British Astronomical Association

VARIABLE STAR SECTION CIRCULAR

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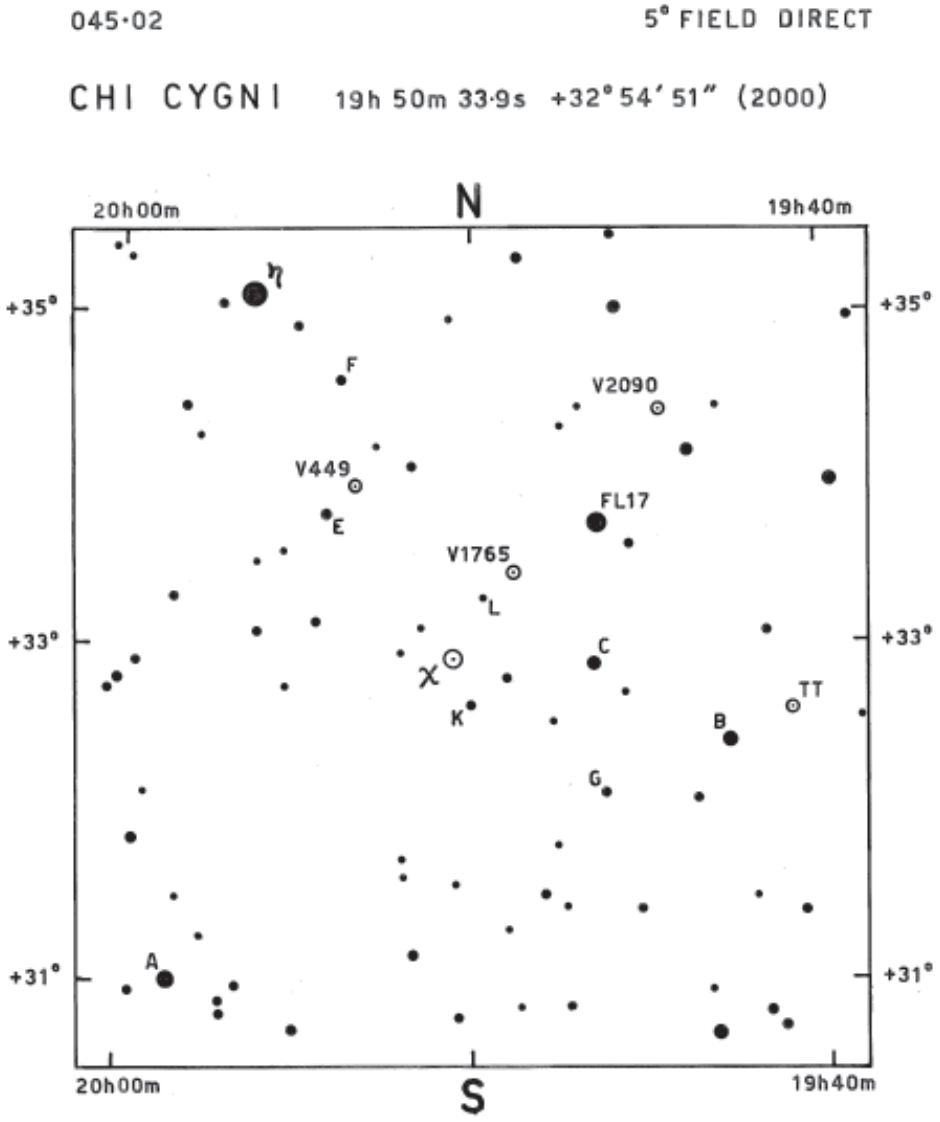
JOHN TOONE



FROM THE DIRECTOR

ROGER PICKARD

VSS Meeting 2014

The recent VSS Meeting at York was a great success and I hope that those of you unable to attend have enjoyed browsing the presentations available at: *http://www.britastro.org/vss/York_June21_2014.htm.*

Missing Data

I wrote in the last Circular that there were many gaps in the data for a large number of the stars on our Programmes.

In order to fill in some of these gaps I am very grateful to Tony Markham for producing the graphs shown in this Issue, and the explanatory text (see "Gaps in Historical Light Curves"). All of the graphs and text have also been placed on the website. So, if you think some of your data is missing and you still have it please contact the me so that we can arrange keying it in.

Binocular Programme

You will notice that we are no longer publishing the full list of Binocular Programme Stars which we have been doing for the last few Circulars. All of the information is on the web pages after all, but for those of you who prefer it in paper format please contact either Melvyn Taylor < *melvyndtaylor@tiscali.co.uk* > or myself < *roger.pickard@sky.com* >.

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THOMAS LLOYD-EVANS (1940-2014)

Tom Lloyd-Evans passed away quite suddenly on 12 June 2014 at the age of 73.

Tom joined the BAA in 1956 after becoming interested in astronomy following encouragement from both parents and teachers alike. Along with his younger brother and during vacations from school, he built wooden box cameras with ex- WD Aero-Ektar lenses and began meteor and aurora photography. Between 1958 and 1965 they carried out a systematic programme to capture meteor spectra which proved an outstanding success, with 17 spectra captured, with one, a -4 mag. Lyrid giving 70 lines. These were measured at the Astronomy Department at St Andrews University, at which Tom was then an undergraduate, and published in the BAA Journal[1]. This drew great praise from the BAA President and Director of the Meteor Section, H. B. Ridley and Tom soon became Assistant Director of the Section!

Upon completion of his PhD in 1966 Tom moved to South Africa where he was to spend the rest of his professional working life. Tom was particularly interested in Miras, carbon and RCB stars, and other post-AGB stars. Among his many activities was the announcement in 1981, with Ian Glass, of a period-luminosity relationship for Mira stars in the Large Magellanic Cloud[2] and work with an international team investigating polycyclic aromatic hydrocarbons in old stars, also in the LMC.

Dr. Tom Lloyd-Evans giving a talk on "Long Monitoring and the Carbon Miras" at the BAA Out of Town meeting which was held in conjunction with the AAVSO, and the BAA Variable Star and Solar Sections, at New Hall College, Cambridge, April 2008

Photo: Rob Januszewski

Tom had many other interests whilst in South Africa including archaeology, hill-walking, botany, scuba diving, and Scottish country dancing! It was here that he met school teacher Marlene Hemmes and they married in 1985 and had two children, Robert and Anne.

Tom retired at 60 and returned to St Andrews to set up an observatory with a 14-inch Meade reflector. He was an active visual variable star observer and reported thousands of observations to both 'The Astronomer' Magazine and the AAVSO. (Sadly, it seems he only reported 70 observations to the VSS). He monitored many under-observed Mira stars, as well as CV's, RCB's etc. His favourite CV was V795 Cyg. He also made many contributions on meteors, aurora and noctilucent clouds. He was also very helpful in refereeing papers for the BAA and was regarded as a 'tough but fair' referee. However he was often frustrated, like the rest of us, at the increasing light pollution and cloudiness even in the east of Scotland. If he could not observe he would be fiddling with his telescopes making adjustments.

He successfully petitioned against a development near his home (in which Gary Poyner made a written statement in support of his objection) which would have seriously increased the light pollution in the area. He frequently suffered weather damage to his dome, and was always making repairs to his Losmandy Titan mount.

Tom was a highly respected astronomer who was President of the Astronomical Society of South Africa 1991-2 and an honorary member in 2001, an honorary member of the BAA and a Fellow of the Royal Astronomical Society, and a member of the International Astronomical Union.

I am grateful to Roger Wood, Dave Gavine and Gary Poyner for much help in preparing this short obituary.

References

1. Observations of Meteor Spectra. J. Brit. Astron. Assoc. **76**, 229, 231-243 (1966).
2. Nature 291, 303-4 (1981).

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THE VARIABLE STAR SECTION MEETING, YORK, 21ST JUNE 2014

MELVYN TAYLOR

John Goodricke and Edward Piggot, The Fathers of Variable Star Astronomy

Martin Lunn, a former citizen of York and its Astronomical Society gave a presentation about the eighteenth century Fathers of Variable Star Astronomy: in particular John Goodricke (1764 to 1786) and Edward Pigott (1753 to 1825). Whilst some historians believe the variations were seen by Arabic observers, or even Chinese, Algol's discovery is normally attributed to G. Montanari, professor at The University of Bologna in 1669. The detailed observations and conclusions as suggested by Goodricke are the key to future understanding of both stellar and galactic planetary systems.

Pigott came from Whitton, west London, and had family links with the Fairfax dynastic family in northern England. Edward Pigott was well connected in the county and the speaker suggested he dressed as a bit of a 'dandy', in the French style. Through his father's business dealings, Gilling Castle in North Yorkshire came to the family, and connections with the aristocracy in York were established. At an early age he had witnessed a partial solar eclipse in 1765, also the transit of Venus in 1769; and as a surveyor he had worked in Europe but moved to Glamorganshire, Llantwit Major. At a stage in his life after Goodricke's death he removed to Bath, probably after the dismantling of the observatory adjacent Bootham in n-west York, and on his death was buried in Bridlington Priory near his mother. Interest in astronomy was taken seriously since in 1779 he made a discovery of Messier 64 the 'Black Eye' nebula and at the age of thirty he discovered a comet. The speaker showed a list of bright stars that Pigott suspected of variability, and which with Goodricke they made comparative brightness observations in a manner that William Herschel had used. It appears both astronomers had plenty of observations and had ideas about the meaning behind them.

Goodricke had problems due to being mute and deaf and was born in Groningen of Henry Goodricke and Levina Sessler. His grandfather, one Sir John Goodricke, owned Ribston Hall to the n-west of York and he tended to rule over the family with a firm hand. Being disabled John attended Mr. Braidwood's academy in Edinburgh for the Deaf and Mute at Dumbie House, now demolished, not far from the modern Parliament building. On attending the educational institution Warrington Academy (1778) his interest in mathematics and Astronomy started and he began writing his astronomical journals. In 1781 he went to York where he met his long time friend Edward Pigott. The two were jointly interested in the Science since Edward's father had a well equipped observatory (probably a 3.75 inch Dollond refractor) on land north of Bootham. John Goodricke lived

and worked in the Treasurers' House adjacent the most famous Minster in England and it was from one of the south facing windows that he made observations. The speaker thought it was reasonable to assume that, due to his personal limitations, Goodricke's eyesight may have been highly attuned, and that his timings done by a regulated pendulum clock were very accurate, possibly aided by visual stellar alignments with architectural features on the Minster. With assistance from York society members, Martin, and others from the University Physics department made on-site experiments in the Treasurers' House to confirm the room and window from which Goodricke made the original observations.

In 1781 William Herschel, having the discovery of the eighth planet Uranus to his credit, was also interested in researching and observing double stars. Herschel discovered the variability of the naked-eye multiple object alpha Herculis (Rasalgethi) in 1795, its modern SRC class has it varying from 2.7 to 4.0 (V). In November of 1781 and in 1782 Goodricke made a whole series of naked-eye observations of Algol together with accurate timings of its variations. The repeated 2.867d fadings of the star suggested to the observers that the reason was due, not to one star changing in brightness, but of two (or a planet) in orbit with both eclipsing the other in this time interval. The orbit of an object in front of a star caused the changing brightness (and the combined magnitude from 2.1 to 3.4). They had hit on the correct theory decades before it was confirmed by spectroscopic analysis of the pair of stars, and Goodricke had the honour of publishing the results and possible cause.

