



The historic 34-inch Hewitt Camera at the Tamworth Regional Astronomy Club Inc (TRAC). Originally built in the 1950's for tracking 'Blue Streak,' a British ballistic missile, then relocated to Siding Spring to monitor artificial satellites (1982-1990). Purchased by TRAC in 2016 and refurbished, including replacing the plate camera with a CCD. Now used for public viewing.

Contents

From the Director -- <i>Mark Blackford</i>	2
Vale Peter Williams -- <i>Dr. Brian Kloppenborg & Andrew Pearce</i>	3
Positional Accuracy of Seven Carina Variables -- <i>Mati Morel</i>	4
The Light Curves of Cepheid type Variables: II -- <i>Ed Budding</i>	6
A Year in the Life of AP Doradus -- <i>Mark Blackford</i>	11
NACAA XXXII, Tamworth 2026	14
Publications watch	16
About	19

From the Director - *Mark Blackford*

Welcome to the second edition of the Newsletter for 2026. Over the Easter long weekend, I attended the National Australian Convention of Amateur Astronomers at Tamworth, NSW. It was great to catch up with several VSS members, and other astronomy enthusiasts. See my report on the weekend later in this issue.

During the conference dinner Professor Fred Watson presented the 2026 Berenice and Arthur Page Medal which is awarded by the Astronomical Society of Australia for excellence in amateur astronomy in Australia and its territories. There were three worthy recipients. Chris Stockdale for co-discovering over 100 exoplanets with the TESS Follow-up Observing Programme, and the team of Jonathan Bradshaw and Renato Langersek for the discovery via occultation timings of rings around the dwarf planet Quaoar with previous Page Medal winner John Broughton.



From left to right: Fred Watson, Renato Langersek, Jonathan Bradshaw and Chris Stockdale.

The 2026 RASNZ conference will be hosted by the Omaka Observatory Trust from 15th – 17th May (<https://www.rasnzconference.org.nz/>) at the Scenic Hotel Marlborough, Blenheim NZ.

On a sad note, we learnt in a post on the VSS Google Group by Andrew Pearce that long-time member Peter Williams had passed away in early March. Peter was a dedicated and highly skilled visual observer for nearly 50 years, and a thoroughly nice guy. Andrew's post and a testimonial by AAVSO Executive Director Brian Kloppenborg can be found on page 3.

As always, we encourage contributions to the Newsletter. Our Editor Ed Budding has indicated that he will not be able to continue in that role due to personal reasons, so I will be taking on the job.

As the days start to cool and nights get longer conditions at Congarinni Observatory have improved somewhat after a poor run of weather in the first 3 months of the year. I was able to observe on 7 nights in April with good prospects for the coming months. However, I will be holidaying overseas so won't be able to take advantage of any clear nights until mid-July.

Wishing you all clear skies and good health,

Mark Blackford

Vale Peter Williams

Dr. Brian Kloppenborg, AAVSO Executive Director

It is with great respect that we remember Peter, whose dedication to the AAVSO and to the science of variable star observing spanned decades. Over the course of his observing career, Peter submitted an extraordinary 184,867 visual observations to the AAVSO International Database, a body of work that reflects not only remarkable persistence, but a deep commitment to advancing our understanding of the physics of variable stars.

Peter's first recorded observation in our database was of R Carinae on January 8, 1972. It marked the beginning of a lifelong contribution to astronomy. Nearly half a century later, his final observation of V380 Scorpii on April 24, 2019, brought to a close a sustained and meaningful effort that few can match. His work provided consistent, high-quality data that has supported and will continue to support countless scientific studies.

Within the AAVSO community, Peter was widely regarded as an excellent visual observer and an exceptionally reliable contributor in the southern hemisphere where his observations helped fill critical gaps in coverage. His dedication was recognized through numerous awards over the years, including the milestone achievement of 175,000 observations in 2017, an accomplishment that speaks to both his skill and perseverance.

Peter was a member of the AAVSO from 2008 to 2025, and during that time he exemplified the very best of what our community strives to be: careful, committed, and quietly impactful. His legacy lives on in the data he collected, the science he enabled, and the example he set for observers around the world.

Andrew Pearce

From a post to the VSS Google Group on March 10th, 2026:

I've just heard the very sad news of Peter Williams passing. Peter was an absolute gentleman and someone I greatly admired. Back in the 80's and 90's, he was a great mentor to me on variable stars and was always willing to give me advice.

I met Peter on a number of occasions when travelling to Sydney and attending a number of NACAA's. In fact, the last time I caught up with him was 2 years ago in Parkes. Just a wonderful human being.

He was very modest, but his astronomy achievements were significant. I think he made well over 180,000 visual observations of variable stars going back over 50 years. He also analysed many of his observations and published many papers in the RASNZ VSS Circulars and the AAVSO Journal often of stars that were not well observed and so he brought many new insights as to their properties.

He also visually discovered a comet back in 1998 (C/1998 P1) when observing the dwarf nova EK TrA and well as two novae, all visually. I'll always remember the evening of 22nd May 1999 when I got a call from a very excited Peter to say he had discovered a bright nova in Vela. I ran outside and saw it with the naked eye very easily. Nova Velorum 1999 would turn out to be the brightest nova since Nova Cygni in 1975. It was all part of his scanning of the night sky with the naked eye before starting an observing session. His knowledge of the night sky was inspiring to me and I'm sure many others.

He will be sadly missed. My condolences to Linda and family. RIP my friend.

Positional Accuracy of Seven Carina Variables

Mati Morel, Variable Stars South

Abstract

The accuracy of positions for a cohort of seven Carina variables (BE, BF, BG, BH, BM, BW and BY) as given by Worsell (1919) has been carefully compared with those from Gaia DR3. I find that his positions for the group, though of low precision, are consistently reliable with small residuals. From my analysis of positions, it is very difficult to point to alternative identifications.

Introduction

Early 20th century photo plates are widely assumed to have had a magnitude limit of 15p. So, when Worsell and others speak of estimates of 16p that is not credible - their magnitude scale is definitely off.

