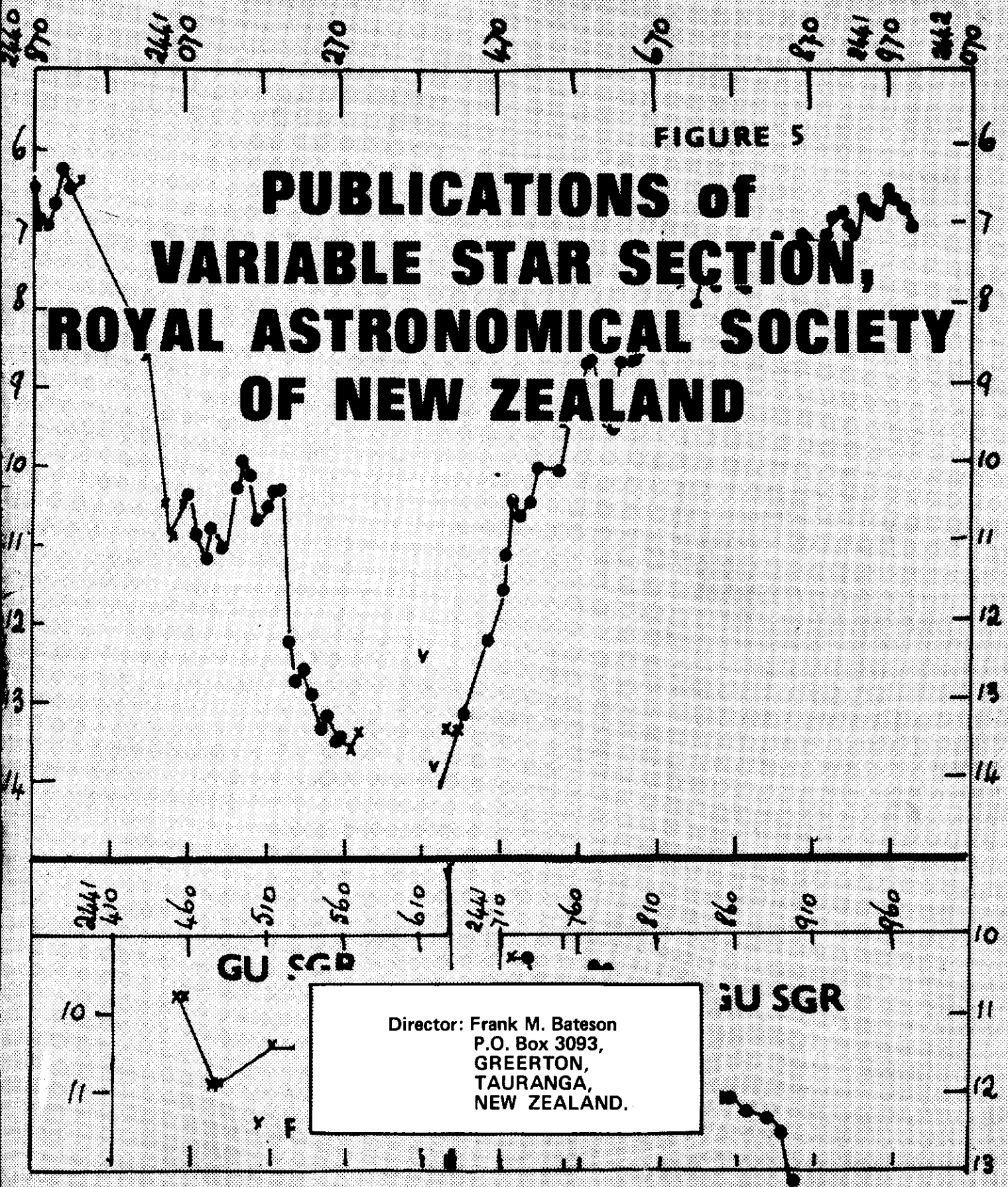




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THE LIGHT CURVE OF OY CARINAE, 1963 JUNE 15 TO 1983 MAY 31.

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SUMMARY. A light curve for the dwarf nova, OY Car, is presented together with detailed curves for some of the observed outbursts. Observed outbursts are tabulated and it is shown that these are either supermaxima or normal short outbursts. Data from the best observed outbursts give a mean maximum magnitude of 11.53 for supermaxima, which have a width of 11.5 days at phase 13.0R-D. The corresponding values for normal maxima are 12.38 and 1.8 days. The frequency of outbursts is examined.

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1. INTRODUCTION.

OY Car is classified as of U Gem type with a photographic range of 12.2 to 16.5. (1). These elements are due to Hoffmeister (2), who on discovering the variability designated the star S6302 Car. It is now known that OY Car is a member of the SU UMa sub-type of dwarf novae. It is one of two southern dwarf novae for which eclipses of the hot spot and primary can be readily observed. Bibliographies appear in (3) and (4).

2. OBSERVATIONS

This paper discusses 4,657 visual observations made by members of the Variable Star Section, Royal Astronomical Society of New Zealand between 1963 June 15 and 1983 May 31. Those who contributed more than 20 observations are listed in Table 1. All observations up to 1976 October 19 were made by A.F. Jones, who commenced monitoring this star shortly after its discovery by Hoffmeister (2). After that date Chart 375 (5) was published which allowed other observers to monitor OY Car. This chart designated the comparison stars by letters as no reliable magnitudes for them were then available. A sequence of V magnitudes for these stars was kindly obtained at the Auckland Observatory by W.S.G. Walker and B.F. Marino. Chart 472 (6) was then issued showing these values. N.Vogt (7) published three colour magnitudes for some of the comparison stars which were in agreement with the values obtained at Auckland. All estimates have been reduced using the foregoing sequences.

TABLE 1-----OBSERVERS" TOTALS OF OBSERVATIONS.

BROWN, N.J.	143	HOVELL, S.	120	OVERBEEK, M.D.	164
CRAGG, T.A.	47	HULL, O.R.	444	PARKINSON, M.	30
DIETERS, S.	25	JONES, A.F.	1,772	ROWE, G.	164
FISHER, D.C.	77	MARINO, B.F.	578	SUMNER, B.	86
HARRIES-HARRIS, E.	55	MENZIES, B.	232	TAYLOR, N.W.	388
HERS, J.	121	ORCHISTON, W.	95	WILLIAMS, P.	36
11 OTHER OBSERVERS WITH LESS THAN 20 OBSERVATIONS EACH					<u>80</u>

TOTAL OBSERVATIONS

4,657

3. LIGHT CURVES

Figures 1a to 1e show the light curve plotted as visual magnitudes against Julian Dates. The Julian Date is shown at 100 day intervals with lighter vertical lines at 10 day intervals. The end and beginning of each calendar year

are shown along the top of the curve. A running number has been assigned to each outburst in the left hand column of Table 2. The same numbers appear on the curve, where they are enclosed in a circle for those outbursts that are considered definite. The remaining outbursts, which are uncertain, have not been numbered on the light curve. Positive observations are shown as black dots even when many observations at the same magnitude were recorded close together in time. This has been done for clarity. As many negative observations as possible have been plotted in order to indicate gaps in the records during which it was possible for an outburst to have gone unobserved.

A number of outbursts are shown in greater detail in Figures 2a, 2b and 2c. The symbols used in plotting these figures are shown on Fig. 2a. The numbers enclosed in circles correspond to the running numbers in Table 2. No separate detailed curves are given for those outbursts for which there was only a few observations. No attempt has been made to depict the eclipses observed as the following paper in this issue discusses these. The horizontal scale in Figs. 2a-2c have been exaggerated compared to the vertical magnitude scale in order to illustrate the light variations clearly. Positive observations very close to each other in time have been combined for the sake of clarity.

4. OUTBURSTS.

A careful inspection of the light curve, in conjunction with the individual observations, indicated 56 possible outbursts. Many of these depend of very few observations, mainly in the 14.1 to 14.6 range. These might represent records on the decline or are possibly variations at minimum. This latter explanation is ruled out as all observations made at minimum indicate that the variable was fainter than 15.5 and usually below magnitude 16. Twenty-one of the possible outbursts were eliminated because it was considered that the observational data was too uncertain, either because the observer considered his estimates doubtful, or because the frequency of negative observations indicated that it was unlikely that an outburst occurred.

Table 2 lists 35 observed outbursts, which are either definite or probable. The numbers in the first column do not imply that any two outbursts are consecutive. The second column shows the type for each outburst if this could be established with S representing supermaxima and N normal outbursts. The next three columns give respectively the J.D. of maximum brightness; the interval, in days, since the previous observed maximum, and the visual magnitude at maximum. Columns 6 and 7 give the Julian Dates, where possible, on which OY Car reached magnitude 13.0 on the rise and decline respectively. The next column shows the width, in days, of the curve at 13.0R-D as derived from the dates in the preceding two columns. The final column shows the number of positive observations used to obtain the data in the previous columns. The large numbers in this column for maxima 28 and 34 are due to frequent observations during eclipses. A question mark after any value indicates that it is uncertain. Notes to the table provide information on some of the doubtful outbursts.

5. DISCUSSION

We found some difficulty in deciding which observations just below magnitude 14 were due to observational error caused by the variable being at the threshold of the instrument, and, which represented an outburst that was only observed either at the start of the rise, or at the end of the visible decline. We do not consider that these are due to fluctuations at minima, because all the positive observations at that phase are from 15.5 to 16.2, whilst the negative observations at minima, when the threshold was well below 14.0 placed the star as fainter than 15.0 or 15.5. Recourse was made to the original records in deciding whether observations below 14.0 were possibly of the fainter part of an outburst. In particular carefull attention was given to the comments, if any, of the observer.

We have disregarded observations just below magnitude 14.0 if the observer expressed doubts about his estimate, or, if the negative observations were close together in time and numerous enough to suggest that no outburst took place. This left the 35 outbursts listed in Table 2, some of which are uncertain owing to the limited number of positive observations.

There are seven intervals of 1,000 days from the date of the first observation. Five of these each has five outbursts. One (J.D. 2,444,204 - 2,445,203) has seven outbursts, obviously because of the very complete coverage, whilst only two outbursts were recorded in the interval J.D. 2,442,204 - 2,443,203 due to the many gaps in the records as well as to the fact that the threshold of the instruments used was brighter than in other intervals. We conclude that in all intervals, except the most recent, some outbursts have passed unobserved. This is not surprising since during most of these intervals all observations were made by the one observer, A.F. Jones, whose records would be broken by adverse weather.

There are nine pairs of supermaxima which appear to be successive super outbursts. The mean interval between such pairs is 328 days. Table 4 also shows the mean intervals between the normal maximum and the supermaximum which followed, as well as the same data for the interval between a supermaximum and the normal outburst that followed it. The normal sequence of outbursts appears to be: Normal, Super, Normal, although this is broken at times but that may be due to gaps in the observations although we consider the effect is real. There is some indication that supermaxima reoccur at intervals of around 284, 324 and possibly 419 days.

Table 5 shows how intervals between the observed outbursts are distributed irrespective of their type. In this table the intervals have been grouped into blocks of 20 days and the mean interval quoted together with the number of outbursts in each mean.

6. CONCLUSIONS

OY Car has super outbursts at mean intervals of 328 days with an indication that this interval changes abruptly at different times. It is possible that cycles of around 284, 324 and possibly 419 days affect the reoccurrence of supermaxima. These have a mean maximum magnitude of 11.53 and a mean width of 11.5 days at the phase 13.0 R-D. Supermaxima are preceded by a normal, short outburst at a mean interval of 161 days and are followed by a normal outburst at a mean interval of 171 days. Normal maxima have a mean magnitude at maximum of 12.38 and a mean duration of 1.8 days at the phase 13.0 R-D. It is probable that a number of outbursts have gone unobserved. This will cause some revision of the foregoing figures as the present close coverage is extended over a longer period of time.

Eclipses of the hot spot and primary can be readily observed but have not been considered in this paper as they are the subject of a separate paper in this issue.

ACKNOWLEDGMENTS

We wish to thank all observers for their observations. In particular our sincere appreciation is extended to A.F. Jones for his long and very careful monitoring of OY Car, without which this paper could not have been written.

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TABLE 2.

OBSERVED OUTBURSTS OF OY CARINAE.								
No	TYPE.	J.D. MAX. 24.....	INT. d	MAX. MAG. _v	13.OR	13.OD	WIDTH 13.OR-D d.	No. OBS.
1	N?	38,204	...	?	...	...	...	2
2	S	356	152	-12.3	...	363	...	9
3	S	678.9	322.9	11.2	677.7	...	...	7
4	N	870	191.1	?	...	...	...	1
5	S	39,096?	226	11.5	095?	105.9	10.9?	5
6	?	445?	349	?	...	...	...	1
7	N?	591?	146	?	...	...	...	1
8	?	704?	113	?	...	...	...	1
9	N	939	235	12.5?	939	940	1	3
10	S	40,092	153	11.8	092	099	7	8
11	N	322?	230	?	...	...	...	2
12	?	360?	38	11.9	...	...	...	3
13	S	681.8	321.8	11.7	680.5	689	8.5	11
14?	N?	828?	146.2	?	...	...	...	2
15	S	968.9	140.9	-12.3	967.6	979	11.4	9
16	S	41,388.9	420	11.6	387.7	400?	12.3?	13
17	N	511	122.1	?	...	513	...	2
18	S	668	157	-12.0	667	675	8	6
19	N	807?	139	12.5?	...	...	...	1
20	S	980?	173	-12.3	...	989?	...	5
21	N?	42,213?	233	?	...	...	...	1
22	S	428.9	215.9	11.2	425.6	437?	11.4?	6
23	N?	43,420	(991.1)	12.3	419?	422	3?	3
24	N	631?	211	?	...	...	...	2
25	S	695	64	11.6	692.5	708	15.5	16
26	N	875	180	12.4	874.9	877.3	2.4	13
27	N	993.6	118.6	12.4	993.4	995.9	2.5	11
28	S	44,241.9	248.3	11.8	240.5	257	16.5	227
29	N	432.9	191	12.5	432.6	433.3	0.7	5
30	S	559	126.1	11.7	558.5	570	11.5	8
31	N	743?	184	?	...	...	...	1
32	S	868.8	125.8	11.6	865.4	878	12.6	22
33	N	45,004.4	135.6	12.0	004.2	005.6	1.4	4
34	S	156.9	152.5	11.1	155.4	168	12.6	104
35	N	277?	120.1	-12.6	...	279.2	...	2

N.B. A minus sign in front of a magnitude indicates that the maximum was probably brighter than shown.

NOTES TO TABLE 2.

No. 1. Observations were: 202.81 (14.1; 206.93 14.4; 209.93 14.6; 208.82 (14.1. Positive observations appear to be at end of decline from a normal maximum.

No. 4. Observations: 868.82 (14.1; 871.88 13.2; 872.90 (14.1. The gap before the positive observation was sufficient for a normal maximum.

No. 6. A large gap in the observations with one positive makes it appear likely that an outburst occurred.

No. 7. Observations: 589.87 (14.1; 592.84 14.0; 595.90 (14.1. The gap is large enough for a normal maximum

NOTES TO TABLE 2 (cont).

- No. 8. Observations: 681.25 (14.1; 707.26 14.1; 708.86 (14.1. It is possible that a supermaximum occurred in this gap.
- No. 9. Observations: 938.89 (14.1; 939.87 12.5; 940.96 13.8; 941.91 14.0; 942.94 (14.1. A maximum certain here.
- No. 11. Observations: 320.88 (14.1; 324.86 14.2; 325.88 14.6; 326.93 (14.1. Probably the fainter part of a decline observed.
- No. 12. Observations: 352.99 (14.1; 360.89 11.9; 361.00 11.9; 365.82 12.6; 374.79 (13.2; 376.91 (14.1. An outburst appears certain.
- No. 14. Observations: 821.82 (14.1; 831.19 14.1; 831.92 14.4; 832.95 (13.2; 836.23 (14.1. Probably the fainter part of decline observed.
- No. 17. Observations: 506.87 (14.1; 513.23 13.0; 513.82 13.9; 515.89 (14.1. Outburst fairly certain.
- No. 18. Maximum probably on 668 rather than on 667 as Fig. 2b might suggest.
- No. 19. Observations: 803.84 (13.2; 806.93 12.5; 812.82 (13.2. Despite only one positive observation a maximum appears definite.
- No. 21. Observations: 207.79 (14.1; 215.83 13.7; 217.82 (13.2. The single positive observation & large gap makes outburst probable.
- No. 24. Observations: 629.98 (13.2; 631.0 13.7; 631.78 (13.2; 632.91 13.7; 633.07 (14.0. A short outburst probable. Positive obs. not clear on Fig. 1d.
- No. 31. Observed at the base of the rise and at the fainter end of decline. A short maximum probable.

TABLE 3.

MAGNITUDES & WIDTHS OF OUTBURSTS OY CARINAE.

<u>TYPE</u>	<u>MEAN MAG,</u> v	<u>No.</u>	<u>EXTREMES</u>	<u>MEAN WIDTH</u> 13.0R-D d	<u>No.</u>	<u>EXTREMES</u> d
NORMAL	12.38	6	12.0 - 12.5	1.8	6	0.7 - 3?
SUPERMAXIMA	11.53	11	11.1 - 11.8	11.5	12	7 - 16.5

TABLE 4.

OY CAR--INTERVALS BETWEEN OUTBURSTS THAT ARE PROBABLY CONSECUTIVE.

<u>TYPE</u>	<u>MEAN INT.</u> d	<u>RANGE.</u> d	<u>No.</u>
NORMAL PRECEDING SUPERMAXIMA	161	64 - 248	12
SUPERMAXIMA	328	279 - 420	9
NORMAL FOLLOWING SUPERMAXIMA	171	122 - 233	11

TABLE 5.

OY Car--DISTRIBUTION OF INTERVALS BETWEEN OBSERVED OUTBURSTS, IRRESPECTIVE OF TYPE.

<u>MEAN INT.</u> d	<u>No.</u>	<u>MEAN INT</u> d	<u>No.</u>	<u>MEAN INT</u> d	<u>No.</u>
51	2	179	3	323	2
121	6	191	2	349	1
142	5	218	3	Over 400	2
153	4	237	4		

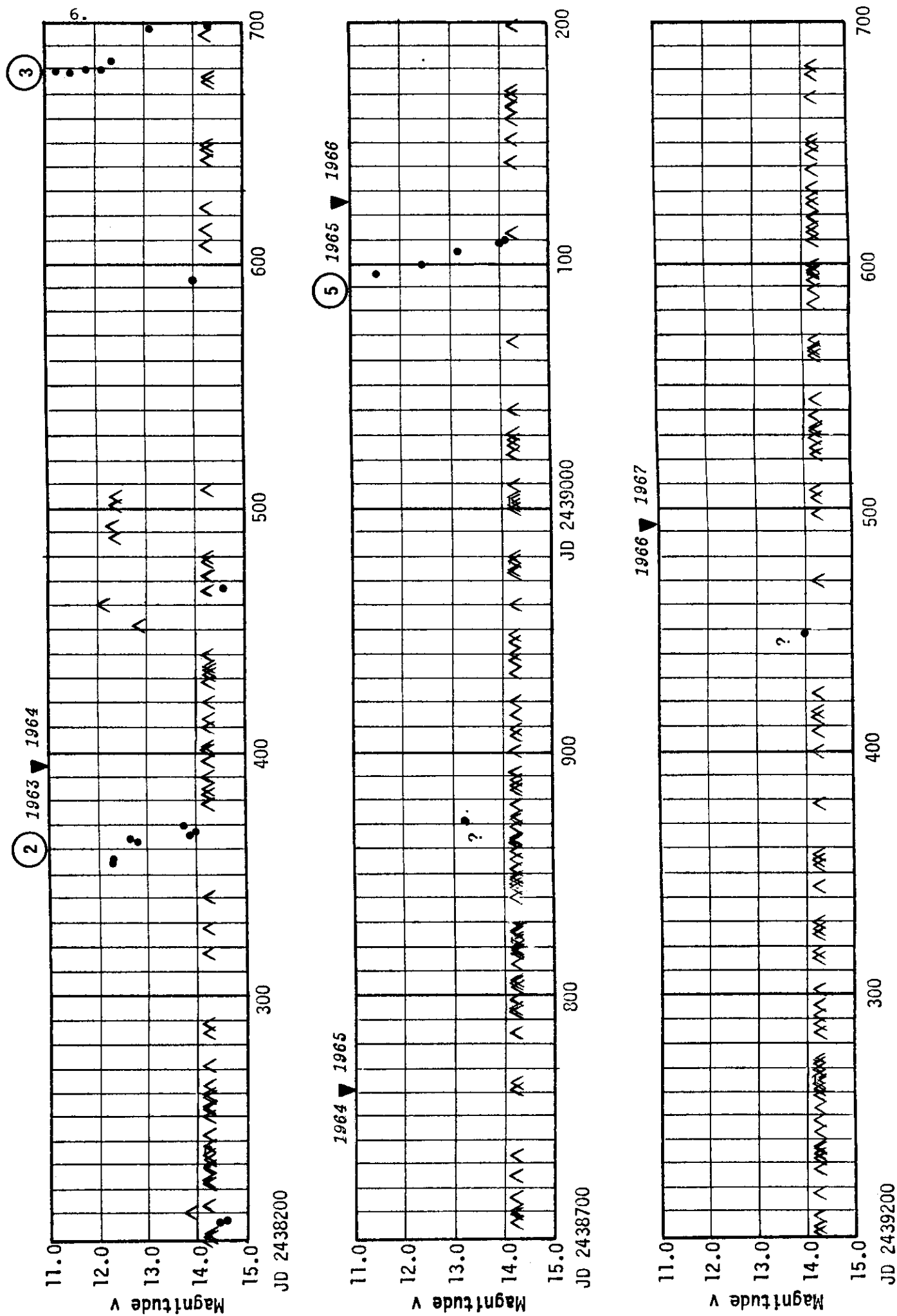


Fig. 1a - 100469 OY Carinae - Light Curve.

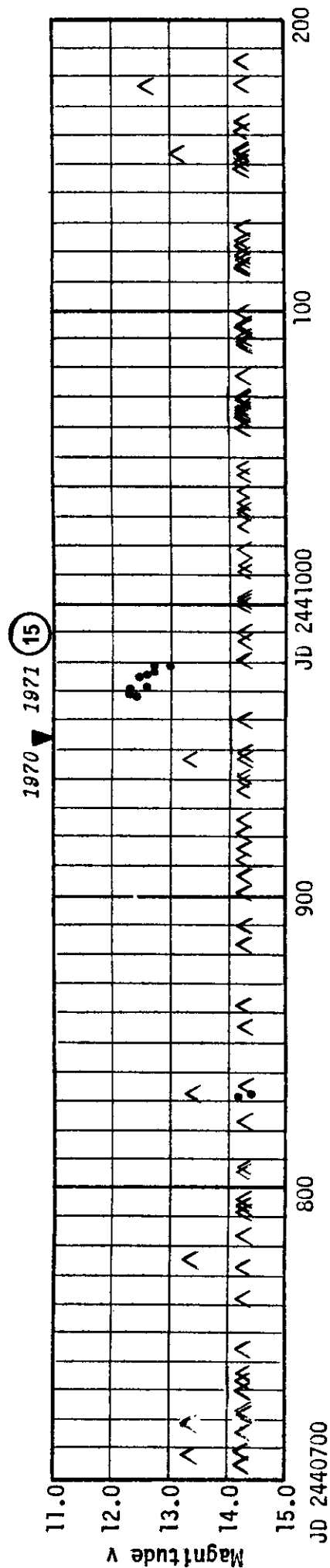
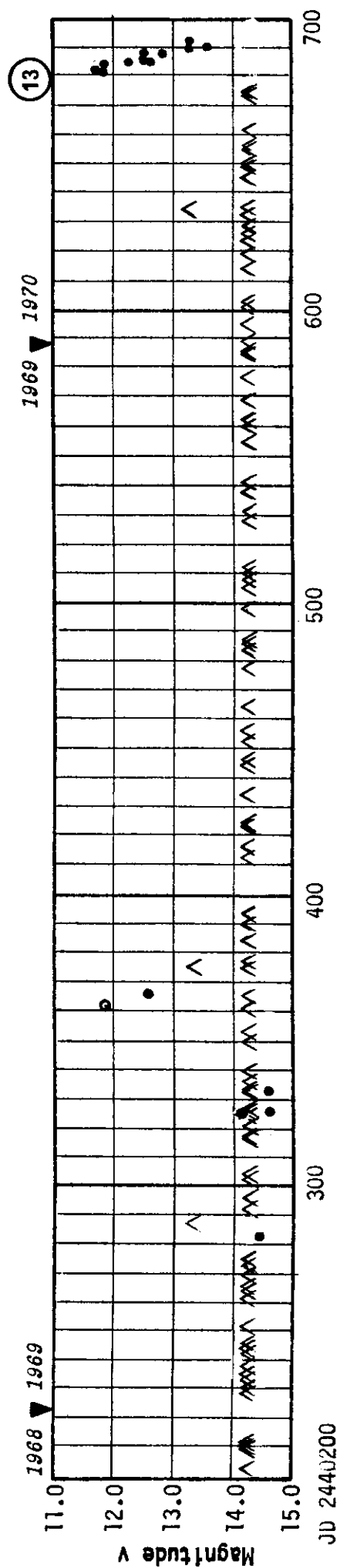
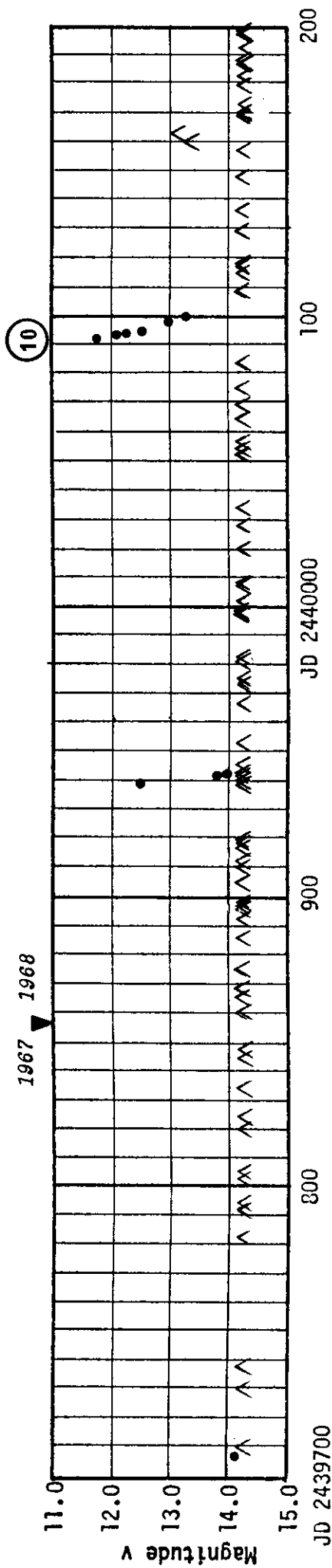


Fig. 1b - 100469 OY Carinae - Light Curve.

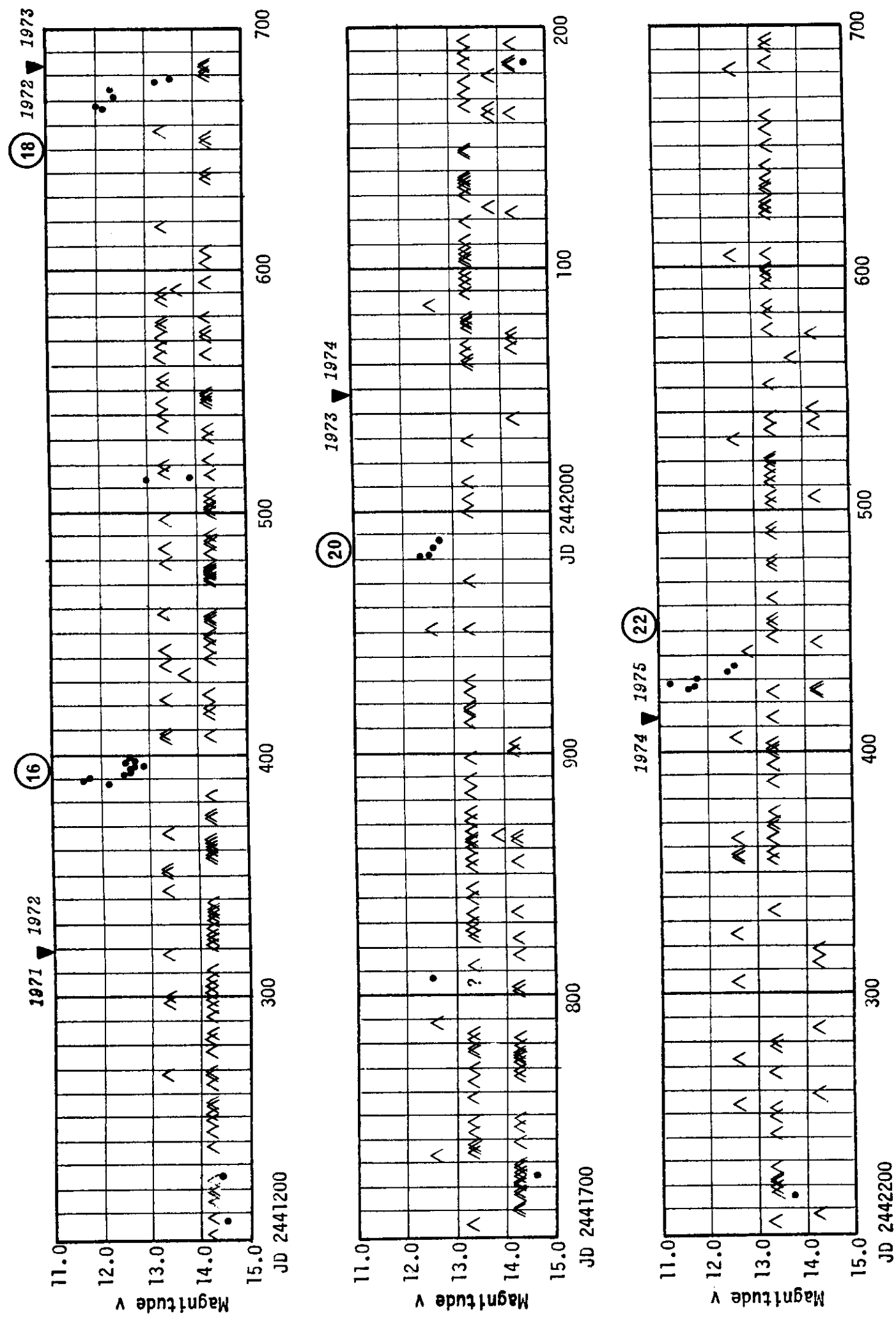


Fig. 1c - 100469 OY Carinae - Light Curve.

