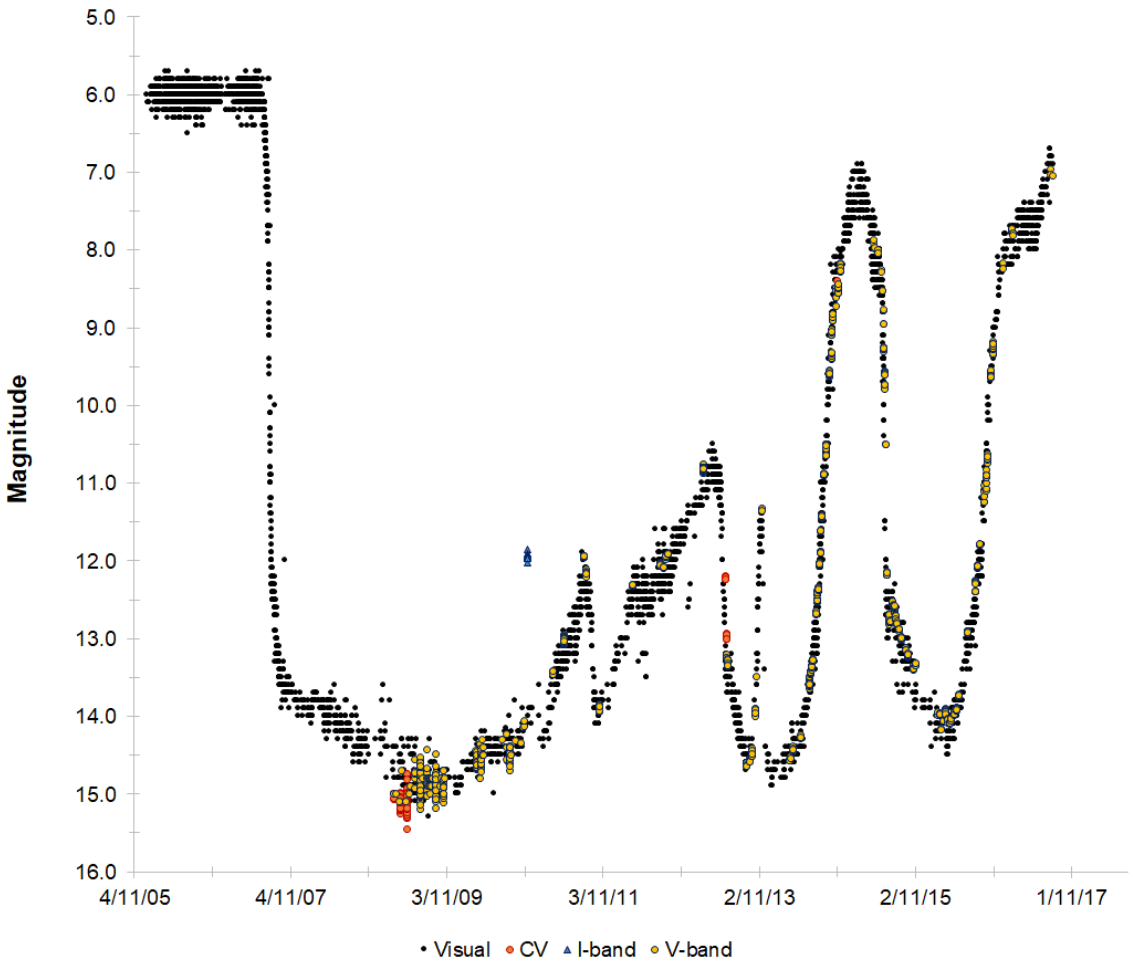
The British Astronomical Association

Variable Star Section Circular

No. 173 September 2017



Office: Burlington House, Piccadilly, London W1J 0DU

Contents

Cover Light curve: R CrB 2005-2017. *BAAVSS on-line database*

Editorial *Gary Poyner*

This Circular has appeared irregularly over the past 95 years in a variety of formats and with a diverse selection of editors. It even disappeared for 37 years between 1935-1972, only for it to reappear under the acting directorship of John Isles who apologised for this hiatus in his opening remarks of VSSC 12 "*we deeply regret the delay since the last Circular*". That was quite an understatement John! Since that time however this publication has been pretty regular with four editions per year and has been a huge success for the VSS, particularly in the pre-internet and WWW years where the Circular was the only means of communication with our observers.

A big change ensued in Mar/Apr 1983, when then editor Storm Dunlop introduced the now familiar A5 size with card covers to VSSC 53. This format has been maintained through the editorships of Tristram Brelstaff, Karen Holland and Janet Simpson - until now!

VSSC 173 becomes the first purely electronic version, and the first VSSC to be free to anyone who wishes to download it – whether BAA member/VS observer or not – from either the BAA or VSS web pages. We hope you approve!

From the Director *Roger Pickard*

Melvyn Douglas Taylor

It is with much sadness that I have to report the sudden death of Melvyn Taylor on 12th August 2017. Alex Pratt advised that Melvyn had phoned him on the evening of Friday 11th August to discuss the observing prospects for the Perseid meteor shower, and therefore it came as a complete shock when he was informed by Melvyn's sister on the Saturday afternoon that Melvyn had passed away at home that morning!

Melvyn had been seriously ill in 2015 when he was found to have a heart condition following the admission to hospital for a routine hernia operation and caught a serious infection to which he never seemed to have fully recovered from.

Melvyn was a very experienced observer, not just of variable stars, but also meteors and lunar occultation's. He was a member of a number of astronomical bodies, including the BAA, SPA, AAVSO, IOTA-ES, several local astronomical societies and had served the VSS extraordinarily well for almost 40 years in one capacity or another.

He will be greatly missed by many observers and all those who knew him as a mentor and a friend.

A more detailed obituary will appear in the next Circular.

Variable Star Circulars now only available in PDF Format

As has been mentioned in the last few Circulars they are now only available in PDF format - except for a very few lucky people for whom the BAA Office has kindly agreed to print them for them. However, this is only a temporary measure in the expectation that those few people will be able to receive email within the next few months.

With this change, we also finally say one last "thank you" to Janet Simpson who has edited the Circulars for the last 10 years and now welcome Gary Poyner who has kindly agreed to take on the role of Circulars Editor.

Guy Hurst achieves 50,000 visual variable star estimates

Guy emailed me in July to advise that on July 2 at 22h19m UT he achieved 50,000 visual estimates when he observed V Aql.

Congratulations Guy on reaching this remarkable mile-stone.

Revised VS Star Catalogue 2017.1

Following a suggestion by Gary Poyner at the last Officers meeting (in November 2016) we have made some extensive changes to the current Telescopic and Binocular Programmes which are now to be called "Pulsating Stars" and "CV's and Eruptives" Programme. The former will be maintained by Shaun Albrighton and the latter by Gary Poyner.

The reasoning behind these changes is partly due to the fact that many users of binoculars use much larger instruments than in the past and can therefore reach fainter magnitudes, and it seemed sensible to amalgamate such stars into one programme. Similarly, it seemed to make sense to amalgamate the Telescopic Programme (apart from the "Red" stars!) and the Recurrent Object Programme into one programme. Further details will be announced in the December VSSC, with the changes occurring from January 2018.

Gary's titles will now be Circulars Editor, CV's and Eruptives Co-ordinator & Webmaster.

And now for something completely different.

You'll see elsewhere in this Circular (page 14) that there is an Article which has nothing to do with Variable Stars!

I was approached (indirectly) by Dr Stuart Eves to see if I could help with determining the orbital period of a small number of Geostationary artificial satellites (four in number). To this end he supplied the latest elements in the form of a "TLES.TXT" file (see below) which I found could be incorporated into the Guide9 planetarium programme (and probably others, but I've not tried that). Now, there has been two problems to date from preventing me from doing this. One is the weather - need I say more?! The other is the fact that these objects are moving far too fast for my very limited field of view (~12' X 9') which they cross in less than 1 minute!

So, ideally, what is needed is a much larger field of view and the ability to track the object for an hour or so. These satellites are typically around 11th - 12th mag, so a telescope equipped with a DSLR should be ideal. Any takers?

AUTUMN MIRA'S

M= Max *m*= min.

R Aql	*M*=Nov/Dec
UV Aur	*M*=Oct
X Cam	*M*=Sep
	m=Nov/Dec
SU Cnc	*m*=Nov
U CVn	*M*=Aug/Sep
RT CVn	*M*=Sep
T Cas	*m*=Nov
Mira	*m*=Sep
V CrB	*M*=Sep
W CrB	*M*=Nov
S Cyg	*M*=Sep/Oct
V Cyg	*m*=Sep/Oct
chi Cyg	*M*=Oct
RU Her	*M*=Sep/Oct
SS Her	*M*=Oct/Nov
	m=Aug/Sep
R Hya	*M*=Oct/Nov
RS Leo	*m*=Sep/Oct
X Oph	*m*=Sep
U Ori	*m*=Nov
T UMa	*m*=Oct/Nov

The TLES.TXT files:- (https://www.n2yo.com/?s=7547|20401|19687|20762)

SKYNET 2B
1 07547U 74094A 17177.09328399 -.00000020 00000-0 00000-0 0 9996
2 07547 10.9808 317.6748 0000426 115.8475 235.7347 1.00257500 91865

SKYNET 4B
1 19687U 88109A 17177.13176191 .00000080 00000-0 00000-0 0 9997
2 19687 15.4113 5.3077 0004775 220.2018 139.7654 0.99675202 85499

SKYNET 4A
1 20401U 90001A 17177.34945126 -.00000253 00000-0 00000-0 0 9995
2 20401 13.3137 12.6294 0014973 236.1916 105.8643 0.98998670 14315

THOR II
1 24808U 97025A 17177.54146605 -.00000224 00000-0 00000-0 0 9998
2 24808 6.8336 52.1369 0005008 237.5164 129.4486 0.98972787 13642

BAA Digital Subscriptions

The BAA has just launched digital subscriptions, initially just for new overseas subscribers. So, if you enjoy the VSS Circulars, live overseas, but are not yet a BAA Member, this is your big opportunity to do so at a reduced rate.

