British Astronomical Association

VARIABLE STAR SECTION CIRCULAR

No 153, September 2012

Contents

ISSN 0267-9272

Office: Burlington House, Piccadilly, London, W1J 0DU

FROM THE DIRECTOR

ROGER PICKARD

Peter Hingley 1951-2012

It is with much sadness that I report that Peter Hingley, the Royal Astronomical Society Librarian, died suddenly at his home on 20th June. Peter will be remembered for his helpful and cheerful demeanor, even when presented with the most obscure queries, and for his wide ranging knowledge. This was not only with regard to the RAS but to almost every aspect of astronomy which had some historical connection. It is especially sad that he was due to retire in only a few months time, and was greatly looking forward to it. When we last spoke (at the BAA Meeting at the end of May) he told of his many plans. He will be greatly missed by both amateur and professional astronomers alike.

VSSC Expenses

Following the enormous increase in postage costs in recent times, I was fearful that the cost of the Circulars were going to have to be increased. However, this has been offset to some extent by the fact that more of you are now taking the Circulars in PDF format. I would like to encourage more of you to think about doing this, to continue to help offset any further increases in postage costs. The cost of the Circulars are dominated by the postage with, for example, envelopes and labels, only costing around £12 per issue, whereas postage has now climbed to over £130 per issue!

Section Meeting

Members are reminded that the next Members meeting will be in collaboration with "The Astronomer" magazine, and will be on 2012 October 13th at St Mary's Church Hall, Basingstoke. A booking form is available at < *http://www.theastronomer.org* >. Alternatively, you can contact Guy Hurst directly (at: 16, Westminster Close, Basingstoke, Hants, RG22 4PP. Telephone 01256 471074), as he is kindly making arrangements for the Meeting,

New Section Secretary

I wish to inform you all that Bob Dryden has agreed to take over theSecretary duties from Clive Beech with immediate affect. Clive has recently taken up a new position within his company which means he is now travelling much more than he used to, and this leaves him much less time for VSS duties. He will not give up everything until at least the end of the year when he hopes to have completed all entries for 2011 and submitted them to Andy for inclusion in the on-line database. However, as from now, I shall be asking all observers who normally submit to Clive to report to Bob instead. You can continue to use the same email address < *visual.variables@britastro.org* > as this has now been re-directed to Bob's own email address. I am very grateful to Clive for having taken on this onerous task back in 2006, and certainly the database is a lot healthier for his efforts - even if we still need observers to report in the correct format! However, we now welcome Bob and hope that he will have an easier time than Clive has had, largely due to Clive's efforts. Welcome on board, Bob.

Reporting Visual Observations using the new Spreadsheet

The Excel spreadsheet has recently been updated so if you are using it to report your observations, and hopefully you are, please download this newer version and use that.

roger.pickard@sky.com

• **A proposed new project for the VSS and Deep Sky Sections can be found on page 11**

The following article was first published in the 'Astronomical Gazette', the Monthly bulletin of the Antwerp Astronomical Society (a non-profit association).
Volume 19, 1-2, January-February 1932, No 217-218

A NEW VARIABLE STAR CLASS THE Z CAMELOPARDALIS TYPE

Félix de Roy

On 15 December 1855, the English astronomer J.R. Hind (1823-1893) discovered a star of 9th magnitude in Gemini, which three days later had faded by half a magnitude at least, and after three weeks had declined to 12th magnitude.

The speed and amplitude of the brightness variation of this star, so different from the other known telescopic variables, which were less numerous at the time, attracted the attention of a lot of dedicated observers, particularly of Pogson, Winnecke, Baxendell Sr., Schönfeld and Knott. They noticed rapidly that the star, which got the name *U Geminorum*, behaved in a very remarkable way.

The star is usually seen as a faint object, close to the 14th magnitude. At extremely irregular intervals varying between two and five? months (62 to 152? days), its brightness rises in a few hours by 3 magnitudes and in about 3 to 4 days it reaches a *maximum* of 9th magnitude, implying that it becomes 100 times brighter than during its "normal" state or *minimum*.

It was noticed also that there are two types of "explosions" or *maxima*, a long one for which the complete brightness variation (from the sudden rise through the gradual decline to 14th magnitude) lasts 20 days in average; the other one is short lasting 12 days in average.

Miss Agnes Clark suggested in 1903 (1) that the two types of maximum alternate in a regular way, a long maximum is always followed by a short one. And indeed, in a remarkable memoir, published in 1908 (2), Mr. J. van der Bilt, of the Utrecht Observatory, studying all observations made between 1855 and 1906 of U Geminorum, showed that this hypothesis is very probable, without a contradicting observation. In 1925, Mr. A.A. Nijland, director of the same observatory, noted (3) that the 262 maxima that occurred since the first one observed by Hind, were still all reconcilable with this supposition. But this rule was proved wrong the same year. It results from the numerous observations I discussed (4), of the two successive short maxima of September and December 1925, without a long maximum could have possibly occurred in between.

During 41 years U Geminorum remained the only known star of this extraordinary type. However, in 1896 Miss Louisa D. Wells discovered on a plate taken at the Harvard College Observatory a variable star, SS Cygni, of which one recognized rapidly that it shows a great resemblance with U Geminorum, and which is observed now almost continuously for 35 years. The amplitude of the brightness variation ($8^m.3$ to $12^m.0$) is somewhat smaller, and next to long and short maxima, one notes also "abnormal" or symmetrical maxima for which the rise is significantly slower; finally, at certain times (1907-1909) the variation is strongly irregular, and as such makes one think that SS Cygni is significantly different from the "pure" U Geminorum type stars.

Eleven years after this discovery, Mr. E. Silbernagel in Munich, found also photographically, the third star resembling this type, SS Aurigae, much fainter than the other two ($10^m.7$ to 15^m) and which also shows short, long, abnormal maxima and times of very irregular variations (1929).

Since then, the discoveries of this type strongly increased, and currently 15 stars are known for which one quite certainly can say they belong to the U Gem type, and 10 others are suspiciously belonging to this group. Most of these, however, do not get brighter than $11^m.0$, so that their observation, which requires almost continuous monitoring, can only be undertaken by using relatively powerful instruments. An observer with a reflector of 15 centimeter or 20 centimeter, in a favorable climate, could do excellent work in this relatively unexplored field.

The maxima of U Gem type variables occur at irregular intervals which can vary between 7 and 152? days, which brings the charm of the unexpected to their observation.

It might be well possible, however, that certain stars of this type would show maxima at even longer intervals. In this context, our attention was attracted by the star *T Pyxidis* which was seen bright (7^m to 8^m) in 1890, 1902 and 1920 while at other times it was between 13^m and 14^m. We have suggested (5) that we could perhaps see it as a U Gem-type star whose variations occur on a much longer time scale (100 times), like epsilon Aurigae among the Algol-type stars. This hypothesis is well plausible because during its last maximum (1920) T Pyxidis showed the characteristic spectrum of novae, and because the spectrum of SS Cyg (and, without doubt, the other U Gem-type variables) show analogous similarities. This hypothesis is also discussed by Mr. H. Ludendorff (6).

*

Among the variables that are most similar to those of the U Gem type, we must mention first of all *Z Camelopardalis* and *RX Andromedae*. The first one was discovered in 1904 in Greenwich during measurements for the astrographical catalogue; the second one in 1905 by Mr. Stanley Williams, who after having held it for a Cepheid, found that its light curve resembles the one of SS Cygni.

Z Cam was observed photometrically in 1905 by G. Van Biesbroeck, who suspected a period of $29^d.5$. A fine dense series of 312 observations obtained by the same observer during 29 months in 1907-09, which do not appear to have attracted enough attention (7), show that the variation was significantly irregular, as illustrated by the published light curve that we reproduce on page 4/5 (Fig. 1). It indicates that this variable can in no case belong to the type U Gem, since its observed minima do not last longer than 20^d, with the exception of one minimum lasting 53^d.

However, Mr. A. Brun, author of two remarkable series of observations of this star (1919-25), based on the fact that two successive maxima of *Z Cam* are sometimes separated by an interval of 40 to 50 days, assigned the U Gem type, while expressing with a "?" that this assignment would still be considered doubtful (8). Mr. Ludendorff, however, did not hesitate to include Z Cam in its latest list of U Gem stars (6). On the other hand, the astronomer of Potsdam strongly suspected *RX And* being in the same case.

Mr. A.A. Nijland from Utrecht, who observed *RX And* since 1909, and *Z Cam* since 1915 continued to contest the classification, based on the criterion of the extended minimum with constant brightness for U Gem type variables. Since 1909 he felt that *RX And* must be catalogued temporarily among the "irregulars" (9). Later on, he placed the star in his class IIIb (with *R Coronae* and the red irregulars with feeble variations), separated from the "semi-regulars" IIb (*U Gem*) and IIc (*SS Cyg* and *RV Tau*). Although it is no longer accepted today, this classification had the merit of clearly separating *RX And* and *Z Cam* from *U Gem*.

It is fair to say that H. Ludendorff noted (6) that the U Gem type stars apparently can be divided into two groups, namely those that have generally extended minima, during which the variable retains roughly the same brightness (*SS Aur*, *U Gem*, *SS Cyg*, *RU Peg*, *UV Per*) and those with sharp minima (*TZ Per*, *Z Cam*, and apparently also *BI Ori*, *SU UMa* and *X Leo*). The first ones are similar in many respects to some long period variables (Mira stars), the second ones resemble more the long-period Cepheids. "We cannot decide yet, added Mr. Ludendorff, if the two groups are transitionally connected (one encounters, for example, sharp minima in *SS Cyg*), or if the U Geminorum type has to be divided in two different classes."

But this distinction did not satisfy Mr. Nijland yet, who wrote a little later (10):

"I do not understand why several authors (for example Ludendorff and Brun) count *Z Cam* (and maybe also *RX And*) among the U Gem type stars, characterised mainly by a quiescent state (interrupted by sudden increases in brightness) lasting much longer, and most of the time much longer than the maxima. I could not observe these prolonged quiescence states in *RX And*, nor in *Z Cam*, otherwise than exceptional. Contrarily, one finds frequently sharp maxima in *RX And* and *Z Cam*, but never in *U Gem*, *SS Aur*, etc…

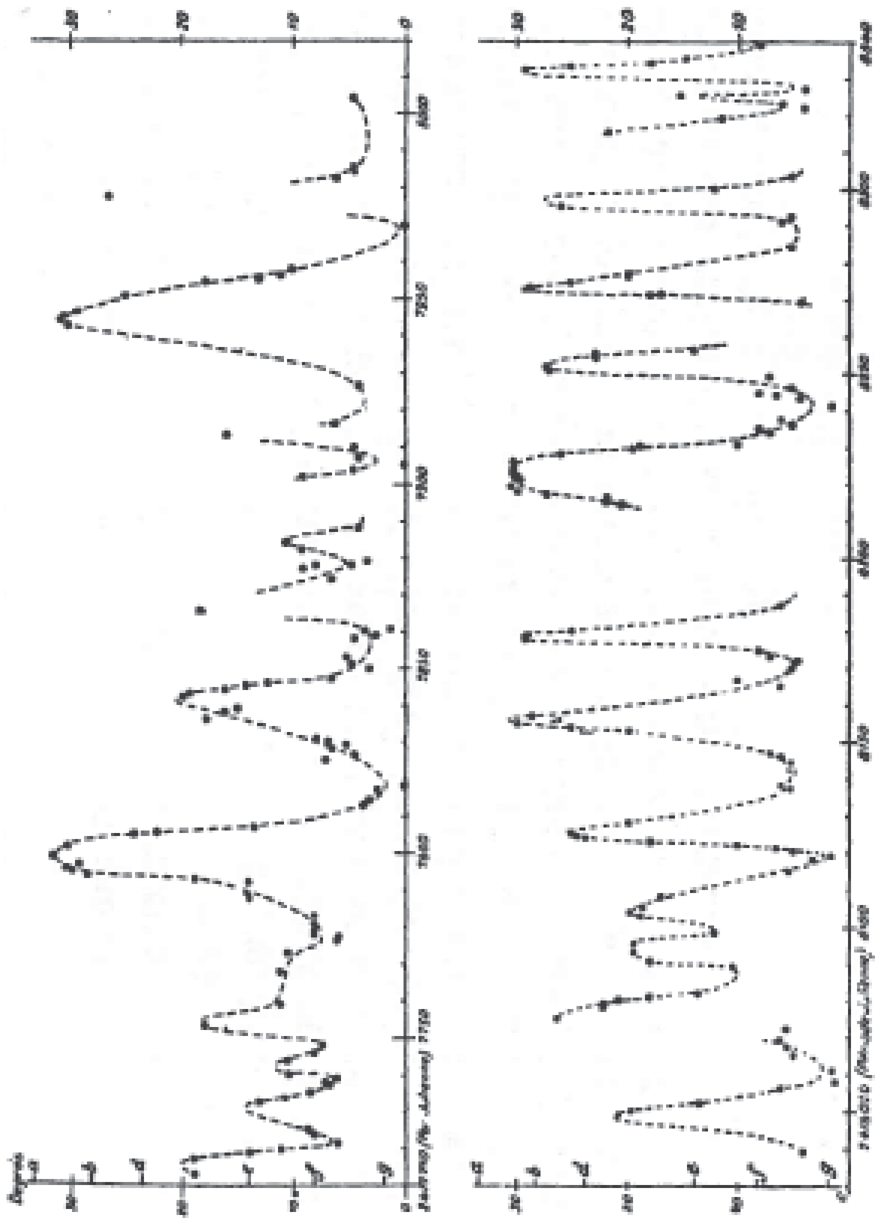
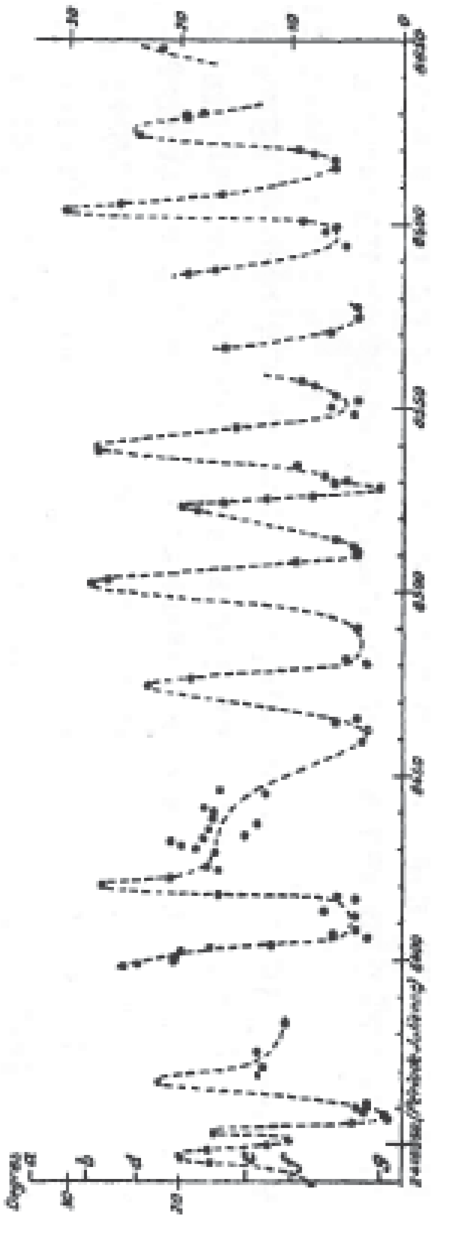


Figure 1: Light curve of Z Camelopardalis after G. Van Biesbroeck.

