British Astronomical Association

VARIABLE STAR SECTION CIRCULAR

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Contents

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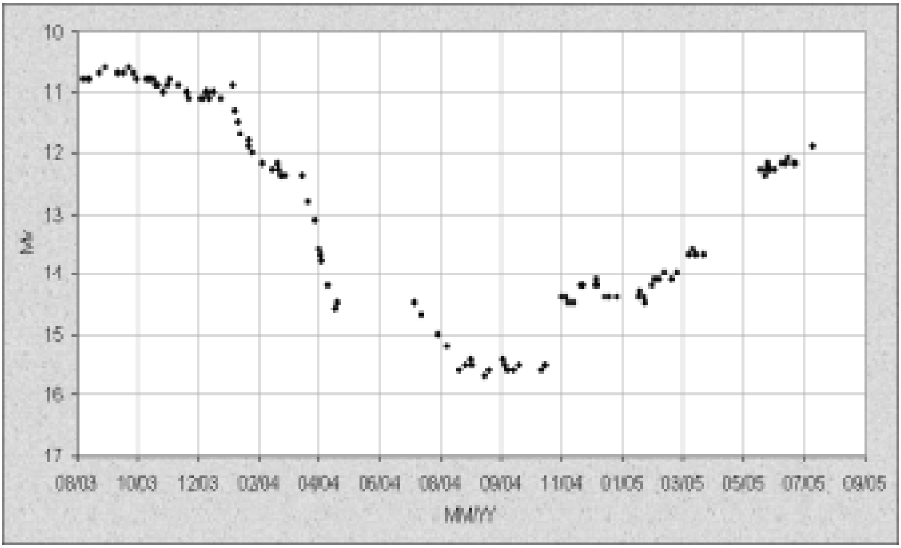
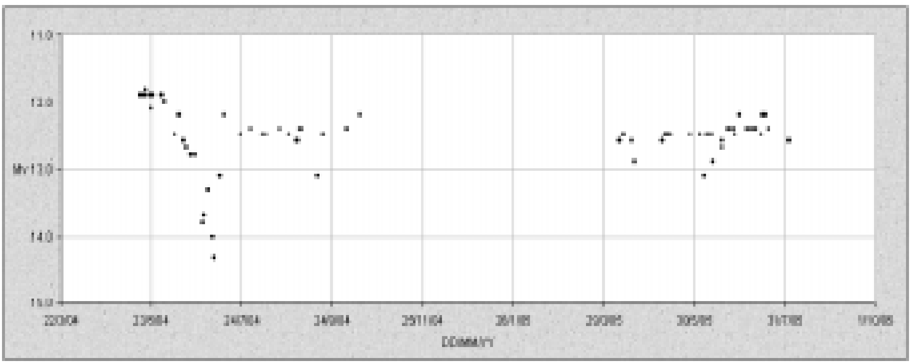
VISUAL LIGHT CURVES

GARY POYNER



DY Per: A typical deep minimum of the RCB star DY Per (Aug 3 2003 to Aug 4 2005), taking approximately twice the length of time from fade to recovery as previous minima. Visual Poyner



NSV 7883 (Her): Interesting star of as yet unknown type. Fade event during June 2004 saw a drop of 2.5 magnitudes, which has yet to be repeated, despite some variations of 0.7 mag during 2005. Large seasonal gap due to local obstructions. Visual Poyner.

FROM THE DIRECTOR

ROGER PICKARD

VSS Director's Award

I've only had one response so far to my note in the last Circular. Is there really no-one else who would like to nominate somebody?

Articles for the Circulars

I was delighted to see the article by Des Loughney and Janet Simpson in the last Circular, and would like to encourage more from other observers. So if you have something to say, perhaps about your favourite variable, then do not be afraid to share it with others. Such articles are always welcome.

The Main Telescopic Programme

There are two stars that were included in the "New" variable star programme that have now been dropped from the revised programme (see the article about the ICCE Programme in the Circular). However, whilst not meeting the criteria for that programme, they are still stars of interest, and so I have included them in the Main Telescopic Programme. The stars are **V386 Cep** and **V513 Per**. In deciding to omit these stars from the ICCE programme, Chris Jones wrote (in part):

V386 Cep

A lengthy data set is available for this object from both visual and photographic sources. The object has a spectrum of S, and the GCVS entry records an SR classification, and a magnitude range of 8.8 to 11.5 (visual). Unpublished work by Collins shows that up to 1994 the object showed small amplitude variations as recorded by the GCVS entry, which is based on Boehme (MVS 12, H.8, 137, 1992). Thereafter the object has shown an increasing amplitude with each cycle, and since 2002 it has shown an amplitude range of more than 4 magnitudes. The period remains unchanged at around 382 days. The star has a very strong deep red colour visually, and is therefore a difficult object to accurately estimate. This object benefits from being circumpolar from the UK (hence the number) and because of this, the temporal spread of the observations is reasonably good.

V513 Per

This object has received a GCVS entry which indicates a range of 10.4 to 13.0, and a Mira type variability (no period is given). Fifty-seven positive observations covering the period JD 2451485 to JD 2453110 indicate a visual range of 11.2 to 15.2; a Mira type variability; and a period of 403 days. There is some weak evidence of a shortening of the period within the span of the data. There are, however, just four full cycles of coverage. With the inherent error in determining the period from visual observations, a lot more data, over a very much longer period is needed to confirm this suspicion.

The 'ICCE" (formerly "New") Variable Star Programme

Chris Jones has put in a large amount of work in revising this programme, and I heartily recommend observers to add one or two of these stars to their observing programmes.

The CCD Programme

Similarly, Karen Holland has spent a lot of time revising and extending this programme, and has also included 4 stars from the ICCE Programme. I hope CCD observers will add some or all of them to their programmes.

RECURRENT OBJECTS PROGRAMME: 2005 JULY OUTBURST OF TY VUL

Jeremy Shears and Gary Poyner

TY Vul was reported to be in outburst on 2005 July 16 by Jeremy Shears as part of his CCD patrol of ROP stars (Figure 1). The outburst was confirmed visually by Gary Poyner:

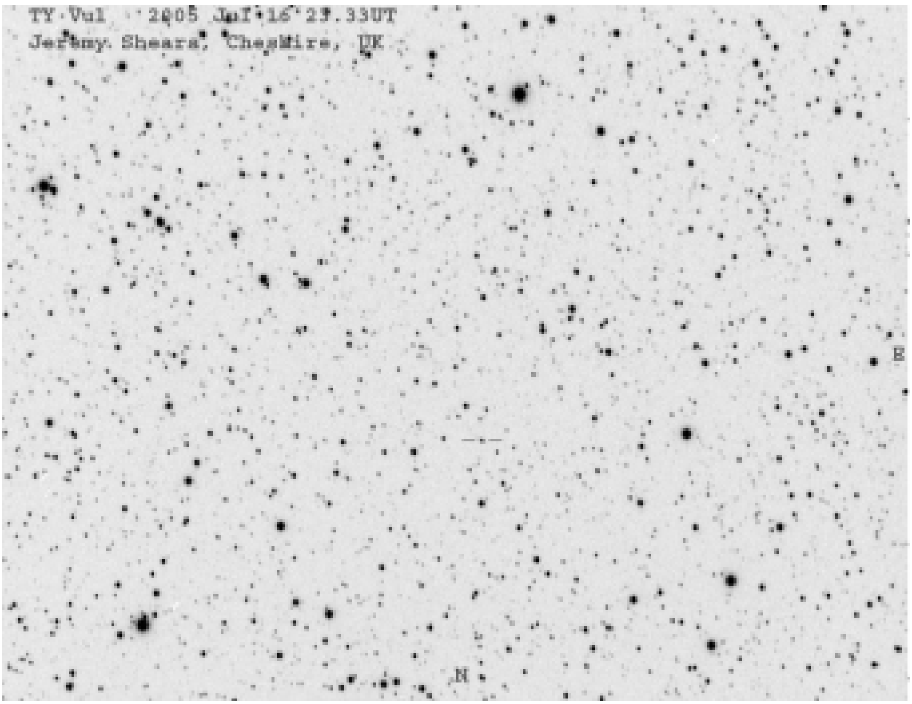


Figure 1, TY Vul on 2005 July 16, 23.33UT, taken using a Takahashi FS102 102 mm refractor, Starlight Xpress MX716 CCD camera, unfiltered. 2 min exposure. Field 25' by 19'

2005 July 16.981	15.1C	Jeremy Shears	102mm OG + CCD
2005 July 17.003	15.0v	Gary Poyner	35cm SCT

Further observations during 2005 July, both from before and during the outburst are shown in the light curve in Figure 2.

The previous outburst occurred on 2004 September 18.

Time series photometry from 2005 July 16.985 to 17.024 showed a very slight rise from 15.15C to 15.10C, then a decline to 15.14, but there was no evidence of superhumps (although the run was not really long enough to be conclusive). This is in contrast to the results obtained during the 2003 December superoutburst, during which a joint AAVSO-CBA campaign showed superhumps which are characteristic of UGSU stars. The superhump period (Psh) was determined as 0.0804 +/- 0.0001d, with an average amplitude of 0.4 magnitudes (see Tonny Vanmunster's CBA Belgium web site, **http://www.cbabelgium.com**, for further details). Hence, it is likely that the current outburst was a normal one, rather than a superoutburst.