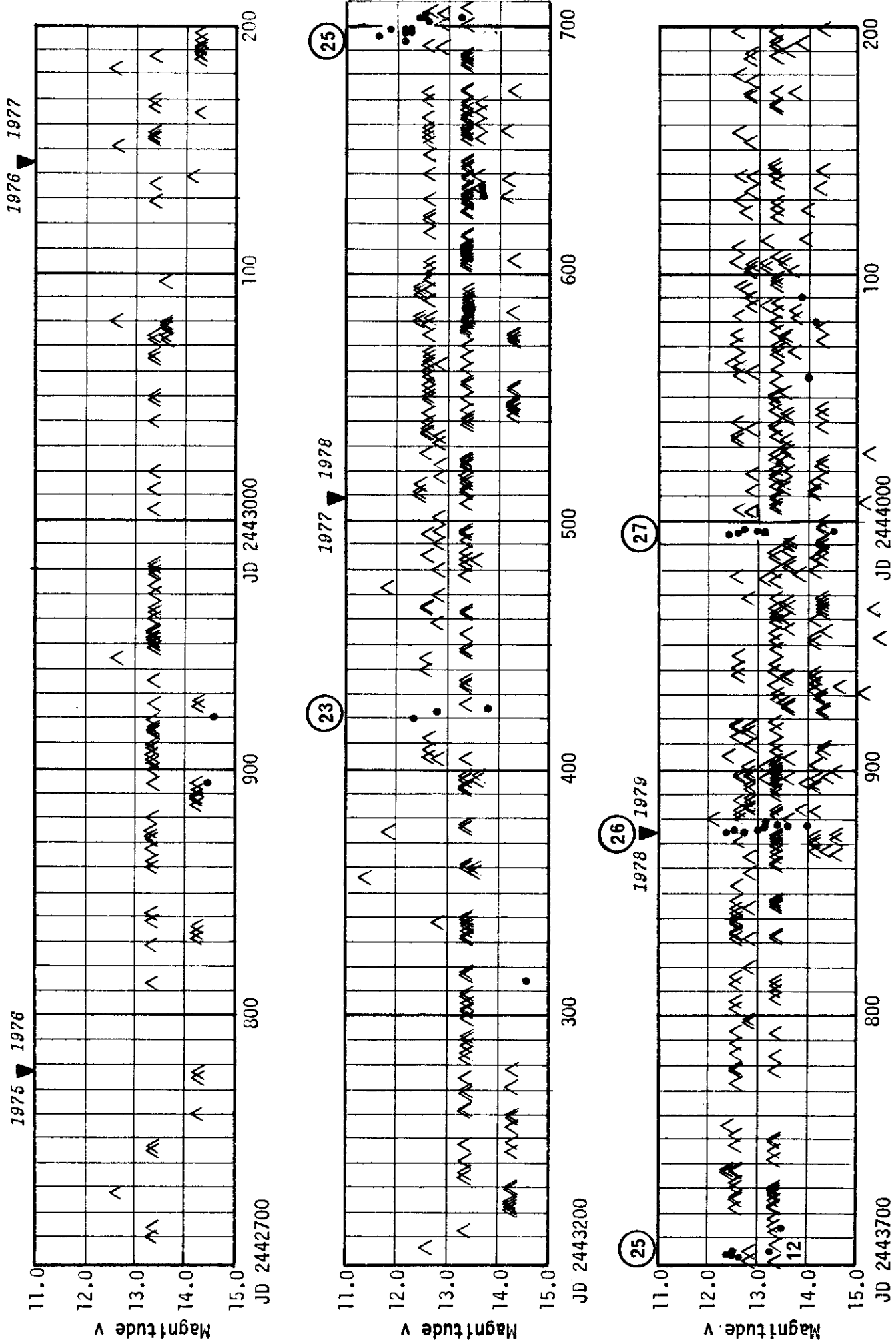


Fig. 1d - 100469 OY Carinae - Light Curve.

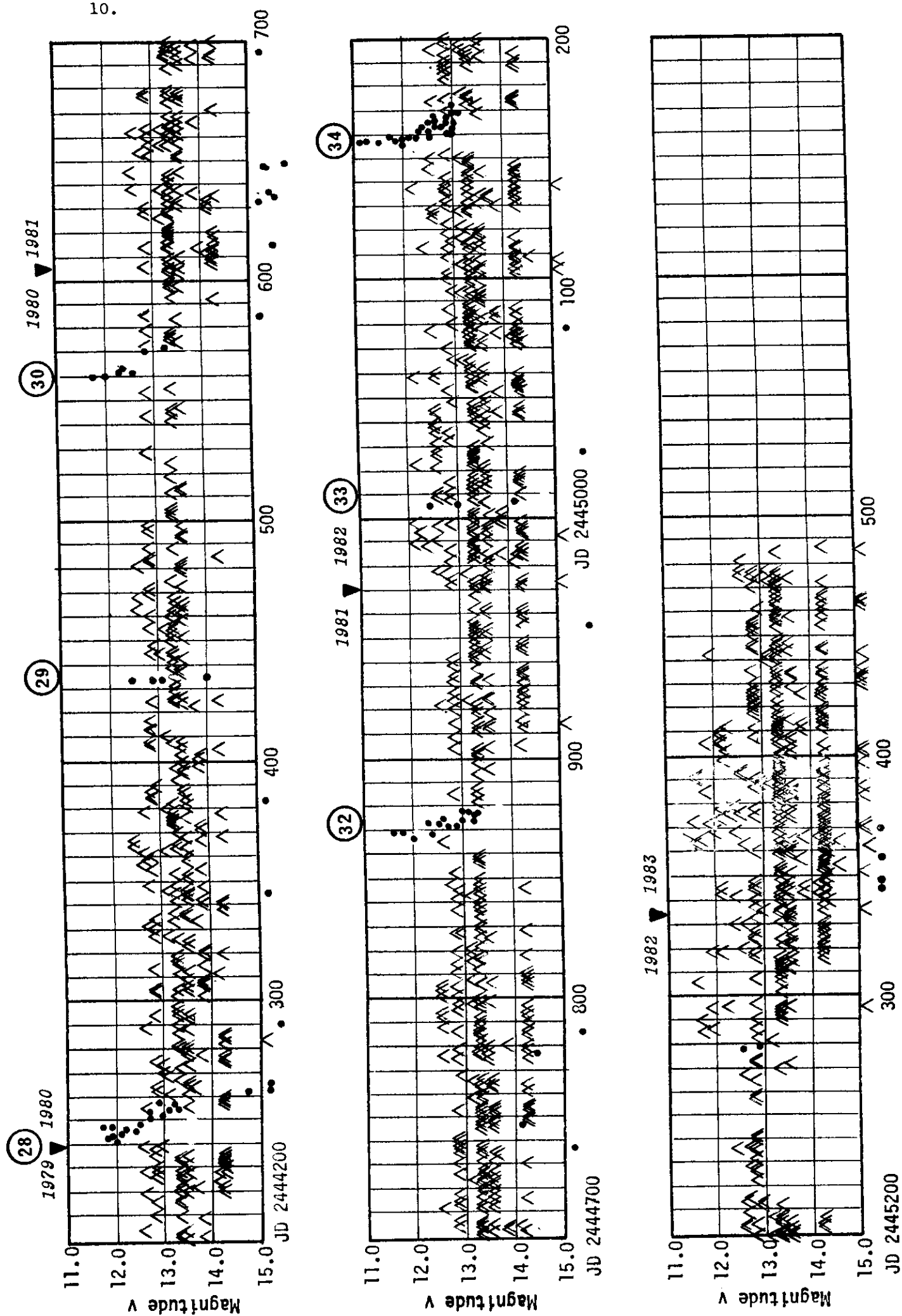


Fig. 1e - 100469 OY Carinae - Light Curve.

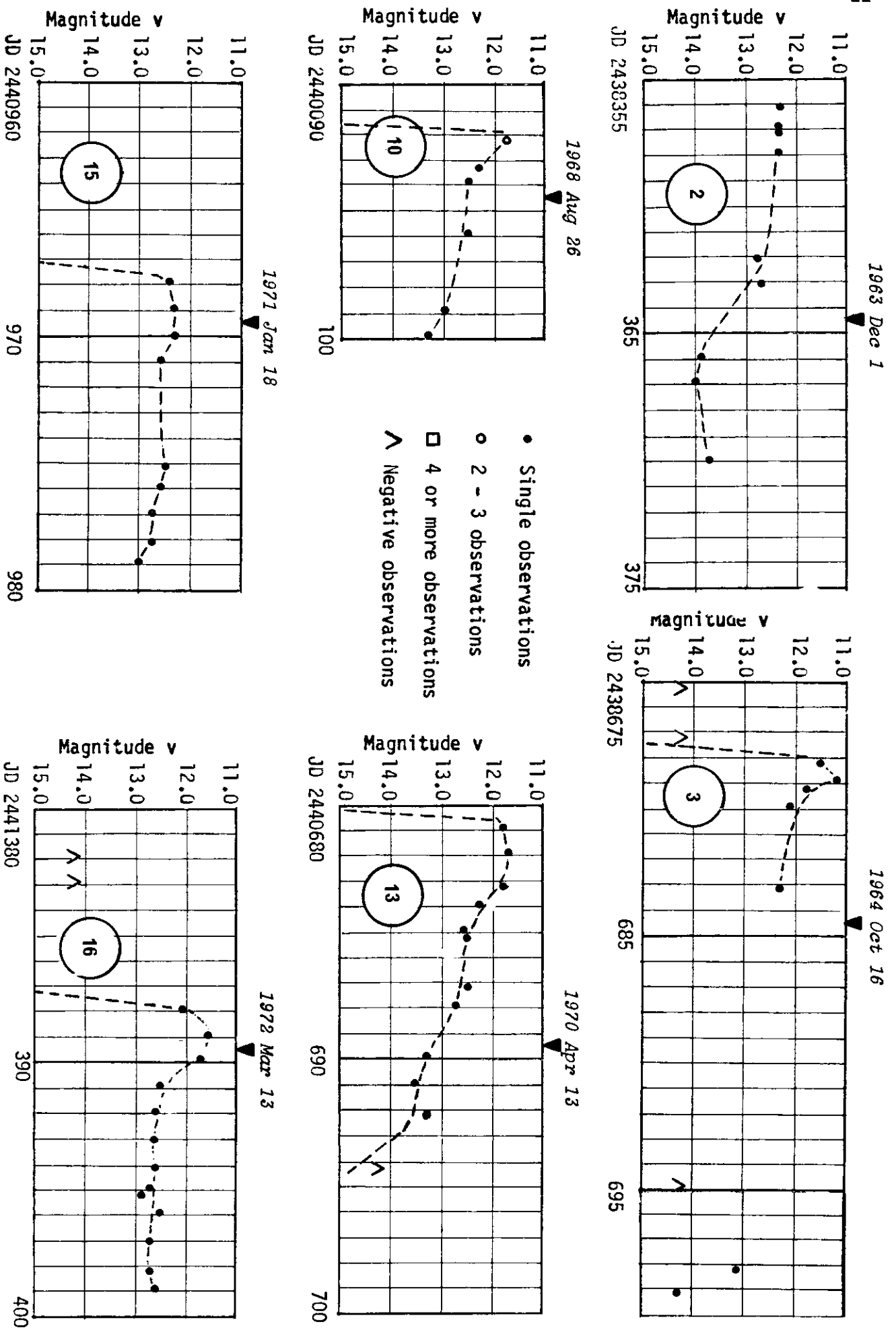


Fig. 2a 100469 OY CARINA - Light Curves of Outbursts.

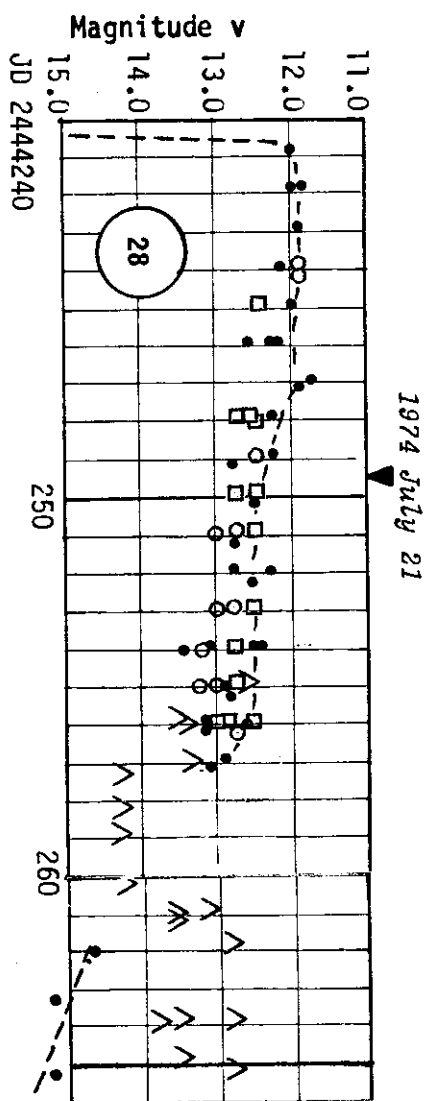
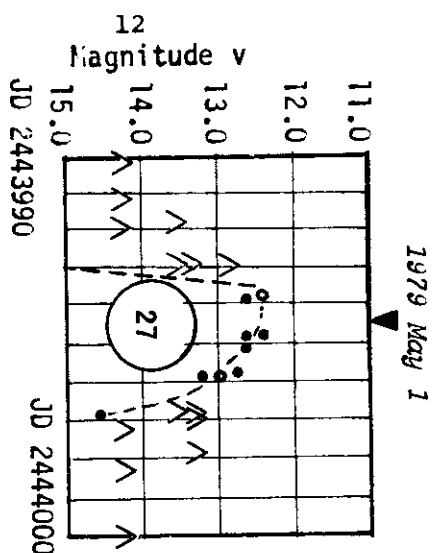
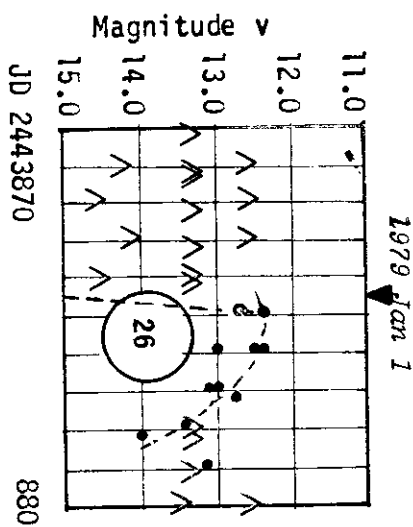
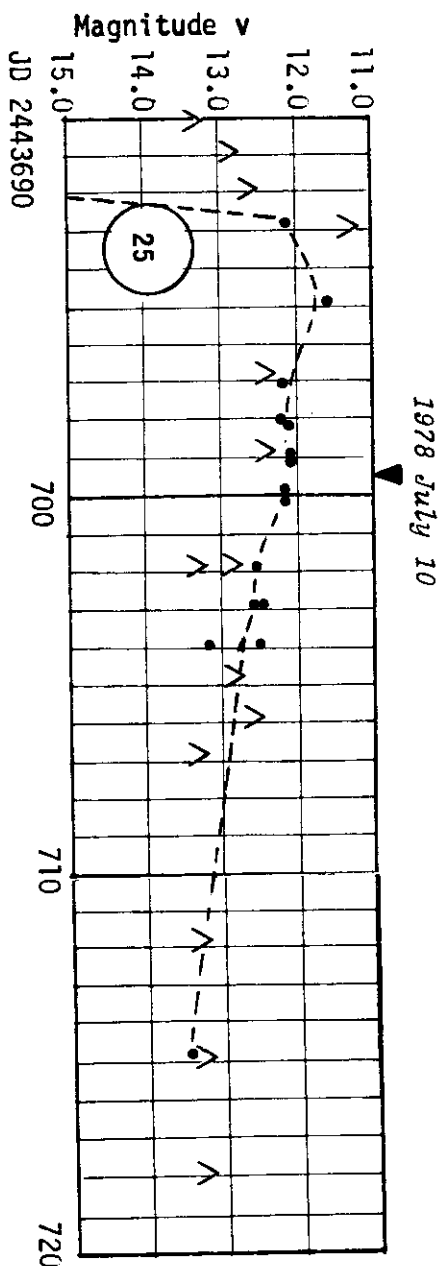
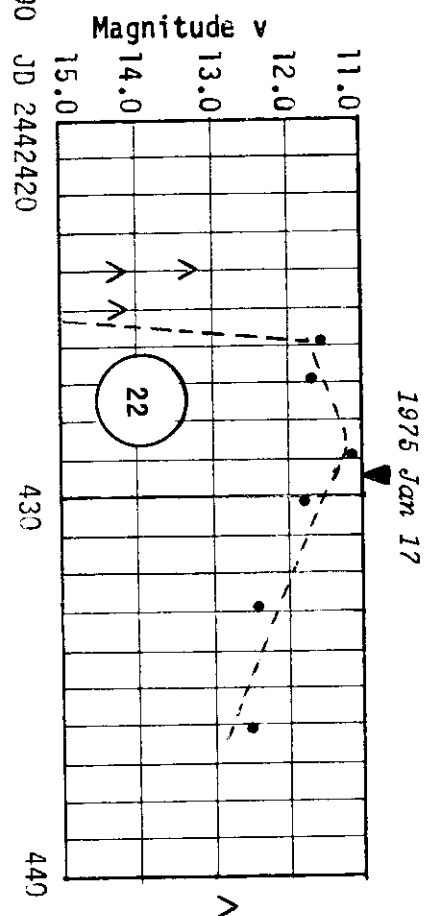
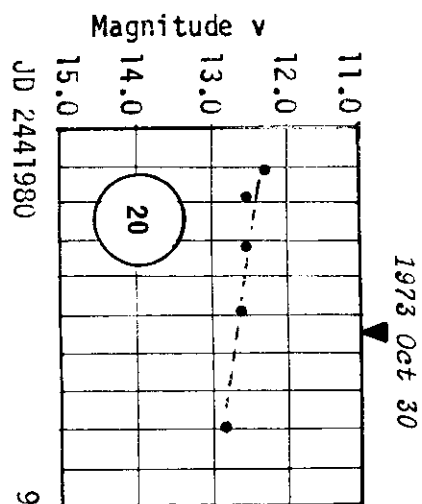
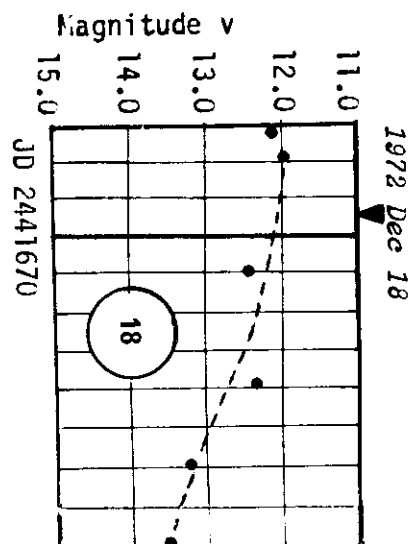


Fig. 2b 100469 OY CARINA - Light Curves of Outbursts.

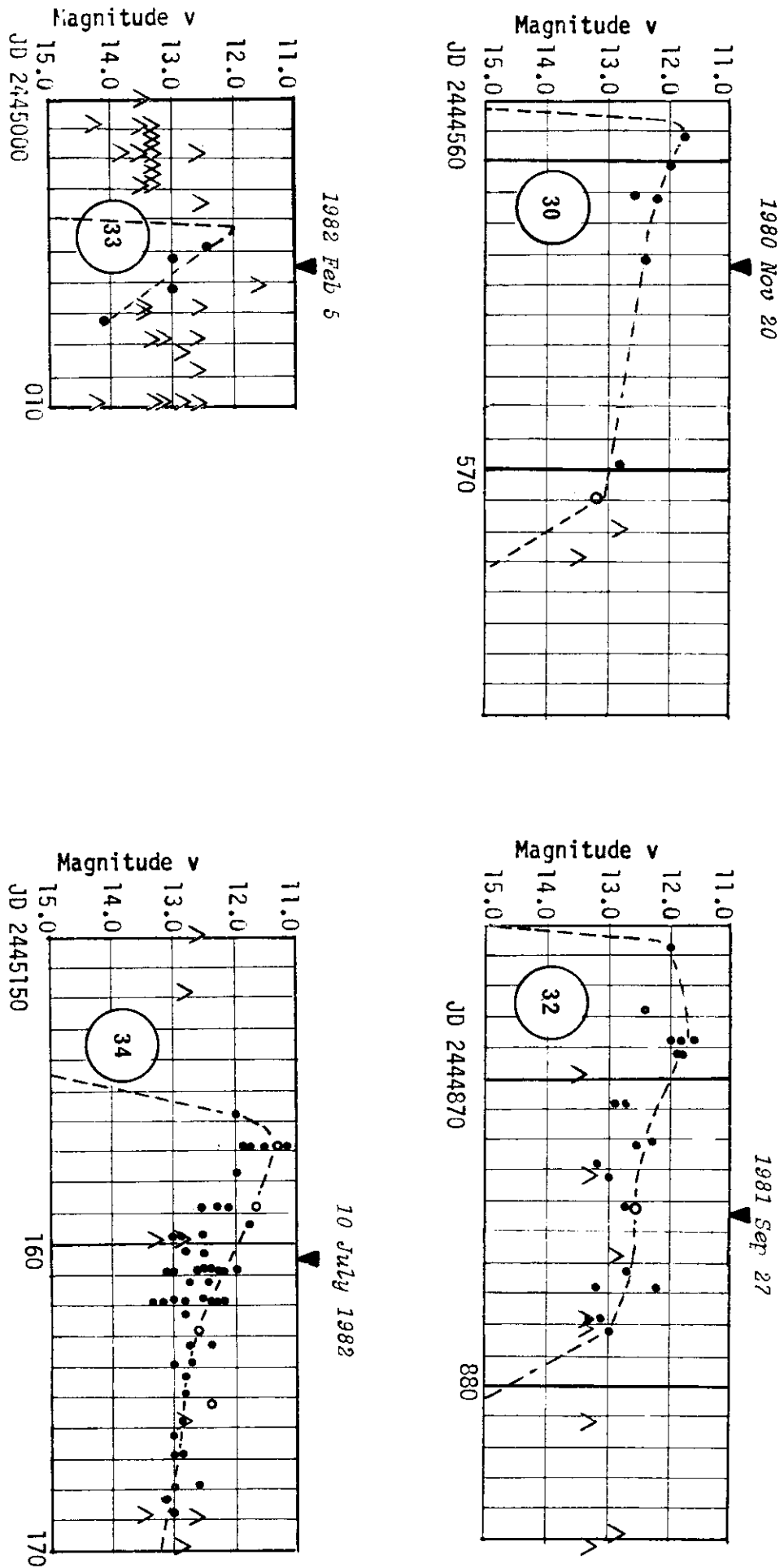


Fig. 2c 100469 OY CARINA - Light Curves of Outbursts.

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VISUAL OBSERVATIONS OF THE ECLIPSES OF THE DWARF NOVA OY CARINAE

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SUMMARY. Visual observations of eclipses of OY Car during supermaxima of 1980 January 8 - 16, and 1982 July 9 and 10 are reported. These have been converted to H.J.D. and phases calculated. Graphs for the eclipses are presented.

1. INTRODUCTION

Observations of eclipses of OY Car were started on 1980 January 8 G.M.A.T., during a supermaximum. No fading was consciously seen, but continual checking between OY Car and the comparison stars seemed to indicate a fall in brightness of 0.2m.

On the next clear evening, January 10, the observing session covered one complete expected period of rotation of the double star system, and again a single fall of 0.2m was noted. This is about the size of random fluctuations that may occur in a visual observer's records of a star of constant magnitude, and so it appeared as if this star, during a supermaximum, was not a suitable one on which to make visual observations of the eclipses.

The time between the two suspected possible fadings was found to be close to an integral number of periods, so further observations were attempted on January 11 and subsequent evenings to January 16. During each session the fading occurred with the spectacular effect familiar to observers of Z Cha. The light curves during eclipses vary considerably in depth from time to time, and observers should be aware that sometimes an eclipse might go undetected.

Further observations were made during a later supermaximum, on 1982 July 9 and 10, G.M.A.T. Two eclipses were observed, both easily detected.

2. OBSERVATIONS

A list of the observations is given in Table 1. The first, second and third

columns give the actual times of the observations. In order to determine the real time between eclipses seen on different days of the year and hence at different positions of the Earth in its orbit, the times of the observations are reduced to Heliocentric Julian Date. These are given in the fourth column. The fifth column contains the observed magnitudes, and the final column the phase at which the observation is made, relative to the estimated eclipse time.

In general, estimates of magnitude were noted at 2-3 minute intervals. Where the magnitude remains constant over a period of time, the observations are omitted from the Table. Places where they are missing are indicated by a dot in the second column.

3. EQUIPMENT AND SITE CONDITIONS.

The telescope was a 250 mm Newtonian reflector, situated in the country about 10 km from Armidale, N.S.W., Australia, at an elevation 1100 metres above sea level and approximate position $30^{\circ} 30'$ South Latitude and $151^{\circ} 40'$ East Longitude.

During all the observations, the altitude of the star remained in the range $30^{\circ} - 35^{\circ}$. The sky was either clear or slightly cloudy except on 1980 January 14, when it was very cloudy. On 1982 July 9 the sky started to cloud over just as the eclipse was ending and became completely overcast 15 minutes later, thus ending an attempt to observe two successive eclipses.

The observations, timing and notes at the telescope were made by one observer (N.W.T.) using a watch set to radio time signals, and a dimmed torch. Taking into account the range in magnitude and the times over which the changes occur, it is unlikely that an accuracy in time of much less than 0.5 minute could be attained by means of visual observations, and so more elaborate means of timing seem unnecessary. For a higher order of accuracy in the calculated period, the observations will need to be extended over several more years.

Some of the eclipse observations are shown in Figures 1 and 2. The graphs for 1980 January 8 to 16 can be compared with the light curve for outburst No. 28 shown in Fig. 2b in the preceding paper in this issue. The shape and depth of the eclipse curve changed as the outburst progressed. The graphs for the eclipses of 1982 July 9 and 10 can be compared to the light curve for outburst 34 shown in Fig. 2c of the previous paper in this issue. The observations of the eclipse on July 10 was further down on the decline and appears to be narrower and deeper than the eclipse observed on July 9.

HJD AND PHASE CALCULATIONS

The Heliocentric Julian Date and phase calculations were made by the second author (A.C.G.) using standard formulae in a Hewlett-Packard HP41C programmable calculator. The ephemeris used in the phase and eclipse calculations was provided by F.M. Bateson, who advised he had received it from N. Vogt.

