

COMMISSIONS 27 AND 42 OF THE IAU
 INFORMATION BULLETIN ON VARIABLE STARS

Number 3972

Konkoly Observatory
 Budapest
 5 January 1994
 HU ISSN 0324 - 0676

PHOTOMETRY OF STARS IN THE
 FIELD OF THE MIRA XY AQUILAE

XY Aquilae (= IRC +00147 = IRAS 19123+0409) is a Mira variable with a cycle length of about 423 days and a maximum brightness of about visual magnitude 9.5. A spectral type of M8 was determined by Cameron and Nassau (1956) from objective-prism plates in the red region. A precise position and finder chart was published by Wolf and Wolf (1905) in the paper announcing the discovery of variability. The position is confirmed by measures appearing in the IRAS catalogue and Guide Star Catalog, as summarized below:

	RA (2000)	Dec (2000)	source
XY Aquilae:	19 ^h 14 ^m 51 ^s .2	+4°14' 31"	Wolf & Wolf (1905)
	50.9	29	IRAS
	51.0	31	GSC

At the request of Charles Scovil of the American Association of Variable Star Observers, I made photoelectric measurements of several stars in the field in order to improve the comparison sequence on a preliminary AAVSO chart for the variable. The existing sequence was based mostly on eye estimates, and contained substantial scatter and a scale error.

I observed the stars using the Lowell 53cm photometric telescope on 8 October 1992, and 20-23 May 1993 UT. Strömgren *y* and *b* filters were used through either a 19- or 29-arcsec diaphragm. Each observation consisted of at least four 10s integrations on 'star' and two 10s integrations on 'sky', with greater numbers for stars fainter than about mag. 10. The range of colors found among randomly-selected field stars is usually well outside the limits of the primary four-color standards, which include no K-giant stars fainter than $V = 5.0$. Thus a set of secondary standards was adopted to enable the calibration of *V* magnitudes of red and reddened stars, which occur in abundance all over the sky. *V* magnitudes were taken mostly from the lists of Landolt (1983a, 1983b, 1992), supplemented by values from Menzies et al. (1991). Strömgren *b - y* colors were taken from the primary four-color standards list of Perry, Olsen, and Crawford (1987), plus much-observed stars from lists by Olsen (1983, 1993), Anthony-Twarog, et al. (1991), and Stetson (1991) - in that order of preference. Some *V* magnitudes come from these sources as well. Several of the Landolt stars have *b - y* values determined using the Lowell 53cm telescope. The data for each night were reduced separately using linear transformations. Atmospheric extinction was estimated on these nights from measurements taken on other nights near this time. Because of the mix of standards, Table 1 shows both the adopted and observed mean *V* and *b - y*, and the number of observations 'n'. The stars are listed in RA order. The *V* data for two stars (in parentheses) were omitted from the transformations. The mean deviations of the observed averages from the assumed values in this group of data are: $V = -0.001 \pm 0.006$; $b - y = 0.000 \pm 0.004$.

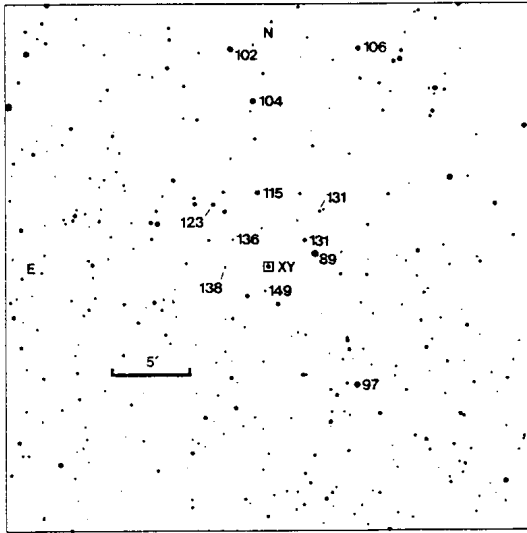


Figure 1. The field of XY Aquilae showing stars from the GSC.
V magnitudes are indicated to the nearest tenth with the decimal point omitted.

Table 1. Standard Star Observations.

Name	V (std)	$b - y$ (std)	V (obs)	$b - y$ (obs)	n
HD 143761	5.403	0.396	5.406	0.393	4
HD 149382	8.944	-0.146	8.952	-0.144	2
HD 153847	7.241	0.244	7.239	0.249	2
HD 160233	9.095	0.031	9.100	0.032	1
HD 160471	6.155	1.162	6.160	1.165	4
HD 161817	6.982	0.137	6.969	0.139	1
BD +04°3508	9.326	1.179	(9.359)	1.188	1
HD 162596	6.342	0.717	6.338	0.716	2
HD 165462	6.336	0.700	6.333	0.696	1
HD 172365	6.369	0.510	6.359	0.514	2
HD 172829	8.474	1.383	8.473	1.378	3
HD 182239	6.657	0.167	6.653	0.168	1
HD 184914	8.178	0.799	8.186	0.804	1
HD 184965	8.529	0.306	8.533	0.308	2
HD 186427	6.230	0.417	6.232	0.415	4
HD 187203	6.448	0.614	6.443	0.611	1
HD 190299	5.666	0.825	5.666	0.821	1
BD -00°4073	9.905	0.776	9.892	0.781	1
HD 199280	6.583	-0.030	6.583	-0.039	1
HD 209960	5.254	0.897	5.253	0.897	1
HD 218155	6.783	-0.004	6.779	-0.001	1
HD 222732	8.860	0.735	(8.835)	0.733	1