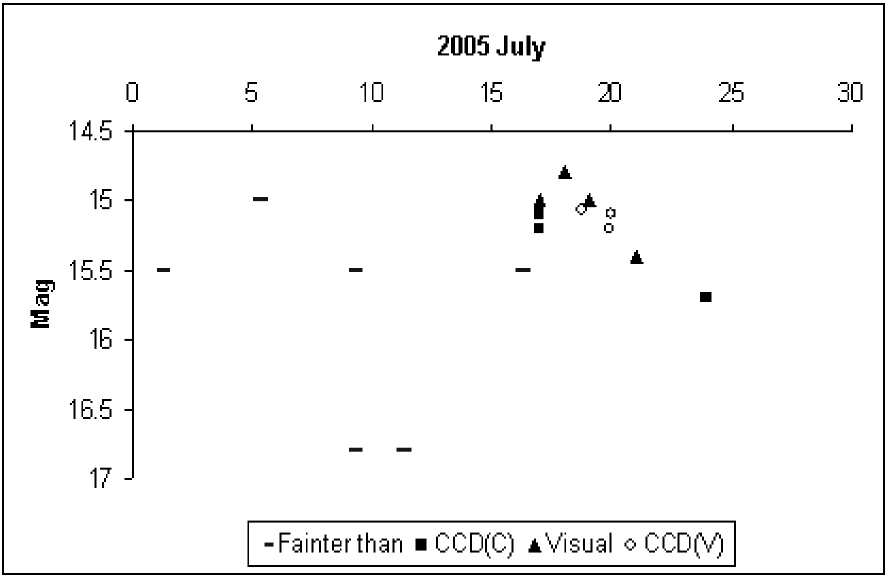


Figure 2. Light curve for the 2005 July outburst of TY Vul
Note these are preliminary data either from the observers directly or from vsnet: Gary Poyner (v), Pavol Dubovsky (v), Hiroyuki Maehara (V), Jose Castillo Escudero (V) and Jeremy Shears (C)

ICCE PUTTING THE 'NEW' BACK INTO THE NEW VARIABLE STAR PROGRAMME

CHRIS JONES

A programme to examine the variable star discoveries of Mike Collins was first proposed under Gary Poyner's Directorship in March 1989 (see VSSC 83), and formally adopted as the *New Variable Star Programme* announced in VSSC 85 (September 1989).

In the time since 1989, although the programme has attracted some interest, and a few observers have followed a selection of the objects, the level of attention that the programme has attracted has been significantly less than that of, for example, the ROP. There have been papers published concerning objects in the programme since 1989, which have resulted in a few objects receiving entries in the GCVS. Some of these papers have even included observations from contributing observers to the 'new' Variable star programme, although these participations have been on an individual basis, rather than as part of the BAAVSS observational database.

The time is therefore ripe for a re-launch of the 'New' Variable Star Programme, with more specific objectives and a revised list of objects.

ICCE stands for:
Identification,
Characterisation,
Correction of
Erroneous GCVS entries

The acronym summarises the objectives of the programme, and the progression of objects onto, through and off of the programme. If the identity of the object is not uniquely known, then the determination of this is the first priority. Where the identity is known, the priority will be to determine the character of the object. The object's *character* includes its range, period of variability, and in some cases (with the support of CCD-equipped observers) the investigation of the variability at different wavelengths. Characterisation effectively entails the collection of sufficient characterisation information to 'classify' the variable within the GCVS scheme.

Once both unique identity and character (classification) have been established, a GCVS entry should follow, on publication of the results, and the object can then be removed from the programme.

For objects where an erroneous GCVS entry is suspected, once sufficient data is available to either confirm or correct the GCVS entry which is under suspicion, the object can be removed from the programme.

ICCE Programme 2005

Identity	NSV	Cons	J2000 RA	Dec	Range Max	Min	Notes	Chart
TAV 0033 +53	15133	Cas	00 36	+59 40	10.3	11?	GCAS	TA
V720 Cas		Cas	00 45	+53 26	12.4??	13.6??	CCD! SR?	TA
TAV 0216 +48		And	02 19	+48 14	9.5	[13.5	Mira?	TA
TAV 0346 +38		Per	03 49	+38 47	10.3	12.2	C Star	TA
CC Cam		Cam	04 57	+69 27	10.8	[14.3		TA
NSV2249	2249	Tau	05 35	+23 53	10.5	[16	Mira?	Hendon
TAV 0559 +06		Ori	06 02	+06 38	10.9	12.9	SRa?	TA
TASV 0626 +34	16874	Aur	06 29	+34 42	9.8	11.9		TA
TAV 0714 +17		Gem	07 17	+17 54	10.5	12.2	CCD! SR?	TA
J0712 +296		Gem	07 12	+29 38	11.3	13.8	CCD! LB?	TA
TASV 1812 +40	24346	Her	18 14	+40 26	9.5	10.3	360d?	TA
NSV10836	10836	Her	18 28	+15 42	11.0	[15.0	Mira?	TA
Q1992/076		Her	18 29	+15 16	11.2	[16	Mira?	TA
V2303 Oph		Oph	18 38	+11 11	10.8	[16	Mira?	TA(BAA)
V335 Vul		Vul	19 23	+24 30	10.1	13.5	C Star	TA (BAA)
TAV 1933 +53		Cyg	19 34	+53 53	10.3	12	CCD!	TA
TASV 1946 +00	24897	Aql	19 49	+00 30	10	[16	Mira 330d?	TA(BAA)
TAV 2034 +61	25186	Cep	20 35	+61 48	9.6	11.2		TA
NSV13806	13806	Cyg	21 36	+32 31	11.1	[16		TA
TASV 2204 +59	25835	Cep	22 06	+59 30	10.1	12.5	SR?	TA
NSV14687	14687	Cep	23 44	+71 46	11.9	[14		TA

Comments on the programme objects:

V720 Cas: The identity of this object is not uniquely known, as there are three stars within the error circle of the original discovery information. CCD images taken some weeks or months apart should reveal which of the three candidates is actually the variable.

NSV2249: This object has been on the CCD programme for some time. The amplitude range and strong red excess of the variable indicate a Mira type variability, but identifying a consistent period for the object has been surprisingly difficult.

TAV 0714 +17: This object has a low amplitude and a strong red colour that make reliable estimation visually difficult.

V2303 Oph: A new BAAVSS chart and sequence for this object is being prepared and will be available shortly.

V335 Vul: A new BAAVSS chart and sequence for this object is being prepared and will be available shortly

J0712+296: This object has a low amplitude and strong red colour that make reliable estimation visually difficult.

TAV 1933 +53: This object has a low amplitude and strong red colour that make reliable estimation visually difficult.

NSV 24897 (TASV 1946+00): A new BAAVSS chart and sequence for this object is being prepared and will be available shortly.

Further detailed comments on each of the objects in the programme will appear in future circulars.

There are opportunities for VSSC members to contribute to the programme in a number of ways:

- CCD-equipped observers who are willing to assist in the development of sequences for these objects would be especially valuable at this stage. There are also objects on the programme (as noted above) that would particularly benefit from observation with CCDs.

- Visual observations of any of the programme stars would, of course, be appreciated. As data starts to accumulate on these objects there will be opportunities for the more statistically-minded to analyse the data for publication.

The intention is to keep the programme small, but dynamic, with new objects being introduced and well-studied objects being removed on a regular basis.

The current list of potential objects for the programme numbers over 600. It is therefore unlikely that we will run out of work to be done in the foreseeable future!

I should be grateful if anybody who is interested in taking part in the programme could contact me (details below), so that I can keep you informed of chart developments and other changes to the programme.

Observations reports, sent to me monthly, would also be welcomed (preferably in TA format, or alternatively BAA format).

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THE VARIABLE STAR SECTION CCD TARGET LIST REV 010805

KAREN HOLLAND

It was probably about ten years ago, that amateurs first eagerly started to buy CCD cameras, which previously had been available only to professionals at world-class observatories. The proud owners of these CCD cameras were astounded at their sensitivity to light, and were completely seduced by the computer interface that allowed them to process their images so easily. Users started to produce spectacular images, first in black and white, and then, later, in colour too. Being quick off the mark, amateurs rapidly realised that they also had a tool that would allow them to compete with the professionals; if they could learn to do photometry, they could unlock the secrets of the systems from which the light came.

Over the years, we have learnt a good deal about how to do photometry well; however, we still have much to learn. It was with this in mind, that the Variable Star Section decided in 2002, that it was time that we should produce a CCD target list, in the same way that we have a telescopic priority list, a recurrent objects list, and a binocular list. Having a CCD target list does not stop anyone from observing whatever objects they are personally interested in, but it does gives the growing number of CCD users who wish to learn to make good measurements, some focus to their work. It means that the relatively small number of CCD observers who want to do good photometry can work on obtaining measurements on the same systems; in that way they can compare their results, and discuss methods and reduction techniques whilst working on the same objects.