As a digital subscriber you will be able to:

* Receive our bi-monthly Journal & annual Handbook, delivered digitally
* Receive our regular BAA Newsletter, delivered by email
* Watch videos of talks by leading experts online
* Access tutorials
* Get help and advice to develop your skills
* Get involved in our observing programmes organised by the BAA Observing Sections
* Participate in our active online discussion Forum
* Present your work on your own BAA Member Page and contribute articles to the Journal

If you are not familiar with the Journal, the 2017 August edition is available online at: https://britastro.org/pdf/aug2017.pdf To find out more about the benefits of a digital subscription to the BAA, please visit https://britastro.org/digital. Signing up online is easy and payments by credit card or PayPal are accepted.

The BAA has been a driving force in amateur astronomy for over 125 years and is today recognised as one of the world's leading amateur groups. Founded in 1890, the BAA is a global community of amateur astronomers with members in over 40 countries.

First Announcement

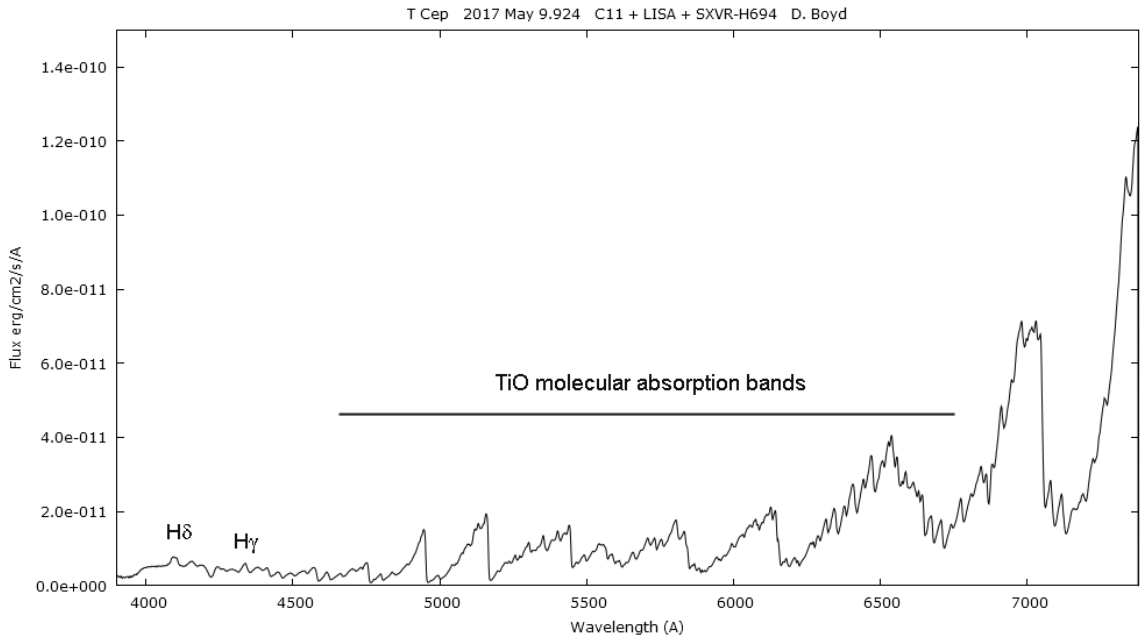
Joint BAA-AAVSO meeting, July 6-8, 2018, Warwick University

Spectrum of T Cep

David Boyd

T Cep is a Mira variable with a pulsation period of 388 days and an approximate V magnitude range of 6 to 10. It is currently (10th May) at V mag 6.5 and approaching the maximum of its cycle. I recorded this spectrum on 9th May with a LISA spectrograph attached to a C11 scope. It is a close match to spectral type M7IIIe. The middle section of the spectrum shows the characteristic saw-tooth absorption bands of the TiO molecule which is present in the cool photosphere of the red giant star.

There are also very weak Hγ and Hδ Balmer emission lines. These tend to appear as the variable approaches and passes through maximum and then disappear again as the star fades.



BAAVSS Chart 2d & 8d / VSX

davidboyd@orion.me.uk

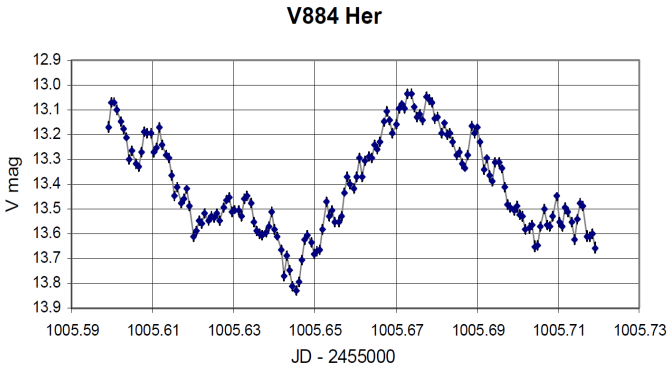
The Polar Programme

Gary Poyner

Following an article written by Prof. Boris Gaensicke in VSSC 129 (September 2006) concerning the importance of magnetic variables and how they are the key to understanding the physical nature of donor stars within those systems, I thought it a rather good idea to set up an observing programme for both visual and CCD observers to monitor a select group of magnetic CV's (Polars) over a prolonged period to see what we might come up with. Boris and I eventually came up with a list of eighteen objects whose long-term variability was not known with any certainty, and a time frame of ten years was thought to be long enough to compile useful light curves. The idea received the full support of the Director and other VSS officers, and a report of the first five years of the programme appeared in BAAJ 123, 2, 2013.

Amazingly that ten year observing period has now been reached, and the decision has been taken to end the observing programme with a final report being written up for the BAAJ.

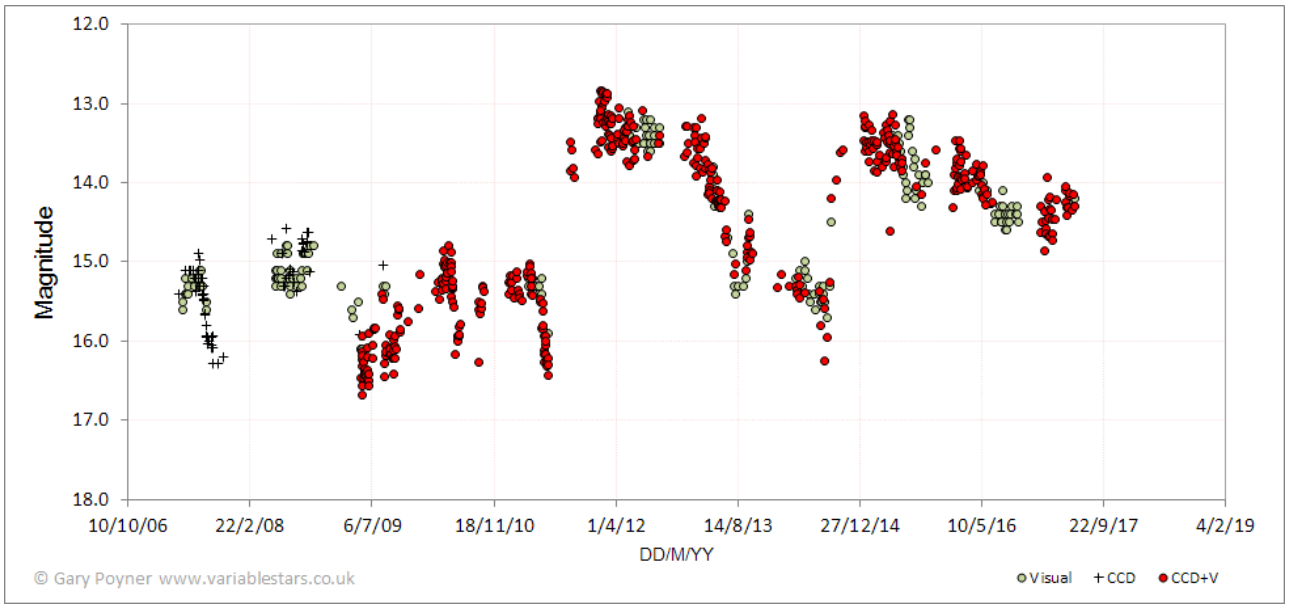
I have to admit that the response to the programme has been somewhat disappointing. I certainly envisaged more observers taking part, especially visual observers with larger telescopes, but this was not too be. CCD observers with both home and remote instruments have however made up for this with excellent coverage of most of the stars on the programme, and we now have a better idea as to how a number of these systems behave over a relatively lengthy period.



Time Series. March 19th 2012. Ian Miller

The highlight of the programme has certainly been the active and relatively bright object V884 Her. The system with the second strongest magnetic field known (next to AR UMa), and a well-established P_{orb} of 1.88h (0.078480d) underwent an unprecedented high state just as the first five yearly report had been completed in 2012. Peaking at an historical high of 12.87V on February 19.4 UT, V884 Her faded slowly to 15.4 vis. in August 2013, recovered to 14.5 vis. by September 2013 before entering a short duration low state of 16.3V in August 2014. Two months later V884 Her reached high state in the mid 13's, and for the past 2.5 years has been varying by ~1.5 magnitudes in visual and V changing from high to an intermediate state of brightness.

V884 Her certainly deserves more attention, and I hope that some observers will add this interesting star to their observing programmes and reporting their observations to the BAAVSS. For the die-hard observers, continuation of the remainder of these objects on the programme would again be of value to our understanding of the long-term behaviour of these magnetic systems.