The 1783 May edition of the Philosophical Journal of the Royal Society contained several items from Goodricke's journals and a paper about the "Light Variation of the star Algol" appeared. A second piece followed up in the 1784 December edition and showed the star's period to be 2d 20h 49m 02.5s (2.8673901d). The interest Goodricke had in clocks came to the fore by a paper in his journal titled "Of the Going of My Clock" in which he notes referring his clock in relation to that of the Minster. In 1783 Goodricke

Photo courtesy of Melvyn D.Taylor

was awarded the Gold Medal of the Royal Society for his remarkable work about the development of stellar processes and was made a fellow of the Royal Society in February 1786. On 20 April 1786 he died at the very young age of near 22 years, several weeks after his last observation in February, and was buried at Hunsingore near Ribston Hall between York and Harrogate.
Goodricke's short astronomical status may have outshone Pigott's yet both had made discoveries of important classes of variable. Pigott is credited with the discovery of the variability of eta Aquilae, R Scuti and the prototype R CrB; Goodricke had two iconic bright stars, beta Lyrae (Sheliak) and delta Cephei.

The Life of Albert Jones (1920 to 2013)

This was the title of **John Toone**'s presentation about one of the greatest visual variable star observers. Albert Francis Arthur Lofley Jones was the offspring of Edward Lofley Jones and Clara Martha Fisher, the Lofley attachment was from his grandmother Sarah Ann. John had traced the great-great grandparents to the mid-eighteenth century with Thomas and Mary Jones living in North Myton, Yorkshire, near Kingston-upon-Hull. The grand parents J.P.R.H. and S.A.L. Jones emigrated to New Zealand on board the ship Schiehallion arriving in Wellington in July 1872. Albert was born 1920 Aug 09 in Linwood, Christchurch and six years later the family moved to Timaru. From the age of 44 he lived in Nelson and passed away 2013 Sep 11. He had had a step-brother, sister and brother. Marrying first to Ann in 1973 John indicated this marriage was not very happy and he married a second time Carolyn in 1984. One of the greatest quotes as told by the speaker was that of his greatest discovery – his wife Carolyn. His education was relatively normal at primary school, then from 1927 to 1932 at Waimataitai School, Timaru where he passed his proficiency exams. From 1933 to 1936 he was at the Timaru Boys' High School and his favourite subject was Chemistry. He was working as a miller at Timaru from 1937 to 1963, with his national service record from 1940 to 1942 seeing him in the Home Guard and the infantry of the Canterbury Regiment. From 1964 to 1985 he worked in a local grocery company in Tahunanui, Nelson. Astronomically he had declined a job site testing at the Mount John facility, and had turned down an offer to be the director of the Carter Observatory.

The first steps in astronomy saw him make a small refractor from a lens kit with card and metal. Probably the ignition to observe and record observations came with an aurora in 1939 when he sent a description of it to the newly opened Carter Observatory. In 1941 he purchased a 5-inch Calver reflector and joined the New Zealand A.S. Then in 1943 CP Puppis exploded as a fast nova to magnitude 0.5 and his light estimates were also sent to Carter. With the 5-inch f/15 reflector he made the first v.s. observation on 1943 June 18 and with the same instrument recovered comet Kopff in 1945. He joined the following astronomical organisations; the VSS of NZAS in 1944, the NSW branch of the BAA 1945, and the Astronomical Society of Belgium 1946. He was elected as FRAS in 1947, and of the RASNZ in 1963, and in 1965 became a member of the IAU. In 1948 he used a 5.5-inch refractor and with it discovered comet 1946P1. In 2000 he co-discovered comet 2000W1. But he, like most visual observers, had 'aperture fever'. Dr. Leslie J. Comrie (a NZ national) who worked in England and became director of the BAA's computing section, and superintendent of the HMNAO, corresponded with Albert over telescope mirrors. With the help of F. J. Hargreaves, Comrie arranged the manufacture and transport of a 12.5-inch f/5 mirror from the U.K. to New Zealand. This formed Albert's new large reflector, which he christened LESBET in 1948, and which was used from 1948 to May 2010. One of John's photographs of Albert with LESBET dated 1987 was shown – the mounting is an equatorial but he used it mainly in an alt/az mode. It had two finders of 45mm and

78mm aperture, a very practical arrangement for visual searching. The inspired name of LESBET originates from Comrie and his wife Betty; Leslie must have informed Albert that she had a perfect figure and the mirror's curves were similarly fine.

From 1953 he was systematically following supernovae and dwarf novae and worked alongside Frank Bateson (Australia) in publishing results of; VW Hyi, Z Cha, EK TrA and many objects of the U Gem class. He also found outbursts of objects that included; T Pyx, V1017 Sgr, V3890 Sgr, and was a co-discoverer of SN1987a (LMC).

Albert Jones with LESBET. Photo courtesy of The Nelson Mail

The list of astronomical awards and medals is remarkable from worldwide organisations recognising his work. The BAA bestowed on him the Steavenson Memorial and the Merlin medals and the AAVSO made him an honorary Life Member. In 1987 he was awarded an OBE, and there were acknowledgements from astronomical bodies such as the RAS, ASP, SAO and from New Zealand universities.

speaker had initially highlighted the outstanding facts of Albert Jones' observations which are immensely appreciated by most amateur observers whether variable star inclined, or not. His observing career of variables spanned from June 1943 to August 2011 from the age of 22 to 91 years. He had around 515,000 observations and is top of the list of five leading visual observers that includes Narumi (Japan), Kato (Japan), Overbeek (S.Africa) and Poyner (UK, Birmingham). There are 365,000 estimates by Jones in the AAVSO international database covering 1963 to 2011. A short list of the first observers making 100,000 estimates are; Butterworth (1939), Albert Jones (1957), de Kock (1958), Cy Fernald (1960) and Leslie Peltier (1962).

The VSS Database

Andrew Wilson, who developed the latest version of the BAAVSS database website spoke about several aspects of it and in particular the on-line submission of observa-

tional data. With the database live and active on 22 February 2014 seventeen individual observers at 15 June had submitted around 93,300 observations (from 738 files) with 294 being manually entered. Seven observers had entered over 1000 estimates. Displaying the database welcome screen the speaker highlighted several of the key zones, for example; reviewing data, the observer area, maintenance of the observations and general information such as the 'home' area updates. He also spoke about new options, problems that may be encountered, the chart sequences, how to upload, edit and correct files. The day before this meeting Andrew had summarised the database which showed a total very close to 2.5 million observations comprising; Visual $1.87x10^6$, CCD $612x10^3$, DSLR 4000 and photographic 1000. He also looked into future plans and ideas such as the importance of recalculating up-to-date magnitudes in accordance with the latest chart sequences. Development of a system to produce phase plots from the database of objects like Mira, semi-regular and eclipsing binary systems is in this plan. Also underway is to incorporate the BAAVSS observations with the AAVSO International Database. Useful and important addresses that assist observers using the database were shown as well as the database secretary's since Andrew noted he was keen to help when called with a query. [These are all given on the VSS' web site. *andyjwilson_uk@hotmail.com*].

Eclipsing Binaries - Something Different

Boris Gänsicke from the University of Warwick had a presentation entitled Eclipsing Binaries - Something Different which looked at; white dwarfs, Cosmology, exo-planets, cataclysmic variables, life in the Universe and with a dedication to the original work of John Goodricke.

Speaking about Algol and Goodricke's visionary summation for the reasons of its variability, the speaker introduced the star in terms of its light-curve and with reference to Mark Garlick's graphic interpretation of the eclipsing system. In measuring orbital periods Goodricke's treatise published in Phil. Trans. R.S. (vol.73, pp 474-482) gave the eclipse duration of about 7 hours and its recurrence every 2 days and 21 hours. Modern fundamental assessments of stellar masses and radii using eclipsing binary data were published by J. Andersen of Copenhagen University Observatory in Denmark (1991). The Doppler effect, that shows how spectral lines shift when a spectroscopic binary is studied, was shown diagrammatically and gives the radial velocity from the equation $\Delta\lambda/\lambda = v/c$.

Stellar parameters, derived from velocity-time relations and times of the eclipsing phases (start and end of fade, and duration at minimum) using the basic stellar equations, were summarised in simplified form that showed the importance of observed data from eclipsing binaries. An important element in the equation for stellar mass is the inclination of the system found from either timings of primary and secondary eclipse or via 3-d (geometric) modeling. In a description of white dwarf stars, those small (similar in size to Earth) but very dense ($5x10^8$ kg/m^3) evolved products of once massive stars, Boris described the basics of distance measures with reference to supernova events. He also noted in two related plots that white dwarf objects become smaller with increasing mass (!). The nature of type Ia SN (e.g. SN 1997ff) can be used as standard candles at cosmological distances that probe and define the expanding Universe as in an accelerating phase. The 2011 Nobel prize for Physics given to Perlmutter, Schmidt and Riess was "…for the discovery of the accelerating expansion of the Universe through observations of distant supernovae". The speaker highlighted relatively recent studies that checked the original work of Chandrasekhar in relation to cataclysmic variables, astrometric binaries, white dwarf eclipsing binaries (e.g.V471 Tau) and very fast eclipses in systems like NN Ser and DQ Her.

The transits of Mercury and Venus over our Sun has led to very sophisticated methods used in micro-photometry to search for objects going around stars in the Milky Way. In conclusion, the prospect of having the vast set of data found by especially by the Kepler probe that has 160,000 exo-planets under examination allows a lot of speculation and further searches for the possibility of life on these bodies.

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(The Report of the 2014 York Meeting will be continued in the next Issue)

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HIROAKI NARUMI

JOHN TOONE

With the sad loss of Albert Jones in September 2013 the title of 'the most prolific living visual observer of variable stars' has passed to Hiroaki Narumi. Outside of Japan Hiroaki is not well known and the purpose of this paper is to remedy that and introduce Hiroaki to the English speaking world.

Hiroaki is based in the town of Uchiko, to the south of Matsuyama on the island of Shikoku at latitude 33ºN and longitude 133ºE. The nearest major city is Hiroshima, 100km to the north on the mainland of Japan. Uchiko is surrounded by mountains but has increasingly suffered from localised light pollution in recent years. Hiroaki has lived in Uchiko throughout his entire life and has submitted (and continues to submit) his observations to the Variable Star Observers League in Japan (VSOLJ).