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TABLE I

OBSERVATIONS OF ECLIPSES AND HJD CALCULATIONS FOR OY CARINAE

(1980) $10^{\text{h}}06^{\text{m}}00^{\text{s}}$, $-70^{\circ}08'.3$

1980	GMAT	JD 2440000+	HJD 2440000+	MAG	PHASE
January 8	$23^{\text{h}}02^{\text{m}}$	4247.9597	4247.9590	12.5	0.451
	23 49		.9917	12.5	.968
	23 51	.9938	.9931	12.7	.990
	23 54	.9958	.9952	12.7	.023
	23 55	.9965	.9958	12.7	.034
	23 57		.9972	12.5	.056
	23 59		.9986	12.5	.078
January 9	00 01	4248.0007	4248.0000	12.5	.100
	00 03	.0021	.0014	12.5	.122
January 10	22 08	4249.9222	4249.9216	12.5	.543
	22 47		.9487	12.5	.972
	22 49	.9507	.9501	12.7	.994
	22 52	.9528	.9522	12.7	.027
	22 53	.9535	.9529	12.7	.038
	22 54		.9536	12.5	.049
	23 00	.9583	.9577	12.5	.115
	23 40	.9861	.9855	12.5	.555
January 11	22 31	4250.9382	4250.9376	12.5	.639
	22 43		.9460	12.5	.771
	22 45		.9473	12.7	.793
	22 46		.9480	12.5	.804
	22 48		.9494	12.5	.826
	22 51		.9515	12.7	.859
	22 52		.9522	12.5	.870
	22 57		.9557	12.5	.925
	23 00	.9583	.9578	12.7	.958
	23 02	.9597	.9591	13.0	.980
	23 04	.9611	.9605	13.0	.002
	23 05	.9618	.9612	13.0	.013
	23 07	.9632	.9626	12.7	.035
	23 11		.9654	12.5	.079
	23 15	.9688	.9682	12.5	.123

TABLE I CONTINUED

OBSERVATIONS OF ECLIPSES AND HJD CALCULATIONS FOR OY CARINAE

(1980) $10^{\text{h}}06^{\text{m}}00^{\text{s}}$, $-70^{\circ}08'.3$

1980	GMAT	JD 2440000+	HJD 2440000+	MAG	PHASE
January 13	23 ^h 04 ^m	4252.9611	4252.9606	12.7	0.689
	23 06		.9620	12.5	.711
	23 29		.9780	12.5	.964
	23 30		.9787	12.7	.975
	23 32		.9806	13.0	.997
	23 34		.9819	13.0	.019
	23 36		.9833	12.7	.041
	23 37		.9840	12.7	.052
	23 40		.9856	12.5	.085
	23 45		.9896	12.5	.140
January 14	23 30	4253.9792	4253.9787	12.7	.818
	23 42		.9870	12.7	.950
	23 44		.9889	13.0	.972
	23 45		.9896	13.2	.983
	23 46		.9903	13.2	.994
	23 48		.9917	13.4	.016
	23 49		.9924	13.2	.027
	23 50		.9931	13.0	.038
	23 51		.9933	12.7	.049
January 15	00 00	4254.0000	.9995	12.7	.148
January 15	22 14	4254.9264	4254.9260	12.9	.825
	22 23		.9322	12.9	.924
	22 25		.9336	13.0	.946
	22 26		.9343	12.9	.957
	22 27.5		.9358	13.0	.974
	22 29		.9368	13.2	.990
	22 30		.9375	(13.2	.001
	22 32		.9389	13.2	.023
	22 33		.9396	13.0	.034
	22 34		.9399	13.0	.045
	22 35		.9405	12.9	.056
	22 46		.9486	12.9	.177

TABLE I CONTINUED

OBSERVATIONS OF ECLIPSES AND HJD CALCULATIONS FOR OY CARINAE

(1980) $10^{\text{h}}06^{\text{m}}00^{\text{s}}$, $-70^{\circ}08'.3$
 (1982) 10 06 03, $-70^{\circ}09'.0$

1980	GMAT	JD 2440000+	HJD 2440000+	MAG	PHASE
January 16	22 ^h 27 ^m	4255.9354	4255.9350	13.0	0.811
	22 29		.9364	12.9	.833
	22 34		.9398	12.9	.888
	22 36		.9412	13.0	.910
	22 40		.9444	13.0	.954
	22 42		.9458	13.2	.976
	22 43.5		.9469	13.4	.992
	22 45		.9479	(13.2	.009
	22 46.5		.9490	13.2	.025
	22 48		.9500	13.0	.042
	22 52		.9523	13.0	.086
	22 54		.9537	12.9	.108
	22 55		.9544	13.0	.119
	22 57		.9563	13.0	.141
1982					
July 9	21 09	5160.8813	5160.8820	12.2	.529
	21 14		.8854	12.3	.584
	21 32		.8979	12.3	.782
	21 33.5		.8990	12.4	.798
	21 35.5		.9004	12.4	.820
	21 37		.9014	12.3	.837
	21 40		.9035	12.3	.870
	21 41.5		.9045	12.4	.886
	21 43.5		.9059	12.3	.908
	21 45.5		.9073	12.3	.930
	21 48.5		.9094	12.4	.963
	21 49.5		.9094	12.5	.974
	21 52		.9111	13.1	.002
	21 53.5		.9122	13.0	.018
	21 54.5		.9128	12.5	.029
	21 56		.9146	12.3	.046
	21 57		.9153	12.3	.057
	22 00		.9167	12.3	.090

TABLE I CONTINUED

OBSERVATIONS OF ECLIPSES AND HJD CALCULATIONS FOR OY CARINAE

(1982) $10^{\text{h}}06^{\text{m}}03^{\text{s}}$, $-70^{\circ}09'.0$

1982	GMAT	JD 2440000+	HJD 2440000+	MAG	PHASE
July 10	21 ^h 27 ^m	5161.8938	5161.8944	12.2	0.569
	21 33		.8986	12.2	.635
	21 35		.9000	12.3	.657
	21 37		.9014	12.2	.679
	21 40		.9035	12.3	.712
	21 43		.9056	12.2	.745
	21 50		.9104	12.2	.822
	21 52		.9118	12.3	.844
	22 02		.9187	12.3	.954
	22 03	.9188	.9194	12.4	.965
	22 04.5	.9198	.9205	12.8	.981
	22 05.5	.9205	.9212	13.2	.992
	22 07	.9215	.9222	13.4	.009
	22 08	.9222	.9229	12.7	.020
	22 08.5	.9226	.9233	12.5	.025
	22 10		.9243	12.3	.042
	22 20	.9306	.9312	12.3	.152

TABLE II

PREDICTED TIMES OF MINIMUM FOR ECLIPSES OBSERVED

The ephemeris used is

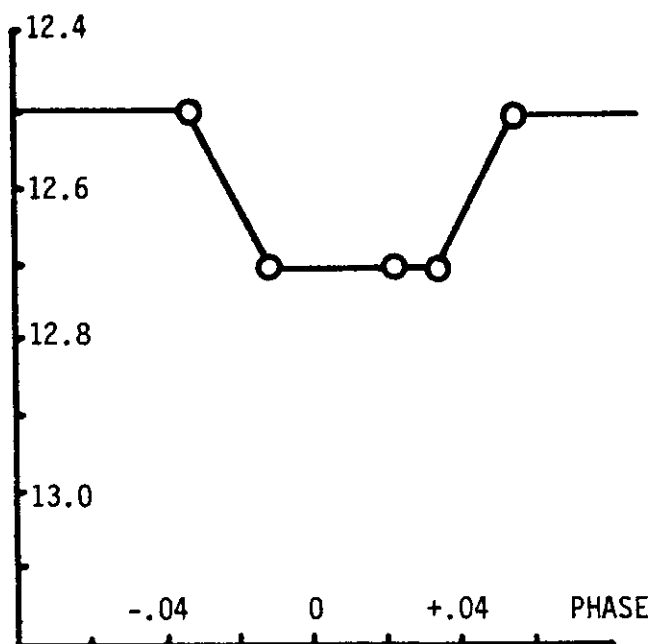
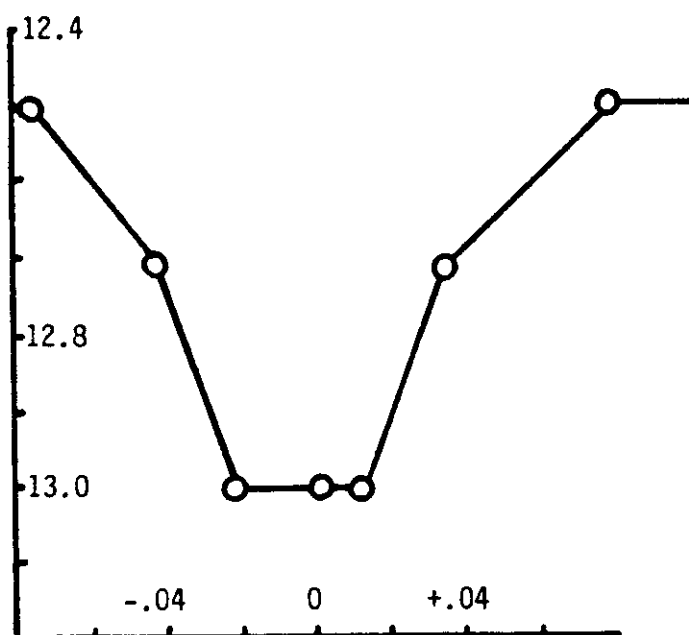
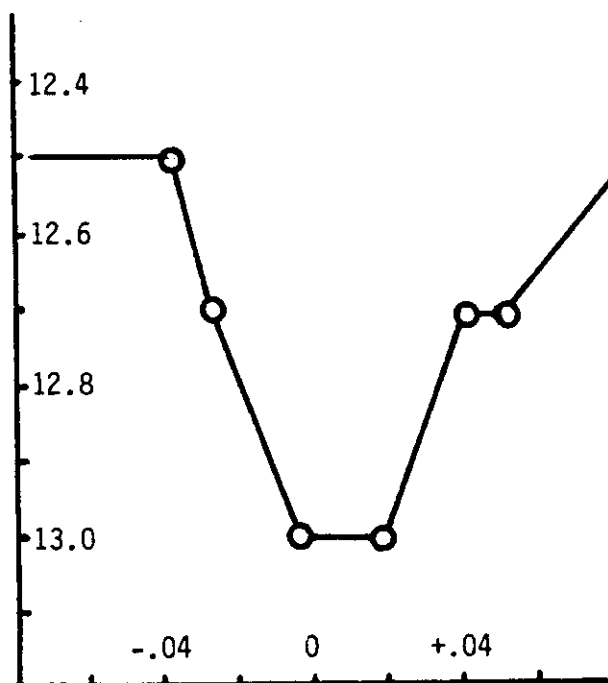
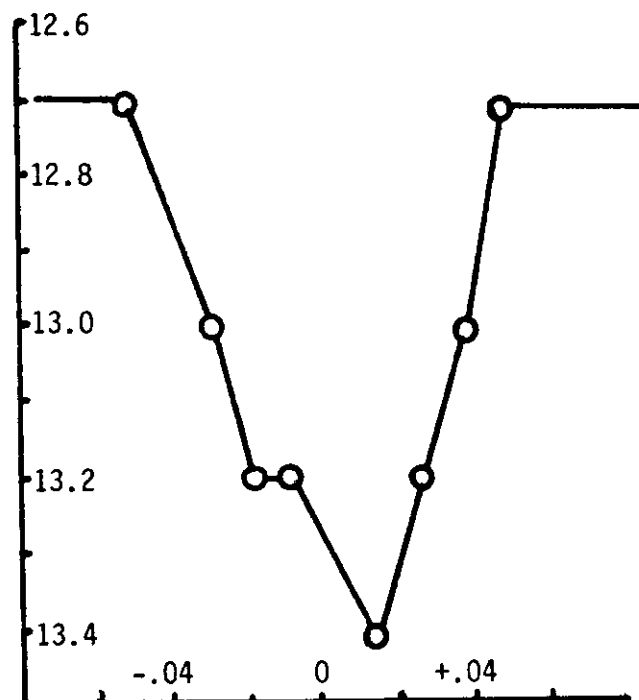
$$\text{HJD} = 2,443,993.5532262 + 0.063120938 E$$

 ± 88 ± 14

DATE (GMAT)	E	HJD 2440000 +	JD 2440000 +	GMAT OF PREDICTED MIN
1980 Jan 8	4031	4247.9937	4247.9942	1980 Jan 8 ^d 23 ^h 51 ^m 39 ^s
10	4062	4249.9504	4249.9510	10 22 49 26
11	4078	4250.9605	4250.9611	11 23 03 59
13	4110	4252.9803	4252.9808	13 23 32 21
14	4126	4253.9902	4253.9907	14 23 46 36
15	4141	4254.9370	4254.9374	15 22 29 51
16	4157	4255.9469	4255.9473	16 22 44 07
1982 July 9	18494	5160.9117	5160.9110	1982 July 9 21 51 50
10	18510	5161.9217	5161.9210	10 22 06 14

FIGURE 1.

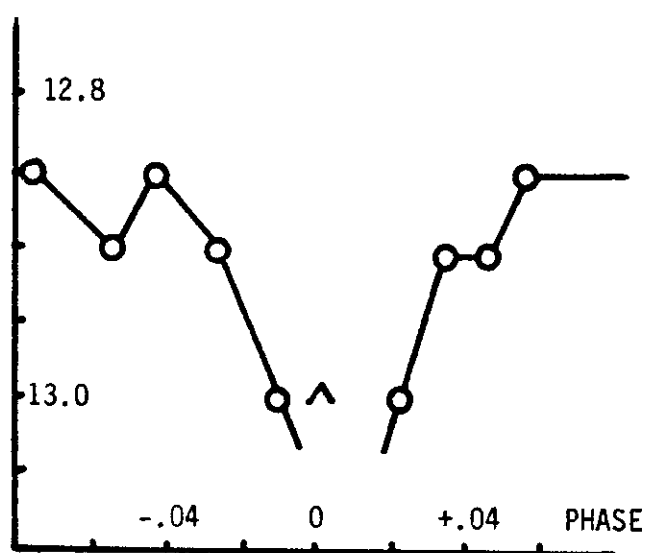
MAGNITUDE

ECLIPSE AT HJD 4247.9937
1980 JANUARY 8ECLIPSE AT HJD 4250.9605
1980 JANUARY 11ECLIPSE AT HJD 4252.9803
1980 JANUARY 13ECLIPSE AT HJD 4253.9902
1980 JANUARY 14OY CARINAE: ESTIMATED LIGHT VARIATIONS AT ECLIPSES

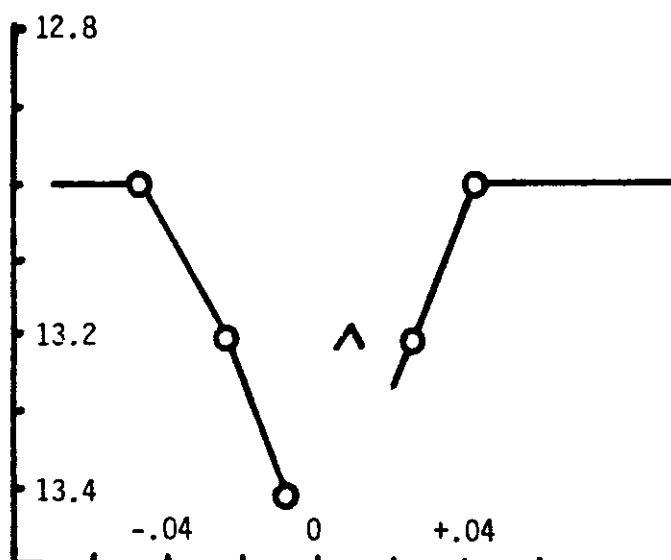
Magnitude is along the vertical axis, phase along the horizontal.
 One minute of time corresponds to 0.011 of phase.
 The graph for the eclipse at HJD 4249.9504 is similar to that at
 HJD 4247.9937, and is omitted.

MAGNITUDE

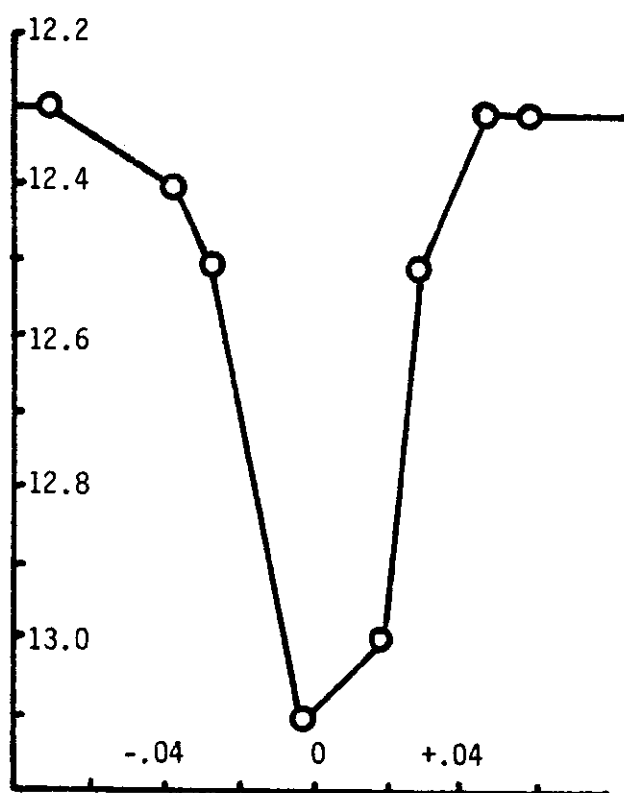
FIGURE 2.



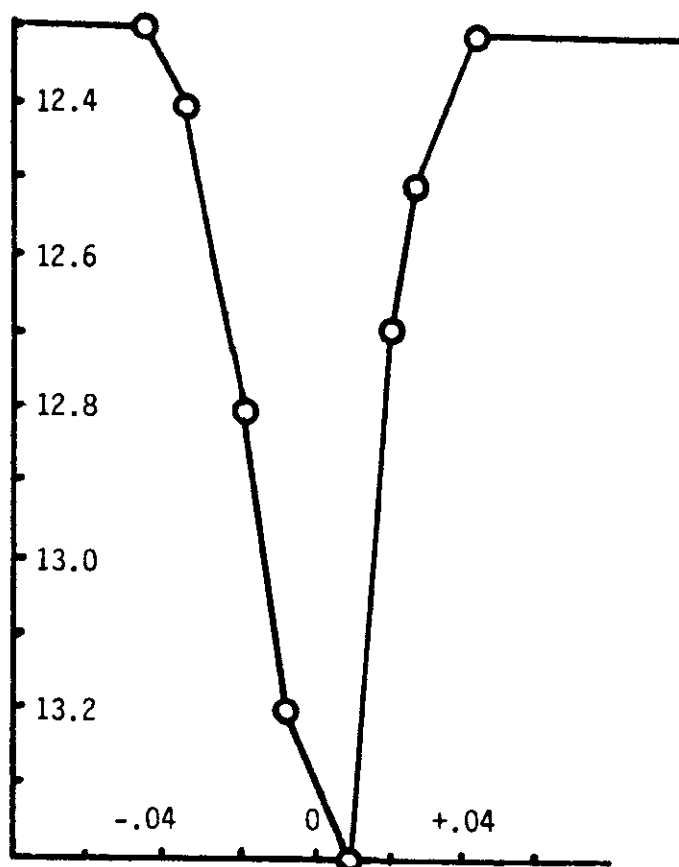
ECLIPSE AT HJD 4254.9370
1980 JANUARY 15



ECLIPSE AT HJD 4255.9469
1980 JANUARY 16



ECLIPSE AT HJD 5160.9117
1982 JULY 9



ECLIPSE AT HJD 5161.9217
1982 JULY 10

OY CARINAE: ESTIMATED LIGHT VARIATIONS AT ECLIPSES

Magnitude is along the vertical axis, phase along the horizontal.
One minute of time corresponds to 0.011 of phase.

U HOROLOGII-- A NEGLECTED MIRA VARIABLE

C. W. Venimore
Variable Star Section, R.A.S.N.Z.

SUMMARY, A light curve covering the interval J.D. 2,434,633 to 2,443,873 from 705 visual observations is presented. Observed maxima are given, from which a period of 352.94 days is derived.

1. INTRODUCTION.

U Hor is a neglected southern Mira variable for which only a limited number of observations are available. Preliminary elements and charts were published (1) when attention was first drawn to this star. The charts were subsequently republished (2) as Nos. 267 and 268. The sequence shown on these charts have been used to reduce all observations. It is hoped that by drawing attention in this paper to U Hor members will give it greater attention in future.

2. OBSERVATIONS

A total of 705 visual observations were made between J.D. 2,434,633 and 2,443,873. Observers, who contributed more than 20 observations were:

Jones, A.F.	489	
Jones, M.V.	94	
McMillan, S.	27	
Taylor, N.W.	33	
11 other observers	62	TOTAL 705.

A.F. Jones observed U Hor at regular intervals to 2,441,513, after which the star has been poorly observed. A light curve, plotted from the individual observations, is shown in Figures 1a - 1d. U Hor falls below the threshold of the instruments used at minimum.

3. DISCUSSION

Table 1 lists the observed maxima, whilst the dates of minima have been obtained from the observed portions of the light curve in the usual way. The dates for minima are therefore not very reliable. Coverage during different cycles is uneven and it appeared that the combining of all observations into a single standard light curve was not justified.

Maxima are generally flat, but this does not always hold. There is a tendency, at times, for every second maximum to be fainter than average. The rise is very much steeper than the fall.

The following elements appear to fit the observations best, giving O-C residuals for maxima of ± 11.33 days.

ELEMENTS: EPOCH (Maximum) 2,439,237 $\pm 352.94^d$
Minimum - Maximum 33% of period.
Mean maximum magnitude: 8.84_v
Range of magnitudes at maximum: $7.8_v - 9.8_v$

All that can be stated about minima is that the minimum magnitude appears to be 14.0_v or fainter. It does seem that some minima are not as faint as others.

ACKNOWLEDGMENTS

I wish to thank F.M. Bateson for his guidance and encouragement.

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- (2). Bateson, F.M., Jones, A.F. & Stranson, I. 1971. Charts for Southern Variables, Ser. 7. Publ. by F.M. Bateson, Tauranga, N.Z.

TABLE 1.MAXIMA AND MINIMA OF U. HOROLOGII.

<u>MAXIMA</u>						<u>MINIMA</u>	
<u>No.</u>	<u>J.D. MAX.</u>	<u>MAG.</u>	<u>O-C</u>	<u>M-m</u>	<u>Wt.</u>	<u>J.D. Min.</u>	<u>m-M</u>
			<u>d</u>	<u>d</u>			<u>d</u>
1	2,434,638	8.1	-10.78	...	4	2,434,895	257
2	986	9.4	-15.72	91	4	2,435,230	244
3	2,435,325	8.0	-29.66	95	4	537	212
4	708	8.8	+ 0.4	171	4	953	245
5	2,436,073	9.6	+12.46	120	4	2,436,200	127
6	388	8.3	-25.48	188	3	585	197
7	748	9.0	-18.42	163	4	2,437,000	252
8	2,437,103	8.9	-16.36	103	3	280	177
9	469	7.8	- 3.30	189	3	734	265
10	820	9.8	- 5.24	86	3	2,438,070	250
11	2,438,175	9.4	- 3.18	105	3	408	233
12	540	8.6	+ 8.88	132	4	778	238
13	895	8.6	+10.94	117	3	2,439,200	305
14	2,439,237	8.5	+ 0.00	37	4	490	253
15	620	9.2	+30.06	130	5	810	190
16	950	9.2	+ 7.12	140	4	2,440,205	255
17	2,440,320	9.2	+24.18	115	4	560	240
18	655	9.8	+ 6.24	95	3	960	305
19	2,441,000	8.8	- 1.70	40	2	2,441,203	203
20	360	9.1	+5.36	157	2	625	265
21	705	8.3	-2.58	80	3	950	245
22	2,442,065	8.4	+ 4.48	115	3	2,442,262	197
23	430	9.0	+16.54	168	3	660	230
24	757	9.1	- 9.40	97	2	980	223
25	2,443,105	8.5	-14.34	125	2	2,443,333	228
26	460	8.5	-12.28	127	2	680	220

EXPLANATIONS TO TABLE 1.

M-m = Interval between minimum and following maximum.

m - M. Interval between maximum and following minimum.

Wt. = Reliability on basis 5 (excellent) to 1 (very poor).

No magnitudes assigned to minima as these not precisely determined.

For same reason dates of minima are uncertain and hence no O-C residuals listed for minima.

FIGURE 1a.

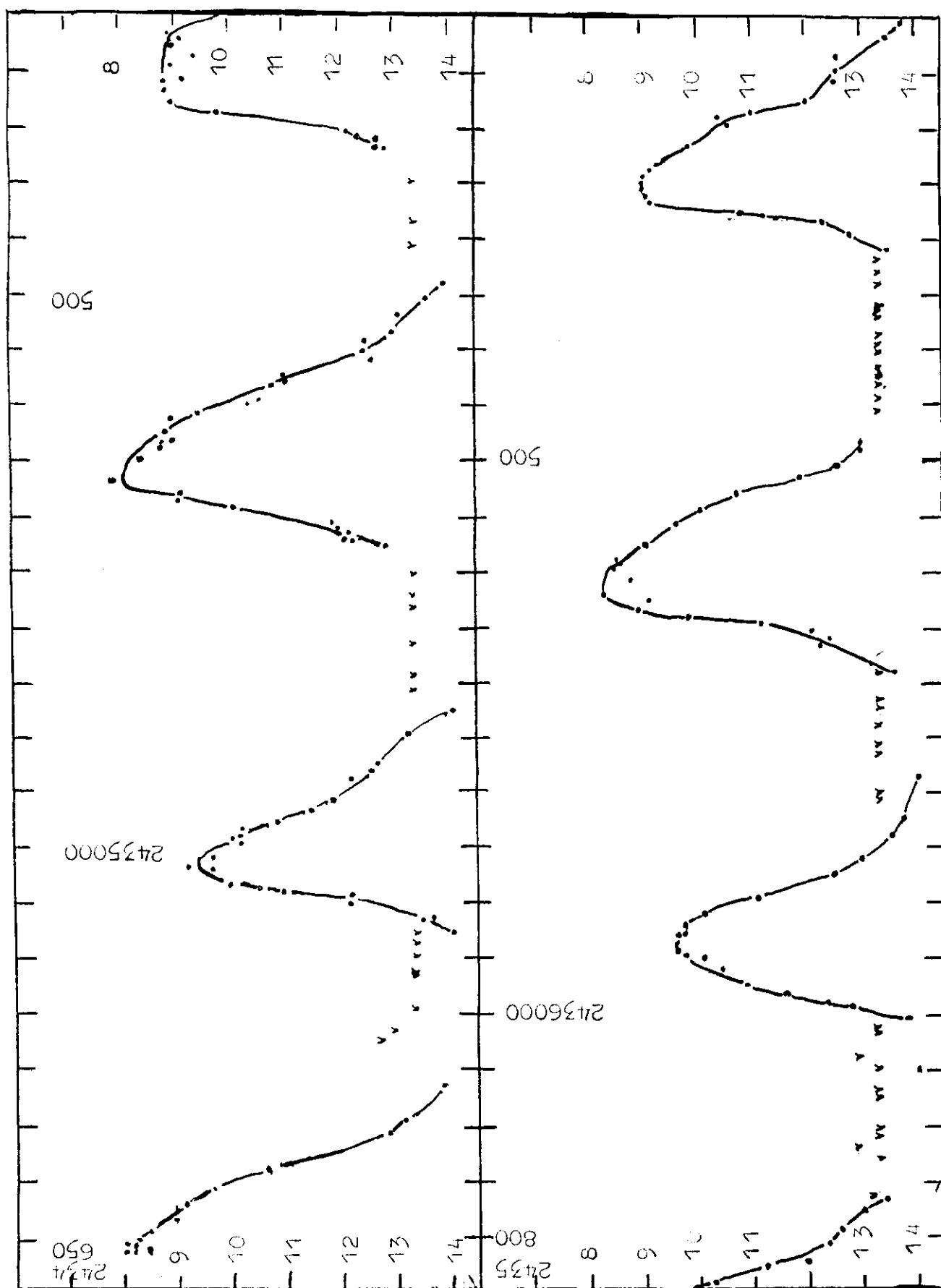


Figure 1: Light Curve of U Hor. from individual observations (1)

FIGURE 1b.

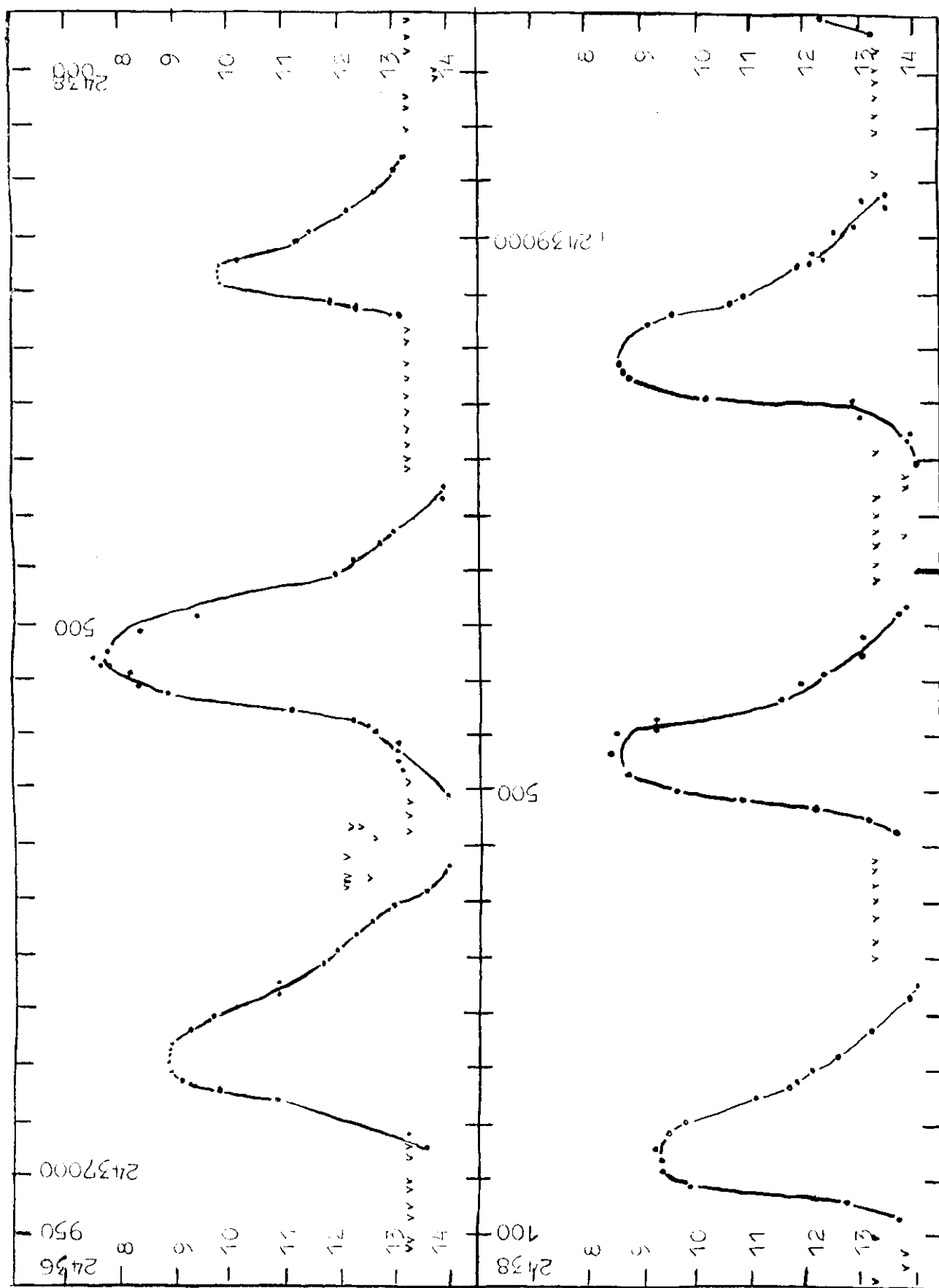


Figure 1: Light Curve of U Hor. from individual observations (2)

FIGURE 1c.