As there are a relatively small number of CCD observers in the UK, it is important, if we want to contribute useful data, that we combine our efforts to work on a well-focused group of projects. We should also aim to produce high quality data that can be re-reduced at a later date if necessary. In this way, professionals will come to trust the quality of our data, as they do currently, with our visual database. High quality is not the same thing as high accuracy; high quality implies that the data should be exactly what it claims it is: a magnitude measurement of 12.5+/-0.5 is a high quality measurement if it is exactly that; future analysts of the data can then be confident of the error on the data. Of course, the more accurate our measurements are, the more useful they are for some applications, but the important thing is that the consumers of our data should have confidence in its integrity.

The CCD target list that has been compiled, will continue to be regularly updated and revised, to reflect the interests of section members, and to take account of feedback that is received. The projects have been deliberately divided to fall into five categories, described below, of increasing difficulty. It is suggested that observers who are completely new to CCD camera use, might wish to begin work on projects in the Beginners category, and progress to the subsequent levels as they become confident in each level. The VS section has a CCD advisor, Richard Miles, who is happy to assist with queries, and his article on CCD observing (UBVRI photometry using CCD cameras, 1998, R. Miles, J.Brit.astron.Assoc.,108(2), 65-74) is well worth consulting for a good, general background. The VS section also runs a mentoring scheme, which pairs new observers with more experienced observers, for guidance and support where required. If you would like to be allocated a mentor, please contact Karen Holland.

The list that was produced in 2002, has now had its first revision, and information regarding the newly revised list is included here. Sequences for these stars are available on the web pages at **http://www.britastro.org/vss/comps_all_charts.PDF**. For the majority of stars a sequence will be defined as a list of suitable comparison stars; only in cases where there may be some difficulty identifying the variable will a chart be produced.

Changes to the target list for revision 1

LL Lyr has been dropped from the programme, partially due to the difficulty in observing it due to its proximity to Vega, but also because the primary reason for observing it was to obtain a determination of the orbital period, and a value for this has now been published.

The comparison star sequence for **HT Cas** has been updated

The new category of objects called the Beginners' category has been added. This is a list of bright fast eclipsing binary stars, that are ideal for new observers to use whilst testing out their equipment and methods.

New stars which have been added are **V402 And**, **V630 Cas**, **V336 Per**, **DV Dra**, **V358 Lyr**, **V452 Cas**, **CI Gem** and **1502+09 Boo**. These are all quite faint, and are likely to be dwarf novae. Because they are too faint for observing by the majority of visual observers, many of their outbursts are likely to be missed. It is hoped that CCD observers will monitor these objects carefully, for the detection and notification of outbursts. VSS Charts exist for all these stars except 1502+09 Boo.

Four stars from the ICCE programme have been added. These are **V720 Cas**, **TAV 0714+17**, **J0712+296**, **TAV1933+53**.

Beginners Category

Star	RA(2000) Dec	Type	Max	Min I	Min II	Orbital Period	Comp VMag	Comp GSCNo	Data Source
AD And	23 36.7 +48 40	EB	10.9	11.6p	11.6	0.99d	10.93	3641 0339	A
OO Aql	11 19.8 +09 18	EW	9.2	9.9	9.8	0.51d	10.25	1058 409	A
AC Boo	14 56.5 +46 22	EW	10	10.6	10.6	0.35d	9.39	3474 966	A
EG Cep	20 16.0 +76 49	EB	9.3	10.2	9.6	0.54d	9.6	4585 413	A
TZ Lyr	18 15.8 +41.07	EB	10.6	11.3	10.8	0.53d	10.06	3107 2554	A
ER Ori	05 11.2 –08 33	EW	9.3	10.0	10.0	0.42d	9.25	5330 364	A

Basic CCD Data

Star	RA(2000) Dec	Type	Range	Orbital Period	Data Source	Notes
V1363 Cyg	20 06 11.6 +33 42 37.7	VY[H]	13.0p-<17.6p	?	C	1,*,**
V1454 Cyg	19 53 38.5 +35 21 45.4	UGSS?	13.9-20.5	?	C	1, *
CG Dra	19 07 32.8 +52 58 29 1	UG?	15 -17.5	0.1893d	B	1, *
V650 Ori	05 31 08.8 +09 45 27.7	UG?	15.5-<17.5	?	C	1, *
V402 And	00 11 07.3 +30 32.36	UGSU	15.5p-20.3B	?	C	*
V630 Cas	23 48 51.9 +51 27 39 1	UG:[I]	14.3-16.6	?	B	*
V336 Per	03 22 53.9 +41 37 01.4	UG	14.3-19.7	?	C	*
DV Dra	18 17 23.10 +50 48 18.1	UGWZ[J]	15.0B-<21.0p	?	C	*
V358 Lyr	18 59 33.0 +42 24 12.2	UGWZ[K]	16.0p-<20.0p	?	C	*
V452 Cas	00 52 18.1 +53 51 51 1	UGSU	14.5 -17.5	?	B	*
CI Gem	06 30 05.9 +22 18 50.7	UGSS:/ UGSU[L]	14.7-18.5p	?	C	*
1502+09 Boo	15 04 41.8 +08 47 54	CV[M]	?-18.5V	?	D	*

Precision Timing Data

Star	RA(2000) Dec	Type	Range	Orbital Period	Data Source	Notes
ES Dra	15 25 31.8 +62 01 00.1	UGSU[O]	>15.4	0.179d	B	*
KU Cas	01 31 02.48 +57 54 13.3	UGSS	13.3p-19.7B	?	C	*
TZ Per	02 13 51.0 +58 22 53.1	UGZ	12.3-15.6	0.263d	B	*

Approximate Differential Photometry

Star	RA(2000)Dec	Type	Range	Orbital Period	Data Source	Notes
NSV2249 Tau	05 35 30.0 +23 52 59	M?	10.7-16.4p	?	E	2
HU Aqr	21 07 58.3 –05 17 39 1	NL/AM	14.7-20.0	0.087d	B	2, *
HT Cas	01 10 13.0 +60 04 36 1	Ecl UGSU	10.8-18.4	0.073d	B	1, 2, *
GO Cnc	09 17 38.13 +16 42 18.2	EA	8.3-8.8	3.65d	F	
NSV 04031 Lyn	08 22 58.6 +45 27 24	EA	8.0-8.8	?	F	1
V720 Cas	00 45 +53 26	SR?	12.4??-13.6??		ICCE	
TAV 0714+17	07 17 +17 54	SR?	10.5-12.2		ICCE	
J0712+296	07 12 +29 38	Lb?	11.3-13.8		ICCE	
TAV 1933+53	19 34 +53 53	?	10-16		ICCE	

Precision Differential Photometry

Star	RA(2000)Dec	Type	Range	Orbital Period	Data Source	Notes
SS Cyg	21 42 42.7 +43 35 10 1	UGSS	8.2-12.1	0.275d	B	
GY Cnc	09 09 50.6 +18 49 47 1	UGSU+E[N]	12.5 -17.6	0.175d	B	*
				Cycle length		
VZ Cam	07 31 04.48 +82 24 41.6	SR	4.9+/-<0.2	? ~23.7d	G	3
CO UMa	11 09 19.11 +36 18 34.0	Lb?	5.8+/->0.2	?	G	3
AT Dra	16 17 15.34 +59 45 17.9	Lb	5.5+/->0.2	?	G	3

Data Sources

Data is derived according to the code given in the Data source column of the table, except where an individual item has a superscripted note, in which case, this item only is from the indicated source. Data sources are as follows:

A BAA Variable Star Eclipsing Binary programme (web page)
B Ritter and Kolb RKcat Edition 7.4 (01/01/05): Ritter, H., Kolb, U., 2003, A&A 404, 301 (update RKcat 7.4)
C Downes and Shara: The Catalog and Atlas of Cataclysmic Variables (2001, PASP 113, 764)
D BAA Variable Star Telescopic programme (web page)
E A Mike Collins discovery, suggested by Chris Jones
F Tony Markam – Eclipsing Binary Secretary VSS
G Albert Zijlstra and Tim Bedding
H Bruch and Schimpke 1992 (A&AS 93,419)
I IBVS 797
ICCE From the Variable Star Section ICCE Programme
J IBVS 3626
K IBVS 5544
L Observation (Gary Poyner) and IBVS 4757
M PASP 97, 41, 1985, and private email to G Poyner from T Kato
N Baade et al A&AS 127, 145, discovery paper
O Vanmunster, http://users.skynet.be/fa079980/cv_2001Dra_ES_jun_2001.html

Notes

1 A CCD chart is available for clarification of this sequence; see web pages
2 Great care must be taken in identifying the variable and comparison stars. The GCVS positions given can be poor at times
3 These 3 stars were selected as being the easiest to observe; however, the list contains many more stars, which can be supplied if required.
* Alert if rising in magnitude, inform Director and Gary Poyner
** Alert if fading in magnitude, inform Director and Gary Poyner

Explanation of types

The following abbreviations are used in the 'Type' column, where the type is known or suspected:

AM AM Her stars, subdivision of the Nova-like variables; polars
CV Cataclysmic variable (type unknown)
E Eclipsing binary [subgroups: EA - Algol type, EB - Beta Lyr type, EW - W UMa type]
Lb Slow irregular variables
M Mira type pulsating variable
N Nova
NL Nova-like
UG U Gem type cataclysmic variable (dwarf nova); UGSS: SS Cyg type; UGSU: SU UMa type; UGZ: Z Cam type; UGWZ: WZ Sge type.
SR Semi-regular variables
VY VY Sculptoris variables, not yet recognized within the GCVS but which show occasional drops from steady high states.

