RASNZ

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OCCULTATION SECTION

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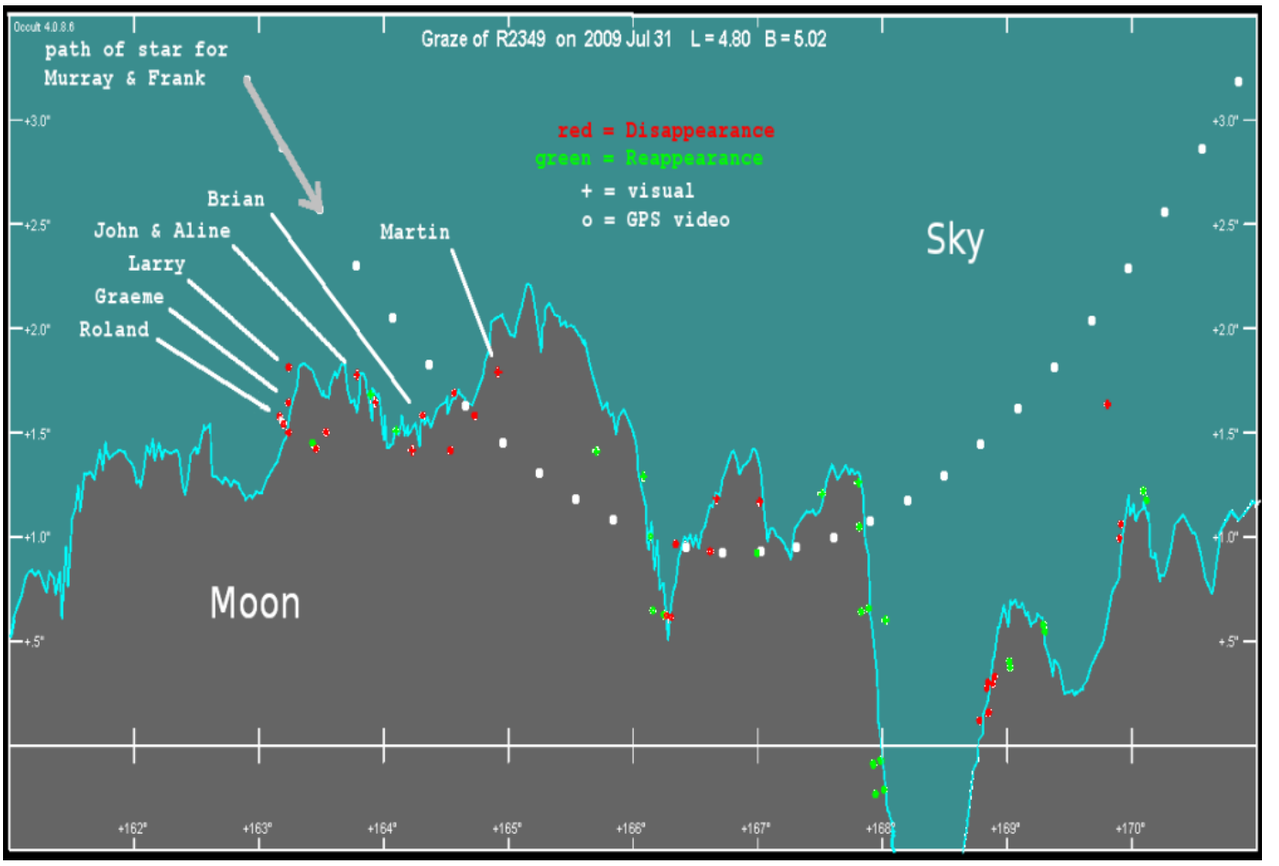

Lunar limb Profile produced by Dave Herald's Occult program showing 63 events for the lunar graze of a bright, multiple star ZC2349 (aka Al Niyat, sigma Scorpi) on 31 July 2009 by two teams of observers from Wellington and Christchurch. The lunar profile is drawn using data from the Kaguya lunar surveyor, which became available after this event. The path the star followed across the lunar landscape is shown for one set of observers (Murray Forbes and Frank Andrews) by the trail of white circles. There are several instances where a stepped event was seen, due to the two brightest components disappearing or reappearing. See page 61 for more details.