V884 Her. Visual and CCD data. G. Poyner

BAAVSS Chart 15' / VSX

The over observation of red stars *Shaun Albrighton*

Since taking over as Binocular Secretary for the VSS I have been examining light curves for a number of stars on the program. What is unfortunately found is that certain stars (red variables and gamma Cas stars) are being over observed by a few observers, sometimes on a nightly basis. As has been well documented this can lead to bias, with the observer remembering the previous observations which can affect the result. This effect is clearly seen on the resultant light curves when the bias observations conflict with those of other observers, resulting in greater spread and erroneous results.

A second effect is that on occasions the observations of one observer can exceed those of the remainder, swamping their results. As a result, the biased observer's results have to be either combined and averaged or ignored in order to produce meaningful results.

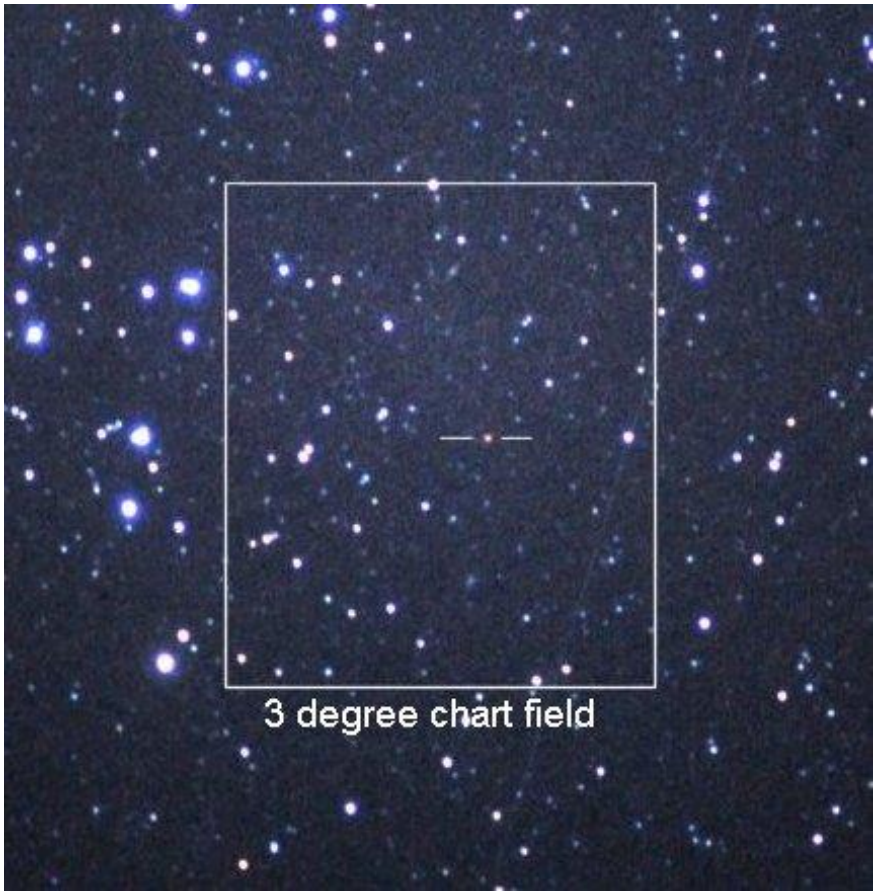
Observers are therefore asked to try and maintain observations of the type of stars referee to approximately one every 7 days. There are of course some types with shorter periods e.g., RV Tau type stars (R Sct and AC Her) or short period SR/Mira variables (SS Her, RY Leo) which benefit from observations every 5 days.

As a final plea, there are many stars on all the sections programs which are neglected. Why not add some of these to your program so that when the British weather plays ball and gives us two clear nights in a row, then there are additional stars available for the observer.

GSC 1992 447 – A red dwarf variable star in Coma *John Toone*

On the 5th May 1991 I travelled to a position three miles north-east of Kendal in Cumbria in order to undertake astrophotography in darker skies than I could achieve from my home in Manchester. I had recently purchased a 135mm, F1.8 lens that allowed me to record stars down to magnitude 12.5 with relatively short exposures. On this particular night, I took several exposures of Virgo and Coma Berenices in an effort to pick up a few of the brighter galaxies in these constellations. One 70 second exposure at 23:14GMT centered on NGC 4565 in Coma (see image below) revealed a very red star directly between NGC 4565 and NGC 4559. I later identified the star as DM+27 2152, AGK+27 1241, PPM102025 and GSC 1992 447. Initially though I labelled it as SV1234+27 and started to observe it visually to see if it exhibited variation.

Between 2nd June 1991 and 24th July 1998, I made visual estimates on 21 nights but there was no significant variation with all estimates reducing to between 10.7 and 10.9mv. I then lost interest in the star thinking it was constant. In 2015, I decided to take another look but it was again recorded at 10.9mv on both the 22nd April and the 16th May. Then finally on 20th May 2017 I checked the star again but this time it was immediately apparent that it had faded below my sequence which cut-off at magnitude 11.1. I did a less than satisfactory step estimate that reduced to 11.6mv giving an indication of the extent of the variation. I asked Roger Pickard & David Boyd if they could provide photometry to allow me to extend the sequence but their FOV's were not suitable for the task. David did however forward to me some APASS photometry of some nearby stars which did the trick. Then armed with an extended sequence I did a more accurate fractional estimate on the 25th May 2017 that reduced to 11.4mv. Nearly a month later on 17th June 2017 it was significantly brighter at 11.0mv almost back to the same level seen previously.



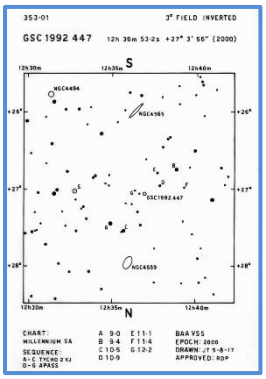
On the basis of my visual observations to date the range of variation is approximately 0.7 magnitude (10.7-11.4mv) but so far, I have not followed the star systematically. Therefore, I don't know the form of the variation nor its true extent.

Within the AGK3 Vol 5 Catalogue +27 1241 is listed as 12.1pg with a spectral class of M9. The GSC lists the V brightness of 1992 447 as 8.91 +/- 0.40 whilst in the Tycho Catalogue the Johnson V magnitude given is 10.36.

The Tycho Catalogue also provides the following properties:

Distance: 44 +/- 24 light years
Luminosity: 0.011 =/- 0.012 times that of the sun
Absolute Mag: 9.7 +/- 1.2

If the above data is accurate then GSC 1992 447 is a very bright low mass/low temperature red dwarf bordering on brown dwarf status. Red dwarfs often exhibit flares but I am not aware of fading activity.



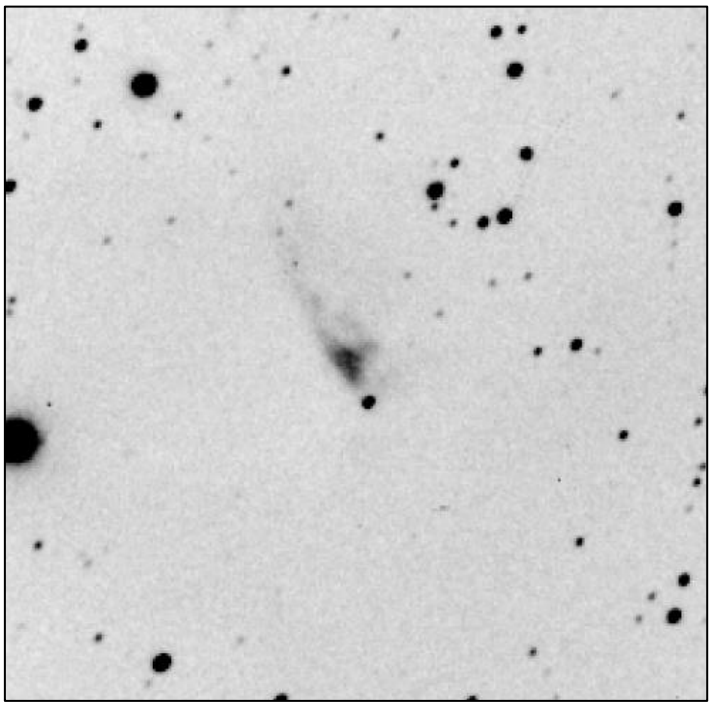
Click chart for full size

Perhaps there was an obscuration event in May 2017 because all other data obtained to date has been within the limits of normal visual photometry scatter. In any case I am convinced that it is variable and I would urge others (particularly CCD observers) to monitor this object using the sequence on the accompanying chart. It would also be useful if the properties of the star could be refined and the red dwarf classification confirmed.

