British Astronomical Association

Variable Star Section Circular

No 83, March 1995

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ISSN 0267-9272

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A word from the new Director.

I was extremely surprised when Tristram telephoned me with the news that he was retiring as VSS Director at the end of January. Imagine then how I felt when he asked me to take over the job! I didn't know what to say, except that I needed time to think it over. I must admit that my initial response was to say no, but after giving it serious thought, I realised that it would prove an interesting challenge and that if I did say no, I would probably regret my decision. When I look back through the long list of distinguished names who have done the job in the past, I realise what an important job it is. I only hope that I can live up to it.

Thankfully, Tristram has agreed to continue with the eclipsing variables and the circulars, for which he has done a wonderful job over the past couple of years. The rest of the team haven't mutinied (yet), so there will be no change there. Also I will continue to co-ordinate the Recurrent Objects Programme for Guy, a role which I enjoy immensely.

I have one or two idea's concerning changes to the programme, including the formation of a separate programme dealing specifically with Mike Collin's discoveries. There will also be additions to the telescopic programme, including the exciting eclipsing dwarf nova IP Peg (see Bill Worraker's article elsewhere in this circular), and the binocular programme will be looked at very closely. Full details on these and other idea's will have to wait until the next circular however. We are planning a meeting of VSS officers for late April, where section matters will hopefully be discussed in depth. Any changes made will be described in the June circular (hopefully), and will be implemented gradually.

As some of you will know, I am first and foremost an observer of variable stars. I must admit that over the past few years I have concentrated on CV's (particularly faint dwarf novae), and ignored red stars (although I still observe about fifteen Mira's). This does not mean that any changes to the programme will be orientated to my personal tastes i.e. faint eruptive stars. I would welcome comments and suggestions as to the way you would like the section to progress in the future, including adding and removing stars from the programme.

Some observers will have received a letter from me a few weeks ago, requesting telephone alerts for several dwarf novae which were on a target list for Dr Bill Welsh, Keele University. The stars in question are...

SY Cnc, CN Ori, U Gem, KT Per, HT Cas, Z Cam, AH Her

Dr Welsh had three nights (Feb. 17-19) on the WHT, hoping to gather data on dwarf novae oscillations (small amplitude, periodic

oscillations seen when DNe are in outburst). The initial request was made through VSNET, the Japanese BBS. I thought that this would be a good opportunity to involve VSS observers in an important pro-am project, so I made contact with those observers who had reported observations on these stars during 1994, requesting notification of outburst activity. Unfortunately the stars in question didn't conform, and no outbursts were reported. AH Her was at standstill, Z Cam had just returned to minima, as had SY Cnc. U Gem, CN Ori & KT Per were all observed at minima, whilst HT Cas (which was a slightly optimistic choice) hadn't been seen in outburst since January 1985! And to rub salt in the wounds so to speak, I observed SY Cnc in outburst last night (Feb 21st), two nights after the observing run had ended!

This sort of request, made through various bulletin boards around the world, are becoming more commonplace. Indeed, as I write these words I am about to send out more letters concerning the ASTRO-2 mission, hopefully to be launched by Endeavour on March 2nd. This too is a request for notification of dwarf novae outbursts during the 14 day mission. I will continue to offer the services of the VSS for projects of this nature, and will make contact with any observer who we know (and by we, I mean Melvyn) is currently active in making observations of the target stars.

I have discovered in talks with various people over the years that many interesting stars are not being observed by VSS observers simply because they are not 'official' programme stars, so I would like to encourage observers to be more diverse in their selection of objects which they observe. It is clear from the above list of 'target stars', that two of the objects are not on the VSS main programme, but this does not mean that they should not be observed. Charts for hundreds of interesting variables are available from various sources such as 'The Astronomer' and the The 'TA' chart catalogue is a very valuable source of AAVSO. information, and is to be highly recommended. The VSS will welcome observations of ANY variable star, not just those listed as programme stars (I have been doing this for years, and haven't had my knuckles wrapped by the secretary yet, so it must be OK). It is however important that Melvyn and Dave McAdam are fully aware of the sequence being used, and if the star is very obscure you may be requested for a photocopy of the chart and sequence.

Much of our efforts will continue towards the computerisation of VSS observations. This has to be the most important project that the section has committed itself to for many years, and it will continue to receive the fullest support from the present Director, as has been the case in the past with John & Tristram.

With the ever growing number of people who use personal computers at home, it should be emphasised that if you can report your observations directly to Dave McAdam on diskette, then please do! Dave will be only too happy to discuss ways of reporting observations in this way. Please remember though that Melvyn will still require details of what stars you have observed, totals etc. A half yearly or yearly written report submitted to Melvyn is a good idea, and will I am sure be much appreciated.

<u>VSS Computerisation - Progress in 1994</u> Dave McAdam

During 1994 the number of observations in the VSS Computer Database was increased by 185,848 - comparable to the previous two years - thanks to the work of the following twenty contributors:

H Joy	68836		C	H Pepper	966	
D McAdam	55009		J	Moran	918	
M J Carson-Rowland	14060		λ	Chew	779	
G Poyner	10905	(1)	G	M Hurst	689	(1)
Nicola + Emma Britton	9383	(2)	N	L McAdam	496	
Bill Bingham	6422		J	Lancashire	395	
D M Swain	6238	(3)	G	Ramsey	87	(1)
D Lloyd	5364	(2)	S	G Ridley	85	(1)
P Barnard	2835		J	D Shanklin	60	(1)
D Gill	2321					

Notes:

- (1) The total consists of the observer's own observations.
- (2) Part of the total consists of the observer's own observations.
- (3) The contribution by D M Swain was due to the addition of further BSS files for 1971-72 which he provided in 1993.

Guy Hurst now reports monthly by E-mail - his and Gary Poyner's results (mentioned in the last circular) are logged within a few days of the end of the month of observation.

At December 31st the grand total stood at 546,761 with more than 70 variables practically up to date. A number of sets of observations were requested and supplied during the year. Major batches went to M Fiorucci, Italy (nearly 1100); I Andronov, Ukraine (6300+) (these two sent on by Guy Hurst}; H Bengtsson, Sweden (8000); E O Ofek, Israel (19800 in two lots); K Holland, Leicester (19400); F M Bateson, RASNZ (9600, two lots). The voluntary and painstaking entry work provides the basis for me to deal with most requests almost by return-of-post.