Visit the Occultation Section website at http://www.occultations.org.nz/

Newsletter of the Occultation Section of the Royal Astronomical Society of New Zealand

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From the Director

This is the first Circular of the 2013 subscription year but contains details of all observational reports submitted to the end of the 2009 calendar year. We hope to have a further Circular containing some 2010 data out later in the year as we slowly catch up to our normal publication schedule.

As it is a new subscription year subs are now due. Subs have been set at $NZ 35.00 for the 2013 calendar year. The previous (printed) Minor Planet Circulars (CA series) has been discontinued as what's on the Section's website fulfils the same function. However the RASNZ/OS is now the *de facto* Australasian section of the *International Occultation Timing Association* (IOTA), and as such financial members of the RASNZ/OS are entitled to receive the *Journal for Occultation Astronomy* (JOA). This is published quarterly by IOTA/European Section. Note that under this arrangement publication of the JOA is being financially supported by the RASNZ/OS. Both the JOA and our Circulars are available as downloadable PDF files from a secure area of our website. The login and password will be supplied to members upon their subscription renewal.

On a personal note, a few of you will be aware that the last couple of years have been difficult for me. In March 2011 I was diagnosed with stage IV renal cell carcinoma (terminal kidney cancer) and have since that time been on an advanced drug which has largely worked spectacularly well in controlling the spread of the cancer. However this is not expected to continue indefinitely and at some point – probably within the next year - I will relinquish the Directorship of the Section. At that time a new Director will be appointed by the RASNZ Council. I will be in email contact with each of you prior to the time I choose to step down.

At this time I would like to thank all those who have contributed to the smooth running of the Section over the past year, with a special thanks to Murray Forbes for working so diligently on the production of this Circular.

Graham Blow

NOTICES

Seventh Trans-Tasman Symposium on Occultations

As I hope you are all well aware, the Seventh Trans-Tasman Symposium on Occultations (TTSO7) will be held over Monday and Tuesday May 27/28 in Invercargill immediately following the RASNZ Conference. The meeting will be very well-attended, and the programme features items designed to appeal to both new and advanced observers alike. A highlight will be the launch of the new Astronomical Digital Video System – see www.astrodigitalvideo.com.au for details.

If you intend to attend this meeting – and the preceding RASNZ Conference – then please register immediately as places are filling fast. The registration form for both the Conference and TTSO7 can be accessed from the TTSO7 web page at: www.occultations.org.nz/meetings/TTSO7/index.htm . Please note that accommodation is becoming limited owing to the Bluff Oyster Festival which is also being held over that period. If you would like to make a presentation to either the RASNZ or TTSO7 meetings then please contact the conference conveners as soon as possible so that your contribution can be scheduled. The following contributions have been received to date:

John Talbot	Recent successful asteroidal occultations in our region in the past year.
Murray Forbes	A Grazing Lunar Occultation on 22 September 2012.
Dave Gault	ADVS - An Overview
Dave Gault & Tony Barry	ADVS - A Demo
Dave Gault & Tony Barry	ADVS - a demo at night (weather permitting)
Greg Bolt	Using SEXTA to validate ADVS
Dave Gault	The ABCs of GPS based observing
John Talbot	Jovian Extinction Events, JEE2012 Observing Campaign Preliminary Results
John Talbot	Prepointing
Murray Forbes	How to get Predictions for Occultations
Willam Hanna	My start in observing occultations
John Talbot	The Process of Recording and Reducing Occultation Results
Jacquie Milner	Observing Occultations Using Video: A Beginners Guide
Brian Loader	Occultation Observations for 2011 and 2012
Brian Loader	How to report lunar occultations
Brian Loader	Using Limovie to measure your observations
John Broughton	Asteroid Dimensions from Occultations
Martin Unwin	The 2012 Transit of Venus from Mussel Point Observatory
Jonathon Bradshaw	depth of magnitude verses field of view
Steve Kerr	An introduction to occultations
Steve Kerr	An introduction to integrating video cameras
Steve Kerr	Mighty-Mini's
Chris Chad	The Samsung security camera as an occultation video camera
Tony Barry	An introduction to the technical aspects of video

