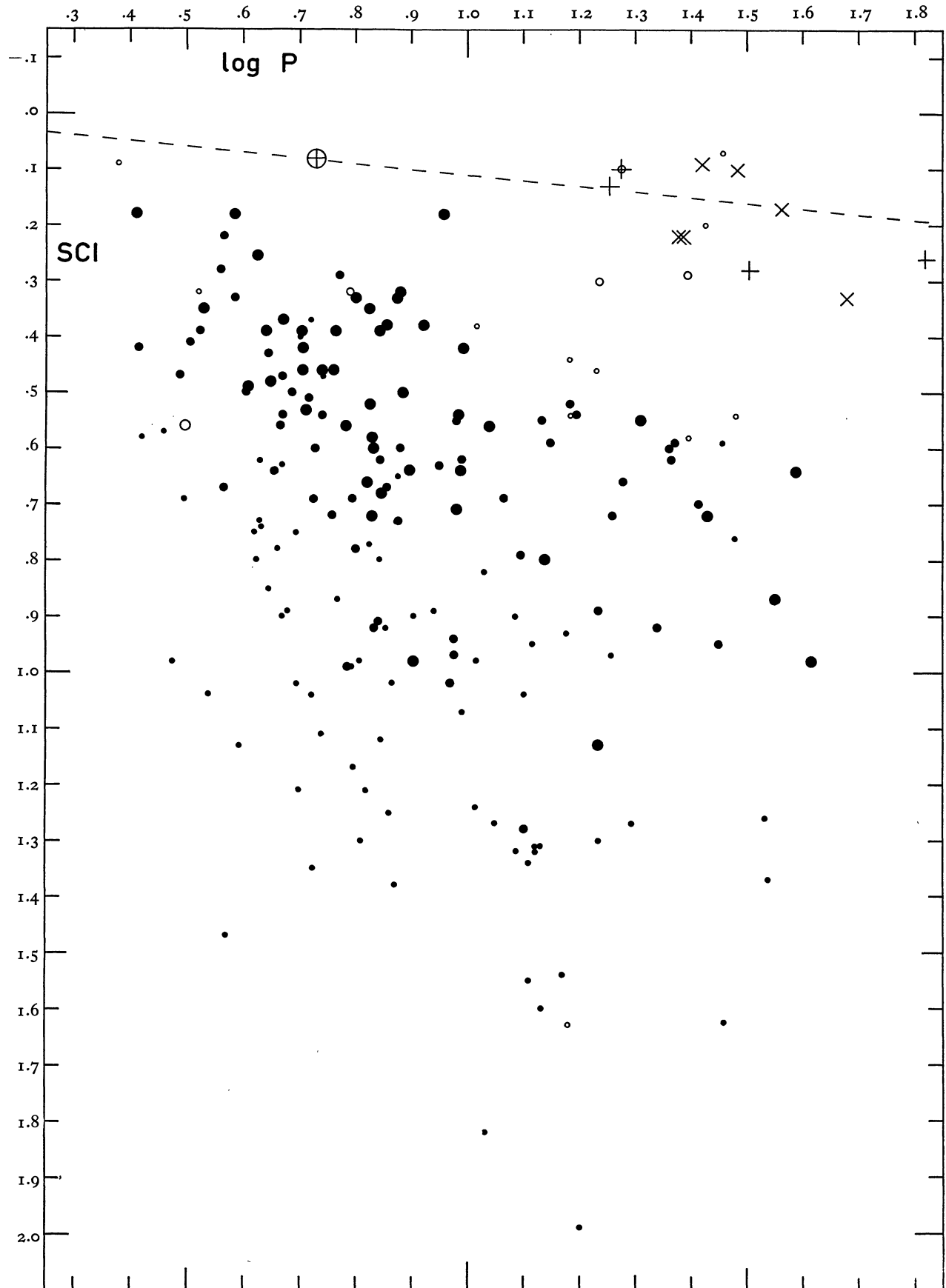
dots, large dots for stars with SPg at maximum brighter than 8, medium dots for stars with SPg at maximum between 8 and 10 and small dots for the fainter Cepheids. The Cepheids of population II have been indicated in a similar way by circles.

As could be expected there is an evident increase in reddening with decreasing apparent brightness. Fur-

Legend to Figure 11.

large dot	: Pop. I Cepheid	SPg max. < 8.0
medium dot	: Pop. I Cepheid	8.0 < SPg max. < 10.0
small dot	: Pop. I Cepheid	SPg max. > 10.0
large circle	: Pop. II Cepheid	SPg max. < 8.0
medium circle	: Pop. II Cepheid	8.0 < SPg max. < 10.0
small circle	: Pop. II Cepheid	SPg max. > 10.0
vertical cross	: Cepheid in Small Magellanic Cloud	
oblique cross	: Cepheid in Large Magellanic Cloud	
circle with cross	: δ Cephei	

FIGURE II



Plot of the observed colour index at maximum against the logarithm of the period

ther it is clear that at least for the stars of population I the Cepheids with short periods are on the average whiter than those with longer periods. The stars of different periods with the smallest values of the colour index fall approximately on a line which runs from $SCI = .05$ at $\log P = .3$ to $SCI = .75$ at $\log P = 1.85$. This effect is at least partially due to the fact that the average distance of the variables with long periods is larger than that for the Cepheids with short periods, as their absolute brightness is so much greater than for the stars in the left-hand side of the figure. It is a very important and difficult question which part of this phenomenon is due to systematic differences in interstellar reddening and which part is due to a real difference in the intrinsic colours of Cepheids of short and long periods.

In this respect the position of the Cepheids of population II in Figure 11 is most interesting. The majority of these stars has a colour index smaller than that of the Cepheids of population I with equal period. Some of these population II Cepheids are very white, although they are nearly all fainter than the 10th magnitude at maximum. The whitest stars among them are:

Name	$\log P$	$SPg(\max)$	$SCI(\max)$
TW Cap	1.456	10.03	.07
UX Nor	.538	11.10	.09
V 626 Sgr	1.427	11.92	.20
ST Pup	1.276	9.46	.10
x Pav	.957	4.11	.18

These data suggest that the intrinsic colour of the population II Cepheids at maximum cannot be much larger than $SCI = .10$, as one even would expect some reddening for Cepheids as faint as the 10th magnitude. For the five stars listed above we do not find any systematic change in colour with period. It should be kept in mind however that the classification of UX Nor as a population II object is based only on the large range of the light-variation.

By the courtesy of Dr GASCOIGNE we obtained the colours of 10 Cepheids in the Magellanic Clouds expressed in the $(P, V)_E$ system. These data have been tabulated below.

