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THE SUN AS A VARIABLE STAR II

Photometric Observations of Uranus, Neptune and Standard Stars in the Years 1953 - 1961

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Abstract

The method used in the reduction of two-color photometric observations is described. Sixteen standard stars of nearly solar type were regularly observed for 7 years and no systematic changes in their brightness were found. The r.m.s. deviation of the yearly mean blue magnitude for none of these stars exceeds $\pm 0\overset{m}{.}009$. No systematic change in the blue magnitudes of Uranus and Neptune over a period of nine oppositions is obtained if the following conditions are fulfilled: 1) the gradient of the energy distribution in the spectrum of each of these planets within the blue filter spectral region is assumed to be the same as for a star with the same B-V color-index as the planet, and 2) with regard to Uranus only, the photometric effects due to its oblateness are half as great as those for the uniform distribution of brightness over the apparent disc of the planet.

Contents

I. Introduction

An outline of the purpose of this work, the methods used and the preliminary results were given in the first part of this paper by Johnson and Iriarte (1) and in earlier papers by Giclas (2), by Hardie and Giclas (3) and by Mitchell (4).

The determination of the precise magnitudes of Uranus and Neptune in blue color is accomplished in three steps. First, atmospheric extinction and the coefficients of transformation from the instrumental to the BV photometric system are determined from the observations of primary standard stars in blue and yellow colors. (discussed in Section II). Secondly, the magnitudes and colors of the comparison stars situated along the paths of Uranus and Neptune are determined by comparison with the mean values for 16 bright stars called "Ten Year Standards" (Section III). Finally, the difference of blue magnitudes between each of the planets and two comparison stars situated at small angular distances from the planet is determined (Section IV). The resulting magnitudes of Uranus and Neptune can be used as indicators of the variability of the Sun.

The observations and their discussion were carried on at the Lowell Obervatory, with the financial support of the U. S. Air Force.*

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II. Atmospheric Extinction and Transformations to The BV System

A. Transformation Equations. The following observing schedule is used for all two-color photometric observations in the present program. The star is measured first with a blue filter (5mm Corning 5030 filter + 2mm Schott GG 13) and next with a yellow filter (3.6mm Corning 3384). For each color two deflections of the Brown recorder which are separated by the deflection for sky background are always obtained. All the measurements of the star and sky background, both with blue and yellow filters are always taken with the same amplifier gain. The observation is concluded by measuring the deflection for a radioactive standard light source without a filter. This source is green in color and is measured at a fixed amplifier gain, such as that used for measuring 4th magnitude stars. The amplifier gain is selected so that the deflections with the blue filter and with the standard source are larger than 0.6 of full scale on the recorder. The deflections with a yellow filter for early-type stars were sometimes only 0.15 of full scale; this probably diminished the accuracy of measures with the yellow filter.

We denote by B' the mean of two deflections for a star observed with the blue filter minus the deflection for sky background with the same filter. By V' we denote the similar difference with a yellow filter and by S' the deflection for the standard source minus the deflection for dark current at the same gain. Furthermore, let S_0 denote the magnitude difference between the star under consideration and an imaginary star which would give the same deflections at a certain fixed, arbitrarily chosen amplifier gain, the same for all the stars in the program.

We define now the quantities:

$$C_{y0} = -2.5 \log B'/Y' \quad , \tag{1}$$

$$m_{y0} = S_0 - 2.5 \log Y'/S' \quad , \tag{2}$$

The color index B-V and the yellow and blue magnitudes of the BV photometric system are connected with C_{y0} and m_{y0} by the equations:

$$B\text{-}V = \frac{A_1 + A_2 C_{y0} - K_1 M}{1 + K_2 M} \quad , \tag{3}$$

$$V = m_{y0} + A_5 + A_6 (B\text{-}V) - Q_{y1} M - Q_{y2} M (B\text{-}V) \quad , \tag{4}$$

$$B = m_{y0} + C_{y0} + A_7 + A_8 (B\text{-}V) - Q_{b1} M - Q_{b2} M (B\text{-}V) \quad , \tag{5}$$

where A_i ($i = 1,2,5,6,7,8$) are the coefficients of transformations to the BV system, $K_1 + (B\text{-}V) K_2$ is the extinction coefficient for blue-yellow color-index while $Q_{y1} + (B\text{-}V) Q_{y2}$ and $Q_{b1} + (B\text{-}V) Q_{b2}$ are the extinction coefficients for the yellow and blue magnitudes.* Equation (5) is obtained by adding the equations (3) and (4) and by making the following substitutions

$$A_7 = (A_1/A_2) + A_5 \quad , \tag{6}$$

$$A_8 = 1 + A_6 - (1/A_2) \quad , \tag{7}$$

$$Q_{b1} = Q_{y1} + (K_1/A_2) \quad , \tag{8}$$

$$Q_{b2} = Q_{y2} + (K_2/A_2) \quad . \tag{9}$$

The air mass at the time of observation, denoted by M, is computed by using the hour angle of a star as read on the telescope's setting circle at the middle of each observation. Tables and graphs facilitating computation of air mass accurate to 0.001 were prepared on the basis of Bemporad's tables of air mass reprinted by Schoenberg (6).

The coefficients of equations (3) and (4) are determined only from the observations of the primary standards of the UBV system. The following 8 stars were considered as such standards: β Cnc, η Hya, HR 4550, 90 Leo (A+B), α Ser, β Lib, ε CrB and τ Her. The magnitudes and colors which were assumed for these stars are those given by Johnson and Harris (7); the values taken from this paper are hence-forth denoted by $(B\text{-}V)_s$ and V_s.

The coefficients K_2 and Q_{y2} describing the color-dependence of extinction are small and their variations are also proportionally smaller than the variations of other coefficients in equations (3) and (4). Therefore, instead of using the nightly values of coefficients K_2 and Q_{y2} it is more reasonable to use the mean values obtained by averaging the values from many nights. Since, however, the behaviour of these coefficients is not sufficiently well known and since their dependence on K_1 and Q_{y1} must be investigated, the coefficients K_2 and Q_{y2} are determined for every night on which a sufficient number of primary standards was observed.

*The coefficients K_1 and K_2 are connected with coefficients k_1 and k_2 in the instrumental system, defined by Johnson (5), by the relations:

$$K_1 = A_2 k_1 - A_1 k_2 \text{ and } K_2 = k_2.$$

After multiplying equation (3) by $1 + K_2M$ we notice that the coefficients (B-V) M for the unknowns K_2 and Q_{y2} are not independent of the coefficients of other unknowns. Therefore a simultaneous determination of K_2 and Q_{y2} with other unknowns of equations (3) and (4) results in a drastic diminution of the weights of these other unknowns, particularly of A_2 and A_6. To avoid such loss of accuracy, we may write equations (3) and (4) in the form:

$$B\text{-}V = -K_2^\circ M\ (B\text{-}V) + A'_1 + A_2C_{y0} - K'_1M \quad (10)$$
$$-(K_2-K_2^\circ)(M-\overline{M})[(B\text{-}V)-(\overline{B\text{-}V})] \quad ,$$

$$V = m_{y0} + A'_5 + A'_6\ (B\text{-}V) - Q'_{y1}\ M$$
$$-Q_{y2}\ (M-\overline{M})\ [(B\text{-}V)-(\overline{B\text{-}V})] \quad , \quad (11)$$

where $\overline{M}$ and $\overline{B\text{-}V}$ are the mean air mass and the mean color-index of the primary standards observed that night, K_2° is the assumed approximate value of K_2 and the new unknowns are connected with the old ones by the relations:

$$A'_1 = [1-(K_2\text{-}K_2^\circ)\overline{M}]\ A_1 + (K_2\text{-}K_2^\circ)\overline{M}\ (\overline{B\text{-}V}) \quad , \quad (12)$$

$$A'_2 = [1-(K_2\text{-}K_2^\circ)\overline{M}]A_2 \quad , \quad (13)$$

$$K'_1 = [1-(K_2\text{-}K_2^\circ)\overline{M}]K_1 + (K_2\text{-}K_2^\circ)(\overline{B\text{-}V}) \quad , \quad (14)$$

$$A'_5 = A_5 + Q_{y2}\overline{M}\ (\overline{B\text{-}V}) \quad , \quad (15)$$

$$A'_6 = A_6 - Q_{y2}\overline{M} \quad , \quad (16)$$

$$Q'_{y1} = Q_{y1} + Q_{y2}(\overline{B\text{-}V}) \quad (17)$$

It can be easily shown that equations (10) and (11) are equivalent to equations (3) and (4) if only the term proportional to $(K_2-K_2^\circ)^2$ is neglected. The accuracy with which the primed coefficients are determined from equations (10) and (11) remains practically unchanged whether we determine $K_2-K_2^\circ$ and Q_{y2} from these equations or whether we neglect the terms containing $K_2-K_2^\circ$ and Q_{y2}. Since the accuracy of determining $K_2-K_2^\circ$ and Q_{y2} from one night's observations is very low and since for the purposes of this work (except for improving V and B-V of the primary standards) we can assume that $Q_{y2}=0$, the difference between A_1, A_2, A_5, A_6, K_1 and Q_{y1} and the corresponding primed coefficients defined by equations (12) to (17) can be neglected. Henceforth we shall omit the prime symbols and A_1 will mean A'_1 etc.

For a reliable determination of the extinction coefficients for each night, at least two primary standards should be observed at low altitude. It was found most practical to observe such stars at altitudes between 22° and 28°. The accuracy of such observations is of course much lower than that of the observations made near the zenith. Following Siedentopf (8), we assume that the mean errors of photometric observations are proportional to the air mass for air masses between 1 and 3. Therefore, before making the least-squares solution of equations (10) and (11) for determining the extinction and transformation coefficients, we divide each of these equations by the air mass M. Moreover, since C_{y0} is subject to observational errors and $(B\text{-}V)_s$ is assumed to be exactly known, we must transform these equations so that the free term is C_{y0}/M and not $(B\text{-}V)_s/M$. The final form* of these equations which were solved for every night when at least 6 primary standards were observed is

$$(K_1/A_2) - a\ (A_1/A_2)\ + B(1/A_2) + c[(K_2\text{-}K_2^\circ)/A_2] = d \quad , \quad (18)$$

$$-Q_{y1} + a\,A_5 + BA_6 - cQ_{y2} = D \quad , \quad (19)$$

where the coefficients are

$$a = 1/M \quad , \quad (20)$$
$$b = (B\text{-}V)_s\ [(1/M) + K_2^\circ] \quad , \quad (21)$$
$$c = [1-(\overline{M}/M)]\ [(B\text{-}V)_s-(\overline{B\text{-}V})_s] \quad , \quad (22)$$
$$d = C_{y0}/M \quad , \quad (23)$$
$$B = (B\text{-}V)_s/M \quad , \quad (24)$$
$$D = (V_s - m_{y0})/M \quad (25)$$

One of the main factors limiting the accuracy of photometric observations is the change of extinction during the night. The first step towards eliminating the influence of this change is to assume that extinction is changing linearly during the night. To eliminate extinction changes of this type we need two groups of observations of standard stars during each night, preferably one near the beginning and the other near the end of the observations of the program stars. Each of these groups should consist

*Unfortunately only for a few nights (in 1961) could the equations in "final" form be solved. For all the other nights the equations (10) and (11) were solved by the least-squares method. This means that for most of the observations of primary standards discussed in this section the change of accuracy with air mass was not taken into consideration. The values of A_2, A_6 and A_8 which are used throughout this paper may be subject to small systematic error, usually not exceeding 0.002, resulting from treating $(B\text{-}V)_s$ as a random variable and C_{y0} as exactly known.

of at least 4 stars, two of them at low altitude and two at high altitude. The least-squares solution of equations (18) and (19) is then made for both groups together, but the extinction coefficients K_1 and Q_{y1} are determined in this solution for each group separately. When reducing the observations of program stars, values of extinction coefficients interpolated between the two pairs obtained from the least-squares solution are used.

B. Solution of Transformation Equations. Since equations (18) and (19) are likely to be used not only by the future observers in this program but also by other photometric observers, it seems worthwhile to give some details of the least-squares solution of these equations.

We assume that the observations of standard stars made on any one night can be divided into two groups; let the number of stars in these groups be denoted by n^I and n^{II}. The coefficients A_1, A_2, A_5, A_6, $K_2-K_2^\circ$ and Q_{y2} are determined for both groups together while K_1 and Q_{y1} are computed for each group separately, so that two pairs, K_1^I, Q_{y1}^I, and K_1^{II}, Q_{y1}^{II}, of these coefficients are obtained. Following Gauss we shall denote (in this section only) by square brackets the sums of the terms in these brackets. If the symbol in brackets has a roman numeral I (or II), this means that it should be summed only over the first (or second) group of standard stars. If there are no roman numerals, the summation is over both groups together.

We introduce the following auxiliary quantities*

$$s_{11} = (n^I)^{\frac{1}{2}} \quad , \quad s_{22} = (n^{II})^{\frac{1}{2}} \quad ,$$

$$s_{31} = \left[a^I\right]/s_{11} \quad , \quad s_{32} = \left[a^{II}\right]/s_{22} \quad ,$$

$$s_{33} = \left[a^2\right] - s_{31}^2 - s_{32}^2 \quad ,$$

$$s_{41} = \left[b^I\right]/s_{11} \quad , \quad s_{42} = \left[b^{II}\right]/s_{22} \quad ,$$

$$s_{43} = [ab] - s_{31}\, s_{41} - s_{32}\, s_{42} \quad ,$$

$$s_{51} = \left[c^I\right]/s_{11} \quad , \quad s_{52} = \left[c^{II}\right]/s_{22} \quad ,$$

$$s_{53} = [ac] - s_{31}\, s_{51} - s_{32}\, s_{52} \quad ,$$

$$s_{61} = \left[d^I\right]/s_{11} \quad , \quad s_{62} = \left[d^{II}\right]/s_{22} \quad ,$$

$$s_{63} = [ad] - s_{31}\, s_{61} - s_{32}\, s_{62} \quad ,$$

$$s_{44} = \left[b^2\right] - s_{41}^2 - s_{42}^2 - (s_{43}^2/s_{33}) \quad ,$$

$$s_{54} = [bc] - s_{41}\, s_{51} - s_{42}\, s_{52} - (s_{43}s_{53}/s_{33}) \quad ,$$

$$s_{64} = [bd] - s_{41}\, s_{61} - s_{42}\, s_{62} - (s_{43}s_{63}/s_{33}) \quad ,$$

$$s_{55} = \left[c^2\right] - s_{51}^2 - s_{52}^2 - (s_{53}^2/s_{33}) - (s_{54}^2/s_{44}) \quad ,$$

$$s_{65} = [cd] - s_{51}\, s_{61} - s_{52}\, s_{62} - (s_{53}s_{63}/s_{33}) - (s_{54}s_{64}/s_{44}) \quad ,$$

$$t_{41} = \left[B^I\right]/s_{11} \quad , \quad t_{42} = \left[B^{II}\right]/s_{22} \quad ,$$

$$t_{43} = [aB] - s_{31}\, t_{41} - s_{32}\, t_{42} \quad ,$$

$$t_{61} = \left[D^I\right]/s_{11} \quad , \quad t_{62} = \left[D^{II}\right]/s_{22} \quad ,$$

$$t_{63} = [aD] - s_{31}\, t_{61} - s_{32}\, t_{62} \quad ,$$

$$t_{44} = \left[B^2\right] - t_{41}^2 - t_{42}^2 - (t_{43}^2/s_{33}) \quad ,$$

$$t_{54} = [Bc] - t_{41}\, s_{51} - t_{42}\, s_{52} - (t_{43}s_{53}/s_{33}) \quad ,$$

$$t_{64} = [BD] - t_{41}\, t_{61} - t_{42}\, t_{62} - (t_{43}t_{63}/s_{33}) \quad ,$$

$$t_{55} = \left[c^2\right] - s_{51}^2 - s_{52}^2 - (s_{53}^2/s_{33}) - (t_{54}^2/t_{44}) \quad ,$$

$$t_{65} = [cD] - s_{51}\, t_{61} - s_{52}\, t_{62} - (s_{53}t_{63}/s_{33}) - (t_{54}t_{64}/t_{44}) \quad .$$

*The least-squares solution presented here is based on the cracovian algorithm introduced by Banachiewicz (9) and thoroughly described by Kopal (10). Our s_{ij} are connected with Kopal's r_{ij} by the relations: $s_{ij} = r_{ij}$ for $j = 1, 2$ and $s_{ij} = r_{ij}\, r_{jj}$ for $j \geqslant 3$.

The unknowns are computed from the formulas:

$$A_2 = s_{44} / \left\{ s_{64} - (s_{54} s_{65}/s_{55}) \right\} \quad ,$$

$$K_2 - K_2^o = A_2 \; s_{65}/s_{55} \quad ,$$

$$A_1 = \left\{ s_{43} - A_2 s_{63} + (K_2 - K_2^o) s_{53} \right\} / s_{33} \quad ,$$

$$K_1^I = \left\{ A_1 s_{31} + A_2 s_{61} - (K_2 - K_2^o) s_{51} - s_{41} \right\} / s_{11} \quad ,$$

$$K_1^{II} = \left\{ A_1 s_{32} + A_2 s_{62} - (K_2 - K_2^o) s_{52} - s_{42} \right\} / s_{22} \quad ,$$

$$Q_{y2} = -t_{65}/t_{55} \quad , \quad A_6 = (t_{64} + Q_{y2} t_{54})/t_{44} \quad ,$$

$$A_5 = (t_{63} - A_6 t_{43} + Q_{y2} s_{53})/s_{33} \quad ,$$

$$Q_{y1}^I = (A_5 s_{31} + A_6 t_{41} - Q_{y2} s_{51} - t_{61})/s_{11} \quad ,$$

$$Q_{y1}^{II} = (A_5 s_{32} + A_6 t_{42} - Q_{y2} s_{52} - t_{62})/s_{22} \quad .$$

The mean errors of a single observation of B-V and V at zenith, are

$$\epsilon_{B-V} = \left\{ \sum_{1}^{n^I + n^{II}} (a\,\delta_{B-V})^2/(n^I + n^{II} - m) \right\}^{\frac{1}{2}} \quad ,$$

$$\epsilon_V = \left\{ \sum_{1}^{n^I + n^{II}} (a\,\delta_V)^2/(n^I + n^{II} - m) \right\}^{\frac{1}{2}} \quad ,$$

respectively, where $(a\delta_{B-V})$ and $(a\delta_V)$ are deviations, reduced to zenith, which should be computed for every star from the formulas

$$a\,\delta_{B-V} = aA_1 + dA_2 - c \cdot (K_2 - K_2^o) - b - K_1 \quad ,$$

$$a\,\delta_V = aA_5 + BA_6 - cQ_{y2} - D - Q_{y1} \quad ;$$

where m denotes the number of unknowns determined from each of the systems of unknowns described in equations (18) and (19). If the stars are divided into two groups, we have m = 5. For only one group $n^{II} = 0$ and m = 4; if, moreover, $K_2 - K_2^o$ and Q_{y2} are not determined we should replace c by zero, omit all the terms s_{i2}, t_{i2} and s_{5i} (i=1, . . ., 6) and assume m=3.

The mean errors of Q_{y2} and A_6 are given by

$$\epsilon(Q_{y2}) = \epsilon_V / t_{55}^{\frac{1}{2}} \quad ,$$

$$\epsilon(A_6) = \epsilon_V \left\{ (1/t_{44}) + (t_{54}^2/t_{44}^2 t_{55}) \right\}^{\frac{1}{2}} \quad ;$$

for the mean errors of $K_2 - K_2^o$, A_2 and of the extinction coefficients the approximate expressions can be used:

$$\epsilon(K_2 - K_2^o) \approx A_2 \; \epsilon_{B-V}/s_{55}^{\frac{1}{2}} \quad , \quad \epsilon(A_2) \approx A_2^2 \cdot$$

$$\epsilon_{B-V} \left\{ (1/s_{44}) + (s_{54}^2/s_{44}^2 s_{55}) \right\}^{\frac{1}{2}} \quad ,$$

$$\epsilon(K_1^I) \approx \epsilon_{B-V} / \left\{ \sum_{1}^{n^I} (M - \bar{M})^2 \right\}^{\frac{1}{2}} \quad ,$$

$$\epsilon(Q_{y1}^I) \approx \epsilon_V / \left\{ \sum_{1}^{n^I} (M - \bar{M})^2 \right\}^{\frac{1}{2}} \quad .$$

If the unknowns are calculated correctly, the following two control equations are fulfilled:

$$[ab]\,A_1 + [bd]\,A_2 - [bc]\,(K_2 - K_2^o) - \left[b^I\right] K_1^I - \left[b^{II}\right] K_1^{II} = \left[b^2\right] - (n^I + n^{II} - m)\,\epsilon_{B-V}^2 \quad ,$$

$$[aD]\,A_5 + [BD]\,A_6 - [cD]\,Q_{y2} - \left[D^I\right] Q_{y1}^I - \left[D^{II}\right] Q_{y1}^{II} = \left[D^2\right] - (n^I + n^{II} - m)\,\epsilon_V^2 \quad ;$$

the terms containing ϵ_{B-V} and ϵ_V are usually negligible if, as seems to be most convenient, all the calculations are made with four digits after the decimal point.

C. Observers and Instruments. The observers working on the photometry of Uranus and Neptune and the instruments used are listed in Table I.

The tube 1P21 No. 12 which has been used since December 1957 is characterized by an exceptionally large dark current when unrefrigerated. When the tube is refrigerated with dry ice the dark current from the cathode amounts to only about 20 electrons per minute. The sensitivity of this tube increases by several per cent, or more, when the tube is illuminated by a bright star, especially if the tube was previously illuminated without applying voltage. When the tube is illuminated by a second magnitude star in the focus of the 21-inch telescope, an appreciable increase of sensitivity can be noticed during the first 10 minutes of illumination. After this time the sensitivity becomes stable and drops down very slowly when the tube is not illuminated. When the tube is initially illuminated by a fainter star, the time necessary for reaching the stable sensitivity is proportionally longer. The sensitivity of multiplier tubes used until 1957 decreased, rather than increased, after illumination by a bright star.

To secure stable sensitivity of the multiplier tube the voltage is applied 1½ hours before observations are started and the tube is illuminated throughout this interval by the standard radioactive light source. Dry ice is put in immediately after applying the voltage. During all the observations, the voltage applied to the multiplier tube is taken from a 900-volt battery constructed from 30-volt batteries connected in series; this is believed to affect the linearity of the multiplier tube less than other types of power supplies.

The calibration of the amplifier and the testing of its linearity were performed at intervals of several months or years. A precision decade resistance box was used for this purpose. The presently used General Radio type 1230-A d.c. amplifier (with gain resistors taken from the previously used amplifier No. 4) is calibrated by a procedure similar to that described by Borgman (11). For determining the exact value of any 2.5-magnitude step, the switch is set in position B (Figure 1) and the fine gain (½ magnitude steps) of the amplifier is adjusted so as to give a full scale deflection of the recorder. The switch is now changed to A and the resistance box is adjusted so as to give the same deflection of the recorder.

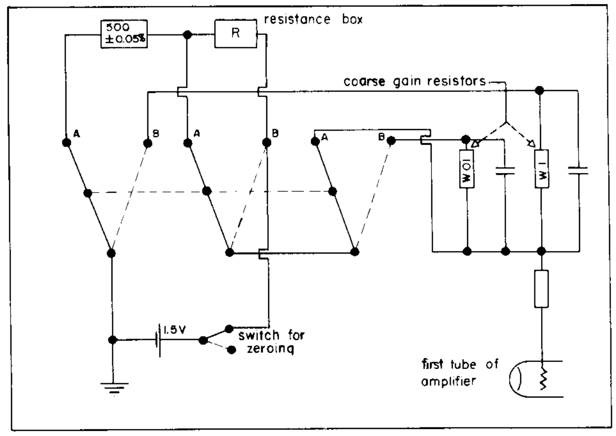

Figure 1. Wiring diagram of simple arrangement for calibrating the General Radio d.c. amplifier and testing its linearity.

The fine gain steps are calibrated and linearity is tested with the switch at position A. For every fine-gain step the resistance box is adjusted so as to give the same deflection of the recorder. Linearity was checked at every fine-gain step separately by changing the setting of the resistance box and comparing the deflections of the recorder with the expected values. No corrections for nonlinearity were applied.

In all the amplifiers used in this program, both coarse-gain and fine-gain resistors were wire-wound.

TABLE I

Observers and Instruments

Period From	Period To	Observer	Telescope	Tube Type	Tube Desig.	
1953, Jan. 21	1953, Feb. 11	H. L. Johnson	McDonald 13-inch	1P21		$A_8 = +0.030$
		H. L. Johnson	McDonald 82-inch	1P21		$A_8 = +0.018$
1953, Feb. 23	1953, Apr. 25	H. L. Johnson	Lowell 42-inch	1P21		$A_8 = +0.046$
1953, Jun. 10	1953, Jul. 3	R. H. Hardie	Lowell 21-inch	1P21		$A_8 = +0.024$
1953, Oct. 30	1954, Mar. 6	R. H. Hardie	Lowell 21-inch	1P21	Y	$A_8 = +0.017$
1954, Mar. 15	1954, Jun. 16	R. H. Hardie	Lowell 21-inch	Lall.		$A_8 = +0.063$
1954, Jun. 17	1954, Jul. 1	R. H. Hardie	Lowell 21-inch	1P21	Y	$A_8 = +0.017$
1954, Oct. 11	1955, Apr. 26	R. H. Hardie	Lowell 21-inch	1P21	2—Ref*	$A_8 = +0.073$
1955, Apr. 28	1955, Jul. 8	R. H. Hardie	Lowell 21-inch	1P21	Y—Unref**	
1955, Sep. 23	1956, Jun. 27	C. F. Knuckles	Lowell 21-inch	1P21	10—Ref.	$A_8 = +0.005$
1956, Sep. 22	1957, Jun. 24	R. I. Mitchell	Lowell 21-inch	1P21	10—Ref.	amplifier No. 4
1957, Sep. 21	1957, Dec. 12	W. M. Sinton	Lowell 21-inch	1P21	10—Ref.	amplifier No. 4
1957, Dec. 26	1958, Jul. 5	W. M. Sinton	Lowell 21-inch	1P21	12—Ref.	amplifier No. 4
1958, Oct. 3	1959, Jun. 10	B. Iriarte	Lowell 21-inch	1P21	12—Ref.	amplifier No. 4
1960, Jan. 28	1960, Oct. 20	K. Serkowski	Lowell 21-inch	1P21	12—Ref.	amplifier No. 4
1960, Nov. 17	1961, Jun. 28	J. Priser & K. Serkowski	Lowell 21-inch	1P21	12—Ref.	General Radio Amplifier No. 838

*Refrigerated
**Unrefrigerated
Lall. = Lallemand

The corrections for the gain steps, based on the calibration of the amplifier, however small, were applied to all the observations.

The coefficients A_2, A_6 and A_8, determined on particular nights, are given in Table II. The dates in this table, as in all other tables in this paper, refer to U.T. The third column gives the number of observations of primary standard stars used for determining the transformation coefficients. The extinction coefficients, K_1 and Q_{y1} were determined together with

TABLE II. Transformation Coefficients

TUBE	DATE	n	A_2	A_6	A_8	REMARKS
	1955					
1P21 No. 2-U**	Feb. 2	2	1.076	−0.040	+0.031:	
	24	11	1.072	−0.001	+0.066	
1P21 No. 2-R*	Apr. 4	18	1.090	−0.019	+0.064:	sky dusty
	11	7	1.087	−0.008	+0.072	wind
	20	13	1.091	−0.005	+0.079	
	21	17	1.077	−0.006	+0.066	
	25	7	1.090	−0.007	+0.076	
				mean	+0.073	
1P21 Y-U 2nd set of filters	May 4	11	1.014	+0.010	+0.024	clouds at end
	6	18	1.012	+0.021	+0.033	
	28	11	1.018	+0.012	+0.030	clouds at end
				mean	+0.029	
1P21 Y-U 1st set of filters	Jun. 20	8	1.055	+0.034	+0.086	
	21	8	1.055	+0.035	+0.087	
	22	8	1.051	+0.029	+0.078	
	27	8	1.045	+0.028	+0.071	
				mean	+0.080	
1P21 No. 10-R	Oct. 27	4	1.012	−0.011	+0.001	
	28	4	1.022	−0.017	+0.005	
	30	4	1.015	−0.014	+0.001	
	31	4	1.023	−0.005	+0.017	
	Nov. 4	2	1.024	−0.015	+0.009	
	7	4	1.014	−0.003	+0.011	hazy
	8	4	1.023	−0.010	+0.012	
	16	2	1.020	−0.018	+0.002	
	19	2	1.018	−0.015	+0.003	
	20	2	1.027	−0.021	+0.005	
	27	2	1.028	−0.022	+0.005	hazy
	1956					
	Jan. 17	25	1.029	−0.018	+0.008	
	19	4	1.021	0.000	+0.021:	
	20	4	1.027	+0.006	+0.032:	
	Feb. 3	19	1.006	−0.004	+0.002	
	10	22	1.026	−0.019	+0.006	
	14	23	1.054	−0.031	+0.020	
	Mar. 5	5	1.021	−0.024	−0.003	
	14	8	1.011	−0.006	+0.005	clouds
	19	36	1.006	+0.003	+0.009	
	Apr. 5	24	1.012	−0.005	+0.006	
	18	12	1.005	−0.011	−0.006	clouds
				mean	+0.005	

*Refrigerated
**Unrefrigerated

TABLE II. Transformation Coefficients (Cont'd)

TUBE	DATE	n	A_2	A_6	A_8	REMARKS
	1957					
1P21 No. 10-R	Mar. 23	13	1.024	−0.014	+0.010	
	24	15	1.019	−0.004	+0.015	wind
	26	3	1.012	−0.008	+0.004	clouds at end
	28	4	1.011	+0.018	+0.029	
	31	3	1.022	−0.013	+0.009	clouds
	Apr. 5	13	1.015	−0.001	+0.014	poor seeing
	6	8	1.015	+0.013	+0.028	
	7	4	1.018	−0.006	+0.012	
	9	3	1.018	−0.015	+0.003	clouds at end
	15	10	1.015	0.000	+0.015	
	16	3	1.019	−0.014	+0.005	clouds at end
	18	7	1.013	+0.011	+0.024	clouds at end
	19	4	1.011	−0.003	+0.008	clouds at end
	20	5	1.020	+0.003	+0.017	clouds at end
	24	4	1.018	+0.030	+0.048	
	26	5	1.008	−0.002	+0.006	clouds at end
	May 1	10	1.015	−0.007	+0.008	extinction changing
	3	8	1.017	−0.002	+0.015	
	5	6	1.015	−0.006	+0.009	clouds
				mean	+0.015	
	May 30	5	1.009	+0.019	+0.028	
	Jun. 1	4	1.016	+0.016	+0.032	
	13	2	1.009	+0.018	+0.027	
	14	2	1.022	+0.007	+0.029	
				mean	+0.029	
	Jun. 22	4	1.014	+0.026	+0.040	
	24	4	1.016	+0.025	+0.037	
	25	6	1.012	+0.021	+0.037	
				mean	+0.038	
1P21 No. 12-R	Dec. 27	5	1.043	−0.070	−0.029:	clouds ?
	1958					
	Jan. 8	6	1.046	−0.046	−0.002	clouds ?
	9	8	1.036	−0.027	+0.008	clouds ?
	16	9	1.039	−0.035	+0.003	
	Feb. 11	8	1.039	−0.036	+0.002	
	27	9	1.043	−0.016	+0.025	clouds ?
	Mar. 20	9	1.046	−0.023	+0.021	clouds
	Apr. 10	10	1.038	−0.027	+0.010	
	11	10	1.041	−0.026	+0.013	
	15	10	1.043	−0.025	+0.016	
	May 4	10	1.042	−0.029	+0.011	
	9	10	1.044	−0.023	+0.019	
	10	10	1.047	−0.027	+0.018	
				mean	+0.013	
	1959					
1P12 No. 12-R	Jan. 5	4	1.025	−0.034	−0.010	
	11	4	1.043	−0.034	+0.007	
	24	4	1.047	−0.048	−0.003	
	29	2	1.031	−0.044	−0.014	clouds
	31	4	1.047	−0.043	+0.002	

TABLE II. Transformation Coefficients (Cont'd)

TUBE	DATE	n	A_2	A_6	A_8	REMARKS
	1959					
1P21 No. 12-R	Feb. 2	2	1.061	−0.051	+0.007	clouds
	4	4	1.051	−0.046	+0.003	
	5	4	1.049	−0.049	−0.002	
	26	4	1.040	−0.038	0.000	
	28	4	1.043	−0.032	+0.003	
	Mar. 1	4	1.039	−0.041	−0.003	
	3	4	1.041	−0.041	−0.002	
				mean	0.000	
	May 9	2	1.034	−0.009	+0.024	
	15	2	1.044	−0.015	+0.027	
	16	2	1.041	−0.028	+0.011	
	27	2	1.068	−0.019	+0.045:	
	28	2	1.061	−0.015	+0.043:	
	1960					
	Jan. 20	2	1.026	−0.067	−0.042	clouds at end
	28	4	1.026	−0.045	−0.020	
	29	2	1.022	−0.052	−0.020	clouds
	Feb. 17	6	1.023	−0.040	−0.018	bad seeing
	18	2	1.026	−0.051	−0.026	clouds
	21	4	1.021	−0.040	−0.019	
	23	6	1.025	−0.041	−0.017	
	25	2	1.030	−0.052	−0.023	clouds
	Mar. 15	6	1.027	−0.042	−0.016	
	17	6	1.023	−0.040	−0.018	
	18	8	1.018	−0.035	−0.017	
	19	6	1.021	−0.032	−0.011	
	21	6	1.024	−0.034	−0.010	
				mean	−0.020	
	Mar. 26	4	1.028	−0.024	+0.003	
	30	6	1.026	−0.030	−0.005	
	Apr. 3	6	1.033	−0.038	−0.006	
	4	2	1.017	−0.046	−0.029	clouds at end
	6	4	1.044	−0.038	+0.004	clouds at end
				mean	−0.007	
	1961					
	Feb. 6	6	1.024	−0.052	−0.029	clouds at end
	8	9	1.028	−0.036	−0.009	clouds at end
	10	8	1.044	−0.027	−0.009	
	15	4	1.022	−0.046	−0.024	
	22	4	1.005	−0.041	−0.036	clouds at end
	24	3	1.038	−0.057	−0.020	strong wind
	Mar. 1	8	1.032	−0.050	−0.019	
	8	4	1.034	−0.050	−0.017	
	23	8	1.027	−0.032	−0.006	
	31	4	1.029	−0.057	−0.029	clouds at end
	Apr. 4	6	1.023	−0.040	−0.018	
	9	7	1.024	−0.040	−0.017	
	12	13	1.024	−0.036	−0.013	
				mean	−0.019	

TABLE III. Extinction Coefficients

DATE		$\Sigma(M-\bar{M})^2$	Err of single observation ε_{B-V} m.e.	ε_V m.e.	Extinction for B-V colors K_1	m.e.	Extinction for V magnitudes Q_{y1}	m.e.	Extinction for B mags. Q_{bl}	Coefficients of color-dependence of extinction K_2	m.e.	Q_{y2}	m.e.
1955													
Feb.	24	0.4	±0.ᵐ006	±0.ᵐ018	0.ᵐ099	±0.ᵐ009	0.ᵐ145	±0.ᵐ029	0.ᵐ237				
Apr.	4	0.7	±0.014	±0.025	0.161	±0.017	0.138	±0.031	0.286				
	21	1.0	±0.015	±0.017	0.117	±0.014	0.132	±0.017	0.239				
May	6	5.9	±0.010	±0.009	0.113	±0.004	0.176	±0.004	0.287	-0.033	±0.005	+0.002	±0.006
Oct.	27	0.8	±0.006	±0.015	0.126	±0.007	0.133	±0.018	0.257				
	28	0.9	±0.007	±0.009	0.129	±0.007	0.120	±0.011	0.246				
	30	3.1	±0.008	±0.015	0.128	±0.005	0.114	±0.009	0.240				
	31	1.4	±0.006	±0.007	0.126	±0.005	0.184	±0.006	0.207				
Nov.	7	0.9	±0.008	±0.001	0.117	±0.008	0.089	±0.001	0.204				
	8	0.7	±0.012	±0.017	0.088	±0.014	0.124	±0.021	0.210				
1956													
Jan.	17	3.5	±0.009	±0.010	0.108	±0.004	0.138	±0.005	0.243	-0.023	±0.006	-0.007	±0.007
Feb.	3	1.2	±0.011	±0.024	0.118	±0.007	0.151	±0.018	0.268				
	10	3.5	±0.009	±0.015	0.117	±0.004	0.158	±0.008	0.272	-0.017	±0.006	0.000	±0.010
	14	2.2	±0.011	±0.016	0.102	±0.007	0.164	±0.011	0.261	-0.034	±0.010	+0.008	±0.015
Mar.	19	9.8	±0.008	±0.012	0.122	±0.002	0.144	±0.004	0.265	-0.028	±0.004	-0.010	±0.006
	19	0.5	±0.011	±0.009	0.105	±0.015	0.158	±0.012	0.262				
Apr.	5	1.0	±0.011	±0.017	0.128	±0.010	0.198	±0.017	0.325				
	5	1.0	±0.006	±0.016	0.128	±0.005	0.172	±0.016	0.298				
1957													
Mar.	23	2.6	±0.005	±0.010	0.109	±0.003	0.185	±0.006	0.291	-0.028	±0.005	+0.003	±0.010
	24	1.0	±0.008	±0.014	0.138	±0.008	0.142	±0.014	0.277				
Apr.	5	0.8	±0.010	±0.014	0.110	±0.010	0.136	±0.016	0.244				
	6	0.4	±0.009	±0.016	0.124	±0.015	0.160	±0.028	0.282				
	15	1.3	±0.007	±0.011	0.132	±0.006	0.212	±0.010	0.342				
	26	1.5	±0.005	±0.008	0.132	±0.004	0.264	±0.007	0.395				
May	1	1.3	±0.009	±0.027	0.145	±0.008	0.296	±0.024	0.439				
	3	0.4	±0.007	±0.017	0.113	±0.011	0.178	±0.027	0.289				
1958													
Jan.	8	1.2	±0.021	±0.013	0.116	±0.019	0.121	±0.012	0.232				
	9	0.8	±0.010	±0.021	0.132	±0.010	0.156	±0.027	0.283				
	16	1.0	±0.006	±0.013	0.116	±0.006	0.134	±0.013	0.246				
Apr.	10	1.3	±0.007	±0.011	0.110	±0.006	0.258	±0.010	0.364	-0.026	±0.008	-0.002	±0.012
	11	2.1	±0.004	±0.014	0.105	±0.003	0.257	±0.010	0.358	-0.031	±0.003	+0.015	±0.012
	15	3.5	±0.008	±0.007	0.121	±0.004	0.174	±0.004	0.290	-0.034	±0.005	+0.007	±0.005
May	4	3.6	±0.009	±0.016	0.130	±0.004	0.187	±0.009	0.312	-0.030	±0.006	+0.007	±0.011
	9	5.0	±0.008	±0.016	0.127	±0.003	0.219	±0.007	0.341	-0.032	±0.004	+0.008	±0.008
	10	7.2	±0.008	±0.025	0.116	±0.003	0.228	±0.009	0.339	-0.030	±0.004	+0.002	±0.012
1959													
Feb.	28	0.6	±0.009	±0.011	0.118	±0.011	0.127	±0.014	0.240				
1960													
Mar.	15	0.4	±0.005	±0.010	0.088	±0.007	0.167	±0.015	0.253				
	17	0.5	±0.008	±0.015	0.114	±0.011	0.203	±0.020	0.314				
	18	0.5	±0.004	±0.022	0.125	±0.006	0.172	±0.032	0.295				
	19	0.4	±0.008	±0.016	0.090	±0.012	0.140	±0.026	0.228				
	21	0.6	±0.005	±0.012	0.105	±0.005	0.142	±0.015	0.244				
1961													
Jan.	10	1.4			0.117		0.105		0.219				
	11	0.4			0.105		0.151		0.253				
Feb.	6	1.8	±0.005	±0.007	0.122	±0.004	0.147	±0.005	0.266	-0.032	±0.012	+0.008	±0.009
	8	2.8	±0.007	±0.012	0.097	±0.004	0.107	±0.007	0.201	-0.057	±0.013	-0.055	±0.024
	10	1.3	±0.005	±0.009	0.130	±0.004	0.131	±0.008	0.258	-0.029	±0.012	-0.001	±0.024
	15	1.1	±0.005	±0.007	0.115	±0.005	0.146	±0.007	0.258				
	24	0.5			0.115	±0.012	0.171	±0.014	0.283				
Mar.	1	2.5	±0.009	±0.009	0.094	±0.006	0.097	±0.006	0.189	-0.057	±0.009	-0.092	±0.020
	22	1.8			0.126		0.160		0.283				
	23	4.7	±0.009	±0.018	0.108	±0.004	0.133	±0.008	0.238				
	31	2.9	±0.011	±0.005	0.102	±0.007	0.134	±0.003	0.233				
Apr.	4	1.9	±0.004	±0.008	0.129	±0.003	0.135	±0.006	0.261	-0.044	±0.010	-0.013	±0.020
	9	3.4	±0.004	±0.012	0.127	±0.002	0.147	±0.006	0.271				
	12	8.4	±0.005	±0.014	0.097	±0.003	0.147	±0.007	0.241	-0.017	±0.005	+0.003	±0.017
					0.109	±0.003	0.145	±0.007	0.251				
	29	0.5			0.078		0.105		0.241				
May	9	1.0			0.110		0.151		0.258				
	16	0.5			0.131		0.202		0.330				
	17	2.5			0.119		0.214		0.330				
	19	0.9			0.111		0.179		0.287				
	21	4.5			0.122		0.177		0.296				
Jun.	2	1.1			0.120		0.157		0.274				
	8	1.1			0.113		0.175		0.285				
	10	0.8			0.115		0.247		0.359				
	28	0.8			0.146		0.226		0.368				

the transformation coefficients on only those nights for which $\Sigma(M-\overline{M})^2$ for the primary standards was larger than 0.3. These nights are listed in Table III.

Examining Table II we notice that the values of A_8 are usually higher in the summer months when the temperature of the air is high and refrigeration with dry ice is not so effective as in the winter. Numerous experiments made by H. L. Johnson proved that for most multiplier tubes the transformation coefficients depend strongly on temperature when the tubes are not refrigerated.

D. Extinction Coefficients. The values of the extinction coefficients determined from the observations of primary standard stars are given with their mean errors in Table III. The second column gives $\Sigma(M-\overline{M})^2$ which can be considered as the weight of the extinction determination. The third and fourth columns give the mean errors of a single observation of B-V and V as obtained from the least-squares solution. The number of observations used in the solution can be found in the third column of Table II. The mean errors are not given in Table III for those nights when only 2 or 3 primary standards were observed. The values of K_1, Q_{y1} and Q_{b1} listed in the 5th, 6th and 7th columns of Table III are plotted as a function of season in Figures 2, 3 and 4. The coefficient K_1 does not seem to vary with the season. Its mean value can be assumed as $0^m.115$. The mean seasonal values of the extinction coefficients with yellow and blue filters (coefficients Q_{y1} and Q_{b1} used for reducing the observations are:

	Yellow Q_{y1}	Blue Q_{b1}
October, November	$0^m.120$	$0^m.232$
December through March 10	.138	.250
March 11 through April 20	.150	.262
April 21 through July	.190	.300

The dependence of extinction on humidity was investigated but no clearly expressed correlation was found.

The last two columns of Table III give the coefficients K_2 and Q_{y2} which describe the color-dependence of extinction; $K_2 = -0.030$ and $Q_{y2} = -0.002$ are their mean values. In reducing the observations it was, however, assumed that $Q_{y2} = 0$ and that Q_{b2} had the value -0.033.

III. Magnitudes and Colors of Standard and Comparison Stars

A. Accuracy of Two-Color Observations. The magnitudes and colors of the Ten-Year Standards and comparison stars were computed from equations (3) and (4), where the values $K_2 = -0.03$ and $Q_{y2} = 0$ were always assumed. The values of A_1, A_2, A_5 and A_6 were determined from the observations of primary standards for every night when two color observations were made. They were never averaged over several nights.