Graham Blow & Murray Forbes

*** IMPORTANT NOTICE RE REPORT FILE NAMING ***

Effective immediately, there are some important changes to the way MP reports and ancillary files should be named. These changes are being made to make it easier for us to catalogue results and to ensure that all the files pertaining to an event end up in the same place without too much additional work on our part. Although a naming standard has been in place, in many cases observers have not been using it. Also, often observers will send an .xls file containing relevant information in the filename, but a csv or lightcurve file simply labelled "lightcurve.lc" or "Ceres.csv" with no date, observer or star name – and often no planet name either!

From now on we request that ALL FILES associated with an event should be reported using the following naming standard (including the underscores "_" where indicated):

<YYYYMMDD>_<Ast#>_<AstName>_<StarCat>_<Star#><+/-><ObserverName>_<St#>_<Ev#>_<Comment>.<FileExtension>

where:

<YYYYMMDD>	= the year using all four digits, month and day
<Ast#>	= the asteroid's number
<AstName>	= the asteroid's name
<StarCat>	= the star's catalog (e.g. 'TYC', 'HIP', 'UCAC4')
<Star#>	= the star's number in the catalog in the appropriate format
<+/->	= a positive (+) or negative (-) event (Note: Not <+/_>)
<St#>	= Observing site 1, 2, or 3 etc for one observer using multiple sites; may be omitted if not applicable.
<Ev#>	= Event number, for use with double stars, binary asteroids, etc; may be omitted if not applicable.
<Comment>	= Anything about the observation that needs to be especially flagged
<FileExtension>	= .xls, .lc, .csv, .jpg, .gif, .png etc

So some example valid report names might be:

20130412_705_Erminia_UCAC2_15977111-Loader.xls	(a negative event)
20130412_705_Erminia_UCAC2_15977111+Blow_St1.xls	(Observation made at Site 1 of 2)
20130110_1796_Riga_HIP_159771+Loader_Ev2.xls	(Event 2 of multiple events)
20130311_211_Isolda_UCAC3_222-060280+Broughton_St2_Ev2.xls	
20130315_9_Metis_TYC_1597-71116-1+Loader_St1.lc	(Site 1 Tangra lightcurve file)
20130228_12_Victoria_HIP_59711+Loader_TangraLC.png	(Graphic of the Tangra lightcurve)
20130228_12_Victoria_HIP_59711+Talbot_Limovie.csv	(CSV output of Limovie)

We are aware that OccultWatcher does not currently include the asteroid name in its report template, but our preference is for this to be inserted manually.

NOTE: Please always fill out a report form, even if you did not see an event. Your negative observation could be crucial in determining where the event did occur. Reports should, where possible, be submitted by email using the Microsoft Excel report form available from our website.

Please email reports to John Talbot (john.talbot@xtra.co.nz) with a cc: to Graham Blow (Graham@occultations.org.nz)

Observing Occultations using Video: A Beginner's Guide

Around the time you receive this Circular we expect to have available an almost-complete version of the Video Occultation Manual, a comprehensive guide to getting started observing occultations using video gear. Jacquie Milner has been working over the past two years to prepare this, and it will be available for download from our website before the end of April. We would like as many people as possible to download and read this before the TTSO7 meeting at the end of May so that an informed discussion can take place about what it includes and any areas that require additional explanation or coverage. Please keep an eye on our website for the link which will appear there shortly.