Hiroaki aged 64, is retired and has been observing variable stars for 40 years. He commenced observing in 1975 and reached the coveted milestones of 100,000, 200,000 and 300,000 observations in double quick time in the years of 1986, 1996 and 2007 respectively. According to the VSOLJ database his total number of observations stood at 350,038 by the end of 2012. Hiroaki's annual average over 38 years is therefore 9,200

V Hya :- Observations by Hiroaki Narumi

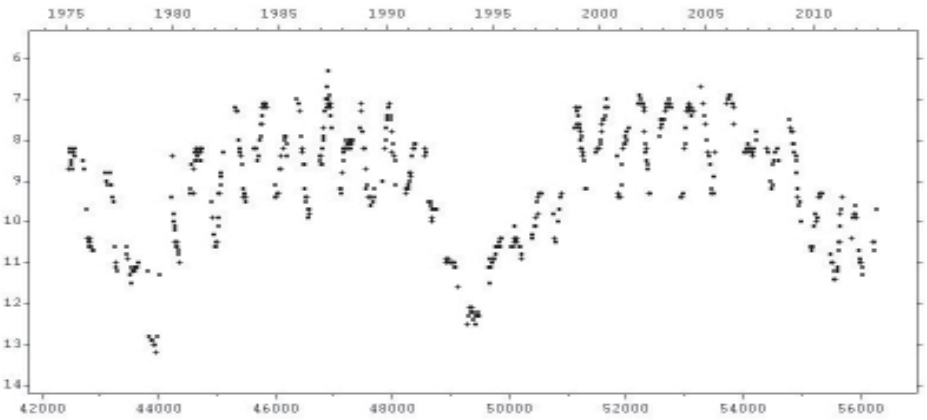


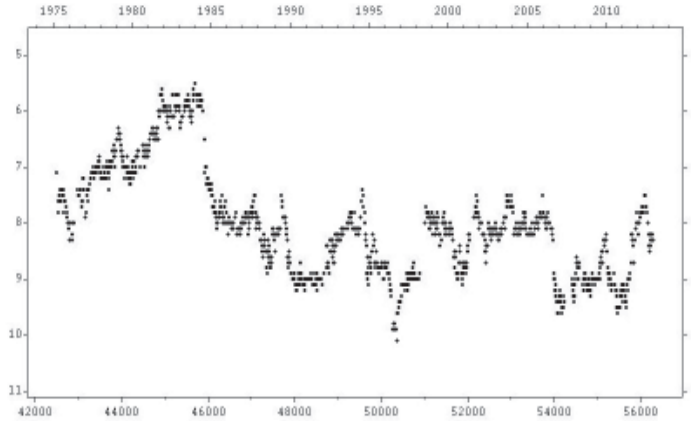
Photo of Hiroaki Narumi taken 15th June 2014.

Photo courtesy of Seiichiro Kiyota (VSOLJ)

which is a truly extraordinary figure and even exceeds Albert Jones average of 7,500 (but made over the longer period of 69 years). Hiroaki's most productive year was 1987 when he made 13,404 observations. There is a backlog in inputting his observations into the VSOLJ database because they are submitted on paper report forms and are so numerous.

Hiroaki observes with a 15cm altazimuth mounted Newtonian supplied by Nishimura Astronomical Instruments and also with 7x50 binoculars. He carries his telescope (see photo above) from his house to a nearby rice field to observe. He monitors all types of

CH Cyg :- Observations by Hiroaki Narumi

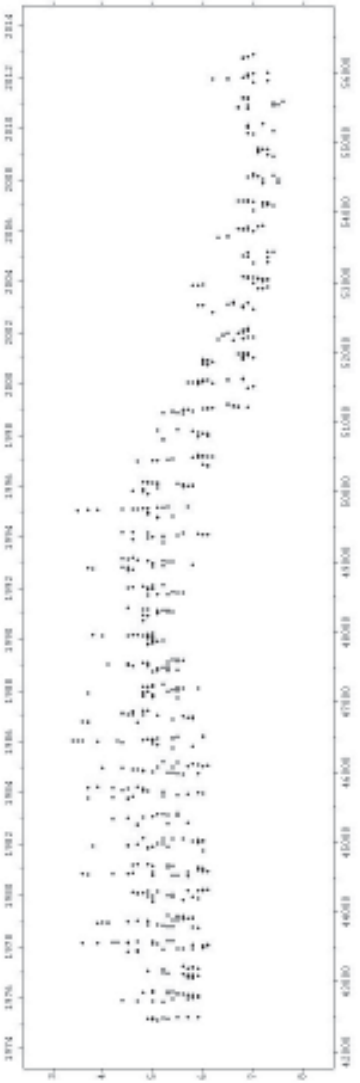


variable stars but his favourite targets are red semi-regular stars. In his earlier years Hiroaki did not record and report negative observations because he felt they were of lesser importance. The value of long term systematic visual observations by an accurate observer such as Hiroaki is illustrated in the light curves reproduced here that have been extracted from the VSOLJ database. In the case of T UMi and L2 Pup, long term and potentially evolutionary behaviour has been recorded.

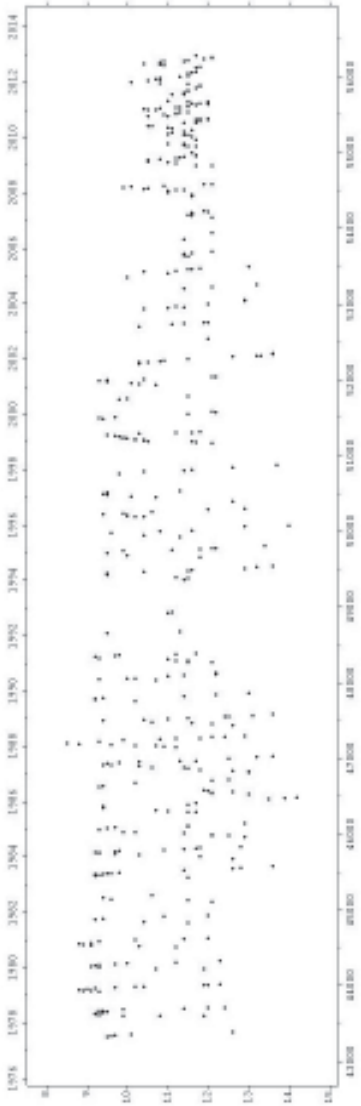
Hiroaki has made the following most valuable recurrent novae outburst detections:

U Sco 1979 (IAUC 3373) and RS Oph 2006 (IAUC 8671)

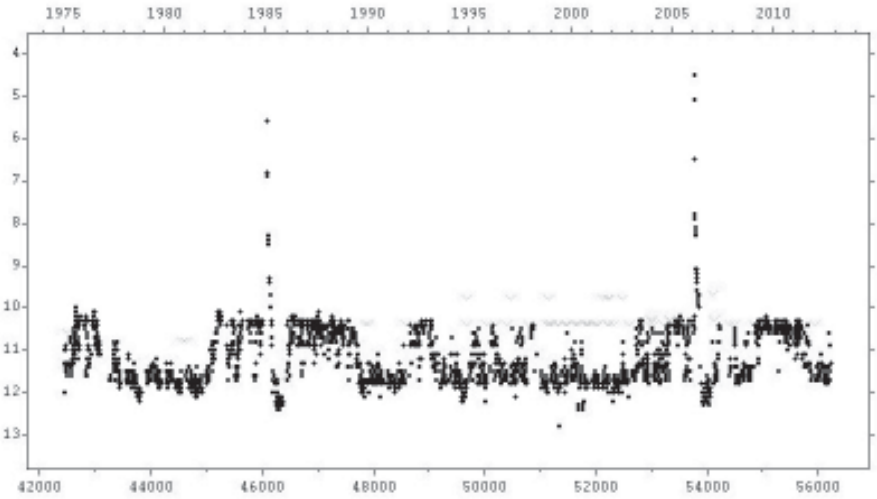
L2 Pup : Observations by Hiroaki Narumi



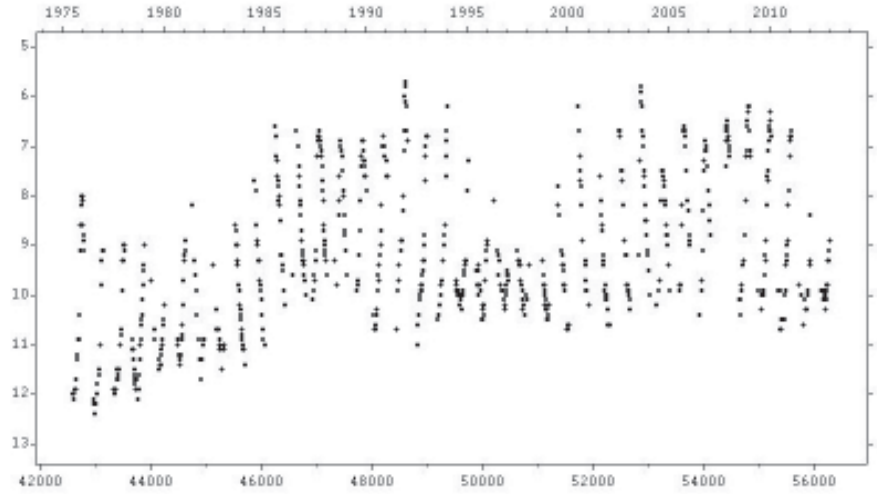
T Umi : Observations by Hiroaki Narumi



RS Oph :- Observations by Hiroaki Narumi



R Aqr :- Observations by Hiroaki Narumi



Hiroaki also independently detected the unexpected 1978 outburst of WZ Sge, a star that was catalogued at that time as a recurrent nova.

In 2012 Hiroaki made 8,909 observations which is very close to his overall annual average so he is showing no signs yet of slowing down. If he maintains this average until the age of 80 then he would have accrued a similar amount of observations to that of Albert Jones, the most prolific visual observer of all time.

The dedicated work of Hiroaki Narumi is inspirational to all visual observers and it is

hoped that when the databases of all variable star organisations are combined he will receive the worldwide recognition that he truly deserves.

Important Note

I am most grateful to Seiichiro Kiyota who has provided most of the information for this paper and skillfully translated it into English. Seiichiro met with Hiroaki at his home for the first time in 20 years on 15th June 2014 and conducted an interview based on a set of questions I had set. Without Seiichiro's kind efforts this paper would not have been possible.

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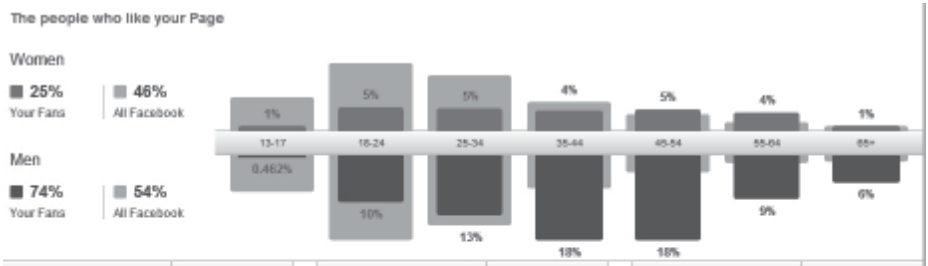
BAA VSS FACEBOOK UPDATE

TONY MARKHAM

As of the end of July, the BAA VSS Facebook page had 436 followers.

The accompanying graphical report from Facebook shows the age profile of our followers, compared with that of Facebook users as a whole. (For those of you viewing in black and white, the lighter bars represent Facebook as a whole and the darker bars represent our membership).

In contrast to the Director's lack of success in identifying any section members that are aged under 40, the Facebook stats suggest that the median age of our followers is probably 41, with 45% of followers being aged under 40. However, we do seem to be rather deficient in followers aged under 25.



Country	Your Fans
United Kingdom	121
United States of America	53
Italy	31
India	21
Spain	17
Brazil	12

City	Your Fans
London, England	10
Istanbul, Istanbul	6
Budapest, Budapest	6
Manchester, England	6
Sheffield, England	5
São Paulo, São Paulo	4

Language	Your Fans
English (US)	153
English (UK)	132
Italian	30
Spanish	22
Portuguese (Brazil)	12
Spanish (Spain)	9

Although only a few women submit observations to the section or attend VSS meetings, a quarter of our followers are female. More than 70% of our followers are based outside the UK.