The nightly values of the extinction coefficients K_1 and Q_{y1} were used only for those nights which are listed in Table III. For other nights the seasonal

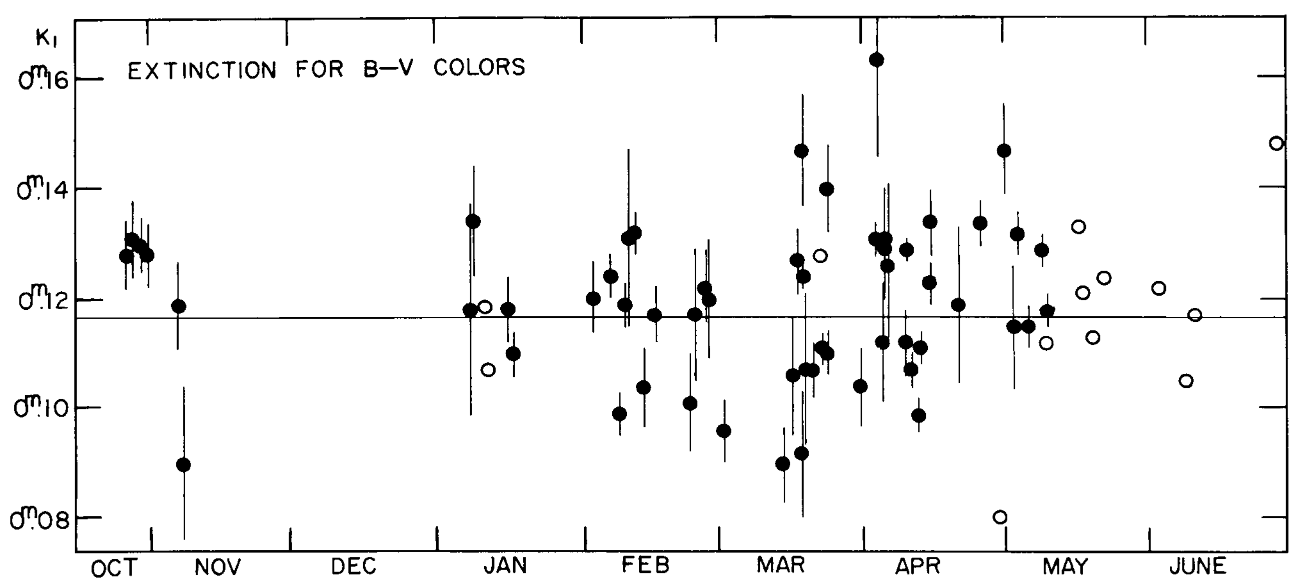

Figure 2. The atmospheric extinction coefficients K_1 for the blue-yellow color index as determined at Lowell Observatory. Vertical lines show the mean errors of nightly values. Open circles represent values based on 2 or 3 standard stars, filled circles those based on 4 or more stars. Horizontal line represents the assumed mean value.

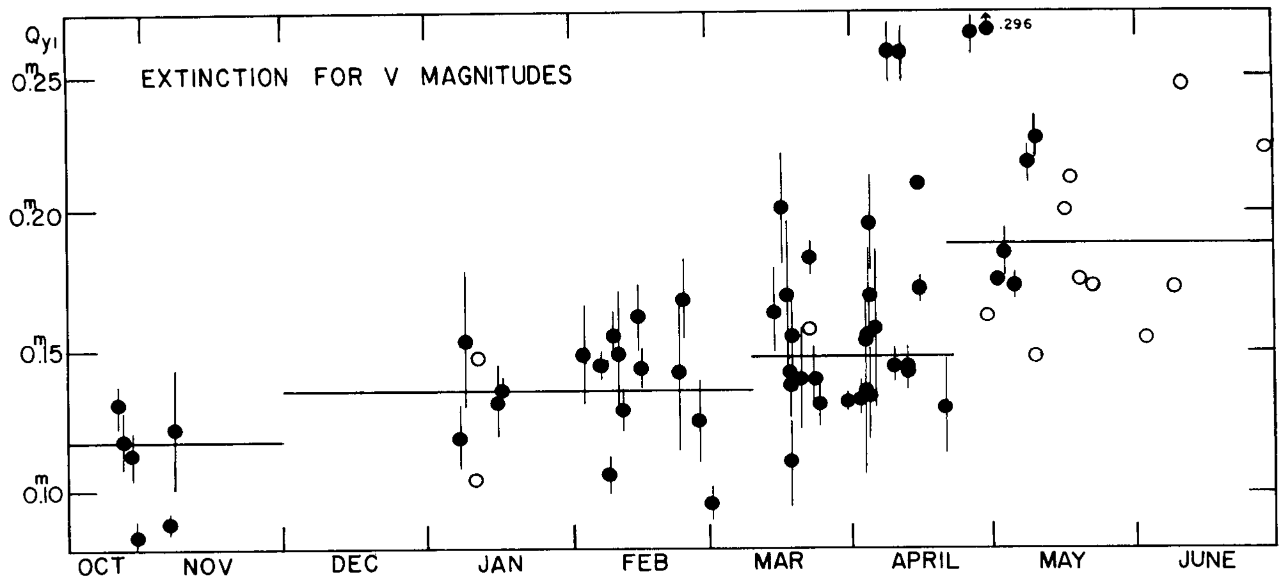

Figure 3. The atmospheric extinction coefficients Q_{y1} for the yellow magnitudes. Notations are the same as in Figure 2. Horizontal lines represent the assumed mean seasonal values.

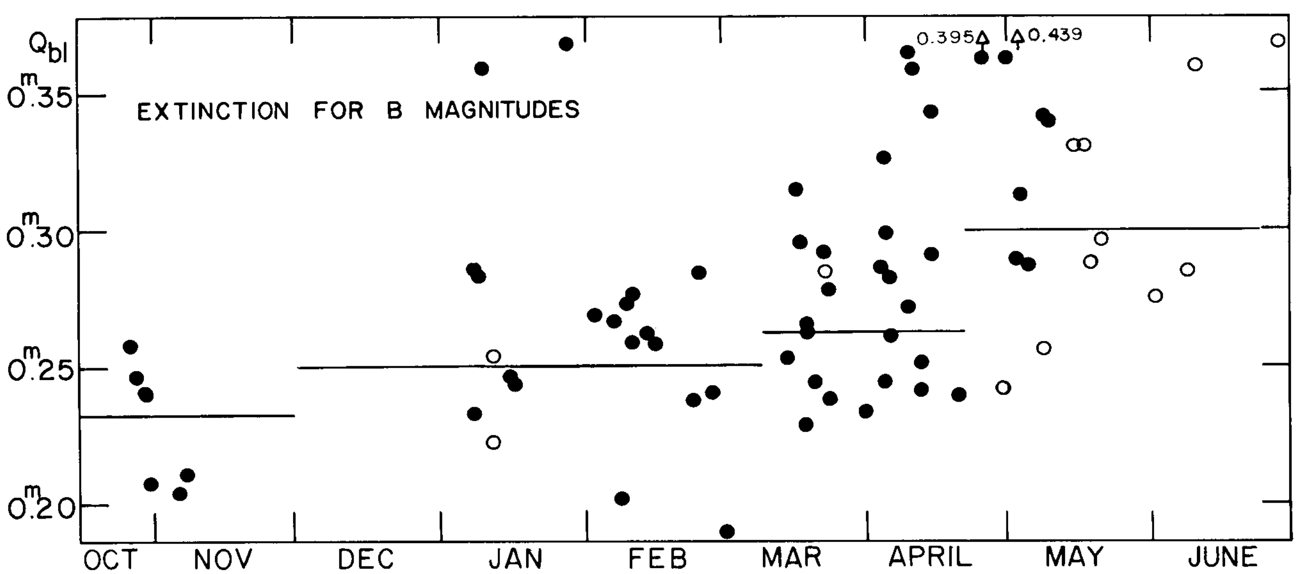

Figure 4. The atmospheric extinction coefficients Q_{b1} for the blue magnitudes. Notations are the same as in Figures 2 and 3.

mean values were used. From the scatter in Figures 2 and 3, it can be roughly estimated that the r.m.s. deviations of nightly values of K_1 and Q_{y1} from seasonal averages are $\sigma(K_1) = \pm 0^m.025$ and $\sigma(Q_{y1}) = \pm 0^m.04$, respectively. The mean errors for a typical observation of the color and magnitude of a bright star at the zenith can be assumed to be $\epsilon_{B-V}(M=1) = \pm 0^m.0075$ and $\epsilon_V(M=1) = \pm 0^m.012$. These values are used for computing the weights of the observations of the Ten-Year Standards and comparison stars, as described below.

We denote by $\overline{M}$ the mean air mass for the primary standard stars used for determining the transformation coefficients A_1, A_2, A_5 and A_6. If these coefficients were the only unknowns determined from the equations (3) and (4), A_1 and A_5 would be distorted by any deviation of extinction coefficients K_1 and Q_{y1} from the assumed seasonal mean values $K_1°$ and $Q_{y1}°$. Instead of the true values for A_1 and A_5, we obtain from the least-squares solution of equations (3) and (4) the coefficients A''_1 and A''_5 connected with the true coefficients by the relations:

$$A''_1 = A_1 - (K_1 - K_1^\circ)\overline{M} \quad , \qquad (21)$$

$$A''_5 = A_5 - (Q_{y1} - Q_{y1}^\circ)\overline{M} \quad , \qquad (22)$$

which are valid when the deviations of K_2 and Q_{y2} from their assumed values can be neglected. The equations (3) and (4) now take the form

$$(B\text{-}V)\,(1 + K_2^\circ M) = A''_1 + A_2 C_{y0} - K_1 - K_1^\circ)\,(M\text{-}\overline{M}) \quad , \qquad (23)$$

$$V\text{-}m_{y0} = A''_5 + A_6\,(B\text{-}V) - (Q_{y1} - Q_{y1}^\circ)\,(M\text{-}M) \quad . \qquad (24)$$

Assuming the seasonal mean values of extinction coefficients we neglect the last terms of equations (23) and (24). Therefore, if we assume that the errors of photometric measurements are proportional to the air mass, the mean errors of the color and magnitude computed by taking into account the uncertainty of extinction are

$$\varepsilon_{B\text{-}V}\,(M) = [M^2\varepsilon^2_{B\text{-}V}\,(M=1) + (M\text{-}\overline{M})^2\sigma^2(K_1)]^{1/2} \quad , \qquad (25)$$

$$\varepsilon_V(M) = [M^2\varepsilon^2_V(M=1) + (M\text{-}\overline{M})^2\sigma^2(Q_{y1})]^{1/2} \quad . \qquad (26)$$

If the weight of the observation at the zenith is taken as 5, the weight of an observation at air mass M is

$$W = \frac{5}{M^2 + (M\text{-}\overline{M})^2\,[\sigma(Q_{y1})/\varepsilon_V\,(M=1)]^2} \qquad (27)$$

This equation was used for computing the weights of all observations given in Tables IV and V. For

Table IV. Observations of Ten Year Standards

ρ Gem

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1955						
Feb.	24	$4^{\mathrm{m}}169$	$+0^{\mathrm{m}}322$	3	$4^{\mathrm{m}}159$	$+0^{\mathrm{m}}319$
Apr.	4	4.210	.328	4	4.214	.318
	11	4.170	.308	4		
	20	4.162	.311	5	4.171	.310
	21	4.191	.326	4	4.192	.322
May	4	4.169	.327	3	4.172	.330
	6	4.168	.321	3	4.163	+0.325
				mean	4.180	+0.320
1956						
Jan.	17	4.173	.321	4	4.181	+0.318
Feb.	3	4.190	.298	4	4.188	.300
	10	4.193	.314	4	4.184	.313
	14	4.193	.308	4	4.183	.304
Mar.	5	4.140	.316	2	4.178	.321
	19	4.179	.323	3	4.182	.315
Apr.	5	4.194	.300	4	4.187	.302
	18	4.174	.333	2	4.170	+0.342
				mean	4.183	+0.312
1957						
Mar.	23	4.182	.302	5	4.181	+0.304
	24	4.194	.311	4	4.199	.305
Apr.	5	4.167	.312	4		
	9	4.187	.316	2		
	15	4.166	.304	3	4.163	.308
	20	4.157	.308	2		
1957						
May	1	$4^{\mathrm{m}}188$	$+0^{\mathrm{m}}331$	2	$4^{\mathrm{m}}177$	$0^{\mathrm{m}}327$
	3	4.191	.312	3	4.194	+0.311
				mean	4.184	+0.309
Dec.	27	4.192	.320	4		
1958						
Jan.	9	4.176	.331	3		
	16	4.177	.315	5	4.180	+0.314
Feb.	11	4.179	.313	2	4.188	.307
	27	4.149	.311	4		
Mar.	20	4.181	.309	2	4.175	.307
Apr.	10	4.178	.314	4	4.178	.309
	11	4.168	.321	4	4.168	.315
	15	4.175	.308	4	4.171	.304
May	4	4.194	.318	3	4.196	.317
	9	4.190	.302	3	4.187	.310
	10	4.226	.311	3	4.220	+0.306
				mean	4.183	+0.310
1959						
Jan.	5	4.141	.322	4	4.173	+0.326
	12	4.185	.321	2	4.190	.323
	24	4.187	.301	3	4.191	.317
	29	4.177	.309	5		
	31	4.183	.312	4	4.192	.317
Feb.	2	4.187	.308	4		
	5	4.168	.331	4	4.173	.332
	26	4.167	.322	4	4.183	.314

Table IV. Observations of Ten Year Standards (Cont'd)

ρ Gem

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1959						
Feb.	28	$4^{m}.215$	$+0^{m}.330$	3	$4^{m}.209$	$+0^{m}.331$
Mar.	1	4 .185	.313	3	4 .187	.323
	3	4 .195	.316	3	4 .218	+0 .330
				mean	4 .189	+0 .324
1960						
Jan.	20	4 .184	.315	4		
	28	4 .181	.314	3	4 .184	+0 .314
Feb.	21	4 .190	.321	2	4 .181	.321
	23	4 .192	.315	1	4 .193	.313
Mar.	15	4 .170	.317	2	4 .171	.324
	17	4 .179	.315	2	4 .173	.321
	18	4 .201	.314	3	4 .186	.313
	19	4 .173	.320	3	4 .181	.321
	21	4 .170	.340	1	4 .176	.315
	26	4 .169	.327	0	4 .162	.329
	30	4 .178	.313	2	4 .183	.315
Apr.	3	4 .169	.309	3	4 .175	.313
	6	4 .200	.319	2	4 .192	+0 .325
				mean	4 .181	+0 .318
1961						
Feb.	6	4 .183	.310	5	4 .183	+0 .308
	8	4 .211	.311	4	4 .206	.302
	10	4 .181	.315	4	4 .174	.309
	15	4 .186	.314	3	4 .173	.314
	21	4 .181	.315	4		
	22	4 .167	.313	4	4 .177	.309
	24	4 .165	.318	3	4 .173	.304
Mar.	1	4 .183	.309	4	4 .176	.306
	8	4 .181	.313	4	4 .169	.311
	23	4 .158	.312	4	4 .154	.311
	31	4 .189	.310	3	4 .183	.325
Apr.	4	4 .192	.323	3	4 .185	.318
	9	4 .171	.306	2	4 .177	.312
	12	4 .183	.316	4	4 .180	+0 .315
				mean	4 .177	+0 .311

10 U Ma

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1955						
Feb.	24	$3^{m}.966$	$+0^{m}.432$	4	$3^{m}.956$	$+0^{m}.429$
Apr.	4	3 .967	.453	3	3 .971	.443
	11	3 .974	.433	3		
	20	3 .977	.440	4	3 .986	.439
May	4	3 .966	.433	3	3 .969	.436
	6	3 .964	.436	4	3 .959	.440

10 U Ma

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1955						
May	28	$3^{m}.980$	$+0^{m}.444$	3	$3^{m}.979$	$+0^{m}.442$
				mean	3 .970	+0 .438
1956						
Jan.	17	3 .955	.439	4	3 .963	+0 .436
Feb.	3	3 .970	.420	4	3 .968	.422
	10	3 .976	.430	4	3 .967	.429
	14	3 .994	.427	5	3 .984	.423
Mar.	5	3 .930	.432	2	3 .968	.437
	19	3 .971	.437	4	3 .974	.429
Apr.	5	3 .954	.435	4	3 .947	.437
	18	3 .978	.427	1	3 .974	+0 .436
				mean	3 .968	+0 .430
1957						
Mar.	23	3 .943	.451	5	3 .942	+0 .453
	24	3 .989	.434	4	3 .994	.428
Apr.	5	3 .958	.428	3		
	9	3 .978	.430	2		
	15	3 .971	.428	3	3 .968	.432
	20	3 .963	.442	2		
	26	3 .976	.438	1		
May	1	3 .996	.446	3	3 .985	.442
	3	3 .963	.442	4	3 .966	.441
	5	3 .986	.430	1	3 .975	+0 .433
				mean	3 .969	+0 .440
Dec.	27	3 .960	.445	3		
1958						
Jan.	8	3 .992	.428	1		
	9	3 .955	.458	3		
	16	3 .981	.424	4	3 .984	+0 .423
Feb.	11	3 .995	.420	2	4 .004	.414
	27	3 .957	.423	4		
Mar.	20	3 .984	.431	2	3 .978	.429
Apr.	10	3 .987	.430	4	3 .987	.425
	11	3 .967	.440	4	3 .967	.434
	15	3 .979	.427	4	3 .975	.423
May	4	3 .975	.427	3	3 .977	.426
	9	3 .972	.432	2	3 .969	.440
	10	3 .988	.440	2	3 .982	+0 .435
				mean	3 .980	+0 .427
1959						
Jan.	5	3 .930	.432	4	3 .962	+0 .436
	12	3 .970	.434	2	3 .975	.436
	24	3 .972	.422	2	3 .976	.438
	29	3 .963	.435	5		
	31	3 .957	.449	4	3 .966	.454
Feb.	2	3 .949	.426	4		
	4	3 .962	.431	5	3 .977	.436
	5	3 .974	.432	5	3 .979	.433

Table IV. Observations of Ten Year Standards (Cont'd)

10 U Ma

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1959						
Feb.	26	$3^{m}947$	$+0^{m}445$	5	$3^{m}963$	$+0^{m}437$
	28	4 .001	.433	3	3 .995	.434
Mar.	1	3 .977	.432	2	3 .979	.442
	3	3 .974	.435	4	3 .997	+0 .449
				mean	3 .976	+0 .439
1960						
Jan.	20	3 .975	.430	4		
	28	3 .981	.427	3	3 .984	+0 .427
Feb.	21	3 .984	.438	4	3 .975	.438
	23	3 .974	.442	4	3 .975	.440
Mar.	15	3 .968	.429	3	3 .969	.436
	17	3 .985	.429	3	3 .979	.435
	18	4 .007	.436	2	3 .992	.435
	19	3 .958	.441	2	3 .966	.442
	21	3 .966	.464	2	3 .972	.439
	26	3 .977	.437	1	3 .970	.439
	30	3 .962	.440	3	3 .967	.442
Apr.	3	3 .959	.427	4	3 .965	.431
	6	3 .989	.420	3	3 .981	+0 .426
				mean	3 .974	+0 .435
1961						
Feb.	6	3 .974	.434	4	3 .974	+0 .432
	8	3 .965	.436	3	3 .960	.427
	10	3 .983	.435	3	3 .976	.429
	15	3 .987	.425	4	3 .974	.425
	21	3 .973	.435	4		
	22	3 .957	.442	4	3 .967	.438
	24	3 .968	.444	4	3 .976	.430
Mar.	1	3 .973	.428	5	3 .966	.425
	8	3 .981	.431	4	3 .969	.429
	23	3 .947	.434	3	3 .943	.433
	31	3 .980	.418	3	3 .974	.433
Apr.	4	3 .980	.436	4	3 .973	.431
	9	3 .965	.434	3	3 .971	.440
	12	3 .981	.429	5	3 .978	+0 .428
				mean	3 .970	+0 .431

11 L Mi

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1955						
Feb.	24	$5^{m}412$	$+0^{m}775$	2	$5^{m}402$	$+0^{m}772$
Apr.	4	5 .413	.778	3	5 .417	.768
	11	5 .407	.766	4		
	20	5 .412	.771	5	5 .421	.770
	21	5 .416	.775	4	5 .417	.771
May	4	5 .406	.764	4	5 .409	.767

11 L Mi

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1955						
May	6	$5^{m}402$	$+0^{m}771$	4	$5^{m}397$	$+0^{m}775$
	28	5 .414	.782	3	5 .413	+0 .780
				mean	5 .412	+0 .772
1956						
Jan.	17	5 .406	.772	4	5 .414	+0 .769
Feb.	3	5 .394	.780	4	5 .392	.782
	10	5 .412	.775	4	5 .403	.774
	14	5 .422	.764	5	5 .412	.760
Mar.	5	5 .380	.755	2	5 .418	.760
	19	5 .414	.770	4	5 .417	.762
Apr.	5	5 .407	.766	4	5 .400	.768
	18	5 .440	.756	2	5 .436	+0 .765
				mean	5 .409	+0 .768
1957						
Mar.	23	5 .402	.763	5	5 .401	+0 .765
	24	5 .420	.770	4	5 .425	.764
Apr.	5	5 .416	.773	4		
	9	5 .415	.776	2		
	15	5 .414	.758	3	5 .411	.762
	20	5 .426	.778	2		
	26	5 .424	.760	1		
May	1	5 .459	.777	3	5 .448	.773
	3	5 .425	.766	4	5 .428	+0 .765
				mean	5 .421	+0 .766
Dec.	27	5 .397	.769	4		
1958						
Jan.	8	5 .414	.766	1		
	9	5 .395	.783	3		
	16	5 .426	.756	4	5 .429	+0 .755
Feb.	11	5 .396	.778	2	5 .405	.772
	27	5 .393	.770	4		
Mar.	20	5 .420	.778	2	5 .414	.776
Apr.	10	5 .424	.762	4	5 .424	.757
	11	5 .411	.777	4	5 .411	.771
	15	5 .428	.782	4	5 .424	.778
May	4	5 .407	.773	3	5 .409	.772
	9	5 .418	.757	3	5 .415	.765
	10	5 .433	.770	3	5 .427	+0 .765
				mean	5 .419	+0 .767
1959						
Jan.	5	5 .367	.763	3	5 .399	+0 .767
	12	5 .381	.788	2	5 .386	.790
	24	5 .394	.758	2	5 .398	.774
	29	5 .382	.768	5		
	31	5 .384	.768	4	5 .393	.773
Feb.	2	5 .401	.775	4		
	4	5 .398	.765	5	5 .413	.770
	5	5 .409	.775	5	5 .414	.776

Table IV. Observations of Ten Year Standards (Cont'd)

11 L Mi

DATE		V System of primary stds.	B-V System of primary stds.	Wt.	V System of 10-year stds.	B-V System of 10-year stds.
1959						
Feb.	26	5$^{\rm m}$.402	+0$^{\rm m}$.763	5	5$^{\rm m}$.418	+0$^{\rm m}$.755
	28	5.441	.764	3	5.435	.765
Mar.	1	5.405	.757	2	5.407	.767
	3	5.404	.752	4	5.427	+0.766
				mean	5.411	+0.769
1960						
Jan.	20	5.412	.772	4		
	28	5.402	.776	3	5.405	+0.776
Feb.	17	5.406	.765	2	5.404	.770
	21	5.419	.776	4	5.410	.776
Mar.	15	5.412	.769	3	5.413	.776
	17	5.418	.756	3	5.412	.762
	18	5.428	.771	2	5.413	.770
	19	5.398	.774	2	5.406	.775
	21	5.404	.795	3	5.410	.770
	26	5.422	.766	2	5.415	.768
	30	5.408	.763	3	5.413	.765
Apr.	3	5.406	.758	4	5.412	.762
	6	5.419	.766	3	5.411	+0.772
				mean	5.410	+0.770
1961						
Feb.	6	5.400	.774	4	5.400	+0.772
	8	5.406	.785	3	5.401	.776
	10	5.413	.784	3	5.406	.778
	15	5.425	.762	4	5.412	.762
	21	5.400	.767	4		
	22	5.389	.766	4	5.399	.762
	24	5.395	.773	4	5.403	.759
Mar.	1	5.402	.768	5	5.395	.765
	8	5.402	.768	4	5.390	.766
	23	5.390	.771	3	5.386	.770
	31	5.402	.759	4	5.396	.774
Apr.	4	5.402	.776	5	5.395	.771
	9	5.399	.762	4	5.405	.768
	12	5.422	.768	5	5.419	+0.767
				mean	5.401	+0.768

40 Leo

DATE		V System of primary stds.	B-V System of primary stds.	Wt.	V System of 10-year stds.	B-V System of 10-year stds.
1955						
Feb.	24	4$^{\rm m}$.801	+0$^{\rm m}$.450	2	4$^{\rm m}$.791	+0$^{\rm m}$.447
Apr.	4	4.793	.458	3	4.797	.448
	11	4.794	.455	4		
	20	4.796	.446	5	4.805	.445
	21	4.800	.455	4	4.801	.451
May	4	4.797	.441	4	4.800	.444
	6	4.791	.454	4	4.786	.458
	28	4.796	.457	3	4.795	+0.455
				mean	4.797	+0.450

40 Leo

DATE		V System of primary stds.	B-V System of primary stds.	Wt.	V System of 10-year stds.	B-V System of 10-year stds.
1956						
Jan.	17	4$^{\rm m}$.783	+0$^{\rm m}$.456	4	4$^{\rm m}$.791	+0$^{\rm m}$.453
Feb.	3	4.788	.459	4	4.786	.461
	10	4.793	.454	4	4.784	.453
	14	4.801	.441	4	4.791	.437
Mar.	5	4.759	.441	2	4.797	.446
	14	4.771	.453	4		
	19	4.783	.466	3	4.786	.458
Apr.	5	4.804	.445	3	4.797	.447
	18	4.801	.436	2	4.797	+0.445
				mean	4.790	+0.451
1957						
Mar.	23	4.794	.444	5	4.793	+0.446
	24	4.786	.464	4	4.791	.458
Apr.	5	4.782	.446	4		
	9	4.802	.444	2		
	15	4.790	.441	3	4.787	.445
	20	4.786	.454	2		
	26	4.797	.453	1		
May	1	4.822	.470	2	4.811	.466
	3	4.788	.442	4	4.791	.441
	5	4.799	.445	1	4.788	.448
	30	4.807	.448	2	4.807	+0.448
				mean	4.794	+0.449
Dec.	27	4.792	.447	4		
1958						
Jan.	8	4.793	.451	1		
	9	4.784	.458	3		
	16	4.784	.453	4	4.787	+0.452
Feb.	11	4.782	.461	2	4.791	.455
	27	4.768	.457	4		
Mar.	20	4.792	.461	2	4.786	.459
Apr.	10	4.794	.451	4	4.794	.446
	11	4.794	.453	4	4.794	.447
	15	4.807	.448	4	4.803	.444
May	4	4.793	.450	3	4.795	.449
	9	4.809	.438	3	4.806	.446
	10	4.814	.452	3	4.808	+0.447
				mean	4.796	+0.449
1959						
Jan.	5	4.754	.446	2	4.786	+0.450
	12	4.782	.453	3	4.787	.455
	24	4.784	.441	2	4.788	.457
	29	4.776	.439	5		
	31	4.781	.441	4	4.790	.446
Feb.	2	4.785	.444	4		
	4	4.779	.445	5	4.794	.450
	5	4.805	.430	5	4.810	.431
	26	4.782	.458	5	4.798	.450

Table IV. Observations of Ten Year Standards (Cont'd)

40 Leo

DATE		V System of primary stds.	B-V System of primary stds.	Wt.	V System of 10-year stds.	B-V System of 10-year stds.
1959						
Feb.	28	4$^{\mathrm{m}}$797	+0$^{\mathrm{m}}$452	3	4$^{\mathrm{m}}$791	+0$^{\mathrm{m}}$453
Mar.	1	4 .792	.445	2	4 .794	.455
	3	4 .775	.432	4	4 .798	+0 .446
				mean	4 .795	+0 .448
1960						
Jan.	20	4 .812	.456	4		
	28	4 .789	.447	3	4 .792	+0 .447
Feb.	17	4 .797	.443	2	4 .795	.448
	21	4 .807	.446	4	4 .798	.446
	23	4 .792	.452	3	4 .793	.450
Mar.	15	4 .793	.450	3	4 .794	.457
	17	4 .804	.440	3	4 .798	.446
	18	4 .812	.454	2	4 .797	.453
	19	4 .791	.440	2	4 .799	.441
	21	4 .793	.473	3	4 .799	.448
	26	4 .798	.449	2	4 .791	.451
	30	4 .791	.449	3	4 .796	.451
Apr.	3	4 .789	.448	4	4 .795	.452
	6	4 .806	.444	3	4 .792	+0 .450
				mean	4 .795	+0 .449
1961						
Feb.	6	4 .786	.456	2	4 .786	+0 .454
	8	4 .795	.457	3	4 .790	.448
	10	4 .800	.464	2	4 .793	.458
	15	4 .808	.440	3	4 .795	.440
	21	4 .794	.450	4		
	22	4 .793	.454	4	4 .803	.450
	24	4 .782	.459	3	4 .790	.445
Mar.	8	4 .805	.450	4	4 .793	.448
	23	4 .800	.446	3	4 .796	.445
	31	4 .802	.438	4	4 .796	.453
Apr.	4	4 .792	.458	4	4 .785	.453
	9	4 .783	.448	4	4 .789	.454
	12	4 .807	.454	4	4 .804	+0 .453
				mean	4 .793	+0 .450

36 U Ma (A)

DATE		V System of primary stds.	B-V System of primary stds.	Wt.	V System of 10-year stds.	B-V System of 10-year stds.
1955						
Feb.	24	4$^{\mathrm{m}}$836	+0$^{\mathrm{m}}$522	2	4$^{\mathrm{m}}$826	+0$^{\mathrm{m}}$519
Apr.	4	4 .831	.529	3	4 .835	.519
	11	4 .830	.528	4		
	20	4 .852	.496	3	4 .861	.495
	21	4 .847	.521	4	4 .848	.517
May	4	4 .831	.516	4	4 .834	.519
	6	4 .838	.515	4	4 .833	.519

36 U Ma (A)

DATE		V System of primary stds.	B-V System of primary stds.	Wt.	V System of 10-year stds.	B-V System of 10-year stds.
1955						
May	28	4$^{\mathrm{m}}$841	+0$^{\mathrm{m}}$518	4	4$^{\mathrm{m}}$840	+0$^{\mathrm{m}}$517
				mean	4 .840	+0 .515
1956						
Jan.	17	4 .823	.519	4	4 .831	+0 .516
Feb.	3	4 .833	.518	4	4 .831	.520
	10	4 .847	.507	4	4 .838	.506
	14	4 .833	.538	4	4 .823	.534
Mar.	5	4 .802	.509	2	4 .840	.514
	19	4 .832	.527	3	4 .835	.519
Apr.	5	4 .830	.521	3	4 .823	.523
	18	4 .843	.500	2	4 .839	+0 .509
				mean	4 .832	+0 .518
1957						
Mar.	23	4 .830	.518	4	4 .829	+0 .520
	24	4 .831	.526	4	4 .836	.520
Apr.	5	4 .830	.522	3		
	9	4 .836	.521	2		
	15	4 .835	.513	3	4 .832	.517
	20	4 .832	.512	2		
	26	4 .848	.522	1		
May	1	4 .874	.529	2	4 .863	.525
	3	4 .830	.530	4	4 .833	.529
	5	4 .839	.512	1	4 .828	.515
	30	4 .839	.513	3	4 .839	+0 .513
Jun.	1	4 .837	.528	3		
				mean	4 .836	+0 .521
Dec.	27	4 .821	.519	4		
1958						
Jan.	8	4 .855	.516	1		
	9	4 .830	.528	3		
	16	4 .827	.517	4	4 .830	+0 .516
Feb.	11	4 .838	.535	2	4 .847	.529
	27	4 .800	.525	4		
Mar.	20	4 .839	.514	2	4 .833	.512
Apr.	10	4 .823	.526	4	4 .823	.521
	11	4 .838	.516	4	4 .838	.510
	15	4 .837	.523	4	4 .833	.519
May	4	4 .826	.516	3	4 .828	.515
	9	4 .845	.507	3	4 .842	.515
	10	4 .858	.519	3	4 .852	+0 .514
				mean	4 .835	+0 .516
1959						
Jan.	5	4 .824	.502	4	4 .856	+0 .506
	12	4 .833	.502	2	4 .838	.504
	24	4 .835	.503	2	4 .839	.519
	31	4 .830	.513	4	4 .839	.518
Feb.	4	4 .837	.502	5	4 .852	.507
	5	4 .827	.528	5	4 .832	.529

Table IV. Observations of Ten Year Standards (Cont'd)

36 U Ma (A)

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1959						
Feb.	26	4^{m}823	+0^{m}525	5	4^{m}823	+0^{m}517
	28	4.844	.521	3	4.838	.522
Mar.	1	4.843	.508	2	4.845	.518
	3	4.805	.494	3	4.828	+0.508
				mean	4.839	+0.515
1960						
Jan.	28	4.829	.520	3	4.832	+0.520
Feb.	17	4.836	.513	3	4.834	.518
	21	4.837	.516	4	4.828	.516
	23	4.835	.514	3	4.836	.512
Mar.	15	4.831	.518	3	4.832	.525
	17	4.843	.508	3	4.837	.514
	18	4.859	.523	1	4.844	.522
	19	4.822	.519	1	4.830	.520
	21	4.825	.545	3	4.831	.520
	26	4.838	.508	3	4.831	.510
	30	4.828	.513	2	4.833	.515
Apr.	3	4.832	.516	4	4.838	.520
	6	4.839	.512	4	4.831	+0.518
				mean	4.833	+0.517
1961						
Feb.	6	4.837	.517	3	4.837	+0.515
	8	4.849	.538	3	4.844	.529
	10	4.848	.533	3	4.841	.527
	15	4.850	.523	3	4.837	.523
	21	4.841	.517	4		
	22	4.832	.526	4	4.842	.522
	24	4.829	.528	3	4.837	.514
Mar.	1	4.846	.523	4	4.839	.520
	8	4.859	.522	4	4.847	.520
	23	4.836	.512	3	4.832	.511
	31	4.840	.509	3	4.834	.524
Apr.	4	4.892	.510	4	4.885	.505
	9	4.824	.509	4	4.830	.515
	12	4.844	.515	4	4.841	+0.514
				mean	4.842	+0.518

β Vir

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1955						
Feb.	10	3^{m}602	+0^{m}548	4		
	24	3.645	.555	4	3^{m}635	+0^{m}552
Apr.	4	3.602	.554	4	3.606	.544
	11	3.612	.564	3		
	20	3.611	.554	4	3.620	.553
	21	3.622	.549	3	3.623	.545

β Vir

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1955						
May	4	3^{m}597	+0^{m}547	3	3^{m}600	+0^{m}550
	6	3.602	.550	3	3.597	.554
	28	3.599	.563	3	3.598	+0.561
1956				mean	3.612	+0.551
Jan.	17	3.589	.554	3	3.597	+0.551
Feb.	3	3.593	.568	3	3.591	.570
	10	3.612	.540	3	3.603	.539
	14	3.599	.549	3	3.589	.545
Mar.	5	3.566	.545	2	3.604	.550
	14	3.600	.558	3		
	19	3.615	.547	2	3.618	.539
Apr.	5	3.611	.542	3	3.604	.544
	18	3.620	.534	1	3.616	+0.543
				mean	3.601	+0.548
1957						
Mar.	23	3.613	.542	3	3.612	+0.544
	24	3.600	.553	4	3.605	.547
Apr.	5	3.608	.558	2		
	15	3.608	.545	3	3.605	.549
	20	3.591	.554	0		
	26	3.612	.550	1		
May	1	3.621	.558	3	3.610	.554
	3	3.603	.551	3	3.606	.550
	5	3.611	.543	1	3.600	.546
	30	3.613	.533	2	3.613	+0.533
Jun.	1	3.617	.545	2		
				mean	3.608	+0.547
Dec.	27	3.602	.548	1		
1958						
Jan.	8	3.600	.546	2		
	9	3.598	.550	3		
	16	3.601	.557	3	3.604	+0.556
Feb.	11	3.587	.563	4	3.596	.557
Apr.	10	3.599	.561	3	3.599	.556
	11	3.654	.569	5	3.654	.563
	15	3.615	.552	3	3.611	.548
May	4	3.600	.545	3	3.602	.544
	9	3.618	.547	3	3.615	.555
	10	3.615	.558	3	3.609	+0.553
				mean	3.614	+0.555
1959						
Jan.	5	3.571	.552	1	3.603	+0.556
	12	3.605	.537	3	3.610	.539
	24	3.596	.532	3	3.600	.548
	31	3.595	.545	4	3.604	.550
Feb.	4	3.576	.552	3	3.591	.557
	5	3.597	.538	2	3.602	.539

Table IV. Observations of Ten Year Standards (Cont'd)

β Vir

DATE		V System of primary stds.	B-V System of primary stds.	Wt.	V System of 10-year stds.	B-V System of 10-year stds.
1959						
Feb.	26	$3^{m}577$	$+0^{m}563$	2	$3^{m}593$	$+0^{m}555$
	28	3 .617	.547	3	3 .611	.548
Mar.	1	3 .606	.533	3	3 .608	.543
	3	3 .582	.536	3	3 .605	+0 .550
				mean	3.603	+0 .548
1960						
Jan.	28	3 .608	.536	3	3 .611	+0 .536
Feb.	17	3 .621	.558	3	3 .619	.563
	21	3 .622	.543	3	3 .613	.543
	23	3 .609	.556	3	3 .610	.554
Mar.	15	3 .608	.538	3	3 .609	.545
	17	3 .612	.544	3	3 .606	.550
	18	3 .622	.537	2	3 .607	.536
	19	3 .603	.548	2	3 .611	.549
	21	3 .607	.568	3	3 .613	.543
	26	3 .612	.549	2	3 .605	.551
	30	3 .603	.547	3	3 .608	.549
Apr.	3	3 .620	.547	3	3 .626	.551
	6	3 .620	.548	3	3 .612	+0 .554
				mean	3 .612	+0.548
1961						
Feb.	6	3 .604	.550	4	3 .604	+0 .548
	10	3 .623	.556	0	3 .616	.550
	15	3 .618	.554	2	3 .605	.554
	21	3 .604	.543	2		
	22	3 .600	.558	1	3 .610	.554
	24	3 .592	.558	2	3 .600	.544
Mar.	1	3 .626	.555	3	3 .619	.552
	8	3 .627	.551	3	3 .615	.549
	23	3 .597	.552	3	3 .593	.551
Apr.	4	3 .606	.548	4	3 .599	.543
	9	3 .585	.543	3	3 .591	.549
	12	3 .611	.561	3	3 .608	+0 .560
				mean	3 .609	+0 .550

β CVn

DATE		V System of primary stds.	B-V System of primary stds.	Wt.	V System of 10-year stds.	B-V System of 10-year stds.
1955						
Feb.	10	$4^{m}259$	$+0^{m}587$	4		
	24	4 .269	.591	4	$4^{m}259$	$+0^{m}588$
Apr.	4	4 .238	.607	2	4 .242	.597
	20	4 .243	.584	5	4 .252	.583
	21	4 .254	.593	4	4 .255	.589
May	4	4 .245	.583	4	4 .248	.586
	6	4 .265	.576	5	4 .260	.580

β CVn

DATE		V System of primary stds.	B-V System of primary stds.	Wt.	V System of 10-year stds.	B-V System of 10-year stds.
1955						
May	28	$4^{m}261$	$+0^{m}585$	4	$4^{m}260$	$+0^{m}583$
				mean	4 .255	+0 .585
1956						
Jan.	17	4 .241	.589	4	4 .249	+0 .586
Feb.	3	4 .242	.595	4	4 .240	.597
	10	4 .267	.583	4	4 .258	.582
	14	4 .279	.596	4	4 .269	.592
Mar.	5	4 .212	.570	2	4 .250	.575
	19	4 .253	.590	5	4 .256	.582
Apr.	5	4 .253	.600	2	4 .246	.602
	18	4 .253	.571	2	4 .249	+0 .580
				mean	4 .253	+0 .587
1957						
Mar.	23	4 .262	.590	5	4 .261	+0 .592
	24	4 .245	.598	4	4 .250	.592
Apr.	5	4 .252	.581	4		
	6	4 .264	.582	4		
	15	4 .264	.589	2	4 .261	.593
May	1	4 .279	.596	2	4 .268	.592
	3	4 .254	.587	2	4 .257	.586
	5	4 .272	.580	2	4 .261	.583
	30	4 .264	.581	5	4 .264	+0 .581
				mean	4 .260	+0 .588
1958						
Jan.	8	4 .246	.585	1		
	9	4 .253	.591	3		
	16	4 .256	.588	2	4 .259	+0 .587
Feb.	27	4 .245	.589	3		
Mar.	20	4 .256	.592	2	4 .250	.590
Apr.	10	4 .256	.594	4	4 .256	.589
	11	4 .255	.585	4	4 .255	.579
	15	4 .260	.597	5	4 .256	.593
May	4	4 .254	.586	4	4 .256	.585
	9	4 .262	.578	3	4 .259	.586
	10	4 .270	.590	4	4 .264	+0 .585
				mean	4 .257	+0 .587
1959						
Jan.	5	4 .208	.562	2	4 .240	.566
	12	4 .259	.573	3	4 .264	.575
	24	4 .252	.572	3	4 .256	.588
	31	4 .248	.579	4	4 .257	.584
Feb.	4	4 .241	.581	5	4 .256	.586
	5	4 .251	.574	4	4 .256	.575
	26	4 .244	.599	4	4 .260	.591
	28	4 .261	.581	3	4 .255	.582
Mar.	1	4 .259	.575	2	4 .261	.585

Table IV. Observations of Ten Year Standards (Cont'd)

β CVn

DATE		V System of primary stds.	B-V System of primary stds.	Wt.	V System of 10-year stds.	B-V System of 10-year stds.
1959						
Mar.	3	$4^{m}.228$	$+0^{m}.578$	4	$4^{m}.251$	$+0^{m}.592$
				mean	4 .256	+0 .583
1960						
Jan.	28	4 .255	.585	2	4 .258	+0 .585
Feb.	17	4 .262	.585	5	4 .260	.590
	21	4 .275	.580	4	4 .266	.580
	23	4 .261	.584	5	4 .262	.582
Mar.	15	4 .253	.581	3	4 .254	.588
	17	4 .266	.580	3	4 .260	.586
	18	4 .282	.586	1	4 .267	.585
	19	4 .252	.579	1	4 .260	.580
	21	4 .245	.611	3	4 .251	.586
	26	4 .263	.586	5	4 .256	.588
	30	4 .249	.584	2	4 .254	.586
Apr.	3	4 .253	.581	4	4 .259	.585
	6	4 .262	.577	4	4 .254	+0 .583
				mean	4 .258	+0 .585
1961						
Feb.	6	4 .261	.583	5	4 .261	+0 .581
	8	4 .275	.598	2	4 .270	.589
	10	4 .267	.607	2	4 .260	.601
	15	4 .266	.590	3	4 .253	.590
	21	4 .268	.589	3		
	22	4 .261	.594	3	4 .271	.590
	24	4 .257	.601	3	4 .265	.587
Mar.	1	4 .269	.593	3	4 .262	.590
	8	4 .279	.591	4	4 .267	.589
	23	4 .278	.589	4	4 .274	.588
	31	4 .266	.576	3	4 .260	.591
Apr.	4	4 .252	.594	5	4 .245	.589
	9	4 .240	.582	5	4 .246	.588
	12	4 .255	.589	5	4 .252	+0 .588
				mean	4 .259	+0 .587

78 UMa

DATE		V System of primary stds.	B-V System of primary stds.	Wt.	V System of 10-year stds.	B-V System of 10-year stds.
1955						
Feb.	10	$4^{m}.942$	$+0^{m}.348$	4		
	24	4 .939	.371	4	$4^{m}.929$	$+0^{m}.368$
Apr.	4	4 .925	.377	3	4 .929	.367
	20	4 .911	.366	5	4 .920	.365
	21	4 .928	.361	4	4 .929	.357
May	4	4 .925	.363	4	4 .928	.366
	6	4 .934	.360	4	4 .929	.364
	28	$4^{m}.931$	$+0^{m}.360$	4	$4^{m}.930$	$+0^{m}.358$
				mean	4 .927	+0 .364
1956						
Jan.	17	4 .915	.370	4	4 .923	+0 .367
Feb.	3	4 .927	.361	4	4 .925	.363
	10	4 .925	.368	4	4 .916	.367
	14	4 .927	.368	4	4 .917	.364
Mar.	5	4 .877	.363	2	4 .915	.368
	19	4 .937	.359	4	4 .940	.351
Apr.	5	4 .933	.362	3	4 .926	.364
	18	4 .929	.356	2	4 .925	+0 .365
				mean	4 .924	+0 .363
1957						
Mar.	23	4 .939	.356	4	4 .938	+0 .358
	24	4 .910	.378	4	4 .915	.372
Apr.	6	4 .928	.358	3		
	15	4 .934	.359	2	4 .931	.363
May	1	4 .946	.371	2	4 .935	.367
	3	4 .926	.365	4	4 .929	.364
	5	4 .948	.356	2	4 .937	.359
	30	4 .920	.371	5	4 .920	+0 .371
Jun.	1	4 .915	.377	4		
				mean	4 .928	+0 .366
1958						
Jan.	8	4 .911	.357	2		
	9	4 .915	.369	3		
	16	4 .916	.363	2	4 .919	+0 .362
Feb.	11	4 .920	.377	3	4 .929	.371
	27	4 .934	.369	2		
Mar.	20	4 .929	.374	2	4 .923	.372
Apr.	10	4 .924	.373	4	4 .924	.368
	11	4 .920	.370	4	4 .920	.364
	15	4 .938	.371	4	4 .934	.367
May	4	4 .928	.368	4	4 .930	.367
	9	4 .936	.358	3	4 .933	.366
	10	4 .927	.376	3	4 .921	+0 .371
				mean	4 .926	+0 .367
1959						
Jan.	5	4 .902	.363	2	4 .934	+0 .367
	12	4 .921	.363	3	4 .926	.365
	24	4 .922	.347	3	4 .926	.363
	31	4 .924	.351	4	4 .933	.356
Feb.	4	4 .910	.372	4	4 .925	.377
	5	4 .924	.355	3	4 .929	.356
	26	4 .914	.373	3	4 .930	.365
	28	4 .933	.362	3	4 .927	.363
Mar.	1	4 .924	.356	2	4 .924	.366