I think that *RX And* and *Z Cam* form a separate class, in which perhaps also *X Leo* and *TW Vir* can be classified, note however that nothing is known even now about the minima."

Personally, I have never considered that *Z Cam* or *RX And* might belong to the U Gem type, and therefore I did not add them in 1924 to the list of the 9 stars included in this



class (5).

Anyway, Mr. Nijland had decided, on the occasion of the publication, at the initiative of the International Astronomical Union, of his new Lists of variable stars "especially recommended to observers" (11), to introduce the new type *Z Camelopardalis*, characterized by "short, or even pointy, minima, which are unknown in the U Gem class". And this example has been followed by Mr. R. Prager in his recent Catalogue and Ephemeris of Variable Stars for 1932 (12). The new type is therefore officially adopted.

*

Mr. Nijland assigns *RX And*, *Z Cam*, *SV CMi*, *TZ Per* and *SU UMa* to this new class, adding a footnote for this last star (usually attributed to the U Gem type) that it shows "short minima typical for Z Cam stars". He also suggests with a "?" the possibility that *X Leo* is also a Z Cam star.

Mr. Prager, however, only lists *RX And*, *Z Cam*, and *TZ Per* among the Z Cam stars, and includes another one, *CN Ori*, which is not included in the list of Mr. Nijland.

Finally, M.L. Jacchia, in a recent study (13) based in part on his own observations (14), assigns the following five stars to this new type:

	Des.	Name	G	g	M	m	A	B	P
1.	005940	RX And	93°	-22°	10.6	13.3	2.7	11.6	14.0
2.	081473	Z Cam	108	+33	10.4	13.2	2.8	11.6	21.9
3.	051800	BI Ori	170	-18	13.2	15.8	2.6	-	24.6
4.	054705	CN Ori	178	-15	11.8	14.4	2.6	-	19.2
5.	020657a	TZ Per	102	-3	12.4	14.9	2.5	13.2	21

The Harvard (des)ignation is well known, and obtained by the hours and minutes of the right ascension followed by the whole degrees of the declination (in italic for southern stars) for 1900, *G* and *g* are the approximate galactic longitude and latitude; *M* and *m* are the mean brightness at maximum and at minimum; *A*, the amplitude; *B* the magnitude called "the base" which will be discussed further; *P*, the mean period.

In Prager's last catalogue, *SV CMi* (285.1928) is marked as a irregular variable varying between $13^m.0$ and $16^m.3$ (photographic magnitudes). Observations for this star would be highly desirable.

According to the recent observations of Mr. L. Jacchia (11), *SU UMa* and *X Leo* belong to the U Gem type stars and not to the Z Cam type; the first one remains fainter than $15^m.0$ during 13 to 33 days, the second one does not rise above 14m.0 during intervals between 13 to 23 days, and both show short and long maxima. The observations of the B.A.A. Variable Star Section confirm these facts. We know little of *BI* and *CN Ori* and of *TZ Per*. According to Prager, the first one of these stars belongs perhaps to the U Gem type stars; the last one shows periods of constant brightness (around $13^m.2$, which is above the minimum) lasting 200 days.

*

Mr. Jacchia indicated as crucial features for the Z Cam type:

1st The short duration of the minima, barely longer than the maxima (counted from the moment that the star starts rising in brightness and the moment where it reaches minimum brightness again). This feature is well expressed by the relationship between this duration (M) and the average period (P). For example for one maximum to the other, M/P ranges from 0.13 to 0.23 for the pure U Gem-type variables, 0.33 for *SS Cyg*, 0.52 for *Z Cam* and 0.59 for *RX And*. Note that from this point of view *SS Cyg* occupies an intermediate position, which confirms its uniqueness.

2nd The irregularity of the light curve, which is rare for the U Gem types, and almost becomes the rule for the Z Cam stars.

3rd The amplitude of the brightness variation is much less than for the U Gem type stars. For the 5 stars listed above, the average is $2^m.64$ (visually) against $3^m.8$ for the 8 U Gem type stars for which the total visual amplitude is currently known.

4th A curious and very special feature consists of the abrupt stop and an almost complete cycle, the brightness of the variables remains constant for some time (or is subject only to changes of several tenths of a magnitude, perhaps doubtful), at a magnitude *in between* the maximum and minimum, closer to the former then to the latter, and that Mr. Jacchia calls the "base magnitude". It is this value in the second last column (B) in the table above. It is not observed up to now otherwise than for *RX And* (lasting maximum 100^d), *Z Cam* (77^d) and *TZ Per* (200^d), this time without apparent relation with the average period. The long *intermediate minimum* which is characteristic for Z Cam type variables and which is already visible in G. Van Biesbroeck's light curve, *always* starts when the brightness *fades*, and always ends with a *decline*. It should therefore be viewed as *an interruption in a minimum*.

It is noteworthy that these long periods of constant brightness have led some authors to assign *RX And* and *Z Cam* to the U Gem class. But they differ significantly from the “constant minimum” of the latter type, both for their uniqueness and by the fact that the magnitude during these periods is intermediate between that of the maximum and minimum. For *Z Cam*, for example, it was observed only 5 times (until the end of 1930), with the interval between the preceding maxima and after the intermediate minimum being:

1909	53d	Van Biesbroeck
1928	62	Brun, Jacchia, Lacchini
,,	52	,, ,, ,,
1929	77	,, ,, ,,
1930	76	Lacchini
	—	
Mean	64d	

The observations of A. Brun (1919-25) seem to indicate the existence of several of these intermediate minima, but their boundaries cannot be determined with certainty. It is possible that there are two types of these minima, one somewhat longer than the other one, but the observed number is still not sufficient to draw conclusions on this fact.

The variables of the Z Cam type seem to be a more yellowish than the U Gem type stars. They show a stronger galactic concentration (mean latitude 18°); they are also more closely concentrated in longitude (on 85°) and, as the U Gem type stars (5) in a sky region (93°-178°) which is antipodal to the variables of type Md, the planetary nebulae, Novae and other types of very luminous stars which are found mainly between G 180° and 360°.

There exists however, maybe another criterion allowing to differentiate the Z Cam-type stars from the U Gem-type stars. This criterion was suggested to me from the period histograms for certain semi-regular and irregular variables, published in 1928 by Mr. B.P. Gerasimovic and Miss Margaret L. Walton (13). These histograms show a plateau between 35 and 65^d for the maxima of *SS Cygni*, and a very remarkable period distribution for the maxima of RX And, indicating a gradual decline between 13^d and 24^d, and a rather limited equiprobability.

With *SS Cyg* being a quite exceptional star, I considered the period distribution of two pure U Gem-type stars (*U Gem* and *SS Aur*) according to all data known up to now, and also for *Z Cam*. The elements for the observations which were provided to me:

		Number maxima	**Period range**	**Mean period**	**Source**
U Geminorum:	1856-1906	64	62-152d?	92.2	J. van der Bilt (2)
	1907-1928	36	69-140	98.5	Nijland & B.A.A.
	1856-1928	100	62-152d?	94.5	
SS Aurigae:	1908-1925	80	30d-140d	59.9	Nijland (16)
	1926-1930	29	7d-142d	54.1	B.A.A.
	1908-1930	109	7d-142d	58.4	

		Number maxima	Period range	Mean period	Source
Z Camelopardalis:	1905-1909	33	7-46d	21.1	G. Van Biesbroeck (7)
	1919-1925	50	6-46	23.9	A. Brun (8)
	1926-1903	54	6-42	20.5	Brun, Jacchia, Lacchini
	1905-1930	137	6-46	21.9	

All values are the periods between two *actually* observed maxima, for which the intervals are fairly well covered by observations of the minimum brightness so we are certain that no other maximum occurred in between. In order to fulfill this condition, we have neglected the periods of six maxima of *SS Aur* marked with a "?" in Nijland's list, and several maxima of *Z Cam* which are not well surrounded by observations of faint brightness.

For *SS Aur*, which can be observed during most of the year, both unusually long intervals of 140^d (1911) and 142^d (1928) appear to be well secured; the first one is regarded as certain by Nijland, the second one (Feb. 21st - Jul. 12th 1928), is firmly established by the observations of the B.A.A. We cannot state this for the two very long intervals, 150^d (1870) and 152^d (1866), of *U Gem* in Van der Bilt's list which are based on the hypothesis of alternating long and short maxima. It would be now controversial if we would stick without doubt to intervals entirely covered by negative observations for this star, or resulting from maxima observed close enough to the conjunction of the variable with the Sun so that we can be virtually certain that an increase in brightness has not gone unnoticed. The complete list of intervals is subject to revision, but those intervals longer than 120 days are comparatively rare that we have retained them temporarily, at least for the record. No such interval has been observed in 1929-1930.

The four faint and abnormal maxima that *SS* Aur displayed in the beginning of 1929 (J.D. 5609=$12^m.3$; J.D. 5616 = $12^m.0$; J.D. 5638 = $12^m.0$; J.D. 5651 = $12^m.7$) provide, together with the next maximum, a much more normal one (J.D. 5668 = $11^m.0$), four exceptional short intervals of 7^d, 22^d,13^d and 17^d. We first thought not to take these into account, because they occurred at a time where the variation of the star was quite exceptional, but we have finally chosen to retain them, because they show all the features of maxima and the very short intervals compensate the two exceptionally long intervals reducing the average period deduced from all of the 109 intervals (58.4^d) close to the mean period of Nijland (56^d).

For *Z Cam*, on the contrary, we did not take into account the already mentioned intervals, during which the variable has faded to its long "intermediate" minimum, because we considered it is actually a *cease* of the variations and it seems therefore preferable not to let it interfere in the determination of the mean period.

It is interesting to note that for *U Gem*, the new observational material accumulated over the last twenty years led to a slight lengthening of the average period, provided that it is valid. For *Z Cam*, on the contrary, as A. Brun noted already, and perhaps for *SS Aur*, the period seems a little shorter.

Figure 2: Period distribution for U Gem, SS Aur and Z Cam. Each point represents an interval between two observed maxima, the average period is indicated by an arrow (in days).

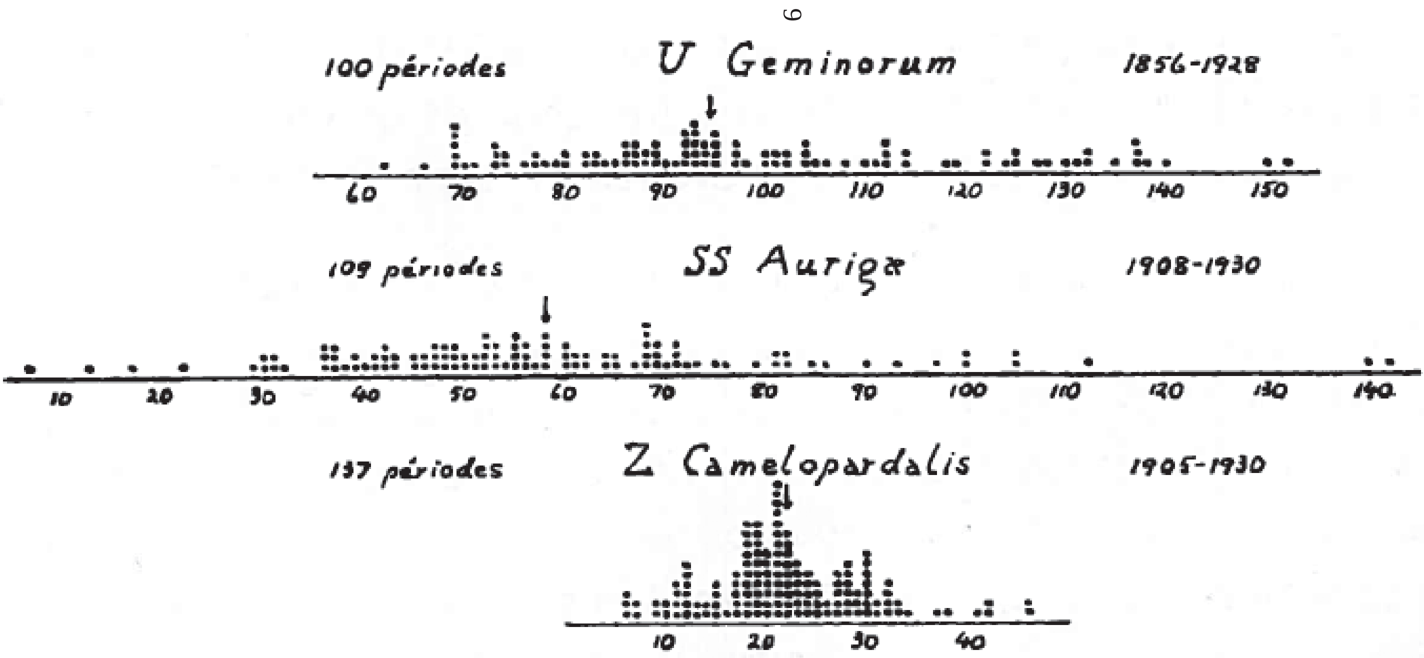


Figure 2 shows graphically the distribution of the periods for the three considered variables, each point represents an interval between two actually observed maxima. The abscissa is in days, the average period was indicated by an arrow.