The range in magnitudes are all visual except where followed by a "p", in which case they are photographic or a "B" when it is a blue filter magnitude.

These magnitudes are approximate and are not well-defined for these objects. They should be taken as a guide only.

Explanation of the CCD Target List Categories
(Repeated from VSSC 114 and updated)

Beginners Category

This category of object comprises bright, fast eclipsing binaries, which are ideal for new CCD observers to monitor, with a view to testing of systems, and checking of initial results.

Basic CCD Data

Projects in this category are designed for CCD observers who want to use their CCD cameras to do useful work, but who are not yet ready to use filters, or to do transformations to convert their magnitudes to a standard system. This means that projects in this category are aimed primarily at the detection of changes, which are too faint for visual observers to routinely monitor, and which will alert other CCD observers to follow these objects.

Precision Timing Data

For projects listed in this category, the emphasis is on obtaining measurements with accurate recording of the time at which the measurements were made. It would also be good practice, and useful in the analysis of the data, if an estimation of the error on the time can be made. No filter is required for these projects.

Approximate Differential Photometry

This category of projects is for those CCD observers who are able to use an appropriate V filter which, when combined with their CCD camera response, puts the derived magnitudes approximately on the standard Kron-Cousins system, without transformations being necessary. Potential observers who would like advice on filter/CCD camera combinations should contact the section CCD advisor. Data from this category, can be combined with that of other observers to build up a useful set of data for analysis. It would be good practice to attempt to estimate the errors of the magnitude and time measurement.

Precision Differential Photometry

This category of work is aimed at the experienced CCD observer who is not only happy to use a filter, but who is also confident at applying the correct transformations to his reduced magnitudes, in order to precisely transform those magnitudes to that of the standard Kron-Cousins system. It would be good practice to include error bars on all measured quantities.

In a future circular, the reasons why observations are required of these objects will be outlined. This article is available in full on the Variable Star Web pages at
http://www.britastro.org/vss/variable_star_section_ccd_target.htm.

RZ CASSIOPEIAE - THE ECLIPSE OF A BINARY STAR

JANET SIMPSON

The 24th April was cloudless, but with an even milky haze covering the sky and a full moon, so it was definitely class 3 conditions, not ideal for observing my first binary eclipse. However the timing was convenient, with the minimum predicted in *Astronomy Now* for 23.00 UT.

I had been meaning for some time to try to observe this star, having checked out its position and the comparison stars, but so far something had always prevented me, so this time I was determined to give it a go. The sky was so bright, I realised I would not be able to follow it to minimum with my 8.5 x 44 binoculars alone, so I brought out my ETX90 telescope with a 40 mm eyepiece which magnifies 31 times.

Ideally to observe binary eclipses you need to be able to obtain Universal time accurately, to within seconds. A GPS receiver will enable you to do this, but I found the website: ***www.lagado.com/tools/time,*** which provided an accurate time for me. You need to remember to deduct an hour for summer time, but since some time inevitably passes between making the observation and checking the watch, it is difficult to be very accurate.

I started observing with binoculars, a bit later than I had intended, so I was not going to be able to cover the whole eclipse (4 hours 50 minutes), and as I did not carry on to the end due to deteriorating visibility, my observations only cover 3 hours 11 mins. My intention was to make an observation every 15 minutes, but I found it difficult to continue this regularly. In between the first 3 binocular observations I spent the time finding and recognising RZ Cas and the comparison stars in the ETX, which reverses the sky horizontally. With this star, I found it easier than expected as RZ Cas was more or less on an extended line from Delta and Epsilon Cas, through Iota, a bright star of magnitude 4.5, with the comparisons on either side of this line. See Figure 1 on the next page, for my diagram of how I found the target star.

The aim of following eclipsing binaries is to produce a light curve from which the time of the minimum can be deduced, for determination of the system's period. If a change to the orbital period is found, this is significant information which needs to be reported. The General Catalogue of Variable Stars elements gives the time of a minimum, from which other minima are predicted by adding multiples of the period. The mid-time of minimum can be deduced from your observations by computer software.

Another method used to determine the minimum is Pogson's method of bisecting cords. In this case, points on the falling and rising sides of the curve are noted at regular intervals and the times of the two points for each magnitude are averaged. Points are then drawn on the graph corresponding to each magnitude and averaged time, and a curve is drawn through them to meet the light curve. This point of intersection defines the time and magnitude of mid-minimum. With this method my mid-minimum worked out as 24.9617, approximately 2305 UT. Thus my minimum was 5 minutes late. Tony Markham, the Eclipsing Binary Secretary of the Variable Star section of the BAA said

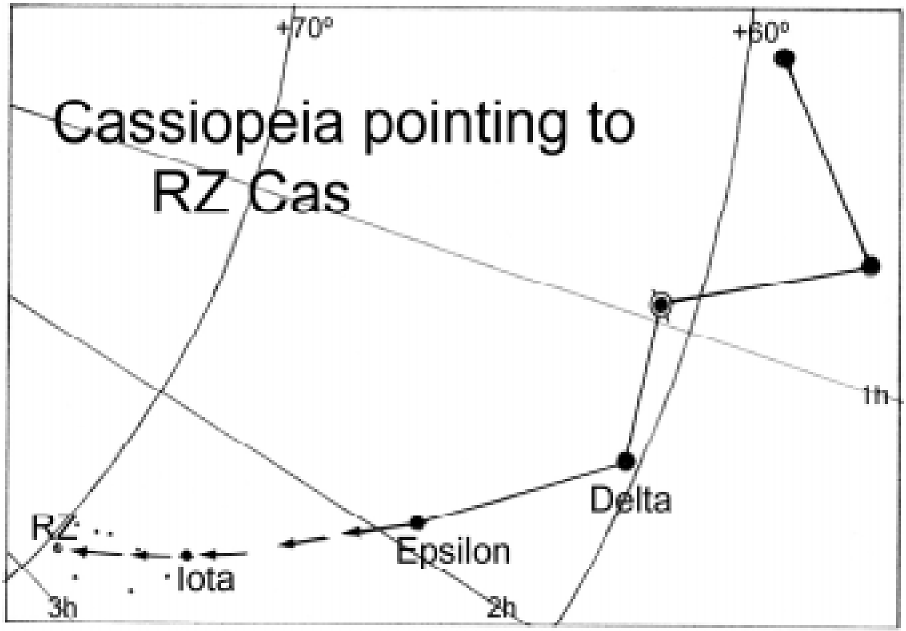

Figure 1: My Method of locating RZ Cas

that the elements for RZ Cas were over 10 years old, and that over the years the orbital period had been slowly increasing, so consequently a mid-eclipse a few minutes later than predicted was not unreasonable. My 8.0 magnitude minimum was slightly fainter than the normally quoted minimum, but that was also not considered a problem, as the time of mid-eclipse was more important than the exact magnitude.

Eclipsing Binaries are binary systems consisting of two stars that have an orbital plane that lies near to the line-of-sight of the observer. The components thus periodically eclipse one another, causing an apparent decrease in brightness, which is greatest when the faintest star passes in front of the brightest. The period of the eclipse, which coincides with the orbital period of the system, can range from minutes to years.

RZ Cas is a classic Algol-type eclipsing binary. In Algol-type stars, the beginning and end of the eclipse can be identified from the light curves. Between eclipses the light remains almost constant, or varies only slightly, due to reflection effects (the increased brightness on the side of the star facing a companion caused by heating from the radiant energy of the companion star). Variations can also occur due to the slightly ellipsoidal shape of components or to physical variations. A secondary minimum may be absent. Periods cover an extremely wide range, from 0.2 days to 10,000 days or more. Light amplitudes also range widely and may reach several magnitudes.