Table IV. Observations of Ten Year Standards (Cont'd)

78 UMa

DATE		V System of primary stds.	B-V System of primary stds.	Wt.	V System of 10-year stds.	B-V System of 10-year stds.
1959						
Mar.	3	$4^{m}899$	$+0^{m}356$	4	$4^{m}922$	$+0^{m}370$
				mean	4 .927	+0 .365
1960						
Jan.	28	4 .919	.369	2	4 .922	+0 .369
Feb.	17	4 .925	.365	5	4 .923	.370
	21	4 .931	.364	4	4 .922	.364
	23	4 .925	.365	5	4 .927	.363
Mar.	15	4 .942	.330	3	4 .943	.337
	17	4 .932	.367	3	4 .926	.373
	18	4 .945	.372	1	4 .930	.371
	19	4 .913	.361	1	4 .921	.362
	21	4 .924	.386	3	4 .930	.361
	26	4 .940	.360	4	4 .933	.362
	30	4 .914	.367	2	4 .919	.369
Apr.	3	4 .935	.366	4	4 .941	.370
	6	4 .932	.361	4	4 .924	+0 .367
				mean	4 .928	+0 .365
1961						
Feb.	6	4 .935	.368	4	4 .935	+0 .366
	8	4 .931	.387	2	4 .926	.378
	10	4 .941	.365	2	4 .934	.359
	15	4 .949	.377	2	4 .936	.377
	21	4 .964	.354	3		
	22	4 .933	.378	3	4 .943	.374
	24	4 .929	.380	3	4 .937	.366
Mar.	1	4 .963	.380	3	4 .956	.377
	8	4 .957	.375	4	4 .945	.373
	23	4 .945	.371	3	4 .941	.370
	31	4 .942	.352	3	4 .936	.367
Apr.	4	4 .936	.370	4	4 .929	.365
	9	4 .908	.353	4	4 .914	.359
	12	4 .931	.383	4	4 .928	+0 .382
				mean	4 .935	+0 .370

HD 115043

DATE		V System of primary stds.	B-V System of primary stds.	Wt.	V System of 10-year stds.	B-V System of 10-year stds.
1955						
Feb.	10	$6^{m}845$	$+0^{m}610$	4		
	24	6 .836	.603	3	$6^{m}826$	$+0^{m}600$
Apr.	4	6 .821	.624	3	6 .825	.614
	20	6 .819	.606	5	6 .828	.605
	21	6 .837	.594	4	6 .838	.590
May	4	6 .845	.603	4	6 .848	.606
	6	6 .842	.596	4	6 .837	.600
	28	6 .850	.606	4	6 .849	+0 .604
				mean	6 .836	+0 .602

HD 115043

DATE		V System of primary stds.	B-V System of primary stds.	Wt.	V System of 10-year stds.	B-V System of 10-year stds.
1956						
Jan.	17	$6^{m}822$	$+0^{m}604$	4	$6^{m}830$	$+0^{m}601$
Feb.	3	6 .860	.598	4	6 .858	.600
	10	6 .849	.592	4	6 .840	.591
	14	6 .856	.620	4	6 .846	.616
Mar.	5	6 .814	.575	2	6 .852	.580
	19	6 .837	.612	4	6 .840	.604
Apr.	5	6 .860	.598	3	6 .853	.600
	18	6 .822	.604	2	6 .818	+0 .613
				mean	6 .843	+0 .601
1957						
Mar.	23	6 .816	.602	4	6 .815	+0 .604
	24	6 .812	.609	4	6 .817	.603
Apr.	6	6 .833	.610	3		
	15	6 .821	.603	2	6 .818	.607
May	1	6 .841	.610	2	6 .830	.606
	3	6 .815	.605	4	6 .818	.604
	5	6 .830	.601	2	6 .819	.604
	30	6 .824	.605	5	6 .824	+0 .605
Jun.	1	6 .814	.605	4		
				mean	6 .820	+0 .604
1958						
Jan.	8	6 .819	.602	1		
	9	6 .812	.607	3		
	16	6 .822	.611	2	6 .825	+0 .610
Feb.	11	6 .809	.615	3	6 .818	.609
	27	6 .820	.605	2		
Mar.	20	6 .814	.609	1	6 .808	.607
Apr.	10	6 .830	.615	4	6 .830	.610
	11	6 .835	.603	4	6 .835	.597
	15	6 .836	.610	4	6 .832	.606
May	4	6 .832	.595	4	6 .834	.594
	9	6 .833	.603	3	6 .830	.611
	10	6 .831	.607	3	6 .825	+0 .602
				mean	6 .829	+0 .604
1959						
Jan.	12	6 .836	.593	3	6 .841	+0 .595
	24	6 .820	.581	3	6 .824	.597
	31	6 .809	.591	4	6 .818	.596
Feb.	4	6 .799	.602	3	6 .814	.607
	5	6 .814	.608	3	6 .819	.609
	26	6 .804	.617	3	6 .820	.609
	28	6 .818	.607	3	6 .812	.608
Mar.	1	6 .837	.592	2	6 .839	.602
	3	6 .800	.580	4	6 .823	+0 .594
				mean	6 .823	+0 .601
1960						
Jan.	28	6 .811	.611	2	6 .814	+0 .611

Table IV. Observations of Ten Year Standards (Cont'd)

HD 115043

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1960						
Feb.	17	$6^{\mathrm{m}}815$	$+0^{\mathrm{m}}599$	5	$6^{\mathrm{m}}813$	$+0^{\mathrm{m}}604$
	21	6.826	.614	4	6.817	.614
	23	6.816	.603	5	6.817	.601
Mar.	15	6.811	.572	3	6.812	.579
	17	6.815	.592	3	6.809	.598
	18	6.830	.605	1	6.815	.604
	19	6.810	.602	1	6.818	.603
	21	6.810	.627	3	6.816	.602
	26	6.825	.605	4	6.818	.607
	30	6.813	.594	2	6.818	.596
Apr.	3	6.820	.608	4	6.826	.612
	6	6.828	.594	4	6.820	+0.600
				mean	6.817	+0.603
1961						
Feb.	6	6.822	.611	4	6.822	+0.609
	8	6.827	.608	3	6.822	.599
	10	6.832	.601	2	6.825	.595
	15	6.843	.610	2	6.830	.610
	21	6.824	.609	2		
	22	6.833	.606	2	6.843	.602
	24	6.814	.631	3	6.822	.617
Mar.	1	6.844	.616	3	6.837	.613
	8	6.851	.614	4	6.839	.612
	23	6.849	.610	3	6.845	.609
	31	6.826	.591	3	6.820	.606
Apr.	4	6.842	.612	4	6.835	.607
	9	6.821	.596	4	6.827	.602
	12	6.820	.610	4	6.817	+0.609
				mean	6.829	+0.607

β Com

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1955						
Feb.	24	$4^{\mathrm{m}}266$	$+0^{\mathrm{m}}568$	3	$4^{\mathrm{m}}256$	$+0^{\mathrm{m}}565$
Apr.	4	4.245	.588	2	4.249	.578
	20	4.235	.566	5	4.244	.565
	21	4.243	.581	4	4.244	.577
May	4	4.247	.564	4	4.250	.567
	6	4.261	.561	5	4.256	.565
	28	4.251	.567	4	4.250	+0.565
				mean	4.250	+0.568
1956						
Jan.	17	4.241	.580	4	4.249	+0.577
Feb.	3	4.240	.591	4	4.238	.593
	10	4.264	.567	4	4.255	.567
	14	4.262	.568	5	4.252	.564

β Com

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1956						
Mar.	5	$4^{\mathrm{m}}206$	$+0^{\mathrm{m}}572$	2	$4^{\mathrm{m}}244$	$+0^{\mathrm{m}}577$
	14	4.235	.590	4		
	19	4.239	.586	5	4.242	.578
Apr.	5	4.273	.564	3	4.266	.566
	18	4.254	.560	2	4.250	+0.569
				mean	4.249	+0.574
1957						
Mar.	23	4.264	.561	4	4.263	+0.563
	24	4.233	.574	3	4.238	.568
Apr.	6	4.256	.572	3		
	15	4.263	.576	2	4.260	.580
May	1	4.252	.566	2	4.241	.562
	3	4.246	.569	4	4.249	.568
	5	4.247	.564	2	4.236	.567
	30	4.254	.573	5	4.254	+0.573
Jun.	1	4.254	.575	4		
				mean	4.250	+0.569
1958						
Jan.	8	4.232	.566	2		
	9	4.243	.582	3		
	16	4.250	.574	4	4.253	+0.573
Feb.	11	4.244	.575	3	4.253	.569
Mar.	20	4.276	.581	2	4.270	.579
Apr.	10	4.249	.581	4	4.249	.576
	11	4.243	.582	4	4.243	.576
	15	4.255	.577	4	4.251	.573
May	4	4.248	.572	4	4.250	.571
	9	4.253	.566	4	4.250	.574
	10	4.250	.576	4	4.244	+0.571
				mean	4.250	+0.573
1959						
Jan.	5	4.221	.570	2		
	12	4.258	.567	3	4.263	+0.569
	24	4.250	.555	3	4.254	.571
	31	4.250	.571	4	4.259	.576
Feb.	4	4.244	.560	3	4.259	.565
	5	4.243	.572	3	4.248	.573
	26	4.240	.582	3	4.256	.574
	28	4.246	.572	3	4.240	.573
Mar.	1	4.258	.556	2	4.260	.566
	3	4.239	.554	4	4.262	+0.568
				mean	4.256	+0.571
1960						
Jan.	28	4.250	.570	2	4.253	+0.570
Feb.	17	4.261	.569	5	4.259	.574
	21	4.256	.579	4	4.247	.579
	23	4.249	.579	5	4.250	.577
Mar.	15	4.259	.571	3	4.260	.578

Table IV. Observations of Ten Year Standards (Cont'd)

β Com

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1960						
Mar.	17	$4^{m}263$	$+0^{m}566$	4	$4^{m}257$	$+0^{m}572$
	18	4 .273	.574	1	4 .258	.573
	19	4 .254	.557	1	4 .262	.558
	21	4 .241	.601	3	4 .247	.576
	26	4 .257	.564	5	4 .250	.566
	30	4 .251	.567	2	4 .256	.569
Apr.	3	4 .244	.572	4	4 .250	.576
	6	4 .250	.569	4	4 .242	+0 .575
				mean	4 .252	+0 .574
1961						
Feb.	6	4 .256	.573	5	4 .256	+0 .571
	8	4 .249	.569	3	4 .244	.560
	10	4 .250	.576	1	4 .243	.570
	15	4 .278	.567	3	4 .265	.567
	22	4 .241	.578	4	4 .251	.574
	24	4 .246	.588	4	4 .254	.574
Mar.	1	4 .251	.566	4	4 .244	.563
	8	4 .251	.569	4	4 .239	.567
	23	4 .259	.578	3	4 .255	.577
	31	4 .249	.559	4	4 .243	.574
Apr.	4	4 .246	.579	5	4 .239	.574
	9	4 .248	.568	3	4 .254	.574
	12	4 .245	.577	5	4 .242	+0 .576
				mean	4 .248	+0 .571

61 Vir

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1955						
Feb.	8	$4^{m}736$	$+0^{m}687$	1		
	10	4 .743	.709	1		
	24	4 .759	.718	4	$4^{m}749$	$+0^{m}715$
Apr.	4	4 .757	.679	4	4 .761	.669
	20	4 .810	.700	0	4 .819	.699
	21	4 .787	.699	1	4 .788	.695
May	4	4 .745	.718	1	4 .748	.721
	6	4 .750	.704	2	4 .745	.708
	28	4 .740	.716	1	4 .739	+0 .714
1956				mean	4 .754	+0 .699
Jan.	17	4 .730	.703	2	4 .738	+0 .700
Feb.	3	4 .742	.695	1	4 .740	.697
	10	4 .742	.702	2	4 .733	.701
	14	4 .734	.729	2	4 .724	.725
Mar.	5	4 .692	.708	1	4 .730	.713
	19	4 .727	.712	2	4 .730	.704
Apr.	5	4 .749	.702	2	4 .742	.704

61 Vir

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1956						
Apr.	18	$4^{m}775$	$+0^{m}691$	0	$4^{m}771$	$+0^{m}700$
				mean	4 .734	+0 .707
1957						
Mar.	23	4 .726	.715	1	4 .725	+0 .717
	24	4 .724	.701	0	4 .729	.695
Apr.	6	4 .761	.706	4		
	15	4 .730	.712	1	4 .727	.716
May	1	4 .714	.680	1	4 .703	.676
	3	4 .748	.710	1	4 .751	.709
	5	4 .774	.749	1	4 .763	.752
	30	4 .741	.697	1	4 .741	+0 .697
Jun.	1	4 .750	.706	1		
				mean	4 .735	+0 .711
1958						
Jan.	8	4 .761	.711	2		
	16	4 .734	.707	2	4 .737	+0 .706
Mar.	20	4 .739	.715	1	4 .733	.713
Apr.	10	4 .723	.725	1	4 .723	.720
	11	4 .726	.699	2	4 .726	.693
	15	4 .730	.706	2	4 .726	.702
May	4	4 .738	.701	2	4 .740	.700
	9	4 .735	.699	2	4 .732	.707
	10	4 .735	.720	2	4 .729	+0 .715
1959				mean	4 .731	+0 .706
Jan.	5	4 .680	.718	0		
	12	4 .711	.730	0	4 .716	+0 .732
	24	4 .707	.688	0	4 .711	.704
	31	4 .726	.705	0	4 .735	.710
Feb.	4	4 .704	.675	0	4 .719	.680
	5	4 .713	.693	0	4 .718	.694
	26	4 .714	.718	0	4 .730	.710
	28	4 .760	.699	1	4 .754	.700
Mar.	1	4 .724	.696	0	4 .726	.706
	3	4 .715	.686	1	4 .738	+0 .700
				mean	(4.746)	(+0.700)
1960						
Jan.	28	4 .726	.705	1	4 .729	+0 .705
Feb.	17	4 .722	.706	0	4 .720	.711
	21	4 .739	.706	1	4 .730	.706
	23	4 .744	.702	1	4 .745	.700
Mar.	15	4 .723	.716	2	4 .724	.723
	17	4 .682	.687	0	4 .676	.693
	18	4 .729	.706	2	4 .714	.705
	19	4 .728	.722	2	4 .736	.723
	21	4 .733	.740	2	4 .739	.715
	26	4 .756	.707	0	4 .749	.709
	30	4 .741	.704	1	4 .746	.706

Table IV. Observations of Ten Year Standards (Cont'd)

61 Vir

DATE		V System of primary stds.	B-V System of primary stds.	Wt.	V System of 10-year stds.	B-V System of 10-year stds.
1960						
Apr.	3	4^{m}757	+0^{m}728	0	4^{m}763	+0^{m}732
	6	4.773	.707	1	4.765	+0.713
				mean	4.734	+0.712
1961						
Feb.	6	4.732	.713	2	4.732	+0.711
	8	4.772	.722	1	4.767	.713
	15	4.731	.714	1	4.718	.714
	22	4.715	.702	1	4.725	.698
Mar.	1	4.755	.725	2	4.748	.722
	8	4.747	.705	1	4.735	.703
	23	4.752	.715	2	4.748	.714
	31	4.751	.694	2	4.745	.709
Apr.	4	4.719	.707	2	4.712	.702
	12	4.746	.723	2	4.743	+0.722
				mean	4.738	+0.712

70 Vir

DATE		V System of primary stds.	B-V System of primary stds.	Wt.	V System of 10-year stds.	B-V System of 10-year stds.
1955						
Feb.	8	4^{m}984	+0^{m}707	4		
	10	4.990	.707	4		
	24	4.998	.717	3	4^{m}988	+0^{m}714
Apr.	4	4.953	.738	3	4.957	.728
	20	4.963	.716	5	4.972	.715
	21	4.959	.729	4	4.960	.725
May	4	4.977	.706	4	4.980	.709
	6	4.995	.710	4	4.990	.714
	28	4.975	.711	4	4.974	+0.709
				mean	4.974	+0.716
1956						
Jan.	17	4.959	.722	3	4.967	+0.719
Feb.	3	4.966	.718	4	4.964	.720
	10	4.986	.714	4	4.977	.713
	14	4.990	.703	4	4.980	.699
Mar.	5	4.928	.725	2	4.966	.730
	14	4.983	.707	4		
	19	4.975	.708	4	4.978	.700
Apr.	5	4.994	.719	3	4.987	.721
	18	4.982	.691	2	4.978	+0.700
				mean	4.975	+0.712
1957						
Mar.	23	4.991	.709	4	4.990	+0.711
	24	4.965	.710	3	4.970	.704
Apr.	6	4.983	.712	3		
	15	4.987	.706	3	4.984	.710
May	1	4.978	.702	3	4.967	.698

70 Vir

DATE		V System of primary stds.	B-V System of primary stds.	Wt.	V System of 10-year stds.	B-V System of 10-year stds.
1957						
May	3	4^{m}983	+0^{m}710	4	4^{m}986	+0^{m}709
	5	4.991	.714	2	4.980	.717
	30	4.979	.710	5	4.979	+0.710
Jun.	1	4.968	.727	4		
				mean	4.980	+0.708
1958						
Jan.	16	4.968	.717	3	4.971	+0.716
Feb.	11	4.961	.723	3	4.970	.717
Mar.	20	5.013	.715	1	5.007	.713
Apr.	10	4.972	.725	3	4.972	.720
	11	4.972	.724	4	4.972	.718
	15	4.988	.725	4	4.984	.721
May	4	4.968	.724	4	4.970	.723
	9	4.976	.696	3	4.973	.704
	10	4.973	.717	3	4.967	+0.712
				mean	4.974	+0.717
1959						
Jan.	5	4.959	.722	1		
	12	4.964	.715	2	4.969	+0.717
	24	4.969	.699	3	4.973	.715
	31	4.967	.706	4	4.976	.711
Feb.	4	4.954	.702	2	4.969	.707
	5	4.956	.716	2	4.961	.717
	26	4.958	.726	2	4.974	.718
	28	4.980	.704	3	4.974	.705
Mar.	1	4.968	.707	3	4.970	.717
	3	4.944	.696	4	4.967	+0.710
				mean	4.971	+0.713
1960						
Jan.	28	4.971	.713	2	4.974	+0.713
Feb.	17	4.975	.707	5	4.973	.712
	21	4.990	.714	4	4.981	.714
	23	4.981	.713	5	4.982	.711
Mar.	15	4.976	.700	3	4.977	.707
	17	4.984	.708	3	4.978	.714
	18	4.991	.718	1	4.976	.717
	19	4.980	.705	1	4.988	.706
	21	4.983	.734	3	4.989	.709
	26	4.995	.714	4	4.988	.716
	30	4.979	.714	2	4.984	.716
Apr.	3	4.977	.704	4	4.983	.708
	6	4.986	.709	4	4.978	+0.715
				mean	4.981	+0.712
1961						
Feb.	6	4.976	.717	4	4.976	+0.715
	8	4.970	.712	3	4.965	.703
	10	4.976	.722	2	4.969	.716
	15	4.980	.709	3	4.967	.709
	22	4.965	.703	4	4.975	.699

Table IV. Observations of Ten Year Standards (Cont'd)

70 Vir

DATE 1961		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
Feb.	24	4ᵐ.964	+0ᵐ.731	3	4ᵐ.972	+0ᵐ.717
Mar.	1	4 .977	.714	4	4 .970	.711
	8	4 .981	.717	4	4 .969	.715
	23	4 .978	.712	3	4 .974	.711
	31	4 .977	.699	3	4 .971	.704
Apr.	4	4ᵐ.975	+0ᵐ.723	4	4ᵐ.968	+0ᵐ.718
	9	4 .973	.705	3	4 .979	.711
	12	4 .972	.717	4	4 .969	+0 .716
				mean	4 .971	+0 .711

τ Boo

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1955						
Feb	8	4ᵐ.498	+0ᵐ.487	4		
	24	4 .503	.488	3	4ᵐ.493	+0ᵐ.485
Apr.	4	4 .488	.480	3	4 .492	.470
	20	4 .482	.479	5	4 .491	.478
	21	4 .475	.494	3	4 .476	.490
May	4	4 .491	.476	4	4 .494	.479
	6	4 .512	.468	4	4 .507	.472
	28	4 .483	.479	4	4 .482	+0 .477
				mean	4 .491	+0 .478
1956						
Jan.	17	4 .493	.470	3	4 .501	+0 .467
Feb.	3	4 .525	.451	4	4 .523	.453
	10	4 .520	.508	4	4 .511	.507
	14	4 .505	.494	4	4 .495	.490
Mar.	5	4 .450	.465	2	4 .488	.470
	14	4 .482	.499	4		
	19	4 .486	.502	4	4 .489	.495
Apr.	5	4 .498	.491	3	4 .491	.493
	18	4 .495	.475	2	4 .491	+0 .484
				mean	4 .500	+0 .483
1957						
Mar.	23	4 .500	.479	4	4 .499	+0 .481
	24	4 .482	.485	4	4 .487	.479
Apr.	6	4 .494	.484	3		
	15	4 .501	.481	3	4 .498	.485
	24	4 .516	.470	1		
May	1	4 .479	.474	2	4 .468	.470
	3	4 .493	.485	4	4 .496	.484
	5	4 .524	.463	1	4 .513	.466
	30	4 .489	.483	4	4 .489	+0 .483
Jun.	1	4 .487	.486	4		
				mean	4 .492	+0 .480
1958						
Jan.	8	4 .484	.483	2		
	16	4 .488	.485	3	4 .491	+0 .484
Feb.	11	4 .479	.481	4	4 .488	.475
Mar.	20	4 .521	.497	1	4 .515	.495
Apr.	10	4 .495	.489	3	4 .495	.484
	11	4 .499	.479	4	4 .499	.473

Table IV. Observations of Ten Year Standards (Cont'd)

τ Boo

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1958						
Apr.	15	4ᵐ.498	+0ᵐ.486	4	4ᵐ.494	+0ᵐ.482
May	4	4 .489	.486	4	4 .491	.485
	9	4 .489	.470	3	4 .486	.478
	10	4 .484	.486	3	4 .478	+0 .481
				mean	4 .491	+0 .481
1959						
Jan.	5	4 .479	.481	1	4 .511	+0 .485
	12	4 .489	.476	2	4 .494	.478
	24	4 .495	.461	3	4 .499	.477
	31	4 .484	.475	4	4 .493	.480
Feb.	4	4 .480	.472	2	4 .495	.477
	5	4 .491	.473	2	4 .496	.474
	26	4 .480	.476	2	4 .496	.468
	28	4 .486	.476	3	4 .480	.477
Mar.	1	4 .484	.470	3	4 .486	.480
	3	4 .471	.452	4	4 .494	+0 .466
				mean	4 .493	+0 .476
1960						
Jan.	28	4 .497	.477	2	4 .500	+0 .477
Feb.	17	4 .528	.439	5	4 .526	.444
	21	4 .510	.474	4	4 .501	.474
	23	4 .486	.490	5	4 .487	.488
Mar.	15	4 .493	.477	3	4 .494	.484
	17	4 .492	.481	3	4 .486	.487
	18	4 .507	.485	1	4 .492	.484
	19	4 .492	.471	1	4 .500	.472
	21	4 .492	.504	3	4 .498	.479
	26	4 .502	.480	5	4 .495	.482
	30	4 .493	.478	2	4 .498	.480
Apr.	3	4 .490	.467	4	4 .496	.471
	6	4 .503	.465	4	4 .495	+0 .471
				mean	4 .498	+0 .475
1961						
Feb.	6	4 .493	.485	4	4 .493	+0 .483
	8	4 .494	.511	3	4 .489	.502
	10	4 .494	.475	2	4 .487	.469
	15	4 .517	.480	3	4 .504	.480
	22	4 .471	.484	4	4 .481	.480
	24	4 .487	.502	2	4 .495	.488
Mar.	1	4 .498	.484	4	4 .491	.481
	8	4 .507	.472	4	4 .495	.470
	23	4 .533	.479	3	4 .529	.478
	31	4 .508	.460	3	4 .502	.475
Apr.	4	4 .500	.483	4	4 .493	.478
	9	4 .494	.469	2	4 .500	.475
	12	4 .499	.474	3	4 .496	+0 .473
				mean	4 .496	+0 .479

Table IV. Observations of Ten Year Standards (Cont'd)

η Boo

DATE		V	B-V	Wt.	V	B-V
		System of primary stds.			System of 10-year stds.	
1955						
Feb.	8	2ᵐ.681	+0ᵐ.588	4		
	24	2 .693	.577	3	2ᵐ.683	+0ᵐ.574
Apr.	4	2 .663	.601	3	2 .667	.591
	20	2 .666	.587	5	2 .675	.586
	21	2 .677	.582	4	2 .678	.578
May	4	2 .679	.577	4	2 .682	.580
	6	2 .697	.571	4	2 .692	.575
	28	2 .667	.584	4	2 .666	+0 .582
				mean	2 .678	+0 .581
1956						
Jan.	17	2 .686	.578	3	2 .694	+0 .575
Feb.	3	2 .695	.573	4	2 .693	.575
	10	2 .689	.585	4	2 .680	.584
	14	2 .684	.592	4	2 .674	.588
Mar.	5	2 .643	.584	2	2 .681	.589
	19	2 .654	.605	4	2 .657	.597
Apr.	5	2 .698	.581	3	2 .691	.583
	18	2 .685	.569	2	2 .681	+0 .578
				mean	2 .681	+0 .584
1957						
Mar.	23	2 .697	.583	4	2 .696	+0 .585
	24	2 .684	.594	4	2 .689	.588
Apr.	6	2 .691	.583	3		
	15	2 .702	.576	3	2 .699	.580
	24	2 .768	.588	1		
May	1	2 .662	.581	1	2 .651	.577
	3	2 .684	.584	4	2 .687	.583
	30	2 .686	.581	5	2 .686	+0 .581
Jun.	1	2 .677	.594	4		
				mean	2 .689	+0 .583
1958						
Jan.	8	2 .682	.585	2		
	16	2 .677	.590	3	2 .680	.589
Feb.	11	2 .666	.590	4	2 .675	.584
Mar.	20	2 .705	.581	1	2 .699	.579
Apr.	10	2 .679	.596	4	2 .679	.591
	11	2 .691	.575	3	2 .691	.569
	15	2 .693	.583	4	2 .689	.579
May	4	2 .677	.591	4	2 .679	.590
	9	2 .678	.582	3	2 .675	.590
	10	2 .678	.595	3	2 .672	+0 .590
				mean	2 .681	+0 .585
1959						
Jan.	5	2 .675	.580	1	2 .707	+0 .584
	12	2 .671	.586	2	2 .676	.588
	24	2 .676	.570	3	2 .680	.586
	31	2 .670	.578	4	2 .679	.583

Table IV. Observations of Ten Year Standards (Cont'd)

η Boo

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1959						
Feb.	4	$2^{\mathrm{m}}.660$	$+0^{\mathrm{m}}.578$	2	$2^{\mathrm{m}}.675$	$+0^{\mathrm{m}}.583$
	5	2 .684	.574	2	2 .689	.575
	26	2 .644	.574	1	2 .660	.566
	28	2 .670	.591	3	2 .664	.592
Mar.	1	2 .687	.568	3	2 .689	.578
	3	2 .641	.576	4	2 .664	+0 .590
				mean	2 .677	+0 .584
1960						
Jan.	28	2 .676	.586	2	2 .679	+0 .586
Feb.	17	2 .677	.579	5	2 .675	.584
	21	2 .695	.582	4	2 .686	.582
	23	2 .683	.584	5	2 .684	.582
Mar.	15	2 .683	.586	3	2 .684	.593
	17	2 .691	.574	3	2 .685	.580
	18	2 .702	.587	1	2 .687	.586
	19	2 .681	.571	1	2 .689	.572
	21	2 .678	.607	3	2 .684	.582
	26	2 .689	.582	5	2 .682	.584
	30	2 .681	.581	2	2 .686	.583
Apr.	3	2 .666	.584	4	2 .672	+0 .588
				mean	2 .682	+0 .584
1961						
Feb.	6	2 .688	.584	4	2 .688	+0 .582
	8	2 .683	.588	3	2 .678	.579
	10	2 .703	.579	2	2 .696	.573
	15	2 .689	.584	3	2 .676	.584
	22	2 .660	.584	4	2 .670	.580
	24	2 .683	.608	3	2 .691	.594
Mar.	1	2 .683	.584	4	2 .676	.581
	8	2 .684	.586	4	2 .672	.584
	23	2 .719	.588	3	2 .715	.587
	31	2 .693	.556	3	2 .687	.571
Apr.	4	2 .687	.582	4	2 .680	.577
	9	2 .674	.582	3	2 .680	.588
	12	2 .686	.585	3	2 .683	+0 .584
				mean	2 .683	+0 .582

σ Boo

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1955						
Feb.	8	$4^{\mathrm{m}}.474$	$+0^{\mathrm{m}}.373$	4		
	24	4 .475	.360	2	$4^{\mathrm{m}}.465$	$+0^{\mathrm{m}}.357$
Apr.	4	4 .445	.384	2	4 .449	.374
	20	4 .442	.368	5	4 .451	.367
	21	4 .449	.371	4	4 .450	.367
May	28	4 .470	.357	4	4 .469	+0 .355
				mean	4 .456	+0 .364
1956						
Jan.	17	4 .466	.368	4	4 .474	+0 .365

Table IV. Observations of Ten Year Standards (Cont'd)

σ Boo

DATE		V	B-V	Wt.	V	B-V
		System of primary stds.			System of 10-year stds.	
1956						
Feb.	3	4ᵐ.482	+0ᵐ.353	4	4ᵐ.480	+0ᵐ.355
	10	4.484	.364	5	4.475	.363
	14	4.487	.371	5	4.477	.367
Mar.	5	4.424	.357	2	4.462	.362
	19	4.470	.369	3	4.473	.361
Apr.	5	4.463	.366	3	4.456	+0.368
				mean	4.473	+0.363
1957						
Mar.	24	4.450	.370	4	4.455	+0.364
Apr.	5	4.460	.356	4		
	15	4.476	.357	2	4.473	.361
	24	4.436	.365	2		
May	1	4.447	.357	2	4.436	.353
	3	4.447	.366	4	4.450	.365
	30	4.458	.364	5	4.458	+0.364
Jun.	1	4.456	.368	4		
				mean	4.455	+0.363
1958						
Jan.	9	4.456	.363	3		
	16	4.458	.369	3	4.461	+0.368
Feb.	11	4.462	.360	4	4.471	.354
Mar.	20	4.495	.371	1	4.489	.369
Apr.	10	4.461	.372	3	4.461	.367
	11	4.451	.372	4	4.451	.366
	15	4.454	.369	4	4.450	.365
May	4	4.459	.366	5	4.461	.365
	9	4.452	.357	3	4.449	.365
	10	4.447	.370	4	4.441	+0.365
				mean	4.457	+0.364
1959						
Jan.	5	4.441	.357	1	4.473	+0.361
	12	4.450	.363	2	4.455	.365
	24	4.468	.342	3	4.472	.358
	31	4.465	.347	4	4.474	.352
Feb.	4	4.449	.356	2	4.464	.361
	5	4.453	.370	2	4.458	.371
	26	4.439	.379	2	4.455	.371
	28	4.459	.352	3	4.453	.353
Mar.	1	4.457	.352	3	4.459	.362
	3	4.423	.346	4	4.446	+0.360
				mean	4.460	+0.360
1960						
Jan.	28	4.467	.365	2	4.470	+0.365
	17	4.458	.365	5	4.456	.370
	21	4.476	.353	4	4.467	.353
	23	4.460	.363	5	4.461	.361
Mar.	15	4.467	.352	4	4.468	.359
	17	4.472	.356	4	4.466	.362

Table IV. Observations of Ten Year Standards (Cont'd)

σ Boo

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1960						
Mar.	18	$4^{\mathrm{m}}.474$	$+0^{\mathrm{m}}.376$	1	$4^{\mathrm{m}}.459$	$+0^{\mathrm{m}}.375$
	19	4 .471	.353	1	4 .479	.354
	21	4 .460	.388	4	4 .466	.363
	26	4 .475	.362	5	4 .468	.364
	30	4 .465	.360	2	4 .470	.362
Apr.	3	4 .451	.358	4	4 .457	.362
	6	4 .470	.351	4	4 .462	+0 .357
				mean	4 .464	+0 .362
1961						
Feb.	8	4 .466	.366	3	4 .461	+0 .357
	10	4 .462	.369	2	4 .455	.363
	15	4 .472	.369	3	4 .459	.369
	22	4 .455	.375	4	4 .465	.371
	24	4 .465	.376	2	4 .473	.362
Mar.	1	4 .479	.362	4	4 .472	.359
	8	4 .476	.365	4	4 .464	.363
	23	4 .466	.348	4	4 .462	.347
	31	4 .483	.336	3	4 .477	.351
Apr.	4	4 .468	.365	4	4 .461	.360
	9	4 .464	.356	3	4 .470	.362
	12	4 .466	.356	5	4 .463	+0 .355
				mean	4 .465	+0 .360

ζ Boo

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)	Corrections to system of 10-year stds. (V)	Corrections to system of 10-year stds. (B-V)
1955								
Apr.	4	$4^{\mathrm{m}}.531$	$+0^{\mathrm{m}}.781$	3	$4^{\mathrm{m}}.535$	$+0^{\mathrm{m}}.771$	$+0^{\mathrm{m}}.004$	$-0^{\mathrm{m}}.010$
	20	4 .544	.780	5	4 .553	.779	+0 .009	−0 .001
	21	4 .530	.766	4	4 .531	.762	+0 .001	−0 .004
May	28	4 .552	.764	4	4 .551	+0 .762	−0 .001	−0 .002
				mean	4 .544	+0 .769		
1956								
Jan.	17	4 .557	.765	4	4 .565	+0 .762	+0 .008	−0 .003
Feb.	3	4 .548	.752	4	4 .546	.754	−0 .002	+0 .002
	10	4 .546	.771	4	4 .537	.770	−0 .009	−0 .001
	14	4 .551	.778	4	4 .541	.774	−0 .010	−0 .004
Mar.	5	4 .501	.773	2	4 .539	.778	+0 .038	+0 .005
	19	4 .553	.777	3	4 .556	.769	+0 .003	−0 .008
Apr.	5	4 .571	.758	3	4 .564	+0 .760	−0 .007	+0 .002
				mean	4 .550	+0 .766		
1957								
Mar.	24	4 .542	.768	4	4 .547	+0 .762	+0 .005	−0 .006
Apr.	5	4 .548	.763	4				
	6	4 .563	.782	3				
	15	4 .558	.772	2	4 .555	.776	−0 .003	+0 .004
	24	4 .538	.773	2				
May	1	4 .528	.753	2	4 .517	.749	−0 .011	−0 .004
	3	4 .535	.765	4	4 .538	.764	+0 .003	−0 .001
	30	4 .548	.771	5	4 .548	+0 .771	0 .000	0 .000

Table IV. Observations of Ten Year Standards (Cont'd)

ζ Boo

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)	Corrections to system of 10-year stds.	
1957								
Jun.	1	4ᵐ.548	+0ᵐ.766	4				
				mean	4 .543	+0 .765		
1958								
Jan.	16	4 .552	.763	3	4 .555	+0 .762	+0ᵐ.003	−0ᵐ.001
Mar.	20	4 .542	.756	5	4 .536	.754	−0 .006	−0 .002
Apr.	10	4 .548	.778	3	4 .548	.773	0 .000	−0 .005
	11	4 .547	.769	3	4 .547	.763	0 .000	−0 .006
	15	4 .541	.772	4	4 .537	.768	−0 .004	−0 .004
May	4	4 .546	.766	4	4 .548	.765	+0 .002	−0 .001
	9	4 .550	.755	3	4 .547	.763	−0 .003	+0 .008
	10	4 .539	.760	3	4 .533	+0 .755	−0 .006	−0 .005
				mean	4 .543	+0 .763		
1959								
Jan.	5	4 .541	.753	0	4 .573	+0 .757	+0 .032	+0 .004
	12	4 .524	.774	1	4 .529	.776	+0 .005	+0 .002
	24	4 .554	.746	2	4 .558	.762	+0 .004	+0 .016
	31	4 .541	.766	3	4 .550	.771	+0 .009	+0 .005
Feb.	4	4 .533	.752	1	4 .548	.757	+0 .015	+0 .005
	5	4 .551	.766	1	4 .556	.767	+0 .005	+0 .001
	26	4 .535	.768	1	4 .551	.760	+0 .016	−0 .008
	28	4 .546	.758	3	4 .540	.759	−0 .006	+0 .001
Mar.	1	4 .531	.755	2	4 .533	.765	+0 .002	+0 .010
	3	4 .507	.749	4	4 .530	+0 .763	+0 .023	+0 .014
				mean	4 .542	+0 .764		
1960								
Jan.	28	4 .551	.767	2	4 .554	+0 .767	+0 .003	0 .000
Feb.	17	4 .541	.772	5	4 .539	.777	−0 .002	+0 .005
	21	4 .556	.765	4	4 .547	.765	−0 .009	0 .000
	23	4 .550	.764	5	4 .551	.762	+0 .001	−0 .002
Mar.	15	4 .558	.757	3	4 .559	.764	+0 .001	+0 .007
	17	4 .556	.754	3	4 .550	.760	−0 .006	+0 .006
	18	4 .561	.764	1	4 .546	.763	−0 .015	−0 .001
	19	4 .532	.758	1	4 .540	.759	+0 .008	+0 .001
	21	4 .536	.796	3	4 .542	.771	+0 .006	−0 .025
	26	4 .550	.761	5	4 .543	.763	−0 .007	+0 .002
	30	4 .543	.765	2	4 .548	.767	+0 .005	+0 .002
Apr.	3	4 .536	.761	3	4 .542	+0 .765	+0 .006	+0 .004
				mean	4 .547	+0 .766		
1961								
Feb.	8	4 .565	.773	2	4 .560	+0 .764	−0 .005	−0 .009
	10	4 .576	.779	1	4 .569	.773	−0 .007	−0 .006
	15	4 .563	.768	3	4 .550	.768	−0 .013	0 .000
	22	4 .541	.774	4	4 .551	.770	+0 .010	−0 .004
	24	4 .525	.785	2	4 .533	.771	+0 .008	−0 .014
Mar.	1	4 .561	.775	4	4 .554	.772	−0 .007	−0 .003
	8	4 .570	.773	4	4 .558	.771	−0 .012	−0 .002
	23	4 .538	.778	3	4 .534	.777	−0 .004	−0 .001
	31	4 .555	.742	1	4 .549	.757	−0 .006	+0 .015

Table IV. Observations of Ten Year Standards (Cont'd)

ζ Boo

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)	Corrections to system of 10-year stds.	
1961								
Apr.	4	4ᵐ584	+0ᵐ778	4	4ᵐ577	+0ᵐ773	−0ᵐ007	−0ᵐ005
	9	4 .557	.754	3	4 .563	.760	+0 .006	+0 .006
	12	4 .550	+0 .748	4	4 .547	+0 .747	−0 .003	−0 .001
				mean	4 .554	+0 .767		

Table V. Observations of Comparison Stars

UA 53 = HD 55052 = 48 Gem

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1954						
Feb.	28	5ᵐ882	+0ᵐ364	3		
Mar.	1	5 .853	.372	3		
1961						
Feb.	6	5 .864	.370	4	5ᵐ864	+0ᵐ368
	8	5 .856	.373	3	5 .851	.364
	10	5 .867	.380	3	5 .860	.374
	21	5 .885	.375	3		
	22	5 .852	.369	4	5 .862	.365
	24	5 .856	.375	3	5 .864	.361
Mar.	1	5 .858	.374	4	5 .851	.371
	8	5 .861	.377	4	5 .849	.375
	23	5 .846	.365	3	5 .842	.364
	31	5 .880	.366	3	5 .874	.381
Apr.	4	5 .861	.379	2	5 .854	.374
	12	5 .873	+0 .374	4	5 .870	+0 .373
				mean	5 .859	+0 .370

NA 54 = HD 118704

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1954						
May	31	8ᵐ501	+0ᵐ543	2		
Jun.	2	8 .507	.564	2		
	12	8 .504	.552	1		
	14	8 .491	.568	2		
	16	8 .454	.562	2		
	17	8 .500	.539	1		
1961						
Feb.	8	8 .515	.546	2	8ᵐ510	+0ᵐ537
	10	8 .495	.545	2	8 .488	.539
	15	8 .520	.548	2	8 .507	.548
	22	8 .475	.531	2	8 .485	.527
Mar.	1	8 .511	.547	3	8 .504	.544
	8	8 .501	.540	2	8 .489	.538
	23	8 .506	.553	2	8 .502	.552
Apr.	4	8 .489	.542	3	8 .482	.537
	12	8 .489	+0 .544	3	8 .486	+0 .543
				mean	8 .494	+0 .541

NB 54 = HD 118705

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1954						
May	31	9ᵐ171	+0ᵐ476	2		
June	2	9 .181	.476	2		
	12	9 .170	.492	1		
	14	9 .166	.499	2		
	16	9 .134	.494	2		
	17	9 .180	.469	1		
1961						
Feb.	8	9 .172	.475	2	9ᵐ167	+0ᵐ466
	10	9 .171	.468	1	9 .164	.462
	15	9 .176	.475	2	9 .163	.475
	22	9 .147	.462	2	9 .157	.458
Mar.	1	9 .190	.458	3	9 .183	.455
	8	9 .178	.470	2	9 .166	.468
	23	9 .196	.445	2	9 .192	.444
Apr.	4	9 .183	.462	3	9 .176	.457
	12	9 .169	+0 .470	3	9 .166	+0 .469
				mean	9 .171	+0 .461

UA 54 = HD 61997

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1953						
Oct.	30	7ᵐ105	+0ᵐ422	3		
Nov.	6	7 .100	.416	3		
	8	7 .102	.431	2		
	23	7 .113	.415	2		
1954						
Feb.	17	7 .120	.421	3		
	23	7 .136	.422	3		
	24	7 .144	.434	3		
	28	7 .146	.413	4		
Mar.	29	7 .119	.421	3		
1961						
Feb.	6	7 .133	.421	4	7ᵐ133	+0ᵐ419
	10	7 .143	.415	3	7 .136	.409
	15	7 .143	.412	3	7 .130	.412
	21	7 .132	.411	3		
	22	7 .129	.409	4	7 .139	.405
	24	7 .108	.423	3	7 .116	.409

Table V. Observations of Comparison Stars (Cont'd)

UA 54 = HD 61997

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1961						
Mar.	1	7$^{\mathrm{m}}$.129	+0$^{\mathrm{m}}$.406	4	7$^{\mathrm{m}}$.122	+0$^{\mathrm{m}}$.403
	8	7.139	.412	4	7.127	.410
	23	7.122	.410	3	7.118	.409
	31	7.139	.414	3	7.133	.429
Apr.	4	7.137	.418	3	7.130	.413
	12	7.136	+0.410	3	7.133	+0.409
				mean	7.129	+0.411

UB 54 = HD 60914

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1953						
Oct.	30	6$^{\mathrm{m}}$.940	+1$^{\mathrm{m}}$.047	2		
Nov.	6	6.938	1.047	2		
1954						
Feb.	17	6.963	1.049	3		
1961						
Feb.	8	6.969	1.052	3	6$^{\mathrm{m}}$.964	+1$^{\mathrm{m}}$.043
	10	6.986	1.067	3	6.979	1.061
	15	6.980	1.046	3	6.967	1.046
	21	6.977	1.044	3		
	22	6.966	1.034	4	6.976	1.030
	24	6.942	1.064	3	6.950	1.050
Mar.	1	6.961	1.052	4	6.954	1.049
	8	6.963	1.056	4	6.951	1.054
	23	6.961	1.046	3	6.957	1.045
	31	6.972	1.046	3	6.966	1.061
Apr.	4	6.974	1.048	3	6.967	1.043
	12	6.979	+1.051	4	6.976	+1.050
				mean	6.964	+1.048

UA′ 54 = HD 58551

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1954						
Mar.	30	6$^{\mathrm{m}}$.544	+0$^{\mathrm{m}}$.468	2		
Apr.	1	6.544	.474	3		
	6	6.540	.466	2		
	22	6.545	.476	2		
	26	6.540	.474	2		
1961						
Feb.	6	6.547	.454	4	6$^{\mathrm{m}}$.547	+0$^{\mathrm{m}}$.452
	10	6.553	.465	3	6.546	.459
	15	6.560	.455	3	6.547	.455
	21	6.549	.472	1		
	22	6.538	.484	4	6.548	.480

UA′ 54 = HD 58551

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1961						
	24	6$^{\mathrm{m}}$.526	+0$^{\mathrm{m}}$.472	3	6$^{\mathrm{m}}$.534	+0$^{\mathrm{m}}$.458
Mar.	1	6.554	.458	4	6.547	.455
	8	6.551	.458	4	6.539	.456
	23	6.530	.459	3	6.526	.458
	31	6.562	.458	2	6.556	.473
Apr.	4	6.562	.455	2	6.555	.450
	12	6.562	+0.464	3	6.559	+0.463
				mean	6.545	+0.460

UB′ 54 = HD 58899

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1954						
Mar.	30	7$^{\mathrm{m}}$.143	+0$^{\mathrm{m}}$.931	2		
Apr.	1	7.147	.927	3		
	6	7.143	.934	2		
	22	7.153	.931	2		
	26	7.141	.927	2		
1961						
Feb.	8	7.168	.920	3	7$^{\mathrm{m}}$.163	+0$^{\mathrm{m}}$.911
	10	7.188	.946	3	7.181	.940
	15	7.168	.919	3	7.155	.919
	21	7.178	.921	1		
	22	7.156	.915	4	7.166	.911
	24	7.135	.947	3	7.143	.933
Mar.	1	7.157	.937	4	7.150	.934
	8	7.165	.930	4	7.153	.928
	23	7.155	.922	3	7.151	.921
	31	7.170	.918	2	7.164	.933
Apr.	12	7.180	+0.921	3	7.177	+0.920
				mean	7.160	+0.925

UA 55 = HD 63772

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1955						
Apr.	20	8$^{\mathrm{m}}$.939	+0$^{\mathrm{m}}$.354	4	8$^{\mathrm{m}}$.948	+0$^{\mathrm{m}}$.353
	25	8.943	.340	4		
May	4	8.961	.361	2	8.964	.364
1956						
Jan.	17	8.943	.353	4	8.951	.350
Feb.	3	8.944	.358	4	8.942	.360
	10	8.968	.352	4	8.959	.351
	14	8.965	.325	5	8.955	.321
Mar.	5	8.932	.348	2	8.970	.353
	14	8.943	.349	3		
	19	8.952	.357	3	8.955	.349

Table V. Observations of Comparison Stars (Cont'd)

UA 55 = HD 63772

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1956						
Apr.	5	8^{m}958	+0^{m}345	4	8^{m}951	+0^{m}347
	18	8 .960	.370	2	8 .956	.379
1961						
Apr.	12	8 .952	+0 .359	3	8 .949	+0 .358
				mean	8 .953	+0 .350

UB 55 = HD 62720

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1955						
Apr.	20	7^{m}400	+0^{m}386	4	7^{m}409	+0^{m}385
	25	7 .388	.391	4		
May	4	7 .416	.393	2	7 .419	.396
1956						
Jan.	17	7 .393	.394	4	7 .401	.391
Feb.	3	7 .410	.378	4	7 .408	.380
	10	7 .425	.378	4	7 .416	.377
	14	7 .423	.357	5	7 .413	.353
Mar.	5	7 .370	.390	2	7 .408	.395
	14	7 .400	.378	3		
	19	7 .401	.391	3	7 .404	.383
Apr.	5	7 .404	.388	4	7 .397	.390
	18	7 .415	.378	2	7 .411	.387
1961						
Apr.	12	7 .424	+0 .384	3	7 .421	+0 .383
				mean	7 .409	+0 .381

NA 55 = HD 120186

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1955						
Apr.	21	7^{m}730	+0^{m}544	3	7^{m}731	+0^{m}540
	25	7 .763	.496	2		
May	4	7 .729	.541	2	7 .732	.544
Jun.	20	7 .723	.557	2		
	21	7 .731	.553	2		
1956						
Jan.	17	7 .704	.546	3	7 .712	.543
	10	7 .704	.544	3	7 .695	.543
Mar.	14	7 .713	.549	2		
	19	7 .711	.561	4	7 .714	.553
Apr.	5	7 .717	.546	3	7 .710	.548
	18	7 .718	.530	1	7 .714	.539
1961						
Apr.	12	7 .714	+0 .550	3	7 .711	+0 .549
				mean	7 .714	+0 .546

NB 55 = HD 119869

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1955						
Apr.	21	8^{m}922	+0^{m}442	3	8^{m}923	+0^{m}438
	25	8 .902	.467	2		
May	4	8 .916	.470	2	8 .919	.473
Jun.	20	8 .910	.454	2		
	21	8 .905	.473	2		
1956						
Jan.	17	8 .893	.452	3	8 .901	.449
Feb.	10	8 .901	.460	3	8 .892	.459
Mar.	14	8 .910	.452	2		
	19	8 .873	.480	4	8 .876	.472
Apr.	5	8 .892	.459	3	8 .885	.461
	18	8 .913	.429	1	8 .909	.438
1961						
Apr.	12	8 .895	+0 .472	3	8 .892	+0 .471
				mean	8 .897	+0 .459

UA 56 = HD 67228 = μ Cnc.