In 2007 the writer collaborated with Giorgio Di Scala in a BVRI photometric study of several Carina variables reported by Worsell (1919). We selected candidate stars according to two criteria:

- 1) Candidates should be in the magnitude range 13 to 14+ B; and
- 2) They should lie within a radius of 20" or so of Worsell's reported positions.

Each star was observed on at least 4 nights, and frequently 5 or 6 nights. Our observations failed to confirm the claimed variability (1 to 1.5mag) for **any** of the group, and constancy was the most common result. There may be some lingering doubts as to whether the correct stars had been identified in the 2007 study. I have now examined Worsell's coordinates (the only means of identification) to confirm his general accuracy, a parameter which was not given much attention in the 2007 paper.

Worsell's data

All of the seven stars, as subsequently designated (below), were found on Cape plates rather than plates taken at Union Observatory Johannesburg. This indicates a different plate and telescope combination to UO. Worsell's original data was retrieved from the printed page in UOC 46 and is shown in Table 1.

Table 1. Worsell's 1875 epoch positions and photographic magnitudes.

GCVS ID	Worsell's ID	RA (1875 epoch)	Dec (1875 epoch)	Range (p)	Guide Star Cat. ID
BE Car	AN 95.1919	10 36.9	-59 40.6	15.0 - 15.8	GSC8957 1405
BF Car	AN 96.1919	10 37.9	-59 35.8	14.8 - 16	
BG Car	AN 97.1919	10 38.1	-59 29.8	14.8 - 16	GSC8957 30
BH Car	AN 98.1919	10 38.1	-59 27.3	14.5 - 16	GSC8957 1651
BM Car	AN 102.1919	10 40.5	-59 43.9	14.0 - 15.5	GSC8957 390
BW Car	AN 115.1919	10 46.95	-58 07.9	15.0 - 16	GSC8626 1124
BY Car	AN 117.1919	10 48.0	-59 36.3	14.5 - 16	GSC 8958 685

Table 2. Worsell's positions converted to 2000.0 epoch and Gaia DR3 coordinates.

GCVS ID	Worsell (1919)		Gaia DR3		Residuals		Photometry (2007 mean)	
	RA 2000.0 epoch	Dec 2000.0 epoch	RA 2000.0 epoch	Dec 2000.0 epoch	RA Sec	Decl. Arcsec	V	B-V
BE Car	10 41 38.34	-60 19 48.3	10 41 36.41	-60 19 45.7	1.93	2.6	12.55	1.64
BF Car	10 42 21.5	-60 15 2.9	10 42 22.81	-60 15 2.5	-1.31	0.4	12.86	1.78
BG Car	10 42 52.66	-60 9 3.4	10 42 52.76	-60 9 2.4	-0.10	1.0	12.16	1.74
BH Car	10 42 52.66	-60 6 34.8	10 42 52.09	-60 6 53	0.57	-18.2	12.50	1.32
BM Car	10 45 18.44	-60 23 19.7	10 45 16.31	-60 23 25.4	2.13	-5.7	12.26	1.96
BW Car	10 51 58.72	-58 47 42.4	10 51 56.47	-58 47 43.7	2.25	-1.3	12.13	1.73
BY Car	10 52 57.98	-60 16 9.8	10 52 50.79	-60 16 44.7	7.19	-34.9	12.05	1.84

Comparing the data

Worsell's 1875 coordinates were computed forward to equinox 2000.0 for comparison with the Gaia DR3 coordinates of the best matching field stars. The results are given in Table 2. Finder charts for all stars can be found in Morel and Di Scala (2007).

Back in 2007 we determined that while Worsell's position for BF Car lands on a vacant spot (no good agreement with nearby stars), his declination is in perfect agreement with a star 0.3min to the west. This implies an error in his RA, possibly a typo. Therefore the 1875 RA of BF Car has been taken as 10h37.6m which was then converted to 2000.0 epoch.

Calculated residuals, in the sense [Worsell]-[Gaia DR3] relate to the end figures of Right Ascension and Declination, as RA-sec and Dec-arcsec. Generally, the residuals are consistent and rather low, indicating little scatter. The exception is BY Car for which the declination residual is somewhat larger than the 20arcsec criteria.

The following points should be noted.

- Each variable is clear of other stars (except for BH Car)
- The matching star is always red, or reddish
- No other red stars lie in the vicinity
- No other likely variables lie in the immediate vicinity.

Conclusion

A comparison of Worsell's positions to Gaia DR3 coordinates shows six of the seven candidate stars match the criteria of mag range 13 - 14B+ and within radius 20arcsec. The residuals are quite small, but this general consistency does not help to explain the non-variability of his discoveries. Perhaps there was an issue related to the plates or methods employed.

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The Light Curves of Cepheid type Variables: II

Ed Budding VSS, RASNZ

Abstract

The review of classical Cepheids continues with a presentation on the Baade-Wesselink technique in action on B and V light curves of β Dor supplied by H Williams & WSG Walker. The results give reasonable values of the distance and mean size of the star that can be compared with other published values.

Introduction

The previous issue of the VSS Newsletter (pp 7 -11; Paper 1) referred to Baade & Wesselink's approach (BW) to the analysis of Cepheid light curves, showing, as an example, the outcome of its application to observations of β Dor, gathered previously by H. Williams and W.S.G. Walker. Basically, the technique is one of comparing a parameterized theoretical model with the observations. The parameters of the model are adjusted so as to optimize the fit; i.e. BW fitting is another case of optimization of data modelling.

The theoretical curve is made by combining simultaneous, but separate, radial velocity (RV) and at least two-filter photometric data. From the colour variation with phase, the variation of surface temperature can be determined. From the temperatures corresponding surface flux values are measured. Meanwhile, the RV data can be integrated (and differentiated) to determine the variation of size (or acceleration) with phase.