	$\log P$	$CI_E \max.$	$SCI \max.$
S.M.C.	1.254	.28	.13
	1.276	.26	.10
	1.504	.40	.28
	1.818	.39	.26
L.M.C.	1.379	.35	.22
	1.387	.35	.22
	1.421	.25	.09
	1.483	.26	.10
	1.563	.31	.17
	1.680	.44	.33

In order to transfer these colours into the Cape S system we need the relation between CI_E or $(P - V)_E$ and SCI . Equation (7) of section 8 gives the relation between $(P - V)_E$ and $(\log I_B - \log I_Y)$. The difference between the relations (1) and (2) of section 5 yields:

$$\log I_B - \log I_Y = +.424 - .389 SCI.$$

Eliminating $(\log I_B - \log I_Y)$ from this last equation and equation (7) we find:

$$SCI = -.216 + 1.233 (P - V)_E.$$

This formula gives the colours in the Cape system as shown in the last column of the small table given above. These values have been plotted in Figure 11 and have been indicated by crosses. The average colour index at maximum for these ten stars is $+ .19$.

This value of the colour index can be considered as the intrinsic colour of the galactic Cepheids of similar periods if the two following conditions are fulfilled: *a*) the Cepheids in the Magellanic Clouds have the same properties as the galactic Cepheids, *b*) the Cepheids in the Magellanic Clouds are not reddened by interstellar absorption. As to *a*) there is little observational evidence for systematic differences between galactic and Magellanic Cloud Cepheids, although according to SHAPLEY and MCKIBBEN NAIL (1952) the frequency curve of the periods in the Small Magellanic Cloud differs significantly from that in the galactic system. But since the discovery by THACKERAY and WESSELINK (1953) of RR Lyrae-type variables in some globular clusters of the Magellanic Clouds it seems practically certain that the Magellanic Cloud Cepheids have the same absolute magnitudes as the galactic Cepheids and that they belong to population I. We shall assume here that there exists no difference in the intrinsic colours. Item *b*) is more difficult to decide. For the Small Magellanic Cloud, with a galactic latitude of -45° , it may well be true that reddening is negligible. But for the Large Cloud with a galactic latitude of -33° this assumption is not so certain, as was pointed out by Dr GASCOIGNE. Dr GASCOIGNE drew attention to the fact that the bright galactic Cepheid β Dor, which has the same galactic latitude as the Large Cloud and which is only six degrees distant from the centre of the Cloud, is redder than any of the Cepheids in the Cloud. However, he mentions that Mr RODGERS found some evidence that this variable may be anomalous. We conclude that the average colour index of $SCI = + .19$ for the ten Cepheids in the Magellanic Clouds must be considered as a maximum value for the intrinsic colours of Cepheids of similar periods.

The five Cepheids of population II with the smallest colour index which have been listed above give a mean colour index of $SCI = + .13$. But in this

case we have no certainty at all that the intrinsic colours are the same as for the Cepheids of population I. Some years ago GASCOIGNE and KRON (1953) have already noticed that the colours of some population II Cepheids are very nearly the same as for the Cepheids in the Small Magellanic Cloud. And ARP (1955) has proved that the Cepheids in globular clusters are very blue and that the colour of these stars depends very little on the period. Finally we have plotted δ Cephei in Figure 11 by a cross and circle. In his first article on Cepheids EGGEN considered δ Cephei as unreddened. Since the revision of the luminosities of Cepheids this assumption has become very doubtful. So HARRIS (1956) derived a total visual absorption for δ Cephei of about .4 magnitude. From a typescript of a paper by CODE on the normal colours of galactic Cepheids we learned that CODE derived a colour-excess of $^m.06$ in the (P, V) system for this bright variable by means of a study of the absorption for neighbouring B-type stars. GASCOIGNE and EGGEN (1957) derived a colour-index of $+ .34$ for δ Cephei in their latest paper. They assume the colour-index $+ .24$ as the most probable value after correction for absorption. This corresponds with a value of $+ .08$ in the SCI system.

If we would have to determine the intrinsic colours of Cepheids at maximum from Figure 11 alone, we could adopt a value of $SCI = + .10$ for all periods. But from the work of CODE we know that there seems to be a slight progress in spectral type with period. CODE determined the spectral type of some galactic Cepheids (1947). Later FEAST (1956) derived spectral types at maximum for a number of Cepheids in the Magellanic Clouds. From the combined results it is evident that the spectral type varies with $\log P$ from F5 to early G for the stars with very long periods. Consequently we have adopted the following relation between intrinsic colour and period:

$$SCI_{max} = + .01 + .10 \log P,$$

which has been represented in Figure 11 by a broken line. This equation differs very little from the one adopted by GASCOIGNE and EGGEN, viz.: $(P - V)_E = + .10 + .13 \log P$. Using the relation between $(P - V)_E$ and SCI this last equation can be written as: $SCI = - .09 + .16 \log P$. For the short periods our relation gives a slightly larger colour index than that used by GASCOIGNE and EGGEN, but the difference is certainly well within the uncertainty of the various assumptions made. STIBBS (1955a) has derived the relation:

$$P - V = + .17 + .18 \log P.$$

STIBBS computed the reddening of the Cepheids by means of a model of the reddening medium, which gives the colour excesses of B stars as a function of distance and galactic co-ordinates. According to his

Figure 2 this relation yields colours for the Cepheids with long periods which are about $^m.15$ redder than those observed for the Cepheids in the Small Magellanic Cloud. If we reduce the $(P - V)$ values to SCI with the same formula used for $(P - V)_E$, STIBBS' relation becomes: $SCI = - .01 + .22 \log P$, which gives somewhat larger colour indices for stars with long periods than our formula.

Our formula yields intrinsic colours at maximum brightness varying from $+ .04$ to $+ .18$ in the Cape S system. One may ask whether these values are reasonable for stars with spectral types from F5Ib to F8Ib.