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1955						
Apr.	11	5^{m}256	+0^{m}619	4		
	12	5 .301	.622	5		
	21	5 .321	.642	4	5^{m}322	+0^{m}638
	25	5 .287	.640	4		
May	4	5 .308	.637	2	5 .311	.640
Oct.	27	5 .297	.629	3		
	28	5 .293	.632	3		
	30	5 .280	.633	2		
	31	5 .283	.625	3		
Nov.	4	5 .308	.639	3		
	19	5 .304	.633	4		
	20	5 .304	.641	4		
	27	5 .304	.637	5		
1956						
Jan.	17	5 .287	.646	4	5 .295	.643
Feb.	3	5 .292	.644	4	5 .290	.646
	10	5 .306	.636	4	5 .297	.635
	14	5 .326	.620	5	5 .316	.616
Mar.	5	5 .271	.628	2	5 .309	.633
	14	5 .307	.625	3		
	19	5 .302	.633	3	5 .305	.625
Apr.	5	5 .287	.634	4	5 .280	.636
	18	5 .308	.630	2	5 .304	.639
1957						
Mar.	23	5 .296	.633	4	5 .295	.635
	24	5 .309	.644	4	5 .314	.638
	26	5 .307	.643	1		

Table V. Observations of Comparison Stars (Cont'd)

UA 56 = HD 67228 = μ Cnc.

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1957						
Apr.	5	5^{m}293	+0^{m}633	4		
	9	5 .307	.632	2		
	15	5 .305	.626	2	5^{m}302	+0^{m}630
	16	5 .310	.633	1		
	19	5 .305	.632	1		
	20	5 .299	.638	2		
May	1	5 .325	.650	1	5 .314	.646
	3	5 .308	.639	3	5 .311	.638
	5	5 .310	.628	1	5 .299	.631
1961						
Apr.	12	5 .313	+0 .634	3	5 .310	+0 .633
				mean	5 .304	+0 .635

UB 56 = HD 68256 = δ Cnc (A+B+C)

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1955						
Oct.	27	4^{m}663	+0^{m}531	3		
	28	4 .671	.527	3		
	30	4 .657	.531	2		
	31	4 .648	.528	3		
Nov.	4	4 .678	.539	3		
	19	4 .669	.535	4		
	20	4 .670	.538	4		
	27	4 .675	.536	5		
1956						
Jan.	17	4 .661	.543	4	4^{m}669	+0^{m}540
Feb.	3	4 .652	.543	4	4 .650	.545
	10	4 .675	.532	4	4 .666	.531
	14	4 .686	.520	4	4 .676	.516
Mar.	5	4 .637	.533	2	4 .675	.538
	14	4 .658	.533	4		
	19	4 .677	.525	3	4 .680	.517
Apr.	5	4 .683	.510	4	4 .676	.512
	18	4 .675	.533	2	4 .671	.542
1957						
Mar.	23	4 .674	.526	4	4 .673	.528
	24	4 .691	.532	4	4 .696	.526
	26	4 .681	.540	1		
Apr.	5	4 .665	.526	3		
	9	4 .679	.528	1		
	15	4 .671	.531	2	4 .668	.535
	16	4 .681	.531	1		
	19	4 .677	.518	1		
	20	4 .665	.536	2		
May	1	4 .689	.539	1	4 .678	.535
	3	4 .683	.529	3	4 .686	.528
	5	4 .670	.531	1	4 .659	.534

UB 56 = HD 68256 = δ Cnc (A+B+C)

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1961						
Apr.	12	4^{m}681	+0^{m}540	3	4^{m}678	+0^{m}539
				mean	4 .674	+0 .530

NA 56 = HD 119638

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1956						
Jan.	17	6^{m}907	+0^{m}542	2	6^{m}915	+0^{m}539
	19	6 .900	.541	1		
	20	6 .899	.535	1		
Feb	3	6 .941	.527	2	6 .939	.529
	10	6 .905	.546	2	6 .896	.545
Mar.	19	6 .907	.566	4	6 .910	.558
Apr.	5	6 .918	.534	2	6 .911	.536
	18	6 .933	.529	0	6 .929	.538
1957						
Mar.	23	6 .900	.546	2	6 .899	.548
	24	6 .906	.542	2	6 .911	.536
Apr.	5	6 .942	.533	1		
	6	6 .905	.531	4		
	18	6 .905	.539	2		
	24	7 .086	.531	0		
May	1	6 .861	.529	0	6 .850	.525
	3	6 .906	.552	1	6 .909	.551
	30	6 .910	.531	1	6 .910	.531
Jun.	1	6 .915	.544	1		
1961						
Apr.	12	6 .925	+0 .540	2	6 .922	+0 .539
				mean	6 .912	+0 .543

NB 56 = HD 121111

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1956						
Jan	17	7^{m}691	+0^{m}549	3	7^{m}699	+0^{m}546
	19	7 .694	.550	4		
	20	7 .697	.541	3		
Feb.	3	7 .714	.534	3	7 .712	.536
	10	7 .690	.548	4	7 .681	.547
Mar.	14	7 .718	.545	3		
	19	7 .698	.554	5	7 .701	.546
Apr.	5	7 .685	.565	3	7 .678	.567
	18	7 .708	.528	1	7 .704	.537
1957						
Mar.	23	7 .680	.556	3	7 .679	.558
	24	7 .681	.558	3	7 .686	.552

Table V. Observations of Comparison Stars (Cont'd)

NB 56 = HD 121111

DATE		V System of primary stds.	B-V System of primary stds.	Wt.	V System of 10-year stds.	B-V System of 10-year stds.
1957						
Apr.	5	7ᵐ.735	+0ᵐ.538	2		
	6	7 .690	.540	4		
	18	7 .736	.509	2		
	24	7 .799	.561	1		
May	1	7 .656	.546	1	7ᵐ.645	+0ᵐ.542
	3	7 .689	.550	2	7 .692	.549
	30	7 .690	.540	2	7 .690	.540
Jun.	1	7 .695	.554	2		
1961						
Apr.	12	7 .702	+0 .552	3	7 .699	+0 .551
				mean	7 .691	+0 .549

UA 57 = HD 72779 = 35 Cnc

DATE		V System of primary stds.	B-V System of primary stds.	Wt.	V System of 10-year stds.	B-V System of 10-year stds.
1955						
Nov.	16	6ᵐ.578	+0ᵐ.681	5		
1956						
Jan.	17	6 .573	.681	4	6ᵐ.581	+0ᵐ.678
Feb.	3	6 .585	.679	4	6 .583	.681
	10	6 .592	.683	4	6 .583	.682
	14	6 .589	.664	4	6 .579	.660
Mar.	5	6 .539	.688	2	6 .577	.693
	14	6 .584	.666	4		
	19	6 .578	.684	3	6 .581	.676
Apr.	5	6 .582	.679	4	6 .575	.681
	18	6 .594	.668	2	6 .590	.677
1957						
Mar.	23	6 .573	.685	5	6 .572	.687
	24	6 .596	.683	4	6 .601	.677
	26	6 .567	.691	1		
	31	6 .589	.693	1		
Apr.	5	6 .576	.671	4		
	7	6 .583	.692	5		
	9	6 .593	.679	2		
	15	6 .584	.668	3	6 .581	.672
	16	6 .581	.675	2		
	18	6 .560	.672	1		
	19	6 .584	.674	1		
	20	6 .579	.678	2		
	26	6 .583	.682	1		
May	1	6 .601	.680	1	6 .590	.676
	3	6 .586	.678	3	6 .589	.677
	5	6 .608	.663	1	6 .597	.666
1961						
Apr.	12	6 .600	+0 .678	4	6 .597	+0 .677
				mean	6 .584	+0 .678

UB 57 = HD 73665 = 39 Cnc

DATE		V System of primary stds.	B-V System of primary stds.	Wt.	V System of 10-year stds.	B-V System of 10-year stds.
1955						
Oct.	27	6ᵐ.380	+0ᵐ.966	3		
	28	6 .381	.981	3		
	30	6 .370	.980	2		
	31	6 .378	.976	3		
Nov.	4	6 .397	.983	3		
	7	6 .382	.979	3		
	8	6 .387	.973	3		
	16	6 .383	.982	5		
	19	6 .386	.982	4		
	20	6 .387	.980	4		
	27	6 .388	.986	5		
1956						
Jan.	17	6 .384	.975	3	6ᵐ.392	+0ᵐ.972
Feb.	3	6 .389	.978	4	6 .387	.980
	10	6 .398	.977	4	6 .389	.976
	14	6 .381	.970	3	6 .371	.966
Mar.	5	6 .355	.988	3	6 .393	.993
	14	6 .394	.978	4		
	19	6 .391	.990	4	6 .394	.982
1957						
Mar.	23	6 .388	.975	5	6 .387	.977
	24	6 .410	.978	4	6 .415	.972
	26	6 .380	.982	1		
	31	6 .397	.990	1		
Apr.	5	6 .389	.965	4		
	9	6 .407	.973	2		
	15	6 .394	.970	3	6 .391	.974
	16	6 .387	.982	2		
	18	6 .359	.967	2		
	19	6 .384	.980	2		
	20	6 .398	.978	2		
	26	6 .382	.985	1		
May	1	6 .419	.985	1	6 .408	.981
	3	6 .391	.980	3	6 .394	.979
	5	6 .408	.960	1	6 .397	.963
1959						
May	28	6 .373	.979	1		
1961						
Apr.	12	6 .391	+0 .974	4	6 .388	+0 .973
				mean	6 .392	+0 .977

NA 57 = HD 121608

DATE		V System of primary stds.	B-V System of primary stds.	Wt.	V System of 10-year stds.	B-V System of 10-year stds.
1956						
Jan.	19	7ᵐ.679	+0ᵐ.536	2		
Feb.	10	7 .692	.523	2	7ᵐ.683	+0ᵐ.522
Mar.	14	7 .700	.539	2		

Table V. Observations of Comparison Stars (Cont'd)

NA 57 = HD 121608

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1956						
Mar.	19	7ᵐ.687	+0ᵐ.556	4	7ᵐ.690	+0ᵐ.548
Apr.	5	7 .690	.546	2	7 .683	.548
	18	7 .694	.531	1	7 .690	.540
1957						
Mar.	23	7 .685	.547	2	7 .684	.549
	24	7 .692	.529	2	7 .697	.523
	28	7 .684	.519	2		
Apr.	5	7 .694	.534	2		
	6	7 .671	.530	4		
Apr.	18	7 .677	.533	2		
	24	7 .811	.538	1		
May	1	7 .671	.524	1	7 .660	.520
	3	7 .671	.560	2	7 .674	.559
	5	7 .664	.552	1	7 .653	.555
	30	7 .691	.527	2	7 .691	.527
Jun.	1	7 .681	.549	2		
1961						
Apr.	12	7 .689	+0 .547	2	7 .686	+0 .546
				mean	7 .684	+0 .541

NB 57 = HD 121496

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1956						
Jan.	19	6ᵐ.841	+0ᵐ.470	2		
1957						
Mar.	23	6 .846	.479	2	6ᵐ.845	+0ᵐ.481
	24	6 .854	.470	2	6 .859	.464
	28	6 .813	.470	2		
Apr.	5	6 .861	.459	2		
	6	6 .836	.462	4		
	18	6 .837	.471	2		
	24	6 .960	.482	1		
May	1	6 .829	.463	1	6 .818	.459
	3	6 .844	.476	2	6 .847	.475
	5	6 .850	.452	1	6 .839	.455
	30	6 .844	.464	2	6 .844	.464
Jun.	1	6 .843	.483	2		
1961						
Apr.	12	6 .853	+0 .478	3	6 .850	+0 .477
				mean	6 .846	+0 .470

UA 58 = HD 75470

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1955						
Nov.	16	6ᵐ.705	+0ᵐ.873	5		

UA 58 = HD 75470

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1956						
Jan.	17	6ᵐ.703	+0ᵐ.860	4	6ᵐ.711	+0ᵐ.857
Feb.	3	6 .695	.885	4	6 .693	.887
	10	6 .730	.860	4	6 .721	.859
	14	6 .726	.853	4	6 .716	.849
Mar.	5	6 .673	.870	2	6 .711	.875
	19	6 .713	.867	3	6 .716	.859
Apr.	18	6 .723	.852	2	6 .719	.861
1957						
Mar.	23	6 .711	.864	5	6 .710	.866
	24	6 .726	.865	4	6 .731	.859
	26	6 .721	.879	1		
Apr.	5	6 .710	.857	4		
	9	6 .719	.862	2		
	15	6 .723	.864	3	6 .720	.868
	16	6 .719	.862	1		
	19	6 .713	.867	1		
	20	6 .714	.860	2		
May	3	6 .716	.864	3	6 .719	.863
Dec.	27	6 .697	.864	4		
1958						
Feb.	11	6 .706	.868	2	6 .715	.862
	27	6 .697	.867	4		
Mar.	20	6 .724	.874	2	6 .718	.872
Apr.	10	6 .725	.864	4	6 .725	.859
	11	6 .729	.865	4	6 .729	.859
	15	6 .732	.859	3	6 .728	.855
May	4	6 .733	.853	3	6 .735	.852
	9	6 .734	.849	3	6 .731	.857
	10	6 .732	.879	3	6 .726	.874
Jun.	8	6 .720	.866	1		
	9	6 .708	.878	3		
	16	6 .711	.865	4	6 .714	.865
1961						
Apr.	12	6 .732	+0 .864	4	6 .729	+0 .863
				mean	6 .720	+0 .863

UB 58 = HD 75974

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1955						
Nov.	16	6ᵐ.671	+0ᵐ.706	5		
1956						
Jan.	17	6 .661	.712	4	6ᵐ.669	+0ᵐ.709
Feb.	3	6 .676	.700	4	6 .674	.702
	10	6 .711	.698	4	6 .702	.697
	14	6 .687	.685	4	6 .677	.681
Mar.	5	6 .637	.697	2	6 .675	.702

Table V. Observations of Comparison Stars (Cont'd)

UB 58 = HD 75974

DATE		V System of primary stds.	B-V System of primary stds.	Wt.	V System of 10-year stds.	B-V System of 10-year stds.
1956						
Mar.	19	6^{m}678	+0^{m}704	3	6^{m}681	+0^{m}696
Apr.	18	6 .683	.698	2	6 .679	.707
1957						
Mar.	23	6 .683	.690	5	6 .682	.692
	24	6 .691	.704	4	6 .696	.698
	26	6 .686	.716	1		
Apr.	5	6 .666	.697	4		
	9	6 .680	.701	2		
	15	6 .671	.703	2	6 .668	.707
	16	6 .683	.709	1		
	19	6 .673	.707	1		
	20	6 .677	.702	2		
May	3	6 .664	.700	3	6 .667	.699
Dec.	27	6 .666	.706	4		
1958						
Feb.	11	6 .666	.710	2	6 .675	.704
	27	6 .654	.713	4		
Mar.	20	6 .685	.709	2	6 .679	.707
Apr.	11	6 .692	.713	4	6 .692	.707
	15	6 .686	.712	3	6 .682	.708
May	4	6 .698	.699	4	6 .700	.698
	9	6 .689	.686	3	6 .686	.694
	10	6 .714	.693	3	6 .708	.688
Jun.	8	6 .669	.700	1		
	9	6 .664	.717	3		
	16	6 .677	.707	4	6 .680	.707
1961						
Apr.	12	6 .693	+0 .704	4	6 .690	+0 .703
				mean	6 .684	+0 .699

NA 58 = HD 123453

DATE		V System of primary stds.	B-V System of primary stds.	Wt.	V System of 10-year stds.	B-V System of 10-year stds.
1956						
Jan.	20	7^{m}629	+0^{m}588	2		
Mar.	14	7 .655	.593	2		
	19	7 .629	.590	4	7^{m}632	+0^{m}582
Apr.	5	7 .650	.581	2	7 .643	.583
	18	7 .657	.556	1	7 .653	.565
1957						
Mar.	24	7 .635	.574	2	7 .640	.568
Apr.	5	7 .650	.598	1		
	6	7 .656	.593	4		
May	30	7 .632	.583	1	7 .632	.583
Jun.	1	7 .629	.572	1		
	25	7 .632	.588	0		
1958						
Feb.	11	7 .633	.555	4	7 .642	.549

NA 58 = HD 123453

DATE		V System of primary stds.	B-V System of primary stds.	Wt.	V System of 10-year stds.	B-V System of 10-year stds.
1958						
Feb.	27	7^{m}647	+0^{m}594	1		
Mar.	20	7 .633	.585	1	7^{m}627	+0^{m}583
Apr.	10	7 .626	.577	2	7 .626	.572
	11	7 .628	.584	2	7 .628	.578
	15	7 .623	.586	2	7 .619	.582
May	4	7 .629	.586	2	7 .631	.585
	9	7 .619	.583	2	7 .616	.591
	10	7 .625	.589	2	7 .619	.584
Jun.	9	7 .620	.586	2		
	16	7 .640	.574	2	7 .643	.574
1961						
Apr.	12	7 .637	+0 .589	2	7 .634	+0 .588
				mean	7 .632	+0 .576

NB 58 = HD 123255 = 95 Vir

DATE		V System of primary stds.	B-V System of primary stds.	Wt.	V System of 10-year stds.	B-V System of 10-year stds.
1957						
May	30	5^{m}462	+0^{m}334	2	5^{m}462	+0^{m}334
Jun.	1	5 .469	.348	2		
	13	5 .463	.352	3		
	14	5 .477	.346	0		
	22	5 .474	.351	2		
	24	5 .464	.348	1		
	25	5 .454	.354	1		
1958						
Feb.	11	5 .446	.347	4	5 .455	.341
	27	5 .459	.344	1		
Mar.	20	5 .474	.356	2	5 .468	.354
Apr.	10	5 .452	.353	2	5 .452	.348
	11	5 .472	.353	2	5 .472	.347
	15	5 .474	.343	2	5 .470	.339
May	4	5 .456	.355	3	5 .458	.354
	9	5 .461	.336	2	5 .458	.344
	10	5 .478	.330	2	5 .472	.325
Jun.	9	5 .458	.345	2		
	16	5 .468	.346	2	5 .471	.346
1961						
Apr.	12	5 .474	+0 .342	3	5 .471	+0 .341
				mean	5 .464	+0 .343

UA 59 = HD 79096

DATE		V System of primary stds.	B-V System of primary stds.	Wt.	V System of 10-year stds.	B-V System of 10-year stds.
1958						
Feb.	11	6^{m}489	+0^{m}744	2	6^{m}498	+0^{m}738
	27	6 .478	.740	4		

Table V. Observations of Comparison Stars (Cont'd)

UA 59 = HD 79096

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1958						
Mar.	20	$6^{m}.502$	$+0^{m}.743$	2	$6^{m}.496$	$+0^{m}.741$
Apr.	10	6.497	.747	4	6.497	.739
	11	6.508	.732	4	6.508	.726
	15	6.510	.735	3	6.506	.731
May	4	6.517	.737	3	6.519	.736
	9	6.509	.726	2	6.506	.734
	10	6.525	.729	3	6.519	.724
1959						
Jan.	5	6.479	.725	4	6.511	.729
	12	6.498	.722	2	6.503	.724
	24	6.500	.718	3	6.504	.734
	29	6.490	.729	5		
	31	6.495	.719	4	6.504	.724
Feb.	4	6.486	.727	5	6.501	.732
	5	6.504	.721	5	6.509	.722
	26	6.490	.733	5	6.506	.725
Mar.	1	6.496	.730	2	6.498	.740
	3	6.492	.720	4	6.515	.734
1961						
Mar.	23	6.514	.728	3	6.510	.727
	31	6.510	.734	2	6.504	.749
Apr.	12	6.500	+0.742	3	6.497	+0.741
				mean	6.506	+0.731

UB 59 = HD 79499

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1958						
Feb.	11	$8^{m}.299$	$+0^{m}.459$	2	$8^{m}.308$	$+0^{m}.453$
	27	8.284	.446	4		
Mar.	20	8.318	.443	2	8.312	.441
Apr.	10	8.315	.460	4	8.315	.455
	11	8.308	.450	4	8.308	.444
	15	8.333	.440	3	8.329	.436
May	4	8.330	.439	3	8.332	.438
	9	8.318	.438	2	8.315	.446
	10	8.325	.465	3	8.319	.460
1959						
Jan.	5	8.277	.440	4	8.309	.444
	12	8.315	.425	2	8.320	.427
	24	8.306	.427	3	8.310	.443
	29	8.303	.440	5		
	31	8.298	.444	4	8.307	.449
Feb.	4	8.283	.451	5	8.298	.456
	5	8.312	.437	5	8.317	.438
	26	8.303	.456	5	8.319	.448
	28	8.356	.439	3	8.350	.440
Mar.	1	8.322	.435	2	8.324	.445

UB 59 = HD 79499

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1959						
Mar.	3	$8^{m}.290$	$+0^{m}.434$	4	$8^{m}.313$	$+0^{m}.448$
1961						
Mar.	23	8.303	.443	3	8.299	.442
Apr.	12	8.307	+0.457	3	8.304	+0.456
				mean	8.315	+0.446

NA 59 = HD 124401

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1957						
Mar.	23	$6^{m}.990$	$+1^{m}.018$	2	$6^{m}.989$	$+1^{m}.020$
	24	7.006	0.989	2	7.011	0.983
Apr.	6	7.019	1.026	4		
1958						
Feb.	27	7.009	1.018	1		
Mar.	20	7.008	1.022	2	7.002	1.020
Apr.	10	6.967	1.037	2	6.967	1.032
	11	6.971	1.029	2	6.971	1.023
	15	6.996	1.022	2	6.992	1.018
May	4	6.984	1.014	2	6.986	1.013
	9	6.981	1.015	2	6.978	1.023
	10	6.975	1.022	2	6.969	1.017
1959						
Jan.	5	6.900	0.993	0	6.932	0.997
	12	6.976	1.006	2	6.981	1.008
	24	6.977	1.016	2	6.981	1.032
	31	6.972	1.010	1	6.981	1.015
Feb.	4	6.975	1.015	1	6.990	1.020
	5	6.969	1.023	0	6.974	1.024
	26	6.974	0.994	0	6.990	0.986
	28	6.996	1.003	2	6.990	1.004
Mar.	1	6.969	1.005	2	6.971	1.015
	3	6.952	1.016	2	6.975	1.030
1961						
Apr.	12	6.994	+1.018	2	6.991	+1.017
				mean	6.984	+1.017

NB 59 = HD 125337 = λVir

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1958						
Feb.	27	$4^{m}.511$	$+0^{m}.125$	1		
Mar.	20	4.523	.130	1	$4^{m}.517$	$+0^{m}.128$
Apr.	10	4.498	.148	2	4.498	.143
	11	4.500	.145	2	4.500	.139
	15	4.527	.123	2	4.523	.119
May	4	4.512	.132	2	4.514	.131

Table V. Observations of Comparison Stars (Cont'd)

NB 59 = HD 125337 = λVir

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1958						
May	9	$4^{m}510$	$+0^{m}122$	2	$4^{m}507$	$+0^{m}130$
	10	4 .505	.142	2	4 .499	.137
1959						
Jan.	5	4 .483	.136	0	4 .475	.140
	12	4 .518	.126	2	4 .523	.128
	24	4 .534	.118	1	4 .538	.134
	31	4 .497	.129	0	4 .506	.134
Feb.	4	4 .527	.119	1	4 .542	.124
	5	4 .521	.111	0	4 .526	.112
	26	4 .509	.118	0	4 .525	.110
	28	4 .533	.108	1	4 .527	.109
Mar.	1	4 .515	.120	2	4 .517	.130
	3	4 .497	.110	1	4 .520	.124
1961						
Apr.	12	4 .526	+0 .138	2	4 .523	+0 .137
				mean	4 .515	+0 .131

UA 60 = HD 81563

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1959						
May	9	$8^{m}319$	$+0^{m}466$	3		
	15	8 .284	.483	1		
	16	8 .310	.468	2		
1960						
Jan.	20	8 .282	.479	4		
	28	8 .278	.480	3	$8^{m}281$	$+0^{m}480$
	29	8 .281	.479	4		
Feb.	17	8 .272	.477	2	8 .270	.482
	18	8 .276	.486	3		
	21	8 .285	.493	2	8 .276	.493
	23	8 .294	.472	2	8 .295	.470
	25	8 .277	.491	2		
Mar.	15	8 .277	.479	3	8 .278	.486
	17	8 .293	.473	3	8 .287	.479
	18	8 .306	.477	2	8 .291	.476
	19	8 .270	.477	2	8 .278	.478
	21	8 .272	.500	3	8 .278	.475
	26	8 .284	.474	2	8 .277	.476
	30	8 .268	.482	3	8 .273	.484
Apr.	3	8 .278	.456	4	8 .284	.460
	4	8 .270	.485	2		
	6	8 .292	.461	3	8 .284	.467
1961						
Apr.	12	8 .268	+0 .497	3	8 .265	+0 .496
				mean	8 .280	+0 .478

UB 60 = HD 82140

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1959						
May	15	$8^{m}395$	$+0^{m}629$	1		
	16	8 .394	.638	1		
	28	8 .249	.616	1		
1960						
Jan.	20	8 .380	.628	4		
	28	8 .372	.641	3	$8^{m}375$	$+0^{m}641$
	29	8 .375	.641	4		
Feb.	17	8 .376	.638	2	8 .374	.643
	18	8 .380	.624	3		
	21	8 .390	.628	2	8 .381	.628
	23	8 .385	.633	2	8 .386	.631
	25	8 .377	.641	1		
Mar.	15	8 .370	.640	3	8 .371	.647
	17	8 .386	.634	3	8 .380	.640
	18	8 .403	.628	2	8 .388	.627
	19	8 .365	.640	2	8 .373	.641
	21	8 .362	.664	3	8 .368	.639
	26	8 .375	.638	1	8 .368	.640
	30	8 .373	.630	3	8 .378	.632
Apr.	3	8 .370	.614	4	8 .376	.618
	4	8 .373	.630	2		
	6	8 .395	.626	3	8 .387	.632
1961						
Apr.	12	8 .373	+0 .644	3	8 .370	+0 .643
				mean	8 .377	+0 .635

NA 60 = HD 126251

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1959						
Jan.	5	$6^{m}451$	$+0^{m}410$	0	$6^{m}483$	$+0^{m}414$
	12	6 .477	.415	2	6 .482	.417
Feb.	4	6 .482	.412	1	6 .497	.417
	5	6 .468	.418	0	6 .473	.419
1960						
Jan.	28	6 .493	.407	2	6 .496	.407
Feb.	17	6 .475	.419	1	6 .473	.424
	21	6 .489	.417	2	6 .480	.417
	23	6 .496	.410	1	6 .497	.408
Mar.	15	6 .489	.413	2	6 .490	.420
	17	6 .487	.414	2	6 .481	.420
	18	6 .490	.422	3	6 .475	.421
	19	6 .497	.414	3	6 .505	.415
	21	6 .492	.444	2	6 .498	.419
	30	6 .491	.417	2	6 .496	.419
Apr.	3	6 .511	.422	1	6 .517	.426

Table V. Observations of Comparison Stars (Cont'd)

NA 60 = HD 126251

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1961						
Apr.	12	$6^m.497$	$+0^m.412$	2	$6^m.494$	$+0^m.411$
				mean	6.491	+0.417

NB 60 = HD 126766

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1959						
Jan.	5	$6^m.633$	$+0^m.423$	0	$6^m.665$	$+0^m.427$
	12	6.643	.422	2	6.648	.424
Feb.	4	6.650	.415	1	6.665	.420
	5	6.641	.417	0	6.646	.418
1960						
Jan.	28	6.642	.425	2	6.645	.425
Feb.	17	6.636	.428	1	6.634	.433
	21	6.643	.416	1	6.634	.416
	23	6.648	.413	1	6.649	.411
Mar.	15	6.652	.429	2	6.653	.436
	17	6.654	.405	2	6.648	.411
	18	6.660	.411	3	6.645	.410
	19	6.647	.432	3	6.655	.433
	21	6.662	.454	2	6.668	.429
	30	6.659	.422	2	6.664	.424
Apr.	3	6.660	.441	0	6.666	.445
1961						
Apr.	12	6.655	+0.424	2	6.652	+0.423
				mean	6.652	+0.423

UA 61 = HD 83683

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1960						
Jan.	20	$6^m.983$	$+0^m.468$	1		
	28	6.965	.470	3	$6^m.968$	$+0^m.470$
Feb.	17	6.958	.479	1	6.956	.484
	18	6.966	.469	3		
	21	6.981	.465	2	6.972	.465
	23	6.971	.476	2	6.972	.474
	25	6.972	.463	1		
Mar.	15	6.970	.458	3	6.971	.465
	17	6.959	.480	3	6.953	.486
	18	6.983	.475	2	6.968	.474
	19	6.958	.474	2	6.966	.475
	21	6.960	.500	2	6.966	.475
	26	6.967	.479	1	6.960	.481
1960						
Mar.	30	$6^m.966$	$+0^m.469$	3	$6^m.971$	$+0^m.471$
Apr.	3	6.956	.470	4	6.962	.474
	6	6.994	.451	3	6.986	.457
1961						
Feb.	6	6.962	.492	3	6.962	.490
	10	6.965	.483	3	6.958	.477
	24	6.966	.487	3	6.974	.473
Mar.	23	6.989	.457	3	6.985	.456
	31	6.987	.460	3	6.981	.475
Apr.	4	6.972	.460	2	6.965	.455
	9	6.948	.474	2	6.954	.480
	12	6.964	+0.480	3	6.961	+0.479
				mean	6.968	+0.473

UB 61 = HD 83509

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1960						
Jan.	20	$7^m.048$	$+0^m.469$	3		
	28	7.034	.474	3	$7^m.037$	$+0^m.474$
Feb.	17	7.035	.473	1	7.033	.478
	18	7.034	.466	3		
	21	7.033	.472	2	7.024	.472
	23	7.040	.468	2	7.041	.466
	25	7.022	.482	1		
Mar.	15	7.028	.475	3	7.029	.472
	17	7.038	.460	3	7.032	.466
	18	7.046	.484	2	7.031	.483
	19	7.024	.474	2	7.032	.475
	21	7.027	.494	2	7.033	.469
	26	7.032	.476	1	7.025	.478
	30	7.032	.467	3	7.037	.469
Apr.	3	7.035	.458	4	7.041	.462
	6	7.055	.464	3	7.047	.470
1961						
Feb.	6	7.042	.477	3	7.042	.475
	10	7.040	.477	3	7.033	.471
	24	7.035	.481	3	7.043	.467
Mar.	23	7.066	.451	3	7.062	.450
	31	7.045	.468	3	7.039	.483
Apr.	4	7.038	.464	2	7.031	.459
	9	7.034	.478	2	7.040	.484
	12	7.030	+0.488	3	7.027	+0.487
				mean	7.037	+0.471

Table V. Observations of Comparison Stars (Cont'd)

NA 61 = HD 128596

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1960						
Jan.	28	$7^{m}.464$	$+0^{m}.651$	2	$7^{m}.467$	$+0^{m}.651$
Feb.	17.	7 .470	.645	1	7 .468	.650
	21	7 .474	.660	1	7 .465	.660
	23	7 .480	.641	1	7 .481	.639
Mar.	15	7 .473	.646	2	7 .474	.653
	17	7 .481	.646	2	7 .475	.652
	18	7 .480	.647	3	7 .465	.646
	19	7 .479	.650	3	7 .487	.651
	21	7 .483	.680	2	7 .489	.655
	30	7 .483	.657	2	7 .488	.659
Apr.	3	7 .492	.665	1	7 .498	.669
1961						
Feb.	6	7 .454	.667	0	7 .454	.665
	8	7 .505	.652	2	7 .500	.643
	22	7 .459	.634	1	7 .469	.630
Mar.	1	7 .508	.656	2	7 .501	.653
	23	7 .538	.644	2	7 .534	.643
	31	7 .494	.643	2	7 .488	.658
Apr.	9	7 .480	.634	2	7 .486	.640
	12	7 .480	+0 .652	2	7 .477	+0 .651
				mean	7 .485	+0 .650

NB 61 = HD 128429

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1960						
Feb.	17	$6^{m}.188$	$+0^{m}.457$	1	$6^{m}.186$	$+0^{m}.462$
	21	6 .201	.450	2	6 .192	.450
	23	6 .191	.455	1	6 .192	.453
Mar.	15	6 .185	.469	2	6 .186	.476
	17	6 .180	.478	2	6 .174	.484
	18	6 .202	.450	3	6 .187	.449
	19	6 .201	.460	3	6 .209	.461
	21	6 .220	.488	2	6 .226	.463
	30	6 .208	.457	2	6 .213	.459
Apr.	3	6 .216	.469	1	6 .222	.473
1961						
Feb.	8	6 .202	.487	2	6 .197	.478
	22	6 .180	.464	1	6 .190	.460
Mar.	1	6 .234	.474	2	6 .227	.471
	23	6 .204	.438	2	6 .200	.437
	31	6 .218	.450	2	6 .212	.465
Apr.	9	6 .195	.449	2	6 .201	.455

NB 61 = HD 128429

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1961						
Apr.	12	$6^{m}.206$	$-0^{m}.456$	2	$6^{m}.203$	$+0^{m}.455$
				mean	6 .201	+0 .461

UA 62 = HD 87176

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1961						
Feb.	6	$8^{m}.099$	$+0^{m}.547$	4	$8^{m}.099$	$+0^{m}.545$
	8	8 .076	.545	3	8 .071	.536
	15	8 .092	.543	3	8 .079	.543
	24	8 .086	.558	3	8 .094	.544
Mar.	23	8 .106	.543	3	8 .102	.542
	31	8 .099	.533	3	8 .093	.547
Apr.	4	8 .092	.547	4	8 .085	.542
	9	8 .076	.537	2	8 .082	.543
	12	8 .083	+0 .555	3	8 .080	+0 .554
				mean	8 .088	+0 .544

UB 62 = HD 86898

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1961						
Feb.	15	$7^{m}.794$	$+1^{m}.042$	3	$7^{m}.781$	$+1^{m}.042$
	24	7 .791	1 .056	3	7 .799	1 .042
Mar.	23	7 .818	1 .036	3	7 .814	1 .035
	31	7 .805	1 .032	2	7 .799	1 .046
Apr.	4	7 .800	1 .040	4	7 .793	1 .035
	9	7 .786	1 .022	2	7 .792	1 .028
	12	7 .799	+1 .047	3	7 .796	+1 .046
				mean	7 .796	+1 .039

NA 62 = HD 129271

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1961						
Feb.	8	$8^{m}.058$	$+0^{m}.837$	2	$8^{m}.053$	$+0^{m}.828$
	10	8 .052	.817	1	8 .045	.811
	15	8 .063	.843	2	8 .050	.843
	22	8 .021	.812	1	8 .031	.808
Mar.	1	8 .070	.842	2	8 .063	.839
	23	8 .051	.815	2	8 .047	.814
Apr.	9	8 .041	.805	1	8 .047	.811
	12	8 .058	+0 .811	2	8 .055	+0 .810
				mean	8 .051	+0 .823

the nights when the extinction was determined, $\sigma(Q_{y1})$ in this equation was replaced by the mean error with which Q_{y1} was determined.

From equations (25) and (26) it can be concluded, that the highest accuracy of photometric observations is obtained when all the stars are observed at the same, fairly high, altitude, except for the few standard stars observed at different altitudes for determining the extinction coefficient.

B. Results for Ten-Year Standards and Comparison stars. The observations of the Ten-Year Standards are listed in Table IV. Only those nights are included for which at least 4 Ten-Year Standards are observed. However, in forming a v e r a g e s and for further discussion only the nights with observations of at least 12 Ten-Year Standards were used. Observations of comparison stars are listed in Table V.

The values V, B-V and their weight, given in the first three columns for each star in Tables IV and V, were computed from equations (3), (4) and (27), respectively, using the transformation coefficients derived from the observations of primary standard stars. The weighted mean of these magnitudes and colors was formed for each Ten-Year Standard using only the nights when at least 12 Ten-Year Standards were observed: these averages are given with their mean errors in Table VI. The deviations of individual observations of the Ten-Year Standards from these averages were computed. The weighted means of these deviations were formed for each night (given in the last two columns of Table IV) and added to all the observations of the Ten-Year Standards and comparison stars observed that night. The magnitudes and colors corrected in this way are given in Tables IV and V in the fifth and sixth columns for each star. These are the values which can be considered as determined by comparison with the mean magnitudes and colors of the Ten-Year Standards. These magnitudes and colors will henceforth be considered to be reduced to the system of the Ten-Year Standards.