RZ Cas consists of a hot primary star and a cooler, evolved secondary component. The system is highly active and has a complicated history of period changes due to mass exchange between components, and ejection of material from the system. The period

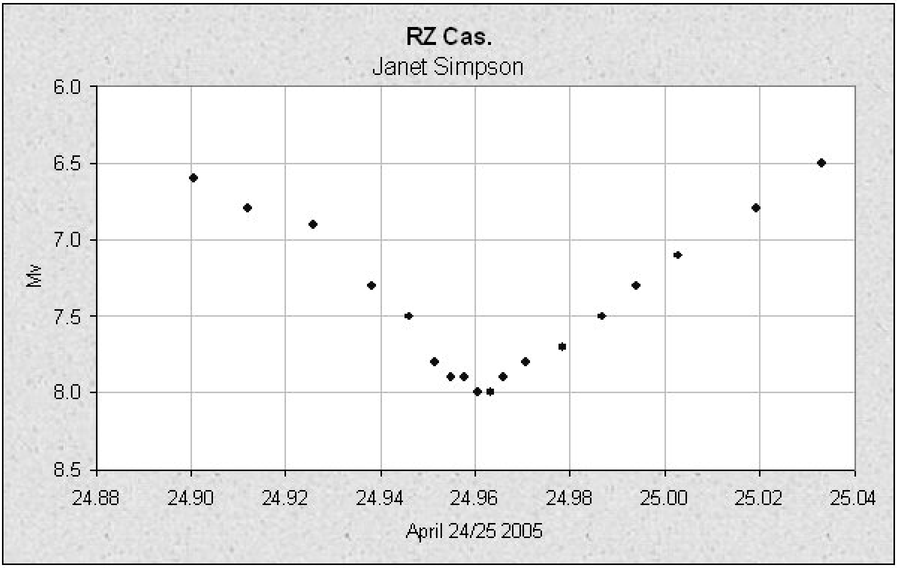

Figure 2: The Light Curve showing the Eclipse of RZ Cas, derived from my Observations

is known to have increased substantially around 1993. Even though RZ Cas is well observed, the AAVSO still need more data to define and confirm details in the period. Most light curves of RZ Cas at minimum have the rounded form of a partial eclipse, but occasionally the light curve seems to show a brief interval of constant light at minimum, which could indicate a total eclipse. However these light curves should be interpreted with caution. All minima are *flat* at the moment when the direction of the light change is reversed. The displacement of just one or two data points by observational scatter can strengthen the impression of a brief interval of constant light. In addition, the shape of the minima of highly active binaries like RZ Cas could be affected by circumstellar gas streams, accretion discs, and starspots.

RZ Cas is one of the most popular eclipsing binaries. It has a range of 6.2-7.8, and so it is normally bright enough for binocular observers. It is circumpolar, which means that it is visible all year round for observers situated in mid-northern latitudes. It has a short eclipse duration, and an unusually fast period of 1.195 days, which means there are several observable minima per month; and, it changes in time. The chart used for these observations is given in Figure 3 on the next page.

References

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AAVSO *Manual for observing Variable Stars:* Featured Star - RZ Cassiopeiae (on web page)
Tony Markham *The Period of RZ Cas* web page
David Levy, *Observing Variable Stars*
Melvyn D. Taylor, ch.14 Variable Stars, *Observational Amateur Astronomer*

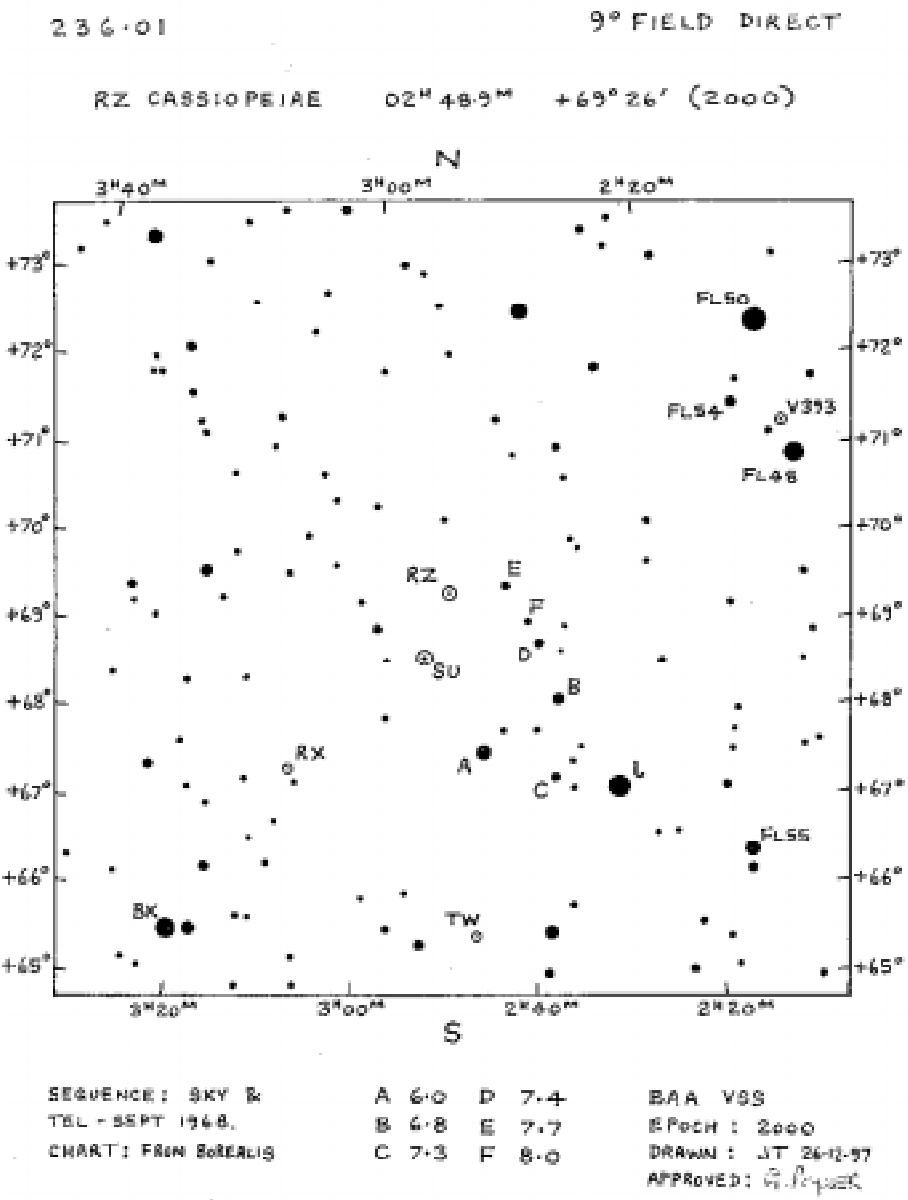

Figure 3: Chart used by the author for Observations of RZ Cas

UK NOVA/SUPERNOVA PATROL: DIGITAL SEARCH AND MILSTAR 5

Guy Hurst

The UK Nova/Supernova Patrol is continually seeking to find new methods in the hunt for novae and supernovae. One of the hazards of the earliest imaging methods were that they were film-based, which ran the risk of 'late checking', and the possibility of missing fast novae which spend little time at maximum.

More recently, the supernova hunters have become well-established in using CCD imaging techniques. In the case of nova-hunting, several patrol members continue to check their specified areas visually with basic binoculars, and this is still an important part of the effort and very much welcomed. However those formerly using such equipment as a 135mm telephoto lens and Kodak 2415 film, such as the dedicated member Mike Collins, have now also moved to digital imaging.

Although I am still using a MX516 Starlight Xpress CCD for occasional deep searching of a few selected areas, I decided to invest in a Canon 10D digital SLR camera, which has a CMOS sensor with approximately 6.30 mega pixels. There is clear benefit not only from obtaining instant images without worrying about that old film still in the camera (!), but also from the much wider field. With an 85mm f1.8 Canon lens, the field of view is about 10 degrees. This is similar to the earlier combination of 135mm lens on film-based SLRs, and provides coverage for one of the 121 target zones of the Milky Way selected at the start of the patrol. In addition, I also purchased a Takahashi Teegul 2 mount with driven RA (battery supply) and *manual wheels* to fine tune field centres in both RA and Dec (see figure 1). A suitable camera bracket was kindly constructed by Martin Mobberley.

I have found from early tests, that high temperatures, such as those we have experienced recently when my thermometer has recorded 20C twice at midnight, can affect both effective focusing and also limiting magnitude. However, on reasonably cool nights the 85mm lens operating at f1.8 and with good focus has, in 30 seconds with ISO 400, reached about magnitude 11.0. For the moment, in the interests of checking at the earliest opportunity (never longer than 24 hours from exposure), I allow the camera to automatically generate jpegs, but I may explore the option, in due course, of collecting raw images and using more specialised software to process them, providing this does not seriously slow the system down. The difficulty of patrolling for novae is that most work is done either in, or near the edges of The Milky Way, where the star density is at its greatest. If exposures were extended beyond 30s, then the checking process would become increasingly difficult, as faint stars would begin to merge with each other.

For the time being, and to simplify matters, I have re-arranged the field centres that I search on to bright stars, which I can easily centre in the camera viewfinder. It is surprising how effective this can be, as some constellations (e.g. Cygnus) seem to have bright stars conveniently placed to ensure slight overlap, but care is needed to avoid missing small areas in which nova might contrive to appear! As with earlier photography, twin exposures are always taken to eliminate flaws, and a number of curious short horizontal streaks have been noted from time to time.

Fig 1: Canon 10D digital SLR with 85mm f1.8 lens on Takahashi motorised mount

After a few months of experimenting, I am convinced that taking the pictures is not really the major challenge of digital nova searching. Without doubt, the real difficulty comes in checking them. My son David, who often uses the software Photoshop for his web-design work, has taught me a technique involving blinking old and new images using 'layers'. After loading the master into one layer, the latest image in a second layer is made partly transparent, showing the alignment and rotation needed to ensure that each coincide. Even though this is done manually, with practice this takes only about a minute at most! Then, viewing each layer alternately creates an extremely effective blink technique. Already, I have re-discovered numerous variables and detected faint asteroids and geo-stationary satellites.