One sees immediately that, despite its seemingly disorderly variations, *Z Cam*, in terms of its periodicity, that is to say, the regular return of its successive maxima during what might be called its times of normal variation, is a much less irregular variable than *U Gem* and SS *Aur*.

Seventy two percent of its maxima occur at intervals varying between 15 and 30 days. The diagram suggests a symmetrical distribution of intervals around the mean period and reflects in a large part the inevitable observational errors. We know that for a completely regular star, this kind of diagram would show *only* aforementioned errors, while for a complete irregular star the points are distributed equally along an infinite line because for such star each cycle length would be equally probable.

It is correct to add for *Z Cam*, that if we include the five long minima which we have called “intermediate”, that the longest period is moved from 46 to 71 days, but the mean period does not change more than from $21^d.9$ to $23^d.4$, which illustrates well the exceptional character of this phenomenon and seems to justify the adopted procedure. We must therefore consider these minima as true standstills of the “normal” variation. These extended minima made us believe that they belonged to the U Gem-type stars.

For *RX And*, the diagram of the cycles for 1924-1926 (13) also shows a period distribution within narrow limits (11 days, if we exclude, of course, the maxima separated by an intermediate minimum), so it seems that we can consider this *concentrated period distribution* as a feature of the Z Cam type. It is possible that in the case of *RX And*, new observations may show intervals much shorter than 13^d and might modify the special character of the published diagram.

The period distribution of *SS Cygni*, with its plateau of equiprobability between 35^d and 65^d, is unique, and confirms once again the exceptional nature of this star, which occupies a special place adjoining to the U Gem type.

For *U Gem* and *SS Aur*, although the period distribution indicates some concentration around the mean period, the scatter is much higher and the character of the diagram is apparently more complex.

For *U Gem*, the influence of the mean period, which was not deducible at the time J. van der Bilt examined this problem, seems to be confirmed in a way by the much larger number of observations obtained since 1907; it seems hard to believe that the collection of 23 intervals (or 23 percent) between 91 and 100 days is only a matter of coincidence. At the other hand, preferential intervals appear to exist up to 70, and perhaps 110 and 135 days, but, contrary to what was observed for *UU Herculis* and *Z Cancri*, these periods are not commensurable, at least in a simple relation, which makes them suspicious.

If one groups the logarithms of the 100 known periods of *U Gem*, one obtains following result:

log *P*	***n***
1.75 to 1.79	1
1.80 ,, 1.84	7
1.85 ,, 1.89	11
1.90 ,, 1.94	16
1.95 ,, 1.99	25
2.00 ,, 2.04	13
2.05 ,, 2.09	11
2.10 ,, 2.14	13
2.15 ,, 2.19	3
	100

The *n* groups quite symmetrically around log 1.98 of the mean period, but the number of periods for log 2.12 (132^d) is abnormal, thereby casting doubt on the existence of very long intervals for this star.

For *SS Aur*, the new observational material confirms the symmetrical distribution of the periods already noted by Nijland (16), with a much stronger scatter at the extremes if one includes the very short intervals observed in 1929.

Summarised, the features of the new type of variable stars, called Z Camelopardalis, distinct from the U Geminorum type, seem to be well established. We believe we can add a feature derived from the period distribution, to those derived from the light curve and the galactic distribution. It remains very desirable to continue observing other stars suspected to belong to this type in order to improve these results.

References

(1) in “Problems in Astrophysics”, London, Black.
(2) Recherches astronomiques de l’Observatoire d’Utrecht, III.
(3) A.N., 224, 306, No 5370 (1925).
(4) Journal of the B.A.A., 41, 283 (1931).
(5) B.A.A. Handbook for 1925, p. 24; Bull. Obs. Lyon, VII, 46 (1925).
(6) Handbuch der Astrophysik, Band VI, Zweiter Teil (1928) pp. 67 and 89.
(7) Annales de l’Observatoire Royal de Belgique, Vol. 13, fasc. 2, p. 154 (1913).
(8) Bull. Obs. Lyon, V, 57 (1923) VII, 203 (1925).
(9) A.N. 182, 315, No 4363 (1909).
(10) A.N. 233, 298, No 5586 (1928).
(11) B.A.N., 5, 243, No 197 (1930).
(12) Kl. Veröff. der Un. Sternw. Berlin-Babelsberg, No 10 (1931).
(13) Coelum, I, 78, Aprile 1931.
(14) Publ. dell’ Oss. Astr. della R. Un. di Bologna, Vol. II (1920).
(15) H.B. 862, p. 27.
(16) A.N. 227, 372, Nr 5446 (1926).

Kindly translated by Eric Broens at the request of John Toone.
The original article was sourced through the NASA Astrophysics Data System Bibliographic Services.

RR TAURI AND ASSOCIATED NEBULA – A PROPOSED NEW PROJECT FOR THE VSS AND DEEP SKY SECTIONS.

Gary Poyner

Each year the BAA Handbook contains a ‘Variable Star of the Year’, and for 2013 the star chosen is the Herbig Ae/Be star RR Tauri (details of which can be read in the 2013 Handbook). RR Tau also provides us with a good opportunity to monitor its associated nebula - GN05.36.5.0. With this in mind a new project is planned along with members of the Deep Sky section to monitor brightness changes (if any) in the nebula, and of course the nightly variations in RR Tau itself.

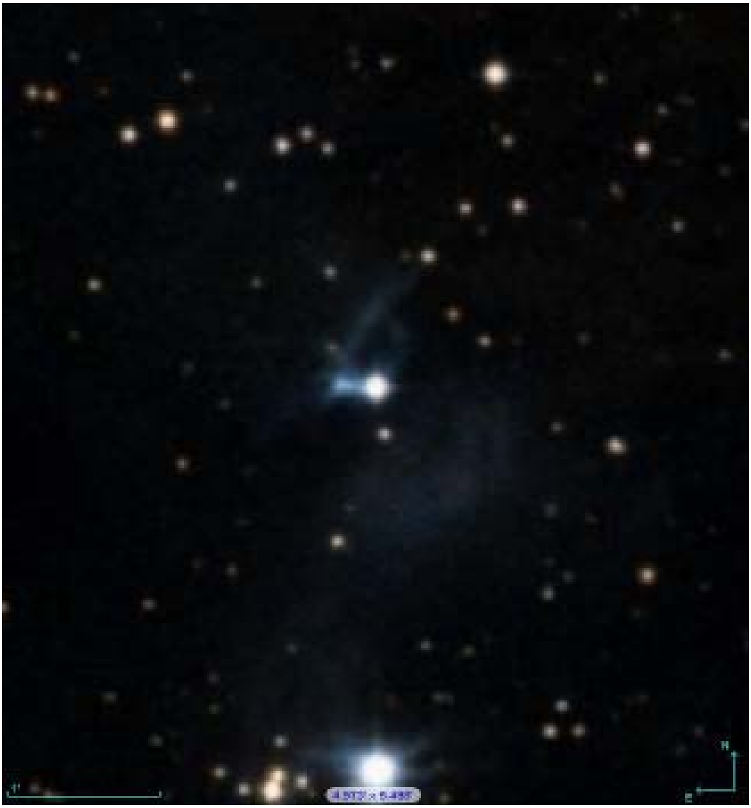


Figure 1:

Digitised Sky Survey colour image of RR Tauri and its associated nebula. The variable nebula can be seen as a bright 'knot' of nebulosity just east of RR Tauri itself (centre star). 4.9′x5.5′ (CDS Aladin v7.0)

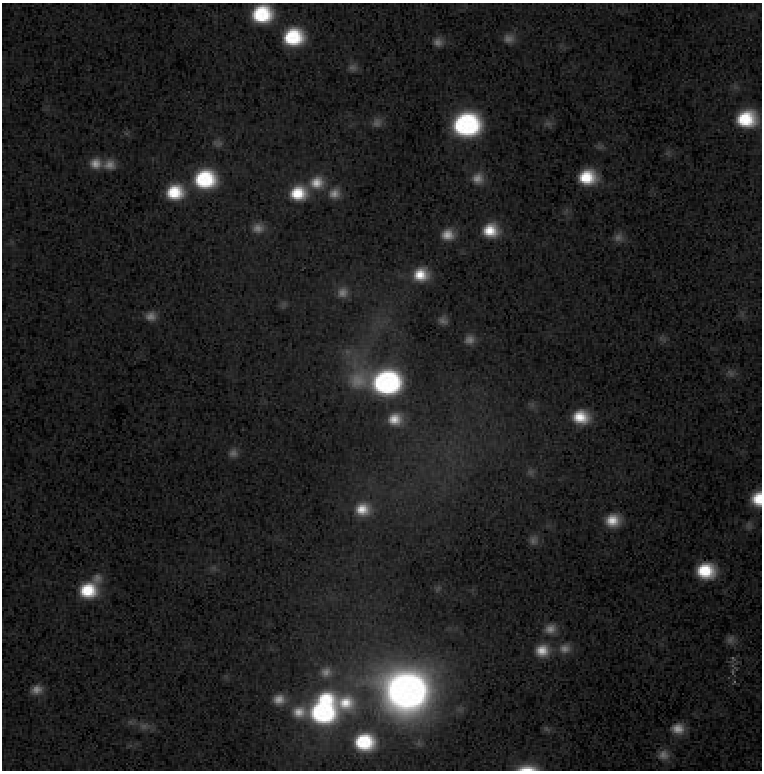
Although the immediate area of RR Tau is immersed in the faint nebulosity which is GN05.36.5.0, the bright knot just a few arc seconds east of the variable is the brightest part, and the area suspected of showing magnitude variations (Fig. 1). It is quite small in size ~7"x10", and quite faint. Roger Pickard made some initial measures in March 2012, and recorded the nebula as magnitude V=17.0, so it is quite a test for imagers and photometrists.

The variability of the nebula was discovered by George Herbig in the late 1950s, but since that time it would appear that no further studies have been made to determine just how variable the nebula is, or whether the variations correlate with the variability of RR Tau itself. Unlike its close cousin T Tau (associated with the ghostly Hinds Variable Nebula of course), whose variations are probably caused by disc instabilities or physical processes in the outer regions of the star itself, the variations we see in RR Tau are almost certainly caused by obscuration events – clouds of 'dust' blocking the light of the star as seen from Earth. This would suggest that any variations detected within the nebula would be a reflection on the intrinsic changes happening within RR Tau itself. The light variations in RR Tau are also much more dynamic than T Tau, with a visual magnitude range of 10.0-14.5 over as little as 90 days or so, compared to T Tauri's range of 9.0-11.5 over the past 50 years.

The aim of the project is simple. Visual VSS observers will monitor the changes in brightness of RR Tau, whilst CCD observers – both VSS and Deep Sky - will attempt to image the nebula on as many occasions as possible, so that we can at the end of the project correlate the two to see if we have anything interesting to show for our efforts. Even if we do not, we will still have answered an important question!

Figure 2: Image of RR Tauri and nebula. 50x60 sec. exposures. 35cm F10 SCT.

R. Pickard



The observing season for RR Tau runs from late September to early May, with gaps for a few days each month due to the presence of the Moon. Photometric measurements of the nebula can be made with software such as AIP4WIN, as it can be treated as an out of focus star because of its small size. Short exposures stacked are recommended to save saturation from RR Tau itself, especially if the star is at its brightest phase. Roger will be happy to give advice on how to do this if required. It is also advised that the same instrument and exposure times are used each time an observation is made, as it has been seen with other variable nebulae projects that variations in instrument choice and exposure time result in data which is difficult to interpret when it comes to attempts at measuring brightness changes in these objects. Observations of RR Tau should of course be reported to the database using the relevant spreadsheets, but photometric measures of the nebula should be sent to me along with any images you take.

RR Tauri can be found at these 2000.0 coordinates 05 39 30.51 +26 22 27.0.

Light curves for RR Tau and T Tau (for comparison purposes) can be viewed from the BAA VSS on-line database at *<http://britastro.org/~vssdb/>*, and a new chart for RR

Tau will be available on the VSS web site in good time for the start of the Autumn 2012 observing season.

Depending on the response from observers, the project is planned to run from September 2012 to April 2013, but we can always extend it for another season if we feel the need to. RR Tau itself will of course remain on the VSS observing programmes.