New Hard Disks Donated by the Stargazers Trust

The VSS database is held on a 386 PC with a 40Mb hard disk, an standard specification at the time of purchase three years ago. Then, it was foreseen that reasonable progress on section records we would eventually require something larger than the 40Mb hard disk. The problem of lack of disk space became pressing in mid-1994. Although partial records can be kept on floppy disks, the software was designed as a whole system and works much less efficiently when files have to be constantly swapped to and from removable media.

The previous director approached Norman Walker, chairman of the Stargazers Trust, who immediately recognised our problem and discussed how the Trust might help best within financial and practical constraints. Thanks to Norman's assistance, the Trust generously donated two 540Mb hard disks, one of which was installed in place of the 40Mb in mid-December 1994 and the second was added mid-January 1995.

SPA-VSS Comparison Star Sequences

Tony Markham has provided details of the sequences now used by observers of the VSS of the Society for Popular Astronomy. These lists are being incorporated into the files alongside the BAA sequences and crossreferenced as far as possible. Some sequences are the same as the respective BAA ones, but some have small magnitude differences for particular comparisons which is why the additional details are helpful in the computer records. Observers should, of course, always reduce their observations on a single sequence rather than using comparison names and magnitudes from more than one source - such mixtures are not easy to deal with. If sequence differences are resolved and revised charts issued, existing computer records can be re-reduced accordingly.

Professional-Amateur Exchanges Report No 11 (1993 July 1 to Dec 31) By Guy Hurst

Date Subject Professional

930701 SN 1993J, BL Lac Objs Yuri Efimov, Crimea Efimov sends list of priority objects and asks for alerts of unusual activity.

930705 RY Sgr B.Marsden, CBAT, Don Pollacco, St Andrews,

Alan Gilmore, New Zealand Telemessage from C.Henshaw in Botswana reporting fade from June 18.4UT, 7.2 to June 26.6UT, 8.0 relayed to professionals.

930710 SN 1993J Brian Skiff, Lowell Observatory, USA Photometry of stars near SN 1993J for improvement of sequence.

930710 SN 1993J G.de Vaucouleurs,USA, T.Prabhu, India Observations by Prabhu in India sent to us via Vaucouleurs to fill time gaps in the light curve analysis.

930713 SN 1993J G.de Vaucouleurs, USA, Harold Corwin, USA Electronic map and sequence update provided to us.

930716 ORFEUS Mission Chris Mauche, USA We agree to monitor a selected UG star list during NASA Shuttle mission which will deploy German space platform (ORFEUS = Orbiting and Retrievable Far and Extreme Ultraviolet Spectrograph). Gary Poyner to assist GMH in collation.

930728 KU Cas Taichi Kato, Japan, B.Skiff, Lowell Obsy, USA Tony Vanmunster, Belgium reports outburst of KU Cas on 1993 July 23 at mag 12.8. Brian Skiff performs photometry on the field for a provisional sequence. Kato relays details to interested groups. Object is suspected UGSU.

930728 OJ 287 Harry J.Lehto, Finland Bjorn Granslo, Norway relays appeal from H.J.Lehto for monitoring of BL Lac object OJ 287 as part of an international campaign. Telescopes on the Canaries (including 4.2m William Herschel) are involved as well as those in Japan, Finland, Germany, Italy, Spain, USA and Mexico.

930811 ORFEUS Mission Chris Mauche, USA Chris Mauche advises us re-scheduled launch now Aug 12. Updates list of cataclysmics which are to be monitored.

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930814 OJ 287 Harry J Lehto, Finland At Dr.Lehto's request we fax a chart and sequence taken from Astron. J. 90(7), p1184 (1985). We supply details of amateur astronomers willing to help. 930814 SW UMa Brian Marsden, CBAT, Chris Mauche, USA Outburst detected by Patrick Schmeer, Germany 1993 Aug 12 mag 11.9 relayed to CBAT and to ORFEUS team. Brian Marsden, CBAT, Janet Drew, Cambridge, 930814 DX And Chris Mauche, USA Outburst detected by Tony Vanmunster, Belgium 1993 Aug 12 mag 14.0 and confirmed Poyner Aug 13.0 mag 13.2 relayed to CBAT. Also relayed to Janet Drew in view of her earlier requests for data on this star, and to ORFEUS team. 930814 Novae Zdenek Urban, Slovakia Expresses interest in receiving data on novae, nova-likes and some symbiotics. 930815 GRO J0422+32 Peter Garnavich, Dominion Obsy, Canada R.M.Wagner, USA Peter relays further outburst Aug 10 V=17.8 rising to Aug 13 15.3. Wagner advises ROSAT will monitor. 930816 SS Cygni Chris Mauche, USA Observations by Schmeer and Hurst of outburst relayed to ORFEUS team. Response received 930823 confirms star monitored Aug 17.08UT-Aug 23.63UT. Covered rise and plateau phase of outburst. 930820 IP Peg Keith Horne, USA, Paula Szkody, USA Paul van Cauteren, Belgium reports IP Peg in outburst. Relayed to Keith Horne and Paula Szkody. Keith Horne also advises moving to Sterrekundig Institut, Netherlands but wishes to continue PRO-AM exchanges. 930824 GRO J0422+32 F.Makino, Japan Results by N.James (Aug 21.021UT, 15.0pv) and G.Poyner (Aug 24.11UT, 15.2v) relayed to Makino re ASCA monitoring Aug 25/26. 930828 SS Cygni Keith Horne, USA Observing at La Palma 'tonight' and requests update on SS Cyg. We supply estimates by Schmeer (Aug 14.86, 12.0, 16.05, 10.9) and Hurst (16.91, 9.9). 930828 Latvian Academy of Sciences Andrejs Alksnis Letter received from Andrejs advising change of e-mail and updating us with news. Wishes to continue PRO-AM exchanges. 930917 Nova Sor 1993 Pam Kilmartin, New Zealand Pam supplies precise position for this nova. 930920 FG Ser Taichi Kato, Japan Apparent differences in magnitude for this star from different groups. We supply details of star F (Munari chart) V=14.72 located SW of variable by 0.5' as check on identification. 930918 RX And Chris Mauche, USA Gary Poyner finds star in outburst Sep 18.038, 11.6v. Data sent to Mauche. 930919 UY Vul Taichi Kato, Japan Taichi points out this star not dwarf nova but IRAS source and prob SR type. 930919 AGNs Damo Nair, Florida Requests AGN magnitude estimates for BL Lac, Mrk 509 and 3C 371 re their monitoring program at Univ of Florida which has operated for last 25 years. 930921 Nova in Lupus Rob McNaught, Australia Supplies to us a precise position obtained Sept 21.