Results for the stars near XY Aql are shown in Table 2, listed in order of decreasing brightness. The stars are identified by HD or GSC number; positions come from either astrometric catalogues or the GSC. Rough spectral types are available for the two brighter stars, obtained from the SIMBAD database. Some of the fainter stars were observed on two or three nights, and the standard deviations of the means are shown in the second line of each entry.

HD 179989 has been used as a standard for observations of Cepheid variables by Moffett and Barnes (1984), who give the values $V = 8.882$ and $B-V = 1.288$ from the means of many observations.

The very red star GSC 0471-2225 showed no signs of variability beyond that expected from observation error, but the observations were made on three consecutive nights. It is worth noting that the magnitude and color required large extrapolations (assumed linear) of the calibration coefficients, despite including HD 172829 as a standard star (it is the reddest Landolt standard brighter than mag. 10).

The faintest star in the list is well beyond the comfortable limits of Strömrgren photometry with the 53cm telescope. The uncertainty expected from photon statistics is about 0.08 mag., but uncertainty in the sky readings on the night this star was measured adds an additional source of error. The values for this star should therefore be regarded as approximate.

Table 2. Photometry of Stars in the Field of XY Aquilae.

Name	RA (2000)	Dec (2000)	V	$b - y$	n	spec
HD 179989	19 ^h 14 ^m 38.9	+4°15' 22"	8.865	0.845	1	K2
HD 179969	19 14 28.3	+4 06 56	9.665	0.407	1	F2
GSC 0472-1448	19 15 00.6	+4 28 32	10.244	0.546	1	
GSC 0471-1431	19 14 54.9	+4 25 12	10.384	0.497	1	
GSC 0471-0744	19 14 27.7	+4 28 36	10.610	0.312	1	
GSC 0471-1092	19 14 53.7	+4 19 18	11.510	0.340	1	
GSC 0472-0297	19 15 05.1	+4 18 33	12.270	0.343	2	
			.008	.003		
GSC 0471-2225	19 14 41.7	+4 16 14	13.089	1.768	3	
			.036	.019		
GSC 0471-1679	19 14 37.8	+4 18 06	13.143	0.692	1	
J191500+0416.2	19 15 00	+4 16.2	13.566	0.628	1	
J191500+0414.3	19 15 00	+4 14.3	13.798	0.561	2	
			.054	.004		
J191415+0412.5	19 14 15	+4 12.5	14.882	0.425	1	

For the convenience of observers, a chart derived from the GSC is shown in Figure 1. The comparison stars are indicated by their V magnitudes rounded to the nearest tenth (decimal point omitted) in the style of visual variable-star charts.

The photometric data herein were reduced using a clever IDL routine written by Laura Woodney and Eliza Fulton. Preparation of this report was facilitated by the use of SIMBAD, maintained by the Centre de Données astronomiques, Strasbourg, France.

Brian A. SKIFF
 Lowell Observatory
 1400 West Mars Hill Road
 Flagstaff AZ 86001-4499
 USA
 e-mail (Internet): bas@lowell.edu

References:

- Anthony-Twarog, B. J., Laird, J. B., Payne, D., and Twarog, B. A., 1991, *Astron. J.*, **101**, 1902
 Cameron, D., and Nassau, J. J., 1956, *Astrophys. J.*, **124**, 346
 Landolt, A. U., 1983a, *Astron. J.*, **88**, 439
 Landolt, A. U., 1983b, *Astron. J.*, **88**, 853
 Landolt, A. U., 1992, *Astron. J.*, **104**, 340
 Menzies, J., Marang, F., Laing, J. D., Coulson, I. M., and Engelbrecht, C. A., 1991, *Mon. Not. R. Astron. Soc.*, **248**, 652
 Moffett, T. J., and Barnes, T. G., 1984, *Astrophys. J. Suppl. Ser.*, **55**, 389
 Olsen, E. H., 1983, *Astron. Astrophys. Suppl. Ser.*, **54**, 55
 Olsen, E. H., 1993, *Astron. Astrophys. Suppl. Ser.*, **102**, 89
 Perry, C. L., Olsen, E. H., and Crawford, D. L., 1987, *Publ. Astron. Soc. Pac.*, **99**, 1184
 Stetson, P. B., 1991, *Astron. J.*, **102**, 589
 Wolf, M., and Wolf, G., 1905, *Astron. Nach.*, **167**, 337