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NEW VARIABLE STARS IN LYRA AND CYGNUS

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This report summarizes the results of a variable-star search in the $20^\circ \times 15^\circ$ area centered at $19^{\rm h}00^{\rm m}/+45^\circ$ (1950).

Eighteen yellow/blue plate pairs (Kodak 103a-D + GG11 filter and 103a-O unfiltered) were exposed between 1967 and 1982, and forty-three films (Kodak TechPan 4415 + GG495 filter) taken in the years 1987 to 2000. Four exposures with a 200/210/300mm Schmidt camera taken 1995–1999 on TechPan without a filter were also examined and used to prepare finding charts. Ten plate or film pairs were scanned for variables with a blink comparator and with four stereo comparators used in tandem. Magnitudes were determined in a stereomicroscope using comparison stars taken from the Guide Star Catalogue (Lasker *et al.* 1990) and the Guide Star Photometric Catalogue (Lasker *et al.* 1988). The yellow-light magnitudes 'm_v' shown in Table 2 are thus tied to the GSC (northern) magnitude scale and will be systematically somewhat brighter than standard Johnson V.

In this field twenty-five new variables were found. Five previously published variables without elements (Dahlmark 1982, Skiff & Williams 1997) were also examined to assess their lightcurves. Finally seven designated but poorly-studied stars were included in the work. Table 1 shows positions and identifications for the new stars. The coordinates were drawn either from the GSC-ACT (Gray 1999) or USNO–A2.0 catalogue (Monet *et al.* 1998); two appear in no catalogue and were estimated ($\pm 2''$) using the Digitized Sky Survey via the Goddard SkyView facility. The source of the positions is coded in column 's' as follows: A = USNO–A2.0, G = GSC-ACT, S = SkyView.

About half the variables have been recently identified by the ROTSE survey (Akerlof *et al.* 2000), and these names are given as well. The ROTSE positions are not as good as those given below. Except for one short-period variable, no lightcurve information was supplied, so the present results extend our knowledge of these variables.

The elements of variation are collected in Table 2. An asterisk by the star name indicates a note at the bottom of the table. The lightcurve determinations are based usually on sixty-five magnitude estimates for each star. From these the magnitude range, provisional variability type, epoch of maximum, and period have been determined. The column 'b–r' shows star colors from USNO–A2.0; these are not well calibrated to any standard system, but serve to indicate in a qualitative way the sorts of stars involved.

Table 1: Positions and identifications

Name	RA (2000)	Dec	s	GSC	IRAS	ROTSE1
LD 342	$18^h02^m28^s.09$	$+50°46'27''.8$	G	3536-0110		
LD 343	18 17 24.60	+42 36 16.2	A		18158+4235	J181724.82+423614.8
LD 344*	18 21 48.43	+51 24 20.6	G	3537-1908	F18206+5122	J182148.31+512419.2
LD 345	18 31 13.83	+46 58 34.7	G	3530-2757		
LD 346*	18 49 43.41	+40 57 49.6	G	3122-2898	18480+4054	
LD 347	19 05 33.82	+39 20 04.3	G	3120-1794		
LD 348*	19 15 20.63	+39 58 49.2	G	3125-1819	F19136+3953	J191520.86+395900.7
LD 349*	19 18 54.46	+43 49 26.0	G	3133-0385		J191853.61+434930.0
LD 350	19 19 55.01	+40 52 40.1	G	3125-0632		
LD 351*	19 28 38.98	+45 05 51.9	G	3543-1107	19271+4459	J192838.56+450547.1
LD 352	19 30 32.95	+48 03 25.4	A		19291+4757	J193032.71+480327.0
LD 353	19 31 43.56	+41 25 38.3	A			J193143.45+412537.9
LD 354*	19 33 10.56	+38 58 33.6	A		19314+3851	J193310.27+385830.6
LD 355	19 35 23.09	+48 03 00.8	G	3560-1804		
LD 356	19 37 38.50	+49 07 50.8	G	3564-2375	19362+4900	J193738.09+490751.9
LD 357*	19 39 08.50	+43 23 49.6	G	3147-1366	19375+4316	J193908.32+432345.2
LD 358	19 42 06.64	+38 03 37.1	A		19403+3756	
LD 359*	19 42 08.44	+47 22 57.3	A		19406+4715	
LD 360	19 43 08.74	+41 34 14.1	G	3144-0947	19414+4126	
LD 361*	19 44 15.69	+39 11 12.2	A			
LD 362	19 47 15.81	+44 27 07.0	A			
LD 363*	19 47 58.82	+38 45 54.5	A		19462+3838	
LD 364*	19 49 26.3	+37 31 59	S		19476+3724	
LD 365	19 52 06.73	+43 31 08.1	G	3149-1648		
LD 366	19 59 38.99	+47 31 33.1	A		19581+4723	
V352 Lyr	18 52 17.06	+42 09 49.0	A		18507+4206	
V396 Lyr	18 59 50.68	+45 21 39.9	G	3541-1654		
EQ Lyr	19 19 02.63	+41 06 34.5	A			
V1253 Cyg	19 18 57.04	+44 57 24.5	A			J191857.81+445729.8
V1503 Cyg	19 19 53.33	+43 45 44.1	G	3133-0201	19183+4340	J191953.20+434541.0
V754 Cyg	19 42 49.75	+51 52 50.8	G	3569-0766	19415+5145	J194249.75+515247.1
IR Cyg	19 47 15.7	+37 50 43	S			

