

PLANET	OBSERVER & APERTURE (cm)	OBSERVING PERIOD (1996)	NO. OBS. NOTES
1996 XZ19	Comba, 46	Dec 12-13	4C
1996 XA20	Comba, 46	Dec 12-13	4C
1996 XB20	Comba, 46	Dec 13-14	6C
1996 XC20	Comba, 46	Dec 13-14	6C
1996 XD20	Comba, 46	Dec 13-18	12C
1996 XZ25	Comba, 46	Dec 14-18	9C
1996 XH26	Comba, 46	Dec 15-18	7C
1996 YA	Comba, 46	Dec 17-18	5C
1996 YT2	Comba, 46	Dec 18-30	8C
6055 P-L	Comba, 46	Aug 13	3C
1179 T-2	Comba, 46	Dec 8-9	6C
4354 T-3	Comba, 46	Aug 12	3C

The Minor Planet Bulletin calls attention to the extensive series of observations made by Paul W. Comba over an extended time interval of many of his 1996 discoveries. These are of great value in calculating preliminary orbits of sufficient reliability to enable their recovery in subsequent apparitions. This in turn establishes him as the official discoverer, with right to recommend a name when the object receives a permanent number.

DIFFERENTIAL PHOTOMETRY OF 700 AURAVICTRIX

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We present the results of differential photometry of the asteroid 700 Auravictrix obtained in February 1996. The data covers a period of 2.5 hours, giving only partial coverage of the lightcurve of the object.

Introduction

700 Auravictrix was chosen for observation due to its listing on the "Critical List" of asteroids needing positional data. The limited field of view of the telescope did not provide a sufficient number of field stars for a plate solution, so it was decided to use the available time to perform photometry of the object. Lagerkvist (1979) performed a photographic study of the lightcurve of 700 Auravictrix and found a sinusoidal lightcurve and a period of 6 hours. The present work presents, to our knowledge, the first CCD study of the lightcurve.

Observations and Reductions

Observations were made during a break in normal class observing at the 0.4-m telescope of the Burke-Gaffney Observatory of Saint Mary's University. The detector was an ST6 CCD cooled to -30°C mounted at the Cassegrain focus. Over a 2.5 hour period 21 unfiltered images were obtained of 45 seconds integration time. In addition to the program images 20 bias, 5 dark and 8 flat field images were obtained to remove the instrumental signature. A journal of the observations is given in Table I.

All reductions were performed using the IRAF package (Massey & Davis 1992). Pre-processing steps involved subtracting the median bias and dark frames and dividing by the median flat image. The

photometry was performed using the aperture photometry software of DAOPHOT (Stetson 1987) as implemented in IRAF. Measurements of the aperture magnitudes of 700 Auravictrix, and each of two comparison stars and were subtracted in order to produce a lightcurve of the asteroid. Inspection of a plot of the difference in magnitude between the comparison stars showed them not to be variable during the short time of the measurements. The lightcurve of Auravictrix is given in Figure 1, in the sense

$$\Delta M = \text{Magnitude 700 Auravictrix} - \text{Magnitude comparison star.}$$

Results

Our lightcurve does not cover a sufficient period of time to provide an independent estimate of the period of 700 Auravictrix. However, comparing our lightcurve to that of Lagerkvist (1979) does help verify several features of their results. Our lightcurve confirms the sinusoidal shape of the Lagerkvist (1979) results. In addition, our data shows that the amplitude of the lightcurve is a minimum of ~ 0.3 magnitudes which is consistent with the value of ~ 0.4 magnitudes found by Lagerkvist (1979).

References

- Lagerkvist, C.-I., (1979). "A Lightcurve Survey of Asteroids with Schmidt Telescopes: Observations of Nine Asteroids during Oppositions in 1977", *Icarus* **38**, 106-114.
- Massey, P., and Davis, L., (1992). "A Users Guide to Stellar CCD Photometry with IRAF", NOAO.
- Stetson, P. B. (1987). "DAOPHOT: A computer program for crowded-field stellar photometry", *PASP* **99**, 191-222.