This project opens up an area where both the VSS and DSS can work together to find out whether this nebula is truly variable, and I hope that as many of you as possiblewill take part.

garypoyner@blueyonder.co.uk

ECLIPSING BINARY NEWS

DES LOUGHNEY

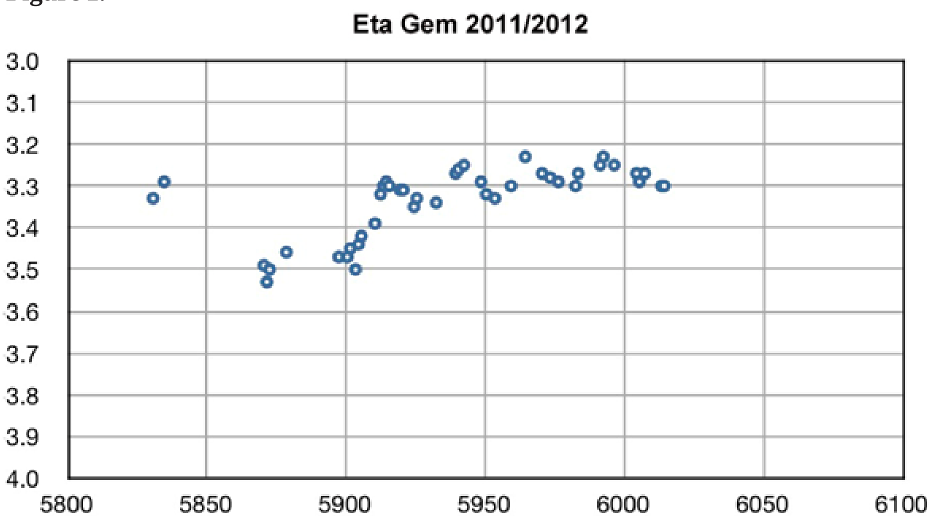
V695 Cygni

My attention has been drawn to the 2013 eclipse of the long period variable V695 Cygni. It has a period of 3784.3 days (or 10.4 years). The midpoint of the eclipse is Sunday 10 November 2013. Totality lasts 61.2 days and ingress and egress 1.7 days. This means that ingress will start around 10 October 2013. It is a zeta Aurigae type of system so that ingress is the time when a relatively small blue white star is shining through the outer atmosphere of a red giant.

The catch with this interesting system is that the variation is only 3.73V to 3.89V. It is not a system for visual observers but it is a good target for DSLR photometry. Because of the potential period errors of long term eclipsing binaries it is recommended that measurements start at the beginning of October.

Eta Geminorum

Figure 1.



By the time this circular is published we should be in the middle of the Eta Geminorum eclipse. As Figure 1 illustrates, the out of eclipse variations seem to be in two modes. There seems to be a broad variation over 233 days when the system varies from about 3.5 to 3.3. There are also short period variations of about 0.1 magnitude every twenty five days. Within the fifty day eclipse the magnitude is predicted to drop to about 3.9.

Let us hope we get an average number of observing opportunities. At the time of writing, in early July, there has, in Edinburgh, been only one opportunity in 43 days.

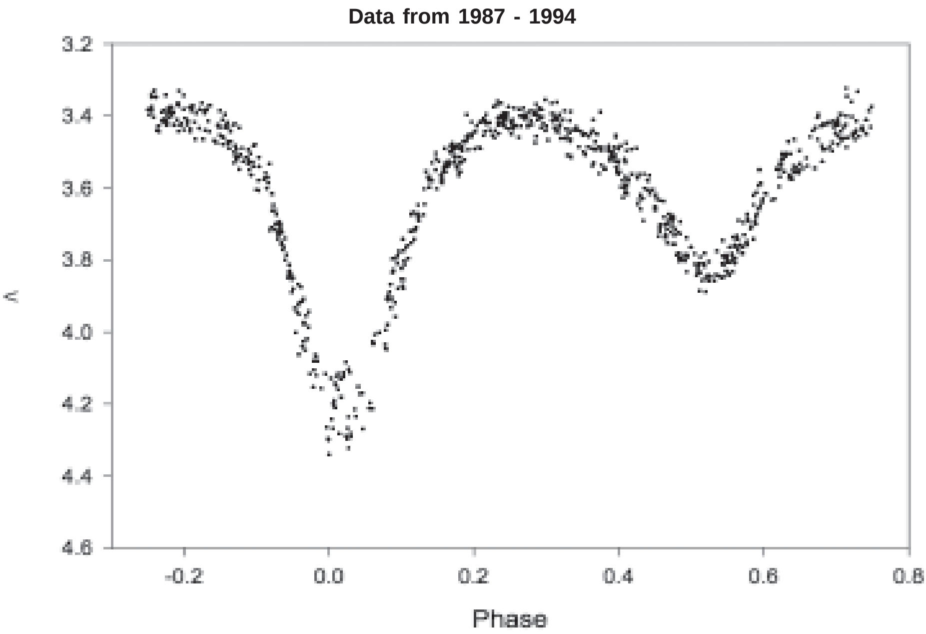
Beta Lyrae

Beta Lyrae was the AAVSO's Variable Star of the Season in 2005 (see VSSC 132). It is a well known eclipsing binary that was discovered to be variable in 1784. Its changes can, like Algol, be followed by the naked eye. It varies from 3.3 magnitude to 4.4 magnitude over a period of about 12.9 days.

Although it is an 'entry level' variable it is very interesting. It is still an object of much research. The system has been directly imaged by the CHARA Array Interferometer and the Michigan Infrared Combiner (MIRC) in 2008. The images have been used to produce an animation which can be viewed on < *http://en.wikipedia.org/wiki/File:Betlyr 2b.theora.ogv* > "Zhao et al. 2008, ApJ 684, L95". The movie animation is very useful for displaying the distortion of the two stars which is caused by their close proximity, and their fuzziness due to an accretion disk.

Because of ongoing research Dr Dirk Terrell (AAVSO) updated his 2005 article in 2011. The new article can be viewed on < *http://www.aavso.org/vsots_betalyr* >.

Figure 2: V band light curve of Beta Lyrae, replotted by Dr. Dirk Terrell (AAVSO), using data from Van Hamme, W.; Wilson, R. E.; and Guinan, E.F.; 1995, AJ 110, 1350.



The system is described as very active where the secondary star is almost obscured by an accretion disk. The dynamics of the system is such that no light curve is exactly the same as another.

The spread of measurements in Figure 2, is not due to observer error but reflects the variations in the density of the accretion disk. For this reason observations of Beta Lyrae are still very useful. Binocular observers may still detect important variations in the light curve.

desloughney@blueyonder.co.uk

PRO-AM CONFERENCE ON STELLAR ASTROPHYSICS, PROGRAMME

Laurent Corp < *laucorp@wanadoo.fr* > web site: *http://rr-lyr.ast.obs-mip.fr/capas2012/index.php*

Friday 28 September 2012

18 h 00 : Registration and Welcome
21 h 00 : **General Public Conference** by **Maurice Sylvestre**

Saturday 29 September 2012

08 h 00 : Registration and Welcome

Astrometric Double and Multiple Stars Session

09 h 00 : A brief recap of the history of double star observation. **Paul Couteau et Edgar Soulié (SAF)**
09 h 30 : The use of the 26-inch telescope in Johannesburg, Baron Ercole Dembowski (1812-1881). **Bob Argyle**
10 h 00 : **PAUSE**

Posters Session

- The BAA VSS On-line database by Roger Pickard and Andy Wilson. Bilingual presentation, **Helen Thomas (BAAVSS, SAF)**
- T.O.M.M.I.G.O. **Laurent Corp (4A, GEOS, AAVSO)**

10 h 30 : Binary star database: state of affairs and prospects. **Oleg Malkov (Institute of Astronomy, Moscow)**
11 h 00 : Accuracy of visual double star catalogue of Pulkovo observatory. **Olga Vasilkova (Pulkovo observatory, St Petersburg, Russia)**
11 h 30 : Dynamic investigations of visual double and multiple stars on the basis of Pulkovo 26 inch refractor observations for 50 years. **Olga Kiyaeva (Pulkovo observatory, St Petersburg, Russia)**
12 h 00 : Determining the orientation of the orbital poles of double stars in the solar neighbourhood. **Daniel Bonneau (OCA)**

12 h 30 : **MEAL BREAK**

13 h 30 : Speckle imaging of double stars by amateurs. **Bernard Trégon (T60)**

14 h 00 : GWP Catalogue Part I. Equatorial Zone : 1725 New Common Proper Motion Systems Found in the GARRAF Survey. **T. Tobal, X. Miret, I. Novalbos, Observatori Astronomic del Garraf, Barcelona, Catalunya (Spain)**

Pulsating Star Session

14 h 30 : Pulsating Stars in the AAVSO Observing Program. **Mike Simonsen (AAVSO)**, in video-conference.
15 h 00 : Pulsating stars in the space missions context. **Philippe Mathias (IRAP)**
15 h 30 : Photometric study of pulsating star BL Cam. **Stéphane Fauvaud (GEOS, Association T60)**
16 h 00 : The GEOS RR Lyr Survey. **Jean-François Le Borgne (IRAP, GEOS)**
16 h 30 : NP CAM a new RV TAURI star. **Roland BONINSEGNA (GEOS)**

17 h 00 : **PAUSE**

Exoplanets, Beginning and End of Star Life Session

17 h 15 : Exoplanets. **Roger Ferlet**
18 h 00 : The application of radial velocity measurements made by amateurs, in the characterisation of stellar pairs and detection of exoplanets. **Christian Buil (T60)**
18 h 30 : Searching for Low Amplitude Variable Stars and Transiting Exoplanets. **Stan Waterman (BAAVSS)**

19 h 00 : **GROUP PHOTO and MEAL BREAK**

21 h 00 : **General Public Conference:** Extra-solar planets, **Roger Ferlet (IAP, Paris, France)** (in French)

Sunday 30th September 2012

08 h 00 : **Registration and Welcome**
09 h 00 : Life and Death of Stars. **James Lequeux (Astronomer Emeritus, Paris Observatory)**
09 h 45 : Supernovae, explosive death of stars. **Remi Cabanac (IRAP)**

10 h 15 : **PAUSE**

Eclipsing and Spectroscopic Binaries Session

10 h 40 : Role of binary and variable stars in the cosmic distance scale. **David Valls-Gabaud (Paris Observatory)**
11 h 10 : The state of eclipsing binary observations by amateurs. **Laurent Corp (4A, GEOS, AAVSO)**
11 h 40 : Classification of eclipsing binaries: extreme and unusual systems. **Oleg Malkov (Institute of Astronomy, Moscow)**

12 h 15 : **MEAL BREAK**

14 h 00 : Spectrographs for small telescopes. **Olivier THIZY (Shelyak Instruments)**
14 h 30 : Amateur spectrometric study of Albireo. **David Antao**
15 h 00 : Be star spectrographic monitoring by amateurs : a ProAm collaboration example. **François Cochard (Shelyak)**

15 h 30 : **VISITE FENAILLE MUSEUM**

Monday 1st October 2012

08 h 00 : **Registration and Welcome**
09 h 00 : The rare eclipse stars ε Aur and ζ Aur: a report on 2011 eclipses.
Jeff Hopkins, in video-conference.
09 h 30 : The use of DSLR photometry in measuring the magnitude of variable stars.
Des Loughney (BAA VSS)

10 h 00 : **PAUSE**

10 h 30 : A Study of 200 Eclipsing Stars recently discovered in Cynus and Auriga.
Stan Waterman (BAA VSS)
11 h 00 : **Discussion and closure of conference**

12 h 00 : **MEAL**

EUROVS 2012 – THE 2ND EUROPEAN VARIABLE STAR OBSERVERS' MEETING

Arto Oksanen

EuroVS 2012 – The 2nd European Variable Star Observers' Meeting will take place on 7 - 9 September 2012 in Helsinki, Finland. The meeting is a continuation from the first European meeting in Groningen, The Netherlands, in October 2010.

The local organizer is the variable star group of Ursa Astronomical Association. The meeting place is The House of Science and Letters in the city centre area of Helsinki, about 500 meters from the main railway station.

The web site < *http://www.ursa.fi/eurovs* > contains more information and a registration form.

Talks and poster presentations are very welcome. Please contact me as soon as possible to reserve your place in the program.

Welcome to Helsinki!

Arto Oksanen
arto.oksanen@jklsirius.fi
tel: +35-40-5659438
Muurame, Finland

ADDITIONAL CAPAS ABSTRACTS FROM DEFINITIVE VERSION 1.2 – 9 August 2012

Session: Astrometric double and multiple stars

1. A Survey of the history of the observation of double stars. **Paul Couteau and Edgar Soulié (SAF)**

For the quasi totality of our contemporaries (non- astronomers) in 2012, the term « double star » is still a mystery. This expose presents a few outstanding points in the history of double stars to which Paul Couteau has consecrated a book.

In the second century A.D., Greek Claude Ptolemy introduced the expression double star, to designate two stars very close to each other in the heavens. Then, Galileo threw a doubt on the validity of Aristotle's Theory that the stars were fixed in relation to each other. In order to eliminate all doubt, Galileo suggested that the angular distances between double stars members be measured. The eventual variations of these angular distances would prove easier to measure than that of two stars further apart.

Some dozen double stars were discovered in the course of the 17th and 18th centuries, before 1780, they were considered celestial curiosities. Then, with admiral perseverance, William Herschel attempted to carry out Galileo's suggestion. After twenty five years of observations, he published his discovery that the relative movement of certain stars within double star systems were neither rectilinear nor uniform. Although he did not quote Isaac Newton's Principia, he thought that components would draw attention to it. Using descriptive terms, William Herschel brought out the law of universal attraction of the solar system. A new branch of astronomy had emerged, the weighing of stars had been made possible!

His discovery attracted a young astronomer, Wilhelm Struve to this new domain in astronomy. Working in Dorpat (which later became Tartu in Estonia) then in Saint-Petersburg, Wilhelm Struve devised an effective four point research programme of binary stars (which is still in use), using the very first astronomical refractor adapted to observing and measuring double stars.