The weighted mean magnitudes and colors of the Ten-Year Standards are given in Table IV for each season; they are averages of values reduced to the system of Ten-Year Standards. These mean values were used for computing the mean blue magni-

TABLE VI. Magnitudes and Colors of Standard and Comparison Stars

TEN-YEAR STANDARDS (in system of primary standards)

HD	Star	V	m.e.	B-V	m.e.	n
58946	ρ Gem	4.181	±0^{m}002	+0.315	±0^{m}001	61
76943	10 UMa	3.973	.002	.434	.001	64
82885	11 LMi	5.409	.002	.769	.001	64
89449	40 Leo	4.794	.001	.449	.001	66
90839	36 UMaA	4.837	.002	.518	.001	67
102870	β Vir	3.609	.002	.550	.001	62
109358	β CVn	4.257	.001	.587	.001	66
113139	78 UMa	4.929	.002	.366	.001	67
114710	β Com	4.252	.001	.572	.001	66
115043		6.827	.002	.604	.001	66
115617	61 Vir	4.742	.003	.709	.002	48
117176	70 Vir	4.976	.002	.713	.001	66
120136	τ Boo	4.496	.002	.479	.002	67
121370	η Boo	2.683	.002	.583	.001	65
128167	σ Boo	4.463	.002	.363	.001	61
121156	ξ Boo	4.548	±0.002	+0.765	±0.001	57

COMPARISON STARS (in system of Ten-Year Standards)

HD	Star	V	m.e.	B-V	m.e.	n
55052	UA 53=48 Gem	5.859	±0^{m}003	+0.370	±0^{m}002	11
50692	UB 53					0
61997	UA 54	7.129	.002	0.411	.002	11
60914	UB 54	6.964	.003	1.048	.003	11
58551	UA′ 54	7.160	.003	0.925	.003	10
58899	UB′ 54	6.545	.004	0.460	.003	11
63772	UA 55	8.953	.002	0.350	.004	11

TABLE VI. Magnitudes and Colors of Standard and Comparison Stars (Cont'd)

HD	Star	V	m.e.	B-V	m.e.	n
62720	UB 55	7.409	±0.002	0.381	±0.004	11
67228	UA 56 = μ Cnc.	5.304	.003	0.635	.002	17
68256	UB 56 = ζ Cnc	4.674	.003	0.530	.003	15
72779	UA 57 = 35 Cnc	6.584	.002	0.678	.002	15
73665	UB 57 = 39 Cnc	6.392	.003	0.977	.002	13
75470	UA 58	6.720	.002	0.863	.002	21
75974	UB 58	6.684	.003	0.699	.002	20
79096	UA 59	6.506	.002	0.731	.002	20
79499	UB 59	8.315	.003	0.446	.002	20
81563	UA 60	8.280	.002	0.478	.003	14
82140	UB 60	8.377	.002	0.635	.002	14
83683	UA 61	6.968	.002	0.473	.002	21
83509	UB 61	7.037	.002	0.471	.002	21
87176	UA 62	8.088	.004	0.544	.002	9
86898	UB 62	7.796	.004	1.039	.002	7
116681	NA 53					0
118704	NA 54	8.494	.004	0.541	.002	9
118705	NB 54	9.171	.004	0.461	.003	9
120186	NA 55	7.714	.004	0.546	.002	8
119869	NB 55	8.897	.006	0.459	.005	8
119638	NA 56	6.912	.003	0.543	.003	12
121111	NB 56	7.691	.004	0.549	.002	12
121608	NA 57	7.684	.003	0.541	.004	11
121496	NB 57	6.846	.004	0.470	.003	7
123453	NA 58	7.632	.003	0.576	.003	15
123255	NB 58 = 95 Vir	5.464	.002	0.343	.002	11
124401	NA 59	6.984	.003	1.017	.003	20
125337	NB 59 = λ Vir	4.515	.003	0.131	.002	18
126251	NA 60	6.491	.003	0.417	.001	16
126766	NB 60	6.652	.002	0.423	.002	16
128596	NA 61 = NB 62	7.485	.004	0.650	.002	19
128429	NB 61	6.201	.004	0.461	.003	17
129271	NA 62	8.051	±0.003	+0.823	±0.005	8

OTHER STARS (in system of primary standards)

HD	Star	V	B-V	n	HD	Star	V	B-V	n
12929	α Ari	2.017	+1.137	11	87777		8.400	+0.578	9
18331	HR 875	5.171	+0.079	11	110379-80	γ VirAB	2.749	+0.353	35
55156	49 Gem	7.068	+0.036	3	114449		7.614	+0.403	4
62345	K Gem	3.574	+0.931	38	116658	α Vir*	0.994:	−0.227	40
61421	α CMi	0.384	+0.418	39	121325		6.188	+0.526	7
69221		7.630	+0.948	5	121865		7.047	+0.978	2
69994		5.830	+1.134	3	121981		6.957	+0.997	2
73344		6.899	+0.542	10	124897	α Boo	−0.039	+1.227	34
73666	40 Cnc	6.610	+0.001	41	126660	ϑ Boo	4.047	+0.499	28
75528	54 Cnc.	6.376	+0.636	10	128752		6.729	+1.005	11
76508		6.172	+1.002	9	128986		6.982	+1.631	5
79009		6.886	+0.062	9	129157		8.410	+0.867	8
81361		6.288	+0.966	7	130109	109 Vir	3.702	−0.009	29
81581		7.754	+0.308	7	134083	45 Boo	4.929	+0.429	25
83343		6.641	+0.438	16					
84722		6.450	+0.428	15					

* Eclipsing variable

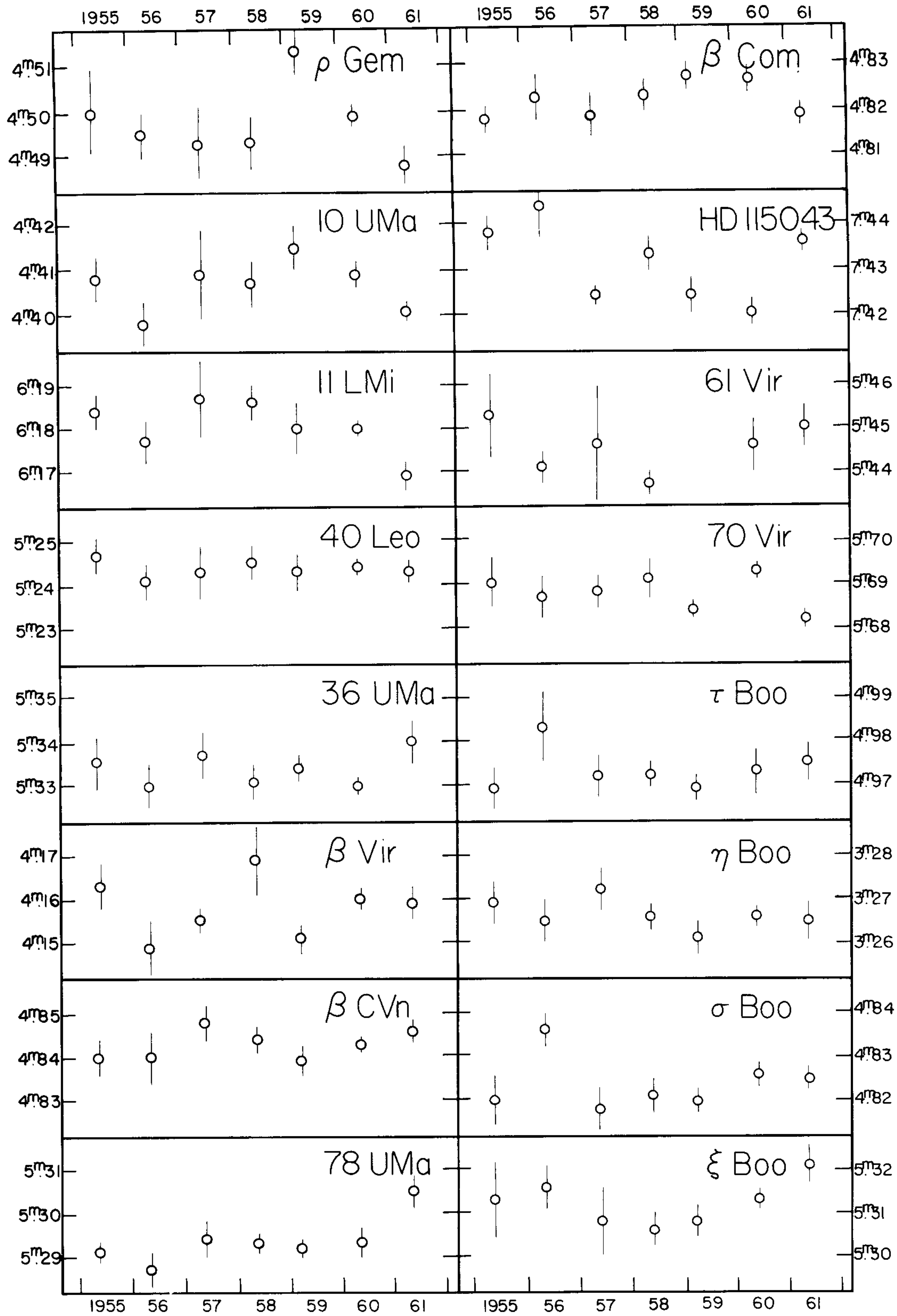

Figure 5. The yearly mean blue magnitudes of the Ten-Year Standard stars. Every point is based on 5 to 13 nights. The vertical lines indicate mean errors.

tudes which are plotted in Figure 5. Examining this figure, and also the nightly values given in Table IV, we can see that there seems to be no variability in the Ten-Year Standards which can not be explained by the errors of observations. For none of these stars does the r.m.s deviation of mean seasonal values from the final mean value exceed $\pm^m_.009$.

The weighted mean magnitudes and colors of the comparison stars, reduced to the system of Ten-Year Standards, are given with their mean errors in Table VI. The last column in this table gives the number, n, of nights included in forming the average. Table VI also contains the weighted mean magnitudes and colors, not reduced to the system of Ten-Year Standards, for some other stars which were observed occasionally in this program. Most of these stars were candidates for comparison stars or Ten-Year Standards which were later rejected.

C. Improved Magnitudes and Colors for Primary Standards of the UBV System. The deviations, δ_V and δ_{B-V}, of observed magnitudes and colors of primary standard stars from the catalogue values were used for improving these last values. Only those 32 nights were used on which at least 6 different primary standard stars were observed and nightly extinction coefficients were determined. The mean δ_V (computed by assuming $Q_{y2} = -0.002$) and the mean δ_{B-V} were computed for every star; let us denote these mean values by $\bar{\delta}_V$ and $\bar{\delta}_{B-V}$. The values $\bar{\delta}_V$ and $\bar{\delta}_{B-V}$ were averaged for the stars β Cnc, η Hya, α Ser, β Lib, ε CrB and τ Her; these average values are denoted by δ°_V and δ°_{B-V}. The quantities $\Delta_V = \bar{\delta}_V - \delta^\circ_V$ and $\Delta_{B-V} = \bar{\delta}_{B-V} - \delta^\circ_{B-V}$ are now treated as corrections which should be added to the magnitudes and colors given by Johnson and Harris (7). These corrections and also the corrected magnitudes and colors are given in Table VII, together with their mean errors computed from the scatter of values δ_V and δ_{B-V}. The mean magnitude and mean color of stars denoted as primary standards by Johnson and Harris remain, of course, unchanged. The last column of Table VII gives the number of observations used for deriving the improved values. The corrections derived from observations in different years and with different multiplier tubes are in good agreement.

The improved values given in Table VII were obtained after finishing all the reductions of the observations of the present program. Therefore all the values of the transformation coefficients, the mean errors of single observations and the magnitudes and colors of Ten-Year Standards and comparison stars given in this paper are based on the data for primary standard stars given by Johnson and Harris (7).

IV. Magnitudes and Colors of Uranus and Neptune

A. Color Indices of Uranus and Neptune. The yellow magnitudes and color indices of Uranus and Neptune are given in Table VIII. They were derived exactly in the same way as the values for the comparison stars in Table V and both of these tables have the same arrangement.

The energy distribution in the spectra of Uranus and Neptune differs strongly from the energy distribution in spectra of color type stars. H. L. Johnson in Progress Report from 1955 writes:

"There has always been some doubt whether the blue-yellow color index B-V that has been determined from the standard U B V system filters, satisfactorily represents the planetary gradient in the blue filter spectral region. We would, in fact, expect the gradient determined from the ordinary B-V to be too blue because of the methane absorption in the yellow region. This is an important matter since this gradient enters into both the extinction and systemic reductions. We have, therefore, made color measures using two filters formed by splitting (from the spectral standpoint) the blue filter into two filters. The exact procedure that we used is the following: We selected a yellow-transmitting sharp cut-off filter glass whose cut-off wavelength lies approximately in the center of the blue filter. During these special observations of the planets and standard stars, deflections were taken with the standard blue filter and with the standard blue filter plus the above yellow filter. By subtraction, we obtain deflections corres-

Table VII. Improved Magnitudes and Colors for Primary Standards of the UBV System

Star	V		Δ_V	B-V		Δ_{B-V}	n
β Cnc	$3^m_.534$	$\pm 0^m_.002$	$+\ 0^m_.014$	$+\ 1^m_.477$	$\pm 0^m_.001$	$-\ 0^m_.003$	36
η Hya	4.299	.002	$-$ .001	-0.195	.001	.000	37
90 Leo AB	5.947	.003	———	-0.159	.001	———	27
HR 4550	6.448	.003	———	$+0.753$	.002	———	30
β Lib	2.608	.003	$-$ .002	-0.109	.002	$-$ .001	28
α Ser	2.640	.002	$-$ .010	$+1.170$	.002	$+$ .002	29
ε CrB	4.144	.002	$-$ .006	$+1.231$	.001	$+$ .001	28
τ Her	3.895	.003	$+$ .005	-0.151	.002	$+$ .001	29

TABLE VIII. Two-color Observations of Uranus and Neptune
(Uncorrected for distance, phase and oblateness effects)

Uranus

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1953						
Oct.	30	5ᵐ518	+0ᵐ568	2		
Nov.	6	5 .520	.551	2		
1954						
Feb.	17	5 .537	.558	2		
	23	5 .563	.544	3		
	24	5 .572	.554	3		
	28	5 .577	.533	2		
Mar.	30	5 .539	.532	2		
Apr.	1	5 .537	.532	3		
	6	5 .545	.528	2		
	22	5 .584	.535	2		
	26	5 .586	.543	3		
1955						
Apr.	11	5 .502	.520	4		
	12	5 .520	.534	5		
	20	5 .547	.535	4	5ᵐ556	+0ᵐ534
	21	5 .566	.537	4	5 .567	.533
	25	5 .546	.532	3		
May	4	5 .594	.535	2	5 .597	.538
Oct.	27	5 .537	.523	3		
	28	5 .541	.523	3		
	30	5 .528	.523	2		
	31	5 .519	.527	3		
Nov.	4	5 .536	.531	3		
	16	5 .501	.534	5		
	20	5 .501	.528	4		
	19	5 .507	.532	4		
	27	5 .480	.529	5		
1956						
Jan.	17	5 .413	.541	4	5 .421	.538
Feb.	3	5 .405	.549	4	5 .403	.551
	10	5 .440	.523	4	5 .431	.522
	14	5 .454	.518	5	5 .444	.514
Mar.	5	5 .433	.527	2	5 .491	.532
	14	5 .474	.523	4		
	19	5 .487	.532	3	5 .490	.524
Apr.	5	5 .511	.529	4	5 .504	.531
	18	5 .550	.527	2	5 .546	.536
1957						
Mar.	23	5 .470	.525	5	5 .469	.527
	24	5 .486	.533	4	5 .491	.527
	26	5 .482	.526	1		
	31	5 .499	.529	1		
Apr.	5	5 .496	.516	4		
	9	5 .519	.517	2		

Uranus

DATE		V (System of primary stds.)	B-V (System of primary stds.)	Wt.	V (System of 10-year stds.)	B-V (System of 10-year stds.)
1957						
Apr.	15	5ᵐ525	+0ᵐ521	2	5ᵐ522	+0ᵐ525
	16	5 .531	.524	2		
	19	5 .524	.525	1		
	20	5 .529	.523	2		
May	3	5 .568	.523	3	5 .571	.522
	5	5 .584	.497	1	5 .573	.500
1959						
Jan.	5	5 .394	.523	4	5 .426	.527
	12	5 .411	.513	2	5 .416	.515
	24	5 .413	.507	3	5 .417	.523
	29	5 .393	.527	5		
	31	5 .391	.518	4	5 .400	.523
Feb.	4	5 .388	.521	5	5 .403	.526
	5	5 .393	.531	5	5 .398	.532
	26	5 .396	.535	5	5 .412	.527
Mar.	1	5 .407	.526	2	5 .409	.536
	3	5 .410	.512	4	5 .433	.526
1960						
Jan.	20	5 .407	.526	4		
	28	5 .408	.522	3	5 .411	.522
	29	5 .400	.523	4		
Feb.	17	5 .380	.531	1	5 .378	.536
	18	5 .390	.532	3		
	21	5 .414	.520	2	5 .405	.520
	23	5 .411	.530	2	5 .412	.528
	25	5 .400	.542	1		
Mar.	15	5 .412	.537	3	5 .413	.544
	17	5 .418	.533	3	5 .412	.539
	18	5 .442	.524	2	5 .427	.523
	19	5 .422	.527	1	5 .430	.528
	21	5 .422	.549	3	5 .428	.524
	26	5 .434	.533	1	5 .427	.535
	30	5 .435	.529	3	5 .440	.531
Apr.	3	5 .436	.524	4	5 .442	.528
	6	5 .476	.515	3	5 .468	.521
1961						
Feb.	8	5 .384	.525	3	5 .379	.516
	10	5 .387	.540	3	5 .380	.534
	24	5 .389	.538	3	5 .397	.524
Mar.	23	5 .441	.512	3	5 .437	.511
	31	5 .415	.538	3	5 .409	.553
Apr.	4	5 .430	.517	2	5 .423	.512
	8	5 .426	.510	2		
	12	5 .456	+0 .531	3	5 .453	+0 .530

TABLE VIII. Two-color Observations of Uranus and Neptune (Cont'd)

(Uncorrected for distance, phase and oblateness effects)

Neptune

DATE		V System of primary stds.	B-V System of primary stds.	Wt.	V System of 10-year stds.	B-V System of 10-year stds.
1954						
May	31	$7^m.901$	$+0^m.404$	2		
Jun.	2	7.912	.396	2		
	12	7.916	.396	1		
	14	7.911	.410	2		
	16	7.881	.412	2		
	17	7.913	.398	1		
1955						
Apr.	21	7.864	.406	3	$7^m.865$	$+0^m.402$
	25	7.877	.391	2		
May	4	7.899	.392	2	7.902	.395
Jun.	20	7.933	.379	2		
1956						
Jan.	17	7.944	.398	2	7.952	.395
	19	7.935	.392	2		
	20	7.922	.407	2		
Feb.	3	7.921	.411	2	7.919	.413
	10	7.911	.389	2	7.902	.388
Mar.	19	7.896	.401	4	7.899	.393
Apr.	5	7.853	.427	2	7.846	.429
	18	7.884	.381	0	7.880	.390
1957						
Mar.	23	7.869	.415	2	7.868	.417
	24	7.862	.410	2	7.867	.404
	28	7.928	.393	2		
Apr.	5	7.870	.402	2		
	6	7.852	.393	4		
May	1	7.844	.380	1	7.833	.376
	3	7.859	+0.412	2	7.862	+0.411

Neptune

DATE		V System of primary stds.	B-V System of primary stds.	Wt.	V System of 10-year stds.	B-V System of 10-year stds.
1957						
	30	$7^m.869$	$+0^m.396$	1	$7^m.869$	$+0^m.396$
1959						
Jan.	12	7.942	.416	2	7.947	.418
	24	7.925	.414	2	7.929	.430
Feb.	4	7.894	.429	1	7.909	.434
	5	7.902	.407	0	7.907	.408
	28	7.890	.409	2	7.884	.410
Mar.	1	7.872	.402	2	7.874	.412
	3	7.854	.402	2	7.877	.416
1960						
Jan.	28	7.910	.422	2	7.913	.422
Feb.	21	7.877	.424	1	7.868	.424
	23	7.860	.436	1	7.861	.434
Mar.	15	7.845	.438	2	7.846	.445
	17	7.845	.429	2	7.839	.435
	18	7.852	.431	3	7.837	.430
	19	7.854	.437	3	7.862	.438
	21	7.854	.468	2	7.860	.443
	30	7.846	.432	2	7.851	.434
1960						
Apr.	3	7.854	.442	1	7.860	.446
1961						
Mar.	1	7.897	.450	2	7.890	.447
	8	7.875	.428	1	7.863	.426
	23	7.880	.419	2	7.876	.418
	31	7.856	.422	2	7.850	.437
Apr.	8	7.831	.421	1		
	12	7.849	+0.424	2	7.846	+0.423

ponding to the amount of light coming through the two halves of the blue filter. We can then compute the planetary gradient in the blue filter region compared with stars observed in the same spectral region. This procedure gives considerably redder values of B-V than the standard U B V filters. The new values lead to more accordant results especially for large hour angles."

The new values of color-indices obtained by Johnson are

$$(B\text{-}V)' = +0^m.721 \text{ for Uranus, and} \qquad (28)$$

$$(B\text{-}V)' = +0^m.628 \text{ for Neptune;*} \qquad (29)$$

they are called henceforth the gradient color indices and are used in the transformation of the blue magnitudes in all subsequent reductions. Similar gradient color indices for transforming yellow magnitudes have not yet been determined with satisfactory precision and therefore these magnitudes cannot be properly transformed to the BV system. The yellow magnitudes given in Table VIII were corrected for color dependence of extinction and reduced to the BV system using the directly observed color-indices given in the same table. The discussion of data contained in Table VIII will therefore be postponed to the further papers of this series.

B. Observations of Planets in Blue Color. The brightness of Uranus and Neptune in blue color is

*Special observations of Uranus and Neptune at the low altitudes of 20° to 25° were made with the blue filter on four nights in 1961 for determining what values of color-indices would be necessary for correcting the observations for color-dependence of extinction. The color indices $(B\text{-}V)' = +0.82 \pm 0^m.11$ (m.e.) for Uranus and $(B\text{-}V)' = +0^m.50 \pm 0^m.05$ (m.e.) for Neptune were obtained. Taking into account the low accuracy of these values they are in satisfactory agreement with Johnson's gradient color-indices.

compared with that of comparison stars at least once a week over a period of several months around each opposition. The blue filter is the same as that used for two-color observations. The comparison of each planet with two comparison stars takes an average of about 80 minutes; the duration of such observations should not exceed 1½ hours.

All observations are made with a diaphragm 48 seconds of arc in diameter (2mm at the cassegrainian focus of the 21-inch telescope). Therefore the satellites Miranda, Ariel, Umbriel and Triton are always measured together with their respective planets. All the photometric data for planets given in this paper refer to planets measured together with the aforementioned satellites. Uranus' satellites Titania and Oberon, which are occasionally within the diaphragm together, may increase the planet's brightness by about $0^m.0008$; this fact is neglected in the present discussion.

Denoting by A the measure for comparison star A, by B that for comparison star B, by P that for planet and by S the deflection for radioactive standard source, we can represent a single observation as:

$$\text{S}\,\underbrace{\text{A B A B A}\ldots\text{B}}_{5\times\text{B}}\,\text{A}\,\underbrace{\text{P A P A}\ldots\text{P}}_{10\times\text{P}}\,\text{A}\,\underbrace{\text{B A B A}\ldots\text{B}}_{5\times\text{B}}\,\text{A S}$$

A total of 10 measures of the planet, 10 measures of star B, and 21 measures of star A are made. Each measure consists of two deflections separated by the deflection for sky background. In the middle of each measurement of sky background the hour angle is read on the telescope's setting circle. The standard time is read during the 11th measure of star A.

All observations of planets in blue color made from January 1953 to June 1961 are listed in Tables IX and X. The first column gives the Universal Time at the middle of the observation with an accuracy of a hundredth of a day. The second column gives the hour angle of the planet at the middle of the observation (E denotes East, W West). The 3rd, 4th and 5th columns give the amplifier's gain used when observing the planet, the comparison star A and comparison star B, respectively. The first number in each of these columns gives the setting of the 2.5 magnitude gain steps, the second number that of the 0.5 magnitude steps. They are given to permit a future rediscussion of the effects of possible nonlinearity of the amplifier and errors in its calibration. The 6th column of Tables IX and X gives the number of measures of the planet, which is usually 10. The number is smaller than 10 when the observations were stopped by clouds or when the planet could be observed only at low altitude; in this latter case the increase in the number of measures would mean that the planet is observed at still lower altitudes which would only reduce the accuracy.

Since the earth, sun, and planets change their relative positions, the measured brightness is corrected to some arbitrary fixed distance. The opposition position for 1950 has been used for this purpose. The correction is determined according to the formula

$$\Delta_d = 5(\log R_0 - \log R + \log\Delta_0 - \log\Delta), \quad (30)$$

where R is the distance of the planet from the sun, Δ is the distance of the planet from the earth and R_0 and Δ_0 are the arbitrary fixed distances to which the corrections are made; their values are given by Hardie and Giclas (3). The distance corrections computed from equation (30) are given in the 9th column of Tables IX and X.

The 7th and 8th columns of these tables give the differential extinction correction, $-Q_{b1}\,\Delta M$, and the correction for the color dependence of extinction, $-Q_{b2}\overline{M}\Delta(B\text{-}V)$, respectively. The values $Q_{b2} = -0^m.033$ and the mean seasonal values of Q_{b1} are used, except for the year 1961 when the use is made of the nightly values of this coefficient. The difference $\Delta(B\text{-}V)$ is defined as

$$\Delta(B\text{-}V) = (B\text{-}V)' - (B\text{-}V)_{\text{star A}}\ , \quad (31)$$

where for the gradient color index $(B\text{-}V)'$ the values given by equations (28) and (29) are used. The difference in air mass is computed from the approximate formula

$$\Delta M = M_{\text{planet}} - M_{\text{star A}} \approx ,$$

$$\approx (A \sin\overline{H} + B\cos\overline{H} + C)\overline{M}^2\ , \quad (32)$$

where $\overline{H}$ is the mean hour angle of the planet and star A, positive westward, $\overline{M}$ is the mean air mass of the planet and star A, while

$$A = \sin(\alpha_{\text{star A}} - \alpha_{\text{planet}})\cos\phi\cos\overline{\delta}\,, \quad (33)$$

$$B = -\sin(\delta_{\text{star A}} - \delta_{\text{planet}})\cos\phi\sin\overline{\delta}\,, \quad (34)$$

$$C = \sin(\delta_{\text{star A}} - \delta_{\text{planet}})\sin\phi\cos\overline{\delta}\,; \quad (35)$$

here α and δ are right ascension and declination, $\overline{\delta}$ is the mean declination of the planet and star A and ϕ is geographic latitude of the observatory.

The corrections given in the 7th and 8th columns of Tables IX and X refer to the middle of the observation. Similar corrections are, however, computed for every measurement of the planet. The individual measures corrected for extinction are used for computing the nightly mean value of the magnitude difference between the planet and comparison

TABLE IX. Magnitude Differences in Blue Color Between Uranus and Comparison Stars (Unit = $0^m.001$)

DATE U.T.	Hour Angle	Amplifier Gains: Uranus	Amplifier Gains: Star UA	Amplifier Gains: Star UB	Number of measures of planet	U-UA: Correction for differential extinction	U-UA: Correction for color dependence of extinction	Distance correction	ΔB'(U-UA) corrected for extinction and distance	ΔB'(UB-UA) corrected for extinction	Color correction to the BV system: U-UA	Color correction to the BV system: U-UB	Phase Correction	Oblateness correction	ΔB(U-UA) Final Value	ΔB(U-UB) Final Value	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1953																	
Jan. 21.21	0.7E				11	0	+10	+ 94	- 152 ± 3		+11		0	-22	- 163		13"tel.
23.25	0.2W				41	- 2	+14	+ 93	- 146 ± 3		+ 6		0	-22	- 162		82"tel.
24.12	2.8E				16	- 2	+16	+ 93	- 141 ± 4		+ 6		0	-22	- 157		82"tel.
25.24	0.1E				20	0	+10	+ 92	- 137 ± 3		+ 6		0	-22	- 153		82"tel.
26.36	2.8W				11	- 4	+16	+ 91	- 137 ± 4		+ 6		0	-22	- 153		82"tel.
27.20	0.8E				6	0	+10	+ 91	- 142 ± 3		+ 6		0	-22	- 158		82"tel.
29.21	0.5E				16	0	+10	+ 89	- 152 ± 2	+ 103 ± 2	+11	+ 4	- 1	-21	- 163	- 273	13"tel.
30.35	2.9W				16	- 4	+16	+ 88	- 142 ± 4	+ 104 ± 2	+ 6	+ 2	- 1	-21	- 158	- 266	82"tel.
Feb. 1.31	2.3W				10	- 3	+14	+ 86	- 144 ± 4	+ 106 ± 2	+ 6	+ 2	- 1	-21	- 160	- 270	82"tel.
2.20	0.7W				9	- 1	+12	+ 86	- 153 ± 3	+ 102 ± 2	+11	+ 4	- 1	-21	- 164	- 273	13"tel.
3.20	0.6W				10	- 3	+14	+ 85	- 152 ± 4	+ 103 ± 2	+11	+ 4	- 1	-21	- 163	- 273	13"tel.
4.17	1.0E				13	0	+12	+ 84	- 152 ± 3	+ 102 ± 3	+11	+ 4	- 1	-21	- 163	- 272	13"tel.
5.16	1.4E				5	0	+12	+ 83	- 143 ± 3		+ 6		- 1	-21	- 159		82"tel.
7.19	0.3E				10	0	+12	+ 81	- 151 ± 3		+11		- 1	-21	- 162		13"tel.
8.16	1.0E				10	0	+12	+ 80	- 150 ± 3	+ 103 ± 3	+11	+ 4	- 1	-21	- 161	- 271	13"tel.
11.16	0.7E				10	0	+12	+ 76	- 152 ± 3		+11		- 1	-21	- 163		13"tel.
12.29	2.4W				10	- 4	+14	+ 75	- 148 ± 4		+11		- 1	-21	- 159		13"tel.
13.27	1.9W				11	- 3	+14	+ 74	- 148 ± 4		+11		- 1	-21	- 159		13"tel.
15.24	1.4W				10	- 2	+12	+ 71	- 150 ± 3		+11		- 1	-21	- 161		13"tel.
19.20	0.8W				10	- 2	+12	+ 66	- 150 ± 3	+ 107 ± 2	+11	+ 4	- 1	-21	- 161	- 275	13"tel.
														mean	- 161	- 272	
23.19	0.1W				10	- 1	+12	+ 60	- 154 ± 4		+16		- 2	-21	- 161		42"tel.
25.22	1.0W				6	- 2	+12	+ 52	- 154 ± 5		+16		- 2	-20	- 160		42"tel.
26.25	1.8W				11	- 4	+14	+ 56	- 150 ± 3		+16		- 2	-20	- 156		42"tel.
27.18	0.2W				10	- 2	+12	+ 54	- 152 ± 3		+16		- 2	-20	- 158		42"tel.
28.23	1.5W				11	- 3	+14	+ 52	- 152 ± 3		+16		- 2	-20	- 158		42"tel.
Mar. 3.28	3.0W				8	- 8	+16	+ 47	- 151 ± 5		+16		- 2	-20	- 157		42"tel.
4.20	1.1W				10	- 2	+12	+ 46	- 157 ± 4		+16		- 2	-20	- 163		42"tel.
5.16	0.2W				10	- 1	+12	+ 44	- 154 ± 3		+16		- 2	-20	- 160		42"tel.
6.16	0.2W				10	- 1	+12	+ 42	- 156 ± 3		+16		- 2	-20	- 162		42"tel.
7.17	0.4W				10	- 2	+12	+ 40	- 154 ± 3		+16		- 2	-20	- 160		42"tel.
10.19	1.2W				10	- 3	+12	+ 35	- 157 ± 4		+16		- 2	-20	- 163		42"tel.
12.19	1.3W				13	- 3	+12	+ 32	- 150 ± 3		+16		- 2	-20	- 156		42"tel.
13.17	0.9W				10	- 2	+12	+ 30	- 151 ± 3		+16		- 2	-20	- 157		42"tel.
14.14	0.4W				10	- 2	+12	+ 28	- 153 ± 3		+16		- 3	-20	- 160		42"tel.
21.14	0.7W				10	- 2	+12	+ 15	- 154 ± 3		+16		- 3	-20	- 161		42"tel.
22.15	1.0W				10	- 2	+12	+ 13	- 154 ± 3		+16		- 3	-20	- 161		42"tel.
27.14	1.1W				10	- 3	+12	+ 4	- 151 ± 3		+16		- 3	-20	- 158		42"tel.
28.13	0.9W				8	- 2	+12	+ 2	- 153 ± 4		+16		- 3	-20	- 160		42"tel.
29.14	1.1W				3	- 3	+14	0	- 152 ± 5		+16		- 3	-20	- 159		42"tel.
31.22	3.4W				10	-11	+16	- 4	- 150 ± 5		+16		- 3	-20	- 157		42"tel.
Apr. 1.14	1.5W				11	- 4	+14	- 6	- 150 ± 4		+16		- 3	-20	- 157		42"tel.
2.15	1.6W				10	- 4	+14	- 8	- 153 ± 4		+16		- 3	-20	- 160		42"tel.
3.12	1.7W				10	- 4	+14	- 10	- 153 ± 4		+16		- 3	-20	- 160		42"tel.
5.14	1.6W				10	- 4	+14	- 14	- 149 ± 4		+16		- 3	-20	- 156		42"tel.
11.13	1.8W				5	- 4	+14	- 26	- 156 ± 5		+16		- 3	-21	- 164		42"tel.
12.14	2.2W				10	- 6	+16	- 27	- 149 ± 5		+16		- 3	-21	- 157		42"tel.
16.15	2.5W				10	- 6	+16	- 35	- 147 ± 5		+16		- 3	-21	- 155		42"tel.
21.17	3.5W				5	-12	+20	- 44	- 146 ± 8		+16		- 3	-21	- 154		42"tel.
24.15	3.0W				10	- 8	+18	- 50	- 149 ± 6		+16		- 3	-21	- 157		42"tel.
25.14	3.1W				10	- 8	+18	- 52	- 150 ± 6		+16		- 3	-21	- 158		42"tel.
														mean	- 159		
Oct. 30.48	1.0E	35	43		10	0	+11	- 24	-1446 ± 2		+ 5		- 3	-33	-1477		U
31.51	0.1E	35	43		10	0	+10	- 26	-1442 ± 2		+ 5		- 3	-33	-1473		R
Nov. 7.55	0.8W	35	43		10	0	+11	- 40	-1446 ± 2		+ 5		- 2	-33	-1476		R
8.47	0.6E	35	43		10	0	+10	- 42	-1444 ± 2		+ 5		- 2	-33	-1474		R
9.52	0.5W	35	43		10	0	+10	- 44	-1446 ± 2		+ 5		- 2	-33	-1476		R

TABLE IX. Magnitude Differences in Blue Color Between Uranus and Comparison Stars (Unit = $0^{m}.001$) (cont'd)

DATE U.T. 1	Hour Angle 2	Amplifier Gains: Uranus 3	Star UA 4	Star UB 5	Number of measures of planet 6	Correction for differential extinction U-UA 7	Correction for color dependence of extinction U-UA 8	Distance correction 9	ΔB'(U-UA) corrected for extinction and distance 10	ΔB'(UB-UA) corrected for extinction 11	Color correction to the BV system U-UA 12	U-UB 13	Phase Correction 14	Oblateness correction 15	ΔB(U-UA) Final Value 16	ΔB(U-UB) Final Value 17	Remarks 18
1953																	
Nov. 12.51	0.6W	35	43		10	0	+10	- 49	-1444 ± 2		+ 5		- 2	-33	-1474		R
13.42	1.3E	35	43		4	0	+11	- 51	-1444 ± 2		+ 5		- 2	-33	-1474		R
17.42	1.2E	35	43		10	0	+11	- 58	-1443 ± 2		+ 5		- 2	-33	-1473		R
24.45	1.0E	35	43		10	0	+11	- 70	-1443 ± 2		+ 5		- 2	-33	-1473		R
28.47	0.7W	35	43		10	0	+10	- 77	-1447 ± 4		+ 5		- 2	-32	-1476		U smoke
Dec. 2.34	2.0E	35	43		10	+ 1	+12	- 82	-1445 ± 3		+ 5		- 1	-32	-1473		U
3.41	0.4E	35	43		4	0	+10	- 84	-1443 ± 2		+ 5		- 1	-32	-1471		U
6.42	0.2W	35	43		10	0	+10	- 89	-1439 ± 3		+ 5		- 1	-32	-1467		R
7.38	0.7E	35	43		10	0	+11	- 89	-1448 ± 3		+ 5		- 1	-32	-1476		U
10.37	0.8E	35	43		10	0	+11	- 93	-1445 ± 3		+ 5		- 1	-32	-1473		U
14.41	0.6W	35	43	43	10	- 1	+10	- 98	-1449 ± 3	+ 461 ± 4	+ 5	- 6	- 1	-31	-1476	-1948	U
21.39	0.4W	35	43	43	9	0	+10	-104	-1451 ± 2	+ 461 ± 4	+ 5	- 6	0	-31	-1476	-1949	U
24.41	1.0W	35	43	43	7	- 1	+11	-106	-1450 ± 3	+ 464 ± 4	+ 5	- 6	0	-31	-1476	-1951	U
29.35	0.1W	35	43	43	10	0	+10	-108	-1453 ± 2	+ 467 ± 4	+ 5	- 6	0	-31	-1479	-1957	U
30.11	0.6W	35	43	43	10	- 1	+10	-110	-1449 ± 3	+ 468 ± 4	+ 5	- 6	0	-31	-1475	-1954	U
31.33	0.1W	35	43	43	10	0	+10	-111	-1449 ± 3	+ 462 ± 4	+ 5	- 6	0	-31	-1475	-1948	U
1954																	
Jan. 2.33	0.1E	35	43	43	7	0	+10	-112	-1449 ± 3	+ 459 ± 4	+ 5	- 6	0	-31	-1475	-1945	U
4.35	0.4W	35	43	43	10	0	+10	-112	-1447 ± 3	+ 462 ± 4	+ 5	- 6	0	-30	-1472	-1945	U
5.37	1.0W	35	43	43	4	0	+11	-113	-1447 ± 3	+ 456 ± 4	+ 5	- 6	0	-30	-1472	-1939	U
10.32	0.2E	35	43	43	5	0	+10	-114	-1444 ± 3	+ 466 ± 4	+ 5	- 6	0	-30	-1469	-1946	R
14.34	0.8W	35	43	44	6	- 1	+11	-114	-1445 ± 2	+ 469 ± 4	+ 5	- 6	0	-30	-1470	-1941	R ?
Feb. 2.29	1.0W	35	43	43	10	- 2	+11	-105	-1447 ± 2	+ 463 ± 4	+ 5	- 6	0	-28	-1470	-1944	R
3.28	0.7W	35	43	43	10	- 2	+10	-105	-1448 ± 2	+ 465 ± 4	+ 5	- 6	0	-28	-1471	-1947	R
4.29	1.1W	35	43	43	10	- 3	+11	-104	-1443 ± 2	+ 468 ± 4	+ 5	- 6	0	-28	-1466	-1945	R
5.21	0.9E	35	43	43	10	+ 2	+11	-104	-1445 ± 3	+ 462 ± 5	+ 5	- 6	0	-28	-1469	-1942	R
6.22	0.6E	35	43	43	10	+ 2	+10	-103	-1447 ± 3	+ 462 ± 5	+ 5	- 6	- 1	-28	-1470	-1944	R
7.27	0.7W	35	43	43	10	- 2	+10	-102	-1449 ± 2	+ 459 ± 4	+ 5	- 6	- 1	-28	-1472	-1943	U
9.19	1.1E	35	43	44	10	+ 3	+11	-100	-1445 ± 3	+ 463 ± 5	+ 5	- 6	- 1	-28	-1469	-1943	R Clds.?
17.20	0.1W	35	43	44	10	0	+10	- 91	-1446 ± 2	+ 465 ± 4	+ 5	- 6	- 1	-28	-1470	-1946	R
18.20	0.1E	35	43	44	10	0	+10	- 90	-1449 ± 3	+ 459 ± 5	+ 5	- 6	- 1	-28	-1473	-1943	R
19.17	0.8E	35	43	44	10	+ 3	+11	- 88	-1444 ± 3	+ 468 ± 5	+ 5	- 6	- 1	-27	-1467	-1946	R
20.17	0.6E	35	43	44	10	+ 2	+10	- 87	-1443 ± 3	+ 464 ± 6	+ 5	- 6	- 1	-27	-1466	-1941	R
21.17	0.7E	35	43	44	10	+ 3	+10	- 86	-1446 ± 3	+ 462 ± 5	+ 5	- 6	- 1	-27	-1469	-1942	R
22.19	0.2E	35	43	44	10	+ 1	+10	- 84	-1446 ± 3	+ 463 ± 4	+ 5	- 6	- 1	-27	-1469	-1943	R
23.21	0.5W	35	43	44	10	- 1	+10	- 83	-1449 ± 3	+ 457 ± 4	+ 5	- 6	- 1	-27	-1472	-1940	U
24.22	0.8W	35	43	44	10	- 2	+11	- 82	-1449 ± 3	+ 462 ± 5	+ 5	- 6	- 2	-27	-1473	-1946	U
28.19	0.1E	35	43	44	10	0	+10	- 76	-1450 ± 3	+ 457 ± 4	+ 5	- 6	- 2	-27	-1474	-1942	U
Mar. 1.18	0.1W	35	43	44	10	0	+10	- 74	-1447 ± 2	+ 460 ± 4	+ 5	- 6	- 2	-27	-1471	-1942	U
2.16	0.2E	35	43	44	10	+ 1	+10	- 73	-1452 ± 4	+ 456 ± 4	+ 5	- 6	- 2	-27	-1476	-1943	U ?
3.15	0.6E	35	43	44	10	+ 2	+10	- 71	-1451 ± 3	+ 454 ± 4	+ 5	- 6	- 2	-27	-1475	-1940	U
4.18	0.1W	35	43	44	6	0	+10	- 70	-1445 ± 3	+ 454 ± 7	+ 5	- 6	- 2	-27	-1469	-1934	R
5.18	0.1W	35	45	44	10	0	+10	- 68	-1448 ± 3	+ 458 ± 4	+ 5	- 6	- 2	-27	-1472	-1941	
														mean	-1472	-1945	
15.16	0.8W	51	54	53	10	+ 1	+ 9	- 51	- 925 ± 2	+1033 ± 5	+16	-13	- 1	-27	- 937	-1999	Lall.
17.18	1.0W	51	54	53	10	+ 1	+ 9	- 47	- 927 ± 3	+1037 ± 4	+16	-13	- 1	-27	- 939	-2005	Lall.*
28.14	0.9W	43	45	52	9	+ 1	+ 9	- 26	- 921 ± 2	+1034 ± 3	+16	-13	- 1	-27	- 933	-1996	Lall.
30.14	1.2W	43	45	52	9	+ 1	+ 9	- 23	- 921 ± 2	+1034 ± 3	+16	-13	- 2	-27	- 934	-1997	Lall.
31.13	1.2W	43	45	52	10	+ 1	+ 9	- 18	- 922 ± 2	+1035 ± 3	+16	-13	- 2	-27	- 935	-1999	Lall.
Apr. 6.13	1.3W	43	45	46	5	+ 1	+ 9	- 9	- 924 ± 3	+1032 ± 4	+16	-13	- 2	-27	- 937	-1998	Lall.
7.13	1.4W	52	54	55	4	+ 1	+ 9	- 7	- 917 ± 2	+1035 ± 4	+16	-13	- 2	-27	- 930	-1994	Lall.**
8.13	1.4W	52	54	55	3	+ 1	+ 9	- 5	- 919 ± 4	+1033 ± 3	+16	-13	- 2	-27	- 932	-1994	Lall.
9.16	1.7W	52	54	55	5	+ 1	+ 9	- 2	- 921 ± 2	+1035 ± 4	+16	-13	- 2	-27	- 932	-1998	Lall.
13.15	2.2W	53	54	56	8	+ 1	+10	+ 4	- 919 ± 3	+1035 ± 3	+16	-13	- 2	-27	- 932	-1996	Lall.
14.14	2.1W	53	54	56	10	+ 1	+10	+ 6	- 921 ± 3	+1032 ± 4	+16	-13	- 2	-27	- 934	-1995	Lall.
15.16	2.5W	53	54	56	10	+ 2	+10	+ 8	- 921 ± 3	+1032 ± 4	+16	-13	- 2	-27	- 934	-1995	Lall.
16.18	3.1W	53	54	56	6	+ 1	+11	+ 10	- 922 ± 3	+1040 ± 5	+16	-13	- 2	-27	- 935	-2004	Lall.
17.16	2.6W	53	54	55	7	+ 1	+11	+ 12	- 921 ± 3	+1035 ± 4	+16	-13	- 2	-27	- 934	-1998	Lall.