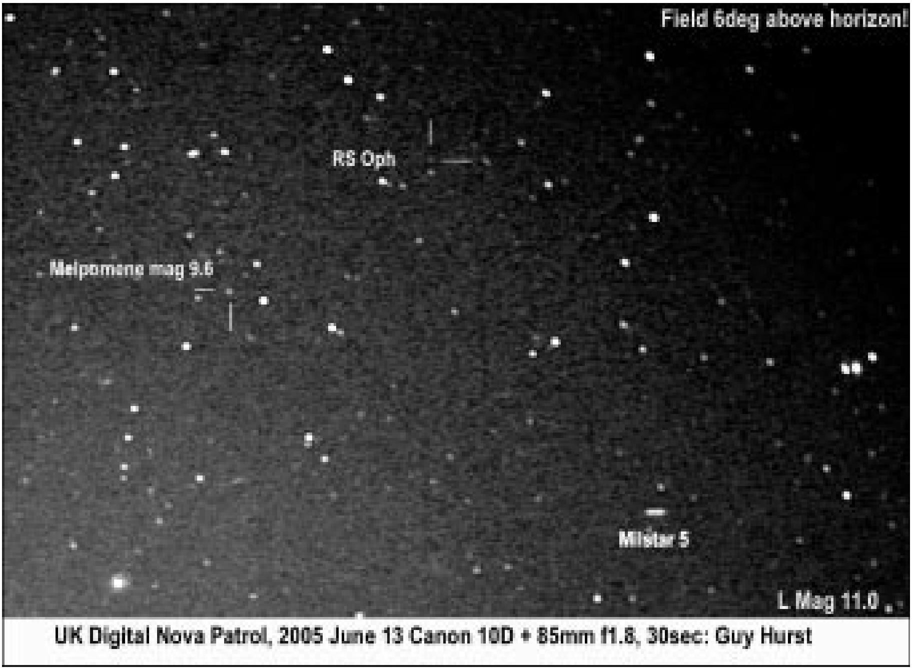

Fig 2: UK Digital Nova Patrol, 2005 June 13. Canon 10D+85mm f1.8 30sec showing RS Oph bright, asteroid Melpomene and satellite Milstar 5

One of my earliest patrol shots in Ophiuchus, 2005 June 13 (figure 2), confirmed that RS Oph was slightly brighter than usual at magnitude 10.5. Additionally Melpomene was detected at magnitude 9.6. A word of caution is needed here: for those, like myself, using Guide 8.0, the main program disc only contains the information necessary to plot asteroids up to around May of 2005 so it is vital to use the second disc to extend plots.

Finally, still on the same image, an elongated line, which had moved slightly on the twin exposure (always taken to eliminate flaws), was later identified as a military satellite, Milstar 5 (see Figure 2 above), by Russell Eberst. The only snag with some of these objects is that they can easily waste time and cause a distraction from the main task of trying to find novae.

What is also surprising is that the whole area of Ophiuchus was so low (six degrees altitude), that no stars were visible to the naked eye at all and yet the 30 second exposure, even at such low altitude, still reached about magnitude 11! Similarly a patrol carried out on 2005 July 21 with the full moon present and thin cirrus, still allowed magnitudes of 10.5 to be reached, so comparatively few nights are unsuitable for this work. All this is a major improvement on photography in such fields.

A side benefit, as clearly illustrated in the earlier patrol work by Mike Collins, is that images allow the monitoring of the brighter variable stars and, occasionally, the discovery of new ones. In the latest patrol of July 21, just before finishing these notes, I re-discovered WW Cygni, an Algol-type system with a catalogued range of 10.0-13.5. Ironically it was absent, and probably in eclipse, on my master shot of June 27.

I hope to write more about progress of the patrol work and pool ideas from all those participating, so feedback would be welcomed. Naturally I would also welcome contact from anyone wishing to join the team!

I would like to give many thanks to numerous people for their advice at this early stage in digital nova patrolling. In particular, Martin Mobberley, Nick James, Mark Armstrong and Mike Collins have been especially bombarded by e-mails from the author who may have asked some very basic questions. But what would you expect from a dedicated visual variable star observer!

BINOCULAR PRIORITY LIST

MELVYN TAYLOR

Variable	Range	Type	Period	Chart
AQ And	8.0-8.9	SRC	346d	82/08/16
EG And	7.1-7.8	ZA		072.01
V Aql	6.6-8.4	SRB	353d	026.03
UU Aur	5.1-6.8	SRB	234d	230.01.
AB Aur	7.2-8.4	INA		83/10/01
V Boo	7-12	SRA	258d	037.01
RW Boo	6.4-7.9	SRB	209d	104.01
RX Boo	6.9-9.1	SRB	160d	219.01
ST Cam	6.0-8.0	SRB	300d?	111.01
XX Cam	7.3-9.7?	RCB?		068.01
X Cnc	5.6-7.5	SRB	195d	231.01
RS Cnc	5.1-7.0	SRC	120d?	84/04/12
V CVn	6.5-8.6	SRA	192d	214.01
WZ Cas	6.9-8.5	SRB	186d	82/08/16
V465 Cas	6.2-7.2	SRB	60d	233.01
γ Cas	1.6-3.0	GC		064.01
rho Cas	4.1-6.2	SRD	320d	064.01
W Cep	7.0-9.2	SRC		83/10/01
AR Cep	7.0-7.9	SRB		85/05/06
mu Cep	3.4-5.1	SRC	730d	112.01
O Cet	2.0-10.1	M	332d	039.02
R CrB	5.7-14.8	RCB		041.02
W Cyg	5.0-7.6	SRB	131d	062.1
AF Cyg	6.4-8.4	SRB	92d	232.01
CH Cyg	5.6-10.0	ZA+SR		089.02
U Del	5.6-7.5	SRB	110d?	228.01
EU Del	5.8-6.9	SRB	60d?	228.01
TX Dra	6.8-8.3	SRB	78d?	106.01

Variable	Range	Type	Period	Chart
AH Dra	7.1-7.9	SRB	158d?	106.01
NQ Gem	7.4-8.0	SR+ZA	70d?	077.01
X Her	6.3-7.4	SRB	95d?	223.01
SX Her	8.0-9.2	SRD	103d	113.01
UW Her	7.8-8.7	SRB	104d	107.01
AC Her	6.8-9.0	RVA	75d	048.03
IQ Her	7.0-7.5	SRB	75d	048.03
OP Her	5.9-6.7	SRB	120d	84/04/12
R Hya	3.5-10.9	M	389d	049.01
RX Lep	5.0-7.4	SRB	60d?	110.01
SS Lep	4.8-5.1	ZA		075.01
Y Lyn	6.9-8.0	SRC	110d	229.01
SV Lyn	6.6-7.5	SRB	70d?	108.01
U Mon	5.9-7.8	RVB	91d	029.03
X Oph	5.9-9.2	M	328d	099.01
BQ Ori	6.9-8.9	SR	110d	84/04/12
AG Peg	6.0-9.4	NC		094.01.
X Per	6.0-7.0	GC+XP		84/04/08
R Sct	4.2-8.6	RVA	146d	026.03
Y Tau	6.5-9.2	SRB	242d	84/04/12
W Tri	7.5-8.8	SRC	108d	114.01
Z UMa	6.2-9.4	SRB	196d	217.01
ST UMa	6.0-7.6	SRB	110d?	102.01
VY UMa	5.9-7.0	LB		226.01
V UMi	7.2-9.1	SRB	72d	101.01
SS Vir	6.9-9.6	SRA	364d	097.01
SW Vir	6.4-7.9	SRB	150d?	098.01

ECLIPSING BINARY PREDICTIONS

TONY MARKHAM

The following predictions, based on the latest Krakow elements, should be usable for observers throughout the British Isles. The times of mid-eclipse appear in parentheses, with the start and end times of visibility on either side. The times are hours UT, with a value greater than 24 indicating a time after midnight. D indicates that the eclipse starts/ends in daylight, L indicates low altitude at the start/end of the visibility and << indicates that mid-eclipse occurred on an earlier date.

Thus, for example, on Nov 3, U Sge D17(19)23L indicates that U Sge will be in mid eclipse at approx 19h UT. The start of the eclipse occurs during Daylight, but the eclipse will be observable from approx 17h UT. After 23h UT, observations will be hindered by Low altitude. Please contact the EB secretary if you require any further explanation of the format.

The variables covered by these predictions are :

RS CVn	7.9-9.1V	**Z Dra**	10.8-14.1p	**U Sge**	6.45- 9.28V
TV Cas	7.2-8.2V	**TW Dra**	8.0-10.5v	**RW Tau**	7.98-11.59V
U Cep	6.75-9.24V	**S Equ**	8.0-10.08V	**HU Tau**	5.92-6.70V
SS Cet	9.4-13.0v	**delta Lib**	4.9-5.9V	**X Tri**	8.88-11.27V
U CrB	7.7-8.8V	**Z Per**	9.7-12.4p	**TX UMa**	7.06-8.80V
SW Cyg	9.24-11.83V	**Y Psc**	9.44-12.23V	**Z Vul**	7.25-8.90V

Note that predictions for RZ Cas, Beta Per and Lambda Tau can be found in the BAA Handbook.