Rapid fade of the Herbig Ae star PV Cephei

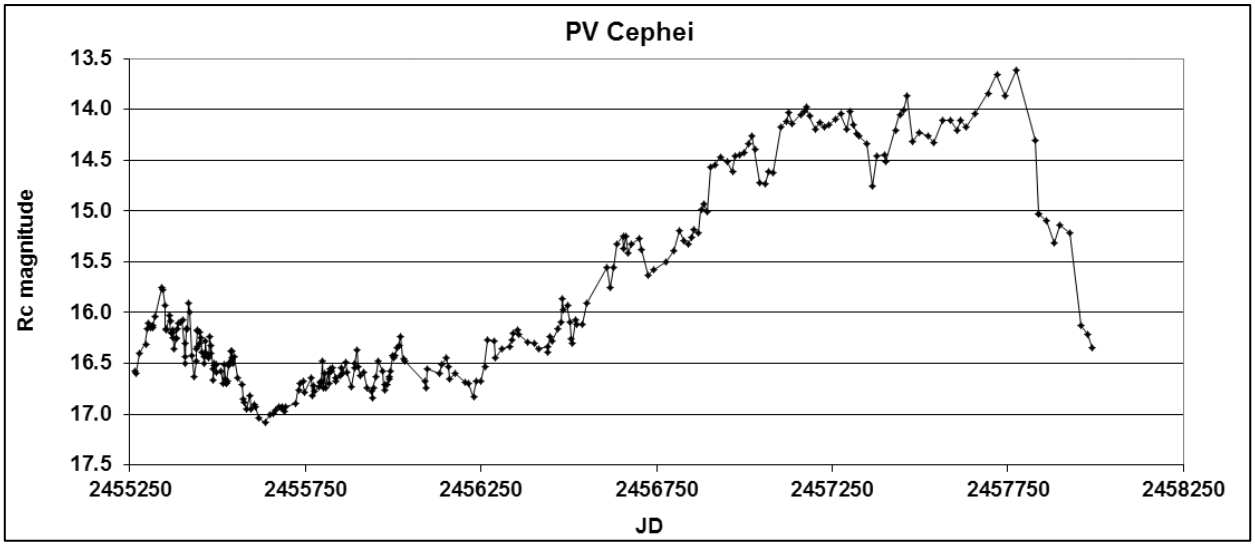
David Boyd

PV Cep is a fairly typical Herbig Ae star, spectral type A5e with mass ~3.5 Msun. It is less than a million years old and its maximum luminosity approaches 100 times that of the Sun. It is still in the process of contracting out of the molecular cloud which surrounds the young star. It has a rather massive circumstellar disc, containing ~20% of the mass of the star with an inclination of ~80 degrees relative to our line of sight so we are looking at the disc almost edge-on. Material from the disc accreting onto the surface of the star may cause periods of increased brightness while obscuration by either the edge of the disc or dust close to the star may contribute to occasional fading of the star. Outflow from the star has cleared a conical cavity in the edge of the surrounding molecular cloud and light from the star illuminating the inside of this cavity creates the variable nebula known as Gyulbudaghian's Nebula



I have been observing the star photometrically since March 2010 both to follow its variability and to investigate the relationship between the brightness of the star and the changing appearance of the nebula. Over this period, I measured the R magnitude of PV Cep on average every 10 days using a 0.35m SCT. After a small initial rise and fade the star reached a low point of R=17.08 in March 2011. It then gradually and irregularly brightened until January 2017 when it reached R=13.62, it's brightest for over a decade. Since then it has faded rapidly to R=16.35 on August 23rd. The light curve of PV Cep from March 2010 to the present is shown below. The image (right) shows the appearance of PV Cep and the nebula on August 23rd.

The increase in the star's luminosity over this period may have been caused by the slow absorption of infalling material from the disc while the recent rapid fade may be due to obscuration by either the disc or a nearby dust cloud. It is unlikely we will ever know but following these changes in the star and the nebula has been an intriguing experience.



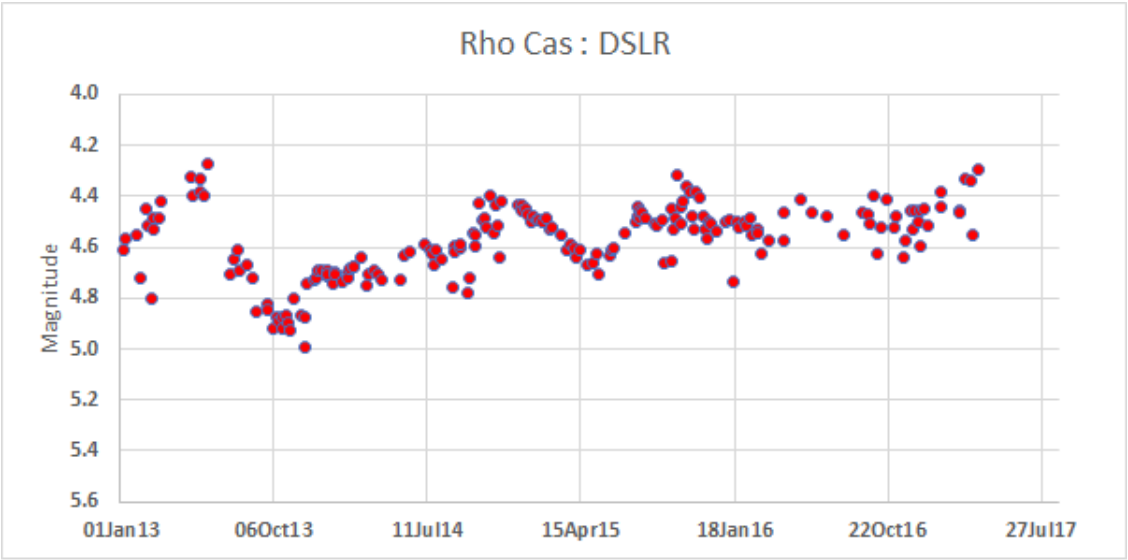
davidboyd@orion.me.uk

AAVSO Chart / VSX

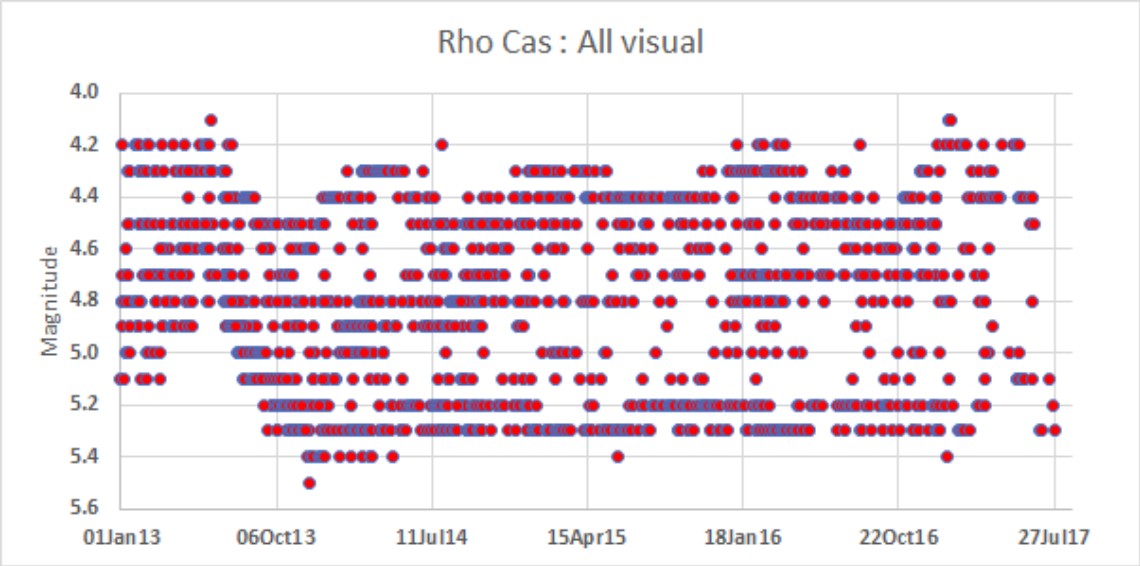
Comparing visual and DSLR observations fairly

Tracie Heywood

When visual and DSLR light curves are compared, the former appears to not fare well. For example, here is a DSLR light curve for rho Cassiopeia between January 2013 and mid-2017, created using the observations in the BAA VSS database.



And here is the corresponding visual light curve…



As can be seen, whereas the DSLR light curve appears to give a clear indication of the ups and downs, the visual light curve shows wide "scatter" and, after 2013, a horizontal line may well be the best fit. However, this comparison hasn't been fair. It has compared the observations of one DSLR observer with the combined observations of many different visual observers.

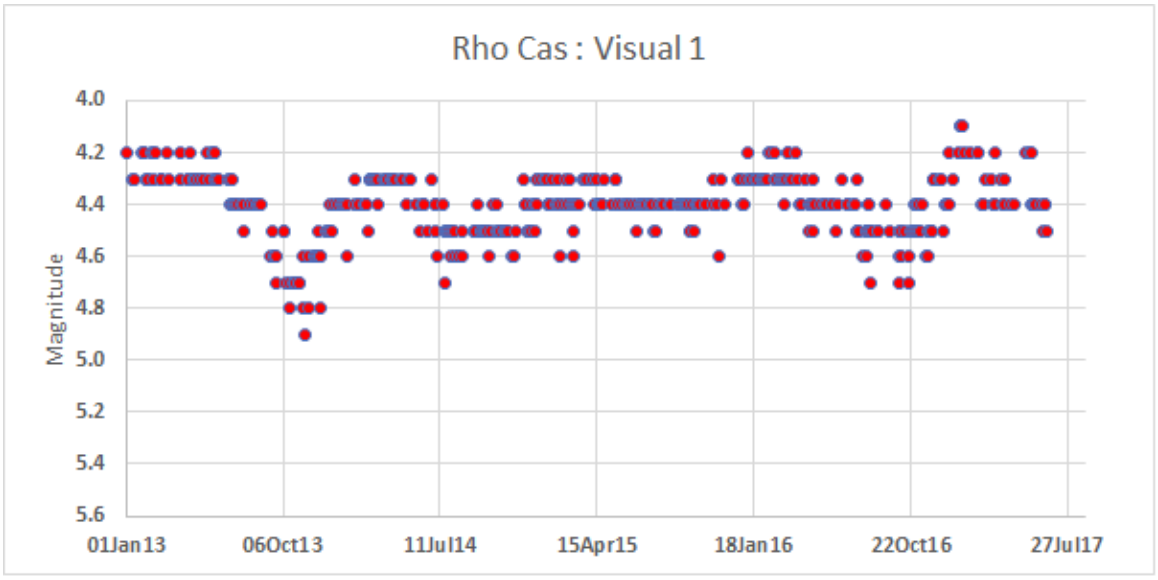
In theory, at least, had there been additional DSLR observers, their observations would have shown very little divergence from those shown here (and would have clarified whether the more "stray" observations are accurate or really stray).