In section 9 we discussed the measures of five bright stars. In connection with U TrA we measured two other bright stars, namely ι^2 and κ Nor. The results of these measures are:

ι^2 Nor, Sp. Ao			κ Nor, Sp. Ko			
$\log I_B$	$\log I_Y$	$\Delta \log I$	$\log I_B$	$\log I_Y$	$\Delta \log I$	
2.568	2.020	+ .548	2.372	2.289	+ .083	
2.565	2.010	+ .555	2.346	2.270	+ .076	
2.568	2.015	+ .553	2.366	2.286	+ .080	
mean	2.567	2.015	+ .552	2.361	2.282	+ .080

Using also the measures of Table 1 from OOSTERHOFF's note in *B.A.N.* 12, 271 (No. 460), 1955 we have measures for 7 Ao and for 12 F-type stars. The magnitudes and colours in the Cape S system of these 19 stars are as follows:

	SP_g	SP_v	SCI	
Sp. Ao	109 Vir	3.49	3.78	-.29
	ι^2 Nor	5.27	5.62	-.35
	E8 1	7.51	7.88	-.37
	E8 2	7.61	8.04	-.43
	E8 3	8.50	8.81	-.31
	E8 45	5.30	5.63	-.33
E9 1	7.82	8.09	-.27	
	mean			-.34
Sp. Fo	E8 11	7.67	7.74	-.07
	E9 6	8.91	8.94	-.03
	mean			-.05
Sp. F2	E8 13	7.84	7.69	+ .15
	E9 7	7.63	7.56	+ .07
	mean			+ .11
Sp. F5	E8 15	8.26	8.09	+ .17
	E8 17	9.32	9.17	+ .15
	E8 18	9.48	9.35	+ .13
	E8 19	9.72	9.50	+ .22
	E9 11	8.34	8.17	+ .17
	mean			+ .17
Sp. F8	E6 22	8.45	8.15	+ .30
	E8 21	9.12	8.84	+ .28
	E9 16	10.61	10.46	+ .15
	mean			+ .24

As the galactic latitudes of the E -regions 8 and 9 are -33° and -45° respectively we cannot expect any serious reddening for the stars in this table. We conclude that the intrinsic colours adopted for the Cepheids are not inconsistent with the colours derived for other F-type stars.

With the aid of the adopted intrinsic colours we have computed the colour excess, E , for all the Cepheids of Table 13. The values of E are given in the 11th column of that table. We have made no distinction between Cepheids of the two populations, although for some Cepheids of population II the observed colour indices are so small that the intrinsic colour probably deviates from the colour predicted by our formula.

12. The conversion of colour excess to total absorption

Before we can apply the photographic period-luminosity relation to derive the distances of the individual Cepheids, we have to know the ratio between the colour excesses which were derived above and the total photographic absorption. This ratio has been studied by many authors. Some of these determinations we shall discuss here shortly and we shall try to adapt them to the photometric system of the colour excesses used in this paper.

OORT (1938) discussed several methods and adopted the value $A_{pg}/E_1 = 9$, in which the colour excess is expressed in the colour system of STEBBINS and HUFFER (1934). STEBBINS, HUFFER and WHITFORD (1943) derived the same ratio from multicolour photometry of B-type stars. According to MORGAN, HARRIS and JOHNSON (1953) the colours C_1 from STEBBINS and HUFFER are related to the colours in the (B, V) system from JOHNSON and MORGAN by the equation: $C_1 = -.144 + .483 (B - V)$. The ratio between the colours $(B - V)$ and the colours in the Cape S system, SCI , is .85 according to STÖY (1956) and .89 according to our formula (15'). If we adopt the value .87, the ratio between the total photographic absorption and the colour excess in the SCI system becomes:

$$A_{pg}/E_{SCI} = 3.8.$$

GREENSTEIN and HENYÉY (1941) derived a somewhat smaller value, namely $A_{pg}/E_1 = 8.1$. This value corresponds with:

$$A_{pg}/E_{SCI} = 3.4.$$

From a study of the absorption in the Andromeda nebula STEBBINS (1950) derived the relation $A_{pg}/E_{int.} = 4.0$. The relation between the colours in the international system and the Cape colours has been given by STÖY (*l.c.*). Applying this relation we find:

$$A_{pg}/E_{SCI} = 3.7.$$

MORGAN, HARRIS and JOHNSON (1953), HILTNER and JOHNSON (1956) and BLANCO (1956) have all adopted the ratio $A_v/E_{(B-V)} = 3.0$. Reduced to the SCI colour-system the ratio becomes $A_v/E_{SCI} = 2.6$, and from this we find for the total photographic absorption:

$$A_{pg}/E_{SCI} = 3.4.$$

Finally we may mention that GASCOIGNE and EGGEN in their article on "Cepheid variables and Galactic Absorption" have adopted the ratio $A_{pg}/E_{(P-V)} = 4.0$. In this case however we have the difficulty that the coefficient in the relation between the $(P - V)$ colours and the $(B - V)$ colours in our equation (16) differs so much from the coefficient given by EGGEN in equation (16'). The two different values of this coefficient yield the following two values of the ratio required:

$$A_{pg}/E_{SCI} = 3.2 \text{ and } A_{pg}/E_{SCI} = 3.6, \text{ respectively.}$$

For this article we shall use the ratio:

$$A_{pg}/E_{SCI} = 3.5,$$

which seems to be a fair compromise between the values discussed above.

13. The period-luminosity relation

For the slope of this relation we have used the co-ordinates given by SHAPLEY (1940). His relation can be represented accurately by two linear formulae for values of $\log P$ smaller and larger than 1.0 respectively. These formulae are:

$$\begin{aligned} \dot{M}_{pg} &= -.34 - 1.68 \log P \quad (P < 10^d) \text{ and} \\ \dot{M}_{pg} &= +.03 - 2.05 \log P \quad (P > 10^d). \end{aligned}$$

According to BLAAUW and MORGAN (1954) the zero-point of SHAPLEY's relation needs a correction of -1.4 magnitude. The authors estimate the part of the probable error of $\pm .3$ of this correction which is due to the uncertainty in the adopted absorption alone to be $\pm .2$. For 9 of the 18 Cepheids used they based the adopted colour excess on measures by EGGEN. But it has now been proved that the intrinsic colours used by EGGEN are too red and consequently the absorption derived is too small. In their article on "Cepheid Variables and Galactic Absorption" GASCOIGNE and EGGEN have shown that recent photo-electric determinations of the colour excess of 17 out of the 18 Cepheids used by BLAAUW and MORGAN yield a considerably larger absorption and consequently a larger correction to the zero-point of SHAPLEY's period-luminosity relation. For this paper

we shall adopt a zeropoint correction of -1.7 and we shall use the following period-luminosity relation:

$$\begin{aligned} M_{pg} &= -2.04 - 1.68 \log P \quad (P < 10^d) \text{ and} \\ M_{pg} &= -1.67 - 2.05 \log P \quad (P > 10^d). \end{aligned}$$

The absolute median photographic magnitudes derived from these equations differ very little from those adopted by GASCOIGNE and EGGEN.

This relation is only valid for galactic Cepheids of population I. For the Cepheids of population II the absolute magnitudes are probably even more uncertain. From the work by ARP (1955) and others it seems to be beyond doubt that the population II Cepheids are less luminous than the ordinary galactic Cepheids. In the present paper we shall adopt absolute median magnitudes for the population II Cepheids which are 1.5 magnitude fainter than for the galactic Cepheids with the same period.