Table 1: Journal of Observations

Date DD : MM : YY	UT (Start) HH : MM : SS	UT (Finish) HH : MM : SS	Exposure time (sec)	Number of Images
02 : 02 : 96	02 : 06 : 00	04 : 29 : 24	45	21

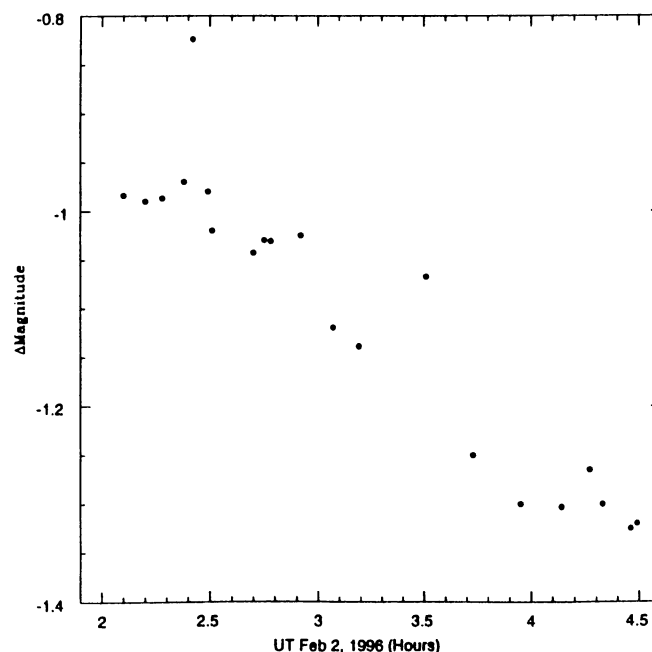


Figure 1. Differential lightcurve of 700 Auravictrix. The data spans a time of 2.5 hours, which does not provide full lightcurve coverage. The sinusoidal nature of the lightcurve is apparent. No light travel time correction has been made.

ASTEROID PHOTOMETRY OPPORTUNITIES AUGUST-OCTOBER

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The table below lists asteroids that come to opposition during the months of August through October that represent useful targets for photoelectric or CCD photometry observations. Observations are typically needed because the asteroid has either an unknown or ambiguous rotational period. The table gives (in order of opposition dates) the asteroid number and name, opposition date, opposition V magnitude, the rotational period (in hours), the estimated lightcurve amplitude (in magnitudes), and the designation PER if observations are needed to determine the rotational period. AMB implies that previous period determinations have given ambiguous results and these alternate periods are listed in the table. RAD indicates the asteroid is a planned radar target, and MOD denotes an asteroid at a critical longitude for shape and pole modeling. Question marks are used to denote uncertain or unknown values.

Now that many amateur and other small observatories have CCD capabilities, much fainter targets are accessible to them. Therefore, we have included a selection of fainter targets, down to opposition magnitude 15. Our emphasis among these fainter targets is to reach to the smallest size bodies possible within that magnitude limit. Thus the objects listed tend to be inner-belt asteroids, or even Mars or Earth-crossing objects, at unusually favorable oppositions. To achieve this, we filter the list of all oppositions to include those objects with H (absolute) magnitude >14.0 (roughly <5 km in diameter), but opposition V magnitude <15.0, and then further eliminate any objects for which adequate observations have already been made. Our criteria for the brighter objects remains the same:

DATE	R.A. (2000)		DEC.	MAG	PHASE
	HR	MIN	DEG	V	ANGLE
Minor Planet 26 Proserpina					
1997 Aug 15	0	23.25	- 2	8.0	11.9
25	0	18.90	- 2	40.2	11.7
Sep 4	0	12.46	- 3	22.3	11.5
14	0	4.50	- 4	9.8	11.2
24	23	55.90	- 4	56.6	11.2
Oct 4	23	47.58	- 5	37.1	11.4
14	23	40.47	- 6	6.1	11.7
24	23	35.26	- 6	20.9	11.9

Minor Planet 189 Phthia					
1997 Sep 14	2	8.28	+13	52.2	13.0
24	2	4.75	+13	10.7	12.8
Oct 4	1	58.63	+12	12.4	12.5
14	1	50.65	+11	1.5	12.2
24	1	41.90	+ 9	44.8	12.1
Nov 3	1	33.58	+ 8	30.9	12.4
13	1	26.85	+ 7	28.2	12.7
23	1	22.50	+ 6	42.6	13.0

Minor Planet 202 Chryseis					
1997 Jul 6	21	57.35	-12	4.0	12.8
16	21	53.66	-12	42.9	12.6
26	21	48.36	-13	31.3	12.5
Aug 5	21	41.79	-14	26.1	12.2
15	21	34.56	-15	23.3	12.0
25	21	27.33	-16	18.5	12.3
Sep 4	21	20.80	-17	7.8	12.5
14	21	15.59	-17	48.3	12.7