Putting together both flux and size variations the full light curve can be modelled as a function of phase. In the application of the BW technique to β Dor, the RV data of Taylor & Booth (1998) was combined with UBV photometry of Williams and Walker collected in Auckland during the second half of the last century (Walker and Budding, 2023). The results were reported during 2001, in the *Communiques* of a photometric group acting within the RASNZ. The optimal mean radius for β Dor was found to be 66.9 solar radii and the distance 312 pc. The same procedure was later applied to the bright southern Cepheid S Mus.

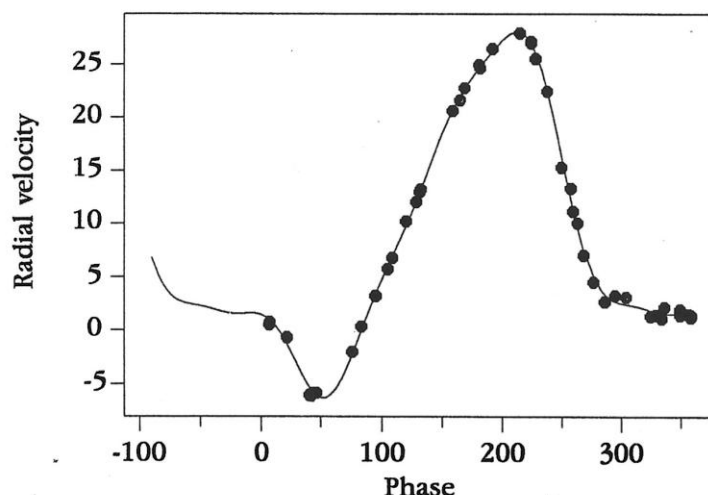


Figure 1: Taylor and Booth's (1998) radial velocity curve for β Dor, here fitted with a Fourier series in terms up to 5θ , where θ is the phase in degrees,

Baade-Wesselink method

The first step is to allow the radial velocity curve to be represented by a Fourier series of the form:

$$v = a_0 + \sum a_i \cos i\theta + \sum b_i \sin i\theta$$

where the component of the star's motion in the line-of-sight v is made up from the constant term a_0 together with the sum of terms in $\cos i\theta$ and $\sin i\theta$, θ being the phase angle, and the cosine and sine coefficients are the constants a_i and b_i . In practice, there would be typically a dozen such terms in the overall series. The result of the curve fitting process applied to the RV data for β Dor is shown in Fig 1.

The observed mean radial motion is normally given in kilometres per second. It is necessary to introduce a scaling factor p to allow for the variation of the local surface projection over the visible hemisphere. Now removing the line-of-sight spatial motion of the star as a whole, v_0 , and then integrating, we find the formula for the position of the line-forming layer R :

$$R = R_0 + p(\sum A_i \cos i\theta + \sum B_i \sin i\theta)$$

where R gives the radius of the line-forming layer at phase θ and R_0 is the mean radius of this layer. A_i and B_i are obtained from a_i and b_i using standard integration formulae.

One might think about a difference in phase between the photometrically related radial movement of the photosphere and the spectroscopically derived motion of the line-forming layer, but both theory and observations agree that this is generally negligible for classical Cepheids, provided adequate care is taken in selecting appropriate lines, and suitable procedures used to determine the line-shifts at a given phase.

The photosphere then has an apparent magnitude at effective wavelength of observation λ given by:

$$m(\lambda) = M_{\text{sun}}(\lambda) - 5 - 5 \log(R/p) - 2.5 \log [(F_{\text{star}}/F_{\text{sun}})(\lambda)] \quad (1)$$

Here M denotes absolute magnitude, and suffixes “sun” and “star” apply to solar and stellar quantities, respectively. The surface fluxes F depend on temperature T as well as wavelength λ . The quantity $(Gk\rho)$ p denotes the distance to the star. This **fitting equation** applies only in the absence of interstellar extinction. It is easy to correct for this, if the absorption is known. For β Dor, the extinction was measured by Taylor and Booth (1998) as $A_V = 0.235$. Then one can correct the measured magnitudes and colours *a priori*.

The flux ratio $F_{\text{star}}/F_{\text{sun}}$ involves in addition to the wavelength, temperatures T_{star} and T_{sun} . If these are brightness temperatures, then by definition the flux ratio is simply expressed as:

$$F_{\text{star}}/F_{\text{sun}} = \{ \exp(c_2/\lambda T_{\text{sun}}) - 1 \} / \{ \exp(c_2/\lambda T_{\text{star}}) - 1 \} \quad (2)$$

where c_2 has the value 0.014388 mK

We now need the value of T_{star} in order to use Eqn 1 as the fitting equation. Continuing with the Baade-Wesselink methodology, we interpret this in terms of the observed colour of the star, though this step may be questioned about how well temperature can be related to colour for Cepheid atmospheres.

It can be shown for normal stellar atmospheres a relationship of the form:

$$1/T = 1/T_0 + k_1 C + k_2 C^2 + h_1 g + \dots \quad (3)$$

has an empirical validity, where T is the temperature, C is a suitably defined broadband colour, g is the gravity; k_i and h_i are rapidly converging c expected (see Budding & Demircan, 2007; ch. 3). In fact, a

gravity-free, linear version of Eqn 3, especially with the longer wavelength, for example $V - R$, is well able to match observations over a relatively small range of temperature variation such as is found with Cepheids. This is quite parallel to the Barnes Evans approach, called after the investigators who thoroughly examined linear relationships between colour and surface flux for many stars.

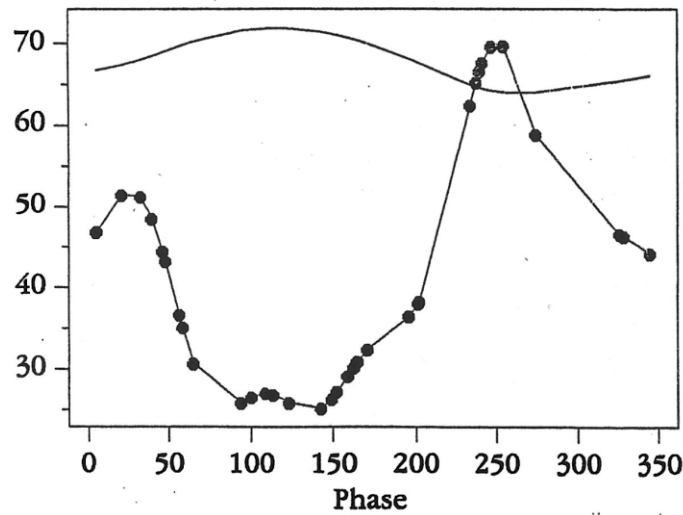


Figure 2: Variations of the radius in solar units (smooth curve near top) corresponding to the integral of the RV curve (Fig. 1). The gravity (irregular curve joining black circles) is in m/sec^{-2} .