With the colour excess derived in section 11, the ratio between colour excess and total photographic absorption discussed in section 12, and with the period-luminosity relation given above, the distances of the individual Cepheids could be determined, if the median photographic magnitudes were known. However this quantity can be derived from the photometric data of Table 13 for those Cepheids only for which the magnitude has been measured at maximum as well as at minimum brightness, but the number of variables for which this information is available is small.

If the relation between the range of the light-curve in blue light and $\log P$ which we derived in section 10, namely: $\Delta SPg = +.32 + .91 \log P$, were strict, we could transfer the period-luminosity relation derived above into a relation between the period and the photographic magnitude at maximum. But we have shown in section 10 that the mean deviation from the period-range relation is as large as $\pm .30$ magnitude and therefore we would introduce considerable accidental errors in the distances if the relation between range and period would be applied as it stands. The reduction from maximum magnitude to median magnitude equals half the range and by applying our formula we would therefore introduce a dispersion of $\pm .15$ magnitude, which would produce a dispersion in the distances of about 7 per cent. In this connection it should be emphasized that little is known about the true deviations from the period-luminosity relation. It seems most unlikely that the dispersion in this relation as shown in Figure 1 of SHAPLEY's paper quoted above is due to observational errors alone or to the combined effect of observational errors and differences in space absorption. Also we do not know of any theoretical arguments which would make us expect that the intrinsic median magnitudes of Cepheids with the

same period but with different ranges of the light-curve would show no dispersion. The dispersion in SHAPLEY's figure may be estimated to be of the order of $\pm .25$ magnitude, which would produce a dispersion in the distances of about 11 per cent. This last dispersion we cannot avoid, but we have tried to reduce the dispersion caused by the differences in range. We have therefore investigated the question whether the determination of the median magnitudes for the Cepheids for which we have only a magnitude at maximum could be improved by making use of the ranges published in the *General Catalogue of Variable Stars*.

For 71 Cepheids of our main table we can use photo-electrical ranges, determined in this paper or by EGGEN, GASCOIGNE and BURR. We have compared these accurate determinations with the values of the range as given in the *General Catalogue*. The comparison is rather unsatisfactory, as we find a mean error of $\pm .30$ magnitude for the range as published in the *General Catalogue*. This mean error, due to observational errors, therefore is as large as the dispersion from the relation we derived above between range and period. Consequently we cannot improve the determination of the median magnitudes by making use of the ranges given in the *General Catalogue* and we decided to compute the median magnitude with the aid of our relation:

$$\Delta SPg = +.32 + .91 \log P.$$

Only for the Cepheids for which photo-electric measures of the range have been observed did we use the actually observed median magnitudes. In Table 13 the light-range has been given in column 11. Photo-electric observations have been indicated by an asterisk, the other values were taken from the *General Catalogue of Variable Stars*. Values from this catalogue which were given for visual light have been multiplied with the factor 1.67.

In deriving the median magnitudes we have made no distinction between the Cepheids of the two populations. The distances of the individual Cepheids expressed in kiloparsecs have been given in the 13th column of Table 13. For the few stars with negative colour excess, we have adopted a colour excess of zero. For the two Cepheids CQ Sco and V 446 Sco distances of 19.4 and 26.1 kpc are found, if we assume these variables to belong to population I. As the galactic latitudes are $-8^\circ.0$ and $-7^\circ.4$ respectively, it seems practically certain that we should consider them as variables of population II. The distances given in Table 13 are based on this assumption.

14. The spatial distribution of the Cepheids

For all the Cepheids in Table 13 we have first computed the distance z from the galactic plane. We

did not use the values of the galactic latitude given in the fourth column of Table 13, which were computed with OHLSSON'S tables, but we have adopted the new galactic pole derived by WESTERHOUT (1957, page 219) from the collected Dutch measures of the interstellar hydrogen emission at 21 cm. The co-ordinates of this pole in OHLSSON'S system are:

$$l_p = 322^\circ \quad \text{and} \quad b_p = 88^\circ.56.$$

The values of the z co-ordinate have been given in the fourteenth column of Table 13. Practically without exception all the Cepheids which we have classified so far as belonging to population II have very large values of this co-ordinate. But there are a few more stars at rather great distances from the galactic plane, which probably have not yet been recognized as members of population II. It may be useful to list here all the Cepheids of our catalogue which belong or may belong to this population¹⁾ (see table in facing column).

For the stars marked by an asterisk in the last two columns the computation of the distance r and of the z co-ordinate was made on the assumption that these variables belong to population I. If they belong to population II the values of both r and z would have to be halved. The evidence that the variables CT Car, KK Cen, BB Her and V 741 Sgr should belong to population II is weak. For a more definite classification accurate light-curves and spectroscopic information would be required. However in the following

Star	log P	$SPg(\max)$	E	r	z
		m	m	kpc	pc
T Ant	.771	9.20	.20	3.15*	+ 640*
TW Cap	1.456	10.03	-.09	6.43	-2700
CT Car?	1.257	12.66:	.83:	8.87*	- 330*
IU Cen	.521	12.85	.26	5.65	+ 500
KK Cen?	1.086	11.82	.78	5.35*	+ 310*
V 420 Cen	1.394	9.81	.14	3.96	+ 945
AL CrA	1.232	12.13	.33	7.76	-1260
KQ CrA	1.480	12.57:	.38:	11.32	-1520
V 347 CrA	1.186	12.79:	.41:	8.51	-1440
TX Del	.790	9.19	.23	1.45	- 610
AP Her	1.017	10.80	.27	3.52	+ 430
BB Her	.875	10.50	.63	2.97*	+ 330*
RX Lib	1.397	12.39	.43	7.94	+3590
UX Nor	.378	13.39:	.04:	8.95	- 800
ST Pup	1.276	9.46	-.04	3.96	-1090
V 626 Sgr	1.427	11.92	.05	12.76	-1590
V 741 Sgr?	1.181	12.68	1.50	1.39	- 170
CQ Sco	1.484	12.99:	.60:	9.73	-1100
V 446 Sco	1.457	13.10	.43	13.06	-1350
V 542 Sco	1.183	13.11	.31	11.64	-1360
SZ Tau	.498	6.96	.50	2.34	- 750
AM Vel	.876	13.55:	.55:	13.81*	- 870*
W Vir	1.237	9.85:	.17:	3.50	+2990

discussion of the Cepheids of population I we shall omit the stars from this table.