Statistics for all attempted observations of Minor Planet Occultations during 2009

Positive Observations (chords) by Observer

Allen, B.....2	Kerr, S.....6	Pavlov, H..... 6
Anderson, P.....1	Litwiniuk, P.....1	Purcell, P..... 3
Bradshaw, J.....6	Loader, B..... 8	Quirk, S.....2
Broughton, J..... 8	Lowe, D..... 3	Russell, S..... 4
Gault, D..... 10	Mckay, G..... 1	Watson, D..... 1
Greenhill, J.....1	Napier-Munn, T..... 1	Wyatt, C.....4
Herald, D..... 6	Parker, S.....3	

Total number of positive observations by observer for 2009 = 77

Negative Observations (Monitored Appulses) by Observer

Adamson, F.....1	Gault, D..... 14	Purcell, P..... 1
Allen, B.....2	Herald, D..... 24	Quirk, S.....8
Anderson, P.....6	Idaczyk, R.....1	Russell, S.....3
Betts, J..... 1	Kerr, S.....14	Talbot, J..... 1
Blow, G.....2	Loader, B..... 48	Watson, D..... 6
Bobroff, P./Kinsley, L..... 1	Lowe, D..... 5	Wyatt, C.....6
Bradshaw, J.....38	Mckay, G..... 1	
Brakel, A.....4	Parker, S.....1	
Broughton, J..... 30	Pavlov, H..... 13	
Butt, T..... 1	Pennell, A.....1	

Total number of negative observations by observer for 2009 = 233

Total number of attempted occultations for the year = 190

Total number of occultations with no positive observations = 144 = 76% of 190
Total number of occultations with at least one positive observation = 46 = 24% of 190

Average number of positive observations for all occultations = 77 / 190 = 0.40
Average number of positive observations per successful occultation = 77 / 46 = 1.67

The total number of occultations with at least one positive observation for the entire world is 211 (D. Herald, IOTA Digest 5334), so our region contributed 22% (= 46 / 211) of these.

Links and References

This Circular contains several references to websites. The more frequently used links are listed below with the full name of the website, URL and the abbreviation that will be used as the reference.
For readers receiving the Circular in electronic (pdf) format, click on the link to open the web page in your browser. In addition, email addresses can also be clicked to generate a pre-addressed email.

Abbrev.	Full Name	Base URL
<MPC>	Minor Planet Center	www.minorplanetcenter.org/iau/mpc.html
<DAMIT>	Database of Asteroid Models from Inversion Techniques	astro.troja.mff.cuni.cz/projects/asteroids3D/
<ISAM>	Interactive Service for Asteroid Models	isam.astro.amu.edu.pl/
<CoR>	Rotation Curves of	translate.google.com/translate?hl=en&sl=fr&u=

Total and Grazing Occultations of Bright Stars in 2013

Dennis Lowe has taken over the task of preparing lists of bright total lunar occultations visible from major cities in Australia and New Zealand over the next year, while Brian Loader has continued to prepare maps and annotations showing the paths of bright grazing occultations over both countries. Please check out these items on our website now.

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Observational Reports: Events to December 2009

NOTE: Please always fill out a report form, even if you did not see an event. Your negative observation could be crucial in determining where the event did occur. Reports should, where possible, be submitted by email using the Microsoft Excel report form available from our website.

Email reports to John Talbot (john.talbot@xtra.co.nz) with a cc: to Graham Blow (Graham@occultations.org.nz)

(776) Berbericia **TYC 2419-00637-1** **2009 January 06**

- C. Wyatt — Tenterfield, NSW — Longitude: +151° 55′ 54.4″ — Latitude: -28° 57′ 15.4″ — Altitude: 827 m — D at 14:47:56.12 — R at 14:48:05.71 — Duration: 9.59 secs — Monitored: 14:40:00 to 14:56:20 — **VISUAL**

Observer's comments: Thin cloud kept moving in and out of the FOV whilst observing. I sketched the star field of the star/asteroid and could see a definite split between them until cloud intervened at 14 h 28 m UT. The cloud broke in the region of the target star about four minutes before the occultation occurred. I used a comparison star in the FOV to determine if the target star had in fact been occulted or if it was cloud interference; the occultation occurred without cloud interference.