Applications

Suppose now we have a set of N photometric observations of a Cepheid at two wavelengths λ_1 and λ_2 i.e. m_j and C_j at assigned phases ϕ_j . The C_j are substituted into Eqn 4, to yield brightness temperatures T_j , used in the flux expression Eqn 2. Corresponding radii at these phases are obtained from the previously given Fourier series. In this way, the observed m_j values are matched by a corresponding set of calculated values mc_j , using Eqn 1, where the quantities p , R_0 , ε , k_1 , T_0 , ρ , etc. thus play the role of parameters in a standard optimization problem.

These parameters are not independently determinable solely from Eqn1, because p , R_0 and ρ appear only in the combination R_0/ρ and p . However, since the values of R_0 and ρ are of particular interest, it is convenient to keep the foregoing notation and take it that p can be given a sufficiently accurate value from theory.

The value of k_1 should not be wildly different from that corresponding to a ‘black body’, just as the photospheric emission is not too far from the Planck prescription at a given temperature. The reference temperature T_0 can then be determined from a suitable comparison source of known colour and brightness temperature such as the Sun, and so:

$$1/T_0 = 1/T_{\text{sun}} - k_1 C_{\text{sun}}$$

The separate roles of radius and temperature can be seen from the approximate formulae derived from a little manipulation of the fitting equation:

$$\Delta m_v \sim 3.0 \Delta (B - V) - 2.2 \Delta R / R$$

Hence, although a 10% change of radius would create a variation of around 0.3 mag, a similar change of colour would enhance this effect. The overall change of brightness of β Dor is about 0.6 mag in V . Since the $B-V$ colour changes by about 0.35mag we can therefore anticipate the scale of radial variation to be relatively small and out of phase with the colour variation.

Results

The radial velocity curves of Taylor and Booth (1998) were fitted with an accuracy of 0.47 km/sec using a 5th order Fourier series (11 terms, see Fig. 1). This appears slightly better than the 6th order Fourier fit that Taylor and Booth presented themselves. Their difference data shows a slightly more uniform and wider spread than ours, though the few stray points visible near the lower turning points of the RV curve are still present in our results. We note, in passing, that the few points taken at the Mt John University Observatory are nicely placed with relatively low scatter in the optimal fitting. Using this fit to the RV data a 6-parameter fit to the Williams and Walker B-V photometry was effected.

We started with a black-body linear colour-temperature relation. The parameters $p = 1.36$ and $\varepsilon = 0$ being set, this led to:

$$R_0 = 67.9 R_{\text{sun}}, k_1 = 4.46 \times 10^{-5}, T_0 = 6429 \text{ K}, \rho = 312.3 \text{ pc}$$

This was not really a feasible model, however, as the normalized χ^2 value was more than 10 times the number of degrees of freedom (ν) even with a generous 0.05 mag error estimate. Moreover, the difference curve showed systematic effects, in the sense of the model being too faint near the light maxima, and too bright near the light minima by around 0.1 mag.

Further examination of the parameter space revealed a long and narrow tract, which is characteristic of closely correlated parameter values; size and distance being probably the main contributors in the present case. Eventually, the following set was obtained:

$$R_0 = 67.9 R_{\text{sun}}, k_1 = 7.15 \times 10^{-5}, T_0 = 7550 \text{ K}, \rho = 312.3 \text{ pc}, \chi^2 / \nu = 1.54, \Delta m = 0.03$$

A second order term in the colour-temperature relation was tried, but such experiments led to the conclusion that good fits can be produced by unphysical parameter-sets away from the foregoing optimal set, while the second-order fit did not substantially improve the quality of the result.

A gravity dependent term was introduced into Eqn (3), since gravity has a distinct anti-phasing with the difference between observed and calculated light curved (see Figs 2 and 4), and also the B filter overlaps slightly with the Balmer discontinuity, so a sensitivity to gravity can be expected. A small negative value of $h_1 = -0.023$ resulted in a definitely improved fit. The other parameters were then found as:

$$R_0 = 66.9 R_{\text{sun}}, k_1 = 7.11 \times 10^{-5}, T_0 = 7530 \text{ K}, \rho = 312.3 \text{ pc}, \chi^2 / \nu = 1.42, \Delta m = 0.03$$

When the star is at relatively low light level and extended, the surface gravity is at its lowest. Under such circumstances the Balmer recombination would tend to make the B brightness somewhat higher than it would be for a (grey) radiator. In other words, the B – V colour is not as great as would really correspond to the temperature drop. The lower subtraction from the gravity term compensates for this, implying a greater drop in surface flux than would correspond simply to the colour alone. Our derived value of h_1 is in keeping with the known ‘luminosity effect’ for giants of temperature ~5000K (see e.g. Allen, 1975).

Note our distance (312.3 pc), that takes account of the interstellar extinction, is close to a value representative of standard astrometric surveys (HIPPARCOS, TYCHO) which give 318.5 +/- 30 pc as an average, while Gaia, more recently, gives 341 +/- 15 pc.