We have grouped the Cepheids of population I of our Table 13 according to distance and for each group we have computed the dispersion in the z co-ordinates and the mean value \bar{z} . The results are as follows:

	$r < 1.0$	$1.0 < r < 2.0$	$2.0 < r < 3.0$	$3.0 < r < 4.0$	$4.0 < r < 5.0$
number	43	58	33	15	11
\bar{r}	.67	1.52	2.40	3.50	4.44
\bar{z}	-37	-10	-36	- 19	+ 18
σ_z	± 68	± 67	± 57	± 130	± 115

Up to a distance of 4 kpc there is no systematic change in z . The result from the last group has very little weight as it contains eleven stars only and furthermore the dispersion in the last two groups is considerably larger than in the first three groups. The average value of \bar{z} computed with weights proportional to the number of stars in each distance group is -21.1 pc. We shall try to derive the true dispersion in the z co-ordinate, not affected by the errors of observation, and the best value of \bar{z} .

If the accidental photometric errors, viz. the errors of observation, the errors involved in the derivation of the median magnitude and in the period-luminosity relation, etc. are assumed to be independent of the distance of the variables, the mean errors of the distances derived are proportional to these distances. Therefore we can write: $\mu_r = \alpha r$. We can make only a rough estimate of this constant α , which depends

directly on the photometric errors. The largest errors are probably due to the period-luminosity relation and to the reduction of the magnitude at maximum to median magnitude. If we adopt mean errors of $\pm^{m.25}$ and $\pm^{m.15}$ respectively for these two types of errors, we find $\alpha = .15$. From the relation $z = r \sin b$ it is easily derived that $\mu_z = \alpha z$. Therefore the mean error of the z co-ordinate is proportional to z itself and is independent from the distance r . The fact that we derived above larger dispersions for distances over 3 kpc can therefore not be explained by the errors of observation. However this increase in dispersion with increasing distance can be understood as follows. In the first place it has been proved by WESTERHOUT (1957, Figure 7) and by KERR, HINDMAN and STAHR CARPENTER²⁾ that the layer of interstellar atomic hydrogen is not really flat and that spiral arms, especially in the outer parts of the galactic system, may deviate considerably from the mean galactic plane.

¹⁾ EGGEN, GASCOIGNE and BURR conclude that α Pavonis also may belong to population II.

²⁾ To be published in *Nature*.

Further, Cepheids at a distance of several kiloparsecs suffer so much interstellar absorption that their apparent magnitude can easily be too faint to be included in our observing programme, which did not include many Cepheids fainter than 12^m . For stars at some distance from the galactic plane the interstellar absorption will be less and therefore the fainter stars from our programme will have systematically larger values of z than the brighter Cepheids.

In the computation of \bar{z} the value of the dispersion should therefore be taken into account. The mean value of z computed from the five groups with weights proportional to n/σ^2 is:

$$\bar{z} = -23.9 \text{ pc.} \\ \pm 5.5 \text{ (m.e.)}$$

This value differs very little from the result derived by WESTERHOUT (1957, page 219), who found a value of $+26 \pm 7$ pc for the distance of the sun from the galactic plane. It certainly is interesting that the observations of Cepheids in the southern hemisphere so completely confirm the position of the galactic equator derived from the interstellar gas in the northern hemisphere.

As the value of the dispersion in the first three distance groups is about the same we shall consider the value derived from these groups combined as the best value of the observed dispersion. We find:

$$\sigma_z \text{ (observed)} = \pm 65 \text{ pc.}$$

The true dispersion must be smaller as our value is still affected by the errors of observation. We have found above that the observational mean error in z is proportional to z . If we adopt a Gaussian partition function with dispersion σ for the true z -values and a similar function for the errors of observation with a dispersion αz , the partition function of the observed z -values is:

$$\frac{1}{2\pi\sigma} dz \int_{-\infty}^{+\infty} e^{-\frac{z'^2}{2\sigma^2}} \cdot e^{-\frac{(z-z')^2}{2\alpha^2 z'^2}} \frac{dz'}{\alpha z'}.$$

Computing the second moment of this function we find:

$$\overline{z^2} = \sigma^2 \text{ (observed)} = \sigma^2 (1 + \alpha^2).$$

We adopted the value .15 for α and consequently the reduction of the observed dispersion to the true dispersion is negligible. From the dispersion given above it follows that only about 12 percent of the Cepheids have distances from the galactic plane larger than 100 pc.

Next we have investigated the total photographic absorption per kiloparsec. Dividing the Cepheids in groups according to distance we find:

	$r < 1$	$1 < r < 2$	$2 < r < 3$	$3 < r < 5$
n	42	58	33	26
$\frac{\Sigma 3.5 E}{\Sigma r}$	2.46^m	1.68	1.08	.70
$\frac{3.5 \bar{E}}{r}$	2.76	1.68	1.09	.72

The decrease of the total absorption with distance is very strong. It is difficult to say whether this can be fully explained by the influence of selection described above, especially as the decrease sets in very clearly at a distance of only one kiloparsec. An ordinary Cepheid with $M = -3.5$ and at a distance of 1000 parsecs has an apparent magnitude of 6.5 if there is no absorption. With an absorption of $2^m.5$ as derived from the nearest Cepheids the apparent magnitude would be $9^m.0$. Stars of this brightness have certainly not been missed in our programme. The effect of the selection becomes serious at a distance of about 2 kpc. A Cepheid at this distance with $M = -3.5$ and with an absorption of 4^m would have an apparent magnitude of 12^m and beyond this magnitude our programme is certainly not complete. But there exists a discrepancy in the value of the dispersion in z for distances between 2 and 3 kpc, which is not larger than that for the nearer Cepheids, and the total absorption per kiloparsec, which for distances between these limits is considerably smaller than for the Cepheids at smaller distances. We shall see below that the spatial distribution of the Cepheids is far from uniform and that Cepheids at a certain distance occur at special longitudes only, especially when the distance is large. Consequently the influence of transparent and obscured regions of the Milky Way may differ considerably for the four distance groups of our table.

In her article on southern early-type stars Miss HOFFLEIT (1956) remarks in point 7 of the summary: "In Sagittarius both the colour excess and the intensity of the K-line are found to increase with distance. In Carina and the H II regions no correlation between distance and colour excess is indicated. All three types of regions show some correlation between distance and the K-line intensity, but the relation is not the same in all three". It is interesting to see that the colours of the Cepheids lead to the same conclusion. The galactic Cepheids in the constellation Carina and those with longitudes between 320° and 0° were arranged according to distance and divided into four groups. The mean values of distance and colour-excess for these groups are as follows (see table on following page).