TABLE IX. Magnitude Differences in Blue Color Between Uranus Comparison Stars (Unit = $0^{m}.001$) (cont'd)

DATE U.T.	Hour Angle	Amplifier Gains: Uranus	Star UA	Star UB	Number of measures of planet	U-UA: Correction for differential extinction	U-UA: Correction for color dependence of extinction	Distance correction	ΔB'(U-UA) corrected for extinction and distance	ΔB'(UB-UA) corrected for extinction	Color correction to the BV system: U-UA	U-UB	Phase Correction	Oblateness correction	ΔB(U-UA) Final Value	ΔB(U-UB) Final Value	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1954																	
Apr. 22.15	2.7W	53	55	56	10	+ 1	+11	+ 22	- 922 ± 3	+1036 ± 4	+16	-13	- 3	-27	- 936	-2001	Lall.
23.16	3.0W	53	55	56	5	+ 2	+11	+ 23	- 922 ± 3	+1030 ± 4	+16	-13	- 3	-27	- 936	-1995	Lall.
26.16	3.4W	53	55	56	5	+ 2	+12	+ 29	- 920 ± 3	+1033 ± 5	+16	-13	- 3	-28	- 935	-1997	Lall.
														mean	- 934	-1997	
Oct. 11.52	1.7E	41	52	44	3	- 2	+14	- 10	-3204 ±10	-1509 ± 3	+27	+25	- 3	-40	-3220	-1713	
12.50	2.0E	41	52	44	10	- 5	+14	- 8	-3214 ± 4	-1511 ± 2	+27	+25	- 3	-40	-3230	-1721	
13.52	1.4E	35	52	44	2	- 3	+13	- 6	-3223 ± 4	-1515 ± 1	+27	+25	- 3	-40	-3239	-1726	
14.50	2.0E	35	51	44	11	- 5	+14	- 4	-3218 ± 4	-1510 ± 2	+27	+25	- 3	-40	-3234	-1726	
15.50	1.9E	35	52	44	10	- 5	+14	- 2	-3216 ± 4	-1513 ± 3	+27	+25	- 3	-40	-3232	-1721	
16.47	2.5E	35	52	44	10	- 7	+15	- 1	-3211 ± 4	-1515 ± 2	+27	+25	- 3	-40	-3227	-1714	
21.47	2.1E	35	51	43	10	- 5	+14	+ 10	-3220 ± 4	-1514 ± 1	+27	+25	- 3	-41	-3237	-1725	
22.46	2.3E	35	51	43	5	- 7	+15	+ 12	-3221 ± 4	-1515 ± 2	+27	+25	- 3	-41	-3238	-1725	
25.48	1.7E	36	52	44	5	- 4	+14	+ 18	-3211 ± 4	-1509 ± 1	+27	+25	- 3	-41	-3228	-1721	
26.45	2.4E	35	52	44	5	- 7	+15	+ 20	-3215 ± 5	-1518 ± 2	+27	+25	- 3	-41	-3232	-1716	
27.48	1.4E	42	53	45	10	- 3	+13	+ 22	-3215 ± 4	-1516 ± 2	+27	+25	- 3	-41	-3232	-1718	
28.49	1.3E	42	53	45	10	- 3	+13	+ 24	-3215 ± 3	-1511 ± 4	+27	+25	- 3	-41	-3232	-1723	
30.52	0.5E	42	53	45	4	- 1	+13	+ 28	-3218 ± 3	-1514 ± 3	+27	+25	- 3	-41	-3235	-1723	
31.45	2.1E	42	53	45	5	- 6	+14	+ 30	-3216 ± 5	-1514 ± 2	+27	+25	- 3	-41	-3233	-1721	
Nov. 4.44	2.0E	34	51	43	5	- 6	+14	+ 38	-3222 ± 5	-1513 ± 2	+27	+25	- 3	-41	-3239	-1728	
5.49	0.8E	35	52	44	10	- 2	+13	+ 40	-3214 ± 3	-1510 ± 1	+27	+25	- 3	-41	-3231	-1723	
7.49	0.7E	35	52	44	10	- 1	+13	+ 44	-3213 ± 3	-1510 ± 1	+27	+25	- 3	-41	-3230	-1722	
8.49	0.4E	35	52	44	10	- 1	+13	+ 46	-3212 ± 3	-1512 ± 1	+27	+25	- 3	-41	-3229	-1719	
9.48	0.6E	35	51	44	10	- 1	+13	+ 46	-3213 ± 3	-1508 ± 1	+27	+25	- 3	-41	-3230	-1724	
13.45	1.0E	35	51	43	5	- 2	+13	+ 55	-3220 ± 3	-1517 ± 2	+27	+25	- 2	-41	-3237	-1722	
16.44	1.2E	35	46	43	10	- 3	+13	+ 61	-3225 ± 3	-1520 ± 1	+27	+25	- 2	-41	-3241	-1723	
17.47	0.5E	35	51	43	10	- 1	+13	+ 63	-3229 ± 3	-1513 ± 1	+27	+25	- 2	-41	-3245	-1734	
18.47	0.1E	35	46	43	5	0	+13	+ 64	-3223 ± 3	-1516 ± 2	+27	+25	- 2	-41	-3239	-1725	
19.45	0.8E	35	46	43	10	- 2	+14	+ 67	-3227 ± 3	-1516 ± 1	+27	+25	- 2	-41	-3243	-1729	
20.47	0.4E	35	46	43	7	- 1	+13	+ 68	-3225 ± 3	-1514 ± 1	+27	+25	- 2	-40	-3240	-1728	
21.46	0.4E	35	46	43	10	- 1	+13	+ 70	-3222 ± 3	-1515 ± 3	+27	+25	- 2	-40	-3237	-1724	clds.
22.46	0.3E	35	46	43	10	- 1	+13	+ 72	-3224 ± 3	-1515 ± 1	+27	+25	- 2	-40	-3239	-1726	
23.46	0.1E	35	46	43	10	0	+13	+ 74	-3226 ± 3	-1517 ± 2	+27	+25	- 2	-40	-3241	-1726	
24.50	0.8W	35	52	44	10	+ 2	+13	+ 76	-3214 ± 3	-1513 ± 1	+27	+25	- 2	-40	-3229	-1718	
26.50	1.0W	35	52	44	10	+ 3	+13	+ 79	-3217 ± 3	-1514 ± 2	+27	+25	- 2	-40	-3232	-1720	
29.45	0.1E	35	52	44	10	0	+13	+ 84	-3221 ± 3	-1512 ± 1	+27	+25	- 2	-40	-3236	-1726	
Dec. 5.36	1.7E	35	52	44	5	- 5	+14	+ 93	-3217 ± 3	-1516 ± 3	+27	+25	- 1	-40	-3231	-1717	
8.43	0.2W	35	52	44	5	0	+13	+ 98	-3217 ± 3	-1511 ± 1	+27	+25	- 1	-40	-3231	-1722	
14.41	0.0	35	46	43	5	0	+13	+106	-3220 ± 3	-1513 ± 3	+27	+25	- 1	-39	-3233	-1722	
17.46	1.4W	35	52	44	5	+ 3	+13	+109	-3208 ± 4	-1517 ± 1	+27	+25	- 1	-39	-3221	-1706	
18.51	2.6W	35	52	44	5	+ 8	+15	+110	-3218 ± 6	-1511 ± 2	+27	+25	- 1	-39	-3231	-1722	
19.46	1.5W	35	52	44	5	+ 3	+13	+111	-3220 ± 4	-1515 ± 2	+27	+25	- 1	-39	-3233	-1720	
21.50	2.6W	35	52	44	10	+ 7	+15	+113	-3217 ± 5	-1516 ± 1	+27	+25	- 1	-39	-3230	-1716	
22.53	3.4W	35	52	44	5	+10	+17	+115	-3213 ± 6	-1514 ± 2	+27	+25	- 1	-39	-3226	-1714	
23.51	3.1W	35	52	44	5	+ 9	+16	+115	-3218 ± 5	-1515 ± 1	+27	+25	- 1	-39	-3231	-1718	
30.45	2.4W	35	52	44	5	+ 5	+15	+121	-3201 ± 5	-1510 ± 1	+27	+25	0	-39	-3213	-1705	
1955																	
Jan. 6.45	2.6W	35	52	44	5	+ 6	+15	+125	-3238 ± 7	-1513 ± 3	+27	+25	0	-38	-3249	-1738	
12.38	1.3W	35	46	43	10	+ 2	+13	+127	-3205 ± 5	-1507 ± 1	+27	+25		-37	-3216	-1710	
														mean	-3234	-1722	
Feb. 10.15	2.3E	35	52		10	+ 2	+15	+117	-3216 ± 4		+27	+25	0	-35	-3224		
10.24	0.2E	35	52		10	+ 1	+13	+117	-3217 ± 3		+27	+25	0	-35	-3226		
10.30	1.2W	35	52		5	0	+13	+117	-3214 ± 4		+27	+25	- 1	-35	-3223		
11.23	0.3E	35	52		10	+ 1	+13	+116	-3220 ± 3		+27	+25	- 1	-35	-3229		
11.29	1.2W	35	52		10	0	+13	+116	-3219 ± 3		+27	+25	- 1	-35	-3228		
11.35	2.6W	35	46		10	0	+15	+116	-3219 ± 3		+27	+25	- 1	-35	-3228		
Mar. 1.28	2.2W	35	52	44	10	- 1	+14	+ 95	-3219 ± 3	-1515 ± 1	+27	+25	- 2	-35	-3229	-1716	
2.31	2.8W	35	52	44	10	- 2	+16	+ 93	-3220 ± 4	-1514 ± 1	+27	+25	- 2	-35	-3230	-1718	
3.28	2.2W	35	52	44	10	- 1	+14	+ 92	-3220 ± 4	-1516 ± 1	+27	+25	- 2	-34	-3229	-1715	

TABLE IX. Magnitude Differences in Blue Color Between Uranus Comparison Stars (Unit = $0\overset{m}{.}001$) (cont'd)

DATE U.T.	Hour Angle	Amplifier Gains: Uranus	Amplifier Gains: Star UA	Amplifier Gains: Star UB	Number of measures of planet	U-UA: Correction for differential extinction	U-UA: Correction for color dependence of extinction	Distance correction	ΔB'(U-UA) corrected for extinction and distance	ΔB'(UB-UA) corrected for extinction	Color correction to the BV system: U-UA	Color correction to the BV system: U-UB	Phase Correction	Oblateness correction	ΔB(U-UA) Final Value	ΔB(U-UB) Final Value	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1955 Mar. 13.26	2.5W	35	52	44	10	- 3	+15	+ 76	-3219 ± 4	-1514 ± 2	+27	+25	- 2	-34	-3228	-1716	hazy
17.25	2.3W	35	52	44	10	- 3	+15	+ 69	-3211 ± 4	-1512 ± 2	+27	+25	- 2	-34	-3220	-1710	
20.21	1.8W	35	52	44	10	- 2	+14	+ 64	-3214 ± 4	-1515 ± 2	+27	+25	- 2	-34	-3223	-1710	
23.24	2.6W	35	52	44	10	- 3	+15	+ 58	-3214 ± 4	-1516 ± 1	+27	+25	- 2	-34	-3223	-1709	
27.22	2.6W	35	52	44	10	- 3	+15	+ 51	-3217 ± 4	-1511 ± 1	+27	+25	- 3	-34	-3227	-1718	***
31.21	2.5W	35	52	44	10	- 3	+15	+ 43	-3215 ± 4	-1514 ± 2	+27	+25	- 3	-34	-3225	-1713	hazy
Apr. 11.22	2.3W	35	52	44	10	- 3	+15	+ 22	-3216 ± 4	-1512 ± 1	+27	+25	- 3	-34	-3226	-1716	windy
18.16	2.4W	35	52	44	10	- 3	+15	+ 9	-3215 ± 4	-1512 ± 1	+27	+25	- 3	-34	-3225	-1715	clouds
20.19	3.2W	35	52	44	10	- 5	+16	+ 5	-3211 ± 4	-1510 ± 1	+27	+25	- 3	-34	-3221	-1713	
21.18	3.2W	35	52	44	10	- 5	+16	+ 3	-3214 ± 4	-1515 ± 2	+27	+25	- 3	-34	-3224	-1711	
25.20	3.7W	35	52	44	10	- 7	+17	- 5	-3212 ± 4	-1511 ± 2	+27	+25	- 3	-35	-3222	-1714	
26.16	3.0W	35	52	44	10	- 5	+16	- 7	-3214 ± 4	-1512 ± 1	+27	+25	- 3	-35	-3224	-1715	hazy
														mean	-3226	-1714	
Sep. 23.48	4.0E	36	36	35	10	-26	+ 5	- 40	+ 171 ± 6	- 728 ± 5	0	+ 1	- 2	-47	+ 122	+ 851	
24.48	4.2E	36	36	34	10	-32	+ 9	- 38	+ 170 ± 8	- 725 ± 7	0	+ 1	- 2	-47	+ 121	+ 847	clouds
27.47	4.0E	36	36	34	10	-26	+ 5	- 33	+ 169 ± 6	- 730 ± 5	0	+ 1	- 2	-47	+ 120	+ 851	
28.47	4.0E	36	36	34	10	-31	+ 5	- 31	+ 171 ± 7	- 732 ± 5	0	+ 1	- 2	-47	+ 122	+ 855	
30.47	3.8E	36	36	34	10	-27	+ 4	- 28	+ 170 ± 6	- 730 ± 4	0	+ 1	- 2	-48	+ 120	+ 851	
Oct. 1.47	3.8E	36	36	34	10	-27	+ 4	- 26	+ 168 ± 6	- 729 ± 4	0	+ 1	- 2	-48	+ 118	+ 848	
4.48	3.7E	36	36	34	10	-25	+ 5	- 21	+ 173 ± 6	- 726 ± 4	0	+ 1	- 2	-48	+ 123	+ 850	clouds
7.47	3.5E	36	36	34	10	-22	+ 4	- 15	+ 170 ± 6	- 730 ± 4	0	+ 1	- 3	-48	+ 119	+ 850	
8.48	3.0E	36	36	34	10	-15	+ 3	- 13	+ 171 ± 4	- 727 ± 2	0	+ 1	- 3	-48	+ 120	+ 848	
10.49	2.8E	36	36	34	10	-15	+ 4	- 9	+ 176 ± 4	- 721 ± 2	0	+ 1	- 3	-48	+ 125	+ 847	clouds
11.50	2.5E	36	36	34	10	-13	+ 4	- 7	+ 171 ± 3	- 728 ± 2	0	+ 1	- 3	-48	+ 120	+ 849	
13.50	2.4E	36	36	34	10	-12	+ 3	- 3	+ 170 ± 3	- 729 ± 2	0	+ 1	- 3	-48	+ 119	+ 849	
17.50	2.1E	36	36	34	10	- 9	+ 3	+ 5	+ 173 ± 3	- 727 ± 2	0	+ 1	- 3	-48	+ 122	+ 850	
18.48	2.4E	36	36	34	10	-12	+ 3	+ 7	+ 173 ± 3	- 728 ± 2	0	+ 1	- 3	-48	+ 122	+ 851	
27.47	2.0E	36	36	34	10	-10	+ 3	+ 25	+ 172 ± 3	- 729 ± 2	0	+ 1	- 3	-49	+ 120	+ 850	
28.46	2.3E	36	36	34	10	-12	+ 3	+ 27	+ 171 ± 3	- 730 ± 2	0	+ 1	- 3	-49	+ 119	+ 850	
30.43	2.9E	36	36	34	10	-17	+ 3	+ 31	+ 169 ± 3	- 732 ± 2	0	+ 1	- 3	-49	+ 117	+ 850	
31.45	2.3E	36	36	34	10	-12	+ 3	+ 33	+ 171 ± 3	- 730 ± 2	0	+ 1	- 3	-49	+ 119	+ 850	
Nov. 1.46	2.1E	36	36	34	10	-10	+ 3	+ 35	+ 171 ± 3	- 730 ± 2	0	+ 1	- 3	-49	+ 119	+ 850	
4.45	2.1E	36	36	34	10	-10	+ 3	+ 41	+ 171 ± 3	- 731 ± 1	0	+ 1	- 3	-49	+ 119	+ 851	
7.41	2.8E	36	36	34	10	-17	+ 4	+ 47	+ 169 ± 3	- 733 ± 2	0	+ 1	- 3	-49	+ 117	+ 851	hazy
8.41	2.7E	36	36	34	10	-15	+ 3	+ 49	+ 170 ± 3	- 732 ± 2	0	+ 1	- 3	-49	+ 118	+ 851	
														mean	+ 120	+ 850	
16.44	1.5E	36	36	34	10	- 7	+ 2	+ 65	+ 902 ± 2	+ 724 ± 1	+ 1	0	- 2	-49	+ 851	+ 129	2
19.37	2.9E	36	36	34	10	- 3	+ 7	+ 70	+ 903 ± 2	+ 724 ± 2	+ 1	0	- 2	-49	+ 853	+ 128	2
20.41	2.1E	36	36	34	10	- 1	+ 6	+ 72	+ 903 ± 2	+ 725 ± 1	+ 1	0	- 2	-49	+ 853	+ 127	2
27.40	1.9E	36	36	34	10	0	+ 7	+ 85	+ 902 ± 2	+ 726 ± 2	+ 1	0	- 2	-49	+ 852	+ 125	2 hazy
1956 Jan. 3.30	1.6E	36	36	34	10	+ 1	+ 6	+134	+ 894 ± 2	+ 724 ± 1	+ 1	0	0	-46	+ 849	+ 124	2
10.29	1.4E	36	36	34	10	+ 3	+ 6	+138	+ 892 ± 2	+ 718 ± 1	+ 1	0	0	-46	+ 847	+ 128	2
17.18	3.5E	36	36	34	10	+ 8	+ 8	+140	+ 900 ± 4	+ 722 ± 4	+ 1	0	0	-45	+ 856	+ 133	2
17.27	1.5E	36	36	34	10	+ 4	+ 6	+140	+ 899 ± 2	+ 727 ± 1	+ 1	0	0	-45	+ 885	+ 127	2
18.18	3.5E	36	36	34	10	+ 8	+ 8	+140	+ 895 ± 3	+ 718 ± 3	+ 1	0	0	-45	+ 851	+ 132	2
19.18	3.4E	36	36	34	10	+ 8	+ 8	+141	+ 898 ± 3	+ 723 ± 3	+ 1	0	0	-45	+ 854	+ 130	2
19.27	1.2E	36	36	34	10	+ 4	+ 6	+141	+ 900 ± 2	+ 724 ± 1	+ 1	0	0	-45	+ 856	+ 131	2
20.43	2.6W	36	36	34	10	+ 5	+ 7	+141	+ 899 ± 3	+ 724 ± 2	+ 1	0	0	-45	+ 855	+ 130	2
29.48	4.3W	36		34	10	+21	+10	+140	+ 902 ± 7		+ 1	0	0	-44	+ 859		2
30.25	1.0E	36	36	34	10	+ 4	+ 6	+140	+ 899 ± 2	+ 724 ± 1	+ 1	0	0	-44	+ 856	+ 131	2
Feb. 3.18	2.4E	36	36	34	10	+ 8	+ 7	+138	+ 901 ± 3	+ 728 ± 2	+ 1	0	0	-44	+ 858	+ 129	2
4.26	0.5E	36	36	34	10	+ 4	+ 6	+138	+ 880 ± 3	+ 714 ± 2	+ 1	0	0	-44	+ 836	+ 122	2
5.23	1.1E	36	36	34	10	+ 5	+ 6	+137	+ 887 ± 3	+ 713 ± 2	+ 1	0	0	-44	+ 844	+ 130	2
5.38	2.5W	36	36	34	10	+ 5	+ 7	+137	+ 890 ± 3	+ 716 ± 2	+ 1	0	0	-44	+ 847	+ 130	2
7.38	2.5W	36	36	34	7	+ 5	+ 7	+136	+ 909 ± 3	+ 724 ± 2	+ 1	0	0	-44	+ 866	+ 141	2 clouds

TABLE IX. Magnitude Differences in Blue Color Between Uranus Comparison Stars (Unit = 0.001 m) (cont'd)

DATE U.T.	Hour Angle	Amplifier Gains: Uranus	Amplifier Gains: Star UA	Amplifier Gains: Star UB	Number of measures of planet	U-UA: Correction for differential extinction	U-UA: Correction for color dependence of extinction	Distance correction	ΔB'(U-UA) corrected for extinction and distance	ΔB'(UB-UA) corrected for extinction	Color correction to the BV system: U-UA	Color correction to the BV system: U-UB	Phase Correction	Oblateness correction	ΔB(U-UA) Final Value	ΔB(U-UB) Final Value	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1956																	
Feb. 10.14	2.8E	36	36	34	10	+10	+ 7	+134	+ 906 ± 4	+ 726 ± 2	+ 1	0	0	-44	+ 863	+ 136	2
10.22	1.0E	36	36	34	10	+ 5	+ 6	+134	+ 902 ± 3	+ 727 ± 1	+ 1	0	0	-44	+ 859	+ 131	2
14.13	2.8E	36	36	34	10	+ 1	+ 7	+131	+ 907 ± 4	+ 730 ± 2	+ 1	0	0	-43	+ 865	+ 133	2
14.39	3.3W	36	36	34	10	+ 6	+ 4	+131	+ 906 ± 3	+ 729 ± 2	+ 1	0	0	-43	+ 864	+ 133	2
15.15	2.4E	36	36	34	10	+ 9	+ 6	+130	+ 893 ± 3	+ 713 ± 2	+ 1	0	- 1	-43	+ 852	+ 136	2
15.39	3.5W	36	36	34	10	+ 6	+ 8	+130	+ 908 ± 3	+ 726 ± 2	+ 1	0	- 1	-43	+ 865	+ 138	2
17.21	1.0E	36	36	34	7	+ 5	+ 6	+128	+ 906 ± 3	+ 727 ± 2	+ 1	0	- 1	-43	+ 863	+ 135	2 clouds
17.40	3.8W	36	36	34	10	+ 8	+ 9	+125	+ 911 ± 4	+ 733 ± 2	+ 1	0	- 1	-43	+ 868	+ 134	2
20.17	1.5E	36	36	34	10	+ 6	+ 6	+125	+ 913 ± 3	+ 729 ± 3	+ 1	0	- 1	-43	+ 870	+ 140	2
20.36	3.0W	36	36	34	10	+ 5	+ 7	+125	+ 900 ± 3	+ 723 ± 1	+ 1	0	- 1	-43	+ 857	+ 133	2
25.34	2.8W	35	35	34	15	+ 4	+ 7	+120	+ 897 ± 3	+ 718 ± 2	0	+ 1	- 1	-43	+ 854	+ 135	2
27.34	3.0W	35	35	34	15	+ 4	+ 7	+117	+ 899 ± 2	+ 722 ± 1	0	+ 1	- 1	-43	+ 856	+ 133	2
28.31	2.4W	35	35	34	15	+ 3	+ 7	+116	+ 898 ± 2	+ 722 ± 1	0	+ 1	- 1	-43	+ 855	+ 132	2
28.36	3.5W	35	35	34	15	+ 5	+ 8	+116	+ 897 ± 3	+ 719 ± 1	0	+ 1	- 1	-43	+ 854	+ 134	2
Mar. 5.13	1.6W	34	34	33	10	+ 7	+ 6	+108	+ 895 ± 3	+ 721 ± 1	0	+ 1	- 2	-42	+ 852	+ 131	2
5.29	2.3W	34	34	33	10	+ 2	+ 6	+108	+ 897 ± 2	+ 721 ± 1	0	+ 1	- 2	-42	+ 854	+ 133	2
14.31	3.0W	34	34	33	5	+ 2	+ 7	+ 94	+ 906 ± 4	+ 726 ± 3	0	+ 1	- 2	-42	+ 863	+ 136	1 clouds
15.30	3.2W	34	34	33	15	+ 2	+ 8	+ 92	+ 904 ± 2	+ 722 ± 1	0	+ 1	- 2	-42	+ 861	+ 138	1
16.31	3.5W	35	35	34	15	+ 2	+ 8	+ 90	+ 899 ± 2	+ 722 ± 1	0	+ 1	- 2	-42	+ 856	+ 133	1
19.25	2.3W	35	35	34	15	+ 2	+ 6	+ 85	+ 901 ± 2	+ 724 ± 1	0	+ 1	- 2	-42	+ 858	+ 133	1
20.25	2.4W	35	35	34	15	+ 2	+ 6	+ 84	+ 898 ± 2	+ 722 ± 2	0	+ 1	- 2	-42	+ 855	+ 132	1
21.29	3.3W	35	35	34	15	+ 2	+ 8	+ 82	+ 900 ± 2	+ 721 ± 1	0	+ 1	- 2	-42	+ 857	+ 135	1
22.27	2.9W	36	36	34	15	+ 1	+ 7	+ 80	+ 897 ± 2	+ 720 ± 2	0	+ 1	- 2	-42	+ 854	+ 133	1 clouds
23.29	3.4W	54	54	53	15	+ 1	+ 8	+ 78	+ 899 ± 2	+ 723 ± 3	0	+ 1	- 2	-42	+ 856	+ 132	4 hazy
27.29	3.8W	55	55	54	15	+ 1	+ 9	+ 71	+ 900 ± 2	+ 720 ± 1	0	+ 1	- 2	-42	+ 857	+ 136	4 hazy
28.26	3.2W	55	55	53	15	+ 1	+ 8	+ 69	+ 902 ± 2	+ 723 ± 1	0	+ 1	- 2	-41	+ 859	+ 135	4
29.24	2.9W	55	55	53	15	+ 1	+ 7	+ 67	+ 902 ± 2	+ 722 ± 1	0	+ 1	- 3	-41	+ 859	+ 136	4
Apr. 5.25	3.3W	55	55	53	15	+ 1	+ 8	+ 54	+ 898 ± 2	+ 719 ± 1	0	+ 1	- 3	-42	+ 854	+ 134	4
9.20	2.4W	55	55	54	15	+ 1	+ 7	+ 47	+ 905 ± 2	+ 722 ± 1	0	+ 1	- 3	-42	+ 861	+ 138	4
11.18	1.8W	55	55	53	8	+ 2	+ 6	+ 43	+ 902 ± 2	+ 726 ± 2	0	+ 1	- 3	-42	+ 858	+ 131	4 clouds
16.21	3.1W	55	55	53	15	+ 1	+ 8	+ 33	+ 901 ± 2	+ 722 ± 1	0	+ 1	- 3	-42	+ 857	+ 134	3C
25.24	4.6W	55		53	10	+ 4	+12	+ 15	+ 902 ± 4		0	+ 1	- 3	-42	+ 858		3C
26.16	2.7W	55	55	53	10	+ 2	+ 7	+ 14	+ 901 ± 2	+ 721 ± 2	0	+ 1	- 3	-42	+ 857	+ 135	3C
30.19	3.6W	55		53	10	+ 2	+ 8	+ 6	+ 903 ± 2		0	+ 1	- 3	-42	+ 859		3C
May 1.18	3.4W	55		53	10	+ 2	+ 8	+ 4	+ 901 ± 2		0	+ 1	- 3	-42	+ 857		3C
11.15	3.5W	55		53	10	+ 3	+ 8	- 14	+ 902 ± 2		0	+ 1	- 3	-42	+ 858		3C
15.14	3.5W	55		53	10	+ 5	+ 9	- 21	+ 904 ± 4		0	+ 1	- 2	-43	+ 860		3C
16.16	3.9W	55		53	10	+ 7	+ 9	- 23	+ 902 ± 5		0	+ 1	- 2	-43	+ 858		3C
17.15	3.6W	55		53	10	+ 6	+ 8	-24	+ 901 ± 5		0	+ 1	- 2	-43	+ 857		3C
														mean	+ 855	+ 132	
Sep. 22.50	3.9E	51	54	54	8	- 3	+ 2	- 36	-1153 ± 2	+ 104 ± 2	+ 1	- 4	- 2	-55	-1209	-1318	
24.48	4.2E	51	54	54	10	- 3	+ 3	- 33	-1151 ± 2	+ 101 ± 4	+ 1	- 4	- 2	-55	-1207	-1313	
Oct. 11.50	2.8E	45	53	53	9	- 5	+ 2	- 2	-1155 ± 2	+ 107 ± 3	+ 1	- 4	- 3	-56	-1213	-1325	
12.48	3.0E	45	53	53	10	- 6	+ 2	- 1	-1157 ± 2	+ 106 ± 3	+ 1	- 4	- 3	-56	-1215	-1326	
16.46	3.4E	45	53	53	10	- 7	+ 2	+ 7	-1150 ± 3	+ 106 ± 2	+ 1	- 4	- 3	-56	-1208	-1319	
17.46	3.2E	45	53	53	10	- 6	+ 2	+ 9	-1156 ± 3	+ 105 ± 2	+ 1	- 4	- 3	-56	-1214	-1324	
28.48	2.1E	45	53	53	10	- 4	+ 2	+ 31	-1155 ± 2	+ 106 ± 2	+ 1	- 4	- 3	-57	-1214	-1325	
Nov. 2.49	1.6E	45	53	53	10	- 3	+ 2	+ 42	-1152 ± 2	+ 107 ± 2	+ 1	- 4	- 3	-57	-1211	-1323	
8.50	0.8E	45	53	53	10	- 2	+ 1	+ 54	-1149 ± 1	+ 112 ± 2	+ 1	- 4	- 3	-57	-1208	-1325	
9.45	1.9E	45	53	53	10	- 4	+ 2	+ 56	-1151 ± 2	+ 107 ± 2	+ 1	- 4	- 3	-57	-1210	-1322	
14.44	2.1E	45	53	53	6	- 4	+ 2	+ 64	-1153 ± 2	+ 103 ± 3	+ 1	- 4	- 3	-57	-1212	-1320	clouds
15.43	2.2E	45	53	53	10	- 5	+ 2	+ 68	-1149 ± 2	+ 112 ± 2	+ 1	- 4	- 3	-57	-1208	-1325	
18.42	2.1E	45	53	53	10	- 4	+ 2	+ 74	-1147 ± 2	+ 112 ± 2	+ 1	- 4	- 3	-57	-1206	-1323	
19.41	2.4E	45	53	53	10	- 5	+ 2	+ 76	-1152 ± 2	+ 109 ± 2	+ 1	- 4	- 3	-57	-1211	-1325	
26.48	0.3E	45	53	53	10	- 1	+ 1	+ 89	-1155 ± 1	+ 105 ± 2	+ 1	- 4	- 2	-56	-1212	-1322	
27.41	2.8E	45	53	53	10	- 6	+ 2	+ 91	-1154 ± 2	+ 110 ± 3	+ 1	- 4	- 2	-56	-1211	-1326	
Dec. 4.40	1.6E	45	53	53	10	- 3	+ 2	+103	-1154 ± 2	+ 111 ± 2	+ 1	- 4	- 2	-56	-1211	-1327	
8.41	1.2E	45	53	53	8	- 2	+ 2	+110	-1158 ± 2	+ 109 ± 3	+ 1	- 4	- 2	-56	-1215	-1329	

TABLE IX. Magnitude Differences in Blue Color Between Uranus Comparison Stars (Unit = $0^m.001$) (cont'd)

DATE U.T.	Hour Angle	Amplifier Gains: Uranus	Amplifier Gains: Star UA	Amplifier Gains: Star UB	Number of measures of planet	Correction for differential extinction (U-UA)	Correction for color dependence of extinction (U-UA)	Distance correction	ΔB'(U-UA) corrected for extinction and distance	ΔB'(UB-UA) corrected for extinction	Color correction to the BV system: U-UA	Color correction to the BV system: U-UB	Phase Correction	Oblateness correction	ΔB(U-UA) Final Value	ΔB(U-UB) Final Value	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1956																	
Dec. 12.38	1.5E	45	53	53	10	- 2	+ 2	+116	-1151 ± 2	+ 113 ± 2	+ 1	- 4	- 2	-56	-1208	-1326	
13.39	1.2E	45	53	53	5	- 2	+ 2	+118	-1156 ± 2	+ 109 ± 3	+ 1	- 4	- 1	-56	-1212	-1326	clouds
14.39	1.4E	45	53	53	10	- 2	+ 2	+119	-1150 ± 1	+ 109 ± 2	+ 1	- 4	- 1	-56	-1206	-1320	
20.37	1.2E	45	53	53	10	- 2	+ 2	+128	-1153 ± 2	+ 112 ± 2	+ 1	- 4	- 1	-55	-1208	-1325	
21.40	0.3E	45	53	53	10	- 2	+ 2	+129	-1154 ± 2	+ 111 ± 2	+ 1	- 4	- 1	-55	-1209	-1325	
29.43	0.9W	45	53	53	10	0	+ 1	+138	-1154 ± 1	+ 108 ± 2	+ 1	- 4	- 1	-55	-1209	-1322	
1957																	
Jan. 16.36	1.0W	45	53	53	4	0	+ 1	+151	-1159 ± 2	+ 110 ± 3	+ 1	- 4	0	-54	-1212	-1327	clouds
17.31	0.9E	45	52	52	10	0	+ 1	+152	-1161 ± 1	+ 107 ± 2	+ 1	- 4	0	-54	-1214	-1326	p seeing
18.34	0.1W	45	53	53	10	0	+ 1	+152	-1151 ± 2	+ 110 ± 2	+ 1	- 4	0	-54	-1204	-1319	
														mean	-1210	-1324	
Feb. 1.40	2.4W	45	53	53	10	- 3	+ 2	+147	-1155 ± 2	+ 112 ± 3	+ 1	- 4	0	-53	-1207	-1324	
14.30	1.0W	44	52	52	10	- 1	+ 1	+147	-1155 ± 2	+ 106 ± 3	+ 1	- 4	0	-52	-1206	-1317	
28.33	2.6W	45	53	53	3	- 7	+ 2	+133	-1154 ± 2	+ 109 ± 4	+ 1	- 4	- 1	-51	-1205	-1319	clouds
Mar. 27.14	0.2E	45	53		7	0	+ 1	+ 93	-1160 ± 2		+ 1	- 4	- 2	-50	-1211		clouds
Apr. 5.24	2.9W	45	53		10	-11	+ 2	+ 75	-1155 ± 2		+ 1	- 4	- 3	-50	-1207		
15.14	1.4W	45	53	53	10	- 5	+ 2	+ 57	-1156 ± 2	+ 103 ± 3	+ 1	- 4	- 3	-50	-1208	-1316	
28.18	2.8W	45	53	53	10	-12	+ 2	+ 31	-1154 ± 4	+ 105 ± 4	+ 1	- 4	- 3	-50	-1206	-1316	p seeing
May 2.18	3.2W	45	53		10	-13	+ 2	+ 24	-1143 ± 4		+ 1	- 4	- 3	-50	-1199		
														mean	-1207	-1319	
Sep. 21.50	4.2E	46	54	54	9	- 8	- 9			- 198 ± 4	- 2	0	- 2	-62			
22.49	4.4E	46	54	54	10	- 9	- 9	- 32	-1468 ± 4		- 2	0	- 2	-62	-1534		
28.48	4.2E	46	54	54	10	-13	- 9	- 23	-1455 ± 4	- 198 ± 2	- 2	0	- 2	-63	-1522	-1322	
29.47	4.0E	46	54	54	10	-12	- 8	- 21	-1455 ± 4	- 196 ± 2	- 2	0	- 2	-63	-1522	-1324	
Oct. 9.48	3.6E	46	54	53	10	-12	- 8	- 4	-1465 ± 4	- 198 ± 1	- 2	0	- 2	-64	-1533	-1333	
10.47	3.7E	46	54	54	10	-13	- 8	- 2	-1456 ± 4	- 197 ± 2	- 2	0	- 2	-64	-1524	-1325	
23.47	3.0E	45	53	53	4	- 9	- 6	+ 23	-1460 ± 3	- 201 ± 3	- 2	0	- 3	-64	-1529	-1326	clouds
24.47	3.0E	45	53	53	8	- 9	- 6	+ 25	-1464 ± 3	- 202 ± 2	- 2	0	- 3	-64	-1533	-1329	
Nov. 7.49	1.4E	45	53	53	10	- 4	- 5	+ 53	-1468 ± 2	- 194 ± 1	- 2	0	- 3	-65	-1538	-1342	
8.45	2.4E	45	53	53	10	- 7	- 6	+ 55	-1466 ± 3	- 197 ± 1	- 2	0	- 3	-65	-1536	-1337	
10.43	2.8E	45	53	53	9	- 9	- 6	+ 59	-1468 ± 3	- 196 ± 2	- 2	0	- 3	-65	-1538	-1340	
17.46	1.6E	45	53	53	10	- 5	- 5	+ 74	-1467 ± 2	- 194 ± 1	- 2	0	- 3	-65	-1537	-1341	
21.39	3.1E	45	53	53	10	-11	- 7	+ 80	-1470 ± 4	- 198 ± 2	- 2	0	- 3	-65	-1540	-1340	
24.50	0.2E	45	53	53	10	- 1	- 5	+ 88	-1461 ± 1	- 200 ± 1	- 2	0	- 3	-65	-1531	-1329	
25.39	2.6E	45	53	53	10	- 8	- 6	+ 89	-1469 ± 3	- 196 ± 1	- 2	0	- 2	-65	-1539	-1340	
27.43	1.7E	45	53	53	10	- 4	- 5	+ 93	-1464 ± 2	- 196 ± 1	- 2	0	- 2	-65	-1533	-1335	
Dec. 3.39	2.3E	45	53	53	10	- 7	- 6	+105	-1463 ± 3	- 197 ± 1	- 2	0	- 2	-65	-1532	-1333	
4.39	2.1E	45	53	53	10	- 6	- 6	+106	-1465 ± 2	- 194 ± 1	- 2	0	- 2	-65	-1534	-1338	
10.38	1.6E	45	53	53	10	- 4	- 5	+117	-1468 ± 2	- 198 ± 1	- 2	0	- 2	-64	-1536	-1336	
12.39	1.5E	45	53	53	10	- 4	- 5	+120	-1466 ± 2	- 199 ± 1	- 2	0	- 2	-64	-1534	-1333	
														mean	-1533	-1334	
26.33	2.0E	44	52	52	10	- 4	- 6	+141	-1464 ± 2	- 196 ± 1	- 2	0	- 1	-64	-1531	-1333	
27.37	1.8E	44	52	51	10	- 3	- 5	+142	-1462 ± 2	- 198 ± 1	- 2	0	- 1	-64	-1529	-1329	
1958																	
Jan. 8.39	0.2W	43	51	51	10	- 5	0	+155	-1474 ± 1	- 197 ± 1	- 2	0	0	-63	-1539	-1340	
9.35	0.7E	43	51	51	10	- 5	- 1	+156	-1471 ± 1	- 197 ± 1	- 2	0	0	-63	-1536	-1337	
10.31	1.6E	43	51	51	10	- 6	- 1	+157	-1471 ± 2	- 199 ± 1	- 2	0	0	-63	-1536	-1335	
12.44	1.9W	43	51	51	10	- 2	- 1	+158	-1470 ± 1	- 200 ± 1	- 2	0	0	-62	-1534	-1332	
14.45	2.0W	43	51	51	10	- 2	- 1	+160	-1472 ± 1	- 198 ± 1	- 2	0	0	-62	-1536	-1336	
16.41	1.2W	43	51	51	10	+ 1	- 5	+161	-1471 ± 1	- 198 ± 1	- 2	0	0	-62	-1535	-1335	
20.45	2.4W	43	51	51	10	+ 2	- 6	+163	-1474 ± 3	- 198 ± 1	- 2	0	0	-62	-1538	-1338	
23.44	2.4W	43	51	51	11	+ 2	- 6	+164	-1476 ± 2	- 200 ± 2	- 2	0	0	-62	-1540	-1338	p seeing
28.41	2.0W	43	51	51	10	+ 2	- 6	+165	-1470 ± 3	- 197 ± 1	- 2	0	0	-61	-1533	-1334	
Feb. 10.37	2.0W	44	52	52	9	0	- 6	+163	-1468 ± 4	- 200 ± 3	- 2	0	0	-60	-1530	-1328	clouds
11.22	1.6E	44	52	52	10	0	- 5	+163	-1468 ± 1	- 196 ± 2	- 2	0	0	-60	-1530	-1332	
12.21	1.7E	44	52	52	10	+ 1	- 5	+163	-1467 ± 1	- 196 ± 1	- 2	0	0	-60	-1529	-1331	
13.20	1.5E	44	52	52	10	+ 1	- 5	+162	-1468 ± 1	- 197 ± 2	- 2	0	0	-60	-1530	-1331	

TABLE IX. Magnitude Differences in Blue Color between Uranus Comparison Stars (Unit = $0^m.001$) (cont'd)

DATE U.T. 1		Hour Angle 2	Amplifier Gains: Uranus 3	Amplifier Gains: Star UA 4	Amplifier Gains: Star UB 5	Number of measures of planet 6	U-UA: Correction for differential extinction 7	U-UA: Correction for color dependence of extinction 8	Distance correction 9	ΔB'(U-UA) corrected for extinction and distance 10		ΔB'(UB-UA) corrected for extinction 11		Color correction to the BV system: U-UA 12	Color correction to the BV system: U-UB 13	Phase Correction 14	Oblateness correction 15	ΔB(U-UA) Final Value 16	ΔB(U-UB) Final Value 17	Remarks 18
1958																				
Feb.	16.19	2.0E	44	52	52	10	- 2	- 1	+160	-1465	± 2	- 195	± 2	- 2	0	0	-60	-1527	-1330	p seeing haze
	18.24	0.5E	44	52	52	10	- 3	0	+159	-1467	± 1	- 197	± 1			0	-60	-1529	-1330	
	27.18	1.5E	44	52	52	10	+ 3	- 5	+151	-1469	± 1	- 199	± 1	- 2	0	0	-59	-1531	-1330	
Mar.	2.20	0.7E	44	52	52	10	+ 2	- 5	+148	-1469	± 1	- 199	± 2	- 2	0	- 1	-59	-1531	-1330	
	5.28	0.8W	44	52	52	10	0	- 5	+145	-1464	± 2	- 195	± 2	- 2	0	- 1	-59	-1526	-1329	
	10.15	1.4E	45	53	53	10	- 1	- 1	+139	-1468	± 2	- 194	± 2	- 2	0	- 1	-59	-1530	-1334	
	18.20	0.0	44	52	52	10	+ 1	- 5	+127	-1465	± 1	- 196	± 1	- 2	0	- 2	-58	-1527	-1329	
	19.15	1.3E	44	52	52	10	+ 4	- 5	+126	-1466	± 1	- 195	± 1	- 2	0	- 2	-58	-1528	-1331	clouds
	20.12	1.3E	44	52	52	10	+ 4	- 5	+124	-1462	± 2	- 195	± 2	- 2	0	- 2	-58	-1524	-1327	
	27.14	0.6E	45	53	53	10	+ 2	- 5	+113	-1466	± 1	- 198	± 1			- 2	-58	-1528	-1328	
Apr.	6.16	0.6W	45	53	53	10	0	- 5	+ 94	-1468	± 1	- 195	± 1	- 2	0	- 3	-58	-1531	-1334	
	9.14	0.5W	45	53	53	10	0	- 5	+ 89	-1465	± 2	- 195	± 1	- 2	0	- 3	-58	-1528	-1331	
	10.15	0.6W	44	52	52	10	0	- 5	+ 88	-1464	± 1	- 197	± 1	- 2	0	- 3	-58	-1527	-1328	
	11.18	1.3W	44	52	52	10	- 1	- 5	+ 86	-1465	± 2	- 198	± 1	- 2	0	- 3	-58	-1528	-1328	
	14.15	0.7W	45	53	52	10	0	- 5	+ 80	-1466	± 3	- 194	± 1	- 2	0	- 3	-58	-1529	-1333	
	15.19	2.1W	45	53	53	10	- 3	- 6	+ 78	-1465	± 2	- 202	± 2	- 2	0	- 3	-58	-1528	-1324	
	23.15	1.4W	45	53	53	10	- 7	- 1	+ 62	-1465	± 2	- 195	± 1	- 2	0	- 3	-58	-1528	-1331	windy
	24.14	1.4W	45	53	53	10	- 7	- 1	+ 60	-1465	± 2	- 197	± 1	- 2	0	- 3	-58	-1528	-1329	
	28.16	2.1W	45	53	53	10	- 4	- 6	+ 53	-1463	± 3	- 197	± 1	- 2	0	- 3	-58	-1526	-1327	
May	4.19	3.1W	45	53	52	10	- 7	- 7	+ 41	-1466	± 3	- 201	± 2	- 2	0	- 3	-58	-1527	-1326	
	9.16	2.9W	45	52	52	10	- 6	- 6	+ 31	-1463	± 3	- 198	± 3	- 2	0	- 3	-58	-1526	-1326	
	10.18	3.2W	45	53	53	10	- 7	- 7	+ 29	-1465	± 3	- 197	± 1	- 2	0	- 3	-58	-1528	-1329	
	17.20	3.6W	45	53	53	10	- 8	- 8	+ 16	-1469	± 3	- 198	± 2	- 2	0	- 3	-58	-1532	-1332	
	23.17	3.8W	45	53	53	10	-10	- 8	+ 6	-1459	± 4	- 201	± 2	- 2	0	- 2	-59	-1521	-1321	
	25.19	4.0W	45	52	52	10	-11	- 8	+ 1	-1472	± 4	- 197	± 2	- 2	0	- 2	-59	-1535	-1336	
Jun.	1.19	4.4W	45	52	52	8	-11	- 9	- 10	-1451	± 7	- 192	± 4	- 2	0	- 2	-59	-1514	-1320	
																	mean	-1531	-1332	
Oct.	3.48	4.3E	44	46		10	+ 8	- 1	- 12	-1121	± 3			0	0	- 2	-71	-1194		
	4.50	4.0E	44	46		9	+ 6	- 1	- 10	-1130	± 3			0	0	- 2	-71	-1203		
	7.49	4.0E	43	45		10	+ 4	- 1	- 5	-1122	± 2			0	0	- 2	-71	-1195		
	8.47	4.1E	43	45		10	+ 3	- 1	- 4	-1122	± 2			0	0	- 2	-71	-1195		
	14.47	3.8E	43	45		10	+ 2	- 1	+ 7	-1122	± 1			0	0	- 2	-72	-1196		
	15.43	4.3E	44	46		10	+ 2	- 1	+ 9	-1126	± 1			0	0	- 2	-72	-1200		
	21.48	3.0E	44	46	54	9	- 2	- 1	+ 20	-1120	± 1	+1522	± 2	0	0	- 3	-72	-1195	-2717	
	22.45	3.0E	44	46	54	10	- 2	- 1	+ 22	-1127	± 2	+1521	± 2	0	0	- 3	-72	-1202	-2723	
Nov.	2.45	3.1E	44	46	54	10	- 2	- 1	+ 44	-1130	± 2	+1525	± 2	0	0	- 3	-72	-1205	-2730	
	3.47	2.4E	44	46	54	10	- 1	- 1	+ 46	-1124	± 1	+1523	± 2	0	0	- 3	-72	-1199	-2722	
	7.48	2.1E	44	46	54	10	- 1	- 1	+ 54	-1127	± 1	+1519	± 2	0	0	- 3	-72	-1202	-2721	
	8.49	1.8E	44	46	54	10	0	- 1	+ 56	-1128	± 1	+1519	± 2	0	0	- 3	-72	-1203	-2722	
	13.50	1.1E	44	46	54	10	+ 1	- 1	+ 66	-1129	± 1	+1519	± 2	0	0	- 3	-72	-1204	-2722	
	14.46	2.2E	44	52	55	10	- 1	- 1	+ 68	-1118	± 1	+1527	± 3	0	0	- 3	-72	-1193	-2720	
	20.43	2.3E	44	52	55	10	- 1	- 1	+ 81	-1114	±12	+1531	± 3	0	0	- 3	-72	-1189	-2720	clouds
	23.48	1.0E	44	46	54	10	+ 1	- 1	+ 87	-1127	± 1	+1524	± 2	0	0	- 3	-72	-1202	-2726	
	29.52	0.3W	44	46	54	10	+ 3	- 1	+ 99	-1120	± 2	+1525	± 2	0	0	- 3	-72	-1195	-2720	bad seeing
	30.40	2.4E	44	46	54	10	- 1	- 1	+100	-1119	± 2	+1525	± 3	0	0	- 2	-72	-1194	-2718	
Dec.	10.44	0.9E	44	52	55	10	+ 1	- 1	+119	-1115	± 3	+1528	± 2	0	0	- 2	-72	-1189	-2717	clouds
	11.40	1.7E	44	52	55	10	0	- 1	+121	-1116	± 1	+1530	± 2	0	0	- 2	-72	-1190	-2720	
	15.41	1.5E	43	45	53	10	0	- 1	+128	-1113	± 1	+1527	± 2	0	0	- 2	-72	-1187	-2714	
	17.34	2.0E	43	45	53	10	+ 1	- 1	+131	-1120	± 1	+1526	± 2	0	0	- 2	-72	-1194	-2720	
	19.46	0.2W	43	45	53	10	+ 3	- 1	+140	-1115	± 1	+1521	± 2	0	0	- 2	-71	-1188	-2709	
	23.37	1.4E	42	45	53	10	+ 1	- 1	+141	-1123	± 1	+1526	± 2	0	0	- 2	-71	-1196	-2722	
	29.33	2.3E	42	44		10	+ 1	- 1	+149	-1122	± 1			0	0	- 1	-71	-1194		
	31.37	1.2E	42	44	52	10	+ 2	- 1	+152	-1123	± 1	+1522	± 3	0	0	- 1	-71	-1195	-2717	windy
1959																				
Jan.	5.36	1.1E	42	45	53	10	+ 2	- 1	+158	-1118	± 2	+1525	± 2	0	0	- 1	-71	-1190	-2715	
	11.35	0.9E	43	51	54	10	+ 2	- 1	+164	-1122	± 1	+1525	± 2	0	0	0	-70	-1192	-2718	
	18.40	0.7W	43	51	54	10	+ 3	- 1	+169	-1125	± 1	+1525	± 2	0	0	0	-70	-1195	-2720	
	31.36	0.8W	43	51	54	10	+ 3	- 1	+176	-1124	± 2	-1518	± 2	0	0	0	-69	-1193	-2711	
																	mean	-1195	-2719	