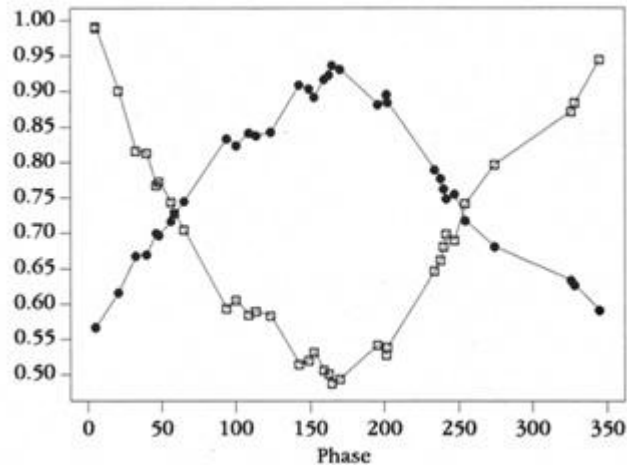


Figure 3: $B - V$ (full circles), and derived relative flux values (open squares) for β Dor.

Note the apparent slight standstill around phase 100 deg., this has its consequence in the corresponding V light curve (Fig 4). Such departures from a smooth light cycle are known to affect Cepheids with periods around that of β Dor.

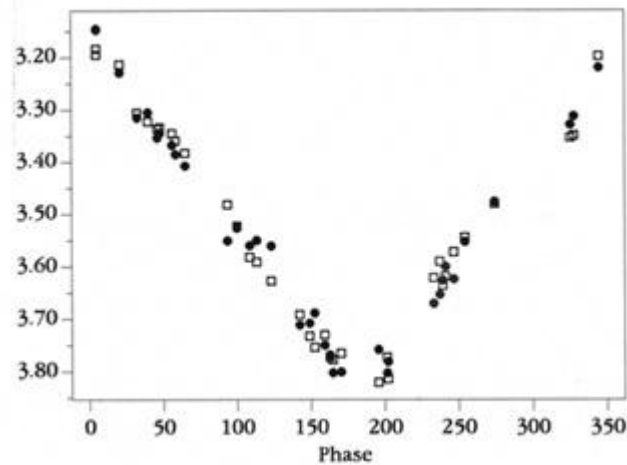


Figure 4: Observations (open squares) compared with the results of the BW model (full circles).

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A Year in the Life of AP Doradus

Mark Blackford, Congarinni Observatory

This article was adapted from a poster presented at the NACAA meeting in Tamworth over the 2026 Easter weekend.

AP Dor is an eclipsing binary with orbital period of ~ 0.4272 days located near the south ecliptic pole and within the Southern Continuous Observing Zone of the Transiting Exoplanet Survey Satellite (TESS). TESS observed AP Dor almost continuously from July 5, 2020, to June 24, 2021 (sectors 27 to 39) at 120 second cadence. The complete light curve is shown in Figure 1, each sector represented by a different colour [1]. Maxima and minima show semi-sinusoidal magnitude variations with period ~ 25 d.



Figure 1: TESS light curve for the period 5/7/2020, to 24/6/2021 showing brightness variations of maxima and minima.

O'Connell Effect

Table 1 lists physical parameters of the system. A single orbit light curve is shown in Figure 2 with the orientation of primary and secondary stars at minimum and maximum magnitudes. The two maxima differ in brightness, a phenomenon known as the O'Connell effect [3]. Although relatively common in short-period eclipsing binaries, the physical cause of the O'Connell effect is not fully understood. Several reasons have been proposed: an asymmetric distribution of star spots, impacts of one-way gas streams between the components of the binary system, or the flow of circumstellar matter, asymmetrically deflected due to Coriolis forces [4].

Table 1: System parameters from [2]

Parameter	Primary	Secondary
Mass ($M_{\odot}$)	1.278	0.746
Radius ($R_{\odot}$)	1.36	1.113
Temperature (K)	6585	6302
Spectral Type	F5	F7
Separation ($R_{\odot}$)	3.019	
Orbital period (d)	0.4271901	

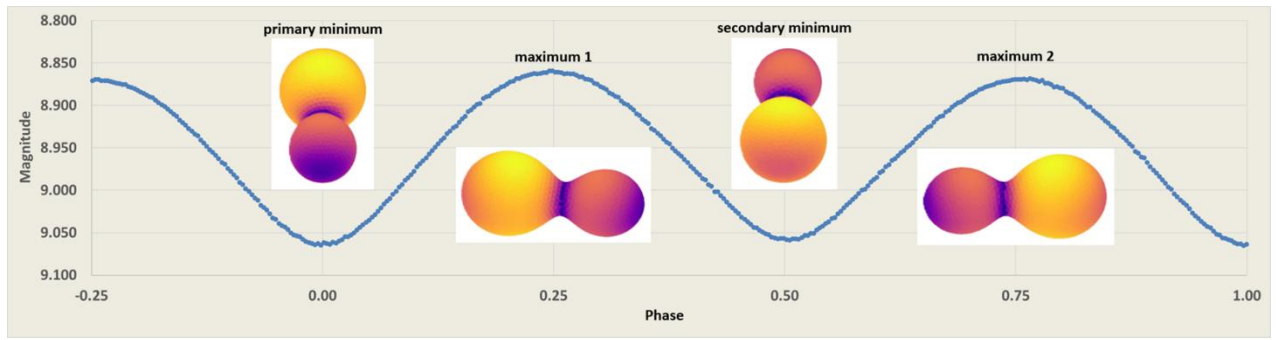


Figure 2: Single orbit light curve, showing orientation of stars at minimum and maximum.

The high-cadence year-long TESS observations show an intriguing pattern of variations in the relative heights of the two maxima as well as the primary and secondary minima. The top panel of Figure 3 is a plot of the magnitude of maximum 1 (blue) and maximum 2 (red) measured at each orbital cycle. Maxima magnitudes vary in a semi-sinusoidal anti-correlated manner with a period of ~59 cycles (or ~25 days). A similar pattern is seen in the primary and secondary minima magnitudes (bottom panel). The period of these fluctuations is much longer than the orbital period of the stars.