930922 3C66A Leo Takalo, Finland Says that 3C66A was V=14.46 in Aug and suggests we monitor as well as OJ 287. 930924 Nova Cvg 1992 Zdenek Urban, Slovak Provides further details of requirements. We send all data to date on Nova Cyg 1992 (1,477 estimates) plus Sept TA. I. Okada, Australia 930924 Nova Lup 1993 Taichi Kato relays pre-discovery images by Okada obtained with 50mm f/2lens plus Fuji P1600 (Sept 16) 930924 OJ 287 Harry Lehto, Finland Responds to our recently faxed chart for this object. Comparison of various sequences undertaken and we agree a revised version of our chart will now be issued worldwide to project participants. 931013 Possible SN in M108 Brian Marsden, CBAT Brian requests confirmation of a possible SN report from Stewart Wilson (discoverer Comet 1961 V). Nick James photographed Oct 14.77UT but finds no new object. 931020 Nebulous object Brian Marsden, CBAT Object seen in binoculars from North Sea Oil Rig near Capella and also by various Danish ships. Copenhagen University Observatory investigating. We confirm no sightings from UK. 931102 Probable nova in M31 R. Treffers, USA Report received of probable nova 65"E, 78"N of nucleus found in Leuschner Obsy SN search Oct 30, R=16.2. Update received 931108 confirms it is a nova. 931104 V366 Lac Andrejs Alksnis, Latvia Martin Mobberley imaged this object with CCD 931018 at approx mag 18. N. James measured precise position all in response to earlier appeal from Latvia for details on this star which had faded beyond their instrumentation. 931105 OSO 0219+428 H.J.Lehto, Finland We ask for chart for this object which = 3C66A and this is faxed to us. 931107 HT Cas J.Mattei, USA, T.Kato, Japan, J.Wood, Reele AAVSO ask if our records show outburst of HT Cas 1985 onwards. We find 1985 Jan 13,11.2; 1987 Feb 10,13.0. Other events in AAVSO Circulars: 1985 Aug 10, 13.2; 1987 Nov 11,13.1; 1989 Nov 10,13.2; 1990 Jun 6, 13.8 appear unconfirmed. Kato provides schedule 931108 which also confirms 1985 Jan outburst but no others. We relay to Janet Wood, Keele. 931113 3C66A L.Takalo, Finland Poyner, Hurst, Worraker confirm outburst: 931111 mag 14.2-14.6, sent to Takalo. 931117 KV And T.Kato, Japan Kato relays news that this faint dwarf nova found in outburst by M.Iida 1993 Nov 16 at V=14.3. Kato then finds superhumps 0.27mags period 1h44m. 931118 DY Per Andrejs Alksnis, Latvia Fade detected by G.Poyner Oct 4, 11.5v; 10, 12.0v, Nov 18, 13.1v, relayed to Alksnis. 931125 Nebulous object Brian Marsden, CBAT We relay news that this object has 'again' been seen from Tyra-East, a Danish Oil Rig in the North Sea. We have not been able to provide an explanation! 931127 V630 Cas R.Honeycutt, USA Paper supplied to us that this 'recurrent' was in outburst late 1992. 6

931128 Supernovae Michael Richmond, USA Michael Richmond proposes e-mail exchange group for data on supernovae. We offer to assist in contribution of our results.

931129 3C66A L.Takalo, Finland We supply updated results 1993 Nov 14-21 confirming object remains bright near mag 14.2v.

931129 Supergiants in M33 Barry Madore, USA Indicated a recent paper by Madore might assist us with sequence work and this was sent to us.

931206 KV And Steve Howell, USA Expresses interest in recent outburst report as star may be a 'TOAD' (Tremendous Outburst Amplitude Dwarf Nova). Supplies listing of all potential 'TOADS' and requests we alert him to outbursts.

931207 LL And B.Marsden, CBAT, Paul Wild, Switzerland, Steve Howell, USA, T.Kato, Japan, Bruce Margon, USA Object reported as a 'nova' in IAUC 3412 (1979) seen again in outburst by Tony Vanmunster, Belgium 1993 Dec 7 mag 14.0v. Confirmed by Poyner. Kato obtains CCD images at Ouda on Dec 9 V=14.0. Suggests position needs correction. Howell obtains spectra and paper planed!

931211 TT Crt Paula Szkody, USA Relayed that Richard Fleet found it in outburst Dec 11 at 13.5v.

931211 OJ 287 & 3C66A L.Takalo, Japan We relay data on OJ287 showing mag 15.1-15.2 Dec 5-10 based on CCD imaging by N.Hewitt. Updated results on 3C66A also supplied. This is part of a LONG SERIES of reports sent to Takalo on these objects not repeated in this listing.

931212 Nova Cas 1993 Nye Evans, Keele Nye requested immediate alert of nova. We trace him to an hotel in Germany where he is having dinner with the IUE coordinator! We arrange for IUE to monitor. Later feedback (931222) from Nye confirms IUE, INT and UKIRT observed within 24 hours and will continue.

931212 Nova Cas 1993 Brian Skiff, USA, Dan Green, CBAT Brian supplies his analysis of Palomar Sky Survey and astrometry of possible pre-outburst candidate. Later he also supplied comparison star sequence. We supply early mag estimates to CBAT.

931215 VZ Agr, HP And Brian Skiff, USA Sequences for these dwarf novae supplied to us.

931217 CDS D.Egret, Strasbourg Announces CDS opening World Wide Web page for SIMBAD.

931220 LL And Steve Howell, USA, Taichi Kato, Japan We supply precise position. (E-Circular 799). Kato provides listing of all observer's mag estimates to date.