TABLE IX. Magnitude Differences in Blue Color between Uranus Comparison Stars (Unit = $0\overset{m}{.}001$) (cont'd)

DATE U.T.	Hour Angle	Amplifier Gains: Uranus	Amplifier Gains: Star UA	Amplifier Gains: Star UB	Number of measures of planet	Correction for differential extinction (U-UA)	Correction for color dependence of extinction (U-UA)	Distance correction	ΔB'(U-UA) corrected for extinction and distance	ΔB'(UB-UA) corrected for extinction	Color correction to the BV system: U-UA	Color correction to the BV system: U-UB	Phase Correction	Oblateness correction	ΔB(U-UA) Final Value	ΔB(U-UB) Final Value	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1959																	
Feb. 4.27	1.1E	43	51	54	10	+ 4	- 1	+176	-1124 ± 1	+1522 ± 2	0	0	0	-68	-1192	-2714	
5.25	1.5E	43	51	54	10	+ 4	- 1	+176	-1124 ± 1	+1522 ± 2	0	0	0	-68	-1192	-2714	
11.36	1.6W	44	51	54	10	+ 3	- 1	+175	-1126 ± 2	+1511 ± 2	0	0	0	-68	-1194	-2705	hazy?
14.38	2.0W	44	41	54	10	+ 3	- 1	+174	-1125 ± 2	+1518 ± 3	0	0	0	-67	-1192	-2710	
19.37	2.2W	44	51	54	10	+ 2	- 1	+172	-1125 ± 2	+1513 ± 3	0	0	0	-67	-1192	-2705	
24.44	4.2W	44	52		9	+ 4	- 1	+169	-1125 ± 4		0	0	0	-67	-1192		clouds
25.36	2.3W	44	52		10	+ 2	- 1	+168	-1119 ± 1		0	0	0	-67	-1186		clouds
Mar. 3.34	2.4W	45	52	55	10	+ 1	- 1	+163	-1124 ± 1	+1512 ± 3	0	0	- 1	-67	-1192	-2704	
7.41	3.4W	45	52	55	10	- 1	- 1	+159	-1124 ± 1	+1512 ± 3	0	0	- 1	-67	-1192	-2704	
13.41	4.6W	45	53		10	- 4	- 1	+152	-1123 ± 2		0	0	- 1	-66	-1190		
15.35	3.3W	45	52	55	10	- 2	- 1	+149	-1127 ± 1	+1509 ± 3	0	0	- 1	-66	-1194	-2703	
19.33	3.2W	45	53		10	- 2	- 1	+144	-1124 ± 2		0	0	- 1	-66	-1191		
26.31	3.0W	45	52	55	10	- 2	- 1	+133	-1115 ± 1	+1523 ± 3	0	0	- 2	-66	-1183	-2706	
Apr. 9.25	2.7W	45	52	54	10	- 2	- 1	+109	-1126 ± 2	+1517 ± 4	0	+ 1	- 2	-66	-1194	-2711	
10.25	2.7W	45	52	54	10	- 2	- 1	+107	-1120 ± 1	+1518 ± 2	0	+ 1	- 2	-66	-1188	-2706	
														mean	-1190	-2707	
1960																	
Jan. 28.34	0.2E	43	54	54	10	+ 1	+ 9	+183	-2640 ± 2	+ 252 ± 1	- 5	- 2	0	-77	-2722	-2971	
29.42	0.1E	43	54	54	3	+ 1	+ 9	+183	-2635 ± 2	+ 254 ± 3	- 5	- 2	0	-77	-2717	-2968	clouds,wind
Feb. 17.33	0.9W	43	54	54	10	0	+ 9	+185	-2637 ± 2	+ 254 ± 2	- 5	- 2	0	-75	-2717	-2968	
18.28	0.4W	43	54	54	7	0	+ 9	+184	-2637 ± 2	+ 257 ± 2	- 5	- 2	0	-75	-2717	-2971	
21.32	0.8W	43	54	54	10	0	+ 9	+183	-2639 ± 2	+ 253 ± 2	- 5	- 2	0	-74	-2718	-2968	p seeing
22.31	0.8W	43	54	54	10	0	+ 9	+183	-2636 ± 2	+ 258 ± 2	- 5	- 2	0	-74	-2715	-2970	clds at end
23.34	1.4W	43	54	54	6	- 1	+ 9	+183	-2637 ± 2	+ 256 ± 2	- 5	- 2	0	-74	-2716	-2969	
25.35	2.0W	43	54	54	6	- 2	+ 9	+181	-2636 ± 2	+ 255 ± 3	- 5	- 2	0	-74	-2715	-2967	
Mar. 3.34	2.0W	43	54	54	6	- 3	+10	+176	-2637 ± 2	+ 251 ± 3	- 5	- 2	0	-74	-2715	-2964	
15.26	1.1W	43	54	54	10	0	+ 9	+164	-2642 ± 2	+ 255 ± 2	- 5	- 2	- 1	-73	-2721	-2973	
17.27	1.5W	43	54	54	7	- 2	+ 9	+162	-2638 ± 2	+ 251 ± 2	- 5	- 2	- 1	-73	-2717	-2965	
19.28	1.8W	43	54	54	6	- 3	+ 9	+159	-2638 ± 2	+ 254 ± 3	- 5	- 2	- 1	-73	-2717	-2968	
21.28	1.9W	44	55	54	6	- 4	+ 9	+156	-2636 ± 2	+ 255 ± 2	- 5	- 2	- 1	-73	-2715	-2967	
Apr. 1.26	2.0W	44	54	54	6	- 5	+10	+141	-2638 ± 2	+ 252 ± 2	- 2	- 1	- 2	-72	-2714	-2965	clouds
3.16	0.2E	44	54	55	6	+ 2	+ 9	+136	-2639 ± 3	+ 253 ± 2	- 2	- 1	- 2	-72	-2715	-2967	
4.20	0.6W	44	54	55	10	0	+ 9	+135	-2635 ± 2	+ 252 ± 1	- 2	- 1	- 2	-72	-2711	-2962	
6.27	1.4W	44	54	55	6	- 2	+ 9	+131	-2638 ± 2	+ 258 ± 3	- 2	- 1	- 2	-72	-2714	-2971	
21.22	2.4W	44	55	55	6	- 8	+10	+104	-2643 ± 4	+ 250 ± 2	- 2	- 1	- 3	-72	-2720	-2969	
May 7.18	2.6W	44	54	54	10	- 8	+10	+ 72	-2640 ± 4	+ 251 ± 2	- 2	- 1	- 3	-72	-2717	-2967	
12.18	2.8W	44	54	54	7	-11	+11	+ 63	-2641 ± 4	+ 250 ± 3	- 2	- 1	- 3	-72	-2718	-2967	
18.18	3.3W	44	54	54	7	-16	+12	+ 51	-2638 ± 6	+ 251 ± 2	- 2	- 1	- 3	-72	-2715	-2965	
21.19	3.6W	44	54	54	6	-19	+13	+ 46	-2643 ± 6	+ 253 ± 3	- 2	- 1	- 3	-73	-2721	-2973	
23.18	3.8W	44	54	54	6	-19	+13	+ 42	-2640 ± 6	+ 248 ± 3	- 2	- 1	- 3	-73	-2718	-2965	
25.18	3.7W	44	54	54	6	-19	+13	+ 38	-2638 ± 6	+ 256 ± 2	- 2	- 1	- 3	-73	-2716	-2971	
28.18	4.0W	44	54	54	6	-24	+15	+ 32	-2641 ± 8	+ 246 ± 5	- 2	- 1	- 3	-73	-2719	-2964	
														mean	-2717	-2968	
Oct. 20.48	3.3E	51	53	53	8	-15	+13	+ 20	-1316 ± 6	+ 62 ± 8	- 5	- 5	- 2	-85	-1408	-1470	clouds
Nov. 17.51	0.9E	45	53	53	10	- 2	+ 9	+ 75	-1313 ± 2	+ 68 ± 2	- 5	- 5	- 3	-85	-1406	-1474	
18.50	1.3E	45	53	53	10	- 2	+ 9	+ 77	-1314 ± 2	+ 66 ± 2	- 5	- 5	- 3	-85	-1407	-1473	
22.51	0.8E	45	53	53	10	- 2	+ 9	+ 85	-1314 ± 2	+ 67 ± 2	- 5	- 5	- 3	-85	-1407	-1474	
26.47	1.5E	45	53	53	10	- 6	+ 9	+ 93	-1316 ± 3	+ 66 ± 3	- 5	- 5	- 3	-86	-1410	-1476	
Dec. 15.51	0.9W	45	53	53	10	+ 4	+ 9	+131	-1313 ± 3	+ 68 ± 1	- 5	- 5	- 2	-85	-1405	-1473	
16.51	0.7W	45	53	53	10	+ 4	+ 9	+133	-1316 ± 3	+ 66 ± 1	- 5	- 5	- 2	-85	-1408	-1474	
31.43	0.3E	45	53	53	10	+ 1	+ 9	+158	-1316 ± 2	+ 66 ± 3	- 5	- 5	- 2	-85	-1408	-1474	
1961																	
Jan. 3.48	1.4W	46	54	54	10	+ 2	+ 9	+163	-1315 ± 3	+ 66 ± 1	- 5	- 5	- 1	-85	-1406	-1472	p seeing
4.44	0.6W	45	53	53	10	+ 1	+ 9	+164	-1316 ± 2	+ 69 ± 1	- 5	- 5	- 1	-85	-1407	-1476	clouds
10.38	0.8E	46	54	54	10	+ 1	+ 9	+172	-1319 ± 4	+ 68 ± 2	- 5	- 5	- 1	-85	-1410	-1478	
11.43	0.6W	46	54	54	10	+ 3	+ 9	+173	-1320 ± 6	+ 68 ± 1	- 5	- 5	- 1	-85	-1411	-1479	
29.36	0.0	45	53	53	10	+ 2	+ 9	+190	-1320 ± 3	+ 68 ± 1	- 5	- 5	0	-84	-1409	-1477	
Feb. 6.33	0.2W	45	53	53	10	+ 2	+ 9	+193	-1323 ± 3	+ 68 ± 1	- 5	- 5	0	-83	-1411	-1479	
8.36	0.5W	45	53	53	7	+ 2	+ 9	+194	-1322 ± 2	+ 66 ± 1	- 5	- 5	0	-83	-1410	-1476	

TABLE IX. Magnitude Differences in Blue Color between Uranus Comparison Stars (Unit = $0\overset{m}{.}001$) (cont'd)

DATE U.T.	Hour Angle	Amplifier Gains: Uranus	Amplifier Gains: Star UA	Amplifier Gains: Star UB	Number of measures of planet	Correction for differential extinction (U-UA)	Correction for color dependence of extinction (U-UA)	Distance correction	ΔB′(U-UA) corrected for extinction and distance		ΔB′(UB-UA) corrected for extinction		Color correction to the BV system: U-UA	Color correction to the BV system: U-UB	Phase Correction	Oblateness correction	ΔB(U-UA) Final Value	ΔB(U-UB) Final Value	Remarks
1	2	3	4	5	6	7	8	9	10		11		12	13	14	15	16	17	18
1961																			
Feb. 15.35	0.8W	45	53	53	8	+ 4	+ 9	+195	-1321	± 3	+ 70	± 1	- 5	- 5	0	-83	-1409	-1479	
21.36	1.4W	45	53	53	7	+ 4	+ 9	+193	-1319	± 3	+ 69	± 1	- 5	- 5	0	-82	-1406	-1475	
22.30	0.3W	46	54	54	10	+ 4	+ 9	+193	-1321	± 3	+ 68	± 1	- 5	- 5	0	-82	-1408	-1476	
Mar. 8.28	0.6W	45	53	53	8	+ 3	+ 9	+185	-1318	± 2	+ 68	± 1	- 5	- 5	0	-82	-1406	-1474	
23.20	0.3E	46	54	54	10	0	+ 9	+169	-1320	± 2	+ 70	± 1	- 5	- 5	- 1	-81	-1407	-1477	
31.17	0.4E	46	54	54	10	+ 3	+ 9	+158	-1318	± 2	+ 70	± 1	- 5	- 5	- 2	-81	-1406	-1476	
Apr. 4.17	0.3E	46	53	53	10	+ 3	+ 9	+151	-1319	± 3	+ 68	± 1	- 5	- 5	- 2	-81	-1407	-1475	
9.19	0.5W	46	54	54	10	+ 3	+ 9	+143	-1323	± 3	+ 67	± 1	- 5	- 5	- 2	-80	-1410	-1477	
May 12.18	2.5W	46	54	54	8	+ 4	+11	+ 81	-1312	± 3	+ 69	± 1	- 5	- 5	- 3	-80	-1400	-1469	
19.16	3.2W	46	54	54	6	+ 6	+13	+ 68	-1314	± 4	+ 67	± 2	- 5	- 5	- 3	-80	-1402	-1469	clouds
21.18	3.3W	46	54	54	10	+ 6	+13	+ 64	-1311	± 4	+ 68	± 2	- 5	- 5	- 3	-80	-1399	-1467	
																mean	-1407	-1475	

Lall. = Lallemand tube, p seeing = Poor seeing, 2 = Amplifier No. 2, 1 = Amplifier No. 1, 4 = Amplifier No. 4, 3C = Amplifier No. 3C, * = Wind, ** = Clouds, *** = 3mm diaphragm.

TABLE X. Magnitude Differences in Blue Color Between Neptune and Comparison Stars (Unit = $0^m.001$)

DATE U.T.	Hour Angle	Amplifier Gains: Neptune	Amplifier Gains: Star NA	Amplifier Gains: Star NB	Number of measures of planet	N-NA: Correction for differential extinction	N-NA: Correction for color dependence of extinction	Distance correction	ΔB'(N-NA) corrected for extinction and distance	ΔB'(NB-NA) corrected for extinction	Color correction to the BV system: N-NA	Color correction to the BV system: N-NB	Phase Correction		ΔB(N-NA) Final Value	ΔB(N-NB) Final Value	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1953																	
Mar. 6.43	0.5W				9	+ 3	+ 7	- 51	- 523 ± 2		+ 7		- 1		- 517		42"tel.
7.42	0.2W				10	+ 3	+ 7	- 50	- 518 ± 2		+ 7		- 1		- 512		42"tel.
12.42	0.5W				10	+ 3	+ 7	- 45	- 518 ± 2		+ 7		- 1		- 512		42"tel.
Jun. 10.20	1.3W	45	45		6	+ 2	+ 8	- 68	- 513 ± 2		+ 4		- 2		- 511		21"tel.
13.19	1.0W	45	46		8	+ 3	+ 8	- 71	- 524 ± 2		+ 4		- 2		- 522		21"tel.*
15.18	1.0W	45	45		10	+ 3	+ 8	- 73	- 518 ± 2		+ 4		- 2		- 516		21"tel.
16.18	1.1W	45	45		10	+ 3	+ 8	- 74	- 519 ± 2		+ 4		- 2		- 517		21"tel.
17.19	1.5W	45	45		10	+ 2	+ 8	- 75	- 520 ± 2		+ 4		- 2		- 518		21"tel.
18.20	1.6W	45	45		10	+ 2	+ 8	- 76	- 517 ± 2		+ 4		- 2		- 515		21"tel.
19.18	1.4W	45	45		10	+ 2	+ 8	- 77	- 517 ± 2		+ 4		- 2		- 515		21"tel.
22.19	1.6W	44	45		10	+ 2	+ 8	- 81	- 518 ± 2		+ 4		- 2		- 516		21"tel.
24.19	1.8W	44	45		10	+ 2	+ 8	- 83	- 519 ± 2		+ 4		- 2		- 517		21"tel.
25.19	1.8W	44	45		10	+ 2	+ 8	- 84	- 516 ± 2		+ 4		- 2		- 514		21"tel.
27.19	2.0W	44	45		10	+ 2	+ 8	- 86	- 518 ± 2		+ 4		- 2		- 516		21"tel.
28.17	1.7W	44	45		10	+ 2	+ 8	- 88	- 517 ± 2		+ 4		- 2		- 515		21"tel.
Jul. 1.18	2.0W	45	45		10	+ 2	+ 8	- 91	- 512 ± 2		+ 4		- 2		- 510		21"tel.
2.18	2.1W	45	45		10	+ 2	+ 8	- 92	- 518 ± 2		+ 4		- 2		- 516		21"tel.
3.17	2.0W	45	45		10	+ 2	+ 8	- 93	- 522 ± 2		+ 4		- 2		- 520		21"tel.
														mean	- 516		
1954																	
Feb. 4.49	0.5E				10	- 2	+ 5	- 84	- 785 ± 2	+ 600 ± 3	+ 1	+ 3	- 2		- 786	-1384	R
5.51	0.1E				10	- 1	+ 5	- 83	- 784 ± 2	+ 597 ± 2	+ 1	+ 3	- 2		- 785	-1380	R
6.49	0.3E				10	- 2	+ 5	- 82	- 784 ± 2	+ 601 ± 3	+ 1	+ 3	- 2		- 785	-1384	R
7.52	0.5W				10	- 1	+ 5	- 80	- 794 ± 3	+ 584 ± 2	+ 1	+ 3	- 2		- 795	-1377	U
10.52	0.8W				5	0	+ 5	- 77	- 798 ± 4	+ 588 ± 5	+ 1	+ 3	- 2		- 799	-1385	U
11.45	0.8E				10	- 3	+ 5	- 76	- 788 ± 2	+ 600 ± 3	+ 1	+ 3	- 2		- 787	-1385	
17.50	0.8W				10	0	+ 5	- 69	- 785 ± 2	+ 600 ± 5	+ 1	+ 3	- 2		- 786	-1384	R
18.50	0.7W				3	0	+ 5	- 68	- 787 ± 6	+ 597 ± 6	+ 1	+ 3	- 2		- 788	-1383	R
20.52	1.4W				6	0	+ 5	- 66	- 782 ± 2	+ 594 ± 3	+ 1	+ 3	- 1		- 786	-1374	R
21.49	0.8W				10	0	+ 5	- 65	- 787 ± 2	+ 594 ± 6	+ 1	+ 3	- 1		- 791	-1389	
24.48	0.7W				10	0	+ 5	- 62	- 776 ± 2	+ 602 ± 4	+ 1	+ 3	- 1		- 776	-1376	U
28.48	0.9W				10	0	+ 5	- 58	- 794 ± 2	+ 592 ± 3	+ 1	+ 3	- 1		- 794	-1384	U
Mar. 1.46	0.6W				10	0	+ 5	- 57	- 786 ± 2	+ 609 ± 3	+ 1	+ 3	- 1		- 786	-1393	U
2.46	0.6W				10	0	+ 5	- 56	- 787 ± 3	+ 602 ± 4	+ 1	+ 3	- 1		- 787	-1387	
5.44	0.4W				10	0	+ 5	- 54	- 793 ± 2	+ 594 ± 3	+ 1	+ 3	- 1		- 793	-1385	R
6.45	0.5W				1½	0	+ 5	- 53	- 802 ± 3		+ 1	+ 3	0		- 801	-1377	U
														mean	- 788	-1383	
28.41	1.2W				10	0	+ 5	- 39	- 787 ± 2	+ 610 ± 2	+ 5	+10	0		- 797	-1387	Lall.
Apr. 1.37	0.4W				10	+ 1	+ 5	- 38	- 786 ± 2	+ 609 ± 2	+ 5	+10	0		- 781	-1385	Lall.
4.37	0.7W				10	+ 1	+ 5	- 37	- 785 ± 2	+ 607 ± 2	+ 5	+10	0		- 780	-1382	Lall.
6.35	0.2E				5	+ 1	+ 5	- 36	- 780 ± 2	+ 608 ± 5	+ 5	+10	0		- 775	-1378	Lall.
9.38	1.2W				10	0	+ 5	- 36	- 781	+ 616 ± 2	+ 5	+10	0		- 776	-1387	Lall.
12.28	1.0E				6	+ 2	+ 5	- 36	- 781 ± 3	+ 611 ± 3	+ 5	+10	0		- 776	-1382	Lall.
13.33	0.2W				5	+ 1	+ 5	- 36	- 770	+ 614 ± 3	+ 5	+10	0		- 775	-1384	Lall.
14.34	0.7W				5	0	+ 5	- 36	- 781	+ 614 ± 3	+ 5	+10	0		- 775	-1385	Lall.
16.28	0.8E				10	+ 2	+ 5	- 35	- 783 ± 3	+ 612 ± 2	+ 5	+10	0		- 778	-1385	Lall.
17.31	0.0				10	+ 1	+ 5	- 35	- 782	+ 603 ± 4	+ 5	+10	0		- 777	-1375	Lall.
22.32	0.6W				10	+ 1	+ 5	- 36	- 777 ± 1	+ 609 ± 2	+ 5	+10	0		- 773	-1377	Lall.
23.38	2.2W				5	- 1	+ 6	- 36	- 779 ± 2	+ 617 ± 3	+ 5	+10	0		- 773	-1386	Lall.
26.30	0.6W				5	+ 1	+ 5	- 36	- 787 ± 2	+ 612 ± 2	+ 5	+10	0		- 781	-1389	Lall.
May 2.31	1.1W				5	+ 1	+ 5	- 39	- 788 ± 2	+ 601 ± 2	+ 5	+10	0		- 783	-1389	Lall.
3.27	0.2W				5	+ 1	+ 5	- 39	- 792 ± 3	+ 600 ± 2	+ 5	+10	0		- 786	-1382	Lall.
4.23	0.8E				5	+ 4	+ 5	- 39	- 779 ± 2	+ 615 ± 2	+ 5	+10	0		- 774	-1384	Lall.
5.25	0.1E				5	+ 2	+ 5	- 40	- 791 ± 1	+ 607 ± 1	+ 5	+10	0		- 785	-1388	Lall.
6.23	0.6E				5	+ 3	+ 5	- 40	- 794 ± 1	+ 600 ± 3	+ 5	+10	0		- 789	-1384	Lall.
8.28	0.8W				5	+ 1	+ 5	- 41	- 787 ± 2	+ 610 ± 2	+ 5	+10	0		- 782	-1387	Lall.
10.28	0.7W				8	+ 1	+ 5	- 42	- 794 ± 2	+ 602 ± 3	+ 5	+10	0		- 788	-1386	Lall.
11.27	0.8W				5	+ 1	+ 5	- 43	- 789 ± 2	+ 610 ± 4	+ 5	+10	0		- 784	-1389	Lall.

TABLE X. Magnitude Differences in Blue Color Between Neptune and Comparison Stars (Unit = $0^m.001$) (cont'd)

DATE U.T.	Hour Angle	Amplifier Gains: Neptune	Amplifier Gains: Star NA	Amplifier Gains: Star NB	Number of measures of planet	N-NA: Correction for differential extinction	N-NA: Correction for color dependence of extinction	Distance correction	ΔB'(N-NA) corrected for extinction and distance	ΔB'(NB-NA) corrected for extinction	Color correction to the BV system: N-NA	Color correction to the BV system: N-NB	Phase Correction		ΔB(N-NA) Final Value	ΔB(N-NB) Final Value	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1954																	
May 12.24	0.2W				5	+ 2	+ 5	- 43	- 779 ± 2	+ 615 ± 3	+ 5	+10	0		- 774	-1384	Lall.
25.22	0.7W				4	+ 1	+ 5	- 52	- 789 ± 2	+ 603 ± 3	+ 5	+10	- 1		- 784	-1383	Lall.
28.24	1.3W				5	0	+ 5	- 54	- 787 ± 2	+ 609 ± 3	+ 5	+10	- 1		- 783	-1387	Lall.
31.23	1.2W				5	0	+ 5	- 57	- 788 ± 2	+ 598 ± 3	+ 5	+10	- 1		- 784	-1377	Lall.
Jun. 1.24	1.4W				5	0	+ 5	- 58	- 786 ± 2	+ 601 ± 5	+ 5	+10	- 1		- 782	-1378	Lall.
2.25	1.8W				5	- 1	+ 5	- 58	- 790 ± 3	+ 608 ± 3	+ 5	+10	- 1		- 786	-1389	Lall.
6.24	0.8W				5	+ 2	+ 5	- 62	- 784 ± 2	+ 610 ± 3	+ 5	+10	- 1		- 779	-1385	Lall.
7.26	1.1W				5	+ 1	+ 5	- 63	- 790 ± 2	+ 603 ± 5	+ 5	+10	- 1		- 785	-1384	Lall.
8.19	0.8W				5	- 2	+ 5	- 64	- 785 ± 3	+ 596 ± 3	+ 5	+10	- 1		- 780	-1372	Lall.
9.19	0.7W				2	- 2	+ 5	- 65	- 779 ± 2	+ 607 ±12	+ 5	+10	- 2		- 775	-1378	Lall.
12.22	1.5W				7	- 1	+ 5	- 68	- 789 ± 4	+ 604 ± 3	+ 5	+10	- 2		- 786	-1380	Lall.
14.23	2.3W				5	- 4	+ 6	- 70	- 779 ± 6	+ 610 ± 4	+ 5	+10	- 2		- 775	-1383	Lall.
16.19	1.4W				5	0	+ 5	- 72	- 784 ± 2	+ 607 ± 5	+ 5	+10	- 2		- 780	-1383	Lall.
17.22	2.0W				5	- 2	+ 5	- 73	- 790 ± 4	+ 604 ± 5	+ 1	+ 3	- 2		- 792	-1395	U
18.17	1.5W				5	- 1	+ 5	- 74	- 781 ± 4	+ 605 ± 2	+ 1	+ 3	- 2		- 782	-1385	U
19.22	2.2W				10	- 4	+ 6	- 75	- 776 ± 3	+ 614 ± 2	+ 1	+ 3	- 2		- 778	-1389	U
20.21	2.1W				10	- 3	+ 6	- 77	- 778 ± 3	+ 612 ± 3	+ 1	+ 3	- 2		- 779	-1389	U
21.22	2.2W				10	- 4	+ 6	- 78	- 783 ± 3	+ 605 ± 2	+ 1	+ 3	- 2		- 784	-1387	U
22.20	1.9W				10	- 3	+ 5	- 79	- 772 ± 3	+ 618 ± 1	+ 1	+ 3	- 2		- 773	-1389	R
28.19	2.2W				10	- 4	+ 6	- 86	- 789 ± 4	+ 766 ± 4	+ 1	+ 3	- 2		- 790		U
29.18	1.9W				5	- 2	+ 5	- 87	- 788 ± 3	+ 677 ± 2	+ 1	+ 3	- 2		- 789		U
30.19	2.4W				11	- 6	+ 6	- 88	- 783 ± 4	+ 619 ± 4	+ 1	+ 3	- 2		- 784	-1403	U
Jul. 1.19	2.4W				10	- 6	+ 6	- 89	- 795 ± 3	+ 598 ± 2	+ 1	+ 3	- 2		- 796	-1392	U
														mean	- 782	-1386	
1955																	
Jan. 12.53	1.2E	45	45	52	10	-10	+ 3	-116	- 17 ± 2	+1099 ± 2	+ 6	+13	- 2		- 13	-1105	R
Mar. 3.39	0.1E	45	45	52	10	- 7	+ 3	- 58	- 16 ± 1	+1102 ± 1	+ 6	+13	- 1		- 11	-1106	R
13.36	1.2E	45	45	52	10	- 8	+ 3	- 50	- 14 ± 2	+1100 ± 2	+ 6	+13	- 1		- 9	-1102	R
17.37	0.8E	45	45	52	10	- 7	+ 3	- 47	- 13 ± 2		+ 6	+13	- 1		- 8		R
27.33	1.0E	45	45	52	10	- 7	+ 3	- 41	- 16 ± 1	+1096 ± 1	+ 6	+13	0		- 10	-1099	R
Apr. 4.31	0.9E	45	45	52	10	- 5	+ 3	- 38	- 15 ± 2	+1097 ± 2	+ 6	+13	0		- 9	-1099	R +
11.30	0.6E	45	45	52	10	- 6	+ 3	- 37	- 12 ± 3	+1098 ± 2	+ 6	+13	0		- 6	-1097	R
13.27	1.2E	45	45	52	10	- 5	+ 3	- 36	- 17 ± 2	+1102 ± 2	+ 6	+13	0		- 11	-1106	R
20.36	1.3W	45	45	52	10	-10	+ 3	- 36	- 14 ± 1	+1097 ± 1	+ 6	+13	0		- 8	-1098	R
21.36	1.4W	45	45	52	10	-10	+ 4	- 36	- 18 ± 1	+1099 ± 2	+ 6	+13	0		- 12	-1104	R
25.33	1.1W	45	45	52	10	- 8	+ 3	- 36	- 14 ± 1	+1101 ± 1	+ 6	+13	0		- 8	-1102	R
26.34	1.2W	45	45	52	10	-10	+ 3	- 37	- 16 ± 2	+1098 ± 3	+ 6	+13			- 10	-1101	R
28.32	0.9W	45	45	52	10	- 7	+ 3	- 37	- 15 ± 1	+1097 ± 1	+ 7	+14			- 8	-1098	U S-Vf
May 3.31	1.0W	45	45	52	10	- 8	+ 3	- 38	- 10 ± 2	+1097 ± 2	+ 2	+ 5	0		- 8	-1102	U UBV
4.33	1.6W	45	45	52	10	-11	+ 4	- 39	- 12 ± 2	+1099 ± 1	+ 2	+ 5	0		- 10	-1106	U UBV
9.30	1.2W	45	45	52	10	- 8	+ 3	- 41	- 15 ± 2	+1098 ± 2	+ 2	+ 5	0		- 13	-1108	U UBV
12.28	1.0W	45	45	52	10	- 8	+ 3	- 42	- 15 ± 1	+1095 ± 2	+ 2	+ 5	0		- 13	-1105	U UBV
16.30	1.7W	45	45	52	10	-12	+ 4	- 44	- 11 ± 2	+1098 ± 2	+ 2	+ 5	0		- 10	-1105	U UBV
Jun. 7.22	1.2W	45	45	52	10	- 8	+ 3	- 61	- 14 ± 3	+1100 ± 2	+ 7	+14	- 1		- 8	-1101	U S-Vf
16.20	1.3W	45	45	52	10	-10	+ 3	- 70	- 17 ± 1	+1098 ± 2	+ 7	+14	- 2		- 11	-1103	U S-Vf
17.19	1.3W	45	45	52	10	-10	+ 3	- 71	- 18 ± 1	+1099 ± 2	+ 7	+14	- 2		- 13	-1105	U S-Vf
20.22	2.2W	45	45	52	10	-17	+ 4	- 74	- 15 ± 2	+1098 ± 2	+ 7	+14	- 2		- 10	-1101	U S-Vf
21.22	2.2W	45	45	52	10	-17	+ 4	- 76	- 20 ± 2	+1099 ± 2	+ 7	+14	- 2		- 15	-1107	U S-Vf
22.19	1.5W	45	45	52	10	-11	+ 4	- 77	- 16 ± 2	+1098 ± 1	+ 7	+14	- 2		- 11	-1102	U S-Vf
27.19	1.9W	45	45	52	10	-14	+ 4	- 82	- 20 ± 2	+1097 ± 2	+ 7	+14	- 2		- 15	-1105	U S-Vf
Jul. 1.20	2.2W	45	45	52	10	-18	+ 4	- 87	- 20 ± 2	+1097 ± 2	+ 7	+14	- 2		- 15	-1105	U S-Vf
2.20	2.3W	45	45	52	10	-19	+ 4	- 88	- 19 ± 3	+1099 ± 1	+ 7	+14	- 2		- 14	-1106	U S-Vf
6.20	2.6W	45	45	52	10	-23	+ 4	- 93	- 22 ± 3	+1100 ± 1	+ 7	+14	- 2		- 17	-1110	U S-Vf
7.19	2.4W	45	45		10	-20	+ 4	- 94	- 21 ± 3		+ 7	+14	- 2		- 16		U S-Vf
8.18	2.2W	45	45		10	-18	+ 4	- 95	- 22 ± 2		+ 7	+14	- 2		- 17		U S-Vf
														mean	- 11	-1105	

TABLE X. Magnitude Differences in Blue Color Between Neptune and Comparison Stars (Unit = $0\overset{m}{.}001$) (cont'd)

DATE U.T. 1	Hour Angle 2	Amplifier Gains: Neptune 3	Amplifier Gains: Star NA 4	Amplifier Gains: Star NB 5	Number of measures of planet 6	Correction for differential extinction N-NA 7	Correction for color dependence of extinction N-NA 8	Distance correction 9	ΔB′(N-NA) corrected for extinction and distance 10	ΔB′(NB-NA) corrected for extinction 11	Color correction to the BV system N-NA 12	Color correction to the BV system N-NB 13	Phase Correction 14	15	ΔB(N-NA) Final Value 16	ΔB(N-NB) Final Value 17	Remarks 18
1956																	
Jan. 17.49	1.8E	46	44	46	10	+21	+ 4	-113	+ 798 ± 5	+ 801 ±11	0	0	- 2		+ 796	- 5	
19.49	1.8E	46	44	46	10	+20	+ 4	-111	+ 792 ± 6	+ 798 ±11	0	0	- 2		+ 790	- 8	
20.49	1.7E	46	44	46	10	+21	+ 4	-110	+ 795 ± 5	+ 799 ±11	0	0	- 2		+ 793	- 6	
29.52	0.3E	46	44	46	10	+26	+ 3	- 98	+ 794 ± 6	+ 792 ±10	0	0	- 2		+ 792	0	
Feb. 3.48	1.2E	46	44	46	10	+22	+ 4	- 92	+ 792 ± 6	+ 792 ±10	0	0	- 2		+ 790	- 2	
5.44	1.8E	46	44	46	10	+20	+ 4	- 90	+ 788 ± 5	+ 780 ±11	0	0	- 2		+ 786	+ 6	
10.45	1.4E	46	44	46	10	+22	+ 4	- 84	+ 796 ± 5	+ 799 ±10	0	0	- 2		+ 794	- 5	
14.45	0.9E	46	44	46	10	+24	+ 3	- 79	+ 796 ± 6	+ 800 ±10	0	0	- 2		+ 794	- 6	
15.44	1.2E	46	44	46	10	+22	+ 4	- 78	+ 792 ± 6	+ 798 ±10	0	0	- 2		+ 790	- 8	
17.46	0.6E	46	44	46	10	+25	+ 3	- 76	+ 791 ± 6	+ 797 ±10	0	0	- 2		+ 789	- 8	
20.42	1.2E	46	44	46	10	+23	+ 4	- 73	+ 788 ± 6	+ 784 ±10	0	0	- 2		+ 786	+ 2	
25.52	1.4W	44	43	44	15	+44	+ 4	- 67	+ 792 ±10	+ 794 ±13	0	0	- 2		+ 791	- 3	
27.51	1.4W	44	43	44	10	+42	+ 4	- 65	+ 793 ±10	+ 790 ±13	0	0	- 1		+ 792	+ 2	
Mar. 13.46	1.2W	44	43	44	15	+39	+ 4	- 52	+ 786 ± 9	+ 771 ±12	0	0	- 1		+ 785	+ 14	
15.46	1.2W	44	43	44	15	+39	+ 4	- 50	+ 791 ± 9	+ 787 ±12	0	0	- 1		+ 790	+ 3	
16.43	0.6W	45	44	45	15	+32	+ 3	- 50	+ 792 ± 7	+ 794 ±11	0	0	- 1		+ 791	- 3	
19.47	1.8W	45	44	45	15	+50	+ 4	- 47	+ 794 ±11	+ 794 ±15	0	0	- 1		+ 793	- 1	
20.44	1.2W	45	44	45	15	+39	+ 4	- 47	+ 790 ± 9	+ 781 ±12	0	0	- 1		+ 790	+ 9	
21.44	1.3W	45	44	45	15	+46	+ 4	- 46	+ 790 ±10	+ 788 ±12	0	0	0		+ 790	+ 2	
22.42	0.7W	45	44	45	15	+37	+ 3	- 46	+ 791 ± 8	+ 797 ±11	0	0	0		+ 791	- 6	
23.43	1.2W	64	63	64	13	+43	+ 4	- 45	+ 786 ± 9	+ 792 ±12	0	0	0		+ 787	- 6	
26.42	1.2W	64	63	64	15	+43	+ 4	- 43	+ 787 ± 9	+ 782 ±12	0	0	0		+ 787	+ 5	
27.43	1.4W	64	63	64	15	+46	+ 4	- 43	+ 791 ±10	+ 784 ±13	0	0	0		+ 791	+ 7	
29.40	0.8W	64	63	64	15	+40	+ 3	- 42	+ 791 ± 9	+ 792 ±11	0	0	0		+ 791	- 1	
Apr. 5.41	1.4W	64	63		15	+46	+ 4	- 39	+ 789 ±10		0	0	0		+ 789		
9.40	1.5W	65	63	65	15	+48	+ 4	- 38	+ 773 ±10	+ 763 ±13	0	0	0		+ 773	+ 10	
13.36	0.9W	65	63	65	15	+40	+ 3	- 37	+ 789 ± 9	+ 792 ±11	0	0	0		+ 789	- 3	
30.32	1.0W	65	63	65	10	+46	+ 3		+ 791 ±10	+ 793 ±12	0	0	0		+ 791	- 2	
May 1.28	0.2W	65	63	65	10	+38	+ 3		+ 788 ± 8	+ 786 ±10	0	0	0		+ 788	+ 2	
11.25	0.0	65	63		10	+38	+ 3	- 42	+ 794 ± 8		0	0	0		+ 794		
14.24	0.1E	65	63	65	10	+39	+ 3	- 43	+ 791 ± 8	+ 786 ±10	0	0	0		+ 791	+ 5	
15.22	0.1E	65	63	65	10	+39	+ 3	- 44	+ 792 ± 8	+ 793 ±10	0	0	0		+ 792	- 1	
16.22	0.0	65	63		10	+39	+ 3	- 44	+ 793 ± 8		0	0	0		+ 793		
17.24	0.3W	65	63	65	10	+40	+ 3	- 45	+ 789 ± 9	+ 792 ±10	0	0	0		+ 789	- 4	
27.20	0.2E	55	53	55	10	+38	+ 3	- 51	+ 793 ± 8	+ 791 ±10	0	0	- 1		+ 792	+ 1	
30.20	0.0	55	53	55	10	+39	+ 3	- 54	+ 795 ± 8	+ 797 ±10	0	0	- 1		+ 794	- 3	
31.19	0.2E	55	53		10	+39	+ 3	- 54	+ 796 ± 8		0	0	- 1		+ 795		
Jun. 6.19	0.4W	55	53	55	10	+41	+ 3	- 60	+ 792 ± 9	+ 789 ±11	0	0	- 1		+ 791	+ 2	
8.18	0.1W	55	53	55	7	+41	+ 3	- 61	+ 792 ± 9	+ 788 ±10	0	0	- 1		+ 791	+ 3	
11.18	0.4W	55	53	55	10	+42	+ 3	- 64	+ 791 ± 9	+ 795 ±11	0	0	- 1		+ 790	- 5	
12.22	1.4W	55	53	55	10	+48	+ 4	- 65	+ 792 ±10	+ 792 ±13	0	0	- 1		+ 791	- 1	
13.20	1.1W	55	53	55	10	+47	+ 4	- 66	+ 786 ±10	+ 790 ±12	0	0	- 1		+ 785	- 3	
14.20	1.3W	55	53	55	10	+47	+ 4	- 67	+ 797 ±10	+ 799 ±12	0	0	- 2		+ 796	- 2	
19.19	1.2W	55	53	55	10	+47	+ 4	- 72	+ 792 ±10	+ 791 ±12	0	0	- 2		+ 790	- 1	
22.19	1.3W	55	53	55	10	+48	+ 4	- 76	+ 768 ±10	+ 758 ±13	0	0	- 2		+ 766	+ 8	
25.20	1.8W	55	53	55	7	+60	+ 4	- 79	+ 775 ±13	+ 769 ±15	0	0	- 2		+ 773	+ 4	
26.18	1.5W	55	53	55	10	+50	+ 4	- 80	+ 788 ±11	+ 788 ±13	0	0	- 2		+ 786	- 2	
27.19	1.6W	55	53	55	10	+54	+ 4	- 81	+ 781 ±12	+ 776 ±14	0	0	- 2		+ 779	+ 3	
														mean	+ 789	0	
1957																	
Jan. 17.50	1.9E	55	55	53	8	-12	+ 4	-116	+ 22 ± 3	- 904 ± 2	+ 1	+ 2	- 2		+ 21	+ 926	
Feb. 1.51	0.5E	55	55	53	10	- 3	+ 2	- 97	+ 20 ± 2	- 904 ± 1	+ 1	+ 2	- 2		+ 19	+ 924	
14.47	0.7E	54	54	52	8	- 3	+ 4	- 83	+ 15 ± 2	- 907 ± 2	+ 1	+ 2	- 2		+ 14	+ 922	
28.39	1.5E	55	55	53	10	- 8	+ 5	- 66	+ 18 ± 1	- 899 ± 2	+ 1	+ 2	- 1		+ 18	+ 918	
Mar. 12.36	1.7E	55	55	53	10	- 8	+ 5	- 55	+ 19 ± 1	- 904 ± 2	+ 1	+ 2	- 1		+ 19	+ 924	
Apr. 26.39	2.2W	55	55	53	10	+ 7	+ 4	- 38	+ 14 ± 3	- 903 ± 3	+ 1	+ 2	0		+ 15	+ 919	
May 2.32	1.0W	55	55	53	10	+ 2	+ 4	- 38	+ 18 ± 3	- 904 ± 2	+ 1	+ 2	0		+ 19	+ 924	
24.33	2.7W	55	55	53	8	+ 5	+ 4	- 48	+ 16 ± 3		+ 2	+ 3	- 1		+ 17		

TABLE X. Magnitude Differences in Blue Color Between Neptune and Comparison Stars (Unit = $0^m.001$) (cont'd)