It is seen that in the Carina region the colour excess is practically constant up to a distance of 4 kpc. In

Carina			$320^\circ < l < 0^\circ$		
n	\bar{r}	\bar{E}	n	\bar{r}	\bar{E}
9	1.17	.45	7	.48	.52
8	2.07	.53	8	.83	.53
8	2.46	.65	8	1.45	1.12
8	4.01	.68	7	2.09	1.16

Sagittarius however the colour excess is about proportional to the distance. As we shall see below, we probably are looking along a spiral arm in Carina, whereas in Sagittarius the line of sight passes two spiral arms more or less at right angles.

We can make a check on our distances by computing OORT's constant A for the differential galactic rotation. We have limited this investigation to the radial velocities determined by STIBBS (1955*b*), who gave velocities for 52 of the Cepheids of our list. His radial velocities have first been corrected for standard solar motion: $V_\odot = 20$ km/sec, $A_\odot = 270^\circ$ and $D_\odot = +30^\circ$. These corrected velocities are given as V'_r in the seventh column of Table 14 on page 127. In the fifth column of the same table we have given the value of $r \cos^2 b \sin 2(l - l_0)$, in which r was taken from Table 13, while l_0 was assumed to be 327° . The value of A was then solved from the equation:

$$V'_r = A r \cos^2 b \sin 2(l - l_0).$$

Using all the 52 stars we derived the value

$$A = +17.0 \text{ km/sec/kpc.} \\ \pm 2.3 \text{ (m.e.)}$$

The dispersion in the radial velocities was found to be ± 13 km/sec. Two stars give very large residuals, namely κ Pavonis and V Velorum. The first of these two Cepheids is rather anomalous. We have seen above that EGGEN, GASCOIGNE and BURR believe that it belongs to population II. V Vel seems to be a very normal Cepheid and we find no reasons to omit this variable from the solution. A solution without κ Pav yields the results:

$$A = +17.4 \text{ km/sec/kpc} \quad \text{and} \quad \sigma = \pm 11.9 \text{ km/sec.} \\ \pm 2.1 \text{ (m.e.)}$$

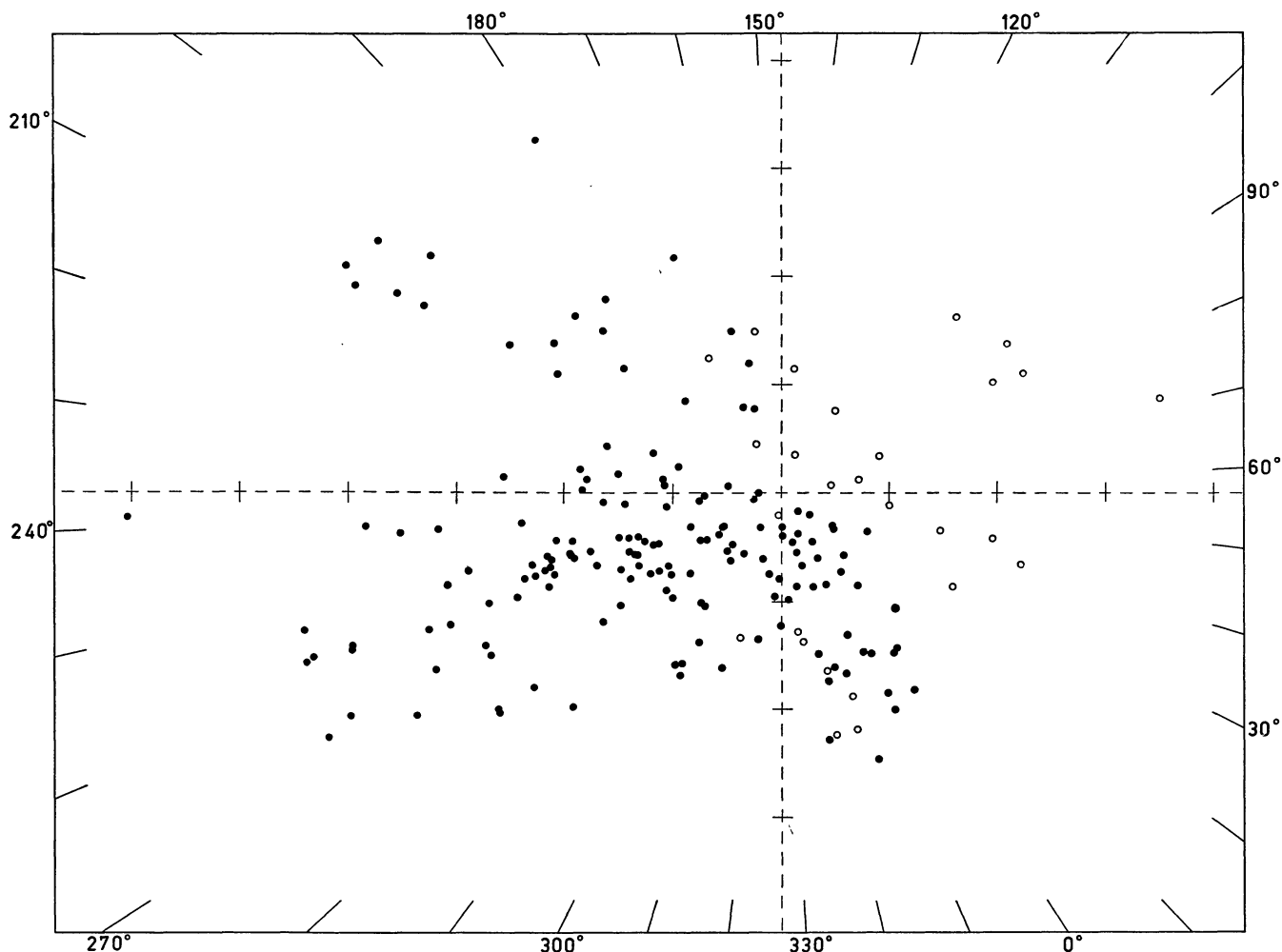
The residuals ($O - C$) are given in the last column of Table 14. This value of A agrees reasonably well with other determinations. According to MORGAN and OORT (1951) the best value of A as derived from proper motions is $+20$ km/sec/kpc ± 2 (m.e.), whereas the average value derived from radial velocities in combination with secular parallaxes for stars with strong galactic concentration is $+19$ km/sec/kpc ± 2 (m.e.) according to these authors. Our value does not deviate significantly from the other deter-

minations, which may be considered as an indication that our system of distances is about correct, at least to a distance of about 2 kpc.