931229 Nova Cas 1993 Sumner, Starrfield Sumner thanks us for supplying 5-day mean light curve to novanet for circulation to professional astronomers worldwide. (E-Circular 803)

931231 SN 1993J Paul Murdin, Cambridge We supply light curves on this object to Paul Murdin at his request.

<u>New Variables Discovered by the HIPPARCOS Satellite</u> <u>Tristram Brelstaff</u>

It has been predicted that the TYCHO photometer on the HIPPARCOS satellite would reveal thousands of previously unknown variable stars. While the full data will not become generally available until 1997, a preliminary list of the more obvious ones has been published in IBVS 4118 (Makarov et al, 1994). This list is reproduced below. The 'T' magnitudes quoted are an average of the B and the V mags and so could be up to about 1 mag too faint for red stars. Ground-based observations are required to determine the type and nature of the variations. This is a golden opportunity for visual observers equipped with binoculars or small telescopes to make a valuable contribution and to show their prowess. You will have to be quick though, I expect there to be quite a bit of competition amongst amateurs all over the world to identify their types and periods.

...

In the list I have added the spectra of some the stars in square brackets. This will give you some idea of the type of variations to look for. The M-type stars are probably semiregular variables and so will require observing about once every 5 days. The A-type stars will probably be either eclipsing binaries or shortperiod pulsating stars and so should be observed at half-hour intervals. If you are going to have a go at one of the latter you will need to observe fairly intensively, taking every opportunity, so that you accumulate several dozen observations over a few weeks. It is unlikely that a few scattered observations will be of much use. You should also aim to get some observations in the early morning (as well as the evening) if possible, as these can make identifying the period much easier. If you do get a good run of observations then I would be only too pleased to help you analyse them and publish the results.

GSC/TIC Id	R.A. 2000	Dec. 2000	T(max)	T(min)	Remarks	
8468.104	0 ^h 20 ^m 20 ^e 2	-57°9'48"	9.37	10.66		
2345,1896	3 19 01.5	32 41 16	7.90	8.33	(AOV?	C
8503, 158	3 37 44.6	-55 23 47	8 67	10.13	NSV 1214	ler
7572.1544	3 44 18.7	-41 53 52	8.22	8 99	350 days period?	
3347.1499	4 48 15.4	47 16 29	9 24	9 77	(KSm)	
3738, 234	5 06 31.7	55 21 13	7 73	8.51	neriodic 90 days [CETT]	
2910.447	5 31 26.8	38 19 11	7.54	8.23	[KS]	
709 . 46	5 32 54.5	13 03 07	9.04	9.69	NSV 2106 [M3]	
3378.458	6 10 21.3	47 44 22	8.16	8.67	[Mum]	
6513,1712	6 16 01.9	-27 30 34	8 29	9.44		
7102,1296	7 05 13.9	-35 56 23	7.42	8.31	NSV 3379	
8143.1629	7 56 20.9	-49 58 55	8.38	9.69		
7132.590	8 01 32.9	-37 11 50	8.06	8.60	400 days period?	
8155.343	8 38 01.0	-46 54 16	7.89	9.35	NSV 4166	
8585,1054	9 36 14.7	-52 32 41	8.13	8.98	360 days period?	
7729.173	11 02 13.9	-41 06 51	7.14	7.55		
8212,1230	-11 04 31.4	-51 13 19	8.43	10.00	SRb type?	
5511.693	11 15 23.6	-11 35 17	7.62	7.96	periodic? (M4II]	
8653,1082	13 14 08.3	-54 41 35	8.59	9.15	17 - C	
1466.869	13 43 59.2	21 49 05	8.81	9.73	[K5]	
2549.677	14 15 58.3	34 26 15	8.91	9.53		
6199.618	15 56 40.1	-22 01 40	8.85	9.83	NSV 7344, R CrB type? [A3]	
7850,1060	15 57 59.7	-43 57 49	8.94	10.07	NSV 7357	-
353,301	15 59 05.8	0 35 45	7.51	8.2	eclipsing? [AOV]	Sar
8710.1370	16 01 36.3	-54 08 36	8.67	9.28	slowly variable	
7362.894	17 15 15.5	-30 32 14	8.77	9.38		15
8353.620	17 21 04.6	-51 07 14	9.47	10.73		
6306.417	19 30 09.6	-19 23 08	8.74	9.28		
5153.387	19 41 07.6	-03 55 10	8.38	9.05	[M4-III]	
8782.316	19 43 13.7	-56 15 36	8.25	8.65		- 1
1089.751	20 46 49.3	7 33 11	8.64	9.12	eclipsing? [F8]	Dal
7987 . 835	21 25 28.4	-41 42 07	8.26	8.98	periodic?	
7990.374	21 54 22.3	-41 15 58	8.59	9.36		
8827.195	22 57 05.8	-57 24 04	7.68	8.71		
8833.1050	23 44 19.2	-54 26 10	8.12	8.74		

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The Active Galactic Nucleus Programme Gary Poyner

The list of AGN which was published in VSSC 75 has been revised somewhat, and includes several new objects. As this is a joint VSS/DSS project, all of the AGN listed below should be considered official VSS objects and part of the telescopic programme. Two objects - 3C279 & W Com - are also included in the recurrent objects programme. Particular attention should be paid to W Com at the moment, as observations made by myself and Tonny Vanmunster (Belgium) in late February indicate that this BL Lac object is in an active state, and at it's brightest magnitude (14.4mv) seen since 1972.

I would like to see more observers - from both section's - get involved with this project. There are roles for the CCD and astro-photographer here, as well as the visual observer. The current international project to observe OJ287 & 3C66A (see VSSC 81) underlines the importance of observing these objects. Most of the work being carried out at present comes from two or three visual observers in the VSS, with Nick Hewitt and David Strange providing unfiltered CCD images for the DSS. Not all of these AGN are beyond the visual range of amateur telescopes. Full details of the programme are available from Nick Hewitt.

The following list gives the AGN currently being monitored...