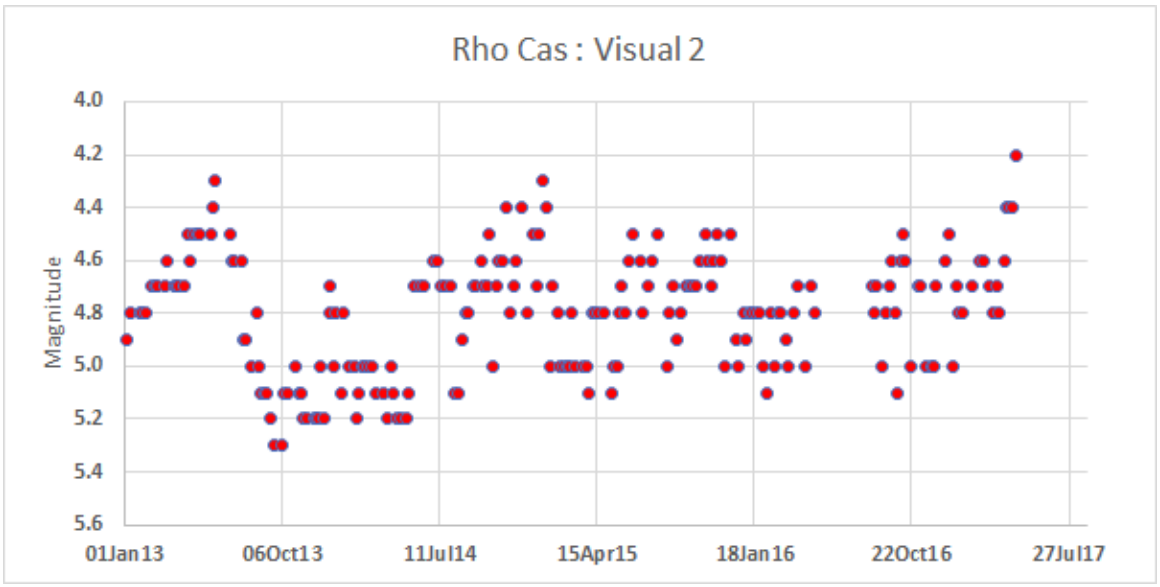
That is, of course, assuming that the other DSLR observers were using the same standard filter and had made the necessary corrections for dark and frames. Had they been using a different filter or no filter at all then they could well have shown a larger divergence than is seen in the visual light curve.

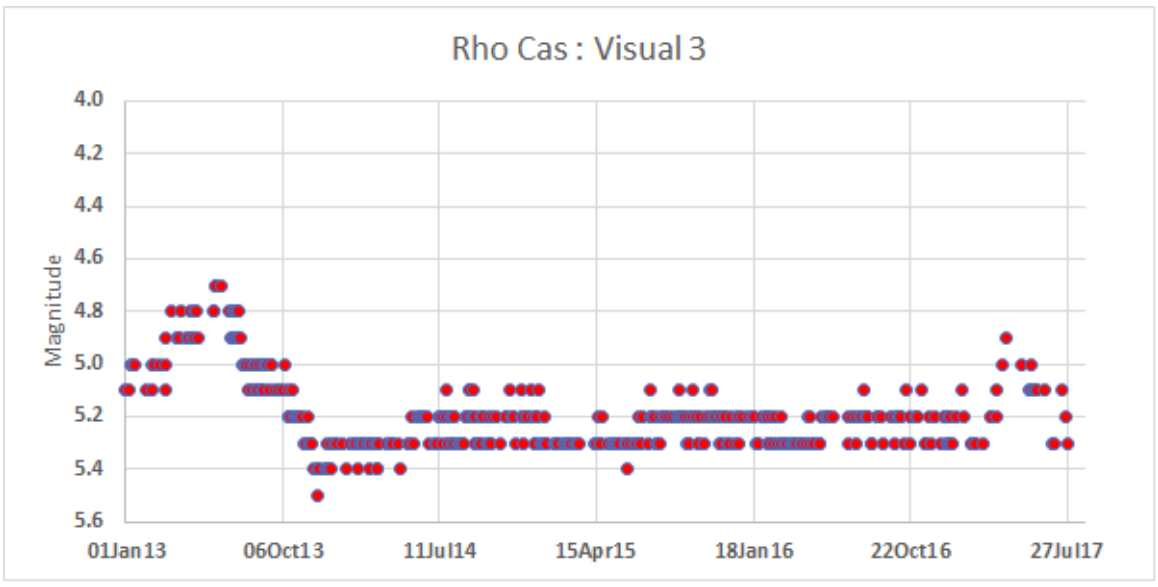
And that is, of course, a clue to the "spread" in the visual observations. Visual observers don't have "standard filters". The colour sensitivity of the eyes varies slightly from observer to observer. The colour of the sky background (from streetlighting) experienced by each observer further complicates the issue. Thus, some observers will have been seeing rho Cas systematically brighter than were other observers. The visual light curve is further complicated by us not knowing which observers were active at each time of each year. Thus, simply averaging the data in 10-day or 30-day bins could produce misleading results.

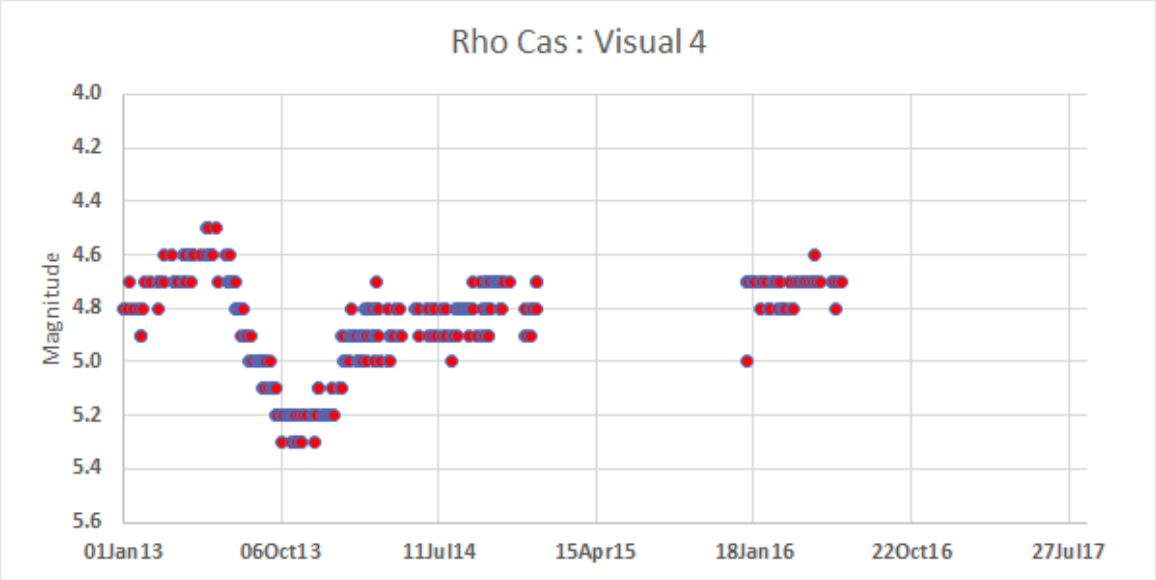
If we want to see more clearly the changes in rho Cas in visual observations, we need to look at the data on an observer-by-observer basis.

Here, all drawn with the same vertical and horizontal scales, are light curves for the four most active visual observers:


Rho Cas : Visual 1
Magnitude
4.0
4.2
4.4
4.6
4.8
5.0
5.2
5.4
5.6
01Jan13
06Oct13
11Jul14
15Apr15
18Jan16
22Oct16
27Jul17


Rho Cas : Visual 2
Magnitude
4.0
4.2
4.4
4.6
4.8
5.0
5.2
5.4
5.6
01Jan13
06Oct13
11Jul14
15Apr15
18Jan16
22Oct16
27Jul17


Rho Cas : Visual 3
Magnitude
4.0
4.2
4.4
4.6
4.8
5.0
5.2
5.4
5.6
01Jan13
06Oct13
11Jul14
15Apr15
18Jan16
22Oct16
27Jul17



The variations of rho Cas now become much clearer than they were in the earlier light curve that combined all visual data. We now see many of the features present in the DSLR light curve.

There does seem to be agreement between the DSLR and individual light curves regarding:

- the maximum in spring 2013
- the minimum in autumn 2013

And probably also regarding:

- the slow rise in average brightness over the years
- the maximum in early 2017

When it comes to the smaller rises and falls during 2014 to 2016, however, there is a lack of agreement. Everyone seems to see them, some seeing a greater amplitude than do others. However, there is considerable disagreement as to when each maximum and minimum occurred! The amplitude of these variations is probably close to the limit of what might feasibly be detected by visual observers, but even the DSLR light curve shows sufficient scatter to make the timing of some maxima and minima uncertain. Maybe there are some seasonal/position angle issues involved?

rho Cas is catalogued nowadays as being a semi-regular variable of type SRd. A period of 320 days has sometimes been suggested, although this is not apparent in any of the above light curves.

tracieheywood832@gmail.com

BAAVSS Chart / VSX

Editor's note…

Readers will have noticed that a continuity error occurred with Tracie Heywood's article on '*The most un-loved variable stars*' in the June 2017 issue. This piece has now been uploaded to the articles section of the VSS web page - http://www.britastro.org/vss/Neglected%20stars.pdf

Our apologies to Tracie for this oversight.