Other double star observers have proved themselves to be remarkable, especially the Reverend William Rutter Dawes; with hindsight, it appears that, despite a great difficulty in observing close couples, his measurements were remarkably precise, as were those of the Austro-Italian Ercole Dembowski. We admire the talent of Alvan Clark, the originator of metal graving, and self-taught optician who knew how to cut objectives of the largest astronomical refractors in the United States of America, and the exceptional record of Sherburne Burham, Clerk of the court of Chicago, who, for a while, became a professional astronomer specialising in double stars, before returning to work once more at the Court. Incited to emigrate by the horror of the First World War, the Belgian George Van Biesbroeck took measurements during seven decades and, at a certain epoch, was the only astronomer to measure several close doubles with the large Yerkes refractor.

The Dutchman Willem Hendrik van den Bos, having emigrated to Johannesburg impresses us by the extraordinary amount of his measurements: 73940. Despite his observatory being ruined during the First World War and losing his fortune, Robert Jonckheere, an amateur astronomer, with a passion for binary stars, persevered with his observations to become a professional astronomer. He transmitted the passion of double stars to France.

The new techniques for observing double stars introduced by Antoine Labeyrie in 1975 completely modified the way of taking measurements.

**Paul Couteau, "These astronomers mad about the sky, or the history of double star observation, Edisud, Aix-en-Provence, 1988".*

Paul Couteau has discovered 2700 double stars. He holds the title of honorary astronomer, ancient president of the 26th Commission (Double stars) of the International

Astronomical Union and President of honour of the Double Star Commission to the SAF. He is one of the last professional observers who measure visual doubles, having an eye at the astronomical telescope eyepiece. He is author of several books, notably "The observation of Visual doubles" published by Editions Flammarion in 1978.

Edgar Soulie < *edgar.soulie@cea.fr* >

2. Dembowski or the use of the 26-inch telescope in Johannesburg. **Bob Argyle**
Baron Ercole Dembowski (1812 - 1881)
This year marks the bicentenary of the birth of one of the greatest observers of double stars. His contributions were marked by the award of the Gold Medal of the Royal Astronomical Society. His life, instruments and method of observations are described.

4. Accuracy of visual double star catalog of Pulkovo observatory. **Olga Vasilkova (Pulkovo observatory , St Petersbourg Russia)**, Kiselev A.A., Kiyaeva O.V., Izmailov I.S., Shakht N.A., Vasilkova O.O.
The precision of relative positions for more than 300 visual double and multiple stars observed in Pulkovo from 1960 to 2007 years with 26-inch refractor is analysed. Different narrow-field reduction methods are considered. The errors obtained with three types of measuring machines using images on nearly 8000 photographic plates are compared.

Olga Vasilkova < olyaov@mail.ru >

5. Dynamic investigations of visual double and multiple stars on the basis of Pulkovo 26-inch refractor observations for 50 years. **Olga Kiyaeva (Pulkovo observatory , St Petersbourg Russia)**, Kiselev A.A., Shakht N.A., Kiyaeva O.V., Romanenko L.G., Izmailov I.S., Grosheva E.A., Kalinichenko O.A.
Regular visual double stars observations were a traditional work in the Pulkovo observatory since W.J.Struve time. They were renewed after the World War in 1958. Before 2007 there were photographic observations, and since 2003 till today there are CCD observations. The program of observations includes mainly the wide pairs (ρ>2").

To determine the orbits of these stars on the basis of a short arc of uniform observations we use the apparent motion parameters (AMP) method suggested by A.A.Kiselev in 1980. Now we obtained 45 AMP-orbits with great orbital periods.

Statistic investigation of orientation of orbits show us that the majority of orbits with periods more than 1000 years have the inclinations of orbital plane to the plane of Galaxy more than 60^o.

Analysis of deviations relative to orbital motions is used to investigate stars with invisible satellites. The most interesting results are presented.

Olga Kiyaeva < *kiyaeva@list.ru* >

6. Determining the orientation of the orbital poles of double stars in the solar neighborhood. **Daniel bonneau (OCA)**, D. Bonneau, J-L. Agati, P. Bacchus, J. Dommanget, A. Jorissen, P. Mauroy, P. Verhas, et E. Soulié.
In the conclusions of research work conducted in 1968 and 1988, Jean Dommanget (astronomer at the Royal Observatory of Belgium) noted that the orbital planes of visual double stars of the solar neighborhood are not distributed isotropically but had rather a certain parallelism.

This research is based on determining the spatial direction of the pole of each orbit. This is achieved by using the elements of this orbit and radial velocity measurements required to remove the ambiguity of the line of nodes orientation.

To verify these results on the basis of a greater number of couples, Edgar Soulie proposed that this study be started again by a working group of the Double Star Commission of the French Astronomical Society.

The first phase of the project allowed formatting the data to create a list of double stars located at a distance from the Sun less than 20 parsecs and whose visual or astrometric orbit is known. Then we looked for new radial velocity measurements published for each binary and added some unpublished CORAVEL measurements. This led to a sample of forty binary stars for which the determination of the orientation of the orbital pole is in progress.

Preliminary analysis of results shows a "hole" between galactic longitudes l = 90° and l =180° in the distribution of the orbital poles for the 18 binaries with distance $d \leq 10$ pc result which appear similar to that already mentioned by Jean Dommanget in 1968 and 1988. The same thing was not found for 24 pairs of distance $10 < d < 20$ pc for which the distribution of the orbital poles appears uniform.

The full statistical analysis of these results should allow a definitive answer to the question of a possible anisotropy of the distribution of orbital planes..

Daniel Bonneau < *daniel.bonneau@oca.eu* >

8. GWP Catalog Part I. Equatorial Zone: 1725 NEW COMMON PROPER MOTION SYSTEMS FOUND IN THE GARRAF SURVEY. **T. Tobal, X. Miret, I. Novalbos, Observatori Astronomic del Garraf, Barcelona, Catalunya (Spain)**

We present the results of the OAG Common Proper Motion Wide Pairs Survey started in late 2008. Today the first part comprising from 00:00 h. to 12:00 h. in RA and from –20 deg to +20 deg in DEC has been completed. 1725 new systems with common proper motion over 50 marcsec / yr have been detected through the study of 115,200 fields of 1 m in RA and 15' in DEC and they have already been included in the WDS.

The analysis was carried out through Virtual Observatory tools involving 12 amateur teams. Currently the second part is underway which have to lead us to complete the entire equatorial belt (-20 deg to +20 deg DEC).

Session: Pulsating stars

1. Pulsating Stars in the AAVSO Observing Program, **Mike Simonsen (AAVSO)**, in video-conference

Mira type variables have been the historical "meat and potatoes" of AAVSO observers since the AAVSO formed in 1911, and remain an important part of the observing program of many AAVSO observers. However, as our knowledge of stellar structure and evolution has grown, so has the number and variety of pulsating stars being studied by amateur and professional astronomers. The following is a summary of our programs, the current state of our observers' capabilities and the questions we are hoping to answer in the coming decades.

Mike Simonsen < *mikesimonsens@aavso.org* >

4. The GEOS RR Lyr Survey, **Jean-François Le Borgne (IRAP, GEOS)**
The GEOS RR Lyr Survey participates to maintain the follow up of the variation of period and Blazhko effect of RR Lyr stars. These period variations are known to have time scales of days to centuries. Their study then requires an effort to collect observations over years. To achieve this aim, the GEOS RR Lyr Survey project performs 2 kinds of observations :
- The recording of maximums of bright (magnitude at minimum less than ~12.5) well studied RR Lyr stars. For this we use the automatic telescopes TAROT. One is located at Calern Observatory in Europe and one at La Silla Observatory in Chile.
- The detailed study of under-studied RR Lyr stars in the magnitude range 12 to 15. This part of the project is provided by the observations of amateur astronomers using 20 to 60 cm diameter telescopes and CCD cameras.

Jean-François Le Borgne < jean-francois.leborgne@irap.omp.eu >

5. NP CAM a new RV TAURI star, **Roland BONINSEGNA (GEOS)**
NP Cam (NSV 2748) was discovered in 1955 by Strohmeier. It was considered as a star showing rapid variation with an F spectra. Visual observations performed by GEOS observers from 1985, permitted to confirm a high amplitude variation (more than 1 magnitude) and a first period value (34.94d) using time of maxima observed.
Meanwhile, 94 B and V measurements were performed at Jungfraujoch Observatory. These confirmed the pulsating nature of the star, but with variable amplitude of the extrema from cycle to cycle.
From 2006 summer, the star is observed continuously by the automatic telescope Tarot (north) in BVRI. Almost six years of data show that NP Cam is an RV Tau type star with a constant mean magnitude (RVa subclass) and a constant apparent period (34.914d). It exhibits alternating secondary and primary minima, exchanging their status over time. Moreover, the star seems to pulsate on a 4F basis, showing two kinds of secondary minima alternating with different depths. The star varies from 11.53 to 13.49 in B, 10.93 to 12.48 in V, 10.37 to 11.76 in R and 9.99 to 11.14 in I.
Spectroscopic observations made in 2012 in low resolution mode, clearly show the variability of Hα emission line as well as other absorption lines over the apparent period.

Roland Boninsegna < roland.boninsegna@skynet.be >

Session: Exoplanets, beginning and end of star life ...

1. Searching for Low Amplitude Variable Stars and Transiting Exoplanets, **Stan Waterman (BAA, VSS)**
This talk describes a 3 month project to analyse data collected over 5 years in Cygnus from a 2.7 degree square area. The search was done specifically to find periodically varying stars with low amplitude, the hope being to find an exoplanet system. Phase plots were created for the 17,000 brightest stars in the area, using all the data and an optimum multiple set of comparison stars for each target star. The method is outlined and the results decribed in detail. Many low amplitude pulsating stars were found and six very low amplitude eclipsing pairs, one of which may be a hot Jupiter system.

2. Measure radial velocities by amateurs: applications to the characterisation of stellar pairs and detection of exoplanets, **Christian Buil (T60)**
I will remind you of what radial velocity is and the amount of precision required in spectro for a given objective. I will illustrate what is possible to obtain with different types of

spectro (measurements of stellar pulsations, eruptive phenomena…). I will also give examples of measurements of stellar doubles, along with the experience I have acquired whilst measuring a few exoplanets. I will also tackle methods used to obtain high precision data reduction.

3. Life and Death of Stars, **James Lequeux (astronome émérite Observatoire de Paris)**
I will present an introduction on the life and death of stars, by drawing on what could be objects of interest for amateurs to study.

Session: Eclipsing and spectroscopic binaries

4. Spectrographs for "small telescopes" , **Olivier THIZY (Shelyak Instruments)**
With the availability of spectrographs on the market (Lhires III, eShel, LISA), more and more amateur astronomers are taking part in observing campaigns for professionals. Collaborations pro/am are helped in diverse way such as using the ARAS forum, the discussion list Spectro-L, and in regular pro/am meetings. A review of instruments available to amateurs will be illustrated by campaigns such as delta Sco, P Cygni, WRR140, epsilon Aurigae where amateurs have made significant contributions.

Olivier Thizy olivier.thizy@shelyak.com

6. Be star spectrographic monitoring by amateurs : a ProAm collaboration example, **François Cochard (Shelyak)**
Spectroscopy becomes a mature technics for amateur obervers, and opens new horizons for collaboration between professionals and amateurs. I will present what we did to monitor Be stars trhough the BeSS database and the ArasBeam observing program (with a special attention to some binaries). This work could give ideas for monitoring spectroscopic binaries or variable stars in general.

9. A Study of 200 Eclipsing Stars recently discovered in Cynus and Auriga, **Stan Waterman (BAA, VSS)**
This talk describes the available statistics of all the eclipsing stars discovered to date by the Cygnus project, the work is ongoing. Details of the databases from Cygnus and Auriga covering 2003 to 2009 will be discussed. Techniques for uncovering eclipsing variables, some with eclipse depths as small as 20mmag will be shown. A selection of stars that seem most interesting will be illustrated in detail.

Thanks to Helen Thomas for French translation

THE EVOLUTION OF THE UGZ (Z CAM) CLASSIFICATION.

John Toone

'It's all about the standstills, if it doesn't exhibit standstills it isn't a Z Cam star'

The above words were used in 2009 by Mike Simonsen to introduce the Z CamPaign within the AAVSO CvNet Section, where the primary objective was to investigate possible misclassifications and establish with certainty what stars truly belonged to the Z Cam (UGZ) class. Whilst the UGZ classification in the 21st Century is very much reliant upon standstills occurring, this was not the original basis for setting aside Z Cam as a separate class of variable star from U Gem, and almost certainly accounts for the perceived misclassification of some UGZ stars for many years prior to 2009.

When SS Cyg was identified in 1896, U Gem lost its unique status of a frequently repeating nova and the dwarf nova (UG) classification was introduced. Other stars discovered from 1904 onwards were added to the UG list. The UG classification was characterised by a light curve where the star stayed at minimum for most of the time, but then at intervals between 40 and 100 days on average, there would be nova type eruptions in the order of 3-5 magnitudes.

At this point everything seemed neat and tidy, but then along came Z Cam and RX And. By 1906 these two stars were generally regarded as belonging to the UG class, but they had shorter periods and seemed to be spending very little time at minimum. This drew their attention to a few European observers, who attempted to follow these stars' rapid variations very closely. The outcome from this was for A. A. Nijland in 1928 to propose that Z Cam be classified separately from the UG class. In 1930 Nijland wrote the following to justify the separate classification:

"Thanks to the valuable work of Brun, Lacchini, Jacchia and other observers, the first serious attempt has been made to solve the problem of the very interesting rapidly varying stars Z Camelopardalis and RX Andromedae; these stars are often placed in one class with U Geminorum and SS Cygni, but on account of the short or even sharp minima, unknown in the U Gem class, it is thought best to put them in a class apart (Z Cam type), to which possibly also X Leonis, TW Virginis and other rapid stars may belong".

Nijland then listed the following stars as Z Cam type: RX And, Z Cam, TZ Per & SU UMa (with X Leo and TW Vir listed as possible Z Cam type).