Notes:

LD 344	StM 431 (M7).
LD 346	StM 439 (M7e).
LD 348	ROTSE1 Dec in error; in a line of four stars.
LD 349	ROTSE1 RA in error; also 1RXS J191854.7+434927; eastern star of two.
LD 351	east-northeastern star of two.
LD 354	northeastern component of a close pair.
LD 357	southern of two stars.
LD 359	northwestern of two stars.
LD 361	southern star of a pair.
LD 363	westernmost star of a trio.
LD 364	eastern of pair.

Table 2: Elements of variation

Name	max (m_v)	min	b–r	type	epoch JD 2400000+	period (days)	Remarks
LD 342	13.5	14.4	–0.2	Ia			
LD 343	11.1	15.8	1.3	M	51444	270	
LD 344	10.8	12.6	2.8	Lb			
LD 345*	11.4	>14.8	2.5	E			
LD 346	12.2	14.2	2.7	Lb			
LD 347*	12.3	13.4	0.6	E	51101	307?	
LD 348	11.0	>16.0	2.5	M	51069	247	
LD 349	12.2	14.0	1.3	RS?			
LD 350	12.5	14.0	2.7	M:	51456	221	
LD 351	12.1	>16.0	3.1	M	50596	320	
LD 352	11.6	15.2	3.7	M	50691	313	
LD 353	12.4	15.0	3.0	M	51500	191	
LD 354	11.9	14.2	1.5	M:	51450	361	
LD 355*	13.8	14.6	0.3	E	51513.3	25.81?	
LD 356	11.8	16.0	4.3	M	51158	404	
LD 357	12.2	13.9	2.9	SR	51542	189	
LD 358	12.2	14.2	2.6	SR	51101	305?	
LD 359	11.8	15.5	5.0	M	51287	455	
LD 360	12.6	14.7	2.8	SR	51406	292	
LD 361	12.0	14.8	5.9	M	51406	339	
LD 362	13.2	14.7	2.8	Lb			
LD 363	11.8	13.7	5.8	M:	51570	405	
LD 364*	12.5	14.0		L			
LD 365	11.5	13.5	3.0	L			
LD 366	12.0	>16.1	5.0	M	51285	435	
V352 Lyr*	12.0	>15.0	3.9	M	51406	351	
V396 Lyr*	12.5	15.3	2.3	SR	51432	229	
EQ Lyr	11.5	15.0	2.6	M	51418	305	
V1253 Cyg*	11.8	>15.0	2.5	SR			
V1503 Cyg	11.4	15.5	2.7	M	51542	311	
V754 Cyg	11.3	13.4	3.0	Lb			
IR Cyg	12.0	15.5		L			
NSV 24916	11.8	14.8		M	51456	253	LD 8
NSV 24928	11.8	13.5	1.5	Lb			LD 9
NSV 24935*	11.4	14.6	1.6	M	51158	301	LD 10
NSV 24955	11.0	15.0	1.4	M	51608	212	LD 11
NSV 24962	11.4	15.2	1.5	M	50637	324	LD 12
NSV 24994	13.2	>16.0		L			LD 14

Notes:

LD 345	constant on all plates at m_v=11.4 except >14.7 on: JD 2441512.5, 2441892.5, and 2442210.5.
LD 347	five minima observed.
LD 349	'cepheid' with $4^{d}.123$ period and full amplitude of $0^{m}.63$ in ROTSE1 list, but only larger, irregular variations seen here. The x-ray detection suggests this is probably an RS CVn type star.
LD 355	five minima observed.
LD 364	as faint as B ~19 on three overlapping POSS-II J plates.
V352 Lyr	range 14.0 < mb < 17.5, period $331^{d}.43$ (Gushchin 1994).
V1253 Cyg	188-226^{d}?
V396 Lyr	mode-switching 176/318^{d}?
NSV 24935	CSS 1172.