Minor Planet 3833 Calingasta					
1997 Jul 16	21	17.33	+11	20.6	15.5
26	21	23.90	+11	16.8	15.2
Aug 5	21	29.43	+ 9	55.0	14.8
15	21	34.76	+ 7	2.0	14.4
25	21	41.05	+ 2	41.9	14.1
Sep 4	21	49.35	- 2	37.8	14.1
14	22	0.59	- 8	6.9	14.3
24	22	14.93	-12	53.3	14.6

Minor Planet 4678 Ninian					
1997 Sep 14	2	11.20	+10	43.0	16.2
24	2	8.66	+10	57.6	15.9
Oct 4	2	2.40	+10	57.8	15.6
14	1	53.43	+10	46.8	15.3
24	1	43.41	+10	30.3	15.2
Nov 3	1	34.19	+10	15.5	15.6
13	1	27.43	+10	9.8	16.0
23	1	24.04	+10	17.9	16.4

opposition V magnitude <12.0 and that the period is unknown, very uncertain, or ambiguously determined. We have dropped low phase angle as a criterion for inclusion, as it seems no one has responded to past listings suggesting phase relation observations.

DATE	R.A. (2000)		DEC.	MAG	PHASE
	HR	MIN	DEG	V	ANGLE
Minor Planet 5682 (1990 TB)					
1997 Aug 15	23	48.04	+14	38.6	15.5
25	23	50.26	+14	43.2	15.2
Sep 4	23	49.56	+14	0.3	14.9
14	23	46.76	+12	30.5	14.7
24	23	43.24	+10	23.9	14.5
Oct 4	23	40.55	+ 7	59.1	14.7
14	23	40.11	+ 5	38.6	15.0
24	23	42.66	+ 3	40.8	15.4

Minor Planet 6108 (1971 QN)					
1997 Jul 6	21	50.78	- 9	3.9	16.0
16	21	50.29	- 8	26.5	15.7
26	21	46.34	- 8	9.1	15.4
Aug 5	21	39.55	- 8	11.6	15.1
15	21	31.28	- 8	30.5	14.9
25	21	23.30	- 8	58.8	15.1
Sep 4	21	17.26	- 9	28.8	15.5
14	21	14.43	- 9	53.1	15.8

Minor Planet (1987 VD)					
1997 Aug 15	0	0.27	+10	36.1	15.8
25	23	59.21	+11	37.6	15.5
Sep 4	23	54.82	+12	6.5	15.2
14	23	48.07	+12	0.6	15.0
24	23	40.58	+11	24.2	14.9
Oct 4	23	34.10	+10	27.4	15.1
14	23	30.23	+ 9	24.5	15.4
24	23	29.82	+ 8	28.5	15.8

Minor Planet (1991 VW3)					
1997 Jul 16	22	21.74	- 7	56.3	16.0
26	22	20.89	- 7	48.9	15.7
Aug 5	22	16.65	- 8	2.9	15.4
15	22	9.75	- 8	35.4	15.0
25	22	1.55	- 9	19.3	14.8
Sep 4	21	53.77	-10	5.2	15.2
14	21	48.15	-10	43.3	15.5
24	21	45.85	-11	6.9	15.8

Minor Planet (1993 FB24)					
1997 Aug 15	0	19.75	+ 0	2.3	16.1
25	0	16.86	+ 0	25.9	15.9
Sep 4	0	10.40	+ 0	32.7	15.6
14	0	1.34	+ 0	26.3	15.3
24	23	51.25	+ 0	13.0	15.1
Oct 4	23	41.92	+ 0	0.5	15.6
14	23	35.01	- 0	3.9	15.9
24	23	31.44	+ 0	4.9	16.3

Asteroid	Opp'n Date	Opp'n V Mag	Per	Amp	
202 Chryseis	Aug 13	12.0	16?	0.1	PER
6108 1971 QN	Aug 14	14.9	?	?	PER
3833 1971 SC	Aug 20	14.2	?	?	PER
1991 VW3	Aug 21	14.7	?	?	PER
26 Proserpina	Sep 20	11.1	10.6?	13.1?	0.15 AMB
1993 FB24	Sep 21	14.9	?	?	PER
1987 VD	Sep 22	14.9	?	?	PER
5682 1990 TB	Sep 23	14.5	?	?	PER
189 Phthia	Oct 20	11.9	>15	>0.2	PER
4678 Ninian	Oct 21	15.0	?	?	PER

Ephemerides for all of the asteroids in the table are included in this issue. Finder charts for some of these asteroids may appear in the Minor Planet Observer. For information on this publication, contact: Brian D. Warner, Box 818, Florissant, CO 80816.