We shall now discuss the spatial distribution of the galactic Cepheids in more detail. The projection of the galactic Cepheids on the galactic plane is shown in Figure 12. The aggregates of high-luminosity stars of classes O — A, investigated by MORGAN, WHITFORD and CODE (1953) have been indicated in the figure by open circles. The markers on the two lines through the sun indicate distances of one kiloparsec. The clearest feature of this diagram is the concentration of Cepheids in the direction $l = 250^\circ - 270^\circ$. Many of these Cepheids belong to the constellation of Carina. That many Cepheids of very different apparent magnitudes are present in this interval of longitude is explained by the fact that the line of sight from the sun follows the Carina spiral arm for three or four thousand parsecs. At a distance of four kiloparsec the number of Cepheids decreases rapidly on account of the magnitude limit of our programme and it becomes difficult to trace this spiral arm any further. But when we follow this spiral arm to the neighbourhood of the sun, the situation becomes rather interesting. Although at longitudes from 250° to 320° no Cepheids are found at a distance from the sun of about one kiloparsec, it seems clear that the Carina spiral arm passes along the sun between longitudes from 260° to 20° at a distance of only .6 or .7 kpc. Many of the Cepheids in this region belong to the constellation of Sagittarius, but this rich group of Cepheids does not belong to the spiral arm to which SCHMIDT (1957) has given the name Sagittarius arm. We shall discuss this arm below.

It has been proved by many investigations that the sun is situated just outside or on the border of the Orion arm, which at a longitude of 150° passes the sun at a distance of about 600 pc. Therefore if the Cepheids are concentrated in the spiral arms, which seems almost certain, the sun seems to be situated more or less in between the Orion and the Carina arms. As we have no Cepheids in our catalogue with longitudes beyond 20° it is difficult to say what happens to this arm at higher longitudes. The four associations I Vul and I, II and III Cyg seem to form a continuation of this arm, but according to Plate B by SCHMIDT (1957) the arm seems then to come to an end somewhere in between the Orion and the Sagittarius arm. In the article on southern early-type stars mentioned already above, Miss HOFFLEIT draws attention to the fact that the early-type stars of high luminosity in the direction of Carina seem to show concentrations at distances of 1.2 and 2 kpc with less well defined concentrations at still larger distances. This effect is clearly shown in her Figure 5. Although the distances do not agree exactly we find similar con-

FIGURE 12



Projection of the galactic Cepheids on the galactic plane. Open circles represent aggregates of high-luminosity stars of classes O – A, investigated by MORGAN, WHITFORD and CODE

concentrations of Cepheids in this direction. Such regions rich in Cepheids are found at distances of .7, 1.4 and 2.2 kpc. Miss HOFFLEIT considers the possibility that these concentrations of early-type stars in the direction of $l = 260^\circ$ do not belong to one and the same spiral arm, but that each of these concentrations would indicate the intersection of the line of sight with a spiral arm running more or less parallel with the Orion and Perseus arms. In her Figure 5 she has drawn three such arms. The arm nearest to the sun passes through the concentration at 1.2 kpc and through the Sagittarius arm, in which several associations were found by MORGAN and co-workers. Our plot of the Cepheids does not confirm this suggestion by Miss HOFFLEIT, which would result in inner spiral arms making large angles with the circles around the galactic centre. The concentrations of early-type stars and Cepheids in the Carina spiral arm seem to be well established. But it has been suspected for many years that spiral arms are not very regular structures and therefore such

concentrations and irregularities are in no way surprising.

Between the longitudes 290° and 10° we find a second concentration of Cepheids at a distance of 1.5 or 2 kpc. This group of Cepheids probably forms a continuation of SCHMIDT's Sagittarius arm. It is interesting to see that seven associations practically co-incide with this group of Cepheids. On the other hand it is quite remarkable that of the eight associations between $l = 310^\circ - 350^\circ$ seven are situated in this continuation of the Sagittarius arm, while only one, II Sco, is situated in the nearer arm, which we have considered as a continuation of the Carina arm, though both concentrations of Cepheids are nearly equally rich.

Following some suggestions made during the last symposium on "Co-ordination of Galactic Research", which was held in Saltsjöbaden in June 1957, we have investigated the distribution of the Cepheids of population I in the region between longitudes 320°

and 20° in some more detail. The nearly complete absence of O associations in the continuation of the Carina spiral arm in this region and the presence of seven associations in the Sagittarius arm could imply that the Cepheids in these two arms are on the average of different age, which probably would result in a different frequency distribution of periods in these two accumulations of Cepheids. In the following table we derived some mean values for these two groups of Cepheids:

	Continuation of Carina arm	Sagittarius arm
	$0 < r < 1.2$ kpc	$1.3 < r < 3.0$ kpc
number of stars	19	16
mean latitude	$-4^\circ.1$	$-2^\circ.6$
dispersion in latitude	$\pm 5^\circ.7$	$\pm 1^\circ.3$
mean distance	.68 kpc	1 .84 kpc
mean log period	.826	.943
mean max. magnitude	$7^m.04$	$10^m.72$

It is clear that the dispersion in latitude is much smaller for the more distant group of Cepheids than for the Cepheids in the continuation of the Carina arm, even more so than could be expected from the ratio of the mean distances of these two groups. Although young stars can be expected to show a smaller dispersion in the z co-ordinate than old stars, the values of ± 68 pc and ± 42 pc, which result from the figures in the table, are not sufficiently accurate to guarantee that this difference is real. In this connection it should be mentioned that most of the Cepheids of population I in the general direction of the galactic centre are situated to the south of WESTERHOUT'S new galactic equator. This fact may be partly due to heavy obscuration to the north of this equator and this would cause an apparent reduction in the dispersion in latitude and in z co-ordinate.

It is also clear from the table that the periods of the Cepheids in the Sagittarius arm are on the average longer than for the Cepheids in the nearer accumulation in the Carina arm. Of the 19 variables in this last group only 2 have periods larger than 10 days, while in the more distant group of 16 stars 7 variables have periods over 10 days. This could be an indication that the Cepheids in the Sagittarius arm, in which several associations occur, are relatively young, but we have to be careful with such a conclusion. The mean photographic magnitude at maximum brightness is 7.04 and 10.72 for the nearer and for the more distant group respectively. As we have not observed many

variables fainter than 12.0 at maximum, a number of Cepheids with short periods and consequently with low absolute magnitude in the Sagittarius arm may not have been included in our programme and therefore the difference in the frequency distribution of the periods in the two groups may be at least partly explained by selection.

Nevertheless the differences found here between the Cepheids in the continuation of the Carina arm and in the Sagittarius arm are sufficiently interesting to ask for more observations of faint Cepheids in this part of the sky. If the programme were complete down to magnitude 14, the questions raised here could be answered definitely.