Nijland's proposal gained support from Felix de Roy (then BAA VSS Director) in 1932 who wrote a full paper on the subject in the 'Gazette Astronomique'. This classic paper has been kindly translated into English for the first time by Eric Broens, and is reproduced in full elsewhere in this Circular. De Roy agreed with L. Jacchia in defining the principle characteristics of the Z Cam class as follows:

1. Short duration of minimum
2. Irregularity of the light curve
3. Reduced brightness variation
4. Periods of constant brightness

So initially the standstills were only one of (and actually listed last) the four key characteristics of the Z Cam class, with the main criteria being the short duration of minima.

The definition of the Z Cam class then slowly evolved with a shift in emphasis from the short minima (and hence period), irregularities and smaller amplitudes, to the standstills:

1941 - Campbell and Jacchia
"All Z Camelopardalis stars have ranges of about three magnitudes. When their variation is regular – and this does not happen too often – they behave very much like U Geminorum stars of short period; the only difference being that their permanence at

constant minimum brightness is relatively shorter, and the amplitude of the variation somewhat shorter. The cycles during these regular spells all fall between 13 and 22 days. One of the strangest characteristics is that from time to time they take a sort of vacation, and remain at almost constant brightness. These vacations may last from a few weeks to many months, and at those times the brightness of the star appears to remain more or less approximately one-third of the way from maximum to minimum".

1943 – Elvey and Babcock
"On the basis of their light variations this group of stars has been divided into two subgroups, those whose light-variations resemble that of SS Cyg, and those that behave similarly to Z Cam. The Z Cam group may be quite regular for long intervals of time but then become erratic".

1957 - Cecilia Payne-Gaposchkin
"The short cycles, small range and protracted hesitations at intermediate magnitude have been chosen to define the subclass that bears the star's name".

1971- Glasby
"In their general behavior they are very like the U Geminorum stars, subject to similar nova-like outbursts, although their mean periods are normally shorter, they spend less time at minimum, and they have smaller amplitudes. The major difference, and that which justifies their inclusion in a separate subgroup, is the periods of standstill. Following certain maxima, the brightness does not fade to a normal minimum but remains virtually constant at some intermediate magnitude".

1982 - Richter and Wenzel
"The intervals at minimum are so short that an almost continuous variation in luminosity takes place. The eruptive cycle occasionally alternates with other, longer intervals at an approximately constant, intermediate magnitude. These standstills generally begin on the decline, and almost always end by completing the decline".

Today the GCVS divides dwarf novae into three sub classes namely: UGSS, UGSU and UGZ which are in fact abbreviations for the prototype stars SS Cyg, SU UMa and Z Cam. The GCVS definition of the UGZ class is as follows:

"Also show cyclic bursts, but differ from UGSS variables by the fact that sometimes after a burst they do not return to the original brightness, but during several cycles retain a magnitude between maximal and minimal ones. The values of cycles are from 10 to 40 days, light amplitudes are from 2 to 5mV".

So eventually the short minima, irregularities and amplitude, became secondary in terms of importance to the standstills, in defining the UGZ class.

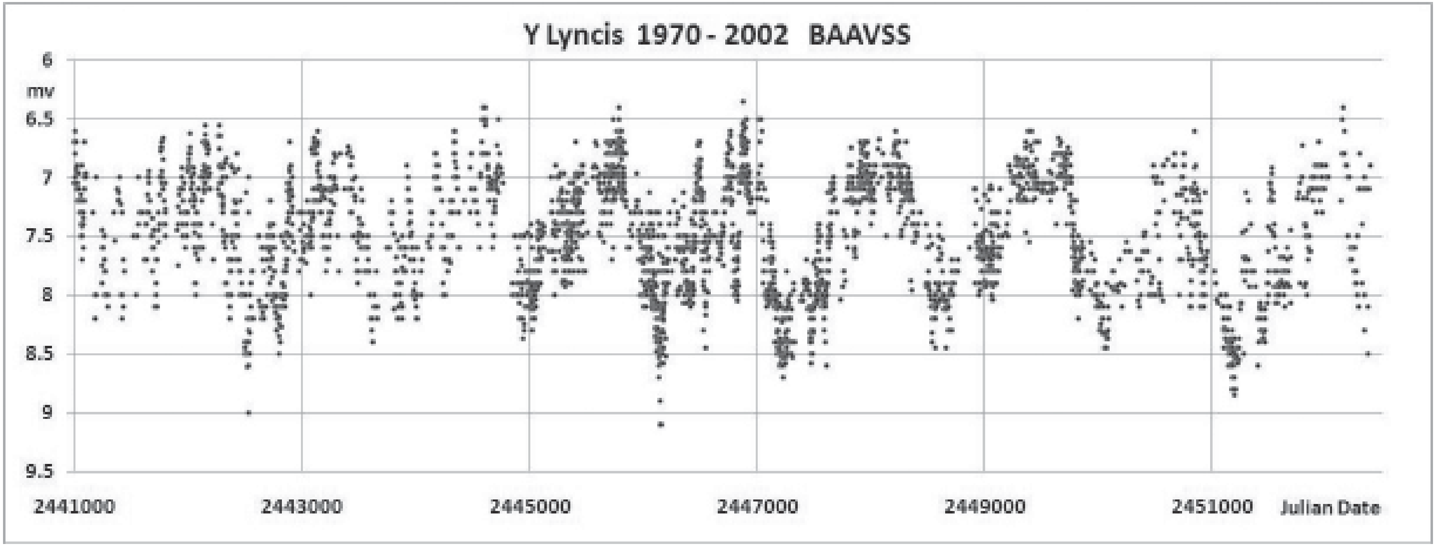
In conclusion I firmly believe that the root cause of some short period dwarf novae being classified as UGZ without displaying standstills, is because the Z Cam class was not initially based primarily on standstills. These so called misclassifications were retained for many years because it was largely forgotten that the Z Cam classification had been subject to a subtle change since being introduced in 1928.

EnootnhoJ@aol.com

Y LYNCIS - BAAVSS - ONE OF THE BEST SRC VARIABLES, Melvyn Taylor

RA 07h 28.2m, Dec. +45° 59.3', SRC, 7.8-10.3p, M6I-II [GCVS]. This object is not easily found at first, by traditional methods, and observers have to be aware of a close (4.5' arc) magnitude star 9.3. Of course being circumpolar its coverage is fairly comprehensive which is excellent as the light-curve shows. In the interval of the light-curve plotted from the BAAVSS database, its visual extreme variation is mag. 6.6 to 8.5 over well defined major periods averaging 1200 days. On these long term variations, are small amplitude variations (from about 0.6 to 1.0 mag.), with a mean period around 150d. The chart sequence no. 229.02 has had few changes and uses comparisons from mag. 5.6 to 8.9.

Contributing to the whole database of this object are observers as listed below:
A B Scott, A Chapman, A Good, A L Smith, A Smeaton, B H Granslo, B J Beesley, B J Keenan, B Jobson, B MacDonald, B R M Munden, B S Crawford, C Henshaw, C J Jackson, C M Allen, D A Picku,p, D Gill, D Hufton, D J Northwood, D L Young, D M Swain, D R B Saw, D Young, E Spooner, E Yusuf, G Maris, G Pointer, G Ramsey, G Stefanopoulos, H Wildey, I A Middlemist, I D Howarth, I Miller, I P Nartowicz, J D Shanklin, J D Wise, J E Isles, J Parkinson, J S Bullivant, J S Day, J S Smith, J Toone, J W Wilson, M A Hather, M Currie, M D Taylor, M Poxon, M S Hoenig, N Reid, P Quadt, P R Clayton, P W Hornby, R A Marriott, R B I Fraser, R D Pickard, R Fraser, R H Mcnaught, R M Steele, R W Cripps, R W Fleet, S Allmand, S J Evans, S Johnston, S R Dunlop, S W Albrighton, T G



BINOCULAR PRIORITY LIST

Melvyn Taylor

(Includes *XX Cam*, *Mira*, *R CrB*, and *R Hya* which are also on the telescopic programme)

Variable		RA (2000) Dec	Range	Type	Period	Chart	Prog
AQ	***And***	00 28 +35 35	8.0-8.9	SR	346d	303.01	
EG	***And***	00 45 +40 41	7.1-7.8	ZAnd		072.02	
V	***Aql***	19 04 -05 41	6.6-8.4	SRb	353d	026.04	
UU	***Aur***	06 37 +38 27	5.1-6.8	SRb	234d	230.02	
AB	***Aur***	04 56 +30 33	6.7-8.4	Ina		301.01	
V	***Boo***	14 30 +38 52	7-12	Sra	258d	037.01	
RW	***Boo***	14 41 +31 34	7.4-8.9	SRb	209d	104.01	
RX	***Boo***	14 24 +25 42	6.9-9.1	SRb	160d	219.01	
ST	***Cam***	04 51 +68 10	6.0-8.0	SRb	300d?	111.02	
XX	***Cam***	04 09 +53 22	7.3-9.7	RCB		068.01	T/B
X	***Cnc***	08 55 +17 04	5.6-7.5	SRb	195d	231.01	
RS	***Cnc***	09 11 +30 58	5.1-7.0	SRc	120d?	269.01	
V	***CVn***	13 20 +45 32	6.5-8.6	SRa	192d	214.02	
WZ	***Cas***	00 01 +60 21	6.9-8.5	SRb	186d	1982Aug16	
V465	***Cas***	01 18 +57 48	6.2-7.8	SRb	60d	233.01	
γ	***Cas***	00 57 +60 43	1.6-3.0	GCAS		064.01	
Rho	***Cas***	23 54 +57 29	4.1-6.2	SRd	320d	064.01	
W	***Cep***	22 37 +58 26	7.0-9.2	SRc		312.01	
AR	***Cep***	22 52 +85 03	7.0-7.9	SRb		1985May06	
Mu	***Cep***	21 44 +58 47	3.4-5.1	SRc	730d	112.01	
O	***Cet***	02 19 -02 59	2.0-10.1	M	332d	039.02	T/B
R	***CrB***	15 48 +28 09	5.7-14.8	RCB		041.04	T/B
W	***Cyg***	21 36 +45 22	5.0-7.6	SRb	131d	062.03	
AF	***Cyg***	19 30 +46 09	6.4-8.4	SRb	92d	232.01	
CH	***Cyg***	19 25 +50 15	5.6-10.5	ZAnd+SR	97	089.03	
U	***Del***	20 46 +18 06	5.6-7.9	SRb	110d?	228.01	
EU	***Del***	20 38 +18 16	5.8-6.9	SRb	60d	228.01	
TX	***Dra***	16 35 +60 28	6.6-8.4	SRb	78d?	106.02	
AH	***Dra***	16 48 +57 49	7.0-8.7	SRb	158d	106.02	
NQ	***Gem***	07 32 +24 30	7.4-8.0	SR+ZAnd	70d?	077.01	
X	***Her***	16 03 +47 14	6.1-7.5	SRb	95d	223.01	
SX	***Her***	16 08 +24 55	8.0-9.2	SRd	103d	113.01	
UW	***Her***	17 14 +36 22	7.0-8.8	SRb	104d	107.01	
AC	***Her***	18 30 +21 52	6.8-9.0	RVA	75d	048.03	
IQ	***Her***	18 18 +17 59	7.0-7.5	SRb	75d	048.03	
OP	***Her***	17 57 +45 21	5.9-7.2	SRb	120d	1984Apr12	
R	***Hya***	13 30 -23 17	3.5-10.9	M	389d	049.02	T/B
RX	***Lep***	05 11 -11 51	5.0-7.4	SRb	60d?	110.01	
Y	***Lyn***	07 28 +45 59	6.5-8.4	SRc	110d	229.01	
SV	***Lyn***	08 84 +36 21	6.6-7.9	SRb	70d?	108.03	
U	***Mon***	07 31 -09 47	5.9-7.9	RVB	91d	029.03	
X	***Oph***	18 38 +08 50	5.9-9.2	M	328d	099.01	
BQ	***Ori***	05 57 +22 50	6.9-8.9	SR	110d	295.01	

Variable		RA (2000) Dec	Range	Type	Period	Chart	Prog
AG	***Peg***	21 51 +12 38	6.0-9.4	Nc		094.02	
X	***Per***	03 55 +31 03	6.0-7.0	GCas+Xp		277.01	
R	***Sct***	18 48 -05 42	4.2-8.6	RVA	146d	026.04	
Y	***Tau***	05 46 +20 42	6.5-9.2	SRb	242d	295.01	
W	***Tri***	02 42 +34 31	7.5-8.8	SRc	108d	114.01	
Z	***UMa***	11 57 +57 52	6.2-9.4	SRb	196d	217.02	
ST	***UMa***	11 28 +45 11	6.0-7.6	SRb	110d?	102.02	
VY	***UMa***	10 45 +67 25	5.9-7.0	Lb		226.01	
V	***UMi***	13 39 +74 19	7.2-9.1	SRb	72d	101.02	
SS	***Vir***	12 25 +00 48	6.9-9.6	SRa	364d	097.01	
SW	***Vir***	13 14 -02 48	6.4-8.5	SRb	150d?	098.01	

Updated 7th February 2010, M.T.

* *

ECLIPSING BINARY PREDICTIONS

Des Loughney

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/time.

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	AI Dra	7.2 - 8.2	U Sge	6.45 - 9.28V
TV Cas	7.2 - 8.2V	Z Vul	7.25 - 8.90V	RW Tau	7.98 - 11.59V
U Cep	6.8 - 9.4	Z Dra	10.8 - 14.1p	HU Tau	5.92 - 6.70V
U CrB	7.7 - 8.8V	TW Dra	8.0 - 10.5v	X Tri	8.88 - 11.27V
SW Cyg	9.24 - 11.83V	S Equ	8.0 - 10.08V	TX Uma	7.06 - 8.80V
V367 Cyg	6.7 - 7.6V	Z Per	9.7 - 12.4p	Del Lib	4.9 - 5.9
Y Psc	10.1 - 13.1	SS Cet	9.4 - 13.0	RZ Cas	6.3 - 7.9

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

For information on other eclipsing binaries see the website:
http://www.as.ap.krakow.pl/o-c/index.php3

Again please contact the EB secretary if you have any queries about the information on this site and how it should be interpreted.