If you haven't seen our Facebook page yet, you can find it at :
https://www.facebook.com/BAAVSS

tonymarkham832@btinternet.com

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RECENT MEASUREMENTS OF HR DEL - FORMERLY NOVA DEL 1967

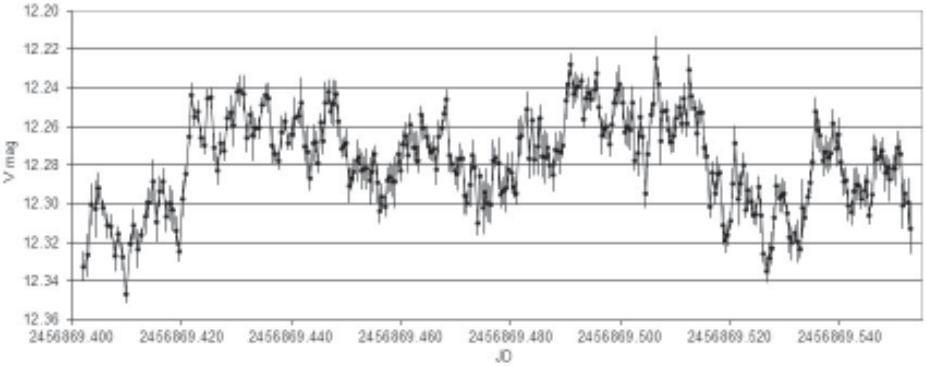
DAVID BOYD

This short article is the result of an unexpected triple coincidence. On July 12th I gave a talk at the BAA Summer Meeting at University College London about the variable star observations of Sir Patrick Moore. The star he observed most over the years, and therefore one of the stars which I highlighted in my talk, was the nova discovered in Delphinus in 1967 by George Alcock and subsequently given the name HR Del. Shortly afterwards Prof Joe Patterson, who coordinates observations by the global network of amateurs known as the Center for Backyard Astrophysics (CBA), proposed an observing campaign on a number of old novae including HR Del. And finally, we had an unusually long run of clear nights during late July which enabled me to obtain time-series V-band photometry of HR Del on 9 nights between July 21st and 31st.

Joe's interest was to see if there was any evidence in the light curve of periods other than the orbital period of 0.214165d found spectroscopically by Kuerster & Barwig (1988) and later confirmed photometrically by Friedjung et al. (2010).

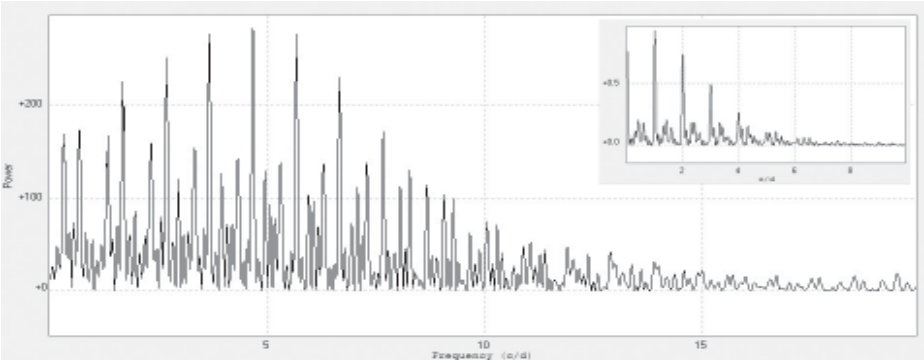
Figure 1 shows a typical light curve from July 30th. The star displays continuous, apparently random, flickering with average total amplitude about 0.04 mag. This indicates the

Figure 1: V-band light curve of HR Del on July 30th.



likely presence of an accretion disc in this white dwarf plus donor star binary system. As the inclination of the binary orbit is reported to be around 42 degrees there are no eclipses. A period analysis of all my data using the Lomb-Scargle method in Peranso gives the power spectrum shown in Figure 2.

Figure 2: Power spectrum of HR Del and spectral window function.



According to Peranso the strongest signal is at a period of 0.2142±0.0012d, consistent with the published orbital period. Inset into Figure 2 is the spectral window function of the data showing that strong alias signals with frequency differences of 1c/d are to be expected since the data were recorded at one day intervals.

Figure 3: Phase diagram of HR Del for the orbital period of 0.2142d.

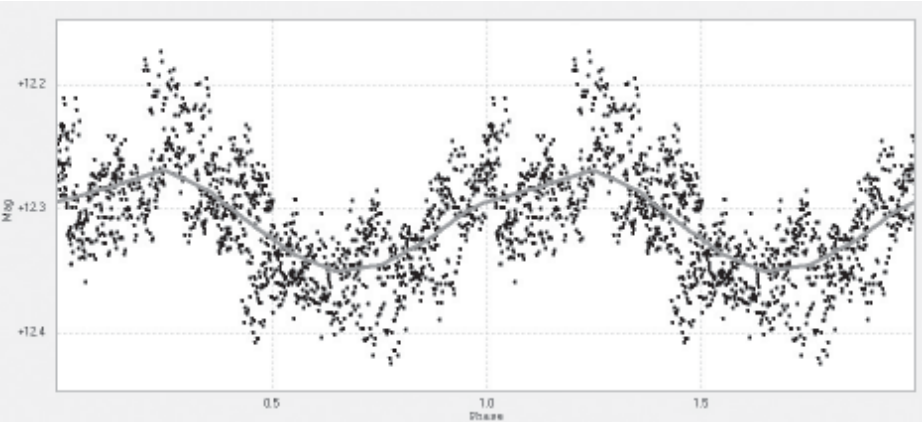


Figure 3 shows the phase diagram of the data folded on this period with the orbital modulation of about 0.08 mag clearly visible under the scatter due to flickering. Removing this period does not reveal any other periods of significance within this relatively small amount of data.

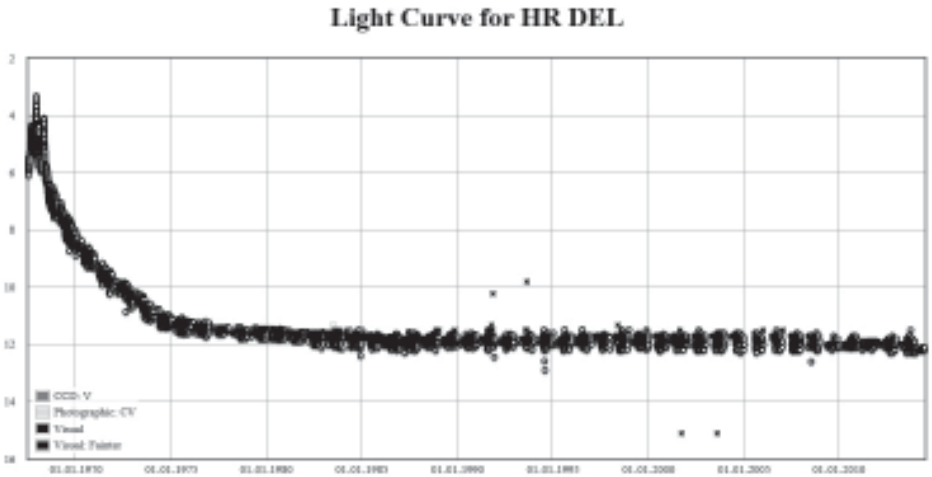


Figure 4: Long term light curve of HR Del from the BAAVSS database.

In due course my data will be combined with that of other CBA observers at different longitudes to provide a more comprehensive analysis.

The long term light curve of HR Del from the BAAVSS database shown in Figure 4 is unusual in that little change has occurred in its magnitude over the last 30 years. When preparing my talk I recorded a spectrum of HR Del, Figure 5, which shows that it is still a

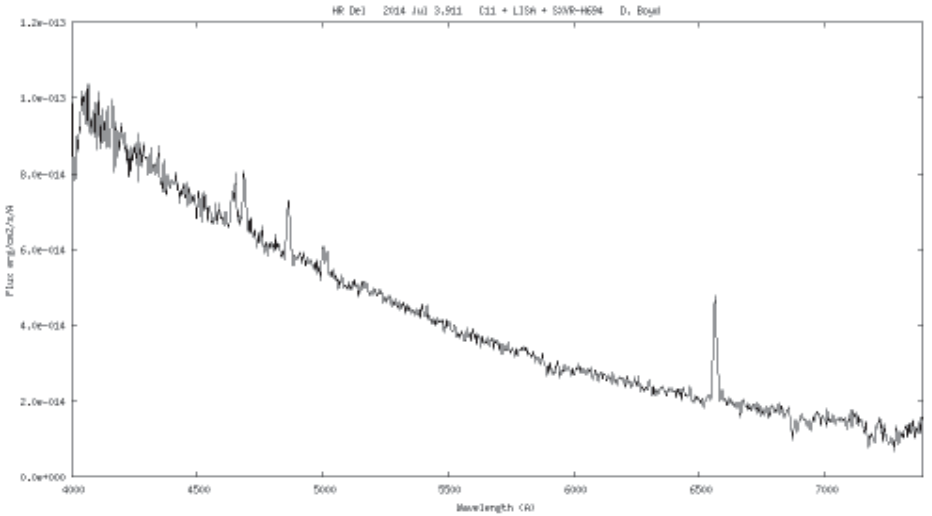


Figure 5: Spectrum of HR Del taken on July 3rd.

very hot object, probably because thermonuclear burning of hydrogen continues at a low level on the surface of the white dwarf and maintains its magnitude. The flux level in my spectrum is very similar to that of a spectrum obtained at the INT (Isaac Newton Telescope) 6 years ago as reported in Friedjung et al. They speculate that the orbital modulation is due to irradiation of one face of the donor star by the hot white dwarf and its accretion disc.

The fortunate set of circumstances which fell in place during July and led to my observing this star shows that even small contributions from a single observer can provide useful information.

References

Kuerster M. & Barwig H., Astronomy & Astrophysics, **199**, 201 (1988)
Friedjung M. et al., Astronomy & Astrophysics, **521**, A84 (2010)
Peranso, *http://www.peranso.com/*

davidboyd@orion.me.uk

* * *

CHI CYGNI – THE FAINTEST MAXIMUM

JOHN TOONE

The maximum of chi Cyg in the summer of 2014 at around 6.5mv as reported by BAA VSS visual observers was the faintest that anyone could recall. The light curve generated from the web-page illustrates the form of the extraordinary flat and faint maximum. To calculate the actual maximum brightness I took the mean value of the brightest class one light estimates of five systematic and experienced (combined career total of 600,000 visual observations) observers reduced to the latest BAA VSS sequence 045.02:

Comparison Stars (sequence 045.02, shown inside front cover of this Issue)

Comp Star	Comp Star ID	Magnitude	Source
C	SAO68835	6.2	Tycho 2 Vj
D	SAO68895	6.4	Hipparcos Vj
E	SAO69052	6.7	Tycho 2 Vj
F	SAO69040	7.0	Tycho 2 Vj

It should be noted that comparison star D (V1765 Cyg) was dropped for sequence 045.02 but the magnitude from sequence 045.01 has been retained for this analysis which is equivalent to the mean Hipparcos Vj value.