2000.0						
OBJECT	TYPE	RA	DEC.	CON	mpg	
PKS0003+15	Q	0.06	+16.09	Peg	16.5-	
3C-66A	Q	2.22	+43.02	And	13.5-16.3	
M77	Sey	2.43	-00.01	Cet	10.4-11.2	
PKS 0422+004	BL	4.22	+00.36	Eri	13.8-17.0V	
BW Tau/3C120	BL	4.33	+05.21	Tau	13.7-14.6	
3C-147	Q	5.42	+49.51	Aur	17.2+/-	
PKS 0735+178	BL	7.38	+17.42	Gem	14.85/	
OJ 287	BL	8.54	+20.06	Cnc	12.4-16.0	
Mark 421	BL	11.04	+38.12	UMa	13.6-14.0	
4C 29.45	Q	11.59	+29.14	UMa	15.6-	
NGC 4151	Sey	12.10	+39.24	CnV	11.1-	
Mark 205	BL	12.21	+75.18	Dra	14.5-	
W Com	BL	12.21	+28.13	Com	11.5-16.0	
3C-273	Q	12.26	+02.20	Vir	12.2-	
3C-279	Q	12.56	-05.47	Vir	11.0-18.0	
PKS 1354+195	Q	13.57	+19.19	Boo	16.2-	
AP Lib	BL	15.16	-24.22	Lib	14.5-16.0	
3CR 345	Q	16.43	+39.48	Her	16.3-	
3C-371	BL	18.06	+65.59	Dra	13.1-15.9	
BL Lac	BL	22.02	+42.16	Lac	12.0-15.0	
NGC 7469	Sey	23.03	+08.52	Peg	12.5-13.0	

Introduction to IP Pegasi Bill Worraker

Dwarf novae have long fascinated both professional and amateur astronomers. Indeed a number of these stars are currently included in the BAAVSS Main Programme and receive good observational coverage. So what is special about IP Peg, and why should observers be encouraged to add it to their programmes? By considering some of the well-known characteristics of dwarf novae and also what is not so well known about them I hope in this article (i) to show that IP Peg, a deeply eclipsing system, is capable of yielding key information for understanding the dwarf nova outburst mechanism, and (ii) to bring out the special role which amateurs can play in gathering this information.

Characteristics of Dwarf Novae

To professionals dwarf novae form an important sub-class of the cataclysmic variables. They are interacting binary systems in which the primary star is a white dwarf while the secondary is a cool main-sequence star. The secondary continuously overflows its Roche lobe (stability boundary) and thus spills gas through the inner Lagrangian point, where the primary takes gravitational control of the gas. The gas then forms an accretion disk round the primary. Where the gas stream meets the disk it is shocked by the resulting sudden deceleration and thus forms a hot spot which, in combination with the disk, is often the source of a large fraction of the light emitted by the system. Instabilities in this flow of material occur from time to time and lead to the release of gravitational energy which is observed as a dwarf nova outburst. In contrast with classical novae the spectrum of a dwarf nova in outburst lacks the blueshifted absorption and/or emission lines characteristic of the material ejected into space in a nova outburst (for further details see Hoffmeister et al 1985).

Amateurs monitoring dwarf novae at visual wavelengths see outbursts of two or more magnitudes at roughly constant but unpredictable intervals which may vary between 10 days and several decades for different objects. For any one star the amplitude and duration of outbursts are noticeably variable. This is true even for the comparatively regular SS Cyg (UGSS) sub-type, where sometimes an alternating pattern of long and short outbursts is observed. In the case of the SU UMa (UGSU) sub-type Superoutbursts (unusually bright outbursts of unusually long duration) occur in between series, typically 3-10 in number, of more normal outbursts. During superoutbursts superhumps, regular smallamplitude light variations with a period slightly longer than the orbital period of the system, are observed. The Z Cam (UGZ) subtype display standstills, in which the decline from outburst may be interrupted by an interval of nearly constant brightness which may last for weeks or months (see Isles 1990, Hoffmeister et al 1985).

The Significance of Eclipsing Systems

The above picture of the nature and observed characteristics of dwarf novae is well established but incomplete in that various important aspects remain unexplained, notably the outburst mechanism itself. Rival theories exist (the mass transfer burst theory and the disk instability theory; see for example Livio and Verbunt 1988, Smak 1984) but it is difficult to distinguish observationally between them (Wood et al. 1989). However the nature of interacting binary systems itself suggests a possible means of probing the structure of these stars in such a way that the detailed predictions of the theories can be tested. Thus if the orbital plane of the system lies close enough to the observer's line of sight the secondary star will periodically eclipse the primary star, hot spot and accretion disk. The resulting light variations can provide a sensitive probe of the state of the hot spot and accretion disk and thus enable various theories of the outburst mechanism to be tested.

Only a very small number of dwarf novae are known to exhibit such eclipses. The longest-known dwarf nova U Gem shows eclipses while at minimum light, but these disappear during outbursts (Isles 1990). Among southern-hemisphere dwarf novae Z Cha and OY Car show eclipses right through their outburst cycles, while in the northern sky we are limited to IP Peg and HT Cas (see Wood et al 1989, Wolf et al 1993). IP Peg has an orbital period of 3.80 hours, the longest period of the group displaying eclipses throughout their light cycles and the only one longward of the ~2-3 hour gap (see Hoffmeister et al 1985, pp. 110-111) in the orbital period distribution of dwarf novae. Moreover with an average outburst interval of about 3 months it can be relied on to go into outburst two or three times in each observing season, which in practice lasts from May to the following January. In contrast the light cycle of HT Cas is measured in years. Thus for northern hemisphere observers IP Peg is by far the best source of eclipse data needed to resolve the question of the dwarf nova outburst mechanism.

The Role of Amateur Observers

It might at first seem pointless for amateurs to try observing eclipses in a star which has already received considerable attention from professional astronomers (see Wolf et al 1993, Marsh 1988, Wood et al 1989 and references therein). However perusal of the literature quickly shows that most professional observations of IP Peg have been made at minimum light, and for a critical test of outburst mechanism theories it is vital to obtain eclipse observations throughout the outburst light cycle, i.e. including outbursts (Wood et al 1989). The visual magnitude of IP Peg in outburst is usually in the range 12-13.5, dropping to



Eclipse of IP Peg, 1994 Sep 01.960 UT



magnitude 14-15 in eclipse minima, all within reach of medium to large-size amateur telescopes. Thus we can see that amateurs have a role in (i) detecting outbursts, (ii) observing the course of an outburst, (iii) observing eclipses during outburst, all of which may be impossible for professionals who usually have to make their observing plans weeks or months in advance. For observers of dwarf novae the special challenge here is to obtain good light estimates during eclipses.