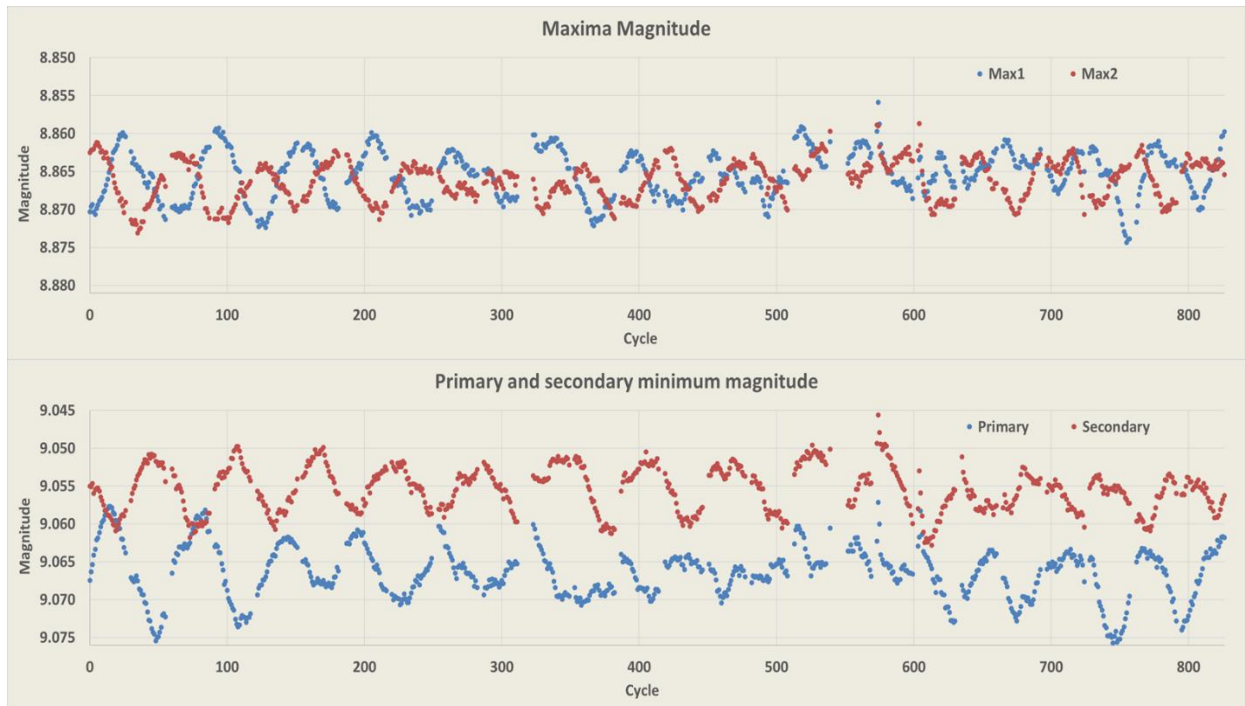


Figure 3: Maxima (left) and minima (right) magnitudes showing anti-correlated semi-sinusoidal variations with period ~25 days.

Orbital Period Change

Figure 4 plots the difference between the observed and calculated times of minimum for all TESS observations from August 2018 to January 2026. Primary (blue) and secondary (red) eclipses are plotted separately. Calculated times were determined using the linear equations:

$$T_{\text{primary}} = E_0 + \text{Period} \times \text{Cycle Number} \quad (\text{Equation 1})$$

$$T_{\text{secondary}} = E_0 + \text{Period} \times (\text{Cycle Number} + 0.5) \quad (\text{Equation 2})$$

Where $E_0 = 2459041.5755$ (BJD) is the adopted primary eclipse zero epoch, and $\text{Period} = 0.4271901\text{d}$. A constant orbital period would result in a straight line. Instead, we have an upward parabola indicating the period is monotonically increasing, usually interpreted in terms of mass transfer between the component stars or mass loss from the system [5].

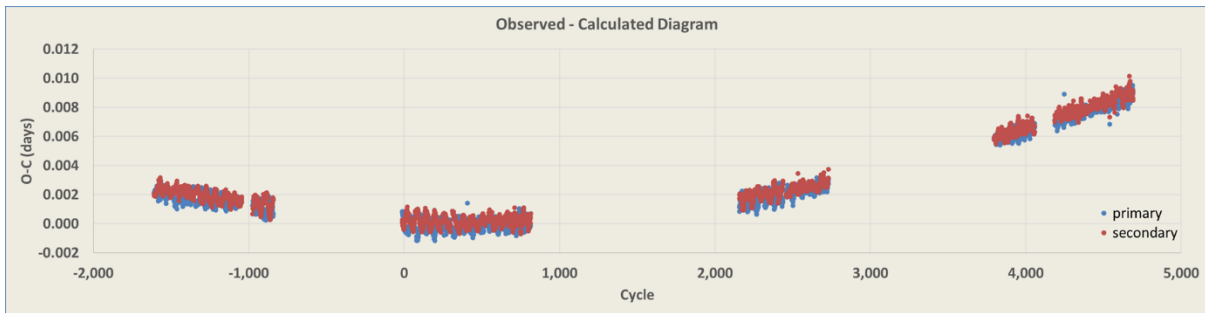


Figure 4: *Observed – Calculated diagram from TESS observations between Aug 2018 and Jan 2026.*

Conclusions

Long time-base observations from the Transiting Exoplanet Survey Satellite reveal cyclical brightness variations in the AP Doradus system additional to its eclipsing binary light curve. These probably result from mass flow between and/or around the two stars in the system, however plausible physical models need to be developed. AP Doradus is not unique in displaying these cyclical variations, work is progressing to identify other examples.

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NACAA XXXII, Tamworth 2026

Mark Blackford, Congarinni Observatory

The recent Easter weekend saw astronomy enthusiasts from around Australia and New Zealand converge on the NSW regional city of Tamworth for the 32nd National Australian Convention of Amateur Astronomers (NACAA). I don't know the actual number of participants but there appeared to be about 60 in the venue with others attending remotely. It was great to catch up with colleagues from previous NACAA's and meet new people doing great things in astronomy.

Several other Variable Stars South members were at the meeting, including John and Aline Homes, Col Bembrick, Roy Axelsen, Jeff Byron, David O'Driscoll and Steve Kerr.