2014 Maximum

Observer	Date	Light Estimate	Magnitude mv
J Toone	29/06/2014	C(4)V(1)E	6.6
J Shanklin	30/06/2014	C(2)V(1)E	6.5
M D Taylor	01/07/2014	C(4)V(1)E	6.6
T Markham	01/07/2014	C-2, D-1	6.5
G Poyner	06/07/2014	C(3)V(2)E	6.5

The mean value for the 2014 maximum that occurred around the 1st July was 6.54mv.

Following a prompt from Tony Markham I searched the BAA VSS database, and earlier contemporary documentation, in an attempt to establish if the maximum seen in 2014 was a record in terms of faintness.

The BAA VSS database is the only major database that is immune from the effects of sequence amendment, so it is ideal for undertaking long term analysis of the maxima and minima levels of Mira stars. In the case of chi Cyg the BAA VSS database provides a continuous and uniformly calibrated record of all maxima since 1900. The faintest maximum recorded by the BAA VSS database was in 1930 so I undertook the same calculation using the brightest class one light estimates recorded by the then five most experienced (combined career total of 350,000 visual observations) observers:

1930 Maximum

Observer	Date	Light Estimate	Magnitude mv
W M Lindley	14/08/1930	=D	6.4
A N Brown	16/08/1930	F+2	6.8
A A Nijland	17/08/1930	D+1, =D	6.4
C F Butterworth	21/08/1930	C(1)V(1)D	6.3
F DeRoy	22/08/1930	C-2, D+1	6.4

The mean value for the 1930 maximum that occurred around the 18th August was 6.46mv.

Therefore the 2014 maximum was marginally the faintest recorded for the period 1900-2014.

For checking maxima pre-1900 I consulted two primary sources:

1909 AnHar, 55, 95; Cannon; Maxima & Minima of Variable Stars of Long Period.
1998 JAD, 4, 7S; Sterken & Broens; Long Term Visual Magnitude Estimates of the Mira Variable chi Cygni I 1686-1900.

The search found four candidates seemingly at approximately magnitude 6.5 and roughly similar to that of 2014. [Continued on page 20]

These are: 1719 January, observed by Christfried Kirch
1735 September, observed by Kirch
1859 February, observed by Heis & Auwers
1861 May, observed by Heis

These maxima occurred before the standard magnitude scale proposed by Pogson was universally adopted. Therefore the light estimates were recorded as grades that the individual observers assigned. Argelander (1856AN, 44, 202) assigned a grade of 12 to the 1719 & 1735 maxima observed by Kirch. Auwers assigned a grade of 10.11 to the 1859 maximum (1860AN, 52, 229). Heis assigned a grade of 10.4 for the 1859 maximum (1860AN, 53, 263) and a grade of 10.0 for the 1861 maximum (1861AN, 56, 69). Therefore Heis rated the 1861 maximum as slightly fainter than the 1859 maximum.

Rosenberg (Abh der Kaiserl. Leop-Carol. Deutschen Akademie der Naturforscher. Band LXXXV, Nr 2) calculated the maximum of 1735 to be equivalent to magnitude 6.5, whereas Hagen (Beobachtungen Veranderlicher Sterne von Eduard Heis und von Adalbert Krueger) calculated the 1861 maximum to be equivalent to magnitude 6.8.

Unfortunately in the short time I have had available to prepare this paper I have not been able to identify the comparison stars used by both Kirch, Auwers and Heis so cannot derive equivalent modern magnitudes from their grade measurements and check the calculations of Rosenberg and Hagen. Therefore it has not been possible to make a direct comparison of the maxima in the 18th & 19th Centuries with those of 1930 and 2014. It should be noted that the maxima of 1719, 1735 & 1861 were not confirmed because they were observed by a single observer. The maximum of 1859 was covered by two observers but Heis considered this maximum to be brighter than that of 1861. In all cases where only one or two observers are involved there is a risk that their individual colour responses (in conjunction with the colour of the comparison stars selected) may have distorted the grade measurements. This risk reduces considerably when data is pooled from four or five observers utilising a common comparison star sequence.

In conclusion it would appear that the 2014 maxima of chi Cyg was certainly the faintest since the 19th Century and the faintest of all time that can be fully corroborated. Finally, this exercise has further vindicated the BAA VSS policy of recording the full light estimate within the database; but more significantly, has provided a good reason for the visual observers to continue their useful photometric work on bright variable stars such as chi Cyg.

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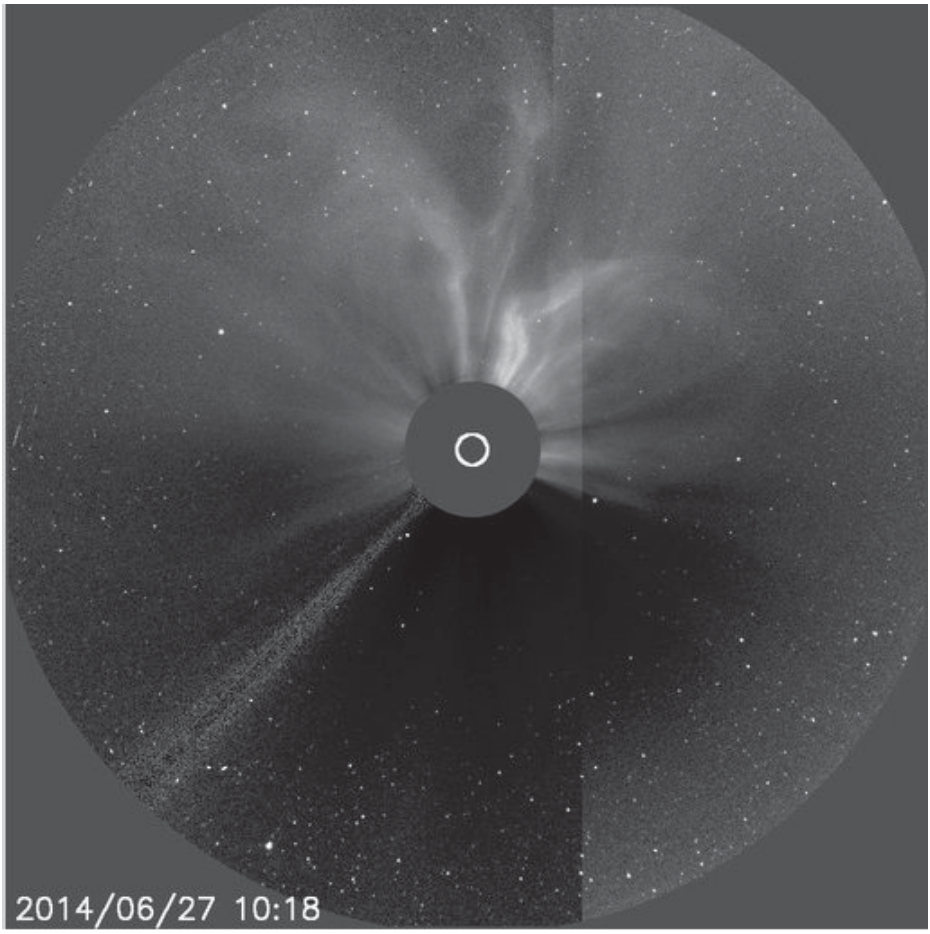
OBSERVING ECLIPTIC VARIABLES NEAR CONJUNCTION

Tony Markham

It would seem reasonable to believe that variable stars that lie close to the ecliptic are unobservable when close to conjunction with the Sun.

However, this is not strictly the case. There are satellites that observe solar activity by blocking out the bright disk of the Sun. The images thus obtained can show background

Image provided by the LASCO instrument of the SOHO spacecraft, from late June, just after the Sun entered Gemini.



stars close to the Sun.

One such example is that provided by the LASCO instrument of the SOHO spacecraft. The accompanying image is from late June, just after the Sun entered Gemini. The bright star to the lower right of the Sun is Eta Gem. Just to the right of Eta Gem can be seen the semi regular variables BU Gem and TV Gem. Further to the right, beyond the bright star 1 Gem, can be seen the semi regular variable BQ Orionis. Just to the left of a small trapezium of stars near the "4 o clock" edge of the image, the Mira type variable U Orionis can be seen.

The colour sensitivity in this image differs somewhat from that of the human eye. The variables appear somewhat brighter than would be expected visually, reflecting the red sensitivity of the instrument. Hence making useful brightness estimates of these vari-

ables would be difficult.

Other variables to which the Sun passes close in the course of a year include X Cnc, R Leo and SS Vir. You can, of course, also use these images to monitor solar activity and to see planets and star clusters (such as M44 and M45) pass through conjunction with the Sun.

Unfortunately, despite U Gem being close enough to the ecliptic to fall within the field of view, the sensitivity of the instrument is unlikely to be sufficient to pick up an outburst of this star. The availability of the images does however raise the possibility of spotting a bright nova that might appear when close to conjunction with the Sun.

The latest image (updated several times per day) can be found at:
http://sohowww.nascom.nasa.gov/data/realtime/c3/512/

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GAPS IN HISTORICAL LIGHT CURVES

TONY MARKHAM

Courtesy of the database software (see *http://britastro.org/vssdb/*) written by Andy Wilson, it is now straightforward to extract observations from the BAA VSS database and to plot historical light curves for variable stars.

This has revealed, however, that there are unexpected gaps in some of the light curves. The gaps do not seem to be random. Rather, all observations for certain whole calendar years are not present for some stars. We have good reason to believe that observations were submitted for the years involved, but it appears that the data later went astray.

How you can help

Obviously it would be wonderful if we could fill in these gaps.

Please have a look through the reports which highlight the gaps in the binocular and telescopic programmes and contact the Director if you believe that you have observations that will fill in some of the gaps.

Binocular Programme gaps

Many people would like to forget some aspects of the 1970s and 1980s. We need to make sure, however, that this does not include the loss of variable star observations.

The light curves which follow* highlight those Binocular Programme stars whose light curves contain gaps lasting for a year or more. In some cases there is also absence of observations from their early years on the programme. Indeed, some stars (including RV Mon, SX Mon, SW Vir and BK Vir) seem to be missing all data from their first 15-20 years. All of the binocular programme stars investigated (apart from a few such as W Cyg and R Sct which had been part of the main programme for several decades already) were

added to the programme within a few years of 1971 and so their light curves should extend back to this period.

As can be seen, many stars have data missing from the late 1970s. There are also many stars with gaps for much of the 1980s (although 1982 often fares much better). Some stars also have gaps of a year or more in the early 1990s. The view of the 1980s and early 1990s is, however, slightly masked in these light curves because Tony Markham has recently resubmitted his observations for these years for many of these stars (particularly those in Cas, Cep, CrB, Cyg, Gem, Her). These years would otherwise have been blank.

Note that despite extensive gaps, R Sct has not been included here as there is still a large amount of data for it awaiting upload.

We know that data was received for the missing years because annual totals were often published for stars on the binocular programme (e.g. VSSC 27 contains totals for 1975, VSSC 65 contains totals for 1986). It is interesting to note however that the website light curves created by Dave McAdam in the late 1990s do not cover years for which there are database gaps, which could suggest that the data was already missing by then (alternatively, it could simply be that the data was to hand but was still awaiting input).

Note that these light curves do not include stars (NSVs, etc) that have been dropped from the binocular programme over the years. However, many of these also show gaps in light curves during the years that they were on the programme.