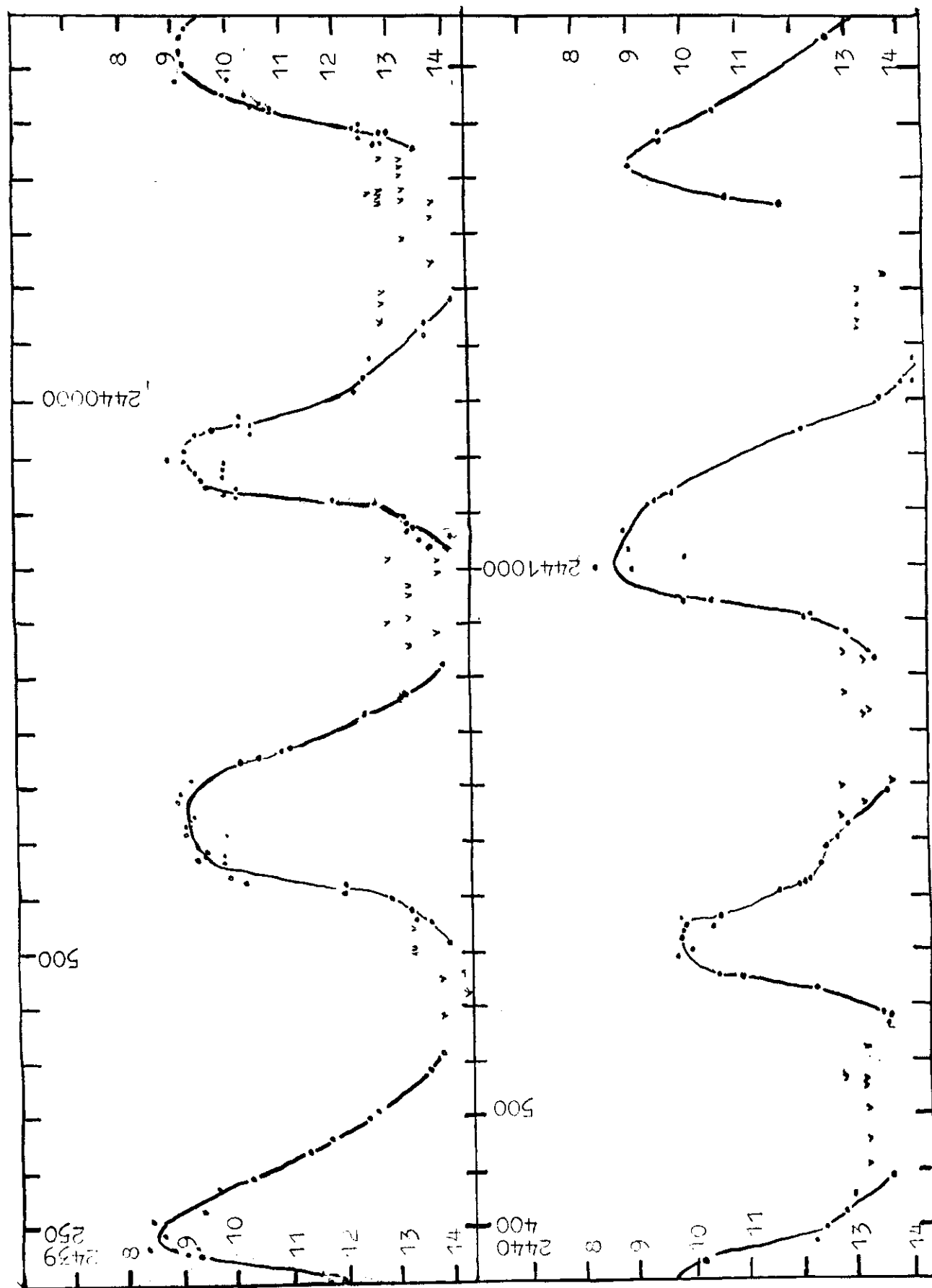


Figure 1: Light Curve of U Hor. from individual observations (3)

FIGURE 1d

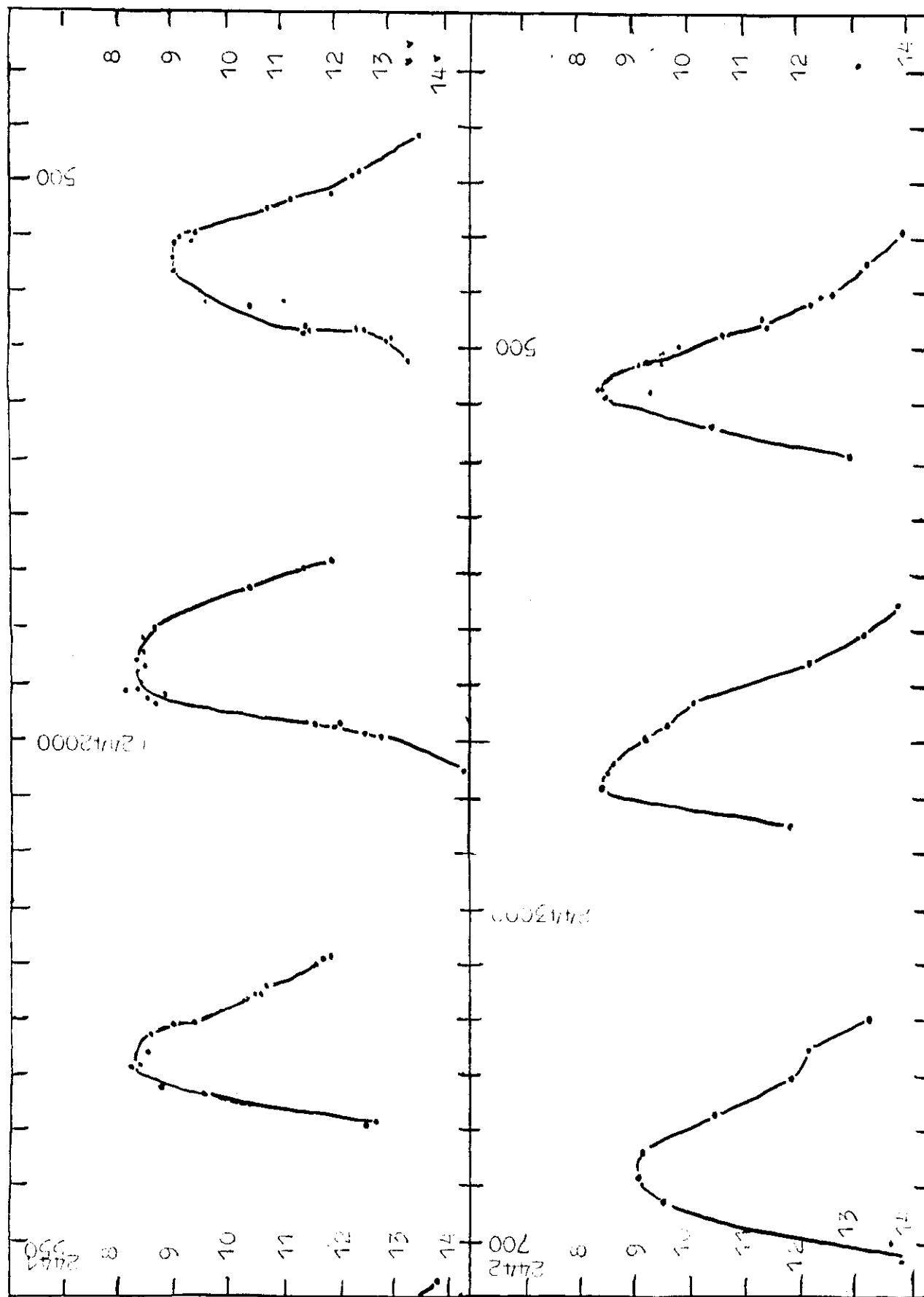


Figure 1: Light Curve of U Hor. from individual observations (4)

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PHOTOELECTRIC UBV SEQUENCES FOR FOUR SUSPECTED RCB STARS

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SUMMARY. Photoelectric UBV data for 34 stars in fields of 4 stars classified RCB or RCB? are given. Y Mus is a known RCB, VZ Sgr and AE Cir are unconfirmed but Z Cir is an Me star.

.....

1. INTRODUCTION

Much of our information on the magnitude variations of the R Coronae Borealis (RCB) stars comes from visual observations. Such data are invaluable for investigation of the irregular and dramatic declines in brightness caused by obscuration and the small amplitude quasiregular variations probably due to pulsation. Analysis of changes in the pulsation rates gives a method for determining both the direction and rate of evolution of these post giant-branch stars (see e.g. Kilkenny 1982) and provides tests for models of stellar pulsation and evolution.

Since there are only about 20 definitely identified RCB stars and not all of these are well-observed, new data is always very useful. Series 14 of the "Charts for Southern Variable Stars" (Bateson, Morel & Sumner 1982) contains several stars classified RCB or RCB?, four of which require additional nearby 'sequence' stars to permit reduction of existing data. At the request of Dr F.M. Bateson, these sequence stars have been measured photoelectrically in the UBV system and the results are listed in Table 1. Y Mus is a known RCB but Z Cir is an Me star (Feast 1965). VZ Sgr and AE Cir are possible but unconfirmed RCBs.

2. OBSERVATIONS

All observations were made in 1983 February-June with the 0.5m and 1m telescopes of the South African Astronomical Observatory. Observations of Cousins' E-region stars (Menzies, Banfield & Laing 1980) enabled reduction of all data to the standard system, with errors in the transformations generally $\leq \pm 0^m.01$. From ten stars observed with both telescopes there seem to be no significant zero-point or colour equation effects between the two systems and the data were therefore merged with uniform weighting. To give an estimate of the accuracy of observations of individual stars in Table 1, the following convention was adopted: where σ , the standard deviation of the mean was $\leq \pm 0^m.015$, three decimal places are quoted, for $\sigma > \pm 0.015$ only two places are given; for $\sigma > \pm 0^m.025$, the appropriate quantity is followed by a colon; for $\sigma > \pm 0^m.05$, the quantity is followed by a double colon. The numbers of observations in the mean is given in column 6 of Table 1 and where there are only two observations, the difference between them rather than the standard deviation is used as the criterion of accuracy.

For the 23 stars brighter than 12th magnitude, the average standard deviations are ± 0.006 , ± 0.005 and ± 0.008 in V, (B-V) and (U-B) respectively (excluding the very poor (U-B) of star 'm' in the VZ Sgr field). The (U-B) measure for the very red star 'm' in the AE Cir field is extremely weak.

The Table 1 stars are designated by letters corresponding to those on the Bateson, Morel & Sumner (1982) charts numbered 602-609 and 612-614 inclusively.

The VZ Sgr field is extremely crowded and, as photometric data were normally obtained with a 21 arcsecond aperture, for several programme stars it proved impossible to exclude faint stars from the aperture. In some cases, these faint stars were only visible with an image intensifier in good seeing and so are unlikely to affect reduction of the visual observations. The 'Note' column of Table 1 indicates when faint stars had to be included in an observation. Because of the high density of faint stars around VZ Sgr, it also proved very difficult to get representative measurements of the sky background. In an attempt to reduce errors from this source, a sky measurement was made after every star (using an image intensifier to select an apparently clear region) but the actual 'sky' subtracted from a 'sky + star' was a smoothed value based on a time-dependent fit to all sky observations in a given region. Essentially, high 'sky' values, where unseen faint stars had obviously been included in the measurement, were rejected.

Star 'm' in the AE Cir field and star 'u' in the VZ Sgr field may be variable but more observations would be required to confirm this.

ACKNOWLEDGMENT

I am grateful to Dr F.M. Bateson for suggesting this work and for the opportunity to contribute in a small way to the visual observation programmes.

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- (4) Menzies, J.W., Banfield, R.M. & Laing, J.D., 1980. SAAO Circ. Vol. 1, No. 5, p 149.

TABLE 1.

<u>FIELD.</u>	<u>STAR</u>	<u>V</u>	<u>(B-V)</u>	<u>(U-B)</u>	<u>N</u>	<u>NOTES</u>
Y Mus 125964	a	10.701	0.212	0.145	2	
	b	11.057	0.146	0.045	2	
	d	8.906	0.340	0.173	2	
	f	9.993	0.241	0.262	2	
	f ¹	10.285	0.170	0.13	2	
	f ²	10.501	0.197	0.029	2	1
	g	10.26	0.096	-0.343	3	
	g ¹	11.315	0.674	0.121	2	
	h	11.268	0.391	0.118	2	
	k	11.455	0.220	-0.262	2	
Z Cir 134369	e	9.599	1.602	1.72:	4	
	f	10.537	0.302	0.23	3	
	g	10.729	0.514	0.138	2	
	h	10.938	0.925	0.690	2	
	k	11.830	0.33	0.211	2	
	n	12.362	1.314	1.27:	3	
	p	14.08::	0.69:	0.13:	4	
	q	12.671	1.396	1.393	2	

TABLE 1 (cont)

<u>FIELD.</u>	<u>STAR</u>	<u>V</u>	<u>(B-V)</u>	<u>(U-B)</u>	<u>N</u>	<u>NOTES</u>
AE Cir	h	12.56	0.317	0.25:	2	
143668	m	13.32::	1.63:	2.5::	2	
	p	14.77::	0.67:	0.16:	2	
VZ Sgr	e	10.149	1.111	0.882	3	
180829	f	10.209	1.203	1.036	3	
	h	10.275	0.628	0.104	2	
	k	10.836	0.716	0.171	2	2
	l	10.936	0.347	0.148	3	
	m	11.05	1.491	1.70::	2	3
	n	11.544	1.240	1.22:	2	
	p	11.727	0.315	0.225	2	1
	q	12.26	1.23:	0.85:	2	
	r	12.53	0.545	0.209	2	3
	s	12.64:	1.11	0.56:	2	2
	t	12.77:	1.15	0.92::	2	2
	u	13.44::	0.79	0.26	2	2

NOTES

1. One faint star included in photometer aperture
2. Two faint stars included in photometer aperture
3. Three faint stars included in photometer aperture

.

PHOTOELECTRIC PHOTOMETRY OF V856 SCORPII & NEARBY
SEQUENCE STARS.

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SUMMARY: Three colour UBV observations are presented of the semi-regular variable star V856 Scorpii and of some of the nearby sequence stars.

1. INTRODUCTION

As a result of a request from the Section Director we have made a number of three colour measurements of the semi-regular variable star V856 Sco. This has a published range of 6.64 to 8.00 V and period of approximately 30 days (1). Additionally several of the nearby field stars have been measured on several nights to confirm a visual sequence for visual variable star observers.

2. OBSERVATIONS

The observations were made using the Griffiths photon detection system with the Mark 1 photometer mechanical section on the Edith Winstone-Blackwell 50cm Cassegrain telescope at the Auckland Observatory. The photoelectric system has been described previously (2).

Figure 1 is a chart of the field showing the variable and the stars observed. This has been prepared from the preliminary chart No. 750 prepared by M. Morel for publication and subsequently published (3) in its final form.

Three stars, HD 143699, HD 143248 and HD 144294, from Cousins & Stoy (4) were used for standardising the observations to the UBV system. HD 143699 (= A in Figure 1) was used as the primary comparison star. HR 6000 (= a) the companion of V856 Sco was used as comparison on two nights when weather conditions deteriorated before comparison A could be measured. Three colour values for 'a' were deduced from the observations on other nights and are given in the notes to Table 1.

Tables 1 and 2 give the three colour observations for V856 Sco and for the measured adjacent field stars.

3. DISCUSSION

V856 Sco shows variations within the published range. Although the observations so far are sparse in number they can be fitted to the approximate period of 30 days. There is sufficient variation in B-V and U-B colours to indicate systematic changes of colour in agreement with the V changes. The mean brightness and colours over the six sets of observations are: $V=7.15$; $B-V=+0.38$; $U-B=+0.31$.

For 'a' the mean magnitude and colours of the five sets of observations are: $V=6.63$; $B-V=-0.08$; $U-B=-0.39$. This is rather brighter than the 7.1 on the preliminary chart but very similar to the mean magnitude of the variable suggesting misidentification between these two close stars. A similar misidentification in the catalogue of Gronbech and Olsen (5) has been pointed out by Anderson et al (6). The error is further repeated in (7) and (8). In clarification V856 Sco (=HR5999 =HD 144668) is the fainter more southerly member of the double formed with 'a' (= HR 6000 = HD 144669).

There is a suggestion in the observations that 'a' has faded slightly during the 50 days observing interval. Further observation is necessary to check this. No significant variability is shown by any of the other measured field stars. Their mean V values are close to the preliminary chart values with a tendency to be about 0.1 magnitudes brighter through the sequence.

Three colour observations of V856 Sco and HR 6000 are being continued during the current observing season.

ACKNOWLEDGMENTS

Assistance with these observations was given by G. Herdman and A.L. Marino.

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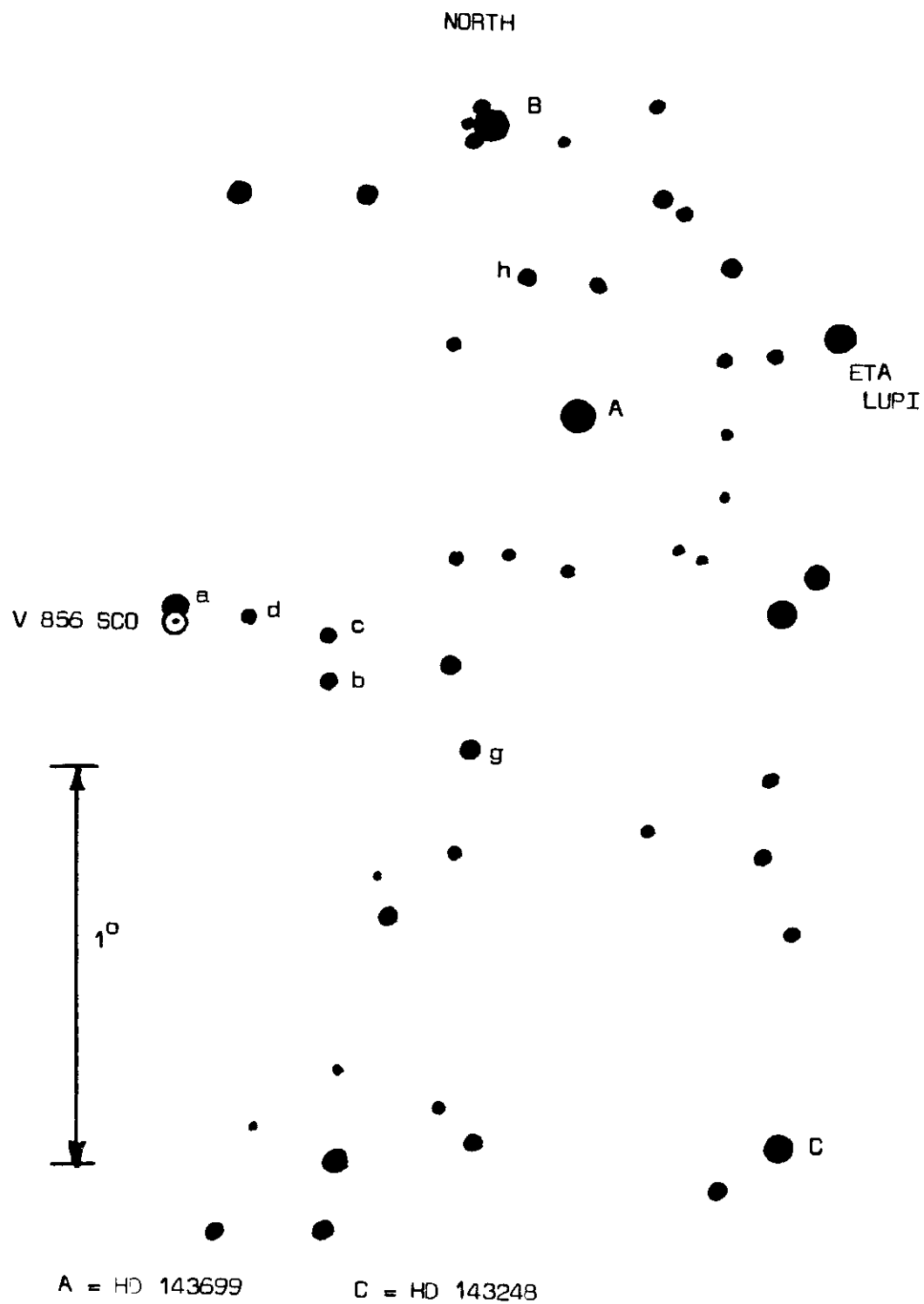


FIGURE 1. Chart of V856 Scorpii field identifying the stars measured photoelectrically.

TABLE 1. Three Colour UBV Observations of V336 Scorpii

J.D. 2445000+	V	B-V	U-B	Comp	Notes
430.960	7.30	+ 0.40	+ 0.35	A	1.
437.812	7.40	0.43	0.33	A	poor conditions
433.312	7.27	0.33	0.32	A	
503.893	7.07	0.35	0.25	a	2.
505.795	6.39	0.35	0.26	A	
530.793	6.37	0.35	-	a	poor conditions

Notes: 1. For 'A' (= HD 143699), $V = 4.98$, $B-V = -0.14$, and $U-B = -0.56$, (Cousins and Stoy, 1963).

2. For 'a' (= HD 144668⁶⁷), deduced $V = 6.63$, $B-V = -0.07$ and $U-B = -0.40$.

TABLE 2. Three Colour UBV Observations of Stars Near V336 Scorpii

Object	J.D. 2445000+	V	B-V	U-B	Comp	Notes
a	430.953	6.60	- 0.08	- 0.40	A	poor conditions
	437.815	6.63	- 0.07	- 0.39	A	
	433.317	6.63	- 0.07	- 0.40	A	
	505.734	6.64	- 0.07	- 0.39	A	
	530.314	6.67	- 0.11	- 0.39	A	
b	437.331	7.31	+ 0.12	+ 0.04	a	poor conditions
	433.319	7.39	+ 0.17	+ 0.02	A	
	503.399	7.35	+ 0.11	+ 0.07	a	
c	437.327	9.02	+ 0.37	+ 0.02	a	poor conditions
	433.317	9.07	+ 0.34	+ 0.06	A	
	503.300	9.02	+ 0.40	+ 0.00	a	
d	433.316	9.23	+ 0.45	+ 0.04	A	
	503.902	9.22	+ 0.30	+ 0.00	a	
g	503.396	6.93	- 0.07	- 0.13	a	
	505.733	6.92	- 0.09	- 0.13	A	
h	530.820	8.30	+ 0.13	+ 0.14	A	
	532.807	8.30	+ 0.14	+ 0.13	A	
B	430.966	6.90	+ 0.37	+ 0.01	A	
	433.326	5.33	+ 0.39	+ 0.00	A	

VISUAL OBSERVATIONS OF V818 SCORPII (Sco X-1) --1974 -1982

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(2) Member, Variable Star Section, R.A.S.N.Z.

SUMMARY: Nine years of visual observations of V 818 Sco are shown to be consistent with the orbital period.

1. INTRODUCTION

V818 Sco has a photographic range of 11.1 to 14.1 (1). In quiescence its maximum and minimum brightness are 12.0V and 13.4V respectively. (2 & 3). The best elements are:

$$\text{J.D.}_{\text{min.}} 2,440,081.13 + 0.^{\text{d}}787313 \text{ E (4).}$$

Many papers have been published on V818 Sco, and (4; 5; 6) should be consulted for references to such papers. There is very rapid flickering in the X-rays on a very short time scale during very active states. Smaller amplitude optical flickering is well correlated with the x-ray flickering (6).

2. OBSERVATIONS

There was a single visual observation in 1973, but regular observing did not commence until 1974 August 16 (J.D. 2,442,276). Observations from that date to 1982 September 10 (J.D. 2,445,223) are discussed in the present paper. All estimates have been reduced according to the sequence shown on charts 386 & 387(7). The contribution of observations by the observers are shown in Table 1 in which negative observations have also been counted.

TABLE 1.TOTALS OF OBSERVATIONS MADE BY OBSERVERS

CRAGG, T.A.	24	
HARRIES-HARRIS, E.	22	
HULL, O.R.	44	
JONES, A.F.	135	
JONES, M.V.	36	
MARINO, B.F.	151	
MATCHETT, V.L.	45	
OVERBEEK, M.D.	98	
PARK, J.	21	
ROWE, G.	74	
TAYLOR, N.W.	177	
WILLIAMS, P.	46	
11 observers with less than	} 50	TOTAL 923
20 observations each		

The main observing season is April through October. A very limited number of observations were made each year in late January, February and March with none in November or December when the field is in conjunction with the sun. The coverage given V818 Sco varied considerably from year to year. Table 2, from which negative observations have been excluded, shows the total observations for each year; the extreme range of magnitudes recorded and the mean magnitude for each year. Table 3 shows the number of estimates for each magnitude recorded during each year.

TABLE 2.

V818 Sco---TOTAL OBSERVATIONS; EXTREME RANGE AND MEAN MAGNITUDE FOR EACH YEAR.

YEAR	TOTAL OBS.	EXTREME RANGE m_v	MEAN MAGNITUDE v
1974	75	11.5 - 13.2	12.26
1975	72	11.4 - 13.2	12.41
1976	35	11.7 - 13.2	12.48
1977	60	11.0 - 13.2	12.42
1978	50	11.9 - 13.2	12.80
1979	71	11.6 - 13.4	12.38
1980	164	11.4 - 13.6	12.42
1981	166	11.0 - 13.8	12.47
1982	215	11.3 - 13.3	12.44

TABLE 3

V818 Sco---YEARLY NUMBER OF OBSERVATIONS FOR EACH MAGNITUDE.

MAG. v	1974	1975	1976	1977	1978	1979	1980	1981	1982	TOTALS
11.0	...	...	...	1	...	...	...	1	...	2
11.1	...	...	...	...	...	...	...	1	...	1
11.2	...	...	...	...	...	...	...	...	...	...
11.3	...	...	...	...	...	...	...	...	1	1
11.4	...	1	...	1	...	...	3	4	3	12
11.5	2	...	...	...	...	...	...	1	3	6
11.6	8	3	...	1	...	2	2	4	4	24
11.7	8	5	3	2	...	6	3	6	2	35
11.8	2	5	...	1	...	2	5	5	8	28
11.9	5	3	3	1	2	2	10	6	2	34
12.0	2	1	1	1	...	5	6	7	18	41
12.1	3	4	...	3	2	5	5	5	4	31
12.2	2	5	1	8	...	6	8	9	22	61
12.3	1	...	...	...	...	2	13	4	10	30
12.4	8	10	9	10	1	6	21	15	21	101
12.5	2	...	...	1	...	3	13	5	15	39
12.6	20	7	6	12	8	16	30	27	26	152
12.7	3	6	2	7	9	8	17	22	20	94
12.8	5	8	4	4	4	1	14	13	29	82
12.9	1	3	3	2	6	1	7	9	14	46
13.0	2	8	2	...	2	...	3	8	7	32
13.1	...	...	...	4	13	2	2	7	2	30
13.2	1	3	1	1	3	2	...	5	1	17
13.3	...	...	...	...	...	...	...	...	3	3
13.4	...	...	...	...	...	2	1	...	...	3
13.5	...	...	...	...	...	...	...	...	...	...
13.6	...	...	...	...	...	...	1	1	...	2
13.7	...	...	...	...	...	...	...	...	...	...
13.8	...	...	...	...	...	...	...	1	...	1
TOTALS	75	72	35	60	50	71	164	166	215	908

3. DISCUSSION

The observations are given in Table 5, where a bracket preceding a magnitude is to be read as "fainter than". We plotted these both on an enlarged scale as individual points, and on a smaller scale as ten days means. We found that for the former there were only a limited number of nights on which there were sufficient observations to enable the times of minima to be determined with a reasonable degree of accuracy. The purpose in plotting ten day means was to see whether there was any longer cycle of either increasing, or decreasing, activity. This appeared to be the case at times but we concluded that it was purely an observational effect due to the fact that in the main observing months most observers tended to observe at much the same time each night. This meant that the observations were at different phases and hence showed a steady increase, or decrease, in brightness over a number of nights giving a false impression of a longer term variation.

In plotting the individual results we had to bear in mind the defects that are inherent in visual observations, causing most observers to have a small systematic deviation in the sense that some tend to have estimates that are slightly too bright, whilst other observers tend generally to be systematic too faint. For variables with long periods, such as Miras, these factors cancel each other out so that ten day means give an accurate picture of the true variation. However, with short period variations these factors become more important especially when there are few observations on the one night. An additional drawback with the observations of V818 Sco was that usually the times recorded were given only to two decimals of a day. This combined with the lack of many observations on any one night made it difficult to determine the exact time of minima.

We therefore limited our determination of minima to those which could be found with reasonable accuracy. The results are given in Table 4, where the first column gives the cycle number; the second column the estimated time of minimum. The third column gives the estimated magnitude at minimum whilst the last column gives the O-C residuals calculated on the basis of the elements quoted on page 35, but rounded off to two decimal places which is the limit of accuracy possible from the observations.

TABLE 4.

ESTIMATED TIMES OF MINIMA OBSERVED FOR V818 SCORPII.

<u>CYCLE</u>	<u>OBSERVED MINIMA</u> J.D.	<u>MAG.</u> V	O-C d
5947	2,444,763.20	12.8	-0.08
5950	765.5	13.0?	-0.14
5964	776.82	13.1	+0.15
5965	777.32	13.8	-0.13
5968	779.80	12.9	-0.01
5977	786.90	13.1	+0.00
5979	788.26	13.6	-0.21
5986	793.91	13.2	-0.08
5990	797.24	13.0	+0.10
6003	807.40	13.2	+0.03
6005	808.93	13.0	-0.01
6049	843.64	13.2?	+0.05
6053	846.73	13.0	-0.01
6081	868.81	13.0	+0.03
6295	2,445,037.21	13.3	-0.05
6414	130.80	13.3	-0.15
6499	197.79	13.3	-0.09

The mean O-C is 0.077^d showing that the observations are at least consistent with the orbital period. Naturally the minima listed in Table 4 are from the more recent years when observations were more numerous. We did not consider that the observations warranted reduction to phases given the drawbacks we have already pointed out.