I would like to thank Gerhard Klaus (Grenchen, Switzerland), who has provided me for many years with finding charts and magnitudes from the GSC for each of my variables. Brian Skiff (Lowell Observatory) has checked the coordinates and identifications, and has prepared the material for publication. The ROTSE stars were located via Taichi Kato's handy 'newvar' list (Kato 2000).

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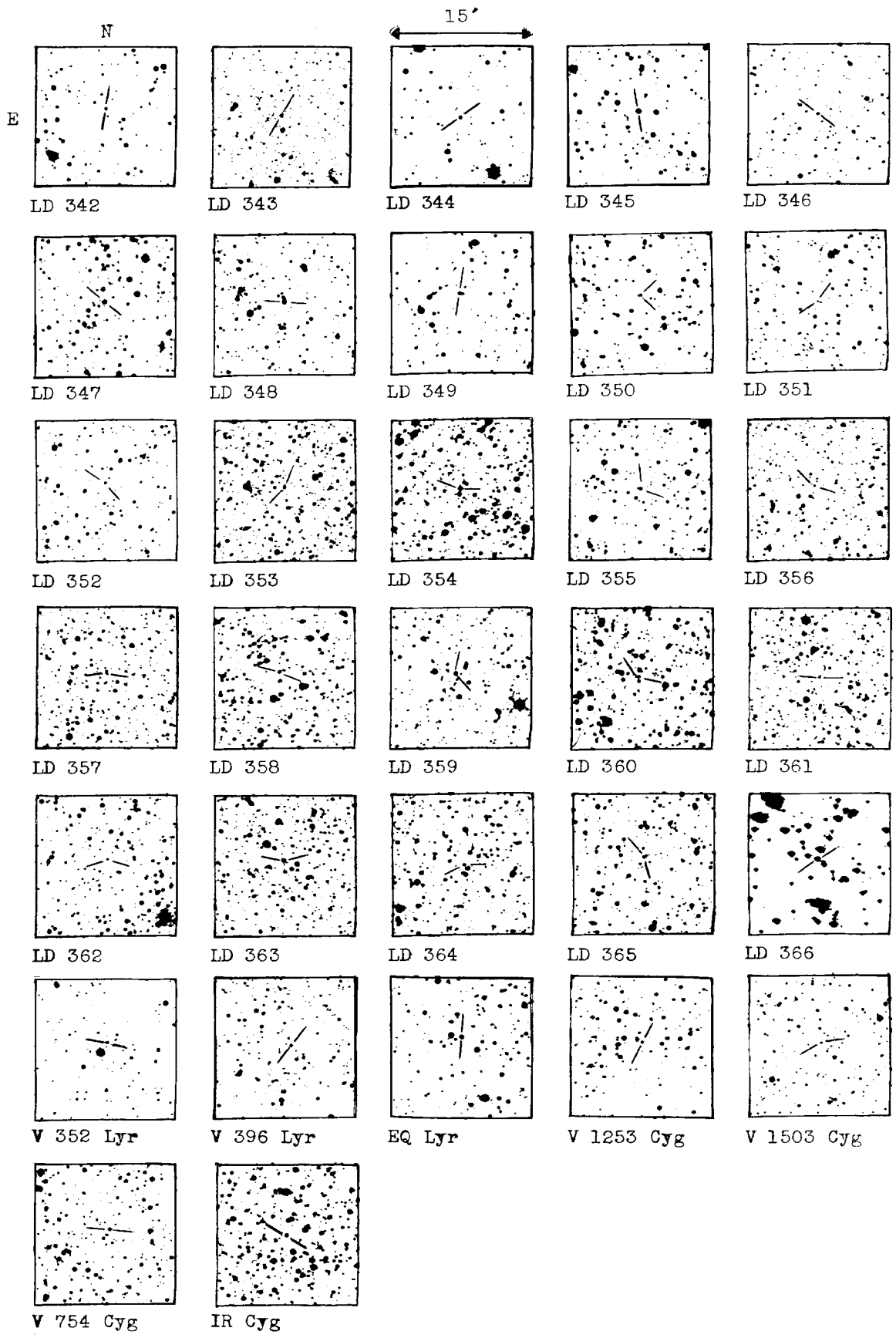
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V 396 Lyr
EQ Lyr
V 1253 Cyg
V 1503 Cyg
V 754 Cyg
IR Cyg

Figure 1.