- D. Lowe — Leyburn, QLD — Longitude: +151° 34′ 2.66″ — Latitude: -27° 58′ 58.3″ — Altitude: 416 m — D at 14:47:55.12 — R at 14:48:07.92 — Duration: 12.80 secs — Monitored: 14:47:22 to 14:49:14 — **VIDEO**

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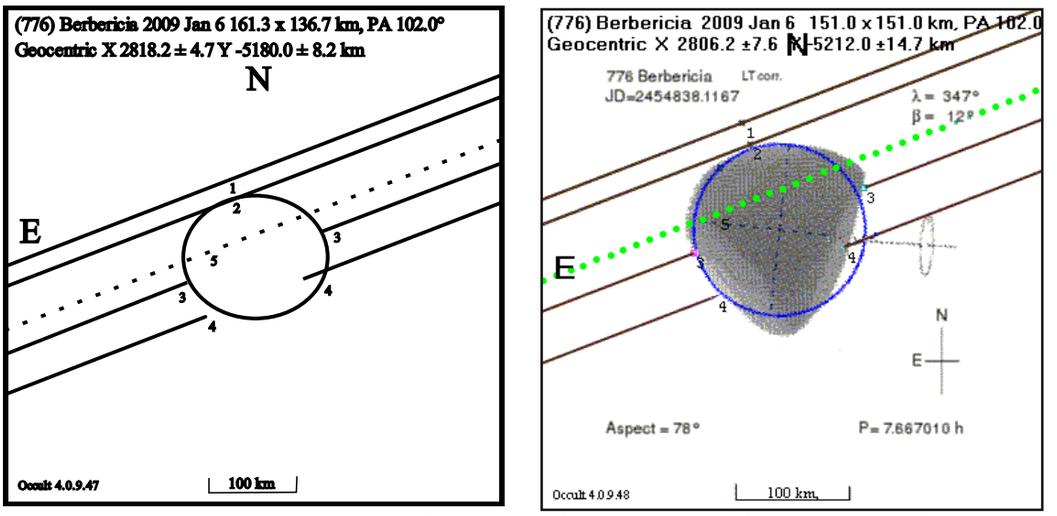
- J. Broughton Reedy Creek, QLD 14:47:26 to 14:48:26
- J. Broughton Brunswick Heads, NSW 14:47:13 to 14:49:35



Key to Plots: 1. J. Broughton, Reedy Creek (miss); 2. J. Broughton, Brunswick Heads (miss); 3. D. Lowe; 4. C. Wyatt; 5. Predicted, 24 Dec 2008.

Discussion: Positive observations were recorded by Chris Wyatt, who was observing visually, and Dennis Lowe, using a video camera with a GPS based time insertor. The ellipse (above left) uses the eccentricity given by <CoR>page2cou.html and has been adjusted to have the same area as a circle with the expected 151 km diameter. With the two chords and as Dennis's chord is longer than the expected maximum chord, we can be fairly sure that he was close to the central line of the event. This makes Chris's times appear about 1.5 secs out. However looking at a 3D model of Berbericia derived from lightcurve data (<DAMIT>data/archive/1-1000/A194.M251.shape.png), the first shape shown is rotated and overlaid on to the plot of the observed data (above right) and gives a better fit to Chris's times than the elliptical profile. This illustrates the importance of deriving the profile from the observed data rather than forcing the data to fit a pre-conceived profile (in this case, by avoiding the temptation to adjust Chris's chord by 1.5 secs to match the ellipse).