Two long period eclipsing variables have eclipses due during this interval. These are KL Cep (mid eclipse Nov 01) and RZ Oph (mid eclipse Dec 23). For further details, see VSSC 114.

In addition, a primary eclipse of the recently discovered NN Del (SAO 126201) is predicted to be centered on approx 13h UT on Nov 26, with a secondary eclipse predicted for approx 05h UT on Dec 14. Outside of eclipses, NN Del is of mag 8.4. Both eclipses are approx 0.5 magnitudes deep, with the primary eclipse lasting approx 17 hours, compared with approx 21 hours for the secondary eclipse. NN Del was discovered via the Hipparcos data, and has a period of approx 99.2684 days and a highly eccentric orbit. More observations are required to define the elements more accurately.

2005 Oct 1 Sat
U CrB D18(16)22
Z Dra D18(17)19
X Tri D18(17)19
Z Per D18(17)22
TV Cas 20(24)28
SS Cet L21(21)26
2005 Oct 2 Sun
TX UMa 04(08)05D
X Tri D18(16)19
U Cep D18(21)25
Z Dra 23(25)28
2005 Oct 3 Mon
RS CVn D18(15)21L
TV Cas D18(19)23
S Equ D18(20)25
RW Tau L20(16)21
2005 Oct 4 Tue
Z Per D18(18)23
Z Vul 19(25)26L
SS Cet L21(20)25
U CrB 21(27)22L
2005 Oct 5 Wed
TW Dra 01(06)05D
Y Psc 02(07)04L
U Cep 04(08)05D
Z Dra D18(18)21
2005 Oct 7 Fri
Z Dra 01(03)05D
U Sge D18(18)23
Z Per D18(20)24
U Cep D18(20)25
TW Dra 20(25)29D
SS Cet L21(20)24
2005 Oct 8 Sat
RS CVn 04(10)05D
U CrB D18(14)20
SW Cyg 19(25)29D
Y Psc 21(25)28L
2005 Oct 9 Sun
RW Tau 00(05)05D
TV Cas 02(06)05D
Z Dra D18(20)23
Z Vul D18(22)25L
2005 Oct 10 Mon
U Cep 03(08)05D
S Equ D18(17)22
TW Dra D18(20)25
Z Per D18(21)26
SS Cet L20(19)24
HU Tau L20(18)22
U Sge 21(27)25L
TV Cas 21(25)29D
2005 Oct 11 Tue
Z Dra 02(05)05D
RW Tau L19(23)28
U CrB 19(25)22L
2005 Oct 12 Wed
Y Psc D18(20)24
U Cep D18(20)25
TV Cas D18(21)25
HU Tau L20(20)23
2005 Oct 13 Thu
RS CVn L03(06)05D
SW Cyg D18(15)21
TW Dra D18(16)21
Z Per D18(22)27
Z Dra 19(22)24
SS Cet L20(19)23
S Equ 22(27)25L
2005 Oct 14 Fri
TV Cas D18(16)20
Z Vul D18(20)25L
RW Tau L19(18)23
HU Tau L20(21)25
2005 Oct 15 Sat
U Cep 03(08)05D
Z Dra 04(06)05D
X Tri 05(07)05D
2005 Oct 16 Sun
X Tri 04(07)05D
Z Per 19(24)29
SS Cet L20(18)23
HU Tau L20(22)26
2005 Oct 17 Mon
X Tri 04(06)05D
TX UMa D18(16)20L
U Cep D18(20)24
U Sge D18(21)24L
RS CVn 18(25)20L
Z Dra 21(24)26
SW Cyg 22(29)29L
2005 Oct 18 Tue
RS CVn L03(01)05D
X Tri 03(05)05D
TV Cas 03(07)05D
U CrB D18(23)21L
HU Tau L20(24)27
2005 Oct 19 Wed
TW Dra 01(06)05D
X Tri 02(05)05D
Z Vul D18(18)23
SS Cet L20(17)22
Z Per 20(25)29D
TV Cas 23(27)29D
2005 Oct 20 Thu
X Tri 02(04)05D
RW Tau 02(07)05D
U Cep 03(07)05D
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TX UMa D18(17)19L
S Equ 19(24)24L
HU Tau 21(25)29
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2005 Oct 21 Fri
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2005 Oct 22 Sat
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TW Dra D18(21)26
X Tri 22(25)27
HU Tau 24(28)30D
2005 Oct 25 Tue
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RW Tau L18(14)19
SS Cet L19(15)20
X Tri 19(22)24
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Z Per 00(05)06D
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Z Vul D17(14)19
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X Tri 19(21)24
TX UMa L21(22)27
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Z Dra 02(05)06D
X Tri 18(20)23
TV Cas 20(24)28
2005 Oct 31 Mon
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HU Tau 04(08)06D
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X Tri D17(20)22
SW Cyg D17(22)28
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Z Vul 19(25)24L
2005 Nov 1 Tue
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RS CVn 04(10)06D
U CrB D17(18)20L
U Cep D17(19)23
X Tri D17(19)22
TV Cas D17(19)23
Z Dra 20(22)24
TX UMa L21(24)28

2005 Nov 2 Wed
TW Dra 02(07)06D
HU Tau 05(09)06D
X Tri D17(18)21
RW Tau 22(27)30D
2005 Nov 3 Thu
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X Tri D17(18)20
S Equ D17(18)23
U Sge D17(19)23L
2005 Nov 4 Fri
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X Tri D17(17)20
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TW Dra 22(27)30D
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SW Cyg 19(25)28L
Z Dra 23(25)28
2005 Nov 10 Thu
U Sge D17(13)19
S Equ D17(15)20
TW Dra D17(17)22
Z Vul D17(20)23L
TV Cas D17(21)25
RS CVn 18(24)18L
TX UMa 23(28)30D
2005 Nov 11 Fri
RS CVn L01(00)06D
U Cep D17(18)23
Y Psc 18(23)26L
2005 Nov 12 Sat
U CrB L04(03)06D
TV Cas D17(16)20
Z Dra D17(19)21
HU Tau L18(16)20
2005 Nov 13 Sun
TW Dra D17(13)18
U Sge D17(22)22L
S Equ 20(25)23L
2005 Nov 14 Mon
RW Tau 00(05)06D
Z Dra 01(03)06
TX UMa 01(06)06D
U Cep 01(06)06D
SW Cyg D17(15)21
HU Tau L18(17)21
2005 Nov 15 Tue
U CrB D17(13)19
Y Psc D17(17)22
Z Vul D17(18)23L
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RS CVn L01(<<)02
TW Dra 03(08)06D
TV Cas 03(07)06D
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U Cep D17(18)22
Z Dra 18(20)23
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RW Tau 19(23)28
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TV Cas 23(27)30D
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X Tri 05(08)06L
HU Tau L18(20)24
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U CrB L03(00)06
X Tri 04(07)05L
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RW Tau D17(18)22
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2005 Nov 20 Sun
X Tri 04(06)05L
TX UMa 04(09)06D
RS CVn D17(15)18L
Z Vul D17(16)21
U Sge D17(16)22L
S Equ D17(22)22L
HU Tau L18(21)25
Z Dra 20(22)24
2005 Nov 21 Mon
X Tri 03(05)05L
U Cep D17(17)22
TV Cas D17(18)22
TW Dra 18(23)28
2005 Nov 22 Tue
X Tri 02(05)05L
Z Dra 04(07)06D
U CrB 05(11)06D
Z Per D17(16)21
HU Tau 19(23)26
Z Vul 22(27)22L
2005 Nov 23 Wed
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Z Dra D17(15)18
SW Cyg D17(19)25
U Sge 20(25)22L
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X Tri 01(03)05L
TW Dra D17(18)23
HU Tau 20(24)28
Z Dra 21(24)26
2005 Nov 25 Fri
X Tri 00(03)05L
RW Tau 02(07)06D
RS CVn 04(10)06D
TV Cas 05(09)06D
Z Vul D17(14)19
Z Per D17(17)22
U CrB D17(22)19L
X Tri 24(26)29
2005 Nov 26 Sat
U Cep D17(17)22
Y Psc 20(24)25L
HU Tau 21(25)29
X Tri 23(25)28
2005 Nov 27 Sun
TV Cas 00(04)06D
TW Dra D17(13)19
Z Dra D17(17)19
S Equ D17(19)22L
Z Vul 20(25)22L
RW Tau 20(25)30
X Tri 22(25)27
2005 Nov 28 Mon
SW Cyg 02(08)06D
Z Per D17(19)23
TV Cas 20(24)28
X Tri 22(24)26
HU Tau 23(27)30
Z Dra 23(26)28
U Cep 24(29)30D
2005 Nov 29 Tue
U CrB 03(09)06D
X Tri 21(23)26
RS CVn L24(29)31D
2005 Nov 30 Wed
TW Dra 04(09)07D
Y Psc D17(19)23
TV Cas D17(19)23
RW Tau D17(19)24
U Sge D17(20)21L
X Tri 20(23)25
2005 Dec 1 Thu
HU Tau 00(04)07D
U Cep D17(17)21
Z Dra D17(19)21
Z Per D17(20)25
X Tri 19(22)24
2005 Dec 2 Fri
TV Cas D17(15)19
U CrB D17(20)18L
SW Cyg D17(22)26L
Z Vul 17(23)22L
X Tri 19(21)24
TX UMa L19(15)19
TW Dra 23(28)31D
2005 Dec 3 Sat
Z Dra 01(03)06
HU Tau 02(05)06L
RW Tau D17(14)19
X Tri 18(21)23
U Cep 24(28)31D
2005 Dec 4 Sun
TV Cas 06(10)07D