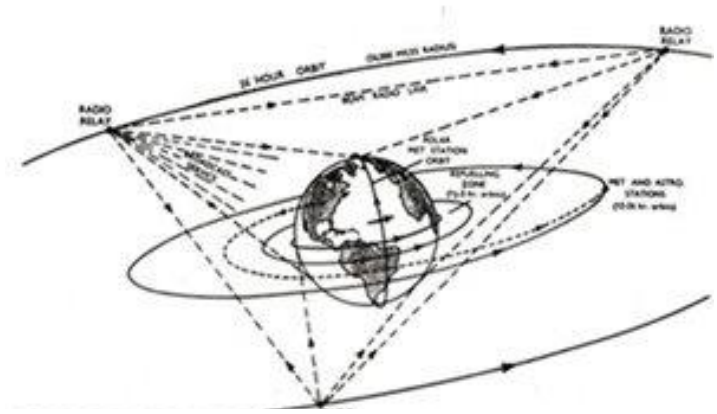
How astronomers can save the Geostationary orbit

Stuart Eves

In 1945, the science fiction author Arthur C Clarke wrote a paper in Wireless World which first popularised the concept of the Geostationary Earth Orbit (GEO) satellite. Based on earlier work by a largely forgotten Slovene scientist, Herman Noordung, Clarke's idea was to exploit the unique orbital altitude (35,786 km) where satellites match the Earth's sidereal rotation period, (thereby appearing fixed in the sky relative to the Earth, and so providing a convenient location from which to relay telephone communications).

The first truly geostationary, (as opposed to geosynchronous), satellite, Syncom 3, was not launched until 1964, but this prime "orbital real-estate" was soon exploited for civil applications including direct-broadcast TV and weather satellites, and for military missions including missile warning, signals intelligence and data relay. Some science missions, including the solar dynamics observatory, have also been placed in GEO orbit. In the future, such monitoring missions may help to provide warning of extreme space weather events generated by the Sun. We all, therefore, potentially benefit from the satellites in GEO.

But we have a problem. Satellites have finite lifetimes, and so run out of station-keeping propellant eventually. Some also cease functioning earlier in their lives, either as a result of an electrical or mechanical failure, or occasionally, (we suspect), as the result of an unfortunate meteoroid strike. Although most satellite operators now responsibly manoeuvre their ageing hardware into higher "graveyard" orbits before the satellite's ultimate demise, more than 50 years of GEO operations has resulted in multiple defunct satellites and other uncontrolled debris objects such as rocket bodies which could cause collisions.



Arthur C. Clarke's vision of a Geo

And the problem is worse than we thought. Recent observations of the GEO orbit region by the US commercial entity ComSpOC have approximately doubled the number of trackable objects up there, to a figure in excess of 2000, (as compared with the official US catalogue). Some discrepancy between these two catalogues is to be expected, as the US chooses not to publish the orbital data for its military satellites in GEO. But this does not account for the majority of the newly-catalogued objects, most of which are probably debris, and which must have their origins in GEO.

We're not sure what's causing this debris, but one possible source of these objects is an unrecorded collision between two defunct GEO satellites. Another is the fragmentation of a satellite which was not properly passivated at the end of its life, which is normally achieved by venting any residual propellant into space, and disconnecting its batteries to prevent a dangerous overcharging scenario in which it could explode. These risks arise because a defunct satellite no longer has an active thermal control subsystem, and so can reach temperatures that it was not designed to withstand. Indeed, repeated thermal cycling is a third process that could lead to materials fracturing and breaking off their host satellite.

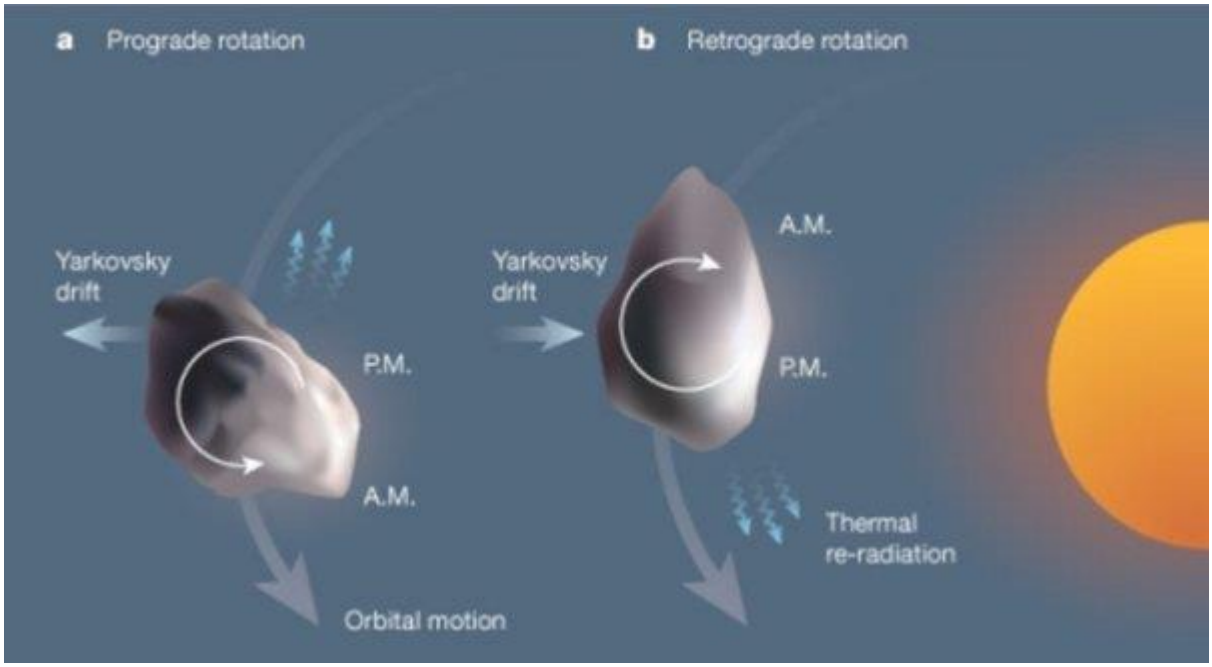
But the mechanism which may actually be responsible for much of the debris population could be one that was first identified in connection with asteroids. The YORP effect involves solar energy heating the body in question. As the asteroid rotates, the "hot spot" re-radiates the energy in a specific direction and this can modify its orbit and also cause it to spin up over time. If this mechanism also works on satellites, it is

plausible that they are spinning up to the point where they are shedding their solar blanketing material and possibly other larger appendages such as solar panels too.

In addition, the variations in the grave-yarded satellites' orbits caused by the related Yarkovsky effect may modify their eccentricities to the point where their perigee altitudes drop back down to GEO height and create a hazard again.

These orbital changes can potentially be monitored with existing tracking telescopes, but the rotational effects created by the YORP effect, (assuming they exist), are harder to measure and much less well understood. However, help may be at hand.

Astronomers have made photometric measurements for many years, observing variable stars, asteroids, comets and more recently, planetary transits. Indeed, this science is now so advanced that it is possible to detect the intensity variations due to the differing reflective phases of a planet as it orbits its parent star, at intensity levels of one part in 10^5.



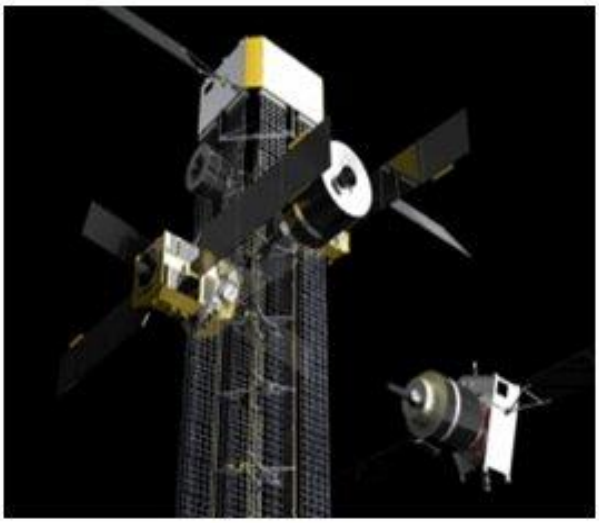
THE YORP AND YARKOVSKY EFFECTS

We probably don't require this level of sensitivity for measuring rotation rates on satellites, (they are irregular shapes, and the projected area seen from the Earth could change significantly over one rotation period, leading to a large variation in apparent magnitude). But what we do need is temporal resolution. The rotation rates of some long-abandoned satellites may have reached 1 Hz, and hence we require much more frequent photometric sampling than is necessary for simply detecting the satellites, or indeed, for observing stars.

If these hypotheses are confirmed by observation, it has two significant implications for the satellite industry. One is that we probably already have some challenging, rapidly-spinning objects to deal with in the vicinity of GEO, and a second is that the current policy of retiring satellites to a super-synchronous graveyard orbit, and then abandoning them, may have to be revisited.

It has been proposed that, rather than being abandoned at the end of their lives, GEO satellites could instead be delivered to a necropolis; an active orbiting repository to which they could be attached. The necropolis would be able to make collision avoidance manoeuvres when required, and could also ensure

that GEO satellites were properly passivated at the end of their lives It has been proposed that, rather than being abandoned at the end of their lives, GEO satellites could instead be delivered to a necropolis; an active orbiting repository to which they could be attached. The necropolis would be able to make collision avoidance manoeuvres when required, and could also ensure that GEO satellites were properly passivated at the end of their lives.