(145486) 2005 UJ438 **UCAC2 39804796** **2009 January 17**

- B. Loader Darfield, NZ 11:40:30 to 11:53:30
- H. Pavlov Marsfield, NSW 11:43 to 11:53

(558) Carmen **UCAC2 36468538** **2009 January 17**

- D. Gault Hawkesbury Heights, NSW D at 16:35:39.7 **VIDEO**
  Longitude: +150° 38′ 27.8″ R at 16:35:44.8
  Latitude: -33° 39′ 52.0″ Duration: 5.1 secs
  Altitude: 286 m Monitored: 16:15 to 16:50

Observer's comments: The main telescope was the 10" Newtonian, but I had the 8" SCT set up and running. The 8" was located approximately 10 m from the 10". The event was observed with both systems but the 10" had better S/N.

- H. Pavlov Marsfield, NSW D at 16:35:37.23 **VIDEO**
  Longitude: +151° 06′ 13.00″ R at 16:35:41.71
  Latitude: -33° 46′ 16.00″ Duration: 4.48 secs
  Altitude: 110 m Monitored: 16:20 to 16:39

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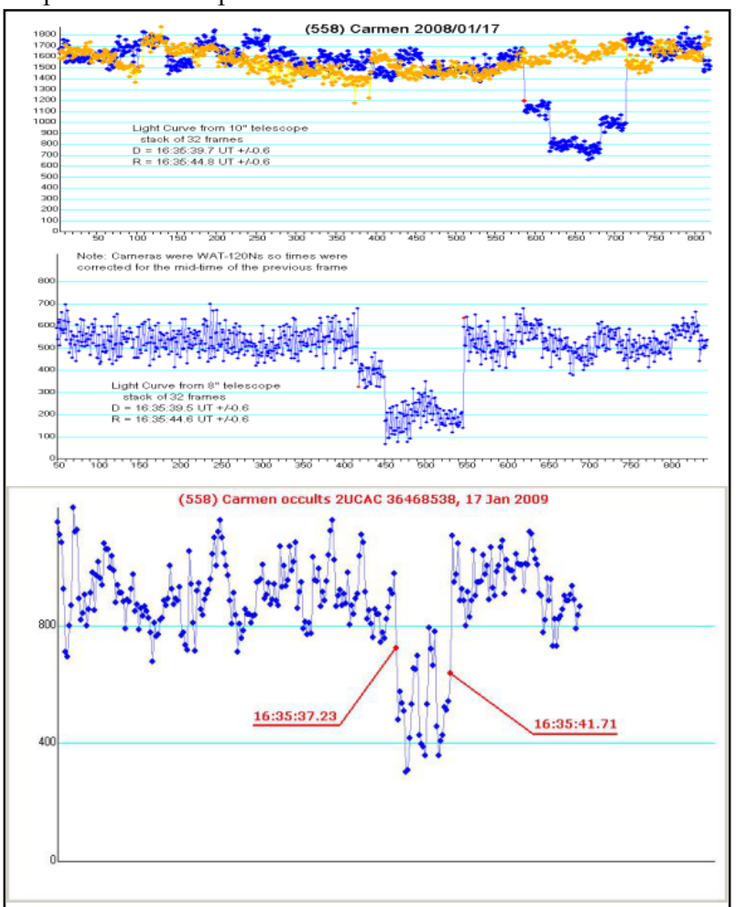
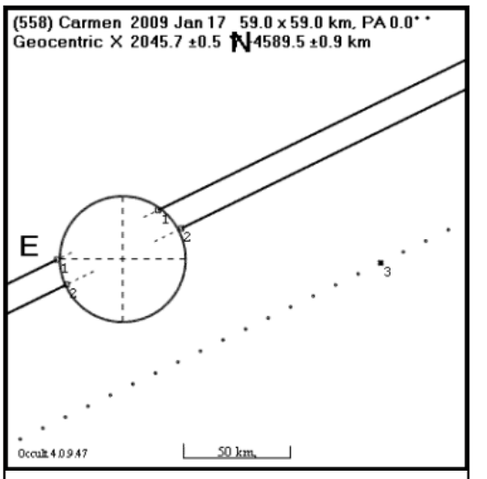
Observer's comments: Recorded using the WAT-120N+ with 16 frame (0.32 sec) integration corresponding to x5 level.
http://www.hristopavlov.net/Observations/Positives/2009-01-17%20Carmen/Event.html