Observing Eclipses of IP Peg

Eclipses of IP Peg during outburst are typically 1.5-2 magnitudes deep and last up to about an hour in total. The techniques required by visual observers to follow them are the standard Pogson or Fractional Step methods. Recent experience suggests that frequent estimates are needed to give good coverage of eclipse light curves. About 1 estimate per minute is achievable and will give much better coverage of the light curve than, say, 1 every 3 minutes. However it helps to look away from the eyepiece between estimates. Timings should be recorded to the nearest second, which can be accommodated on the standard BAAVSS report forms.

So far I have only discussed visual observations. However last year a special project was set up to observe eclipses of IP Peg during outbursts in the 1994/95 observing season under the joint auspices of The Astronomer magazine and the BAAVSS. Some of the observations made in the course of this project were obtained using CCD equipment by Terry Platt and by St. John Robinson at Keele Observatory (some CCD and visual results are shown in the attached eclipse light curves). Terry's results have shown that useful eclipse observations can be obtained with a telescope aperture of 20cm, a standard CCD camera and an integration time of 40 seconds. There are pitfalls in using CCD equipment for this kind of work, notably with respect to filtering, which is necessary to ensure comparability of the results with visual estimates. However when properly used it is free of some of the sources of error which have plagued visual observers over the years such as bias, position angle error etc. Therefore I would strongly suggest that anyone in possession of a working CCD system, or contemplating such, could do astrophysically important work by observing eclipses of IP Peq.

Whether readers of this article observe by standard visual methods or using CCD systems I hope that you will see that you can do exciting and very valuable work on IP Peg and that you will add it to your observing programmes as a high-priority object. Eclipse predictions for the 1995/96 season will be made available this spring. If you wish to know more about IP Peg please contact myself (address given below) or the BAAVSS Director Gary Poyner. Basic data on IP Peg

Position: (1950) RA 23h 20m 39.5s, Dec +18° 08' 42'' (2000) RA 23h 23m 08.7s, Dec +18° 24' 58.5'' Type: UGSS + eclipses Range: 12.0-18.6B (normal minimum 15.5V) Outburst cycle length: 95 days average Orbital period: 3 hours 48 minutes Eclipses during outburst: Total duration 45-60 minutes, depth approximately 1-2.5 magnitudes (visual). Chart and sequence for visual work on IP Peg: A chart and sequence dated 1994 January 30 is available from the Editor of The Astronomer, Guy M. Hurst, 16 Westminster Close, Kempshott Rise, Basingstoke, Hants. RG22 4PP. Star D of this sequence should not be used as a comparison for IP Peg.

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Nova Aquilae 1995

A new nova has been discovered in Aquila by Kesao Takamizawa, Sakumachi, Japan on two T-Max 400 films taken on Feb 7.839 & 7.842, using a 10cm f4.0 lens. The magnitude at discovery was 8.1. The following position has been provided by Y. Kushida, Yatsugatake South Base Observatory (IAUC 6133).

RA 19h 05m 26s.57 Dec -1°42'03".5 (2000.0)

RA 19h 02m 51s Dec -01°46'40" (1950.0)

R. M. Wagner and R. Bertram, Ohio State University; and S. G. Starrfield, Arizona State University, report on IAUC 6134 that the "Optical spectra (range 450-570 nm, resolution 1 nm) of the nova candidate were obtained at the Perkins 1.8-m telescope on Feb.10.54 UT. The spectra show strong H-beta and permitted Fe II emission lines. The continuum over this spectral range is relatively flat. The FWHM of H-beta emission is about 1200 km/s. The spectra confirm this object as a slow 'Fe II'-class nova in its post-maximum phase of development."

The chart shown here has been created by Guy Hurst with the sequence reference N/029.01, which should be quoted on all observation reports. The field can be seen from the UK at about 05.00am, and any observations made should be reported to Guy as soon as possible.



Nova Aquilae 1995

visual × CCD/pv results

JD 2449000+ Updated 950226 Guy Hurst



Supernova 1995D in NGC 2962

Discovered by Reiki Kushida (Yamanashi, Japan) on February 10.756UT, using a 25cm SCT + unfiltered CCD at magnitude 14.0.

Y. Kushida has measured the following accurate position from five CCD images by the discoverer: R.A. = 9h40m54s.79, Decl. = +5°08'26".6 (equinox 2000.0), which corresponds to a point 11" east and 90".5 south of the centre of NGC 2962. (IAUC 6134)

Astrometry by Nick James (Chelsmford, UK) from CCD images taken around 20h UT on 1995 Feb 17 yield the following precise position:

09 40 54.73 +05 08 26.6 (2000.0) (8 GSC stars)

Nick obtained the images using a 120s exposure with a Sony CX027BL CCD + 0.30m Newt.

S. Benetti, C. Mendes de Oliveira, European Southern Observatory (ESO); and A. Manchado, Instituto de Astrofísica de Canarias, report that inspection of a fully-reduced CCD spectrogram (range 350-100 nm, resolution 1 nm) obtained on Feb. 13.18 UT with ESO 1.5-m telescope (+ Boller & Chivens spectrograph), confirms that SN 1995D is a type-Ia supernova, about 1 week before maximum light. The spectrum is dominated by P-Cyg lines of intermediatemass elements superimposed on a very blue continuum. (IAUC 6135)

The accompanying chart has been produced by Guy Hurst. Please quote the sequence reference TA950214 when reporting observations.



Supernova 1995D in NGC 2962

• Visual × CCD/pv results

JD 2449000+ Updated 950226 Guy Hurst



Eclipsing Binary Predictions

The following predictions are calculated for an observer at 53 degrees north, 1.5 degrees west but 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 GMAT, that is UT-12h. 'D' and 'L' are used to indicate where daylight and low altitude, respectively, prevent part of the eclipse from being visible. Charts for all of the stars included in these predictions (17 in all - see VSSC 80 for a list) are available from the Eclipsing Binary Secretary at 10p each (please enclose a large SAE).