A Geo Necropolis Concept

For active satellites, this is relatively feasible – robotic technology is already close to having the required capabilities, and various "space tugs" are currently under development. But it is comparatively easy to attach a space tug to a cooperative, stable target spacecraft. Much more challenging is the task of capturing a rapidly spinning or tumbling object that the YORP effect may have created

.

To design an appropriate satellite capture system, we urgently need to know what the true state of affairs is in GEO. Ultimately, we may need short range surveillance of these problematic objects in GEO via an inspection satellite to see exactly how extended exposure to the space environment has degraded their materials. But the first step to improve our understanding is to reach out to the astronomical community to ask for help in characterising the rotation rates of the most problematic objects.

(*Dr Stuart Eves, Lead Mission Concepts Engineer, Surrey Satellite Technology Limited.*)

586 Variable Stars in Cygnus

Stan Waterman

Hi everyone, this is just a paragraph to remind people of my website:

http://www.stanwaterman.co.uk/variablestars

I'd really love some candid feedback, the more candid the better. The site is in its early stages as far as design is concerned and many of the reports need to be updated a little. I was advised to put the reports in pdf which means you have to use the back button to leave one and move on to another.

If you would like more info on a particular star or set of stars please let me know. I have nearly 100,000 data points on each of them and it's a doddle to do more phase plots, light curves, averaged, unaveraged, day by day, year by year etc. – or send you the whole dataset if you want it.

The stars there now are all from my main area, named with great originality, area 'a' centered at 21h 08m 30s/ 46° 30m 00s.

They are divided into three range bands, 325 at <0.1mag, 218 between 0.1 to 0.5mag and 43 that move >0.5 mag and 5 period bands, Irregular, <0.2 day, 0.2 to 1d, 1-5d and >5d. About 20 of them are already known.

There are some interesting eclipsing binaries (I have 200 in area 'a' alone), and a few nice long period variables with large movement, one 11459 has a span of 6.03 magnitudes, 3381 is an interesting 'dippy' star.

I have another 400 from area 'a' to do and then many others!

stanwaterman@aol.com

Eclipsing binary news – August 2017

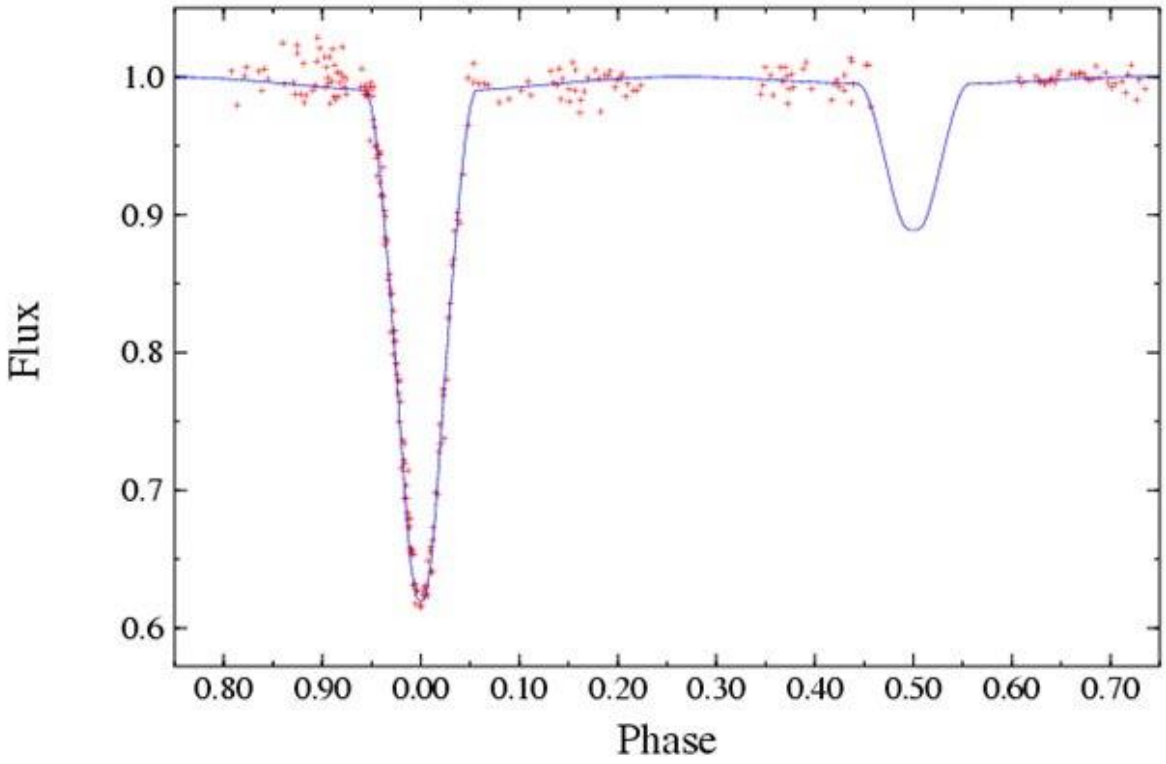
Des Loughney

BH Draconis

It is maybe time to have another look at BH Draconis. It's an EA/SD system with a period of around 1.82 days. It therefore has frequent eclipses. Krakow states that the primary minimum has a depth of 0.6 magnitude. GCVS states that primary minimum has a depth of 0.89 magnitude plus a secondary minimum of 0.2 magnitude.

Below is a light curve from 1981 [1] which is characteristic of an EA system. It always interesting to find out whether a semidetached system has evolved over a period of 36 years (1981 to 2017). There is a chart in our catalogue - 285.01.

1: http://caleb.eastern.edu/model_display.php?model_id=1054



BV Draconis

An interesting eclipsing binary is BV Dra which is an EW/KW system, and is readily observable from the UK. As an EW system, it is in eclipse all the time. Estimations/ measurements are worthwhile at any time. The general magnitude is 7.88V so is an object that can be observed with binoculars or with DSLR photometry. The primary and the secondary eclipse have an amplitude of about 0.6 magnitude. The period of the eclipse is about 0.35 days. The KW description means that it is a contact binary. It is always worth monitoring the evolution of contact binary systems.

A BAAVSS chart has yet to be made on BV Dra but anyone wishing to look at the system so should contact me and I will forward an informal chart.

BG Geminorum - the only black hole eclipsing binary system?

This is an unusual system. A paper from 1999 <https://arxiv.org/abs/astro-ph/9911179> suggests that BG Gem is an eclipsing binary where the unseen primary star is actually a black hole. It is the longest period black hole binary and the only eclipsing black hole binary system. It is not classified by either Krakow or the GCVS as an eclipsing binary system because, I presume, a black hole is not defined as an actual star. Nevertheless, the system has a period of 91.6 days and varies between 12.9 and 13.6V. Because of its unusual characteristics it is a system that is perhaps worth observing by our CCD experts.

Smallest Eclipsing Binary

Astronomers have identified the smallest star in an eclipsing binary system: <http://www.syfy.com/syfywire/astronomers-find-the-maybe-smallest-star-ever-seen>. The star seems to be just 0.081 the mass of the sun. It is about the same size as Saturn and is at about the lowest mass that can sustain fusion.

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. Sahara 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.

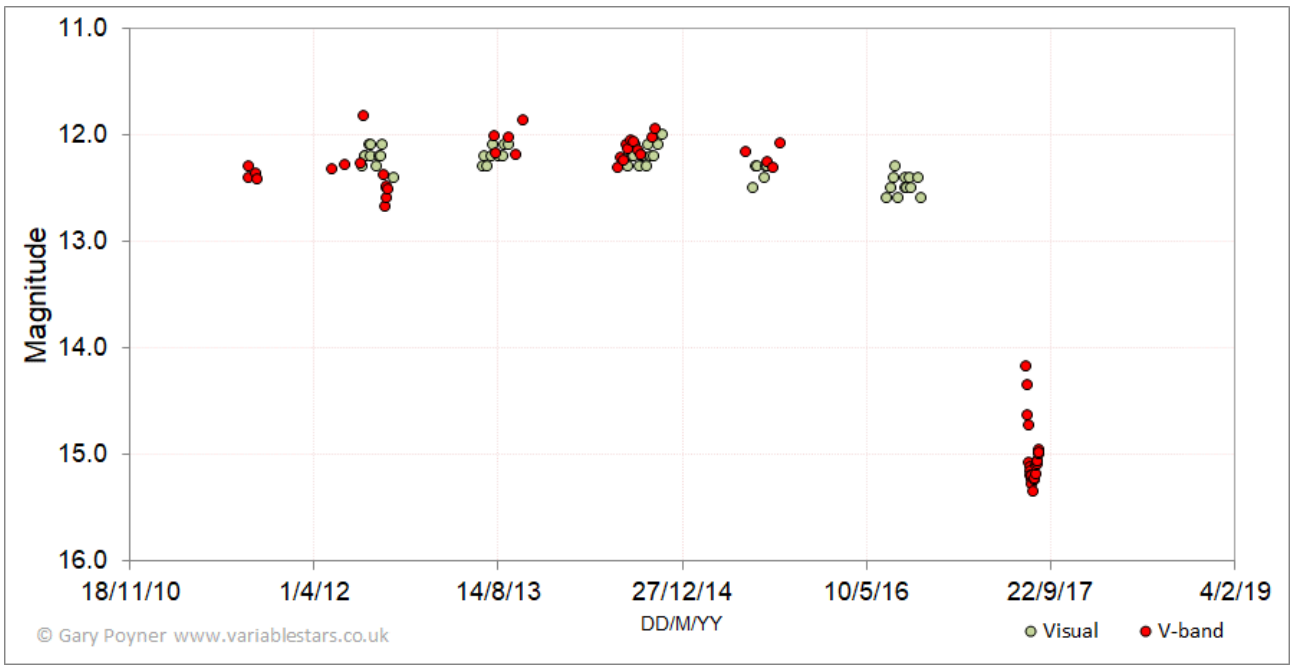
The GCVS website gives SW Cyg a period of 4.57313411 days but the Krakow website lists the period of SW Cyg as 4.572986 days. The latter is more likely to list the most up to date period. It must always be borne in mind that small changes in a period can result in significant changes in the times of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

The 2017 fade of FH Sct

Gary Poyner

FH Sct is an RCB star located in the region of the open cluster M26 (NGC 6694) in Scutum. At declination -09 29, the field is always very difficult to observe from my location in north Birmingham (especially when Aston Villa are playing at home – 2.5 miles due south) due to the light pollution from the City, but fortunately for me since I added the star to my programme in 2011 FH Sct has varied at maximum magnitude from 11.8-12.7V so that I was able to monitor it easily. Visual observations have been supplemented by occasional V-band CCD data from the Bradford Robotic Telescope until its demise in 2015.