DATE U.T.	Hour Angle	Amplifier Gains: Neptune	Amplifier Gains: Star NA	Amplifier Gains: Star NB	Number of measures of planet	N-NA: Correction for differential extinction	N-NA: Correction for color dependence of extinction	Distance correction	ΔB'(N-NA) corrected for extinction and distance	ΔB'(NB-NA) corrected for extinction	Color correction to the BV system: N-NA	Color correction to the BV system: N-NB	Phase Correction		ΔB(N-NA) Final Value	ΔB(N-NB) Final Value	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1957																	
May 25.24	0.6W	55	55	53	10	0	+ 4	- 49	+ 16 ± 1	- 904 ± 1	+ 2	+ 3	- 1		+ 17	+ 922	
26.23	0.6W	55	55	53	10	0	+ 4	- 49	+ 18 ± 1	- 902 ± 1	+ 3	+ 4	- 1		+ 20	+ 923	
27.26	1.1W	55	55	53	8	+ 1	+ 4	- 50	+ 13 ± 2	- 904 ± 2	+ 3	+ 4	- 1		+ 15	+ 920	
28.24	0.7W	55	55	53	10	0	+ 4	- 51	+ 14 ± 2	- 904 ± 1	+ 3	+ 4	- 1		+ 16	+ 921	
29.20	0.2E	55	55	53	10	0	+ 3	- 51	+ 11 ± 2	- 902 ± 2	+ 3	+ 4	- 1		+ 13	+ 916	
Jun. 4.20	0.3E	55	55	53	4	0	+ 4	- 56	+ 13 ± 1	- 899 ± 3	+ 3	+ 4	- 1		+ 15	+ 915	
13.21	1.2W	55	55	53	10	0	+ 4	- 64	+ 12 ± 1	- 901 ± 1	+ 3	+ 4	- 1		+ 14	+ 916	
14.22	1.4W	55	55	53	8	0	+ 4	- 65	+ 13 ± 2	- 904 ± 1	+ 3	+ 4	- 1		+ 15	+ 920	
20.22	1.7W	55	55	53	10	0	+ 4	- 71	+ 14 ± 2	- 897 ± 1	+ 3	+ 6	- 2		+ 15	+ 915	
22.20	1.3W	55	55		10	0	+ 4	- 73	+ 15 ± 3		+ 3	+ 6	- 2		+ 16		
24.21	1.9W	55	55		6	0	+ 4	- 76	+ 18 ± 3		+ 3	+ 6	- 2		+ 19		
														mean	+ 17	+ 920	
1958																	
Jan. 8.53	1.6E	53	53	43	10	+ 6	+ 2	-130	+ 19 ± 2	-2402 ± 5	+ 1	+ 4	- 2		+ 18	+2423	
9.53	1.7E	53	53	43	8	+ 5	+ 2	-129	+ 22 ± 4	-2405 ± 3	+ 1	+ 4	- 2		+ 21	+2429	
14.54	1.2E	53	53	43	10	+ 6	+ 2	-123	+ 17 ± 2	-2406 ± 3	+ 1	+ 4	- 2		+ 16	+2425	
16.54	1.1E	53	53	43	10	+ 6	+ 2	-120	+ 17 ± 2	-2404 ± 3	+ 1	+ 4	- 2		+ 16	+2423	
20.53	1.0E	53	53	43	10	+ 6	+ 2	-115	+ 22 ± 2	-2403 ± 3	+ 1	+ 4	- 2		+ 21	+2427	
23.55	0.4E	52	53	43	10	+ 8	+ 2	-112	+ 26 ± 2	-2399 ± 5	+ 1	+ 4	- 2		+ 25	+2427	
Feb. 16.49	0.8E	54	54	44	10	+ 7	+ 2	- 82	+ 22 ± 3	-2390 ± 3	+ 1	+ 4	- 2		+ 21	+2414	
18.46	0.8E	54	54	44	10	+ 7	+ 2	- 77	+ 25 ± 3	-2403 ± 3	+ 1	+ 4	- 2		+ 24	+2430	
24.43	1.0E	54	54	44	10	+ 6	+ 2	- 73	+ 16 ± 2	-2409 ± 3	+ 1	+ 4	- 2		+ 15	+2427	
Mar. 2.40	1.4E	54	54	44	10	+ 6	+ 2	- 67	+ 15 ± 2	-2410 ± 3	+ 1	+ 4	- 1		+ 15	+2428	
5.41	1.0E	54	54	44	10	+ 7	+ 2	- 64	+ 22 ± 2	-2407 ± 3	+ 1	+ 4	- 1		+ 22	+2432	
6.42	0.6E	54	54	44	9	+ 8	+ 2	- 63	+ 18 ± 4	-2409 ± 3	+ 1	+ 4	- 1		+ 18	+2431	
10.41	0.5E	54	54	44	10	+ 9	+ 2	- 59	+ 26 ± 3	-2401 ± 3	+ 1	+ 4	- 1		+ 26	+2431	
18.39	0.5E	54	54	44	10	+ 9	+ 2	- 53	+ 25 ± 4	-2399 ± 3	+ 1	+ 4	- 1		+ 25	+2427	
20.45	1.0W	54	54	44	10	+13	+ 2	- 51	+ 23 ± 4	-2404 ± 4	+ 1	+ 4	- 1		+ 23	+2430	
25.40	0.0	54	54	44	10	+10	+ 2	- 48	+ 19 ± 3	-2404 ± 3	+ 1	+ 4	0		+ 20	+2426	
27.45	1.5W	54	54	44	10	+16	+ 2	- 46	+ 15 ± 4	-2409 ± 3	+ 1	+ 4	0		+ 16	+2427	
Apr. 1.39	0.3W	54	54	44	10	+11	+ 2	- 44	+ 21 ± 3	-2407 ± 3	+ 1	+ 4	0		+ 22	+2432	
9.31	1.0E	54	54	44	10	+11	+ 2	- 40	+ 16 ± 3	-2405 ± 3	+ 1	+ 4	0		+ 17	+2425	
10.35	0.0	54	54	44	10	+11	+ 2	- 40	+ 17 ± 3	-2405 ± 3	+ 1	+ 4	0		+ 18	+2426	
11.35	0.2W	54	54	44	10	+12	+ 2	- 40	+ 18 ± 3	-2410 ± 3	+ 1	+ 4	0		+ 19	+2432	
15.33	0.2E	54	54	44	10	+11	+ 2	- 38	+ 22 ± 3	-2403 ± 3	+ 1	+ 4	0		+ 23	+2429	
22.36	1.2W	55	55	45	10	+17	+ 2	- 38	+ 21 ± 3	-2402 ± 3	+ 1	+ 4	0		+ 22	+2427	
23.33	0.5W	55	55	45	10	+16	+ 2	- 38	+ 23 ± 3	-2404 ± 3	+ 1	+ 4	0		+ 24	+2431	
25.38	1.8W	55	55	45	10	+22	+ 2	- 38	+ 20 ± 4	-2411 ± 4	+ 1	+ 4	0		+ 21	+2435	
May 1.31	1.2W	54	55	45	10	+17	+ 2	- 38	+ 21 ± 4	-2412 ± 4	+ 1	+ 4	0		+ 22	+2437	
6.30	0.9W	54	54	44	10	+17	+ 2	- 39	+ 20 ± 3	-2399 ± 3	+ 1	+ 4	0		+ 21	+2423	
9.30	0.9W	54	54	44	10	+17	+ 2	- 40	+ 18 ± 3	-2402 ± 3	+ 1	+ 4	0		+ 19	+2424	
10.28	0.5W	55	55	45	10	+16	+ 2	- 40	+ 18 ± 3	-2408 ± 3	+ 1	+ 4	0		+ 19	+2430	
14.35	2.3W	55	55	45	10	+24	+ 3	- 42	+ 23 ± 5	-2410 ± 5	+ 1	+ 4	0		+ 24	+2437	
17.25	0.6W	55	55	45	10	+16	+ 2	- 43	+ 20 ± 4	-2407 ± 4	+ 1	+ 4	0		+ 21	+2431	
18.22	0.5E	54	54	44	10	+17	+ 2	- 43	+ 38 ± 4	-2399 ± 3	+ 1	+ 4	0		+ 39	+2441	
19.26	0.7W	54	54	44	10	+16	+ 2	- 44	+ 17 ± 3	-2399 ± 3	+ 1	+ 4	0		+ 18	+2420	
25.22	0.1E	54	54	44	10	+16	+ 2	- 47	+ 17 ± 3	-2399 ± 3	+ 1	+ 4	- 1		+ 17	+2419	
27.27	1.2W	54	54	44	10	+17	+ 2	- 49	+ 25 ± 3	-2404 ± 3	+ 1	+ 4	- 1		+ 25	+2432	
28.30	1.8W	54	54	44	5	+17	+ 2	- 49	+ 32 ± 6	-2404 ± 4	+ 1	+ 4	- 1		+ 32	+2439	
Jun. 1.22	0.3W	54	54	44	10	+17	+ 2	- 52	+ 22 ± 3	-2404 ± 3	+ 1	+ 4	- 1		+ 22	+2429	
3.21	0.3W	54	53	44	10	+17	+ 2	- 54	+ 23 ± 4	-2403 ± 3	+ 1	+ 4	- 1		+ 23	+2429	
8.24	1.4W	54	54	44	10	+18	+ 2	- 58	+ 24 ± 4	-2401 ± 4	+ 1	+ 4	- 1		+ 24	+2428	
13.24	1.8W	54	54	44	9	+19	+ 2	- 62	+ 21 ± 4	-2396 ± 5	+ 1	+ 4	- 1		+ 21	+2420	
14.23	1.5W	54	54	44	9	+15	+ 2	- 63	+ 19 ± 4	-2394 ± 5	+ 1	+ 4	- 1		+ 19	+2416	
19.24	2.1W	53	53	43	9	+19	+ 2	- 68	+ 17 ± 5	-2409 ± 5	+ 1	+ 4	- 2		+ 17	+2428	
23.22	1.8W	53	53	43	10	+18	+ 2	- 72	+ 21 ± 4	-2402 ± 4	+ 1	+ 4	- 2		+ 20	+2425	
24.20	1.8W	54	54	44	10	+18	+ 2	- 73	+ 26 ± 4	-2397 ± 5	+ 1	+ 4	- 2		+ 25	+2425	
3.23	2.5W	53	53	43	10	+17	+ 3	- 83	+ 29 ± 4	-2411 ± 7	+ 1	+ 4	- 2		+ 28	+2442	

TABLE X. Magnitude Differences in Blue Color Between Neptune and Comparison Stars (Unit = $0^m.001$) (cont'd)

DATE U.T.	Hour Angle	Amplifier Gains: Neptune	Amplifier Gains: Star NA	Amplifier Gains: Star NB	Number of measures of planet	N-NA: Correction for differential extinction	N-NA: Correction for color dependence of extinction	Distance correction	ΔB'(N-NA) corrected for extinction and distance	ΔB'(NB-NA) corrected for extinction	Color correction to the BV system: N-NA	Color correction to the BV system: N-NB	Phase Correction		ΔB(N-NA) Final Value	ΔB(N-NB) Final Value	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1958																	
Jun. 5.20	2.0W	53	53	43	10	+18	+ 2	- 85	+ 16 ± 5	-2405 ± 5	+ 1	+ 4	- 2		+ 15	+2423	
														mean	+ 20	+2427	
1959																	
Jan. 11.51	2.2E	53	52	41	10	-19	-24	-129	+ 226 ± 9	-3349 ±16	0	0	- 2		+ 224	+3573	
19.49	2.2E	53	53	41	4	-19	-23	-120	+ 232 ±10	-3351 ±16	0	0	- 2		+ 230	+3581	
24.49	1.9E	53	52	41	10	-16	-22	-114	+ 223 ± 8	-3349 ±14	0	0	- 2		+ 221	+3570	
Feb. 4.45	2.0E	53	53	41	10	-18	-22	-100	+ 232 ± 8	-3355 ±15	0	0	- 2		+ 230	+3585	
11.51	0.2E	54	53	41	10	- 5	-19	- 91	+ 230 ± 5	-3351 ±11	0	0	- 2		+ 228	+3579	
14.42	2.0E	54	53	42	10	-17	-22	- 88	+ 233 ±10	-3349 ±15	0	0	- 2		+ 231	+3580	
Mar. 1.29	2.1E	55	54	43	10	-18	-22	- 71	+ 227 ± 8	-3355 ±15	0	0	- 2		+ 225	+3580	
3.43	0.8E	54	54	42	10	- 6	-19	- 69	+ 231 ± 5	-3352 ±12	0	0	- 2		+ 229	+3581	
7.44	0.2E	54	54	42	10	- 4	-19	- 65	+ 231 ± 5	-3353 ±11	0	0	- 1		+ 230	+3583	
13.44	0.2W	54	54	42	10	- 2	-19	- 59	+ 233 ± 4	-3351 ±11	0	0	- 1		+ 232	+3583	
15.39	0.8E	54	54	42	10	- 7	-20	- 57	+ 231 ± 6	-3350 ±12	0	0	- 1		+ 230	+3580	
19.37	0.2E	54	54	42	10	- 3	-18	- 52	+ 233 ± 4	-3349 ±11	0	0	- 1		+ 232	+3581	
Apr. 9.38	0.4W	54	53	42	10	0	-19	- 41	+ 232 ± 4	-3348 ±11	0	0	0		+ 232	+3580	
10.37	0.4W	54	53	42	10	0	-19	- 41	+ 234 ± 4	-3350 ±11	0	0	0		+ 234	+3584	
28.33	0.7W	54	53	42	10	+ 1	-19	- 38	+ 229 ± 4	-3351 ±11	0	0	0		+ 229	+3580	
29.28	0.5E	54	54	42	10	- 1	-19	- 38	+ 234 ± 4	-3348 ±11	0	0	0		+ 234	+3582	
May 9.32	0.8W	55	54	42	10	+ 2	-19	- 39	+ 238 ± 4	-3340 ±11	0	0	0		+ 238	+3578	
11.34	1.8W	54	54	43	10	+ 2	-19	- 40	+ 246 ± 4	-3347 ±11	0	0	0		+ 246	+3593	
13.27	0.1W	55	54	43	10	+ 1	-19	- 40	+ 233 ± 4	-3342 ±11	0	0	0		+ 233	+3575	
15.24	0.0	55	54	42	9	+ 1	-19	- 41	+ 236 ± 4	-3344 ±11	0	0	0		+ 236	+3580	
19.26	0.4W	54	54	42	6	+ 1	-19	- 43	+ 232 ± 4	-3345 ±11	0	0	0		+ 232	+3577	
27.24	0.6W	54	54	42	10	+ 2	-19	- 47	+ 237 ± 3	-3341 ±11	0	0	0		+ 237	+3577	
28.25	0.7W	54	54	42	10	+ 2	-19	- 48	+ 235 ± 4	-3348 ±11	0	0	- 1		+ 234	+3582	
Jun. 3.23	0.6W	55	55	43	6	+ 2	-19	- 52	+ 237 ± 4	-3341 ±11	0	0	- 1		+ 236	+3577	
5.22	0.5W	55	55	43	10	+ 2	-19	- 53	+ 236 ± 4	-3335 ±11	0	0	- 1		+ 235	+3570	
9.19	0.0	55	55	43	10	+ 2	-19	- 56	+ 237 ± 3	-3343 ±11	0	0	- 1		+ 236	+3579	
10.18	0.2E	55	55	43	10	+ 2	-19	- 57	+ 239 ± 4	-3346 ±11	0	0	- 1		+ 238	+3584	
														mean	+ 234	+3580	
1960																	
Jan. 29.38	1.2E	53	51	51	2			-110	+1323 ± 2	+ 161 ± 4	- 5	- 4	- 2		+1316	+1156	
Feb. 21.52	0.6W	53	51	51	5	- 7	+10	- 82	+1325 ± 2	+ 165 ± 2	- 5	- 4	- 2		+1318	+1154	
23.53	1.0W	53	51	51	4	- 6	+11	- 80	+1331 ± 3	+ 166 ± 3	- 5	- 4	- 2		+1324	+1159	
Mar. 15.49	1.7W	53	45	45	5	- 7	+11	- 58	+1338 ± 3	+ 169 ± 3	- 3	- 3	- 1		+1334	+1165	
17.48	1.2W	53	51	51	10	- 6	+11	- 57	+1330 ± 2	+ 166 ± 3	- 3	- 3	- 1		+1326	+1160	
18.49	1.5W	53	51	51	6	- 6	+12	- 56	+1324 ± 2	+ 163 ± 3	- 3	- 3	- 1		+1320	+1157	
19.46	1.1W	54	51	51	10	- 6	+11	- 55	+1332 ± 1	+ 166 ± 2	- 3	- 3	- 1		+1328	+1162	
20.46	1.2W	54	51	51	7	- 6	+11	- 54	+1331 ± 1	+ 163 ± 2	- 3	- 3	- 1		+1327	+1164	
21.47	1.2W	54	51	51	6	- 6	+11	- 53	+1328 ± 2	+ 166 ± 2	- 3	- 3	- 1		+1324	+1158	
30.43	1.1W	53	51	51	10	- 6	+11	- 47	+1328 ± 1	+ 166 ± 2	- 2	- 1	0		+1325	+1160	
Apr. 3.35	0.7E	54	51	51	6	-10	+11	- 45	+1331 ± 1	+ 170 ± 2	- 2	- 1	0		+1329	+1160	
21.30	0.6E	54	51	52	10	- 8	+11	- 38	+1327 ± 1	+ 165 ± 3	- 2	- 1	0		+1325	+1161	
25.29	0.7E	53	51	51	10	- 8	+11	- 38	+1330 ± 2	+ 167 ± 3	- 2	- 1	0		+1328	+1162	
May 7.26	0.5E	53	51	51	10	- 7	+11	- 38	+1329 ± 1	+ 167 ± 3	- 2	- 1	0		+1327	+1161	
12.25	0.4E	53	45	45	10	- 6	+11	- 40	+1325 ± 2	+ 171 ± 3	- 2	- 1	0		+1323	+1153	
18.32	1.5W	53	45	45	10	- 7	+12	- 42	+1327 ± 1	+ 173 ± 3	- 2	- 1	0		+1325	+1153	
20.24	0.1E	53	45	45	10	- 6	+11	- 42	+1329 ± 2	+ 165 ± 3	- 2	- 1	0		+1326	+1163	
21.25	0.0	53	51	51	10	- 6	+11	- 43	+1340 ± 2	+ 166 ± 2	- 2	- 1	0		+1338	+1170	
23.25	0.2W	53	51	51	10	- 6	+11	- 44	+1344 ± 2	+ 170 ± 3	- 2	- 1	0		+1342	+1173	
25.24	0.3W	53	51	51	5	- 6	+11	- 45	+1347 ± 2	+ 170 ± 2	- 2	- 1	0		+1345	+1176	
26.22	0.2E	53	51	51	10	- 6	+11	- 46	+1343 ± 1	+ 168 ± 3	- 2	- 1	0		+1341	+1173	
28.24	0.2W	53	51	51	3	- 6	+11	- 47	+1342 ± 2	+ 167 ± 2	- 2	- 1	0		+1339	+1173	
Jun. 17.23	1.5W	53	45	45	10	- 8	+12	- 62	+1328 ± 1	+ 166 ± 2	- 2	- 1	- 1		+1325	+1160	
21.23	1.8W	53	45	45	10	-10	+12	- 66	+1327 ± 2	+ 170 ± 3	- 2	- 1	- 1		+1324	+1155	
25.21	1.6W	53	45	45	10	- 8	+12	- 70	+1331 ± 2	+ 170 ± 3	- 2	- 1	- 2		+1329	+1158	
27.20	1.5W	53	45	45	10	- 8	+12	- 72	+1328 ± 2	+ 165 ± 3	- 2	- 1	- 2		+1324	+1160	
30.22	2.1W	53	45	45	10	-12	+13	- 75	+1326 ± 2	+ 164 ± 3	- 2	- 1	- 2		+1322	+1159	

TABLE X. Magnitude Differences in Blue Color Between Neptune and Comparison Stars (Unit = $0^m.001$) (cont'd)

DATE U.T.	Hour Angle	Amplifier Gains: Neptune	Amplifier Gains: Star NA	Amplifier Gains: Star NB	Number of measures of planet	Correction for differential extinction (N-NA)	Correction for color dependence of extinction (N-NA)	Distance correction	ΔB'(N-NA) corrected for extinction and distance	ΔB'(NB-NA) corrected for extinction	Color correction to the BV system: N-NA	Color correction to the BV system: N-NB	Phase Correction		ΔB(N-NA) Final Value	ΔB(N-NB) Final Value	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1960																	
Jul. 1.22	2.2W	53	45	45	6	-12	+13	- 76	+1326 ± 2	+ 168 ± 3	- 2	- 1	- 2		+1324	+1155	
12.19	2.1W	53	45	45	7	-12	+13	- 89	+1322 ± 1	+ 171 ± 4	- 2	- 1	- 2		+1318	+1148	
16.19	2.4W	53	45	45	6	-14	+14	- 94	+1325 ± 1	+ 168 ± 4	- 2	- 1	- 2		+1318	+1154	
														mean	+1327	+1162	
1961																	
Feb. 10.46	1.6E				9	- 6	- 1	-100	+ 101 ± 2	-1475 ± 2	0	- 2	- 2		+ 99	+1572	
15.47	1.0E				8	- 4	- 1	- 91	+ 106 ± 1	-1473 ± 2	0	- 2	- 2		+ 104	+1575	
22.48	0.6E				6	- 3	- 1	- 83	+ 109 ± 1	-1467 ± 2	0	- 2	- 2		+ 107	+1572	
Mar. 1.46	0.3E				10	- 2	- 1	- 75	+ 105 ± 1	-1473 ± 1	0	- 2	- 2		+ 103	+1574	
8.46	0.1W				8	- 3	- 1	- 67	+ 107 ± 1	-1473 ± 2	0	- 2	- 1		+ 106	+1577	
22.41	0.3E				10	- 4	- 1	- 54	+ 104 ± 1	-1471 ± 2	0	- 2	- 1		+ 103	+1572	
23.45	0.8W				7	- 2	- 1	- 54	+ 103 ± 1	-1471 ± 2	0	- 2	- 1		+ 102	+1571	
31.44	0.9W				6	- 3	- 1	- 48	+ 106 ± 2	-1476 ± 1	0	- 2	- 1		+ 105	+1579	
Apr. 9.40	0.6W				10	- 3	- 1	- 43	+ 104 ± 1	-1475 ± 1	0	- 2	0		+ 104	+1577	
May 9.28	0.1W				10	- 1	- 1	- 38	+ 99 ± 1	-1474 ± 1	0	- 2	0		+ 99	+1571	
16.31	1.7W				6	-10	- 1	- 40	+ 100 ± 2	-1476 ± 1	0	- 2	0		+ 100	+1574	
17.28	0.5W				10	- 4	- 1	- 40	+ 98 ± 1	-1476 ± 1	0	- 2	0		+ 98	+1572	
21.28	0.6W				7	- 2	- 1	- 42	+ 102 ± 1	-1473 ± 1	0	- 2	0		+ 102	+1573	
Jun. 2.32	2.4W				5	-14	- 1	- 48	+ 103 ± 4	-1479 ± 1	0	- 2	+ 1		+ 100	+1577	
8.23	0.7W				10	- 4	- 1	- 52	+ 100 ± 1	-1476 ± 2	0	- 2	+ 1		+ 99	+1572	
10.21	0.5W				10	- 4	- 1	- 54	+ 99 ± 2	-1471 ± 1	0	- 2	+ 1		+ 98	+1568	
28.21	1.6W				8	-14	- 1	- 57	+ 114 ± 3	-1476 ± 2	0	- 2	+ 2		+ 108	+1582	
														mean	+ 102	+1574	

U = Unrefrigerated tube, R = Refrigerated tube, Lall. = Lallemand tube, * = Clouds at end, + = dusty sky, f = Filter.

star A. Such mean values, corrected for extinction effects and with distance corrections added, are given in the 10th column of Tables IX and X. They are accompanied by their mean errors computed by taking into consideration the scatter of individual measures and uncertainty of extinction corrections. We can see in Figure 4 that the r.m.s. deviation of the nightly value of the extinction coefficient Q_{b1} from its mean seasonal value equals approximately 1/5 of this mean seasonal value. Assuming the same relative uncertainty for coefficient Q_{b2} the mean errors given in the 10th column are computed from the formula

$$\varepsilon = \left\{ \varepsilon_i^2 + (Q_{b1}\Delta M/5)^2 + [Q_{b2}\overline{M}\Delta(B\text{-}V)/5]^2 \right\}^{1/2} \qquad (36)$$

where ε_i is the mean error of the mean magnitude difference between the planet and the comparison star A computed from the scatter of individual measures corrected for extinction. This intrinsic mean error ε_i is computed either from the sum of squares of the deviations or from the approximate formula [cf Pearson (12)]

$$\varepsilon_i \approx (\text{Max X} - \text{Min X})/\sqrt{n} \quad , \qquad (37)$$

where Max X and Min X are the largest and the smallest values of magnitude difference and n is the number of values used. The formula (37) gives for $3 \leqslant n \leqslant 10$ the estimates of mean error of mean values which do not differ systematically from those computed from the sum of squares of the deviations, and are only slightly less accurate. For the observations near the meridian under good atmospheric conditions values of ε_i between $\pm 0^m.0006$ and $\pm 0^m.0012$ were obtained.

The 11th column of Tables IX and X gives the magnitude difference between the comparison stars B and A, corrected for extinction. The extinction corrections were computed for every measure of star B, using the equations (31) - (35), in which the values for the planet are replaced by corresponding values for comparison star B. The mean errors are computed from equation (36).

The magnitude difference between the planet and comparison star A reduced to the BV photometric system can be obtained by adding the corrective term $A_8\,\Delta(B\text{-}V)$ to the values in the 10th column of Tables IX and X. The values $\Delta(B\text{-}V)$ found from equation (31) and the mean seasonal values of the transformation coefficient A_8 given in Table II are used for computing the values of this corrective term given in the 12th column of the above mentioned tables (for the years 1953 - 1954 the values of A_8 given in the last column of Table I are used; the observations used for determining these values were not available to the present author). A similar corrective term for the magnitude difference between the planet and comparison star B is given in the 13th column of Tables IX and X. As can be seen in Table II most of the determinations of the coefficient A_8 were made between January and April. Therefore the assumed values of this coefficient for other months are usually highly uncertain. For estimating errors of corrective terms given in the 12th and 13th columns we should also take into consideration the uncertainty of the gradient color indices, $(B\text{-}V)'$, of the planets.

The uncertainty of terms $A_8\,\Delta(B\text{-}V)$ seems to be the principal source of inaccuracy in our observations.

C. Phase and Oblateness Effects. The coefficients describing the dependence of brightness of Uranus and Neptune on their phase were computed by Sinton (13), who used the observations made in the present program. These coefficients, a, and the phase angles, i, are used for computing the phase corrections, $\Delta_i = -a i^2$, which are given in the 14th column of Tables IX and X. The maximum phase angle is about 3° for Uranus and 2° for Neptune.

The polar axis of Uranus is situated approximately in the plane of the ecliptic and in November 1945 it was directed approximately towards the earth. For the purpose of eliminating the photometric effects of the changing direction of Uranus' polar axis relative to the earth, two assumptions are made. First, we assume that the equatorial plane of Uranus coincides with the mean orbital plane of its four brightest satellites. Second, because of the lack of quantitative information about the brightness distribution on the disk of Uranus, we assume that it is uniform and hence that the total brightness of Uranus is proportional to its projected area, as seen from the earth. The last assumption is, of course, a very rough approximation to the real situation.

On these assumptions Uranus is brightest when its polar axis is directed towards the earth. The corrections are added to all the observed magnitudes of Uranus to give them the values to be expected (on our simplifying assumptions) if the polar axis of Uranus is directed towards the earth. These oblateness corrections are computed from the following formula, resulting from the expression for the projected area and from the definition of stellar magnitude,

$$\Delta_{obl} = 1.25 \log [1 - (1\text{-}b^2) \cos^2 (\vartheta_1 - L)] \quad , \qquad (38)$$

where the square of the ratio of the polar-to-equatorial axis is $b^2 = 0.833$ according to Lowell (14) and the longitude of the node of the orbits of Uranus' satellites referred to the earth equator is $\vartheta_1 = 165°81$ for the epoch 1900 and 166°53 for the epoch 1950 according to Newcomb (15): for the period covered by the observations here reported we assume $\theta_1 = 166°65$. By L is denoted the geocentric longitude of Uranus which can be found from the formula obtained by simple trigonometry,

$$\tan(L - L_{hel}) = \frac{\sin(L_{\odot} - L_{hel})}{R + \cos(L_{\odot} - L_{hel})} , \tag{39}$$

where L_{hel} is the heliocentric longitude of Uranus (given in Nautical Almanac), $L_{\odot}$ is longitude of the sun and R is the distance of Uranus from the sun, expressed in astronomical units.

The oblateness corrections computed from equation (38) are given in the 15th column of Table IX. The 16th and 17th columns give the finally adopted magnitude differences between the planet and the comparison stars, computed from the formulas

$$\Delta B(\text{planet-star A}) = \Delta B'(\text{planet-star A}) + A_8[(B\text{-}V)' - (B\text{-}V)_{\text{star A}}] + \Delta_i + \Delta_{obl} , \tag{40}$$

$$\Delta B(\text{planet-star B}) = \Delta B'(\text{planet-star A}) - \Delta B'(\text{star B-star A}) + A_8[(B\text{-}V)_{\text{star A}} - (B\text{-}V)_{\text{star B}}] + \Delta_i + \Delta_{obl} \tag{41}$$

TABLE XI. Blue Magnitudes of Uranus

Observations From	Observations To	Mean of Final Values $\Delta B(U\text{-}UA)$	Mean of Final Values $\Delta B(U\text{-}UB)$	Blue Magnitude of Star A (in System of Ten-Year Standards) B_{UA}	m.e.	Blue Magnitude of Star B (in System of Ten-Year Standards) B_{UB}	m.e.	Blue Magnitude of Uranus derived from Star A B_U	Blue Magnitude of Uranus derived from Star B B_U	Correction to be added to B_N if directly observed color for Uranus is used δ_{color}	Correction to be added to B_N if photometric oblateness of Uranus is twice smaller than geometric δ_{obl}
1953, Jan. 21	1953, Feb. 19	-0.161	-0.272	$6^m.229$	±0.004	.....		$6^m.068$	.....	-0.013	+0.012
1953, Feb. 23	1953, Apr. 25	-0.159		6.229	±0.004			6.070		-0.017	+0.011
1953, Oct. 30	1954, Mar. 5	-1.472	-1.945	7.540	±0.003	$8^m.012$	±0.004	6.068	$6^m.067$	-0.012	+0.015
1954, Mar. 15	1954, Apr. 26	-0.934:	-1.997:	7.005	±0.004	8.085	±0.005	6.071:	6.088:	-0.019	+0.013
1954, Oct. 11	1955, Jan. 12	-3.234	-1.722	9.303	±0.004	7.790	±0.004	6.069	6.068	-0.021	+0.020
1955, Feb. 10	1955, Apr. 26	-3.226	-1.714	9.303	±0.004	7.790	±0.004	6.077	6.076	-0.021	+0.017
1955, Sep. 23	1955, Nov. 8	+0.120:	+0.850	5.939	±0.004	5.204	±0.004	6.059:	6.054	-0.010	+0.024
1955, Nov. 16	1956, May 17	+0.132:	+0.855	5.939	±0.004	5.204	±0.004	6.071:	6.059	-0.010	+0.022
1956, Sep. 22	1957, Jan. 18	-1.210	-1.324	7.262	±0.003	7.369	±0.004	6.052	6.045	-0.010	+0.028
1957, Feb. 1	1957, May 2	-1.207	-1.319	7.262	±0.003	7.369	±0.004	6.055	6.050	-0.010	+0.025
1957, Sep. 21	1957, Dec. 12	-1.533	-1.334	7.583	±0.003	7.383	±0.004	6.050	6.049	-0.010	+0.033
1957, Dec. 26	1958, Jun. 1	-1.531	-1.332	7.583	±0.003	7.383	±0.004	6.052	6.051	-0.010	+0.030
1958, Oct. 3	1959, Apr. 10	-1.190	-2.707	7.237	±0.003	8.761	±0.004	6.047	6.054	-0.008	+0.034
1960, Jan. 28	1960, May 28	-2.717	-2.968	8.758	±0.004	9.012	±0.003	6.041	6.044	-0.006	+0.038
1960, Oct. 20	1961, May 21	-1.407	-1.475	7.441	±0.003	7.508	±0.003	6.034	6.033	-0.004	+0.042

TABLE XII. Blue Magnitudes of Neptune

Observations From	Observations To	Mean of Final Values $\Delta B(N\text{-}NA)$	Mean of Final Values $\Delta B(N\text{-}NB)$	Blue Magnitude of Star A (in System of Ten-Year Standards) B_{NA}	m.e.	Blue Magnitude of Star B (in System of Ten-Year Standards) B_{NB}	m.e.	Blue Magnitude of Neptune derived from Star A B_N	Blue Magnitude of Neptune derived from Star B B_N	Correction to be added to B_N if directly observed color for Neptune is used δ_{color}
1953, Mar. 6	1953, Jul. 3	-0.516		$(8^m.784)$*				$(8^m.268)$*		-0.017
1954, Feb. 4	1954, Mar. 6	-0.788	-1.383	9.035	±0.004	$9^m.632$	±0.005	8.247	$8^m.249$	-0.015
1954, Mar. 28	1954, Jul. 1	-0.782:	-1.386:	9.035	±0.004	9.632	±0.005	8.253:	8.246:	-0.022
1955, Jan. 12	1955, Jul. 8	-0.011	-1.105	8.260	±0.004	9.356	±0.008	8.249	8.251	-0.026
1956, Jan. 17	1956, Jun. 27	+0.790	-0.001	7.455	±0.004	8.240	±0.004	8.245	8.239	-0.013
1957, Jan. 17	1957, Jun. 24	+0.017	+0.920	8.225	±0.005	7.316	±0.005	8.242	8.236	-0.017
1958, Jan. 8	1958, Jul. 5	+0.020	+2.427	8.208	±0.004	5.807	±0.003	8.228	8.234	-0.013
1959, Jan. 11	1959, Jun. 10	+0.234	+3.580	8.001	±0.004	4.646	±0.004	8.235	8.226	-0.011
1960, Jan. 29	1960, Jul. 16	+1.327	+1.162	6.908	±0.003	7.075	±0.003	8.235	8.237	-0.009
1961, Feb. 10	1961, Jun. 28	+0.102	+1.574	8.135	±0.004	6.662	±0.005	8.237	8.236	-0.007

* Not to be reduced to the system of Ten-Year Standards

Since the errors of the coefficients A_8, of the planetary gradient color indices (B-V)′ and of the oblateness corrections are not known, the mean errors of the final magnitude differences, computed from equations (40) and (41), can not be estimated. Their weighted mean values are computed for every interval of several months during which A_8 apparently did not change rapidly. These mean values are given in the corresponding columns of Tables IX and X and in the 2nd and 3rd columns of Tables XI and XII. The weights used for computing the mean values of ΔB(planet - star A) are taken as inverse squares of mean errors given in the 10th column of Tables IX and X. The mean errors given in the 10th and 11th columns of these tables are used for computing the weights of ΔB(planet - star B).

D. Variations in Brightness of Uranus and Neptune. The mean magnitude differences between the planets and their comparison stars, the blue magnitudes of comparison stars and the blue magnitudes of the planets obtained by comparison with star A and, separately, by comparison with star B, are given in the 3rd to 8th columns of Tables XI and XII. The blue magnitudes of the comparison stars, given in these tables, are reduced to the system of Ten-Year Standards and obtained by adding the yellow magnitudes and blue-yellow colors of the same stars given in Table VI. The blue magnitudes of the planets given in the 7th and 8th columns of Tables XI and XII are obtained by adding the 3rd and 5th or 4th and 6th columns of these tables, respectively. The values for the year 1954 marked by colons are obtained with Lallemand's multiplier tube and may not be directly comparable with other values which were all obtained with the 1P21 multiplier tubes. There is no obvious evidence of variability of any of the comparison stars except for UA56 = μCnc. The values obtained by comparison with this star are marked by colons in Table XI. The blue magnitudes reduced to the system of Ten-Year Standards are not available for the comparison stars UB 53 = HD 50692 and NA 53 = HD 116681. The value for this last star obtained by comparisons with primary standard stars during the year 1953 is given in Table XII in parentheses.

For every opposition the average of blue magnitudes given in the 7th and 8th columns of Tables XI and XII is computed (omitting the values with colons and in parentheses) and given in Table XIII. The blue magnitudes of the planets given in this table are plotted in Figure 6. This figure shows an increase in brightness of Uranus by about $0^m_.035$ and an increase in brightness of Neptune by about $0^m_.014$.

Examining the mean values of the transformation coefficient A_8 given in Tables I and II we notice that the values of this coefficient are decreasing during the period covered by the present observations. Therefore, if we assume another value for the gradient color-index of the planets we would obtain another rate of increase in their brightness. In particular, assuming for the reduction to the BV system and for correction for the color-dependence of extinction the directly observed color-indices of the planets (as given in Table VIII), instead of gradient color-indices (B-V)′ given by the equations (28) and (29), we must add to the blue magnitudes of

TABLE XIII.

The mean blue magnitudes, B, for the two planets, obtained assuming H. L. Johnson's gradient color-indices of planets and photometric oblateness of Uranus equal to geometric.

Opposition	Uranus	Neptune
1953	6.069	
1954	6.068	8.248
1955	6.072	8.250
1956	6.056	8.242
1957	6.050	8.239
1958	6.050	8.231
1959	6.050	8.230
1960	6.042	8.236
1961	6.034	8.236

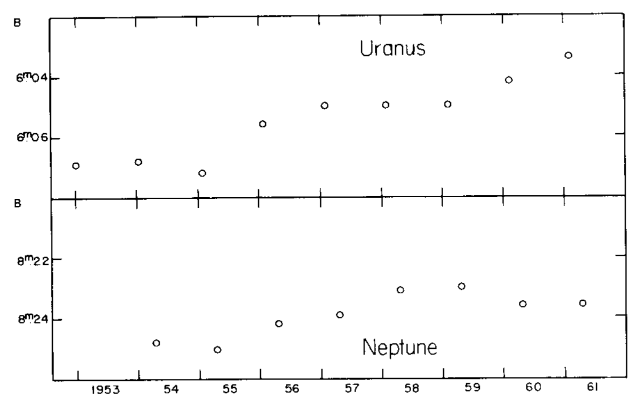

Figure 6. The mean blue magnitudes for the two planets obtained using H.L. Johnson's values of the gradient of the energy distribution in the spectra of these planets within the blue filter spectral region. For Uranus it is assumed that the distribution of brightness over the apparent disc of the planet is uniform.

the planets the corrections given in the 9th column of Tables XI and XII. They are computed from the formula

$$\delta_{\text{color}} = (A_8 - Q_{b2}\overline{M}) \ [(B\text{-}V)' - (B\text{-}V)] \ , \quad (42)$$

where B-V is the directly observed color index of the planet. The mean blue magnitudes of Neptune corrected in this way are given in Table XIV and in

TABLE XIV.

The mean blue magnitudes, B, for the two planets, obtained assuming the directly observed color-indices of planets and photometric oblateness of Uranus half as great as geometric.

Opposition	Uranus	Neptune
1953	6.066	——
1954	6.071	8.233
1955	6.070	8.224
1956	6.069	8.229
1957	6.067	8.222
1958	6.072	8.218
1959	6.076	8.219
1960	6.074	8.227
1961	6.072	8.229

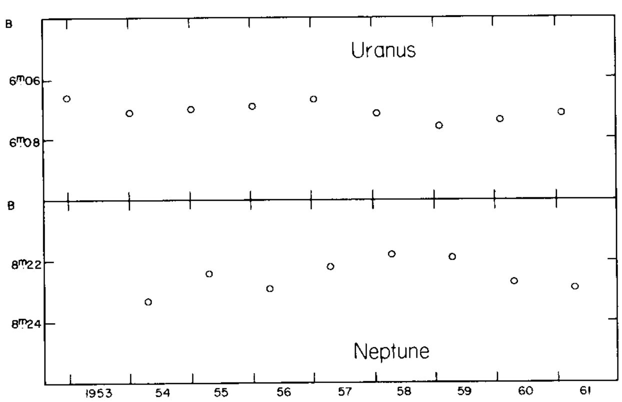

Figure 7. The mean blue magnitudes for the two planets obtained assuming that the gradient of the energy distribution in the spectrum of each of these planets within the blue filter spectral region is the same as for a star having the same B-V color-index as the planet. For Uranus it is assumed that the photometric effects due to its oblateness are half as great as those for the uniform distribution of brightness over the apparent disc of the planet.

Figure 7. No significant change in brightness of Neptune can be seen in these data.

The brightness of Uranus also will not show the significant change in the years 1953 - 1961 if, in addition to assuming the directly observed color-index, we shall assume that the photometric effects of oblateness of Uranus are half those computed on the assumption of uniform brightness distribution on the disc of the planet. Taking into consideration the presence of equatorial belts and limb darkening on Uranus this last assumption seems reasonable.

The corrections which should be added to the blue magnitudes of Uranus if "photometric" oblateness is half the geometric, are given in the last column of Table XI. The final blue magnitudes of Uranus with the corrections from the last two columns of Table XI are given in Table XIV and in Figure 7.

Our present knowledge of the distribution of energy in the spectra of Uranus and Neptune and of the distribution of brightness on the disc of Uranus is not satisfactory for deciding whether there are any changes in brightness of Uranus and Neptune caused by variability of solar energy output. As soon as these can be determined by actual observations the degree of solar variability can be more accurately found from existing data.

V. Suggestions for Future Observers in this Program

Special observations should be undertaken for redetermining the gradient colors (B-V)′ of the planets which are used for transforming the observations into the BV system and for computing the corrections for the color-dependence of extinction. It should be taken into account that these gradient colors depend critically on the width of the band-pass for the combination of the filter, multiplier tube and the telescope.

The limb darkening of Uranus and, hence, the photometric effects of its oblateness should, if possible, be determined from photoelectric scans across the disc of the planet.

Every series of measurements of the planet in blue color should be accompanied by observations of at least 4 standard stars, preferably in 2 colors. Two low altitude (22° - 28°) standard stars and two high altitude stars should be observed. One of the low altitude stars should be situated in the East and the other in the West. One of the standard stars observed at high altitude should be blue, the other red. These observations will be used for determining the coefficients Q_{b1} and A_8. Planetary observations at hour angles larger than 1½ hours for negative declinations and larger than 3 hours for positive declinations should not be made.

The comparison stars should be chosen so that their colors do not differ much from the gradient color-index (B-V)′ of the planet; one of them should be redder than the planet, another bluer. They should have very nearly the same declination as the planet.

The telescope, filters, multiplier tube or amplifier should not be changed without serious reason. If the multiplier tube must be changed, the new tube should be selected so that the coefficients A_6 and A_8 are very near to zero. The image of the telescope's mirror on the cathode should be carefully centered for maximum output.

The calibration of the amplifier's gain and tests for linearity of the amplifier and recorder should be made often, preferably every 2 or 3 months. These tests should be done at widely differing temperatures for checking any temperature effect. The battery used as a power supply for the multiplier tube and that used in the recorder should often be checked.

Every observation should be made at such gain of the amplifier that the deflection of the recorder is not smaller than 0.55 and not larger than 0.95 of full scale. This means that in most cases the observations with the yellow filter should be made at an amplifier's gain different from that used for the observations of the same star with blue filter.

To avoid fatigue of the multiplier tube no standard stars should be used for which $B < 3\overset{m}{.}7$. In particular, η Boo, β Lib and α Ari should not be used as standards. The list of stars used for determining the extinction and transformation coefficients should contain not only primary standards of the UBV system but at least 8 other well observed stars selected from among the secondary standards. The stars κ Gem, HD 73665, ϑ Hya, ρ Leo, 109 Vir, ι Her, β Oph and μ Her A may be suitable for that purpose.

The accuracy of two-color observations can be highly increased if comparison stars and standard stars are all measured at the same fixed altitude. Only a few (4 to 6) standard stars should be observed at substantially different altitudes to make possible determining the extinction coefficients. On those nights when Neptune comparison stars are observed, the fixed altitude must be low because of the low declination of Neptune and extinction stars can be observed near the zenith. On these nights the Uranus comparison stars should not be observed; they should be observed on other nights when a higher value of fixed altitude is chosen. Every year each of the comparison stars used since 1953 and each of the comparison stars chosen for the next year should be observed on at least 6 nights. Eight stars or more should be included in the least-squares solution for simultaneous determination of extinction and transformation coefficients for every night.

The radioactive standard source should be observed through color filters. Usually the two-color observations of a star can be accompanied by the measurement of the standard source with only one (e.g. blue) filter. However, before and after measuring the bright star (for which, say, $B < 4\overset{m}{.}0$) the standard source should be measured with both yellow and blue filters for checking if the fatigue of the multiplier tube is the same in both colors.

The observations should be made only on photometric nights with no trace of clouds. It is much better to have fewer but superior observing nights. The observations made on poor nights may destroy the accuracy of the whole program. When the observations are made in the presence of the Moon, the sky background should be measured alternately north and south from the star (or planet) to eliminate the influence of moonlight reflected within the telescope tube.

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