S Equ D17(16)21L
Z Per D17(21)26
X Tri 17(20)22
RS CVn L24(24)31

2005 Dec 5 Mon

HU Tau 03(07)06L
X Tri D17(19)22
Z Dra 18(20)23
TW Dra 19(24)29
TX UMa L19(16)21

2005 Dec 6 Tue

TV Cas 02(06)07D
U CrB L02(07)07D
RW Tau 04(08)06L
del Lib L06(07)07D
U Cep D17(16)21
X Tri D17(19)21

2005 Dec 7 Wed

Z Dra 03(05)07D
HU Tau 04(08)06L
SW Cyg D17(12)18
U Sge D17(14)20
X Tri D17(18)20
Z Vul D17(20)21L
Z Per 18(23)27
TV Cas 21(25)29

2005 Dec 8 Thu

X Tri D17(17)20
TW Dra D17(19)24
TX UMa L19(18)22
RW Tau 22(27)30L
U Cep 23(28)31D

2005 Dec 9 Fri

SS Cet 02(07)03L
X Tri D17(16)19
U CrB D17(17)18L
TV Cas D17(21)25
Z Dra 20(22)25
RS CVn L23(19)26

2005 Dec 10 Sat

X Tri D17(16)18
U Sge 17(23)20L
Z Per 19(24)29

2005 Dec 11 Sun

Z Dra 04(07)07D
S Equ D17(13)18
TW Dra D17(14)19
X Tri D17(15)18
U Cep D17(16)21
TV Cas D17(16)20
RW Tau D17(21)26
TX UMa L19(19)24
SW Cyg 20(26)26L
Y Psc 21(26)24L

2005 Dec 12 Mon

SS Cet 01(06)02L
SW Cyg L04(02)07D
Z Dra D17(15)18
Z Vul D17(18)21L

2005 Dec 13 Tue

U CrB L02(04)07D
del Lib L05(07)07D
Z Per 21(25)30
Z Dra 21(24)26
U Cep 23(28)31D

2005 Dec 14 Wed

TW Dra 05(10)07D
RW Tau D17(16)20
S Equ 18(23)21L
TX UMa L18(21)25

2005 Dec 15 Thu

SS Cet 01(05)02L
TV Cas 03(07)07D
Z Dra 06(08)07D
Z Vul L06(05)07D
Y Psc D17(20)23L

2005 Dec 16 Fri

SW Cyg D17(15)21
U Cep D17(16)20
Z Dra D17(17)19
Z Per 22(27)30L
TV Cas 23(27)31D

2005 Dec 17 Sat

TW Dra 00(05)07D
RW Tau 05(10)06L
HU Tau D17(15)19
Z Vul D17(16)21L
U Sge D17(17)20L
TX UMa L18(22)27
Z Dra 23(26)28

2005 Dec 18 Sun

SS Cet 00(05)02L
TV Cas 18(22)26
U Cep 23(27)31D

2005 Dec 19 Mon

RS CVn 03(10)07D
Y Psc D17(14)19
HU Tau D17(16)20
TW Dra 19(24)29
Z Per 23(28)30L
RW Tau 24(29)29L

2005 Dec 20 Tue

U CrB L01(02)07D
del Lib L05(06)07D
Z Vul L06(03)07D
TV Cas D17(18)22
Z Dra D17(19)21
TX UMa 19(24)29
SW Cyg 23(29)25L
SS Cet 23(28)26L

2005 Dec 21 Wed

SW Cyg L03(05)07D
U Cep D17(15)20
HU Tau D17(18)21
S Equ D17(20)20L

2005 Dec 22 Thu

Z Dra 01(03)06
Z Vul D17(14)19
TW Dra D17(20)25
RW Tau 18(23)28

2005 Dec 23 Fri

Z Per 01(05)06L
HU Tau D17(19)23
TX UMa 21(25)30
U Cep 22(27)31D
RS CVn 22(29)31D
SS Cet 23(28)26L

2005 Dec 24 Sat

TV Cas 05(09)07D
Z Dra 18(20)23
Z Vul 20(25)20L

2005 Dec 25 Sun

TW Dra D17(15)20
RW Tau D17(18)22
SW Cyg D17(19)25L
HU Tau D17(20)24

2005 Dec 26 Mon

TV Cas 00(04)07D
Z Per 02(07)06L
X Tri 02(05)03L
Z Dra 03(05)07D
U Cep D17(15)20
TX UMa 22(27)31D
SS Cet 22(27)25L

2005 Dec 27 Tue

U CrB L01(00)05
X Tri 02(04)03L
del Lib L04(06)07D
U Sge D17(21)19L
HU Tau 18(22)25
TV Cas 20(24)28

2005 Dec 28 Wed

X Tri 01(04)03L
TW Dra 05(10)07D
S Equ D17(17)20L
Z Dra 20(22)25
U Cep 22(27)31D
RS CVn L22(24)30

2005 Dec 29 Thu

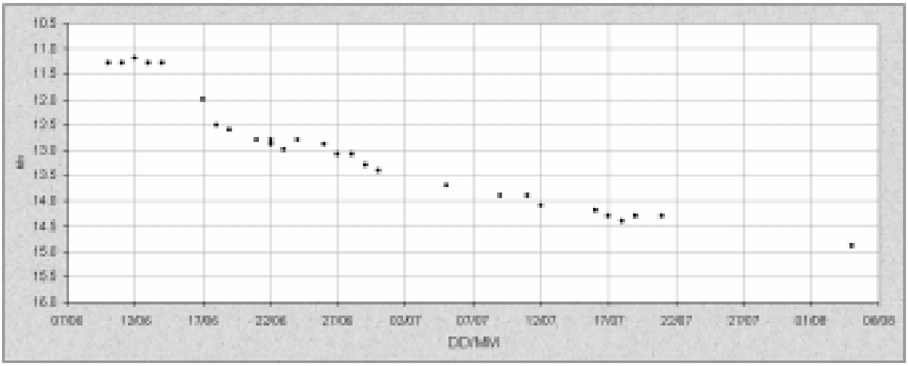
X Tri 00(03)03L
Z Per 03(08)06L
TV Cas D17(19)23
Z Vul 17(23)20L
HU Tau 19(23)27
SS Cet 22(26)25L
X Tri 24(26)27L
TX UMa 24(28)31D

2005 Dec 30 Fri

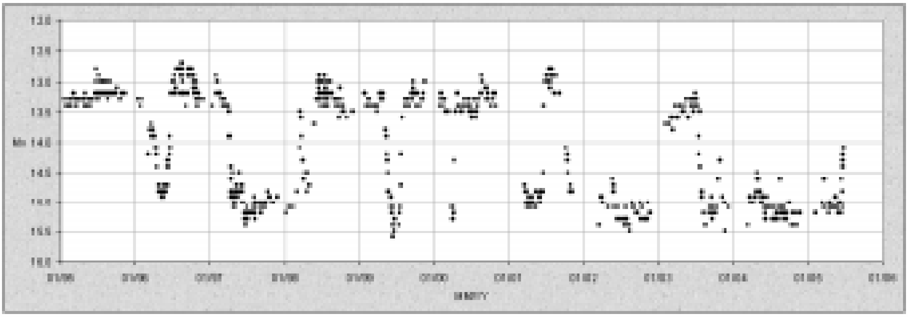
SW Cyg 03(09)07D
Z Dra 04(07)07D
U CrB 05(11)07D
Y Psc 17(22)22L
X Tri 23(25)27L

2005 Dec 31 Sat

TW Dra 01(06)07D
RW Tau 02(06)05L
U Sge L06(06)07D
U Cep D17(15)19
TV Cas D17(15)19
Z Dra D17(15)18
HU Tau 20(24)28
X Tri 22(25)27L



V1663 Aql (Nova Aql 2005): Discovered by Grzegorz Pojmanski, Warsaw University Astronomical Observatory on June 9th 2005. Visual Poyner June 10-Aug 4, 2005.



AM Her: This is the prototype of the class of Variable stars known as Polars. It's visual range is 12.0-16.0. Visual Poyner

The deadline for contributions to the issue of VSSC 126 will be 7th November, 2005. All articles should be sent to the editor (details are given on the back of this issue)

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Nova and Supernova discoveries
First telephone the Nova/Supernova Secretary. If only answering machine response, leave a message and then try the following: Denis Buczynski 01524 68530, Glyn Marsh 01772 690502, or Martin Mobberley 01284 828431.

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