Telescopic Programme gaps

The Telescopic programme has had a long history and the paper report forms for some variables have had to survive two world wars! In general, the light curve gaps occur during the earlier decades, and coverage after the mid 1970s looks to be rather good - we do not see the later gaps that occur for Binocular programme stars.

The light curves which follow* highlight Telescopic Programme stars whose light curves contain gaps lasting for a year or more.

It is possible that in some cases that a star was dropped from the programme and then later reinstated. This may explain the gaps for R And and for W CrB. However, VSSC 16 (1973 Sep) and VSSC 20 (1974 Sep) do include annual totals for 1972 and 1973 for W CrB, but the data in its light curve only resumes from 1974 onwards.

Some gaps are understandable – several, but not all, stars have gaps during the years of the Second World War.

There are also notable spells of many years when data for some stars was sparse. This could either indicate that data has been lost or simply that the section was less active and/or the stars involved were less popular at the time.

Once again, the website light curves created by Dave McAdam in the late 1990s do not cover years for which there are database gaps - they often start just after the end of the last gap - which could suggest that the data was already missing by then (alternatively, it could simply be that the data was to hand, but was still awaiting input).

Many of the stars currently on the Telescopic programme are relatively recent additions. It has been assumed therefore that the start of their light curves most likely coincides with when they were added to the programme. Examples include SU Tau (1964), XX Cam (1971), CH UMa (1972), X Leo (1981), FG Sge (1984), AX Per (1988), V Sge (1989), Z UMi (1995). However, some members may well have observations available from earlier years when these stars were not officially part of the programme. Such observations would be useful additions to the database.

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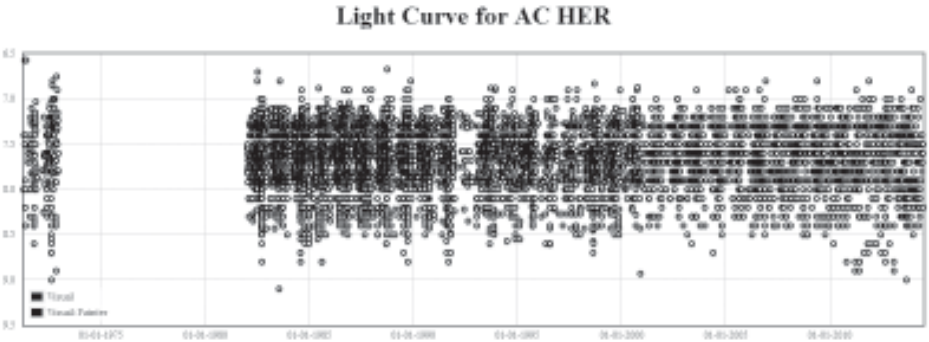
*** Editor's Note:** It has not been possible to include all the light curves in this Edition of the Circular. However any of the light curves, including those displayed below and on the following pages, can be viewed at < *http://britastro.org/vssdb/* >by entering the star designation. The relevant stars are as follows:-

Binocular Programme: RX And, UV Cam, X Cnc, SS Cyg, V973 Cyg, BN Gem, TU Gem, AC Her, ST Her, R Lyr, XY Lyr, TT Tau, Y Tau, ST UMa, VW Uma.

Telescopic Programme: R And, V Boo, V Cam, X Cam, Z Cam, T Cas, R CrB, S CrB, W CrB, U Gem, S Per, SU UMa, T UMa.

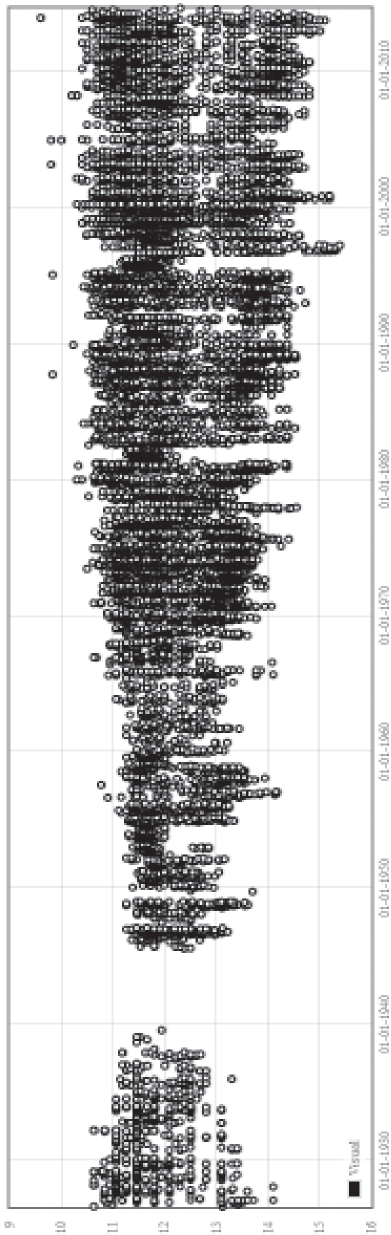
With the exception of AC Her (shown below), the curves included are displayed in the order listed above.



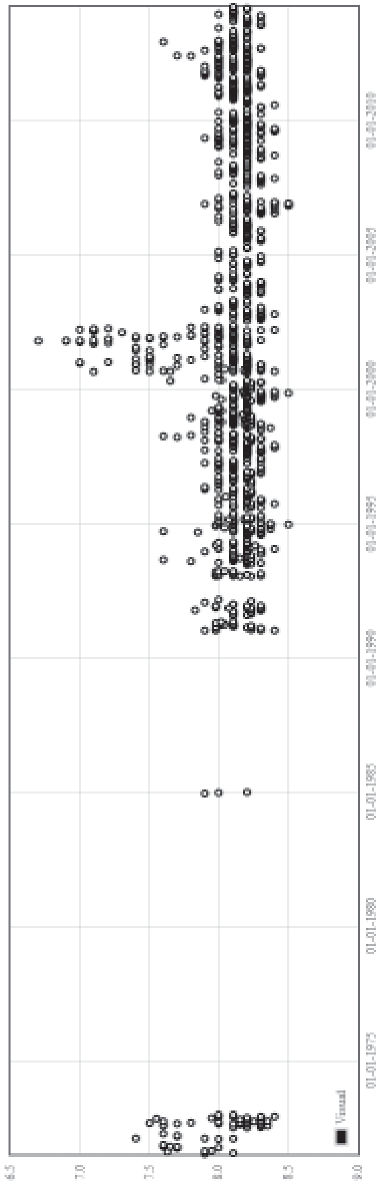
AC Her is one of the stars whose historical light curve on the BAAVSS database exhibits gaps in the data.

Gaps in Historical Light Curves Examples

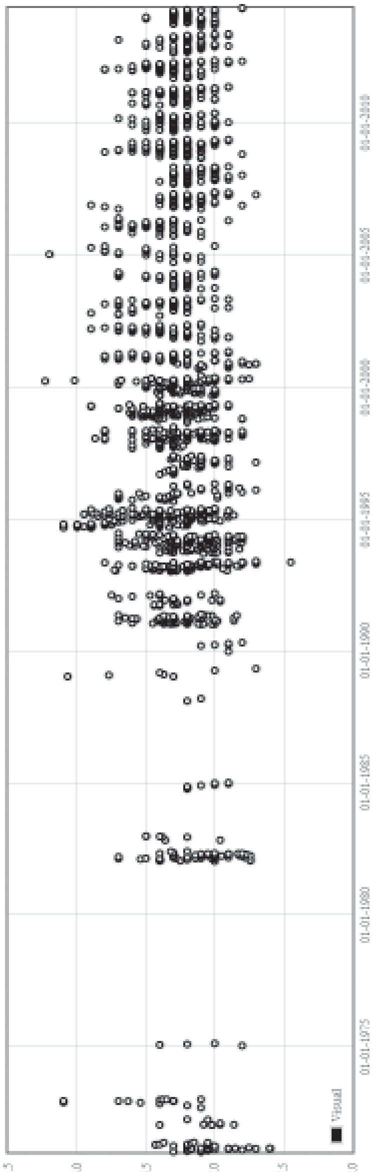
Light Curve for RX AND



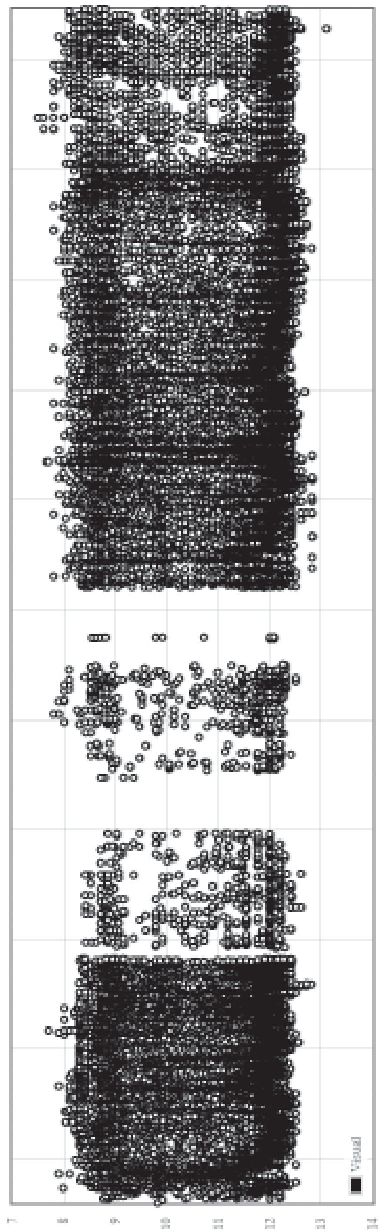
Light Curve for UV CAM



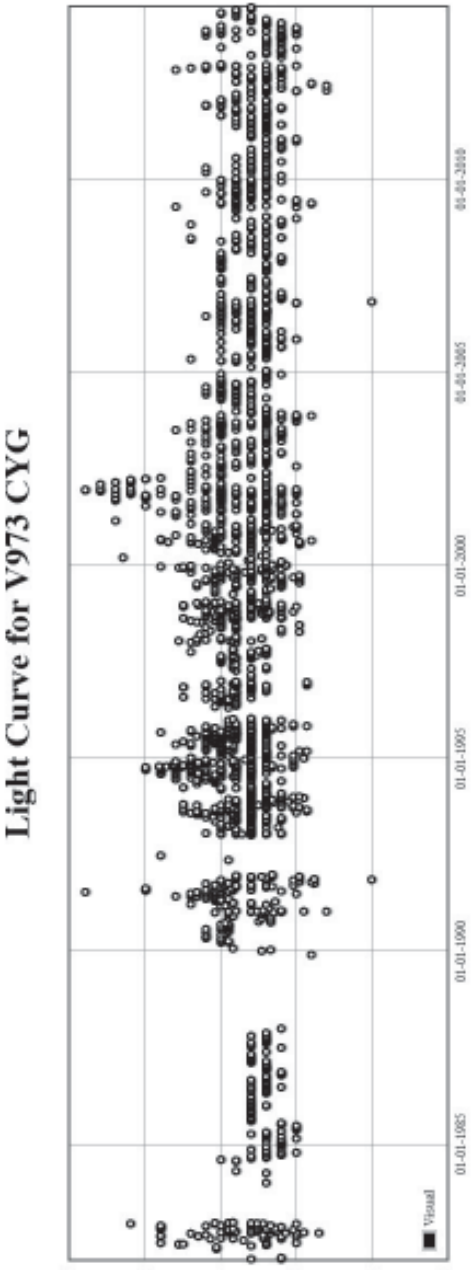
Gaps in Historical Light Curves Examples