4. CONCLUSIONS

It is shown that visual observations of V818 enable determination of the orbital period to be determined with reasonable accuracy. Observers are requested to make more frequent observations of this x-ray source and to provide more precise times for their observations, preferably to four decimals of a day. The extreme visual range of V818 Sco is 11.0 to 13.8 but the normal range is 11.6 to 13.2. The mean magnitude for successive observing seasons varied from 12.26 to 12.80, possibly reflecting different levels of activity but certainly affected by the number of observations each year.

ACKNOWLEDGMENTS

We are indebted to the observers for their observations, made with such skill and accuracy.

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TABLE 5.
OBSERVATIONS OF V818 SCORPII.

2441000 +		2442000 +		2442000 +		2442000 +	
779.90	12.0	310.90	11.7	578.90	12.7	697.91	11.8
2442000 +		311.88	11.7	593.92	12.8	699.89	11.8
276.88	12.6	313.88	12.6	599.92	12.6	710.91	12.4
276.90	12.5	314.88	(12.4	601.08	12.6	854.31	(11.4
277.90	12.9	315.88	12.7	602.99	11.7	889.96	11.9
277.92	13.0	315.89	12.7	605.97	13.2	903.01	12.7
278.88	12.8	315.91	12.6	606.87	12.4	904.94	12.2
278.97	13.0	316.91	12.4	606.92	12.7	916.98	12.4
279.89	11.6	317.89	12.5	607.00	12.6	918.90	11.7
279.94	11.6	318.88	12.6	609.07	11.9	933.95	12.8
280.90	12.4	319.88	12.7	614.91	11.9	965.91	12.4
280.93	12.6	319.89	12.6	618.92	12.0	976.91	12.9
286.91	12.6	321.88	11.9	621.91	11.6	979.88	12.4
288.90	12.6	322.88	11.6	622.95	12.8	979.94	12.6
290.88	12.0	323.89	11.9	625.02	13.0	981.90	12.9
290.89	12.4	325.92	11.7	625.95	12.8	990.93	12.6
292.01	11.8	326.89	12.1	626.06	13.0	994.94	12.9
292.90	12.6	327.88	11.7	629.98	13.0		
293.88	12.4	327.89	12.6	630.94	12.4	2443000 +	
293.90	12.4	329.88	11.6	630.95	12.2	002.90	12.0
294.89	11.6	329.89	11.7	630.99	11.6	005.89	12.6
294.90	11.7	329.89	12.4	634.02	12.8	007.94	12.4
294.92	12.4	331.89	12.6	634.98	13.0	011.91	12.6
296.90	11.6	333.90	11.7	635.98	12.4	018.92	12.4
296.92	11.8	334.91	11.9	636.89	12.7	027.92	11.7
296.93	11.6	336.90	11.9	636.95	12.6	031.92	12.4
297.90	11.5	338.89	11.7	637.92	12.4	033.92	13.0
297.91	12.2	339.89	12.6	640.91	13.0	033.92	11.9
297.98	12.6	340.87	12.8	640.97	13.0	036.92	12.4
						036.96	11.7
298.94	12.6	432.84	11.7	641.89	12.8	039.92	12.4
299.88	12.1	434.23	11.9	642.91	12.2	040.90	12.6
299.90	11.5	438.25	12.6	648.88	12.8	042.88	12.8
299.91	12.0	452.27	11.7	648.89	12.4	043.91	12.4
301.89	12.6	473.25	11.7	648.91	12.8	044.92	13.0
302.89	12.8	488.08	12.1	649.89	12.9	045.90	13.2
302.92	12.6	493.16	12.9	649.92	13.2	047.93	12.6
303.88	12.2	494.24	12.9	651.92	13.0	060.90	12.8
303.89	12.3	506.03	12.1	652.97	12.2	061.91	12.8
304.89	12.6	512.00	11.8	653.95	13.0	067.90	11.9
304.89	12.4	520.26	12.6	656.93	13.2	075.89	12.7
305.89	12.6	520.98	12.2	662.95	12.7	252.00	12.8
306.89	12.6	540.01	12.2	665.91	12.1	254.98	12.4
306.89	12.8	542.06	11.6	672.94	12.7	256.00	11.8
306.96	12.6	545.93	12.6	674.94	12.1	271.97	12.6
307.88	11.6	548.93	12.7	677.91	11.8	272.90	12.4
307.92	13.2	552.92	12.4	681.94	11.7	274.92	11.9
308.88	11.9	563.97	12.4	687.90	12.4	275.10	11.7
309.88	12.1	569.90	12.4	690.90	12.8	283.95	12.9
309.92	12.8	575.94	11.4	692.89	11.8	284.91	12.2

TABLE 5 (cont)

V818 SCO.

2443000 +		2443000 +		2443000 +		2444000 +	
285.92	12.6	434.89	12.7	784.95	12.6	113.83	12.5
287.90	12.8	437.90	12.2	786.90	12.8	122.93	12.7
287.90	12.5	438.92	(12.4	786.93	12.6	125.91	12.1
299.89	12.7	565.19	12.9	791.83	13.1	126.87	12.6
301.93	12.7	586.14	13.1	791.84	(12.4	126.89	12.0
303.00	(12.4	589.17	13.1	804.92	11.9	128.83	13.4
306.92	12.6	591.16	13.2	902.16	12.7	129.92	(12.4
306.94	12.1	605.06	13.1	910.11	11.7	131.90	12.3
308.00	12.4	605.13	12.8	938.12	12.7	131.96	12.4
308.92	12.6	611.05	12.7	964.16	11.6	134.86	12.0
310.92	12.8	620.10	12.8	991.11	12.7	136.83	12.6
314.86	12.4	621.25	(11.4	995.10	12.6	136.93	12.4
331.81	13.1	634.95	13.1	996.99	12.7	138.83	12.8
333.81	13.1	637.82	13.2	998.15	13.4	139.84	11.7
335.02	12.2	638.92	13.1	2444000 +		139.85	11.7
336.84	11.0	656.92	13.1	010.90	12.6	141.85	12.0
336.99	12.6	657.81	12.9	012.88	12.4	141.85	12.2
341.00	12.6	658.86	12.7	015.84	12.0	141.87	12.6
342.89	12.4	658.89	12.7	015.93	12.6	142.83	(13.4
344.91	12.9	661.85	13.1			142.86	12.0
345.93	12.2	664.90	12.7	017.94	12.7	145.85	11.7
347.00	12.6	665.82	12.7	027.91	12.6	152.83	12.1
361.82	12.4	667.00	12.9	031.96	12.6	154.83	12.2
362.82	12.6	668.84	13.1	038.93	13.1	156.82	12.2
363.92	12.7	669.90	12.9	040.89	13.2	156.85	12.2
364.92	12.6	682.80	13.0	045.96	12.3	156.89	12.6
365.90	12.6	682.90	12.6	048.91	13.2	159.91	12.6
366.00	12.4	684.93	12.6	049.00	13.1	161.83	12.2
367.82	12.7	685.84	12.7	056.97	12.4	167.84	11.9
369.90	12.7	686.84	13.0	058.92	12.6	168.84	11.7
371.00	12.7	687.82	12.6	058.93	12.2	170.82	(11.4
371.83	13.1	688.82	12.7	066.83	12.4	171.83	11.9
371.95	12.1	692.80	13.2	066.86	12.6	173.83	(11.6
389.82	13.1	694.84	12.7	073.80	12.6	260.14	12.3
392.00	12.5	697.89	12.9	074.85	12.5	276.17	12.3
394.90	12.4	699.00	12.6	077.83	12.7	286.18	12.7
394.96	12.2	699.83	13.1	080.80	11.8	296.19	12.7
396.92	12.1	708.99	(11.4	081.85	12.6	311.19	12.5
399.90	12.0	714.81	12.6	083.80	12.7	314.18	12.4
402.90	11.6	718.92	13.1	084.80	12.6	320.04	12.4
408.81	13.2	719.92	12.9	095.83	12.5	322.23	12.5
422.90	11.7	726.84	12.7	099.89	12.1	325.18	12.6
423.92	12.4	728.94	12.1	100.00	12.4	338.00	13.0
424.91	11.4	730.94	12.8	100.85	12.6	340.00	12.4
426.82	12.2	740.90	12.1	101.82	11.7	341.00	12.0
427.91	12.2	751.00	13.1	101.85	11.6	341.96	12.5
428.91	12.6	751.90	12.4	103.84	12.1	342.02	12.4
429.92	12.6	753.92	11.9	104.91	11.8	343.96	12.6
430.90	12.4	758.90	12.6	105.86	12.9	344.97	12.6
433.89	12.2	783.83	13.1	111.84	12.1	345.96	12.9

TABLE 5 (cont)

V818 SCO.

2444000 +		2444000 +		2444000 +		2444000 +	
346.99	13.0	409.84	12.5	461.95	12.1	515.95	11.4
349.19	12.9	409.94	12.3	461.97	11.8	516.93	12.4
351.97	11.9	411.94	12.8	463.94	11.8	518.94	12.7
352.23	12.4	412.00	13.6	464.92	11.8	520.90	12.2
354.91	(11.6	412.95	12.8	465.79	12.4	637.15	12.3
361.00	12.7	420.92	12.5	466.88	11.9	643.18	12.7
365.06	(11.4	421.80	11.8	467.87	12.0	665.53	12.6
365.93	12.8	424.81	12.5	467.87	12.6	675.21	12.8
367.98	13.1	425.85	12.6	468.94	12.3	678.10	12.2
368.05	(12.4	426.87	11.7	469.00	11.7	692.23	12.9
369.32	11.6	426.89	12.6	472.97	12.7	696.20	12.7
369.91	12.7	426.90	12.1	475.87	12.4	711.20	12.3
370.25	11.9	427.89	12.8	477.88	12.2	718.96	12.9
370.94	12.6	427.94	12.8	478.89	12.3	721.93	12.8
371.90	12.2	430.92	12.4	479.90	12.7	722.02	12.8
372.88	12.9	432.95	12.6	480.91	12.0	725.53	12.4
372.98	12.6	433.81	12.8	480.92	(13.4	725.92	12.7
374.02	12.2	433.90	12.6	481.91	12.4	727.93	13.0
374.05	11.9	434.90	12.6	481.91	12.3	733.59	12.2
375.01	11.9	436.82	11.7	482.81	12.3	738.25	12.4
375.23	12.6	436.92	12.6	482.82	12.2	747.86	12.7
376.97	12.9	436.98	11.4	482.90	12.0	749.94	12.7
378.00	12.1	437.79	11.6	482.94	12.2	752.82	12.6
378.88	12.3	439.83	12.7	482.95	12.3	752.94	12.6
379.88	12.9	439.89	12.6	483.90	12.6	756.93	12.7
380.85	12.9	440.90	12.4	484.81	12.1	763.30	12.6
381.87	12.8	441.91	11.9	484.86	11.9	763.79	11.9
384.91	12.7	444.80	12.7	485.95	(12.4	764.92	12.2
386.89	12.5	446.87	12.6	485.96	12.6	764.96	12.6
387.24	12.0	447.79	12.2	486.95	(13.4	765.85	12.4
387.90	(12.4	449.79	11.8	487.83	12.8	766.80	11.8
392.93	12.4	450.82	11.9	487.95	13.4	775.81	12.1
395.81	12.6	450.84	12.4	489.87	12.0	776.82	13.1
395.88	12.6	452.84	(13.0	489.93	12.7	777.32	13.8
397.88	12.6	453.90	13.1	489.94	12.4	777.85	12.0
398.79	12.5	453.98	12.6	490.00	12.6	778.80	12.6
399.92	12.4	454.81	12.9	490.95	12.8	778.91	12.7
399.95	12.6	454.84	12.8	492.86	12.7	779.76	12.1
400.80	12.6	454.94	12.8	492.96	12.3	779.80	12.9
400.91	12.3	454.95	12.4	493.82	12.7	779.85	12.6
402.81	12.6	455.83	12.7	493.90	12.2	779.89	12.9
403.78	12.6	456.00	12.5	495.90	12.8	780.29	12.5
404.84	12.5	456.82	12.7	496.81	12.6	780.80	12.5
405.77	12.8	456.95	12.6	503.83	11.9	780.93	11.8
405.87	12.5	458.79	12.1	510.81	12.6	781.91	12.6
406.94	12.5	458.84	12.3	510.84	12.6	784.85	12.4
407.78	12.7	458.92	11.9	510.96	12.4	784.92	12.7
407.96	12.4	459.83	12.3	511.84	12.8	785.76	11.0
408.80	12.4	459.94	12.7	511.95	12.4	786.75	11.9
408.93	12.4	461.81	12.5	512.93	11.4	786.90	13.1

TABLE 5 (cont)

V818 SCO.

2444000 +		2444000 +		2444000 +		2445000 +	
787.94	12.6	824.28	11.4	870.91	12.5	050.19	12.4
788.26	13.6	828.81	13.0	871.94	12.4	054.11	12.7
788.76	11.7	829.79	12.4	872.86	(13.0	054.19	12.9
788.83	11.7	830.82	12.7	872.88	12.4	055.08	11.9
788.90	12.8	832.91	12.6	872.90	12.6	055.19	12.7
788.95	12.7	833.79	13.2	873.89	12.4	055.64	12.6
789.77	12.1	833.93	12.9	875.94	12.7	056.15	12.8
789.80	11.6	835.90	11.9	876.84	12.6	057.09	12.9
789.82	12.6	836.80	12.2	876.95	12.4	058.42	11.8
789.94	12.7	836.91	11.8	877.85	11.8	060.51	12.6
791.26	12.7	837.84	12.5	877.85	12.2	061.11	12.6
791.81	11.9	839.00	11.6	878.82	12.0	062.14	12.6
791.89	12.9	841.81	12.6	878.85	11.9	062.20	13.0
792.76	12.7	841.96	12.0	879.23	12.4	066.24	12.9
792.78	12.6	842.81	11.7	879.83	(12.7	071.45	12.5
792.85	11.7	842.83	12.2	882.25	12.8	075.00	12.7
793.75	12.7	843.82	12.6	882.93	12.8	075.93	12.2
793.80	13.1	843.82	12.7	883.24	12.8	076.57	12.8
793.84	13.1	843.91	12.6	884.83	13.1	077.07	12.6
793.91	13.2	843.93	12.4	884.84	(12.4	079.32	12.6
794.80	12.6	844.82	11.6	884.93	(11.4	080.65	12.0
794.98	12.8	844.83	12.6	885.83	13.0	081.90	12.3
796.86	11.6	845.25	11.4	885.83	12.7	084.25	12.3
797.24	13.0	845.83	11.7	886.82	(12.6	085.92	12.7
797.78	12.0	845.83	12.8	887.83	(12.6	088.97	12.2
802.80	12.6	846.83	12.6	892.82	12.4	089.34	11.8
804.21	12.4	847.00	11.9	892.94	11.4	091.25	12.3
804.80	12.4	847.27	12.0	894.94	12.4	094.21	12.6
805.86	12.7	848.23	12.2	898.94	12.5	094.96	12.8
806.24	13.1	848.81	(12.6	901.90	12.2	103.61	11.4
806.81	12.8	848.82	12.2	992.16	12.2	104.90	12.2
806.89	12.9	849.24	12.3	999.17	12.3	105.56	11.3
807.27	13.2	850.00	12.1	2445000 +		106.40	12.2
807.82	12.8	850.27	11.4	001.18	12.5	106.87	12.2
808.93	13.0	852.22	13.0	004.60	11.6	107.08	12.5
810.96	11.1	854.25	(12.4	006.17	12.5	107.26	12.7
811.79	12.7	858.81	12.7	008.19	12.9	108.60	11.5
811.81	12.6	863.88	12.6	014.19	12.9	109.05	12.2
812.00	12.6	864.27	(12.4	019.10	12.2	110.07	11.6
815.80	13.1	864.81	11.8			110.29	12.2
815.95	13.0	864.81	12.0	021.09	12.8	110.62	11.5
816.84	12.7	864.90	11.5	029.52	12.8	110.92	12.2
818.82	12.6	865.81	11.7	036.07	12.0	111.25	12.4
818.85	12.9	865.82	12.8	036.60	12.4	112.91	12.4
819.89	13.2	867.24	(12.4	037.21	13.3	113.05	12.2
820.79	13.2	867.85	12.7	040.15	12.2	113.30	12.2
820.82	12.9	868.81	13.0	043.18	(12.4	113.97	12.6
821.81	12.8	868.85	12.6	048.06	12.6	114.00	12.4
823.00	12.1	869.95	12.6	048.57	12.8	114.28	12.8
823.39	12.0	870.85	12.3	049.18	12.0	115.90	12.6

TABLE 5 (cont)

V818 SCO.

2445000 +		2445000 +		2445000 +		2445000 +	
116.27	12.8	146.35	12.5	171.80	13.0	199.94	12.4
120.01	12.6	146.81	12.4	171.87	12.2	200.00	11.7
129.80	(13.0	147.81	12.3	172.03	12.0	200.82	12.6
129.90	12.7	148.26	12.6	172.21	13.0	200.82	11.6
130.80	13.3	148.90	12.8	172.81	12.9	201.29	12.4
130.83	12.7	149.26	12.4	172.88	12.6	202.28	11.8
132.80	12.5	149.78	12.6	172.99	12.2	202.82	12.4
132.82	12.1	151.81	12.2	173.80	13.2	202.87	11.6
133.78	12.6	159.78	12.8	173.88	12.6	203.83	12.0
134.25	12.4	159.84	12.0	174.24	12.8	203.95	11.8
134.80	12.5	160.23	12.0	174.80	12.4	204.00	11.9
134.87	12.5	160.80	12.7	175.81	12.7	204.21	11.4
135.79	12.4	161.22	12.2	175.98	11.8	205.00	11.7
137.04	12.9	161.31	12.4	176.27	11.8	205.26	12.0
137.27	12.9	161.80	12.6	176.79	12.5	205.82	12.8
137.79	12.6	161.91	12.0	176.91	12.2	205.87	12.2
138.36	12.0	162.20	12.0	178.32	12.8	206.23	12.2
138.86	12.9	162.80	12.3	187.80	12.6	206.81	12.0
138.96	12.7	162.90	12.7	187.82	12.6	207.23	12.4
139.23	12.9	163.24	12.7	187.87	12.0	207.86	(12.4
139.78	13.0	163.80	12.3	188.83	12.4	208.80	(12.8
140.07	12.7	163.90	12.3	190.27	11.8	210.81	13.0
140.25	12.8	164.22	12.4	190.91	12.6	212.81	12.0
141.21	12.4	164.87	13.1	191.88	12.8	214.81	13.0
141.28	12.8	165.39	12.4	191.19	12.0	215.88	12.8
141.94	13.0	165.78	13.0	192.23	12.8	218.81	12.5
142.27	12.8	165.82	12.6	194.19	12.0	219.23	12.2
142.34	12.4	166.25	12.8	194.90	12.1	220.27	12.0
143.00	12.5	166.79	12.8	194.90	12.5	220.88	12.7
143.04	12.7	166.85	12.7	195.30	12.2	221.20	11.4
143.23	12.8	166.97	12.9	195.80	12.3	221.83	12.9
143.80	12.7	167.96	12.5	196.26	12.1	222.26	11.8
143.89	12.9	168.27	12.8	197.24	12.8	223.23	12.5
144.39	12.8	168.79	12.7	197.79	13.3	223.81	12.6
144.79	(12.8	169.32	12.9	197.90	12.3		
145.31	12.0	170.23	12.8	198.23	12.8		
145.80	12.6	170.80	12.8	198.81	12.7		
145.90	12.8	171.25	12.6	199.88	11.5		

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THE SEMI-REGULAR VARIABLE, RX RETICULI

A.W. Dodson
(Variable Star Section, R.A.S.N.Z.)

SUMMARY: The light curve of the semi-regular variable, RX Ret is presented covering 18 years of visual observations. A period of about 75 days was found on which there appears to be superimposed a second wave with a period of approximately 170 days. Both the amplitude and form of the light curve vary so that the primary period is not always well expressed.

1. INTRODUCTION

RX Ret is classified SRd with a photographic range of 9.1 to 11.2, and with the spectral class, KO (1). RX Ret = CoD -67^O213 = CPD -67^O258 = HD 24308 = HV 11960 = S4823.

Boyce (2) discussed 1,605 photographic observations covering 50 years. These suggested two superimposed periods. However, she commented that even the main period was not regular enough to yield a solution. Her paper appears to be the only previous discussion of RX Ret.

2. OBSERVATIONS

There are available for discussion 916 visual observations made by members of the Variable Star Section, Royal Astronomical Society of New Zealand. These cover the interval J.D. 2,439,623 to 2,445,076 (1967 May 12 to 1982 April 16). Table 1 shows the observations contributed by the individual observers.

TABLE 1

OBSERVERS'S ESTIMATES OF RX RETICULI

CHRISTIE, G.W.	21	MARINO, A.	29
CRAGG, T.A.	16	MARINO, B.F.	43
CROMPTON, A.	50	MATCHETT, V.L.	11
DODSON, A.W.	12	McMILLAN, S.	11
FISHER, D.C.	35	OVERBEEK, M.D.	104
GILLER, R.H.	16	PATERSON, D.	17
HARRIES-HARRIS, E.	11	ROWE, G.	25
HOVELL, S.	19	TREGASKIS, B.	13
HULL, O.R.	126	VENIMORE, C.	233
JACKSON, M.G.	13	WALKER, W.S.G.	12
JONES, M.V.	23		
LAUDER, S.	16		
28 observers with less than 10 obs. each			<u>60</u> TOTAL 916

All estimates were made using chart No. 67 (3) and the sequence of comparison stars shown thereon.

3. LIGHT CURVE

The observations were grouped into ten day means, which were plotted. The number of estimates in each mean varied from one to eleven. The light curve appears in Figures 1a and 1b, in which crosses represent means dependent on a single observation; open circles means from 2 or 3 estimates, and filled circles means from four, or more, observations.

No attempt has been made to draw a smoothed curve through the plotted points, because of the nature of the variations. Instead the variations are shown by connecting the plotted points.

The vertical scale of the light curve is 10mm = 1 magnitude, and 20mm = 100 days on the horizontal, with divisions at every 50 days. Julian Dates, at 100 day intervals, are shown at the bottom of the light curve with the middle and end of each calendar year shown along the top.

4. DISCUSSION

The amplitude varies considerably, and at times is about 0.5 magnitudes, which only exceeds the probable error of the observations by 0.3 magnitudes. This makes it difficult to decide on which points should be regarded as maxima or minima when the amplitude is small. This also means that the period is well expressed at times, whilst during other intervals it is very poorly expressed.

Observed dates of maxima and minima are given in Table 2. These have been determined with greater weight given to those for which there were several observations in the means. Consideration was also paid to those means that were not dominated by one observer. For both maxima and minima the Table gives the observed dates, magnitude and interval, in days, between successive maxima or minima. A running number has been assigned to each maximum irrespective of whether it was considered to be consecutive or not. In the latter case the interval is enclosed in brackets. Columns 5 and 9 give respectively the interval, in days, between the preceding minimum and the maximum, and the interval, in days, between the preceding maximum and the minimum. The dates which are followed by magnitudes given to hundredths are considered more reliable than those where the magnitude is given to tenths.

The mean maximum magnitude, from the 30 most reliable determinations, is 8.33 with a range of 7.80 to 8.97. The mean minimum magnitude, from 23 most reliable minima, is 9.11, with a range of 8.46 to 9.75.

Details of the period are:

From Maxima Mean $76^d.3$. Range 49 to 119 days

From Minima Mean 73.0 Range 44 to 120 days

A period of about 75 days appears to be the best value. A second variation is apparent at times with an approximate period of 170 days. This becomes difficult to notice when the amplitude is small.

The mean interval between minima and the following maxima is $41^d.7$, and, between maxima and the following minima is $38^d.4$.

5. CONCLUSIONS

RX Ret is a typical SRd variable with a semi-regular period of about 75 days on which, at times, there appears to be superimposed a second period of approximately 170 days. Both periods are often poorly expressed. The mean range is 8.33 to 9.11 but the amplitude varies considerably.

ACKNOWLEDGMENTS

I wish to thank the observers for their records. I am also indebted to Frank Bateson for his encouragement, assistance and guidance, without which this paper could not have been written.

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TABLE 2.

OBSERVED MAXIMA & MINIMA OF RX RETICULI

No.	MAXIMA				MINIMA			
	J.D. 24.....	MAG _v	INT _d	M-m _d	J.D. 24.....	MAG _v	INT _d	m-M _d
1	39,833	7.4	...	...	39.860	8.8	...	27
2	886	8.23	53	26	909	8.65	49	23
3	940	8.17	54	31	980	8.90	71	40
4	40,026	8.0	86	46	40,061	8.7	81	35
5	099	8.3	73	38	141	9.2	80	42
6	210	8.08	111	69	261	8.85	120	51
7	307	8.25	97	46	370?	(9.0	109	63
8	527	8.27	(220)	(157)	580	8.75	(210)	53
9	601	8.32	74	21	641	8.87	61	40
10	710	8.46	109	69	733	9.0	92	23
11	800?	8.2?	90	67	888	9.0	(155)	88
12	971	8.46	(171)	83	41,000	8.76	112	29
13	41,024	8.5	53	24	044	8.80	44	20
14	269	8.65	(245)	(225)	301	8.92	(257)	32
15	328	8.50	59	27	361	9.43	60	33
16	400	8.37	72	39	427	9.6	66	27
17	560?	8.0?	(160)	(133)	611	8.8	(184)	51
18	633	8.1	73	22	674	9.55	63	41
19	690	8.81	57	16	743	9.55	69	53
20	42,031	8.0	(341)	(288)	42,093	8.46	(350)	62
21	131	7.96	100	38		...	...	...
22	250?	8.3?	119	...	278	9.1	...	28?
23	355	8.1	105	77	419	9.54	(141)	64
24	459	7.80	104	40	483	9.34	64	24
25	537	7.97	78	54		...	...	...
26	800?	8.25	(263)	...	819	8.6	...	19
27	860	8.23	60	41	890	9.60	71	30
28	919	8.83	59	29	986	9.3	96	67
29	43.021	8.5	102	35	43,053	9.0	67	32
30	080	8.3	59	27	109	8.90	56	29
31	131	8.40	51	22	164	9.52	55	33
32	199	8.97	68	35	229	9.23	65	30
33	488	8.43	(289)	(259)	580	9.75	(351)	92
34	630	8.23	(142)	50	655	9.8	75	25
35		...	...	...	805	9.0	(150)	...
36	859	8.15	...	54	881	8.95	76	22
37	920	8.07	61	39	966	9.0	85	46
38	992	8.23	72	26	44,020	8.8	54	28
39	44,047	8.3	55	27	172	9.6	(152)	125
40	231	7.90	(184)	59	275	9.0	103	44

TABLE 2 (cont)

No.	MAXIMA				MINIMA			$\frac{m-M}{d}$
	$\frac{J.D.}{24\dots\dots}$	$\frac{MAG}{V}$	$\frac{INT}{d}$	$\frac{M-m}{d}$	$\frac{J.D.}{24\dots\dots}$	$\frac{MAG}{V}$	$\frac{INT}{d}$	
41	44,335	8.4	104	60	...	...	...	...
42	588	8.67	(253)	...	44,609?	9.7	...	21
43	647	8.35	59	38	677	9.34	68	30
44	701	8.57	54	24	721	8.95	44	20
45	750	8.5	49	29	771	9.2	50	21
46	818	8.5	68	47	848	9.0	77	30
47	883	8.5	65	35	927	8.85	79	44
48	45,000	8.42	117	73		...	...	...

THE LIGHT CURVE APPEARS ON PAGES 49 & 50.

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COLOURS FOR THE VARIABLE STAR V384 CARINAE
(Venimore's Star)

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SUMMARY: Three colour UBV observations of V384 Car confirm the conclusions from visual observations that this star is probably a semiregular or irregular pulsating variable.

1. OBSERVATIONS

Venimore (1,2) has described visual observations of V384 Car during the interval J.D. 2,441,066 to 2,444,900. His data show a semi-regular variation of approximately 1.2 magnitudes mean range, and he derived the ephemeris for minimum light of, J.D. 2,442,198 + 355.5 days.

Following receipt of Publication 10 (C82) we have made two sets of three colour UBV observations to estimate an approximate spectral type for the star. The Auckland Observatory 50cm telescope and Mark 1 photoelectric photometer in photon detection mode were used for the observations (3).