October

2012 Oct 1 Mon
U Cep.......03(07)05D
AI Dra......03(05)05D
RZ Cas.....D18(18)21
X Tri.........D18(19)21
Z Dra...........24(26)29

2012 Oct 2 Tue
RW Tau.....01(05)05D
X Tri........D18(18)20
U CrB....D18(19)22L
Z Per........D18(19)24
RZ Cas........21(23)25
U Sge........21(26)25L
TX UMa..24(29)29D

2012 Oct 3 Wed
Z Vul........D18(15)20
X Tri........D18(17)20
SW Cyg....D18(19)25
U Cep......D18(19)24
RS CVn..D18(20)21L

2012 Oct 4 Thu
RZ Cas.....01(04)05D
TV Cas.....05(09)05D
X Tri........D18(17)19
AI Dra......D18(19)20
Z Dra.......D18(19)22
RW Tau.....L20(24)29

2012 Oct 5 Fri
Y Psc........01(06)04L
TW Dra....02(07)05D
Z Per........D18(20)25
Z Vul.........20(26)25L
AI Dra.........22(24)25

2012 Oct 6 Sat
TV Cas.....00(04)05D
Z Dra.......01(04)05D
TX UMa..02(06)05D
U Cep......02(07)05D
S Equ........D18(18)23

2012 Oct 7 Sun
AI Dra......03(04)05D
RZ Cas.....D18(18)20
RW Tau.....L19(18)23
TV Cas........20(24)28
TW Dra....21(26)29D

2012 Oct 8 Mon
SW Cyg......03(09)05D
RS CVn....D18(15)20L
U Cep.........D18(19)24
Z Per...........D18(22)26
Z Dra............19(21)23
Y Psc...........20(24)28L
RZ Cas..........20(22)25
V367 Cyg....23(68)29L

2012 Oct 9 Tue
TX UMa..03(08)05D
U CrB......D18(17)22L
TV Cas.......D18(19)23
U Sge........D18(21)25L
V367Cyg.D18(44)28L
HU Tau.......L21(18)22
S Equ...........23(28)25L

2012 Oct 10 Wed
RZ Cas.......01(03)05D
Z Dra..........03(06)05D
AI Dra........D18(19)20
V367Cyg..D18(20)28L
TW Dra......D18(21)26
Z Vul........D18(23)25L

2012 Oct 11 Thu
U Cep.........02(07)05D
V367Cyg.D18(<<)28L
TV Cas.......D18(15)19
Z Per.............18(23)28
HU Tau.......L20(19)23
AI Dra..........22(24)25

2012 Oct 12 Fri
TX UMa....05(09)05D
Y Psc.........D18(19)23
SW Cyg......D18(22)28
Z Dra............20(23)25
U CrB.........22(27)22L

2012 Oct 13 Sat
U Sge...........00(06)00L
RW Tau......03(07)05D
AI Dra........03(04)05D
RS CVn......04(11)05D
S Equ.........D18(15)20
TW Dra......D18(17)22
RZ Cas.......D18(17)20
U Cep.........D18(19)23
HU Tau.......L20(21)24

2012 Oct 14 Sun
SS Cet.........05(09)05D
Z Dra..........05(07)05D
RZ Cas..........19(22)24
Z Per............20(24)29

2012 Oct 15 Mon
TV Cas.....02(06)05D
Z Dra.......D18(16)18
Z Vul......D18(21)25L
HU Tau.....L20(22)26
RW Tau....21(26)29D

2012 Oct 16 Tue
RZ Cas........00(03)05
U Cep.......02(06)05D
U CrB......D18(14)20
U Sge........D18(15)21
AI Dra......D18(19)20
S Equ.........20(25)24L
TV Cas.....21(25)29D
Z Dra..........22(25)27

2012 Oct 17 Wed
SS Cet......04(09)05D
RZ Cas.....05(07)05D
X Tri........05(08)05D
SW Cyg....D18(12)18
HU Tau.....L20(23)27
Z Per.........21(26)29D
AI Dra.........22(23)25

2012 Oct 18 Thu
RS CVn..L03(06)05D
X Tri........04(07)05D
U Cep.......D18(18)23
TV Cas.....D18(21)25
RW Tau.....L19(20)25

2012 Oct 19 Fri
TW Dra....02(07)05D
AI Dra......03(04)05D
X Tri........04(06)05D
RZ Cas.....D18(17)19
Z Dra.......D18(18)20
U Sge........18(24)24L
U CrB.......19(25)21L
HU Tau.......21(25)28

2012 Oct 20 Sat
Y Psc........03(07)03L
X Tri........03(06)05D
SS Cet......03(08)05D
U CrB....L05(01)05D
TV Cas.....D18(16)20
Z Vul........D18(19)24
RZ Cas........19(21)24
Z Per........22(27)29D
Z Dra..........24(26)29

2012 Oct 21 Sun
U Cep.......01(06)05D
X Tri.........02(05)05D
TX UMa...D18(14)19
RW Tau......L18(15)19
SW Cyg.....20(26)29L
TW Dra.....22(27)30D
HU Tau.....22(26)30D
RZ Cas.........24(26)28

2012 Oct 22 Mon
X Tri.........02(04)06D
AI Dra.......D18(19)20
RS CVn......19(25)19L

2012 Oct 23 Tue
X Tri.........01(04)06D
RS CVn...L02(01)06D
SS Cet.......03(07)06D
RZ Cas......04(07)06D
U CrB........D18(12)18
U Cep........D18(18)23
Z Dra.........D18(19)22
S Equ.......D18(22)24L
Y Psc..........21(26)27L
AI Dra..........22(23)25
HU Tau.....23(27)30D
Z Per..........24(28)30D

2012 Oct 24 Wed
X Tri............00(03)05
TV Cas......03(07)06D
RW Tau.....04(09)06D
TX UMa.D18(15)19L
TW Dra.....D18(22)27
X Tri............24(26)29

2012 Oct 25 Thu
Z Dra........02(04)06D
AI Dra..........03(04)05
RZ Cas......D18(16)18
Z Vul.........D18(17)22
TV Cas......23(27)30D
X Tri............23(25)28

2012 Oct 26 Fri
HU Tau.....01(05)06D
U Cep.......01(06)06D
SS Cet........02(07)05L
SW Cyg.....D18(16)22
U Sge.......D18(18)23L
U CrB.....D18(23)21L
RZ Cas.........18(21)23
X Tri............22(25)27
RW Tau.....23(28)30D

2012 Oct 27 Sat
Z Per..........01(06)06D
TX UMa..D18(17)19L
TW Dra......D18(18)23
RS CVn....D18(20)19L
Y Psc.........D18(20)25
V367Cyg..D18(58)27L
TV Cas..........18(22)26
Z Dra............19(21)24
TX UMa.....L22(17)22
X Tri.............22(24)27
Z Vul...........22(28)24L
RZ Cas..........23(25)28
2012 Oct 28 Sun
RS CVn......L02(<<)02
HU Tau......02(06)06D
U Cep.........D18(18)22
AI Dra........D18(18)20
V367Cyg..D18(34)27L
X Tri.............21(23)26
2012 Oct 29 Mon
SS Cet..........02(06)05L
Z Dra..........03(06)06D
RZ Cas.......04(06)06D
V367Cyg..D17(10)27L
TV Cas.......D17(18)22
RW Tau.......L18(22)27
X Tri.............20(23)25
U Sge...........22(27)23L
AI Dra..........22(23)24
2012 Oct 30 Tue
Z Per..........02(07)06D
HU Tau.......03(07)06D
U CrB.......L05(10)06D
V367Cyg..D17(<<)27L
TW Dra.......D17(13)18
Z Vul..........D17(15)20
TX UMa..D17(18)19L
S Equ........D17(19)24L
X Tri.............20(22)25
TX UMa.....L21(18)23
SW Cyg.......23(29)28L
2012 Oct 31 Wed
U Cep.........01(05)06D
AI Dra...........03(04)05
TV Cas........D17(13)17
Y Psc..........D17(15)19
RZ Cas........D17(15)18
X Tri.............19(21)24
Z Dra............20(23)25

November

2012 Nov 1 Thu
SS Cet........01(06)05L
HU Tau.....05(09)06D
RS CVn...D17(15)19L
RW Tau......L18(16)21
RZ Cas.........18(20)23
X Tri............18(21)23
Z Vul..........20(26)24L
2012 Nov 2 Fri
TW Dra.....03(08)06D
Z Per..........04(08)06D
TV Cas......05(09)06D
Z Dra.........05(07)06D
U Sge.........D17(13)18
U Cep........D17(17)22
TX UMa.D17(20)19L
U CrB......D17(20)20L
X Tri............18(20)23
TX UMa....L21(20)25
RZ Cas.........22(25)27
2012 Nov 3 Sat
Z Dra.........D17(16)18
AI Dra.......D17(18)20
X Tri..........D17(19)22
2012 Nov 4 Sun
TV Cas......00(04)06D
SS Cet.........00(05)05L
RZ Cas......03(05)06D
Z Vul..........D17(13)18
X Tri..........D17(19)21
SW Cyg......D17(19)25
AI Dra..........22(23)24
Z Dra...........22(25)27
TW Dra.....23(28)30D
2012 Nov 5 Mon
U Cep........00(05)06D
Z Per..........05(10)06D
X Tri.........D17(18)20
TX UMa.D17(21)18L
U Sge.......D17(22)23L
TV Cas.........20(24)28
TX UMa....L21(21)26

2012 Nov 6 Tue
AI Dra........02(04)05
RS CVn...04(10)06D
U CrB...L04(07)06D
S Equ.......D17(16)21
X Tri.......D17(17)20
Z Vul........18(23)23L
SS Cet.......24(28)29L
2012 Oct 30 Tue
RW Tau....01(05)06D
X Tri........D17(17)19
U Cep......D17(17)22
Z Dra.......D17(18)20
TV Cas....D17(19)23
RZ Cas....D17(20)22
TW Dra......18(23)28
Y Psc........23(27)26L
2012 Nov 8 Thu
X Tri........D17(16)18
TX UMa..L21(23)28
RZ Cas.......22(24)27
Z Dra..........24(26)29
2012 Nov 9 Fri
SW Cyg....03(09)04L
SW Cyg.L06(09)06D
TV Cas....D17(15)19
X Tri........D17(15)18
AI Dra.....D17(18)19
U CrB....D17(18)20L
RW Tau.......19(24)28
S Equ........21(26)23L
SS Cet.......23(28)28L
2012 Nov 10 Sat
U Cep......00(05)06D
RZ Cas....03(05)06D
TW Dra...D17(18)23
AI Dra........22(23)24
2012 Nov 11 Sun
RS CVn..L01(05)06D
Z Per........D17(12)17
Z Dra.......D17(19)22
Z Vul.....D17(21)23L
Y Psc........17(22)26L
HU Tau....L18(15)19
TX UMa..L21(24)29
2012 Nov 12 Mon
AI Dra........02(04)05
U Sge.......D17(16)22
U Cep......D17(17)21
RW Tau....D17(18)23
SS Cet......22(27)28L

2012 Nov 13 Tue
Z Dra.........02(04)06D
TV Cas......02(06)06D
U CrB.....L04(05)06D
S Equ.........D17(13)18
TW Dra.....D17(14)19
RZ Cas......D17(19)21
SW Cyg...D17(23)28L
HU Tau......L18(17)21
2012 Nov 14 Wed
Z Per..........D17(14)19
TX UMa...21(26)30D
RZ Cas.........21(24)26
TV Cas.........21(25)30
U Cep........24(28)30D
2012 Nov 15 Thu
RW Tau.....D17(13)17
Y Psc.........D17(16)21
AI Dra.......D17(18)19
V367Cyg.D17(49)26L
HU Tau......L18(18)22
Z Dra............19(21)24
U Sge..........19(25)22L
SS Cet.........22(26)28L
2012 Nov 16 Fri
RS CVn...L01(01)06D
RZ Cas......02(04)06D
TW Dra.....04(09)06D
U CrB.....D17(16)19L
Z Vul.......D17(19)23L
TV Cas......D17(21)25
V367Cyg.D17(25)26L
S Equ..........18(23)22L
AI Dra..........21(23)24
2012 Nov 17 Sat
Z Dra.........03(06)06D
V367Cyg.D17(01)26L
Z Per..........D17(15)20
U Cep........D17(16)21
HU Tau......L18(19)23
TX UMa...23(27)30D
2012 Nov 18 Sun
AI Dra..........02(03)05
RW Tau.....02(07)06D
V367 Cyg..D17(<<)21
SW Cyg.....D17(12)18
TV Cas.......D17(16)21
SS Cet.........21(26)28L
TW Dra.....23(28)30D

2012 Nov 19 Mon
RZ Cas.....D17(18)21
HU Tau.....L18(21)25
Z Dra...........21(23)25
U Cep......23(28)30D

2012 Nov 20 Tue
U CrB....L03(03)06D
X Tri.........05(08)05L
Z Per.........D17(17)21
RS CVn..D17(20)18L
RZ Cas........21(23)25
RW Tau.......21(26)30

2012 Nov 21 Wed
TX UMa..00(05)06D
RS CVn....L01(<<)02
X Tri.........05(07)05L
Z Dra.......05(08)06D
Z Vul........D17(17)22
AI Dra......D17(18)19
HU Tau.......18(22)26
TW Dra.......19(24)29
SS Cet.......21(25)28L