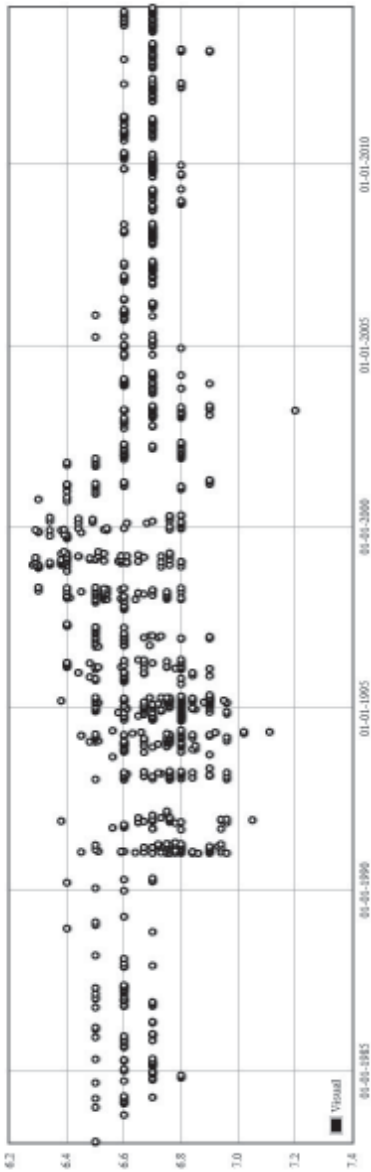


Light Curve for X CNC

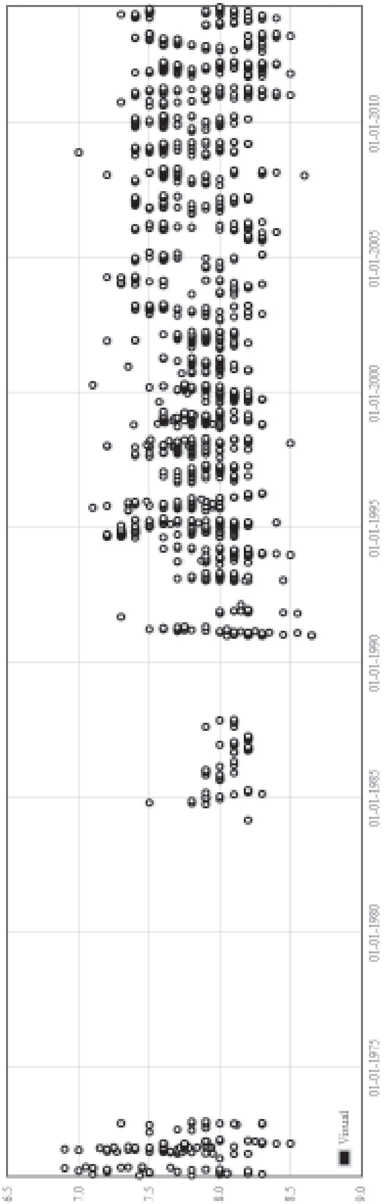


Light Curve for SS CYG

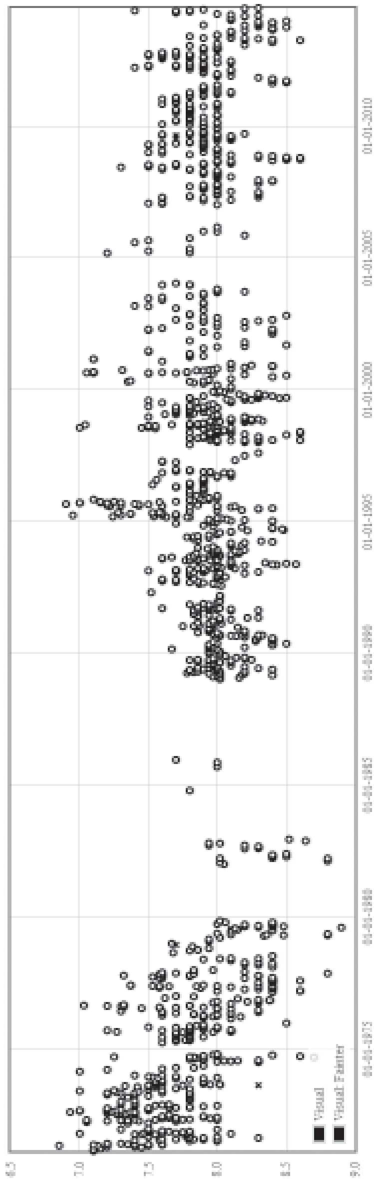

Light Curve for V973 CYG
5.5
6.0
6.5
7.0
7.5
8.0
01-01-1985
01-01-1990
01-01-1995
01-01-2000
01-01-2005
01-01-2010
Visual


Light Curve for BN GEM
6.2
6.4
6.6
6.8
7.0
7.2
7.4
01-01-1985
01-01-1990
01-01-1995
01-01-2000
01-01-2005
01-01-2010
Visual