The Tamworth Regional Astronomical Club (TRAC) hosted the conference, held in the auditorium of the West's Diggers Club. David O'Driscoll, as NACAA General Secretary and Program Chair was heavily involved in preparations for the meeting and also chaired the conference. In her keynote address Marnie Ogg, founder of the Australasian Dark Sky Alliance, outlined efforts to improve lighting regulations to protect our night skies and establish Dark Sky Places. She is optimistic for the future.

Two further speakers touched on aspects of night sky brightness. Ken Grant's talk "Long Baseline Sky Darkness Measurements: A Statistical Approach" presented a more rigorous approach to sky brightness measurement than the current rather ad hoc approach. Astrotourism as a vehicle for educating communities about light pollution was the topic of Donna Burton's presentation.

Ken Grant's second talk described the establishment of the Swan Reach Observatory through a generous donation from a local business owner. The 70cm research-grade corrected Dall-Kirkham telescope (Planewave CDK700) housed in a large slide off roof building will be used for research and public viewing. SRO is about 2 hrs northeast of Adelaide in the River Murray Dark Sky Reserve and enjoys some of the clearest, darkest skies in South Australia.

Robotic telescopes accessible via the internet from almost anywhere in the world are becoming increasingly available for education, outreach and research. Andrew Yen and Michael Fitzgerald gave an overview of the development of the technology and the current state of play of their NextAstro observatory control system. NextAstro can control your own local telescope, or other telescopes around the world. For those of us hampered by local weather conditions it might be worth subscribing to such a global telescope network.

Of particular interest was Joe Cali's excellent presentation on "Continued enjoyment of visual observing with age-related deterioration of eyesight" in which he described his own experiences. Instead of trying to sum up the talk here, I refer the interested reader to Joe's website where you can find a series of files used in his presentation (<https://joe-cali.com/NACAA/>).

Surjit Wadhwa gave a highly entertaining account via Zoom, of his journey from amateur astronomer with an interest in contact binary stars to being awarded a PhD for his research into red nova progenitors. That was followed by Roy Axelsen's nostalgic reflection on his two decades of amateur astronomical activities, from visual variable star observing through PEP, DSLR and finally CMOS photometry.

Andrew Wendelborn summarised current variable star and occultation activities within the Astronomical Society of South Australia. These included the detection of an outburst of a flare star by Jake Lancaster, Seestar smart scopes for VSO by Andrew Murphy and David Benn and Robert Jenkins' maintenance of the Bob Nelson Eclipsing Binary O-C database.

The Perdrix Address was presented by David O'Driscoll in which he spoke on the lasting effects on astronomy club meetings and conferences such as NACAA of the COVID pandemic, particularly the adoption of remote participation via streaming services.

Stephen Kerr gave the final talk of the conference on how changes in technology and science objectives have impacted occultation observing in recent years. Satellite astrometry has vastly increased the number of small asteroids with precise orbits and the accuracy of predicted occultation paths. The Twentieth Trans-Tasman Symposium on Occultations was held on Easter Monday.

NACAA officially wrapped up with the farewell BBQ held at the very impressive Tamworth Astronomy and Science Centre on the outskirts of Tamworth. This is the home of Tamworth Regional Astronomical Club (TRAC) with one dome and two roll-off roof observatories. The large building contains lecture facilities, geological and paleontological specimens and space related displays. I highly recommend a visit if you are in the area.

The next NACAA will be held over Easter 2028 (April 14-17), hosted by the Canberra Astronomical Society.



BSN-VI: Multiband Light Curve Modeling of Four W UMa-Type Contact Binaries. I. Revisiting Energy Transfer Mechanisms and Luminosity Behavior

Sarvari, Elham; Poro, Atila; Michel, Raul; Pala, Anna Francesca; Tanriver, Mehmet; Bulut, Ahmet; Keskin, Ahmet; Blackford, Mark G.

Abstract

We presented the first high-precision, detailed photometric analysis of four W Ursae Majoris (W UMa)-type contact binaries, Linear 10772300, Linear 11150338, Linear 20372537 and DM Cir. In addition to ground-based multiband photometric observations, data from the Transiting Exoplanet Survey Satellite were employed for the analysis of the DM Cir system. New ephemeris and linear fit to the O—C diagrams were derived using extracted times of minima and additional literature. The light curve modeling was performed using the PHysics Of Eclipsing BinariEs Python code and the BSN application, employing a Markov Chain Monte Carlo approach. In each systems, the two stellar components exhibited minimal temperature differences ($\Delta T < 150$ K), confirming efficient energy exchange within their common convective envelopes. Absolute parameters were estimated using the Gaia Data Release 3 (Gaia DR3) parallax and astrophysical equations. Based on effective temperatures and component masses, two systems were classified as W-subtype systems, while others belonged to the A-subtype. We computed the initial masses of the primary (M1i) and secondary (M2i) components for four target systems using a method based on the observational properties of overluminous secondary components. We found initial primary masses in the range $0.6\text{--}1.0M_{\odot}$ and initial secondary masses in the range $0.9\text{--}1.7M_{\odot}$ with mass loss $< 1.0M_{\odot}$. We investigated the relative energy transfer rates (U1 and U2) and nuclear luminosities (L10 and L20) based on the physical parameters of 411 W UMa-type contact binaries, including the four systems analyzed in this study, through wide range of mass ratios. The results for all systems provided a comprehensive view of energy transfer behavior throughout different evolutionary stages of contact binaries.

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Pub Date: March 2026

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arXiv: arXiv:2602.12864

Stellar structure and rates of stellar precession

Inlek, G.; Budding, E.