1995 Apr 1 Sat	RZ Cas D08(10)12	S Equ L14(19)16D	2 Per D09(07)09L
U Cep D08(11)16	Z Dra 12(14)16D	1995 Apr 22 Sat	Z Vul L09(09)14
ST Per 09(13)11L	Z Vul 14(20)16D	RZ Cas D08(09)11	RZ Cas 10(12)14
Z Per 11(16)12L	Z Per L16(20)16D	1995 Apr 23 Sun	S Equ L13(13)15D
Z Per L16(16)16D	1995 Apr 11 Tue	TW Dra D08(09)15	1995 May 6 Sat
1995 Apr 2 Sun	X Tri D08(08)08L	RZ Cas 11(13)15D	TX UMa D09(07)12
Z Dra 09(11)13	U Cep D08(10)15	1995 Apr 25 Tue	U Cep D09(09)14
TX UMa 10(14)16D	RZ Cas 12(14)16D	ST Per D08(09)10L	Z Dra D09(09)12
U Sge 14(20)16D	TX UMa 14(19)16D	Z Vul L10(13)15D	U Sge 10(16)15D
1995 Apr 3 Mon	S Equ L14(11)16D	Z Dra 10(13)15	RZ Cas 14(17)15D
RZ Cas D08(06)08	1995 Apr 12 Wed	1995 Apr 26 Wed	1995 May 7 Sun
SW Cyg L08(05)11	TW Dra D08(04)09	TW Dra D08(05)10	TW Dra D09(10)15D
RW Gem 11(16)12L	RW Gem D08(06)11	U Cep D08(09)14	Z Vul 14(20)15D
Z Vul L11(11)16	X Tri D08(07)08L	RW Gem 09(14)11L	1995 May 8 Mon
TW Dra 13(18)16D	SW Cyg D08(09)15	U Sge L10(12)15D	Z Per D09(08)09L
1995 Apr 4 Tue	1995 Apr 13 Thu	1995 Apr 28 Fri	ST Per L15(15)15D
ST Per D08(05)09	X Tri D08(07)08L	RZ Cas D09(08)10	1995 May 9 Tue
RW Tau D08(11)11L	Z Dra D08(08)10	S Equ L13(16)15D	TX UMa D09(09)13
RZ Cas 08(10)13	Z Vul L11(07)12	1995 Apr 29 Sat	SW Cyg 13(19)15D
S Equ L15(14)16D	1995 Apr 14 Fri	Z Per D09(04)09	1995 May 10 Wed
Z Per L16(17)16D	Z Dra 14(16)16D	RW Tau D09(09)09L	TW Dra D09(06)11
1995 Apr 5 Wed	TX UMa 16(20)16D	RW Gem D09(11)10L	Z Vul D09(07)12
TX UMa 11(16)16D	1995 Apr 15 Sat	RZ Cas 10(13)15	RZ Cas D09(07)09
RZ Cas 13(15)16D	RW Gem D08(03)08	Z Dra 12(15)15D	Z Dra D09(11)14
1995 Apr 6 Thu	RW Tau 08(13)10L	1995 Apr 30 Sun	1995 May 11 Thu
U Cep D08(11)16	Z Vul 12(17)16D	TX UMa D09(04)09	U Cep D09(08)13
RW Gem D08(13)12L	1995 Apr 16 Sun	Z Vul L09(11)15D	RZ Cas 09(12)14
TW Dra 08(13)16D	RZ Cas D08(09)11	SW Cyg 10(16)15D	Z Per L14(10)14
Z Dra 10(13)15	U Cep D08(10)15	RZ Cas 15(17)15D	1995 May 12 Fri
1995 Apr 7 Fri	U Sge L11(09)14	1995 May 1 Mon	TX UMa D09(10)15D
RW Tau D08(06)10	1995 Apr 17 Mon	U Cep D09(09)14	S Equ L12(09)15D
X Tri 08(11)08L	Z Dra D08(09)12	TW Dra 15(20)15D	Z Vul 12(18)15D
SW Cyg 13(19)16D	ST Per D08(10)10L	1995 May 2 Tue	RZ Cas 14(16)15D
Z Per L16(19)16D	RZ Cas 11(14)16D	Z Per D09(06)10L	1995 May 13 Sat
1995 Apr 8 Sat	TW Dra 14(19)16D	RW Gem D09(08)10L	U Sge L09(10)15D
X Tri D08(10)08L	1995 Apr 18 Tue	Z Dra D09(08)10	1995 May 14 Sun
Z Vul L11(09)14	RW Tau D08(07)10L	1995 May 3 Wed	SW Cyg D09(09)15D
TX UMa 13(17)16D	Z Dra 16(18)16D	TX UMa D09(05)10	Z Dra 11(13)15D
1995 Apr 9 Sun	1995 Apr 19 Wed	ST Per D09(08)09L	Z Per L13(11)15D
Z Dra D08(06)08	U Sge 12(18)16D	USge L10(06)12	1995 May 15 Mon
TW Dra D08(09)14	1995 Apr 20 Thu	Z Dra 14(16)15D	Z Vul D09(04)10
X Tri D08(09)08L	TW Dra 09(14)16D	1995 May 4 Thu	TX UMa D09(12)15D
RW Gem D08(09)12L	Z Vul L10(15)16D	RZ Cas D09(07)10	1995 May 16 Tue
ST Per D08(12)11L	1995 Apr 21 Fri	TW Dra 10(15)15D	U Cep D09(08)13
U Sge L11(14)16D	U Cep D08(10)15	1995 May 5 Fri	U Sge 13(19)14D
1995 Apr 10 Mon	SW Cyg D08(12)16D	RW Gem D09(04)10	ST Per L14(14)14D
X Tri D08(09)08L	Z Dra 09(11)14	SW Cyg D09(05)11	1995 May 17 Wed