Gaps in Historical Light Curves Examples



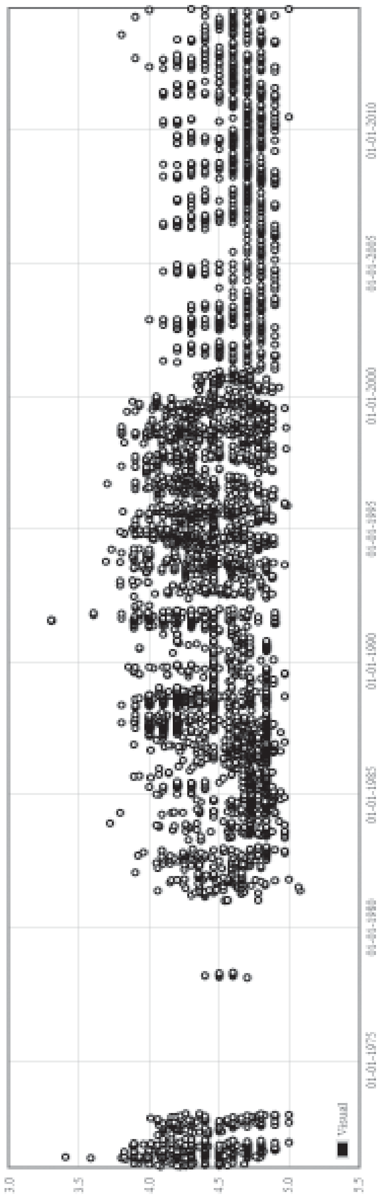
Light Curve for TU GEM



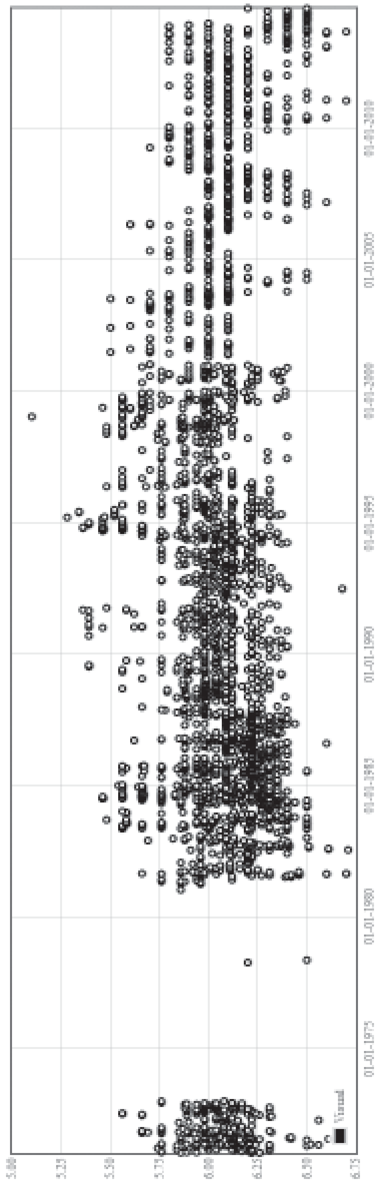
Light Curve for ST HER

Gaps in Historical Light Curves Examples

Light Curve for R LYR

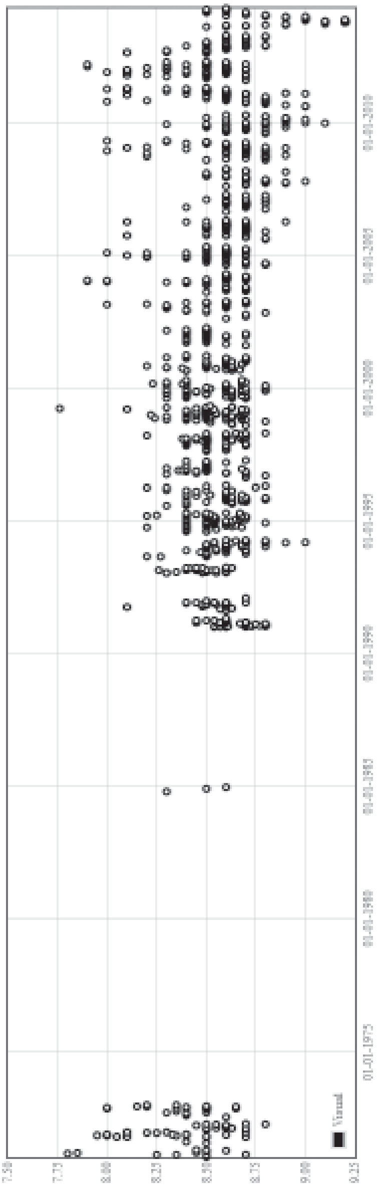


Light Curve for XY LYR

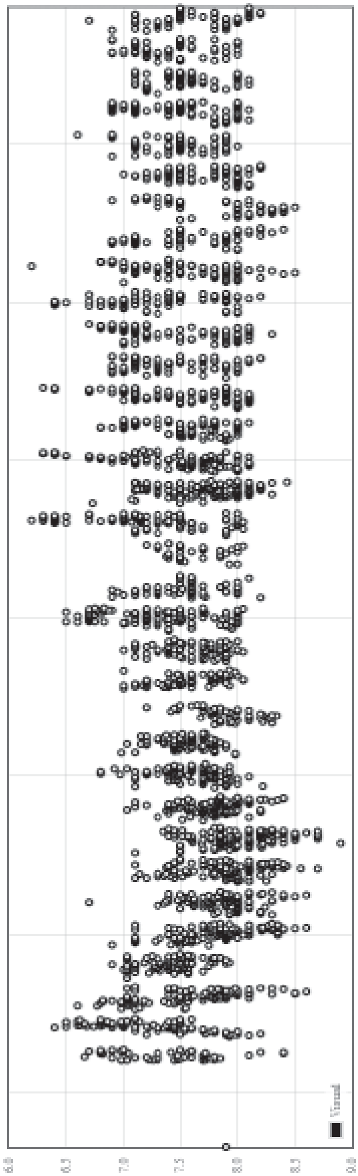


Gaps in Historical Light Curves
Examples

Light Curve for TT TAU

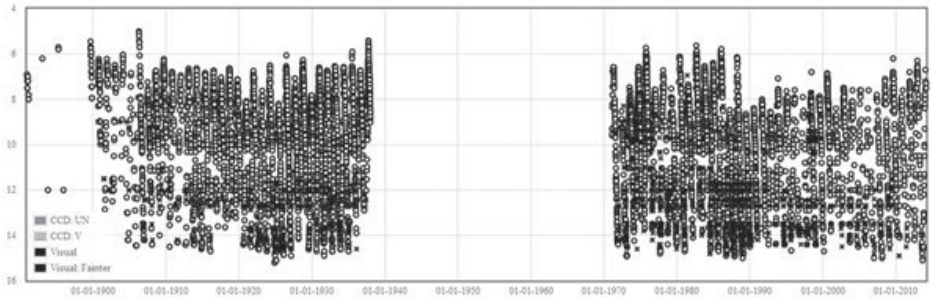


Light Curve for Y TAU

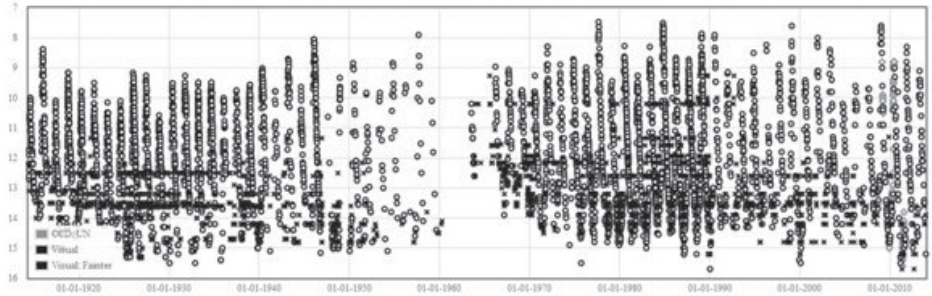


Gaps in Historical Light Curves - Examples

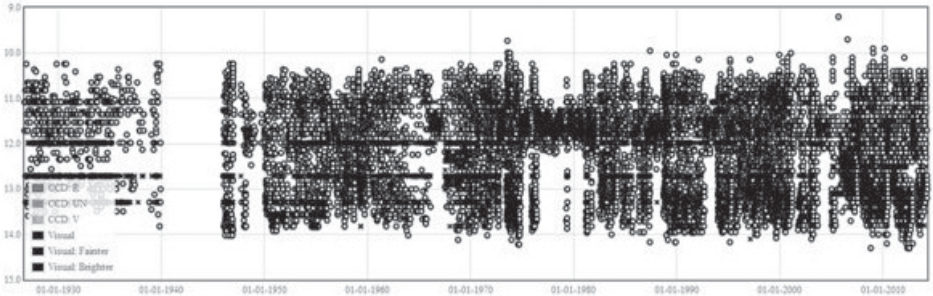
Light Curve for R AND



Light Curve for V CAM

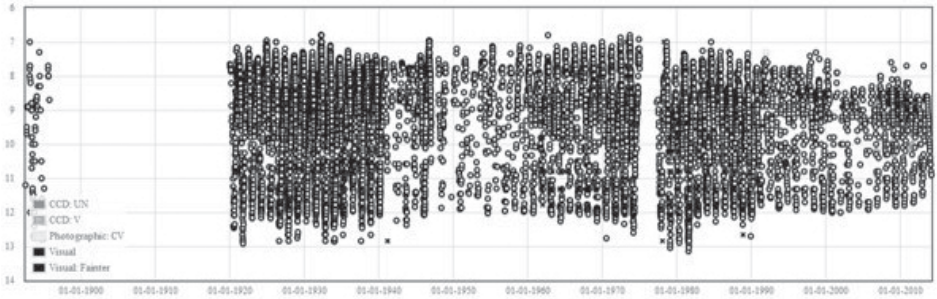


Light Curve for Z CAM

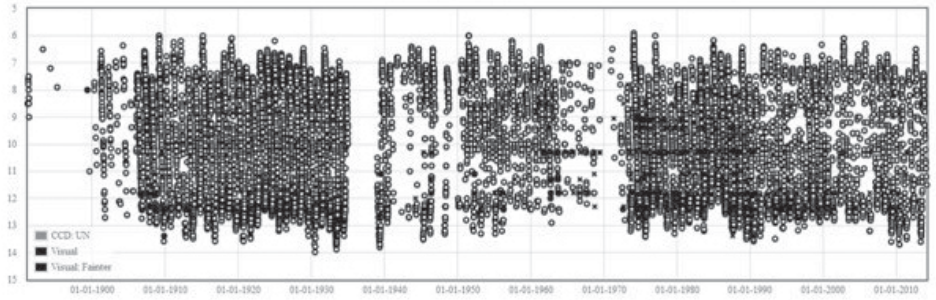


Gaps in Historical Light Curves - Examples

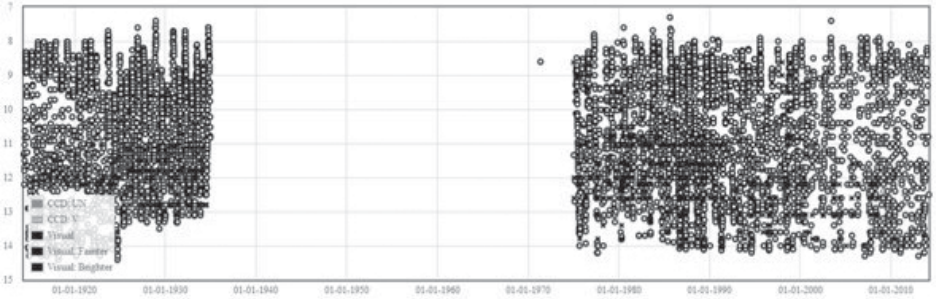
Light Curve for T CAS

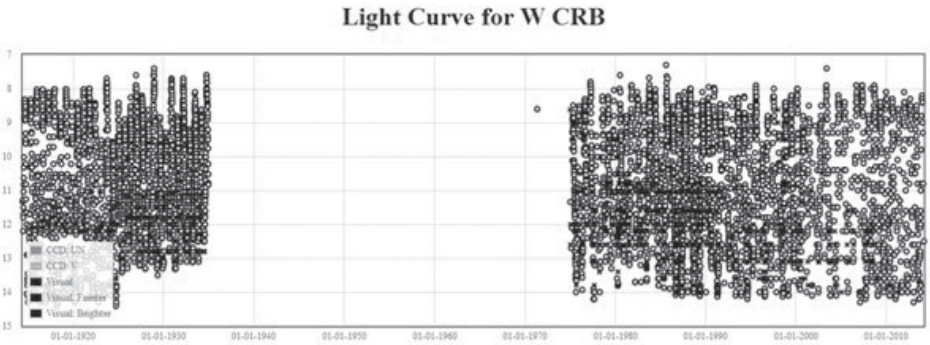


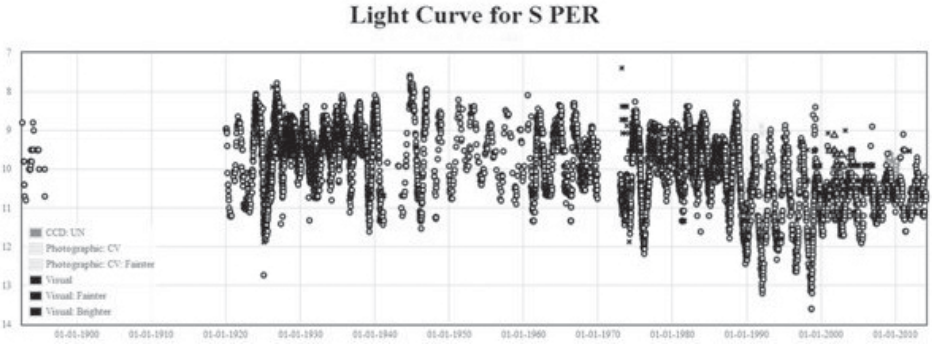
Light Curve for S CRB



Light Curve for W CRB







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BINOCULAR PROGRAMME

MELVYN TAYLOR

The various Priority levels of the Binocular Programme can now be found on the VSS web site at: *http://www.britastro.org/vss/bin_prog_priority_191013.htm* or for a full listing in constellation order at:

http://www.britastro.org/vss/chartcat_binoc.htm

In addition, these listings can be obtained in paper format from both Melvyn Taylor and Roger Pickard < *roger.pickard@sky.com* >, and of course they can be viewed in Circulars 157 - 160.

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ECLIPSING BINARY PREDICTIONS – WHERE TO FIND THEM

DES LOUGHNEY

The publication of Eclipsing Binary Predictions is now discontinued in the VSS Circular. Predictions for RZ Cas, Beta Per and Lambda Tau can still be found in the BAA Handbook. Predictions, completed on a monthly basis, are available on the BAA VSS website at:

http://www.britastro.org/vss/dpredict.html

If readers require paper copies of the predictions please contact me.

The best source for predictions for Eclipsing Binaries is the Mt. Suhora Astronomical Observatory, Cracow Pedagogical University website (known as the Krakow website)at:

http://www.as.up.krakow.pl/o-c/index.php3

Click on 'Constellation List', choose your constellation and then choose your system.

A webpage will then appear with lots of useful information regarding the system. In the section entitled 'Light Elements' there is a link entitled 'current minima and phase'. When you click on this link, in the example of Beta Lyrae, you get predictions of primary and secondary eclipses for a period of three months. For systems with very short periods such as RZ Cas the predictions are for one week. For a system such as SW Cyg, with a period of around 4.57 days, the predictions are for a month.

The Krakow website does not tell you how much of an eclipse will be observable at a particular time of the year at your latitude and longitude. However, it has some useful literature references for each system, although they may not necessarily be up to date. Nor are references to the 'Information Bulletin on Variable Stars' included, but these can be found at:

http://www.konkoly.hu/IBVS/IBVS.html

Although the Krakow website lists the depth of eclipses it does not list the actual V magnitudes at maximum and minimum. For an indication of these magnitudes you will need to visit the 'General Catalogue of Variable Stars' website at:

http://www.sai.msu.su/groups/cluster/gcvs/gcvs/

Click on 'GCVS Query Form', type in a designation such as SW Cyg, and click on 'Search'. The resulting information displayed shows that maximum is 9.24V, primary minimum 11.83V, and secondary minimum 9.30V. These magnitudes, however, may have been determined some time ago.

The GCVS website gives SW Cyg a period of 4.57313411 days but the Krakow website lists the period of SW Cyg as 4.572986 days. The latter is more likely to list the most up to date period. It must always be borne in mind that small changes in a period can result in significant changes in the times of minima if the period was determined a few years ago.

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* ***** *

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CCD Guide	BAA Office	£7.50
Binocular Booklet	Director or BAA Office	£2.50
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CONTRIBUTING TO THE CIRCULAR

If you would like to prepare an article for consideration for publication in a Variable Star Section Circular, please read the *Notes for Authors*, published on the web pages at:
http://www.britastro.org/vss/circs.htm; reproduced in full in VSSC132 p 22, or contact the editor (details on back cover) for a pdf copy of the guidelines.

If you are unsure if the material is of a suitable level or content, then please contact the editor for advice.

The **deadline for contributions** to the next issue of VSSC (number 162) will be 7th November 2014. All articles should be sent to the editor (details are given on the back of this issue).

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