2012 Nov 22 Thu
RZ Cas........01(04)06
TV Cas.....03(07)06D
X Tri.........04(06)05L
U Cep.......D17(16)21
Z Dra.......D17(16)19
U Sge.....D17(19)22L
SW Cyg....20(26)27L
AI Dra.........21(23)24

2012 Nov 23 Fri
Y Psc.........00(05)01L
X Tri.........03(06)05L
SW Cyg..L05(02)06D
RZ Cas.....06(08)06D
U CrB....D17(14)19L
Z Per.........D17(18)23
RW Tau....D17(20)25
S Equ.....D17(20)22L
HU Tau.......20(24)27
Z Dra...........22(25)27
TV Cas.....23(27)30D

2012 Nov 24 Sat
TX UMa..02(07)06D
AI Dra.........02(03)05
X Tri.........02(05)05L
TW Dra....D17(19)24
SS Cet.......20(25)27L
U Cep.......23(28)30D

2012 Nov 25 Sun
X Tri.........02(04)05L
RS CVn..D17(15)17L
RZ Cas.....D17(18)20
TV Cas........18(22)27
HU Tau.......21(25)29

2012 Nov 26 Mon
X Tri.........01(04)05L
RW Tau....D17(14)19
Z Vul........D17(15)20
Z Dra.......D17(18)20
Z Per........D17(19)24
U CrB.......19(24)19L
Y Psc........19(23)25L
RZ Cas........20(23)25

2012 Nov 27 Tue
X Tri.........00(03)05L
U CrB.......L03(00)06
TX UMa..03(08)06D
del Lib....L06(07)06D
TW Dra....D17(15)20
U Cep......D17(16)20
SW Cyg....D17(16)22
AI Dra......D17(18)19
TV Cas.....D17(18)22
SS Cet.......19(24)27L
HU Tau.......22(26)30
X Tri..........24(26)29

2012 Nov 28 Wed
Z Dra...........00(02)05
RZ Cas........01(03)06
Z Vul.........20(26)22L
AI Dra.........21(22)24
X Tri..........23(26)28

2012 Nov 29 Thu
RW Tau....04(09)07D
RZ Cas.....05(08)07D
TV Cas.....D17(13)18
U Sge........D17(14)19
Z Per.........D17(21)25
X Tri..........22(25)27
U Cep......23(27)31D
HU Tau....24(28)31D

2012 Nov 30 Fri
AI Dra.........02(03)04
RS CVn.....04(10)07D
TX UMa..05(10)07D
TW Dra....05(10)07D
U CrB.......06(11)07D
U CrB.......D17(11)17
S Equ......D17(17)22L
Y Psc........D17(18)22
Z Dra...........17(20)22
SS Cet........19(23)27L
X Tri............22(24)27

December

2012 Dec 1 Sat
TV Cas.....05(09)07D
Z Vul.........D17(13)18
RZ Cas.....D17(17)20
X Tri............21(24)26
RW Tau.....23(27)31D
SW Cyg.....24(30)26L

2012 Dec 2 Sun
HU Tau.....01(05)07L
Z Dra...........02(04)07
SW Cyg..L04(06)07D
U Cep.......D17(15)20
U Sge.........17(23)21L
Z Per............17(22)27
RZ Cas........20(22)24
X Tri............20(23)25

2012 Dec 3 Mon
TW Dra....00(05)07D
TV Cas.....00(04)07D
TX UMa..06(11)07D
AI Dra......D17(17)19
U CrB.....D17(22)18L
SS Cet........18(23)27L
V367 Cyg..18(63)25L
Z Vul.........18(24)22L
X Tri............20(22)25

2012 Dec 4 Tue
RZ Cas............00(03)05
U CrB..........L02(<<)04
HU Tau.........02(06)06L
del Lib.......L06(07)07D
V367 Cyg..D17(39)25L
RW Tau...........17(22)27
Z Dra.............19(21)24
X Tri..............19(21)24
TV Cas...........20(24)28
AI Dra............21(22)24
U Cep..........22(27)31D
RS CVn.....L24(29)31D

2012 Dec 5 Wed
RZ Cas........05(07)07D
V367 Cyg..D17(15)25L
X Tri..............18(21)23
Z Per...............18(23)28
TW Dra..........20(25)30

2012 Dec 6 Thu
AI Dra.............02(03)04
Z Dra...........04(06)07D
HU Tau.........04(08)06L
V367 Cyg..L07(<<)07D
V367 Cyg..D17(<<)25L
SW Cyg........D17(19)25
TV Cas.........D17(19)24
SS Cet..........17(22)27L
X Tri..............18(20)23

2012 Dec 7 Fri
U CrB..........03(09)07D
AI Dra..........07(08)07D
V367 Cyg..L07(<<)07D
S Equ...........D17(14)19
Z Dra..........D17(14)17
U Cep..........D17(15)20
RW Tau........D17(16)21
RZ Cas.........D17(17)19
X Tri..............17(19)22

2012 Dec 8 Sat
HU Tau.........05(09)06L
TV Cas.........D17(15)19
X Tri...........D17(19)21
TW Dra........D17(20)25
Z Vul..........D17(21)21L
RZ Cas............19(21)24
Z Per..............20(25)29
Z Dra..............21(23)25

2012 Dec 9 Sun
U Sge.....D17(17)21L
AI Dra.....D17(17)19
X Tri........D17(18)21
SS Cet.........17(21)26
TX UMa..L19(14)19
U Cep......22(27)31D
RS CVn.....L23(24)31
RZ Cas.......24(26)28

2012 Dec 10 Mon
Z Dra.......05(08)07D
RW Tau....06(11)06L
TV Cas....06(10)07D
X Tri.......D17(17)20
U CrB...D17(20)18L
S Equ........19(24)21L
AI Dra.........21(22)23

2012 Dec 11 Tue
SW Cyg..L04(09)07D
RZ Cas.....04(07)07D
del Lib...L06(07)07D
Z Vul.....L07(08)07D
TW Dra...D17(15)20
Z Dra.......D17(16)19
X Tri........D17(17)19
Y Psc........20(25)24L
Z Per.........21(26)31L

2012 Dec 12 Wed
AI Dra........02(03)04
TV Cas....02(06)07D
U Cep......D17(15)19
X Tri........D17(16)18
SS Cet......D17(21)26
TX UMa..L18(16)20
Z Dra..........22(25)27

2012 Dec 13 Thu
RW Tau....00(05)06L
AI Dra.....06(08)07D
X Tri........D17(15)18
RZ Cas....D17(16)19
Z Vul.....D17(19)21L
TV Cas.......21(25)30

2012 Dec 14 Fri
U CrB....L02(07)07D
TW Dra...06(11)07D
HU Tau....D17(13)17
X Tri........D17(15)17
RZ Cas.......18(21)23
U Cep......22(26)31D
Z Per.........23(27)31L
RS CVn....L23(20)26

2012 Dec 15 Sat
AI Dra......D17(17)19
Z Dra........D17(18)20
Y Psc......D17(19)23L
SS Cet.......D17(20)25
SW Cyg..D17(23)25L
TV Cas........17(21)25
TX UMa...L18(17)22
RW Tau........19(24)28
RZ Cas........23(26)28

2012 Dec 16 Sun
SW Cyg....L03(<<)05
Z Vul......L06(06)07D
U Sge........D17(11)17
HU Tau.....D17(14)18
AI Dra..........21(22)23

2012 Dec 17 Mon
Z Dra...........00(03)05
TW Dra....01(06)07D
RZ Cas.....04(06)07D
U Cep.......D17(14)19
TV Cas......D17(16)21
U CrB.....D17(18)17L
S Equ......D17(21)20L
Z Per..........24(29)30L

2012 Dec 18 Tue
AI Dra.........01(03)04
del Lib....L05(06)07D
HU Tau....D17(16)20
Z Vul......D17(17)21L
RW Tau.....D17(18)23
SS Cet.......D17(20)24
TX UMa...L18(19)23

2012 Dec 19 Wed
AI Dra......06(08)07D
Y Psc........D17(14)18
RZ Cas.....D17(16)18
U Sge......D17(20)20L
Z Dra...........17(20)22
TW Dra........20(26)31
U Cep.......21(26)31D

2012 Dec 20 Thu
SW Cyg....07(13)07D
SW Cyg....D17(13)19
HU Tau.....D17(17)21
RZ Cas.........18(20)23

2012 Dec 21 Fri
Z Per............01(06)06L
U CrB.......L01(04)07D
Z Dra.............02(04)07
TV Cas........03(07)07D
Z Vul.........L06(04)07D
RW Tau.......D17(13)17
AI Dra.........D17(17)18
SS Cet.........D17(19)24
TX UMa......L18(20)25
RZ Cas...........23(25)27

2012 Dec 22 Sat
U Cep.........D17(14)19
HU Tau.......D17(18)22
TW Dra.......D17(21)26
V367Cyg...D17(53)24L
AI Dra............21(22)23
TV Cas........23(27)31D

2012 Dec 23 Sun
RZ Cas.......03(06)07D
V367Cyg..L06(29)07D
U Sge........L06(06)07D
Z Vul...........D17(15)20
V367Cyg..D17(29)24L
Z Dra.............19(21)24

2012 Dec 24 Mon
AI Dra............01(03)04
RW Tau........02(07)05L
Z Per............03(07)06L
RS CVn.......03(10)07D
V367Cyg..L05(05)07D
V367Cyg..D17(05)23L
S Equ........D17(18)20L
SS Cet.........D17(18)23
HU Tau.......D17(20)24
TX UMa.....L18(22)26
TV Cas...........18(22)27
SW Cyg.......20(26)25L
U Cep.............21(26)31

2012 Dec 25 Tue
SW Cyg....L03(02)07D
Z Dra..........04(06)07D
del Lib.......L05(06)07D
V367Cyg..L05(<<)07D
AI Dra.........06(07)07D
V367Cyg..D17(<<)23L
RZ Cas........D17(15)17
TW Dra.......D17(16)21

2012 Dec 26 Wed
Z Vul....L06(02)07D
Z Dra......D17(15)17
U Sge....D17(15)19L
TV Cas...D17(18)22
RZ Cas......17(20)22
HU Tau......17(21)25
RW Tau...21(25)29L
Y Psc.......22(26)23L

2012 Dec 27 Thu
Z Per.......04(09)06L
U Cep.....D17(14)18
AI Dra....D17(17)18
SS Cet.....D17(18)22
TX UMa...19(23)28
Z Dra.........21(23)26
RZ Cas......22(24)27

2012 Dec 28 Fri
U CrB...L01(02)07D
X Tri.......03(05)03L
TW Dra..07(12)07D
Z Vul.......D17(13)18
TV Cas...D17(13)18
HU Tau......19(23)26
AI Dra.......20(22)23
RS CVn...23(29)31D

2012 Dec 29 Sat
X Tri.......02(04)03L
RZ Cas...03(05)07D
Z Dra......05(08)07D
SW Cyg..D17(16)22
RW Tau...D17(20)25
U Sge.......18(24)19L
U Cep........21(26)30

2012 Dec 30 Sun
AI Dra.......01(02)04
X Tri.......01(04)03L
TV Cas...05(09)07D
Z Per.......05(10)06L
Z Dra......D17(16)19
SS Cet.....D17(17)22
Y Psc....D17(21)22L
Z Vul.......18(24)20L
HU Tau......20(24)28
TX UMa...20(25)29

2012 Dec 31 Mon
X Tri.......01(03)03L
TW Dra..02(07)07D
AI Dra....06(07)07D
S Equ....D17(15)19L
Z Dra.........22(25)27
X Tri.......24(26)27L

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The **deadline for contributions** to the next issue of VSSC (number 154) will be 7th November, 2012. All articles should be sent to the editor (details are given on the back of this issue).

Printed by RAMPrint 01604 233677

SECTION OFFICERS

Director
Roger D Pickard
3 The Birches, Shobdon, Leominster,
Herefordshire HR6 9NG
Tel: 01568 708136
Email: *roger.pickard@sky.com*

Secretary
Bob C Dryden
21 Cross Road,
Cholsey,
Oxon, OX10 9PE
Tel: 01491 652006
Email: *visual.variables@britastro.org*

Chart Secretary
John Toone
Hillside View, 17 Ashdale Road,
Cressage, Shrewsbury, SY5 6DT.
Tel: 01952 510794
Email: *EnootnhoJ@aol.com*

Binocular Secretary
Melvyn Taylor
17 Cross Lane, Wakefield,
West Yorks WF2 8DA
Tel: 01924 374651
Email: *melvyndtaylor@tiscali.co.uk*

Nova/Supernova Secretary
Guy M Hurst
16 Westminster Close, Basingstoke,
Hants, RG22 4PP
Tel and Fax: 01256 471074
Email: *Guy@tahq.demon.co.uk*

Eclipsing Binary Secretary
Des Loughney
113 Kingsknowe Road North,
Edinburgh EH14 2DQ
Tel: 0131 477 0817
Email: *desloughney@blueyonder.co.uk*

Database Secretary
Andy Wilson
12 Barnard Close, Yatton,
Bristol, BS49 4HZ
Tel: 01934 830 683
Email: *andyjwilson_uk@hotmail.com*

Recurrent Objects Co-ordinator
Gary Poyner
67 Ellerton Road, Kingstanding,
Birmingham, B44 0QE.
Tel: 07876 077855
Email: *garypoyner@blueyonder.co.uk*

Circulars Editor
Janet Simpson
Goatfield Cottage, Furnace, Inveraray,
Argyll, PA32 8XN
Tel: 01499 500234
Email: *sim_jan@btinternet.com*

Webmaster
Gary Poyner
(see above)

TELEPHONE ALERT NUMBERS

Nova and Supernova discoveries
First telephone the Nova/Supernova Secretary, Guy Hurst: 01256 471074
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