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RZ Cas D09(11)13	TX UMa 13(18)14D	U Sge D10(11)14D	U Sge D10(14)14D
Z Vul 10(15)14D	1995 May 29 Mon	ST Per L13(10)14D	1995 Jun 20 Tue
Z Per L13(12)14D	RZ Cas D10(10)12	X Tri L13(14)14D	U Cep D10(06)11
1995 May 18 Thu	Z Dra D10(11)14	1995 Jun 10 Sat	1995 Jun 21 Wed
TX UMa D09(13)14D	S Equ L11(14)14D	U Cep D10(06)11	TX UMa D10(06)10
TW Dra 11(16)14D	Z Per 13(18)14D	RZ Cas D10(09)11	TW Dra D10(08)13
Z Dra 12(15)14D	1995 May 30 Tue	X Tri L13(14)14D	Z Dra 11(13)14D
RZ Cas 13(16)14D	U Sge D10(07)13	SW Cyg 13(19)14D	Y Psc L12(12)14D
Y Psc L14(15)14D	RZ Cas 12(14)14D	1995 Jun 11 Sun	1995 Jun 22 Thu
1995 May 19 Fri	1995 May 31 Wed	RZ Cas 11(13)14D	S Equ D10(15)14D
S Equ L12(06)12	U Cep D10(07)12	X Tri L13(13)14D	ST Per L12(15)14D
1995 May 20 Sat	1995 Jun 1 Thu	1995 Jun 12 Mon	U Cep 13(18)14D
U Sge D09(04)10	Z Vul D10(09)14D	S Equ D10(08)13	1995 Jun 23 Fri
Z Per L13(14)14D	SW Cyg 10(16)14D	X Tri L13(12)14D	Z Vul D10(11)14D
1995 May 21 Sun	TW Dra 12(17)14D	U Cep 14(18)14D	RZ Cas D10(12)14D
U Cep D09(08)13	ST Per L13(11)14D	1995 Jun 13 Tue	1995 Jun 24 Sat
Z Dra D09(08)10	1995 Jun 2 Fri	Z Dra D10(10)12	TX UMa D10(07)12
TW Dra D09(11)14D	Z Dra 11(13)14D	Z Vul 10(16)14D	SW Cyg D10(13)14D
TX UMa 10(15)14D	U Sge 11(17)14D	X Tri L13(12)14D	1995 Jun 25 Sun
1995 May 22 Mon	Y Psc L13(16)14D	1995 Jun 14 Wed	U Cep D10(05)10
Z Vul D10(13)14D	1995 Jun 4 Sun	ST Per 13(17)14D	Z Dra 12(15)14D
S Equ L12(17)14D	RZ Cas D10(09)12	X Tri L13(11)13	1995 Jun 26 Mon
Z Dra 14(16)14D	TW Dra D10(12)14D	1995 Jun 15 Thu	U Sge D10(09)14D
1995 May 23 Tue	1995 Jun 5 Mon	U Cep D10(06)11	Z Per L11(06)11
RZ Cas D10(10)13	U Cep D10(07)12	SW Cyg D10(09)14D	1995 Jun 27 Tue
SW Cyg D10(12)14D	S Equ L11(11)14D	TW Dra 12(17)14D	TX UMa D10(09)14
U Sge D10(13)14D	RZ Cas 12(14)14D	S Equ 13(18)14D	U Cep 13(17)14D
Z Per L13(15)14D	1995 Jun 6 Tue	1995 Jun 16 Fri	1995 Jun 28 Wed
1995 May 24 Wed	SW Cyg D10(06)12	U Sge D10(05)11	Z Dra D10(08)10
TW Dra D10(07)12	Z Vul D10(07)12	RZ Cas D10(08)10	Z Vul D10(09)14D
TX UMa 11(16)14D	Z Dra 12(15)14D	1995 Jun 17 Sat	1995 Jun 29 Thu
RZ Cas 13(15)14D	Y Psc L13(11)14D	Z Dra D10(11)14D	RZ Cas D10(12)14D
ST Per L14(12)14D	1995 Jun 7 Wed	RZ Cas 10(13)14D	S Equ D10(12)14D
1995 May 25 Thu	TW Dra D10(07)12	ST Per L12(08)12	Z Per L10(07)12
Z Dra D10(10)12	X Tri L13(16)14D	Y Psc 13(18)14D	U Sge 12(18)14D
1995 May 26 Fri	1995 Jun 8 Thu	U Cep 13(18)14D	TW Dra 13(18)14D
U Cep D10(07)12	Z Vul 12(18)14D	1995 Jun 18 Sun	1995 Jun 30 Fri
Z Per L13(16)14D	X Tri L13(15)14D	TW Dra D10(13)14D	TX UMa D10(10)14D
1995 May 27 Sat	1995 Jun 9 Fri	Z Vul D10(13)14D	ST Per L11(14)14D
Z Vul D10(11)14D	Z Dra D10(08)10	1995 Jun 19 Mon	

Z Ursae Minoris - A Correction

Z UMi, the new R CrB star, was misidentified on the chart given on page 2 of VSSC 82. The star with a ring round it should be deleted. Z is actually the star labelled '11.2'. This confusion was caused by an incorrect position being given in the General Catalogue of Variable Stars.

Selected Light-Curves

The light-curves on the following page were plotted from the VSS Computer Archive by Dave McAdam. This archive is supported in part by grants and donations from the Royal Astronomical Society and the Stargazers Trust.



SV Sagittæ:

SV Sge is an RCB type variable star located at RA 19h 05.58, Dec +17,32.9 (1950) with a photographic range of 11.5-16.2p, although it's normal maximum magnitude is about 10.5. The star has been monitored since 1988 by VSS members, and two minima have been observed since that date - 1989 and 1991. Charts appear in VSS circular No. 68 pg 28-29, 1989.

Recent observations by John Toone and the Hungarian observer Laszlo Szentasko indicate a further fade is in progress. John Toone's observations (to Feb 10th) show that SV Sge has faded to magnitude 13.4. The accompanying light curve - plotted by Dave McAdam from the sections computer records - show the activity of the star since 1988, including the present decline. The plot was generated from 913 observations from the following observers...

S.W. Albrighton, J.S. Day, R.C. Dryden, M.J. Gainsford, M. Gill, J.E. Isles, S. Koushiappas, I.A. Middlemist, R.W. Middleton, G. Poyner, J. Toone & W.J. Worraker.

Observers are urged to monitor SV Sge at every opportunity in the morning sky, in order that the decline and subsequent activity is thoroughly covered. Estimates should of course be made with care, as most RCB stars do display radial pulsation's, although this has not yet been confirmed in this star.

Observing SV Sge when at minimum magnitude can be extremely difficult. A close field star of magnitude 14.9 SW of the variable makes identification very important, especially if both stars are on the very edge of the telescopes magnitude threshold. If SV Sge fades to the point where this field star is used, a note should accompany any observations reported stating whether one or both stars have been seen.