In June 2017 FS Sct began the first fade observed since February 2011, and luckily this has coincided with a period of testing I, along with others, am carrying out on the Open University new COAST telescope – the replacement for the BRT. Taking advantage of this I scheduled one of my allotted jobs to observe FH Sct in Johnson V to follow the fade to minimum. The weather on Mount Teide has been significantly better than the UK during the Summer period, and has resulted in an excellent run of 24 nights out of 34.



AAVSO Chart / VSX

At the time of writing (Aug 26) the fade seems to have reached a minimum of 15.35V on August 8, and has recovered slightly to 14.9V by Aug 26. An examination of the AAVSO light curve for the previous fade in 2011 (the only other fade to be recorded) reveals the current minimum is ~0.5V deeper than 2011 with a decline rate of 43d from max. compared to 60d six years ago. Hopefully I will be able to follow it back to maximum brightness in the coming months and make a similar comparison for the recovery rate – if it does indeed return to maximum! Other than myself, there are no other observers reporting data on FH Sct to the VSS database.

Section Publications

Please make cheques payable to the BAA and please enclose a large SAE with your order.

Hard Copy Charts	**Order From**	**Charge**
Telescopic	Chart Secretary	Free
Binocular	Chart Secretary	Free
Eclipsing Binary	Chart Secretary	Free
Observation Report Forms	Director/Red Star Co-ordinator	Free
Chart Catalogue	Director	Free
Observing guide to variable stars	BAA Office	£2.50 £2.75 non-members
Binocular VS charts Vol 2	Director or BAA Office	£1.00 £1.25 non-members

Charts for all stars on the BAAVSS observing programmes are freely available to download from the VSS Website www.britastro.org/vss

Contributing to the VSSC

Written articles on any aspect of variable star research or observing are welcomed for publication in this Circular. The article must be your own work and should not have appeared in any other publication. Acknowledgement for light curves, images and extracts of text must be included in your submission if they are not your own work!

Please make sure of your spelling before submitting to the editor. English (not American English) is used throughout this publication.

Articles can be submitted to the editor as text, RTF or MS Word formats. Light curves, images etc. may be submitted in any of the popular formats. Please make the font size for X & Y axes on light curves large enough to be easily read.

Deadlines for contributions are the 15th of the month preceding the month of publication. Contributions received after this date may be held over for future Circulars. Circulars will be available for download from the BAA and BAAVSS web pages on the 1st day of March, June, September and December.

Notes for readers: *All text bookmarks, www and officers (only) e-mail links are active. Clicking on an image with a blue border will take you to a relevant image or text elsewhere in this Circular.*

Deadline for the next VSSC is November 15, 2017

BAA www.britastro.org
BAAVSS www.britastro.org/vss
BAAVSS Database http://britastro.org/vssdb/
VSSC Circular Archive http://www.britastro.org/vss/VSSC_archive.htm

Section Officers

Director
Roger Pickard
3 The Birches, Shobdon, Leominster, Herefordshire HR6 9NG
Tel: 01568 708136 E-mail roger.pickard@sky.com

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

Chart Secretary
John Toone
Hillside View, 17 Ashdale Road, Cressage, Shrewsbury SY5 6DT
Tel: 01952 510794 E-mail enootnhoj@btinternet.com

Pulsating Stars Co-ordinator
Shaun Albrighton
4 Walnut Close, Hartshill, Nuneaton, Warwickshire CV10 0XH
Tel: 02476 397183 E-mail shaunalbrighton93@gmail.com

CV's & Eruptive Stars co-ordinator, Circulars Editor & Webmaster
Gary Poyner
67 Ellerton Road, Kingstanding, Birmingham B44 0QE
Tel: 07876 077855 E-mail garypoyner@gmail.com

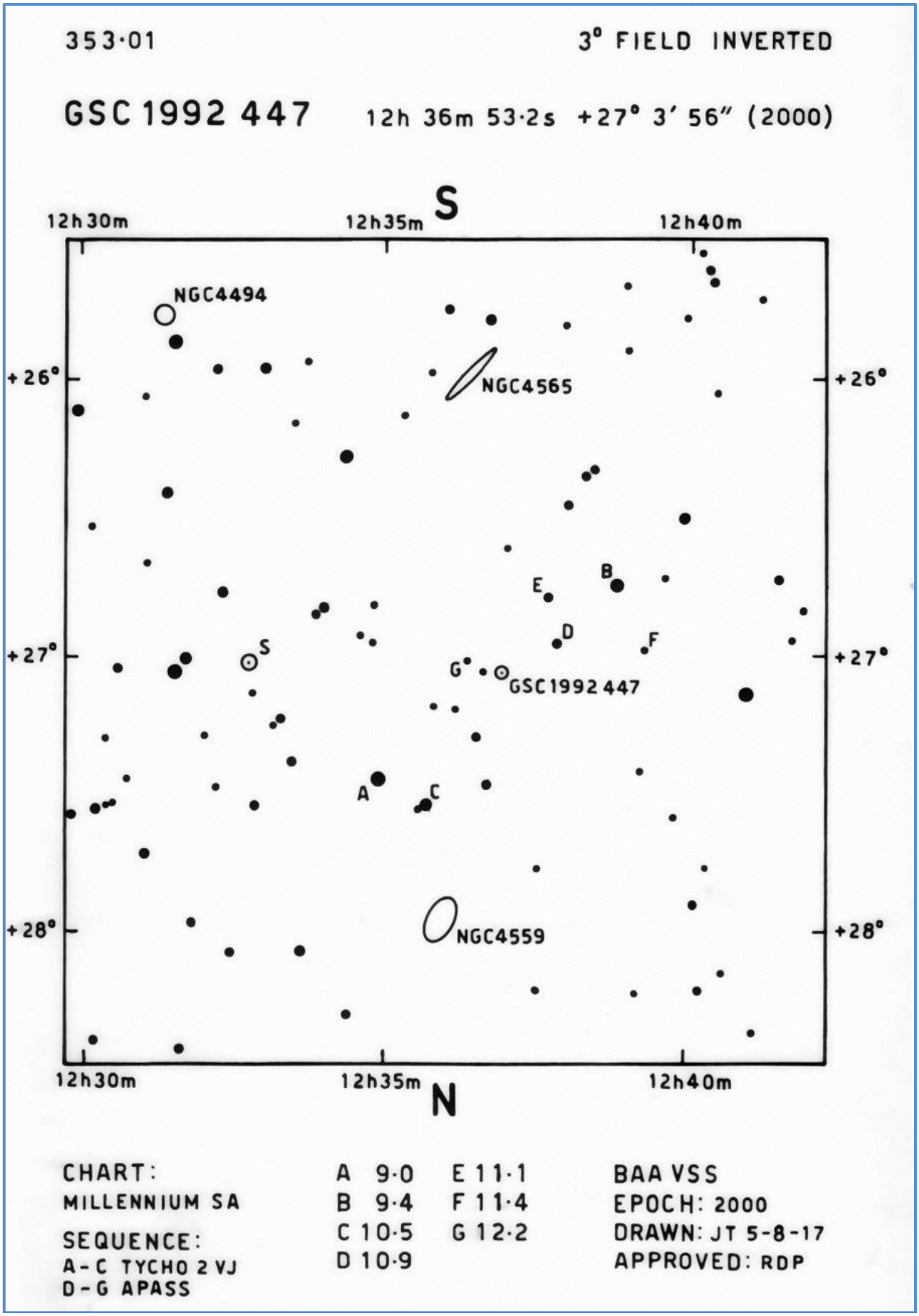
Nova/Supernova Secretary
Guy Hurst
16 Westminster Close, Basingstoke, Hants RG22 4PP
Tel: 01256 471074 E-mail guy@tahq.demon.co.uk

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

Database Secretary
Andy Wilson
12, Barnard Close, Yatton, Bristol BS49 4HZ
Tel: 01934 830683 E-mail andyjwilson_uk@hotmail.com

Telephone Alert Numbers

For Nova and Supernova discoveries telephone Guy Hurst. If answering machine leave a message and then try Denis Buczynski 01862 871187. Variable Star alerts call Gary Poyner or Roger Pickard or post to BAAVSS-Alert - but please make sure that the alert hasn't already been reported.


353·01
3° FIELD INVERTED
GSC 1992 447
12h 36m 53·2s +27° 3′ 56″ (2000)
S
12h30m
12h35m
12h40m
NGC4494
NGC4565
+26°
+27°
+28°
E
B
D
F
G
S
GSC 1992 447
A
C
NGC4559
N
CHART:
MILLENNIUM SA
SEQUENCE:
A-C TYCHO 2 VJ
D-G APASS
A 9·0
B 9·4
C 10·5
D 10·9
E 11·1
F 11·4
G 12·2
BAA VSS
EPOCH: 2000
DRAWN: JT 5-8-17
APPROVED: RDP