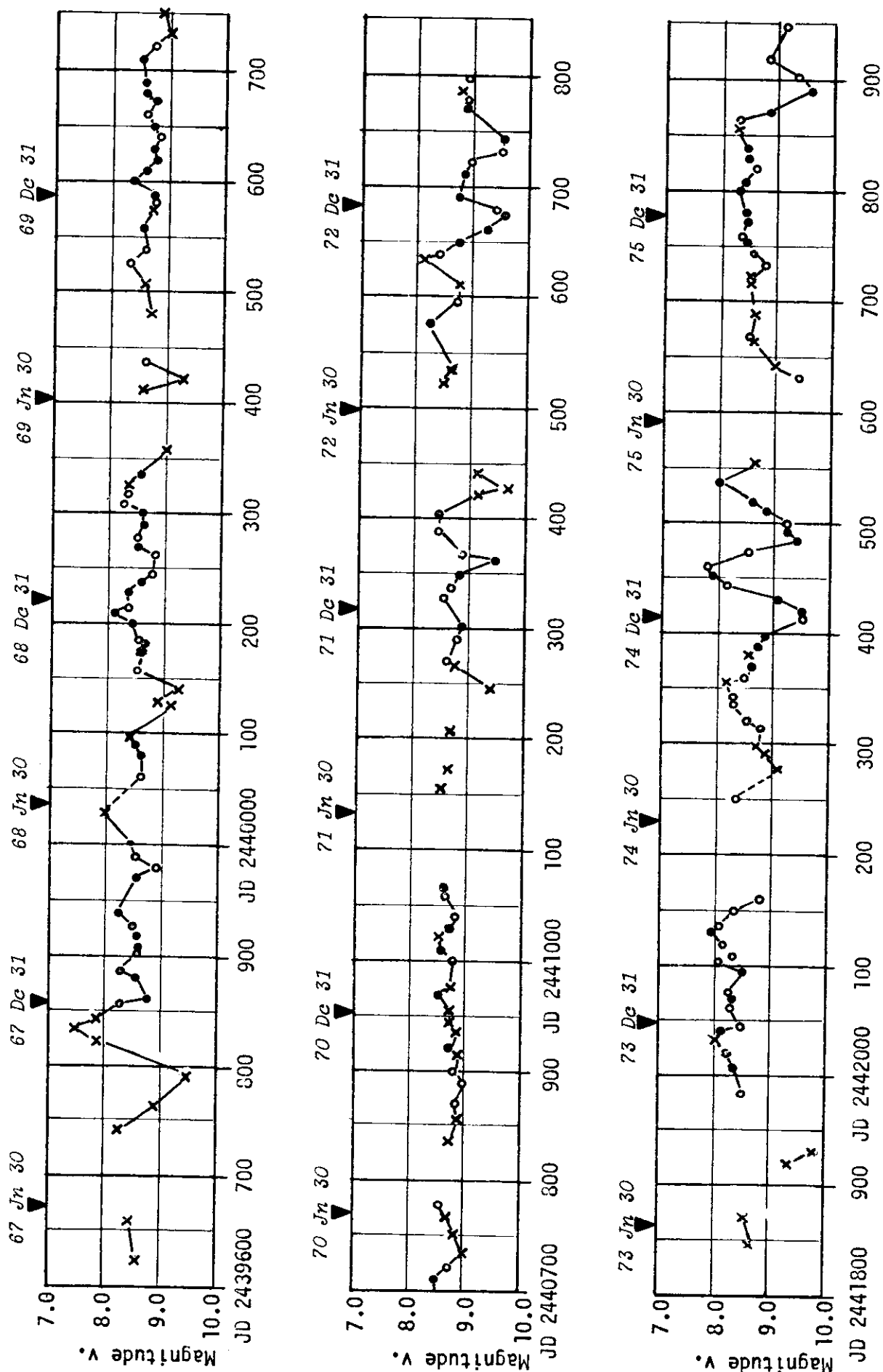
Star "54" (HD 80671) on Venimore's chart was used as the comparison star, which is also a standard star in the catalogue of Cousins and Stoy (4). The values for this are: $V = 5.38$; $B-V = +0.42$; $U-B = -0.05$. As an additional check the standard star HD 80710 from the same catalogue was also measured and a good fit was obtained.

The nearby variable star, RW Car, was also measured on the same nights and results reduced from the same comparison stars.

The results for both stars are:

$\frac{J.D.}{V384\ Car}$	$\frac{V}{V}$	$\frac{B-V}{B-V}$	$\frac{U-B}{U-B}$	$\frac{PHASE}{PHASE}$
2445452.880	10.84	+1.50	+1.7:	0.156
2445488.790	10.85	+1.47	+2. :	0.257
<u>RW Car</u>				
2445452.886	13.56	+1.72	...	
2445488.799	13.86	+2.08	...	

The phase positions are calculated from the ephemeris above.



034666 RX RETICULI.

Fig. 1a 034666 RX RETICULI - LIGHT CURVE 1967 - 1976

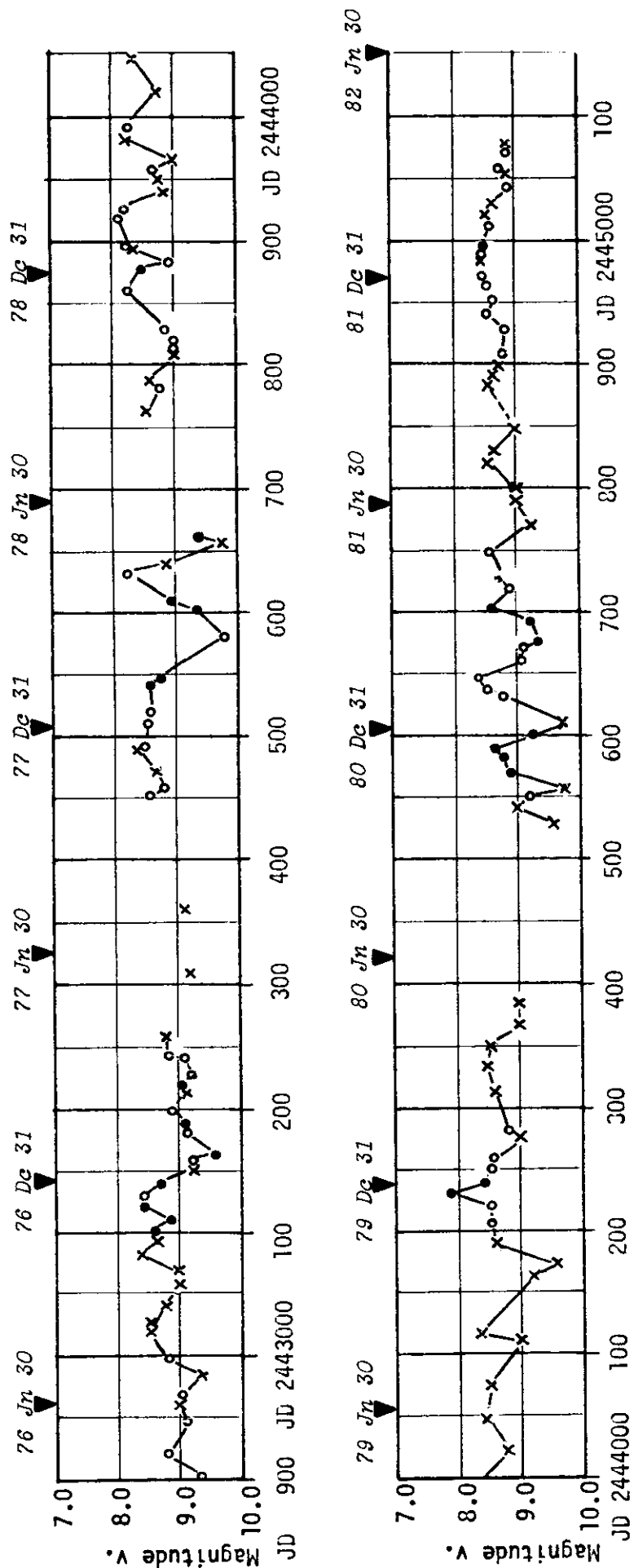


Fig. 1b 034666 RX RETICULI - LIGHT CURVE - 1976 - 1982

034666 RX RETICULI.

Being red stars there were very few detectible photons in the U filter and hence U-B values For V384 Car must be given low weight.

2. DISCUSSION

The colours of V384 Car indicate a spectral classification of approximately K5 III. This is consistent with the semi-regular variations observed visually, for a low amplitude giant pulsational star. The minima and general irregularities of the visual light curve are strikingly similar to the variations observed photoelectrically on the star EG Mus. This latter object is a later type star, mean B-V approximately 1.85, and it has a little larger amplitude (5).

REFERENCES

- (1). Venimore, C.W. 1979. Publ. 7 (C79), V.S.S., R.A.S.N.Z.
- (2). Venimore, C.W. 1982. Publ. 10 (C82), V.S.S., R.A.S.N.Z.
- (3). Walker, W.S.G. & Marino, B.F. 1978. Publ. 6 (C78); V.S.S., R.A.S.N.Z.
- (4). Cousins, A.W.J. & Stoy, R.H. 1963. Roy. Obs. Bull. 64.
- (5). Marino, B.F. & Walker, W.S.G. Unpublished.

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REPORT ON SOME NOVAE & SUSPECTED RECURRENT NOVAE.

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SUMMARY: Negative observations of some old novae and suspected recurrent novae are summarised. Any positive observations not already published are given.

1. INTRODUCTION

In Circular M82/3 it was stated that negative observations of old novae, which had faded below the threshold of instruments used, would no longer appear in the Monthly Circulars of the V.S.S., R.A.S.N.Z. in order to save space. Instead it was intended to summarise these in the Publications from time to time.

All observations reported here have been made visually using the Charts and sequences published in the various issues of Charts for Southern Variables. The novae types quoted have been taken from the 3rd Edition of the General Catalogue of Variable Stars and its supplements.

2. OBSERVATIONS

011118 WX Cet. Na. Nova Cet 1963. A possible recurrent nova.

96 observations were made between 2,444,173 and 2,445,208. All were negative with the variable being noted as usually "Fainter than 13.2 and occasionally as "Fainter than 15.0."

061700 V616 Mon. Nr. Nova Mon 1975.

All observations to 2,445,027 have been given in the Monthly Circulars. Since that date 41 observations were recorded, all of which were negative with one exception. On 2,445,330.327 it was recorded at 13.1. The negative observations ranged from (12.3 to (13.8.

063462 RR Pic. Nb. Nova Pic 1925.

Ten day means were published in Publ. 5 (C77) to 2,443,090 in continuation

of records published earlier. Since that date 960 observations have been made. These have been given as means for the month each month in the Monthly Circulars. Table 1 lists the 10 day means since the pervious published list. No attempt has been made to relate the individual observations to the short orbital period of 0.145026 the amplitude of the variations barely exceeds the probable error of the visual observations.

080835 CP Pup. Na. Nova Pup 1942.

Observations and a light curve from discovery to 2,432,774 were published in Circular 49. Since that date 721 observations have been recorded. The positive observations and a few negative ones are given in Table 1.

090031 T Pyx. Nr. Nova Pyx 1967.

Observations of the 1966-67 outburst, first detected by Albert Jones were published in Circulars 122,, 123 and 125. The last two also included light curves. These carried positive observation to 2,439,589.01. Since that date 1,420 observations have been made. The remaining unpublished positive observations are listed in Table 1. After T Pyx had faded to magnitude 13.6 the great majority of the observations were negative and these are not shown in the table.

110361 RS Car. Na. Nova Car 1895,

Observations to 2,440,821 were published in Circular 165 and earlier circulars. Since that date to 2,445,339 420 observations have been made, all of which were negative except the following:

2,442,090.9 13.5
2,442,777.0 16.0.

The first of these must be regarded as very doubtful. Usually RS Car has been recorded as fainter than 13.0 and on a few occasions fainter than this.

155526 T CrB. Nr. Nova CrB 1946.

Observations to 2,441,826 were published in Circulars 91, 92, 98, 99, 106 and 109. From that date to 2,445,203 an additional 47 observations recorded. These have been published in the Monthly Circulars.

161617 U Sco. Nr. Nova Sco 1936.

Observations of the 1979 outburst were published, with a light curve, in Publ. 7 (C79), V.S.S., R.A.S.N.Z. Since 2,444,122 to 2,445,196 a total of 288 negative observations have been made. Usually the star was noted as invisible and fainter than from 13.2 to 14.0 and occasionally fainter than 16.0. U Sco has been at, or near minimum, during this interval.

165312 V841 Oph. Nb. Nova Oph 1848.

Observations from 2,443,659 to 2,444,879 appear in Table 1. These have been summarised in the Monthly Circulars.

174406 RS Oph. Nr. Nova Oph 1967.

Observations of the 1967 outburst were published in Circular 165. This carried published results to 2,441,073. Monthly summaries have since appeared, and now all observations since the foregoing date appear in Table 1.

175327 V999 Sgr. Nb. Nova Sgr 1910.

Possibly a recurrent nova. Observations to 2,440,913, summarised in Circ. 165.

Since that date 325 observations made up to 2,445,549. All were negative.

181123 FM Sgr. Na. Nova Sgr 1926.

Observations to 2,440,913 summarised in Circ. 165. Since that date and up to 2,444,522 all observations have been negative except the following:

2,441,884.7 about 14.2)
 2,442,302.7 about 14.0)
 623.8 about 14.0) ALL ESTIMATES APPROXIMATE IN ABSENCE OF RELIABLE
 685.6 about 14.7) MAGNITUDES FOR FAINT COMPARISON STARS.
 2,443,359.0 about 16.0)
 2,444,176.9 about 15.8)
 522.0 about 16.0)

181325 V1016 Sgr. Na. Nv Sgr 1899.

Observations to 2,440,163 summarised in Circ. 165. Since then 392 observations made up to 2,444,170. All were negative except:

2,441,945.7 About 15.0)
 2,443,257.2 About 15.7)
 360.0 About 15.7)
 645.1 About 15.0) MAGNITUDES APPROXIMATE IN ABSENCE OF RELIABLE
 771.0 About 15.5) MAGNITUDES FOR FAINTER COMPARISON STARS.
 805.0 About 15.7)
 2,444,013.2 About 15.0)

181525 V441 Sgr. Na. Nova Sgr 1930.

Observations to 2,440,919 summarised in Circ. 165. An additional 241 observations made from 2,441,065 to 2,445,143. All were negative except:

2,442,685.6 About 14.5)
 2,443,360.0 About 14.7) MAGNITUDES APPROXIMATE IN ABSENCE OF RELIABLE
 757.0 About 15.2) MAGNITUDES FOR FAINT COMPARISON STARS.
 805.0 About 14.7)
 991.3 About 14.7)
 2,444,464.0 About 15.7)
 877.0 About 15.2)

182221 HS Sgr. Na. Nova Sgr 1900.

Observations to 2,440,913 summarised in Circ. 165. An additional 218 observations made from 2,441,074 to 2,445,390. All were negative.

182529 V1017 Sgr. Z And?

This star was formerly classified as a Recurrent Nova. Observations to 2,440,986 were published in Circ. 165. Observations of the 1973 outburst were reported in Special Circulars S. 1 and S.2, and in Circ. M73/2 and 73/3. An additional 825 observations have been made up to 2,444,731 all of which were negative except for the positive estimates that have appeared in the Monthly Circulars since the 1973 outburst.

3. DISCUSSION

The observations for almost all the stars mentioned have been made during all months of the respective observing seasons. The records are sufficiently close in time to be able to state that it is unlikely that any outbursts have been missed--certainly none brighter than magnitude 13.0. Where it is stated that observations were negative this means that the variable was invisible and fainter than the threshold of the instruments used, normally from 13 to 14^m.

TABLE 1 - OBSERVATIONS.

(a) 063462 RR PICTORIS--TEN DAY MEANS.

J.D.	MEAN M_V	No. Obs	J.D.	MEAN M_V	No. Obs.	J.D.	MEAN M_V	No. OBS	J.D.	MEAN M_V	No. Obs
2443000+			601.33	11.97	3	2444000+			2444000+		
102.75 12.07	6		608.88	12.0	1	222.33 12.17	3		798.64	12.0	1
109.58 11.84	6		619.80	11.92	4	227.91 12.20	3		806.79	12.13	3
122.60 11.90	2		631.35	12.29	14	238.03 12.00	2		821.64	11.8	1
131.25 11.83	6		639.93	12.28	10	248.44 12.17	3		841.55	11.8	1
139.67 11.91	7					262.43 12.10	4		851.07	12.05	2
145.78 11.80	2		648.38	12.35	2	269.23 11.90	4		872.19	12.07	3
160.02 11.98	5		659.06	12.16	10	278.43 12.10	2		883.51	11.8	1
170.75 12.00	5		665.81	12.0	1	292.47 12.12	4		886.76	11.87	3
182.37 12.05	2		681.83	12.00	2	303.93 11.93	3		899.28	12.00	3
188.95 12.04	5		688.47	11.90	3	308.60 11.95	6		907.29	12.05	4
197.56 12.0	3		698.79	12.0	1	320.92 11.99	8		922.14	12.10	4
211.53 12.10	3		736.14	11.9	1	330.70 12.03	6		932.52	12.00	6
217.17 12.00	7		750.20	11.7	1	343.52 11.99	2		940.50	11.87	11
228.17 12.07	3		756.21	12.0	1	350.18 11.90	3		950.84	11.98	5
238.30 12.0	1		778.14	11.9	1	362.24 11.94	5		962.32	12.00	7
250.65 11.87	7		801.00	11.95	2	367.82 12.05	2		971.13	11.86	5
255.86 12.00	2		809.76	11.92	5	398.33 11.90	2		980.70	11.99	13
270.80 12.0	1		820.0	11.9	1	407.80 11.8	1		990.46	11.96	15
278.22 12.00	8		831.14	11.95	4	491.10 12.0	1		999.80	12.00	17
292.70 11.90	2		841.60	11.93	3	525.95 12.0	1				
301.27 11.95	4		849.67	11.87	4	550.15 12.17	4		2445000+		
309.35 11.92	5		870.38	11.93	7	558.80 12.05	2		010.74	12.07	7
316.75 12.0	1		880.02	12.10	3	568.21 12.10	3		016.74	12.05	6
330.76 11.83	3		892.32	12.01	8	583.00 12.08	5		028.27	12.20	3
348.17 12.0	1		900.24	11.93	7	593.39 12.02	6		042.36	12.03	7
371.73 11.95	2		908.77	11.92	4	601.78 12.04	7		049.13	12.19	8
383.17 12.0	1		921.52	12.20	2	609.44 12.10	16		058.34	12.11	8
396.18 12.0	1		930.95	12.20	5	618.85 11.85	4		072.45	11.95	4
408.62 12.00	2		950.85	12.2	1	630.72 12.10	19		079.67	12.11	7
442.44 11.95	4		960.52	12.08	5	640.60 12.19	8		088.37	12.10	9
449.95 11.94	11		968.90	12.0	1	650.28 11.97	12		101.20	12.40	2
461.02 11.90	13		990.84	12.15	2	659.09 12.05	9		111.15	12.17	8
470.11 11.95	11					669.83 12.13	10		117.80	11.90	3
480.11 11.97	14		2444000+			677.60 12.27	8		132.83	12.10	3
489.60 12.13	3		008.88	12.00	3	693.27 12.04	15		140.36	11.88	4
501.89 11.90	2		018-87	12.0	1	699.82 12.09	25		148.36	11.65	2
511.13 11.96	5		027.79	12.0	1	709.07 12.03	9		178.63	12.0	1
520.95 11.96	5		040.29	12.10	2	721.94 12.13	20		192.63	11.8	1
527.09 12.0	1		143.09	12.0	1	729.17 12.21	12		200.63	12.0	1
539.90 12.02	4		153.15	12.0	1	736.68 12.28	5		210.61	12.00	3
549.88 11.83	3		168.99	12.0	1	749.75 12.15	23		224.17	11.9	1
560.39 11.90	2		179.37	12.00	3	761.68 12.27	12		229.76	12.10	3
567.90 12.0	1		187.10	12.0	1	770.65 12.15	4		240.65	11.83	3
580.27 11.86	5		200.91	12.0	1	778.79 12.10	9		253.9	12.2	1
590.85 12.03	3		208.91	12.25	2	788.41 12.13	3		262.93	12.0	1

TABLE 1-OBSERVATIONS (cont)

(a) 063462 RR PICTORIS---TEN DAY MEANS (cont)

<u>J.D.</u>	<u>MEAN</u> <u>M_v</u>	<u>No</u> <u>OBS.</u>	<u>J.D.</u>	<u>MEAN</u> <u>M_v</u>	<u>No</u> <u>OBS.</u>	<u>J.D.</u>	<u>MEAN</u> <u>M_v</u>	<u>No</u> <u>OBS.</u>
2445000+			2445000+			2445000+		
270.21	12.00	2	318.86	11.91	9	369.95	11.97	9
280.06	12.10	3	329.18	11.87	4	380.20	12.07	12
288.69	12.10	3	341.23	11.95	8	388.11	11.92	5
295.25	12.25	2	349.70	11.95	8	398.45	12.12	4
309.67	12.00	5	362.17	11.86	6			

(b) 080835 CP PUPPIS - INDIVIDUAL OBSERVATIONS (Refer page 52)

<u>J.D.</u>	<u>M_v</u>	<u>Obs</u>	<u>J.D.</u>	<u>M_v</u>	<u>Obs</u>	<u>J.D.</u>	<u>M_v</u>	<u>Obs</u>	<u>J.D.</u>	<u>M_v</u>	<u>Obs</u>
			2433000+								
2432000+			360.9	12.3	Jo	2433000+			2434000+		
824.2	12.2	Jo	384.9	12.6	Jo	948.2	12.6	Jo	418.0	12.9	Jo
854.1	12.2	Jo	388.9	12.3	Jo	956.2	12.6	Jo	444.9	13.5	Jo
862.1	12.3	Jo	420.9	12.6	Jo	959.1	12.6	Jo	454.9	13.0	Jo
941.1	12.3	Jo	422.9	12.6	Jo	985.1	12.6	Jo	478.9	13.1	Jo
954.1	12.2	Jo	436.8	12.6	Jo	999.0	12.6	Jo	504.9	13.1	Jo
970.9	12.2	Jo	441.8	12.6	Jo				514.9	12.8	Jo
2433000+			451.8	12.6	Jo	2434000+			532.8	13.1	Jo
005.9	12.2	Jo	443.8	(12.6	Bt	005.0	12.6	Jo	569.8	(12.6	Jo
026.9	12.3	Jo	472.8	12.6	Jo	014.0	12.6	Jo	570.8	12.9	Jo
039.8	12.4	Bt	480.8	12.7	Jo	018.1	12.6	Jo	608.2	12.9	Jo
041.8	12.4	Bt	502.3	12.5	Jo	033.0	12.7	Jo	631.2	12.8	Jo
056.9	12.2	Jo	509.2	12.4	Jo	045.1	12.6	Jo	639.2	12.7	Jo
065.8	12.5	Bt	531.2	12.5	Jo	063.0	12.8	Jo	655.2	12.9	Jo
095.9	11.8?	Jo	536.2	12.5	Jo	075.9	12.6	Jo	692.1	12.9	Jo
114.8	11.8?	Jo	563.1	12.5	Jo	098.0	12.6	Jo	695.1	(12.6	Jo
120.8	12.6	Jo	597.0	12.6	Jo	105.9	12.8	Jo	754.0	12.8	Jo
130.3	12.8	Jo	601.1	12.7	Jo	122.9	12.8	Jo	780.0	12.6	Jo
148.2	12.3	Jo	624.1	12.6	Jo	129.9	12.6	Jo	781.1	12.8	Jo
158.2	12.3	Jo	652.0	12.7	Jo	150.8	12.8	Jo	800.0	12.9	Jo
162.2	12.3	Jo	654.0	12.6	Jo	156.9	12.8	Jo	812.9	(12.6	Jo
180.2	12.3	Jo	660.0	12.6	Jo	177.8	13.0	Jo	836.0	12.9	Jo
186.2	12.3	Jo	679.9	12.6	Jo	181.9	12.9	Jo	863.9	13.1	Jo
188.2	12.3	Jo	712.0	12.6	Jo	191.8	13.4	Jo	887.9	12.9	Jo
209.2	12.5	Jo	722.0	12.7	Jo	205.8	12.9	Jo	916.8	12.9	Jo
217.1	12.3	Jo	741.9	12.6	Jo	206.8	12.7	Jo			
230.0	12.3	Jo	769.9	12.6	Jo	219.3	13.4	Jo	2435000+		
237.0	12.3	Jo	773.9	12.4	Jo	242.2	13.5	Jo	015.2	12.8	Jo
248.1	12.6	Jo	793.9	12.7	Jo	250.2	12.6	Jo	074.1	(13.8	Jo
265.0	12.3	Jo	799.8	12.7	Jo	274.2	12.5	Jo	105.1	13.0	Jo
277.1	12.3	Jo	806.8	12.7	Jo	281.2	12.6	Jo	185.0	12.9	Jo
293.0	12.5	Jo	820.8	12.7	Jo	300.2	12.8	Jo	235.9	12.8	Jo
300.0	12.5	Jo	849.8	12.7	Jo	334.9	12.6?	Jo	247.9	13.0	Jo
311.1	12.3	Jo	871.3	12.6	Jo	362.1	12.6	Jo	463.0	12.8	Jo
329.1	12.3	Jo	888.2	12.6	Jo	370.1	13.0	Jo	489.0	12.6	Jo
334.9	12.3	Jo	902.2	12.6	Jo	373.1	12.9	Jo	507.0	12.7	Jo
352.9	12.3	Jo	928.1	12.6	Jo	385.0	12.7	Jo	602.9	12.8	Jo

TABLE 1--OBSERVATIONS (cont)

(b) 080835 CP PUPPIS--(cont)

<u>J.D.</u>	<u>M_v</u>	<u>Obs.</u>	<u>J.D.</u>	<u>M_v</u>	<u>Obs.</u>	<u>J.D.</u>	<u>M_v</u>	<u>Obs.</u>	<u>J.D.</u>	<u>M_v</u>	<u>Obs.</u>
2435000+			2441000+			2442000+			2444000+		
633.8 12.8 Jo			736.9 14.8 MA			782.9 14.4 Ft			020.0 14.0? H1		
986.9 13.1? Jo			744.9 14.5 Jn			819.0 14.5 Ft			023.8 14.0? H1		
			767.9 14.5 Jn			840.0 14.4 Ft			167.2 15.5 Cj		
2436000+			771.9 14.7 MA						235.1 (14.0 H1		
			776.0 (14.9 MA			2443000+			264.0 15.0 Cj		
006.8 13.1 Jo			779.9 14.5 Jn			077.1 (14.0 Ov			341.0 15.0 Cj		
340.9 13.9 Jo						078.2 (14.0 Ft			694.0 14.7 Cj		
			2442000+						707.0 15.0 Cj		
2441000+			079.8 14.7 Cj			173.9 (13.9 Rg					
361.0 13.7 Jn			131.7 14.3 Cj			174.0 14.3 Cj					
361.9 14.0 Jn			417.0 (14.8 Ft			253.8 14.7 Rg					
363.9 14.0 Jn			422.1 14.9 MA			258.0 14.8 Cj					
388.9 14.5 Jn			422.1 14.6 MA			491.0 15.2 Cj					
389.9 14.5 Jn			423.1 14.8 Ft			523.9 14.0 Rg					
						547.1 (14.0 Sb					
390.9 14.5 Jn			424.0 14.8 Ft								
391.9 14.5 Jn			425.9 14.1 Ft			548.9 14.2 Rg					
392.9 14.5 Jn			425.9 14.1 Ce			549.9 13.8 Rg					
394.9 14.5 Jn			428.0 13.9 Ft			550.9 14.0 Rg					
411.9 14.5 Jn			428.0 14.0 Ft			551.9 13.9 Rg					
412.9 14.5 Jn			428.9 14.0 Ft			569.9 13.5?H1					
413.9 14.5 Jn			429.9 14.0 Ft			576.9 14.6 MA					
416.9 14.5 Jn			431.9 14.7? MA			578.1 (14.3 Cj					
417.9 14.5 Jn			432.9 14.5 Ft			598.9 14.6 MA					
419.9 14.5 Jn			435.9 14.3 Ft			607.9 (14.4 Wk					
424.9 14.5 Jn			442.9 14.5 Ft			938.0 15.0 Cj					
684.0 14.5 Jn			472.7 14.7 Cj			988.0 14.5 Cj					
694.0 14.5 Jn			744.0 14.2 Ft			991.1 14.5 Sb					
716.9 14.5 Jn			745.0 14.2 Ft			995.0 14.5 Cj					
719.9 14.2 Jn			772.0 14.3 Ft								
722 9 14.8 MA			773.0 14.3 Ft								
734.9 14.5 Jn			777.0 14.4 Ft								

N.B.
Estimates of 14.5 or
fainter are approximate.