In the direction of Canis Major and Puppis we find two rather isolated groups of Cepheids, at $l = 200^\circ$, $r = 2.4$ kpc and at $l = 209^\circ$, $r = 4.1$ kpc. Both groups may have an extension towards smaller values of the longitude, but our programme is not complete any more in that region. These groups practically coincide with an arm which is clearly shown on Plates A and B of *B.A.N.* No. 475.

The Carina spiral arm is one of the main features of Figure 1 in the article by KERR, HINDMAN and STAHR CARPENTER. But in this figure we find no indication of any arms in the direction of $l = 236^\circ$ up to a distance of 4 or 5 kpc from the sun. However, in our diagram about one dozen Cepheids is found in this direction with distances from .5 to 2 kpc. It could well be that this group of Cepheids is situated in an extension of the Orion arm.

Finally we may remark that in the longitudes from 300° to 340° only one Cepheid occurs with a distance slightly larger than 2 kpc, while at other longitudes we found distances of 5 kpc and even more. This fact is probably due to a strong increase in the interstellar absorption in the direction of the galactic centre.

The present investigation has shown that the Cepheids are very suitable objects for an exploration of the detailed structure of our galactic system. But it is as clear that this programme should be extended to much fainter Cepheids. It is to be expected that the discovery of such faint Cepheids is far from complete at this moment and consequently the search for faint Cepheids should be encouraged. The work involved could be considerably reduced by limiting this search to a small strip along the galactic equator. At a distance of 4 kpc nearly all Cepheids should be situated within 2° from this equator. But above all a similar investigation of the Cepheids in the northern hemisphere is badly needed.

TABLE 14

Star	l	b	r	V_r	V'_r	$(O-C)$	$r \cos^2 b / \sin z (l-l_0)$
T Ant	232.5	+11.8	3.15	+29.5	+15.2	+7.0	+ .471
V 496 Aql	356.1	-8.6	.70	+5.2	+14.1	+4.0	+ .582
l Car	250.7	-6.8	.27	+1.4	-11.9	-9.8	- .122
U Car	256.8	+ .1	1.34	+ .4	-10.5	+4.4	- .854
V Car	242.7	-11.9	.79	+16.1	+ .6	+3.2	- .150
Y Car	253.4	- .2	1.48	-5.8	-17.6	-3.6	- .802
ER Car	257.8	+1.4	.90	-18.1	-28.6	-18.4	- .597
GI Car	258.0	+2.6	1.51	-21.4	-31.7	-14.2	-1.008
IT Car	259.2	-1.1	1.28	-14.0	-24.4	-8.9	- .889
UX Car	252.5	+ .3	1.56	+10.4	-1.6	+12.4	- .803
VY Car	254.3	+1.3	1.39	-1.2	-12.6	+1.1	- .790
V Cen	284.2	+2.8	.74	-22.3	-24.8	-12.0	- .736
AZ Cen	260.5	- .3	1.46	-12.3	-22.3	-3.7	-1.067
UZ Cen	262.6	-1.1	1.65	-5.1	-14.6	+7.8	-1.285
XX Cen	277.3	+4.1	1.41	-15.7	-20.2	+3.9	-1.385
V 339 Cen	281.1	-1.1	1.41	-24.3	-28.3	-3.8	-1.410
V 378 Cen	273.8	- .1	1.27	-17.7	-23.8	-2.6	-1.218
V 381 Cen	278.6	+3.8	1.13	-30.8	-34.9	-15.4	-1.118
V 419 Cen	259.8	+4.2	1.24	-17.2	-26.8	-11.5	- .881
R Cru	267.3	+ .8	.87	-13.5	-21.4	-8.2	- .758
S Cru	271.1	+4.1	.70	-6.6	-15.8	-4.6	- .646
T Cru	267.2	+ .2	.62	-6.0	-14.0	-4.6	- .539
X Cru	270.1	+3.5	1.25	-25.0	-31.7	-11.9	-1.139
AG Cru	269.4	+2.8	1.35	-4.5	-11.5	+9.7	-1.219
β Dor	238.5	-32.3	.25	+8.1	-8.6	-8.4	- .009
R Mus	269.6	-6.9	.82	+3.8	-4.4	+8.4	- .734
S Mus	267.1	-7.8	.64	+11.8	+2.8	+12.3	- .546
RT Mus	264.1	-5.4	1.50	-1.8	-11.4	+9.6	-1.206
S Nor	295.3	-6.3	.66	+3.3	+3.2	+13.3	- .582
BF Oph	324.8	+7.2	.80	-31.4	-20.8	-19.7	- .061
\times Pav	295.4	-26.3	.42	+37.6	+35.0	(+40.2)	- .301
AP Pup	223.1	-4.9	.98	+17.9	- .1	-8.0	+ .453
AT Pup	222.0	- .8	1.67	+28.8	-11.2	-25.7	+ .835
WX Pup	209.2	- .3	2.34	+53.4	+34.9	+1.3	+1.930
U Sgr	341.4	-5.9	.57	+3.9	+16.9	+12.2	+ .272
W Sgr	328.5	-5.4	.40	-26.4	-16.4	-16.8	+ .021
X Sgr	328.9	-1.2	.32	-13.7	-3.0	-3.4	+ .021
RV Sco	318.1	+4.3	.76	-18.3	-9.9	-5.9	- .231
V 482 Sco	322.9	-1.2	.96	+11.1	+20.2	+22.6	- .137
V 500 Sco	326.7	-2.8	1.23	-13.8	-3.9	-3.7	- .012
V 636 Sco	311.1	-6.4	.64	+ .8	+5.7	+11.5	- .333
R TrA	284.5	-8.4	.67	-9.1	-12.9	-1.5	- .653
S TrA	289.6	-9.0	.80	+6.6	+4.4	+17.5	- .753
U TrA	290.7	-8.9	1.27	-13.7	-15.6	+5.0	-1.183
T Vel	233.2	-3.2	1.08	+8.0	-8.4	-10.9	+ .142
V Vel	244.2	-3.8	1.07	-28.7	-43.1	-38.5	- .265
AH Vel	230.0	-6.3	.49	+26.0	+8.8	+6.8	+ .117
AX Vel	230.8	-7.0	1.11	+24.2	+7.0	+2.9	+ .235
BG Vel	233.8	-2.3	.71	+10.9	-4.6	-6.0	+ .079
RZ Vel	230.5	-1.2	1.51	+25.5	+8.9	+3.0	+ .340
SV Vel	253.8	+2.5	2.03	+4.5	-6.9	+12.6	-1.120
SX Vel	233.2	-1.6	1.80	+30.9	+14.7	+10.6	+ .237

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