Abstract

We investigate the detectability and behaviour of spin—axis precession, applying classical formulae to twelve close binary systems (α CrB, AR Cas, FT Ori, QX Car, AI Hya, AG Per, V526 Sgr, V346 Cen, YZ Cas, MY Cyg, β Aur, RZ Cha), for which recent data have been published (Berkowitz, 2024). Using EZ-Web ZAMS models together with an extended version of the RADAU code, we computed internal structure parameters k_2 , gyration radii β , and mechanical ellipticities ϵ_m from which corresponding theoretical precession ratios (P/U) can be derived. Comparison with long-term photometric inclination changes $|\Delta i|$ reveals a clear physical trend: systems with high precessional rates and relatively large masses (e.g., QX Car, AR Cas, AI Hya) exhibit the largest inclination variations, whereas older and more evolved systems (such as FT Ori and α CrB) show significantly weaker signatures. In all cases, the observed $|\Delta i|$ values lie systematically below the corresponding ZAMS predictions, consistent with increasing central concentration, reduced mechanical ellipticity, and progressive tidal damping as the stars evolve. Overall, the results show that spin—axis precession is not only detectable in young massive

binaries, but its amplitude directly traces their internal structure, underscoring precession's potential as a powerful diagnostic for probing stellar interiors and guiding future evolutionary modelling.

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V570 Per: Characterization of a Benchmark Eclipsing Binary

Yücel, Gökhan; Alan, Neslihan; Banks, Timothy; Canbay, Remziye; Bakış, Volkan; Bilir, Selçuk

Abstract

This study presents a comprehensive analysis of the detached binary system V570 Per through combined photometric, spectroscopic, and astrometric observations. By disentangling the composite spectra, precise fundamental parameters and detailed chemical abundances were determined for both stars. The primary component has a mass of $1.4569-0.0100+0.0094 M_{\odot}$, a radius of $1.543-0.009+0.012 R_{\odot}$, an effective temperature of $6556-26+64$ K, and a metallicity of $+0.18-0.01+0.03$ dex, while the secondary has a mass of $1.3579-0.0089+0.0094 M_{\odot}$, a radius of $1.377-0.015+0.013 R_{\odot}$, an effective temperature of $6468-21+32$ K, and a metallicity of $+0.15-0.01+0.02$ dex. The system is estimated to be $577-60+60$ Myr old with a synchronized orbit. The available O – C data imply a minimum mass of $0.57 M_{\odot}$ or $0.11 M_{\odot}$ for the third body, corresponding to eccentric and circular orbits, respectively. MESA evolutionary models indicate that the primary will fill its Roche lobe and begin mass transfer to the secondary in about 2.8 Gyr, whereas the secondary will reach the terminal-age main sequence in approximately 3.2 Gyr. The chemical composition of both stars shows remarkable consistency, confirming their common origin, except for calcium, which is significantly enhanced in the primary. Line measurements support this difference and are therefore interpreted as an intrinsic abundance variation rather than an artifact of the analysis. The overall solar-rich metallicity, combined with a relatively low α -element content, links V570 Per to the Galactic thin-disk population. In addition, Galactic orbit analyses of open clusters in the solar neighborhood have revealed that the V570 Per system may have originated from the Melotte 25 open cluster.

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arXiv: arXiv:2511.14830

FQ Circini: An Ordinary Nova with a High-mass B1 V(n)(e) Companion Whose Decretion Disk Transfers Mass to the White Dwarf via Roche–Lobe Overflow

Schaefer, Bradley E.; Pearce, Andrew; Love, Tom; Shara, Michael M.; Townsend, Lee; Murphy, Simon J.; Corbally, Christopher J.

Abstract

FQ Cir was an ordinary fast He/N classical nova, peaking at $V = 10.9$. The pre-eruption and post-eruption counterpart was at $V = 14.0$, making this the smallest known classical nova amplitude, 3.1 mag. The nova light and the counterpart coincide at 0." 034, and the counterpart is a rare hot/blue emission-line star with flickering, so the identification of the quiescent nova is certain. The counterpart is a weak Be main-sequence star, B1 V(n)(e). A coherent photometric period appears in all four TESS Sectors and in the AAVSO post-eruption light curve, as ellipsoidal modulation with an orbital period of 2.041738 days. The companion must have been spun up to a fast rotation, and like all Be stars, a decretion disk is exuded. With the constraints of the blackbody radius and the main sequence, the companion mass is $13.0-0.5+0.2 M_{\odot}$, with radius $6.2 \pm 0.2 R_{\odot}$. This is the discovery of a cataclysmic variable with a high-mass companion, a new class that we call "high-mass cataclysmic variables." The white dwarf mass is $1.25 \pm 0.10 M_{\odot}$ and must have an accretion disk that supplies fuel for the nova eruption. FQ Cir represents a new mode of accretion in interacting binaries, with Roche lobe overflow from the decretion

disk feeding mass into the usual accretion disk around the white dwarf, for disk-to-disk accretion. From the mass budget of the binary, the primary star must have its initial mass be $>7.7 M_{\odot}$, forming an ONe white dwarf, so FQ Cir can never become a Type Ia supernova.

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arXiv: arXiv:2511.16594

About

Variable Stars South is an international association of astronomers, mainly amateur, interested in researching the rich and under-explored myriad of southern variable stars.

Renamed from the Variable Star Section of the Royal Astronomical Society of New Zealand, it was founded in 1927 by the late Dr Frank Bateson, OBE, and became the recognised centre for Southern Hemisphere variable star research.

VSS covers many areas and techniques of variable star research, organised into projects such as Beginners' Visual Observations and Dual-Maxima Miras. The goal of each project is to obtain scientifically useful data and results. These may be published in recognised journals or supplied to international specialist data collection organisations.

VSS is entirely an internet based organisation, working through our website <http://www.VariableStarsSouth.org> and its e-group <http://groups.google.com/group/vss-members>. It also encourages members to work with major international organisations such as the British Astronomical Association, the Center for Backyard Astrophysics, and the American Association for Variable Star Observers.

To find out more, please visit our website, where, incidentally, you will find PDF copies of all our newsletters. Our website has a great deal of information for VSS members, and for anyone interested in southern hemisphere variable star research. All VSS project information and data is kept here too.

Who's who

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Publication dates are January, April, July, and October, nominally on the twentieth day of these months and the copy deadline is the thirteenth of the month though earlier would always be appreciated.

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