(c) 090031 T PYXIDIS--INDIVIDUAL OBSERVATIONS - Refer page 52

<u>J.D.</u>	<u>M_v</u>	<u>Obs.</u>	<u>J.D.</u>	<u>M_v</u>	<u>Obs.</u>	<u>J.D.</u>	<u>M_v</u>	<u>Obs.</u>	<u>J.D.</u>	<u>M_v</u>	<u>Obs.</u>
2439000+			2439000+			2439000+			2439000+		
589.9 9.6 Jo			594.0 10.2 Bt			596.9 10.2 Jo			598.9 10.4 Jo		
589.9 10.0 As			594.8 9.9 Ld			596.9 10.3 Sr			599.0 10.4 Hi		
590.0 9.9 Hi			595.0 9.6 Hi			596.9 10.1 Tr			599.9 10.3 Jo		
591.0 10.0 Sh			595.0 10.4 Hn			597.0 10.4 Hn			600.0 10.2 Jn		
591.9 10.0 Ty			595.0 10.4 Bt			597.0 10.1 Ac			600.9 10.9 Jn		
592.0 10.0 Jn			595.1 10.4 Hn			597.0 10.6 Mt			601.9 10.9 Jn		
592.1 9.9 Bt			595.8 10.4 Jo			597.0 10.4 Bt			601.9 10.6 Hn		
592.8 9.7 Ld			595.8 10.1 Bd			597.0 10.2 Jn			602.8 10.6 Jo		
592.8 10.0 Jo			595.9 10.5 Hn			597.9 10.8? Hi			602.9 11.1 Jn		
592.9 10.3 Bt			596.0 10.1 Ac			597.9 10.8 Jn			603.8 11.5 Jo		
592.9 10.2 Hn			596.0 10.2 Jn			598.0 10.5 Ac			603.9 10.8 Jn		
593.1 10.1 Ac			596.8 9.8 Ld			598.0 10.8 Sh			603.9 11.5 Tr		
594.0 10.0 Ml			596.8 10.4 Jo			598.9 10.2 Jn			604.9 10.8 Jn		
									604.9 11.8? Tr		

TABLE 1---OBSERVATIONS (cont)

(c) 090031 T PYXIDIS---INDIVIDUAL OBSERVATIONS

<u>J.D.</u>	<u>M_v</u>	<u>Obs</u>	<u>J.D.</u>	<u>M_v</u>	<u>Obs</u>	<u>J.D.</u>	<u>M_v</u>	<u>Obs</u>	<u>J.D.</u>	<u>M_v</u>	<u>Obs</u>
2439000+			2439000+			2439000+			2439000+		
605.0	11.7	Jo	627.9	11.1	Ty	668.8	12.2	Jo	802.1	13.6	Jo
605.0	10.9	Hn	627.9	12.2	Jo	668.9	12.6	Sh	805.1	13.6	Jo
605.9	11.2	Jn	630.8	12.1	Jo	669.8	12.3	Jn	807.2	13.6	Jo
606.0	12.3?	Ty	631.8	12.3	Jo	669.9	12.3	Tr	816.0	(13.5	Jo
606.9	11.2	Jn	631.9	11.9	Jn	670.8	12.4	Bt	820.1	13.6	Jo
607.0	12.1	Tr	635.8	12.0	Jn	670.8	12.3	Jn	826.1	13.6	Jo
607.9	11.3	Jn	636.9	12.0	Jo	671.8	12.4	Bt	833.1	13.6	Jo
607.9	12.0	Jo	636.9	12.3	Tr	671.9	12.0	Jn	835.2	(13.4	Jn
608.0	11.9	Tr	638.8	12.3	Jo	671.9	13.0?	Mt	841.9	(13.5	Jo
608.9	11.7	Jn	638.8	12.0	Jn	673.9	12.2	Jn	855.2	(13.5	Jo
608.9	10.9?	Hn	638.9	12.5	Mt	675.9	12.3	Jn	857.0	13.6	Jo
609.8	12.1	Jo	639.8	12.1	Bt	676.9	12.3	Jn	876.0	14.3	Jo
609.9	11.7	Jn	639.8	12.3	Jn	677.8	12.2	Jo	886.0	(13.7	Jo
610.9	11.5	Jn	639.9	12.4	Jo	677.8	12.6	Bt	894.1	13.6	Jo
610.9	11.7	Mt	640.8	12.2	Jn	677.9	12.3	Jn	896.1	(13.7	Jo
611.9	11.7	Jn	641.9	12.3	Jn	678.8	12.5	Bt	899.2	13.6	Jo
611.9	12.1	Jo	641.9	12.3	Tr	678.9	12.4	Jn	904.9	(13.7	Jo
611.9	11.5	Sh	642.9	12.3	Bt	679.8	12.1	Jo	917.0	13.7	Jo
612.9	11.7	Ty	642.9	12.2	Jn	679.8	12.6	Bt	918.0	13.7	Wk
612.9	12.2	Jo	643.9	12.1	Bt	679.9	13.7?	Jn	918.9	14.1	Jo
613.9	11.7	Ty	644.9	12.1	Bt	680.8	12.2	Jo	918.9	14.0	Mf
614.9	11.8	Jn	645.8	12.1	Jn	681.8	12.6	Jn	962.9	(13.7	Jo
614.9	11.9	Bt	645.8	12.5	Jo	682.8	12.3	Jo	974.9	(13.7	Bt
614.9	12.2	Jo	645.9	12.3	Bt	682.8	12.6	Bt	976.0	(13.7	Bt
614.9	11.7	Jn	646.8	12.4	Jo	683.8	12.2	Jo			
615.9	11.7	Jo	647.9	11.9	Sh	683.8	12.6	Bt	2440000+		
616.8	12.3	Jo	647.9	12.2	Jo	687.8	12.4	Jo	002.8	14.2	Jo
618.9	11.8	Jn	648.9	12.2	Jo	694.8	12.4	Jo	008.9	13.5?	Mt
618.9	11.7	Tr	649.9	12.0	Sh	695.8	12.5	Jo	009.9	13.5	Mt
618.9	11.5	Sh	650.9	12.2	Jo	707.3	13.0	Jo	025.0	(13.7	Mt
619.9	12.2	Jo	651.8	12.4	Jo	708.3	13.1	Jo	074.3	14.0	Jo
									192.1	14.1	Jo
619.9	11.8	Jn	653.9	12.3	Jn	710.3	13.0	Jo	385.8	14.2	Wk
621.9	11.9	Bt	653.9	12.3	Bt	715.3	13.3	Jo	764.8	14.0	Cj
621.9	11.9	Jn	654.8	12.5	Jn	718.2	13.3	Jo			
622.9	12.1	Bt	655.8	12.4	Bt	730.2	13.1	Jo	2441000+		
622.9	12.0	Jn	655.9	12.2	Jo	732.2	13.1	Jo	339.0	14.7	Jn
623.9	12.2	Jo	656.8	12.2	Jn	738.2	13.4	Jo	360.0	13.9	Jn
623.9	12.1	Bt	656.9	12.4	Bt	747.2	13.7	Jo	360.9	13.9	Jn
624.8	12.2	Jo	656.9	12.3	Mt	748.2	13.9	Jo	361.9	13.9	Jn
624.9	12.0	Jn	657.8	12.2	Jn	763.2	14.2	Jo	362.9	13.9	Jn
626.9	11.6?	Bt	658.8	12.4	Jn	768.2	13.7	Jo	387.9	14.7	Jn
626.9	11.9	Ty	659.8	12.3	Jn	775.2	14.0	Jo	388.9	14.7	Jn
626.9	11.9	Jn	660.8	12.3	Jn	777.2	14.1	Jo	389.9	14.7	Jn
626.9	12.2	Jo	666.9	11.9	Jo	789.0	(13.4	Bt	390.9	14.7	Jn
626.9	11.7?	Sh	666.9	12.3	Jn	791.1	13.9	Jo	391.0	(14.0	Wk
627.8	11.9	Jn	668.8	12.4	Bt	794.1	13.9	Jo	391.9	14.7	Jn

TABLE 1--OBSERVATIONS (cont)

(c) 090031 T PYXIDIS (cont)

J.D.	M _v	Obs	J.D.	M _v	Obs	J.D.	M _v	Obs	J.D.	M _v	Obs
2441000+			2441000+			2442000+			2443000+		
392.9 14.7	Jn		777.0 14.8	Ft		097.2 14.6	Ft		644.9 15.0	Sb	
393.9 14.7	Jn		777.0 14.8	Wk		098.0 14.6	Ft		652.0 15.5	Sb	
394.9 14.7	Jn		778.0 (14.5	Wk		098.1 14.6	Ft		810.2 (14.0	Sb	
400.8(14.0	Wk		779.8 14.7	Ft		099.1 15.0	Ft		867.1 (14.0	Sb	
411.9 14.7	Jn		780.7 13.8?	Cj		100.0 (14.5	Ft		870.1 (14.0	Sb	
412.9 14.7	Jn		780.9 14.7	Ft		101.9 14.0?	Mt		871.1 (14.0	Sb	
413.9 14.7	Jn		786.8 14.6	Ft		103.9 14.9	Ft		882.2 (14.5	Sb	
414.9 14.7	Jn		787.8 14.3	Ft		131.7 14.0?	Cj		894.1 (14.0	Sb	
415.9 14.4	Jn		790.9 14.2	Ft		406.2 (13.7	Jn		898.1 (14.2	Sb	
416.9 14.7	Jn		792.9 14.5	Ft		406.5 13.0?	Ov		907.1 (14.2	Sb	
417.9 14.7	Jn		793.8 14.5	Ft		412.9 (13.4	Jn		927.1 14.7	Sb	
419.9 14.7	Jn		794.8 14.5	Ft		422.9 (14.5	Wk		928.1 (14.5	Sb	
424.0 14.7	Jn		796.0 14.6	Ft		425.9 (14.0	Ce		932.0 (14.5	Sb	
425.0 14.7	Jn		796.8 15.0	Ft		428.0 15.0	Ft		933.1 (14.5	Sb	
427.0 14.7	Jn		799.0 15.0	Ft		431.9 14.9	Ft		937.1 (14.2	Sb	
437.9 14.7	Jn		800.0 15.0	Ft		432.9 14.5	Cj		937.1 15.3	BA	
449.8(14.5	Wk		800.8 15.0	Ft		442.9 (14.0	Ft		963.1 (14.2	Sb	
452.9 14.7	Jn		801.8 15.0	Ft		490.0 (14.0	Ft		966.0 (14.0	Sb	
454.9 14.7	Jn		802.0 (14.5	Ft		490.0 (14.0	Bf		984.1 (14.4	Sb	
456.9 14.7	Jn		807.8 15.0	Ft		490.7 14.3	Cj		987.0 (14.4	Sb	
457.9 14.7	Jn		808.8 15.0	Ft		492.0 (14.0	Bf		990.0 (14.4	Sb	
469.9 14.7	Jn		810.8 (14.5	Ft		492.0 (14.0	Ft		991.0 15.0	Cj	
662.0 14.1	Jn		821.8 14.9	Ft		512.9 14.6	Ft		991.0 (14.4	Sb	
682.1 14.7	Jn		823.9 14.9	Ft		772.1 (14.5	Ft		992.0 (14.4	Sb	
684.0 14.7	Jn		828.9 15.0	Ft		776.0 (14.5	Ft		995.0 (14.4	Sb	
688.0 14.4	Jn		832.9 14.4	Ft		777.0 15.0	Ft				
693.8 13.8?	Cj		837.9 14.8	Ft		783.0 15.0	Ft		2444000+		
694.0 14.7	Jn		840.8 14.9	Ft		783.8 13.3?	Cj		011.0 (14.4	Sb	
711.0 14.4	Jn		863.9 (14.0	Ft		804.0 (14.5	Ft		019.0 (14.4	Sb	
714.0(14.5	Wk					833.8 13.5?	Cj		024.0 (14.4	Sb	
716.9 14.4	Jn		2442000+			833.9 (13.5	Ce		039.0 (14.4	Sb	
720.0 14.4	Jn		049.0 (14.5	Ft		860.8 14.5	Ft		042.9 (14.4	Sb	
721.9 14.2	Jn		071.9 14.7	Wk		861.9 (14.0	Ft		230.1 14.2?	Rg	
734.9 14.4	Jn		073.1 14.9	Ft		867.8 14.8	Cj		252.2 (14.0	BA	
736.0(14.5	Wk		073.2 14.9	Ft		867.8 (14.8	MA		344.0 14.9	Cj	
738.0 14.4	Jn		074.0 14.9	Ft		869.0 14.8	Ft		577.3 14.8	BA	
739.0 14.9	Ft		074.1 14.9	Ft		891.0 (14.0	Wk		698.3 14.0?	Ov	
740.0(14.8	Wk		074.9 14.6	Ft		950.2 14.0?	Ov		2445000+		
742.0 14.9	Ft		076.0 14.9	Ft					351.0 14.7	Cj	
744.9 14.8	Ft		080.0 15.1	Ft		2443000+			354.1 (14.4	Gp	
754.0 15.0	Ft		081.1 14.4	Ft		254.9 (14.5	Wk				
755.9 15.1	Ft		086.9 14.3	Ft		258.9 15.3	Wk				
762.9 14.9	Ft		089.9 (14.5	Ft		290.9 (14.0	Wk				
765.8 14.6	Ft		090.1 15.1	Ft		515.1 (15.0	Cj				
766.9 14.8	Ft		093.0 15.0	Ft		547.0 (14.0	Sb				
767.8 14.5	Ft		094.9 (14.0	Ft		549.0 (14.0	Wk				
771.0 14.8	Ft		096.0 (14.5	Ft		603.0 14.3?	Tr				
772.0 15.0	Wk		096.9 14.6	Ft		639.1 (14.0	Sb				

TABLE 1 --- OBSERVATIONS (cont)

(d) 165312 V841 OPHIUCHI--INDIVIDUAL OBSERVATIONS (Refer page 52)

<u>J.D.</u>	<u>M_v</u>	<u>Obs</u>	<u>J.D.</u>	<u>M_v</u>	<u>Obs</u>	<u>J.D.</u>	<u>M_v</u>	<u>Obs</u>	<u>J.D.</u>	<u>M_v</u>	<u>Obs</u>
2443000+			2444000+			2444000+			2444000+		
659.0 13.1	Ty		077.9 13.1	Wy		479.9 13.1	Wy		812.0 13.0	Wy	
688.8 11.8	Rg		099.9 14.0	Ty		480.9 13.0	Pk		815.9 13.3	Wy	
692.8 12.0	Rg		104.9 13.2	Wy		481.9 12.9	Pk		821.3 13.3	Ov	
697.9 12.2	Rg		125.9 12.8	Cj		482.9 12.8	Pk		832.9 12.9	Wy	
699.9 13.0	Wy		125.9 13.3	Ty		483.9 13.2	Pk		833.9 13.0	Wy	
712.9 13.0	Wy		128.8 13.3	Rg		484.9 13.0	Rg		835.9 13.6	Ty	
712.9 13.1	Ty		371.9 14.0	Ty		486.0 13.8	Ty		836.9 13.2	Wy	
714.8 11.8?	Rg		372.0 (12.6	Wy		490.0 13.5	Wy		843.8 12.8	Hl	
717.9 13.0	Wy		397.1 12.8	Wy		490.9 13.4	Wy		843.9 13.1	Wy	
723.9 13.0	Wy		397.9 13.3	Ty		492.9 13.4	Wy		847.3 13.3	Ov	
725.9 (14.0	Hl		426.9 13.5	Pk		493.9 13.2	Wy		848.2 13.1	Ov	
726.8 11.8?	Rg		427.9 13.1	Ty		498.0 13.3	Wy		849.2 13.1	Ov	
726.9 12.6	Hl		430.9 13.9	Cj		498.9 13.5	Wy		850.0 13.4	Ty	
741.9 12.9	Ty		430.9 13.3	Wy		500.9 13.3	Wy		857.8 (12.0	Hl	
745.0 13.0	Wy		442.0 13.8	Wy		510.9 13.7	Cj		863.2 13.3	Ov	
749.9 12.6	Hl		454.0 13.2	Pk		727.9 13.1	Ty		872.8 12.2	Hl	
784.0 12.9	Ty		454.9 13.4	Ty		733.6 13.0	Ov		875.9 (12.6	Wy	
988.0 13.0	Wy		454.9 13.6	Pk		749.9 (12.6	Wy		877.9 12.4	Hv	
991.1 13.1	Sb		457.0 13.6	Pk		779.9 12.9	Ty		879.9 13.1	Wy	
						783.2 13.3	Ov				
2444000+			458.9 13.1	Wy		787.0 (13.6	Hv				
011.9 14.0	Ty		458.9 13.0	Pk		787.9 13.1	Wy				
024.0 13.1	Wy		461.9 12.9	Cj		795.0 12.9	Wy				
039.9 13.6	Ty		462.0 13.6	Pk		796.0 (12.0	Hl				
048.9 13.0	Wy		463.9 13.6	Pk		802.8 (12.0	Hl				
049.9 14.3	Cj		473.0 (12.6	Pk		808.9 13.2	Hv				
067.9 13.3	Ty		478.9 13.3	Pk		808.9 12.6	Ty				
069.9 13.0	Wy		479.9 13.3	Pk		811.8 12.9	Jo				

(e) 174406 RS OPHIUCHI--INDIVIDUAL OBSERVATIONS

2,441000+			2441000+			2441000+			2441000+		
074.2 10.8	Jn		778.2 11.5	Hl		868.0 10.7?	Hl		936.9 11.7	Jn	
128.9 11.7	Jn		787.1 11.5	Ty		870.9 12.1	Mf		938.9 11.8	Ty	
129.9 11.5	Jn		800.9 11.6	Cj		883.9 11.8	Ty		940.9 11.6	Jn	
184.9 (10.4	Hl		805.2 12.1	Mm		887.9 11.5	Tr		944.9 11.6	Jn	
211.9 (10.3	Hl		806.0 11.8	Ty		894.9 11.3	Jn		946.9 11.6	Jn	
430.1 11.7	Ty		811.0 11.9	Mm		895.9 11.1	Hl		947.9 11.5	Ty	
454.1 11.5	Ty		815.2 12.2	Mm		897.9 11.3	Ty		949.9 11.6	Jn	
472.9 11.7	Ty		825.0 11.8	Ty		899.9 11.7	Jn		950.0 11.5	Tr	
502.9 11.1	Ty		829.1 12.1	Mm		914.9 11.5	Ty		951.9 11.6	Jn	
533.0 12.1	Ty		834.9 11.6	Jn		914.9 11.7	Jn		953.9 11.6	Jn	
570.9 11.7	Ty		835.0 11.9	Mm		917.9 (10.9	Hl		955.9 11.5	Jn	
593.7 11.9	Cj		838.0 11.5	Ty		918.9 11.5	Hl		957.9 11.6	Jn	
594.9 12.1	Ty		855.9 (10.9	Hl		918.9 11.7	Jn		965.9 11.6	Jn	
743.2 11.5	Ty		858.9 12.0	Jn		921.9 11.6	Jn		969.9 11.7	Jn	
758.2 11.8	Ty		864.9 11.9	Jn		923.9 11.7	Jn		969.9 12.1	Ty	
772.2 (10.9	Hl		865.9 11.8	Ty		925.9 11.6	Jn		971.9 11.6	Jn	

TABLE 1 --- OBSERVATIONS (cont)

(e) 174406 RS OPHIUCHI--INDIVIDUAL OBSERVATIONS (cont)

J.D.	M _v	Obs	J.D.	M _v	Obs	J.D.	M _v	Obs	J.D.	M _v	Obs
2441000+			2442000+			2442000+			2442000+		
973.9	11.6	Jn	302.9	11.7	Jn	630.9	10.9	Ty	978.0	11.5	Wu
976.9	11.6	Jn	303.9	(11.5	H1	631.0	10.6	Mm	993.0	10.2	Ty
979.9	11.7	Jn	304.9	11.7	Jn	632.0	11.3	Sy			
983.9	11.6	Jn	306.9	11.7	Jn	632.9	11.2	H1	2443000+		
									006.0	10.5	Cj
2442000+			306.9	(11.5	H1	636.9	11.7	Wu	007.9	11.1	H1
154.1	11.8	Ty	310.9	11.6	Jn	648.9	10.8	Mm	007.9	11.9?	Sb
182.0	11.3	Ty	314.9	11.6	Jn	652.9	11.1	Sy	018.8	10.0	H1
186.0	11.7	Jn	317.9	11.6	Jn	656.0	11.5	Sy	021.0	10.5	H1
194.2	11.8	Jn	319.9	11.6	Jn	657.0	11.5	Sy	022.1	11.1	Sy
196.1	11.4	H1	321.9	11.6	Jn	659.0	10.9	Sy	023.1	11.0	Sy
198.2	11.1	H1	324.8	11.4	H1	661.0	10.9	Sy	024.9	11.3	Ty
208.0	11.5	Ty	325.8	11.5	H1	662.0	10.8	Sy	040.9	11.1	H1
211.9	11.5	Ty	326.9	11.3?	Ty	664.0	10.3	Ty	041.0	11.5	Wu
217.1	12.2	Wu	329.9	11.6	Jn	666.0	10.9	Sy	042.9	10.4	H1
217.9	11.8	Jn	333.9	11.5	Tr	677.9	10.4	Ty	043.9	11.0	H1
220.0	11.7	Ty	336.9	11.6	Jn	680.0	10.6	Sy	044.9	10.8	H1
225.9	11.8	Jn	338.9	11.6	Jn	681.9	9.8?	H1	067.9	10.6	Ty
234.9	11.8	Jn	340.9	11.6	Jn	682.0	10.8	Sy	080.0	10.9	Sy
241.9	12.1	Ty	348.9	11.5	Jn	688.9	11.2	Ty	081.0	11.0	Sy
241.9	12.2	Jn	350.9	11.6	Jn	689.8	9.9?	H1	082.0	11.0	Sy
244.9	12.4	Jn	354.9	11.2	Ty	690.0	10.4	Sy	084.9	10.6	Ty
245.9	12.3	Jn	354.9	11.1	Jn	707.9	10.7	Ty	094.0	10.8	Sy
247.9	12.0	Jn	355.9	11.5	Jn	711.9	10.7	Sy	095.0	10.9	Sy
249.9	12.1	Jn	360.9	11.1	Jn	713.9	10.2	Sy	096.0	10.9	Sy
252.9	11.7	Ty	362.9	10.9	Jn	721.9	11.1	Ty	227.2	11.4	H1
253.9	12.0	Jn	473.3	11.7	Jn	827.3	10.6	Ty	230.2	11.8	Ty
255.1	10.9?	H1	487.2	11.2	Ty	873.3	11.0	Ty	252.0	11.8	Ty
255.9	11.9	Jn	494.3	11.6	Jn	898.1	11.4	Sb	255.2	12.2	Sb
261.9	11.8	Jn	511.2	11.3	Ty	905.0	11.3	Ty	264.2	11.7	Sb
261.9	11.8	Ty	520.3	11.6	Jn	917.0	11.5	Sy	275.0	12.1	Ty
265.9	11.8	Jn	522.2	11.8	H1	918.1	11.5	Wu	284.1	12.2	Sb
267.9	11.8	Jn	540.0	11.2	Ty	925.0	11.3	Sy	301.9	12.1	Ty
269.9	11.7	Jn	570.0	11.3	Ty	926.0	11.5	Wu	310.1	12.0	Wu
271.9	11.6	Jn	572.9	11.5	Sy	930.9	11.5	Sy	327.9	11.4	Ty
272.0	11.7	Wu	579.0	11.5	Sy	934.0	11.2	Ty	336.8	11.0	Rg
273.9	11.8	Jn	592.0	11.3	Sy	935.0	11.4	Sy	347.0	10.8	Rg
275.9	11.3	H1	592.9	11.5	Sy	950.1	10.1?	H1	359.9	11.3	Ty
275.9	12.0	Jn	594.0	11.5	Wu	955.0	11.5	Sy	361.8	10.6	Rg
277.9	11.8	Jn	596.0	11.4	Sy	956.0	11.6	Sy	366.9	11.2	H1
279.9	12.0	Jn	598.2	11.2	H1	956.0	11.5	Wu	367.8	10.7	Rg
293.9	11.9	Ty	600.0	11.1	Ty	957.0	11.4	Sy	374.9	10.6	H1
293.9	12.3	Jn	600.9	11.3	Sy	958.0	11.6	Sy	389.9	10.7	Rg
296.9	11.6	Jn	603.0	11.5	Sy	959.0	11.4	Sy	389.9	10.9	H1
299.9	11.7	Jn	606.2	11.5	Mm	960.0	11.0	Sy	392.0	10.4	H1
299.9	11.7	H1	618.9	11.4	Mm	962.1	11.6	Sy	395.9	11.7?	Ty
301.9	11.4	H1	625.1	10.6	Mm	962.9	10.4	Ty	395.9	10.8	H1

TABLE 1 - - OBSERVATIONS (cont)

(e) 174406 RS OPHIUCHI--INDIVIDUAL OBSERVATIONS (cont)

<u>J.D.</u>	<u>M_v</u>	<u>Obs</u>	<u>J.D.</u>	<u>M_v</u>	<u>Obs</u>	<u>J.D.</u>	<u>M_v</u>	<u>Obs</u>	<u>J.D.</u>	<u>M_v</u>	<u>Obs</u>
2443000+			2443000+			2444000+			2444000+		
396.0	11.5	Wu	712.1	11.5	BA	032.0	11.8	Ty	802.8	11.7	Hl
397.9	10.9	Hl	716.9	11.7	Hl	042.1	11.7	Hl	809.9	11.9	Hv
399.9	10.5	Hl	719.9	11.7	Hl	057.1	11.2	MG	811.8	11.7	Jo
402.0	11.4	Sb	720.9	11.7	Hl	058.9	11.5	Ty	813.8	11.7	Jo
403.9	10.3	Hl	725.8	11.5	Hl	072.0	12.3	BA	817.8	11.7	Jo
405.9	10.4	Hl	726.0	11.7	Wu	078.1	11.9	MG	823.0	11.8	Ty
408.8	10.8	Rg	726.9	11.7	Hl	096.9	11.3	Ty	836.8	12.1	Jo
411.9	10.3	Hl	726.9	11.4	Ty	101.9	11.4	Hl	841.8	11.8	Jo
419.9	11.8?	Ty	739.8	11.5	Hl	114.1	11.3	MG	843.8	11.8	Hl
420.1	11.0	Sy	746.1	12.1	Sb'	124.9	11.8	Ty	846.8	11.7	Jo
421.1	11.2	Sy	748.0	12.4	Wu	125.2	11.7	Hl	850.0	11.5	Ty
422.1	11.0	Sy	749.8	11.7	Hl	129.2	12.2	MG	850.0	11.9	Cj
429.1	10.9	Sy	751.1	12.5	Sb	135.0	11.8	Cj	857.8	11.2	Hl
430.1	11.0	Sy	753.9	11.4	Hl	138.9	11.4	Hl	864.9	11.4	Hv
431.1	11.0	Sy	753.9	12.1	Ty	139.9	11.3	Hl	868.8	11.5	Jo
						141.9	11.5	Hl	872.8	11.8	Hl
435.1	11.4	Sy	755.9	11.7	Hl						
457.9	11.8	Ty	756.1	12.2	Sb	142.1	11.6	MG	876.8	12.1	Jo
558.2	11.7	Ty	756.9	11.7	Hl	142.8	11.4	Hl	885.9	12.4	Jo
573.3	11.5	Ty	757.1	11.7	BA	145.8	11.4	Hl	886.9	11.7	Hl
582.3	11.7	Ty	758.0	12.4	Sb	151.9	(11.5	Hl	895.9	11.4	Hv
590.3	11.7	Ty	760.0	12.0	Wu	155.9	11.5	Ty	897.9	11.5	Ty
593.1	11.2	Hl	770.9	11.7	Hl	320.2	11.3	Hl			
600.1	10.3	Hl	772.8	11.7	Hl	352.0	11.5	Ty	2445000+		
602.1	11.5	Ty	775.0	12.0	Wu	355.1	11.4	Hl	049.1	11.3	Ty
622.1	10.3	Hl	777.0	(11.5	BA	369.1	11.7	Hl	054.2	11.4	Jo
623.1	10.4	Hl	778.8	11.7	Hl	372.0	11.3	Ty	055.1	11.4	Hv
628.1	11.1	Hl	778.9	12.7	Ty	393.9	11.5	Ty	056.2	11.3	Jo
630.0	11.8	Ty	782.9	11.5	Hl	409.1	11.5	MG	066.2	11.3	Jo
645.1	11.3	Sb	782.9	12.1	Dd	423.9	11.5	Hl	071.2	11.1	Jo
645.1	11.7	Hl	784.9	12.3	Cj	437.8	11.8	Hl	076.0	11.4	Hv
646.2	11.2	Hl	786.0	12.1	Tr	453.9	11.5	Ty	083.0	11.5	Ty
648.1	11.3	Hl	786.9	12.7	Ty	459.1	11.6	MG	084.2	11.1	Jo
657.2	11.7	Hl	791.9	(11.5	Hl	461.9	12.0	Gh	087.2	11.1	Jo
659.1	11.9	Sb	798.8	11.7	Hl	462.0	12.1	Cj	090.3	11.6	Pm
661.0	12.4	Wu	800.9	12.4	Ty	462.1	12.1	MG	091.2	11.2	Jo
661.2	11.7	Hl	957.2	11.6	Hl	486.0	11.8	Ty	093.2	11.1	Jo
662.2	11.7	Hl	970.2	11.2	Hl	497.0	11.8	Cj	094.2	10.9	Jo
663.1	11.7	Hl	980.2	11.5	Hl	518.9	11.8	Ty	105.2	11.1	Jo
663.9	11.8	Ty	985.0	12.1	Ty	537.0	12.2	Tr	107.2	11.1	Jo
668.1	11.5	Hl	991.1	11.8	Cj	546.9	11.8	Ty	108.2	11.5	Pm
684.1	11.7	Hl	991.2	12.0	Sb	720.0	11.5	Ty	112.2	11.4	Pm
689.1	11.6	BA	2444000+			730.0	11.7	Ty	112.4	11.3	SK
690.9	11.5	Hl	011.0	11.3	Ty	765.0	11.7	Ty	117.2	11.1	Jo
699.0	12.0	Wu	024.2	11.4	MG	788.9	12.1	Ty	119.9	10.7	Ty
701.8	11.3	Hl	024.2	11.3	Hl	790.1	11.7	Hl	122.2	10.9	Jo
703.9	11.7	Ty	028.1	11.5	Hl	797.9	11.8	Jo	131.9	11.0	Jo

TABLE 1 -- OBSERVATIONS (cont)

(e) 174406 RS OPHIUCHI--INDIVIDUAL OBSERVATIONS (cont)

J.D.	M _v	Obs	J.D.	M _v	Obs	J.D.	M _v	Obs	J.D.	M _v	Obs
2445000+			2445000+			2445000+			2445000+		
131.9	10.9	Ty	173.9	10.3	Jo	249.9	10.4	Jo	488.0	11.0	Jo
135.9	11.1	Jo	174.9	10.7	Hv	252.9	10.5	Dd	488.3	11.0	Pz
136.4	11.5	SK	175.4	10.6	SK	258.9	9.8?	Jo	490.9	10.8	Dd
140.0	10.9	Jo	187.8	11.0	Jo	387.2	11.4	Jo	495.9	11.1	Ty
146.9	11.1	Jo	191.0	10.4	Cj	389.2	11.4	Jo	500.9	10.9	Jo
156.8	10.3	Jo	191.4	11.2	SK	413.2	10.8	Jo	515.9	11.2	Jo
159.8	10.2	Jo	193.3	11.0	SK	421.2	10.8	Jo	524.3	11.4	Pz
160.9	10.5	Ty	194.9	10.8	Ty	433.2	10.9	Jo	526.9	11.3	Ty
161.9	10.2	Jo	198.4	11.1	SK	437.2	10.8	Jo	527.9	11.1	Ty
163.9	10.1	Jo	199.8	10.9	Jo	442.2	10.9	Jo	529.4	11.6	SK
165.8	10.2	Jo	221.9	10.9	Jo	459.4	10.7	Pz	545.3	11.4	PZ
168.0	10.1	Jo	223.9	10.7	Ty	463.0	11.1	Ty			
171.3	10.5	SK	226.8	10.7	Dd	464.6	11.0	MX			
171.9	10.1	Jo	233.9	10.5	Tr	468.2	11.1	Jo			
172.3	10.6	SK	248.9	10.5	Ty	477.2	11.1	Jo			

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A VISUAL ATLAS OF THE LARGE MAGELLANIC CLOUD

Mati Morel

Variable Star Section, R.A.S.N.Z.

SUMMARY: The writer has recently published "A Visual Atlas of the Large Magellanic Cloud" (1). This paper outlines its scope, and suggests how it can best be used by amateur astronomers.

1. INTRODUCTION

It is difficult for amateur astronomers to adequately observe many objects in the Large Magellanic Cloud because existing atlases do not provide readily available sequences of reliable magnitudes. Such data is only available from a large number of publications, often not accessible to the average amateur observer. The present Atlas is an attempt to remedy this position by providing accurate positions for a wide variety of objects together with V magnitudes whenever these are available.

2. SCOPE OF THE ATLAS

The Atlas has been produced with the amateur astronomer in mind. The limiting magnitude varies from region to region but is about 14^m which is the threshold of the majority of instruments currently used by amateurs. The main objective has been to show objects for which accurate coordinates, magnitudes and spectral type are available from catalogues or other sources. The following objects have been incorporated in the Atlas:-

- (i) FIELD STARS. All stars and objects in the CPD and CoD, or in the H.D. catalogue or its extension.
- (ii) All stars listed in the catalogues in Appendix 1.
- (iii) As many other bright field stars as possible, not in catalogues, but selected from field photographs.

Appendix 1 contains several catalogues of LMC member stars. It should be noted that while all of these LMC members have been plotted, no attempt has been

made to identify them as such.

PHOTOELECTRIC V MAGNITUDES. The range of V magnitudes is 4.3 to 13.9. This data has been taken from publications listed in Appendix 2. The Atlas charts show only V magnitudes which are accurate and reliable. Approximately determined magnitudes are excluded, as also are those subject to disagreement. All magnitudes have been rounded to the nearest tenth, with decimal point omitted.

VARIABLE STARS.

(a) A total of 237 known variable stars are plotted. These include most of the variables that have maxima brighter than 14.3.

(b) Twenty suspected variables with maxima of 14.0, or brighter. This data has been extracted from (2).

STAR CLUSTERS AND EMISSION NEBULAE.

(a) All objects having NGC or IC numbers, except those shown to be duplications or non-existent.

(b) Some additional bright clusters selected from the Shapley-Lindsay or Hodge-Sexton catalogues, as identified in (3). The objects in (a) and (b) have all been checked against their original description, wherever possible. Where discrepancies occur correct identifications are proposed.

3. CHARTS

There are seven charts covering 117 square degrees on the scale of $68'' \times 8'' = 1 \text{ mm}$. Epoch 1950.0. The charts cover from R.A. 04h 30m to 06h 30m and declinations -64° to -75° . There is reasonable overlap between adjoining charts.

4. BOOKLET

A 30 page booklet accompanies the charts and includes the following tables:-

Table 1. A list of 264 known or suspected variables. Most of these are Harvard Variables extracted from (3). Data given for each star is Name; HD or HDE number; 1950 position; maximum and minimum magnitudes if available, otherwise mean magnitude and range; type of variation; period and spectral type; UBV photoelectric observations; remarks.

Table 2. A complete index of Harvard variables in Table 1.

Table 3. A list of 20 suspected variables NSV number (2) and other name is given with other data as for Table 1.

Named variables (e.g. SX Dor; RT Men) are shown on the charts as a small dot within an open circle with the designation of the variable beside it. All other variables are shown as a small dot labelled with a small "v".

Table 4. Complete list of NGC and IC objects. Data given is NGC/IC number; 1950 position; type of object; symbol used.

Table 5. List of additional clusters. Data given is Name; other names; HD or HDE number; 1950 position; symbol used; remarks.

Four basic ways are used to plot non-stellar objects on the charts.

An ellipse () means a background galaxy.

An open circle (o) means a relatively large, bright cluster or nebula.

A cross (+) means a relatively small, faint cluster or nebula.

Fourthly, some clusters are plotted as individual bright members.

The issue of what constitutes a 'bright', or 'faint', cluster is a purely subjective decision on my part, with no basis in published magnitudes. It serves only as a rough guide.

5. GENERAL

Any Atlas based on catalogue data will reflect the completeness, or otherwise, of the catalogues used. Every effort has been made to add as many additional stars as possible from photographs and photographic charts. Every effort has been made to show the visual aspect of the region by frequently comparing the Atlas charts with the yellow light charts (3) and correcting where necessary. In addition, about 90 red supergiants, ranging from 11.05 to 13.93V

have been plotted from (4). The low precision of the coordinates in (4) has made identification difficult, or in some cases impossible.

6. POSSIBLE OBSERVING PROGRAMMES

(a) NOVAE. Newly discovered novae can be readily plotted on the charts. Immediate magnitude estimates will then be possible using the reliable sequence magnitudes on the charts. Searches for novae can also be made using the charts. This can be done either visually or photographically but observers are cautioned to have any suspected discovery verified before making any announcement.

(b) VARIABLE STARS. The Atlas will enable existing programmes on Mira variables to continue. Other programmes that can be undertaken are observations of the S Dor type stars. The brightest member of this class in the LMC is S Dor itself, and the Variable Star Section is anxious to obtain more observations of it. Possible members of the S Dor type should also be observed.

Photoelectric observers will find the Atlas useful for observing the irregular variables of small amplitude. Both photoelectric and visual observers are encouraged to observe HDE 269006 = CPD -71° 308 which has slowly, but steadily, risen by 1.1 magnitudes in 13 years.

Observers with larger instruments should study HV 12842, the brightest R CrB variable in the LMC. Its maximum magnitude is 13.65V. There is almost no limit to the variety of objects that can be observed by amateurs using the Atlas. It would, however, be wise for anyone wishing to commence one or more of these programmes to first consult with the Director, Variable Star Section, R.A.S.N.Z. so that such programmes can be carried out in a systematic manner in conjunction with others interested.

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My sincere thanks go to Dr. C. Jasehek for furnishing several extensive catalogues of stellar data. Thanks are also due to Dr. Wayne H. Warren, Jr., for kindly furnishing a computer print out of LMC members. Appreciation is also expressed to Dr. F.M. Bateson for assistance with bibliography and for the extended use of a field photo (U Dor field).

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LIGHT CURVE OF NOVA MUSCAE 1983

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(2) Member, V.S.S., R.A.S.N.Z.

SUMMARY: A light curve of Nova Mus 1983 is presented. This is from visual observations. The observations are discussed.

1. OBSERVATIONS

Nova Mus 1983 has been well observed by members of the Variable Star Section, Royal Astronomical Society of N.Z. Observations were made visually with a variety of instruments, and the nova is still under observation.

The results in this paper cover the interval J.D. 2,445,354 to 2,445,616. Observations were particularly numerous during the first 50 days, after which they became fewer when the nova was in a less favourable observing position from many sites.

Preliminary charts, prepared by M. Morel, were distributed shortly after discovery. These were replaced with chart No. 742 (1), based on a V plate kindly supplied by A.C. Gilmore, Mt. John University Observatory. An accurate position for the nova was measured by P.M. Kilmartin (2) from this plate and this was shown on Chart 742.

Comparison stars were identified on the preliminary charts and on chart 742 by letters. W.S.G. Walker, G. Herdman and B.F. Marino (3) obtained V magnitudes

at the Auckland Observatory for sequence stars down to magnitude 10.8. They hope to determine values for the fainter stars during the next observing season. Observations have been reduced using the Auckland sequence. Unfortunately some observers used other sequence stars for which no reliable magnitudes are available. Such observations have not been included in this paper.

2. LIGHT CURVE.

The light curve is shown in Figs. 1 and 2 in which the plotted points are half day, or daily, means according to the number of observations made on each day. The explanation of the symbols used in plotting to show the number of observations in each mean is illustrated in Fig. 2. A smooth curve has not been drawn through the plotted points although the fit of this is easily seen in the Figures. Instead the plotted points have been connected to show the apparent fluctuations observed. It should be noted that Fig. 1 is on an expanded scale compared to Fig. 2. This was done for the sake of clarity in plotting the interval in which observations were particularly numerous.

Three small crosses appear at the start of Fig. 1. The first of these at J.D. 2,445,350 are pre-discovery photographs taken by E. Gainsford and S. Pattie (4), whilst the other two are the discovery magnitudes by W. Liller (5).

3. DISCUSSION

The nova had an initial sharp decline from 7.2 to 9.0 in 5 days at a steady rate of $0.36M_V$ per day. Over the next 11 days the nova fluctuated between 8.5 and 9.0. This was followed by an interval from J.D. 2,445,369 to 2,445,385 in which the amplitude of the variations were larger after which a very slow decline set in with small amplitude fluctuations. This decline appeared to be broken by a distinct brightening from 10.6 to 9.8 which lasted for a few days centred on J.D. 2,445,580.

We concluded that the marked variations referred to above are real and mark the transition stage of Nova Mus. This feature is not uncommon in novae - see for examples several of the light curves in (6). Our conclusion appears to be supported by the colour changes and variations reported in (7).

The visual observations are systematic too bright when compared to the V magnitudes (7). Differences between V and M_V are, of course, well known. Bateson (8) has shown that such effects vary from one observer to another. They are also strongly affected by moonlight and the colour of the variable. We are inclined to agree with (7) that the systematic difference between the V light curve and the M_V curve is probably due to the additional contribution to the visual estimates from the very strong H α emission line.

ACKNOWLEDGEMENTS

We thank all members of the V.S.S., R.A.S.N.Z. for their careful observations. Our thanks are also due to A.C. Gilmore and P.M. Kilmartin for the photos of the field of Nova Mus and for the accurate position determined. We are indebted to the Auckland Observatory Group for determining the magnitudes of the sequence stars. We wish to thank K.M. Harrison for forwarding slides of the pre-discovery photos taken by E. Gainsford and S. Pattie, and P.M. Kilmartin and A.C. Gilmore for their examination of these.

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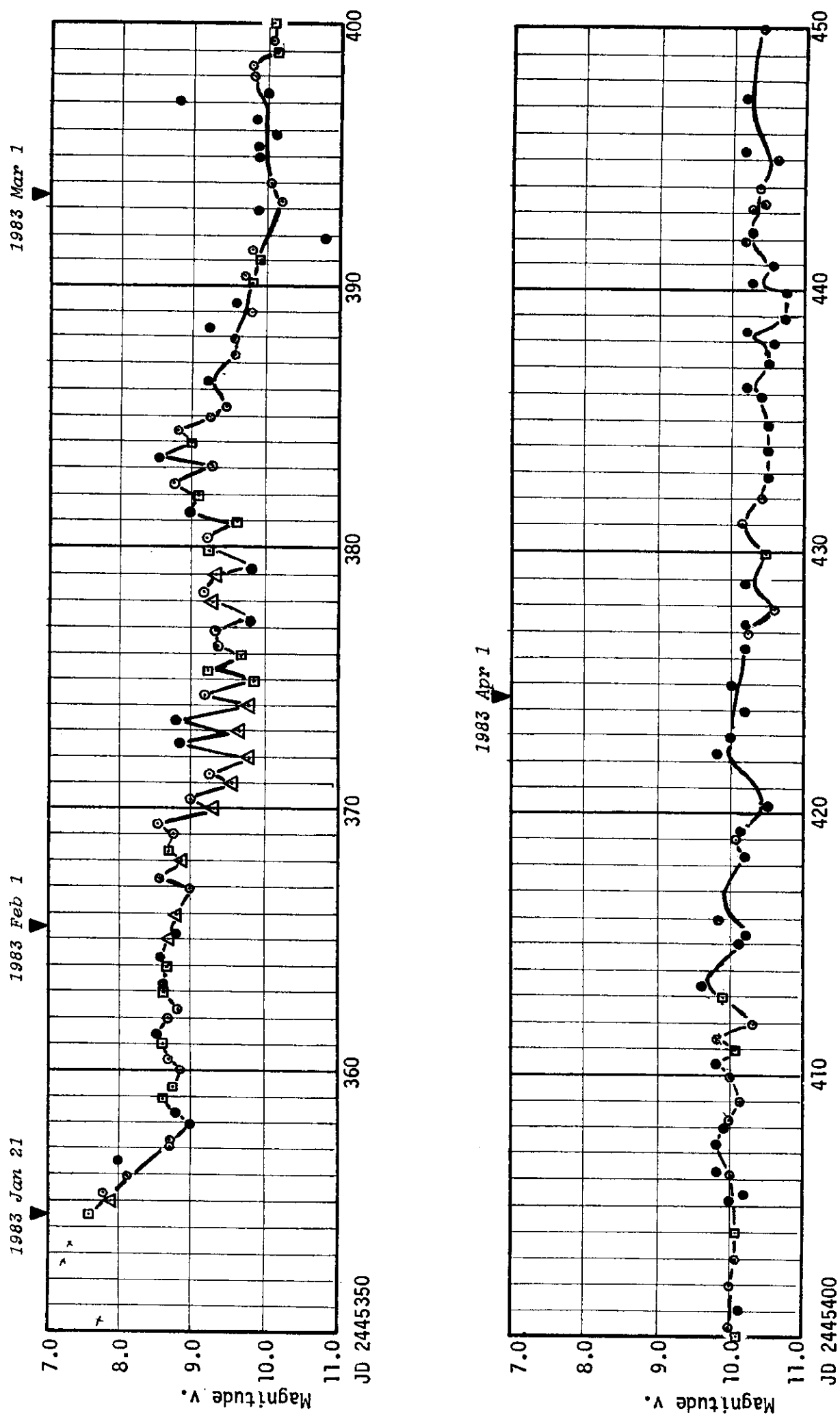


Figure 1. 114766 Nova Muscae 1983 ~ Light Curve.

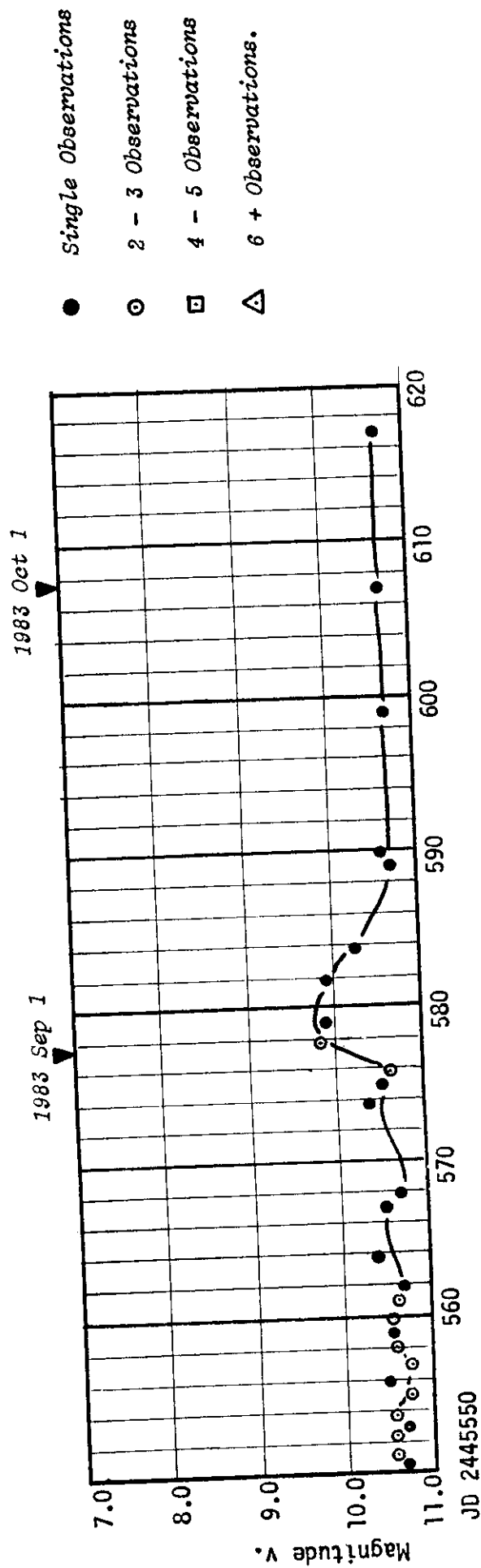
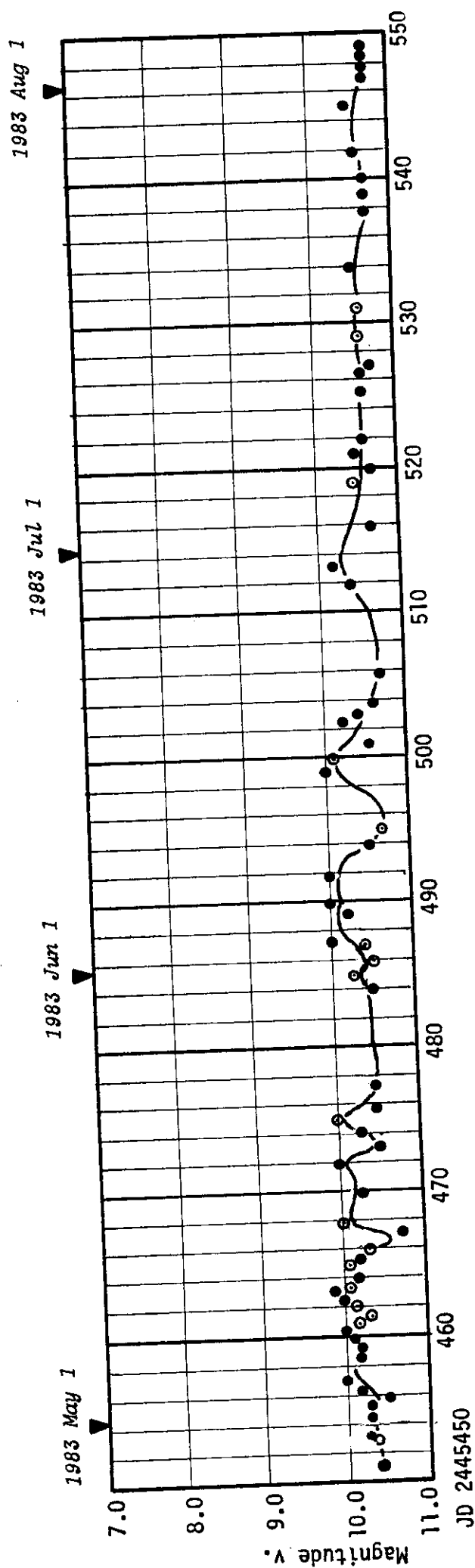


Figure 2. 114766 Nova Muscae 1983 ~ Light Curve.

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ASTRONOMICAL RESEARCH LIMITED.

Frank M. Bateson.

Astronomical Research Ltd is a private, non-profit company formed several years ago with the object of providing the finance necessary to enable the V.S.S., R.A.S.N.Z. to function effectively and to enlarge its services. The initial establishment of the company was made possible by the transfer to it of personal assets by way of an excellent library and office equipment from myself.

The Variable Star Section was established in 1927 and, until 1969, was largely financed by myself assisted by grants from various trusts and by small subscriptions to the old style circulars. The demands for the results of the Section coupled with the volume of the work involved made it obvious at that time that the Section required a headquarters and at least one person working full time on its activities. The headquarters was established in Tauranga and, apart from some voluntary social work, I devoted myself entirely to the work of the Section.

A few years ago the Publications, Monthly Circulars and Charts for Southern Variables were all upgraded. Astronomical Research Ltd was then formed to promote the sale of these publications and to increase financial support for the Section. This finance comes from subscriptions, , grants, donations and the occasional advertising revenue.. No salaried staff are employed but considerable assistance comes from the voluntary services of several members.

The services we offer are those provided by the Publications and Monthly Circulars, for which current subscription rates are listed on the outside back cover of this issue. Charts for Southern Variables, of which 16 series containing 750 charts have been published, were commenced under a personal grant from the IAU. Subscriptions have made it possible to continue to publish these charts.

Data on a wide variety of variable stars is supplied on request on the basis that if it requires less than one hours work no charge is made. A typing charge is made at current N.Z. rates when requests involve additional hours of work. Additionally advice on the activity of southern variables is supplied, on request, by telex, cable or phone as required. The actual cost of such messages is payable by those requiring the data plus the cost of inward phone calls from observers and a small service charge.

We are always happy to cooperate on any programme, or to add fresh stars to the observing list. Assistance by way of grants or donations is always appreciated. Members of the Section can assist in this direction also by obtaining more subscribers to the various publications. Our accounts are, of course, subject to an annual audit by a Chartered Accountant.

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REPORT OF THE VARIABLE STAR SECTION, ROYAL ASTRONOMICAL SOCIETY OF NEW ZEALAND

FOR YEAR ENDED 1983 DECEMBER 31.

OBSERVATIONS. The table below lists the visual observations received for the year ended 1983 August 31. This date is adhered to so that such lists can be compared with those of previous years. This avoids inflating the totals for one year and decreasing them in another after the Society changed its year to that ending on 31 December.

TABLE OF OBSERVERS OBSERVATIONS.

OBSERVER	STARS	OBS	OBSERVER	STARS	OBS
ARN, W.L.	5	5	LECHNER, J.A.	2	6
BARRETT, A	1	4	LESLIE, A.	13	244
BEGG, D.L.	19	162	LOADER, B.	11	16
BLANE, D.	7	9*	LUMLEY, E.	25	146
BROWN, N.J.	41	388	MANDY, W.G.	4	49
BRYANT, K.	8	40	MARINO, B.F.	111	1136
CAMPOS, J.A.S.	28	124	MARTIN, D.S.	30	259
COULING, G.G.	18	316	MENZIES, B.	31	972
CRAGG, T.A.	453	1278	MEYERS, P.	5	16
CRISP, R.	3	3	MOREL, M.	5	31
DIETERS, S	44	324	MORRISBY, A.G.F.	116	469*
DINGLEY, A.	5	10	O'KANE, J.	27	127
DODSON, A.W.	51	302	ORCHISTON, W.	65	744
DREDGE, A.	28	199	OVERBEEK, M.D.	300	8100*
DURHAM, D.	59	445	PAGANO, L.	12	19
EMMERSON, R.	3	15	PARK, J.	19	250
FLEET, R.W.	56	300*	PAZZI, , L.	76	648*
GILLER, R.	17	36	PROSSER, G.L.	44	93*
GOLTZ, W.	94	548	ROUNTHWAITE, T.	21	34
HARRIES-HARRIS, E.	47	616	ROWE, G.H.	63	849
HOVELL, S.	30	145	St. GEORGE, L.E.	21	291
HAYWARD, G.	4	15	SAUNDERS, S.	54	453
HENNESSY, D.	2	3	SHINKFIELD, R.C.	10	18
HENSHAW, C.	1	43	SMITH, S.	4	7
HERDMAN, G.	38	287	STABENOW, R.	16	184
HERS, J.	46	1451*	STEPHANOPOULOS, G.	133	737
HIGGS, N.T.	49	319	TAYLOR, N.W.	127	1249
HIGGS, S.	11	17	THOMAS, R.	34	169
HULL, O.R.	235	3571	TREGASKIS, T.B.	191	662
HULL, O.A.	4	6	TURLE, L.	11	601
IVES, B.A.	2	8	VENIMORE, C.W.	36	405
IVES, F.J.	54	407	VINCENT, J.	24	502 *
JONES, A.F.	113	5528	WILLIAMS, P.	145	1468
JOZSA, A.	9	54	WILLIAMSON, L.J.	16	121
KENT, K.	3	3	WINNETT, R.D.	45	183

* = Results also communicated to A.A.V.S.O.

TOTAL OBSERVATIONS 38,239

Compared to the previous 12 months there was an increase in both the number of active observers and in the total observations. The eight observers, who made more than 1,000 observations, accounted for just over 62% of the total. The contributions from the less prolific observers showed a distinct increase which gave a better spread of estimates amongst observers.

PUBLICATIONS. Monthly Circulars have been published each month. Four issues of the newsletter "CHANGING TRENDS" were circulated to active visual observers during the year. These have proved very popular with members and have drawn many favourable comments. However, they will not appear at quarterly intervals unless members supply more items for inclusion.

Publications No. 10 was distributed. It is pleasing to note that owing to an increased number of subscribers it was possible to enlarge this number by fifty percent compared with the previous issue. This has also made it possible to maintain this page size and length in the current issue. This number should have been published just after the New Year holidays but has been delayed owing to the pressure of other urgent work.

The fourth edition of "THE OBSERVATION OF VARIABLE STARS" was also published and has proved popular. Series 16 of CHARTS FOR SOUTHERN VARIABLES was published in terms of the original grant referred to in the previous report.

M. Morel published his "VISUAL ATLAS OF THE LARGE MAGELLANIC CLOUD" which fills a need for good visual charts of the L.M.C.

HEADQUARTERS Last year I commented in the Annual Report that 1982 had been the most productive and satisfying in the Section's history. The current year has vastly exceeded that of 1982 in all respects. This has been due not only to the volume of observations and the ever increasing requests for data, but also to an even larger volume of correspondence than last year.

Office equipment has been maintained and extended. The reorganisation of the chart material referred to last year has continued with the result that when time permits, probably in 1985, it should be possible to issue a complete list of all sequence magnitudes as a summary of those published in many old Circulars as well as those published more recently. I am indebted to my wife for her assistance in many aspects of the routine work, and to Mrs. A. Walsh, for some voluntary typing help.

PAPERS. The work of the Section has been greatly aided by the work of our valued Recorder, Gordon Smith, who has maintained the permanent records in an excellent state as well as compiling the lists of observations for use by the A.A.V.S.O. and B.A.A. The flow of papers for the Publications has been, in a large measure, due to the devotion of A.W. Dodson, C.W. Venimore N.W. Taylor and G. Stephanopoulos. Not all their contributions have yet been published because additional data is awaited in order to complete some papers.

CHARTS. The production of charts has been continued by M. Morel with the skill and attention to detail that has made his work so highly regarded. We are indebted to A.C. Gilmore and P.M. Kilmartin of the Mount John Observatory and to H.O. Williams, Auckland Observatory, for many photos that have enabled charts to be produced. We are also indebted to B.F. Marino, W.S.G. Walker G. Herdman for their determination of sequence magnitudes for Nova Mus 1983 and other variables. D. Kilkenny, S.A.A.O., has kindly supplied sequences for some suspected R CrB stars and is working on other sequences as his programmes permit. Some of his results appear in this issue.

PHOTOGRAPHIC SEARCH FOR DWARF NOVAE. A.C. Gilmore, Mt. John University Observatory, and H.O. Williams, Auckland Observatory, have supplied a number of photos of variables on this programme. These have not to date resulted in any new dwarf novae being found.

NOVA PATROL. Regular visual searches are now being conducted by some members. It is expected that in 1984 more members will take part in this programme.

NOVAE. Members have continued to monitor a number of old novae that are still visible, as well as monitoring several recurrent novae and novae discovered during the year. In particular Nova Mus 1983 was well observed and a summary of the results appear in this issue.

SUPERNOVAE. Several supernovae discovered in 1983 have been observed. A chart is under preparation for the eclipsing binary in NGC 2346 which has had close attention by the Auckland Observatory group. B.F. Marino has kindly supplied a sequence and the photo taken by H.O. Williams. It is pleasing to note that it is hoped that an atlas of galaxies is expected to be published in 1984. This will make the observation of supernovae easier and greatly aid the checking of reported discoveries.

SPECIAL PROGRAMMES. There is no need to enlarge on these in this report because members have been well aware of those on which we cooperated during the past year through the notices in the Monthly Circulars, Special Circulars and letters as well as notes in the Society's Newsletter. Our help in these programmes has been greatly appreciated by those who sought our aid.

ROUTINE PROGRAMMES The routine programmes on dwarf novae, Mira, R CrB and unusual variables has been maintained with success. Efforts have been made to add a number of neglected southern miras to these programmes, for which purpose some charts have already appeared and others will be found in Series 17, CHARTS FOR SOUTHERN VARIABLES to be published in 1984.

A.A.V.S.O. We have continued to supply copies of members' observations of Mira variables for inclusion in the light curves and predictions issued by the A.A.V.S.O. Old published records of such stars are being prepared for storage in the archives of the A.A.V.S.O., although this work has fallen behind schedule owing to more urgent matters.

B.A.A. We have continued to exchange observations with the B.A.A. for the mutual programmes referred to in previous reports. A.W. Dodson is currently working on the first paper that will combine observations from both Sections.

FINANCES. Astronomical Research Ltd has been able to secure several small grants during the year as well as additional subscriptions. This has made it possible to enlarge both Publications 10 and 11. The frequency of these publications is limited by the availability of typing assistance as well as the time that I can devote to the typing.

ACKNOWLEDGEMENTS. First and foremost I would like to express my sincere appreciation to all observers, no matter how large or small their contribution, for their observations. For the most part these have been made with skill and accuracy, but I must sound a note of warning to some new members. The observation of variable stars is not a numbers game in which the aim is to secure the largest number of observations; that is best left to the experienced observers. It is quite useless making numerous estimates of variables that will never become visible in the instrument used. This only leads to a string of quite useless negative records, which whilst they swell an individual's total estimates are of no use whatsoever.

My thanks are also due to Jim Park, Victoria Astronomical Society, for his cooperation and for increasing interest in the Section in his area. To Jan Hers and Dannie Overbeek for their cooperation in supplying copies of their own observations, and those of their members for our use. I am indebted to Brian Marino and Stan Walker for the close cooperation with the Auckland Observatory. Finally I must thank the many professional colleagues who have assisted the Section through their support.