The top two figures (above left) show the lightcurves from two cameras that Dave Gault was using at the same site. The top figure also includes a comparison star (the yellow points). Note: the frame counts from each light curve do not start at the same time. The bottom figure is Hristo Pavlov's lightcurve.



Key to plot:
1. H. Pavlov;
2. D. Gault;
3. Prediction 08 Jan 2009.

Discussion: Positive observations were recorded by Dave Gault and Hristo Pavlov, both using video systems with GPS based time insertors. The apparent steps in Dave's lightcurves (most noticeable in the top lightcurve) are actually the results of the in-camera integrations. The circle above is plotted at the expected 59 km diameter of Carmen. With two chords we have some confidence that Dave was close to the central line of the event.

(154) Bertha	**HIP 74591**	**2009 January 24**
• A. Pennell	Beverly Begg Obs, Dunedin, NZ	14:15:30 to 14:17:30
• B. Loader	Staveley, NZ	14:12:30 to 14:20:00

(13) Egeria	**HIP 54491**	**2009 January 29**	
• P. Litwiniuk	Pakenham, VIC	D at 15:09:57.4	**VIDEO**
	Longitude: +145° 29′ 00″	R at 15:10:19.5	
	Latitude: -38° 04′ 02″	Duration: 22.1 secs	
	Altitude: 62 m	Monitored: 15:03:30 to 15:13:35	

Observer's comments: The air was quite turbulent and unsteady at the low altitude (14 degrees) of the target star, which also appeared slightly fainter than expected. The timings were collected using the frame-by-frame advance of a VCR deck. The reappearance has a large uncertainty because I

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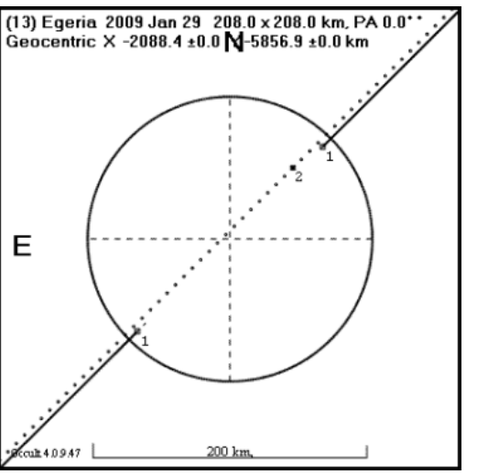
accidently recorded over it before obtaining a more precise value.

Discussion: A 22.1 second occultation was recorded by Peter Litwiniuk. Peter's times are less precise than normally found in a video observation, as explained in his 'observer's comments' above. The circle (right) is plotted at the expected 208 km diameter of Egeria.



Key to plot:
1. P. Litwiniuk;
2. Prediction 22 Jan.

(271) Penthesilea **TYC 1397-00920-1** **2009 January 29**

• J. Bradshaw	Samford Valley, QLD	D at 12:56:10.22	**VIDEO**
	Longitude: +152° 52′ 22.68″	R at 12:56:14.78	
	Latitude: -27° 21′ 22.80″	Duration: 4.56 secs	
	Altitude: 95 m	Monitored: 12:48 to 13:00	

Observer's comments: Clear and steady using GSTAR-EX with 2x integration and Gamma 6. Subtracted 20 ms from frame values. A late gradual dimming is seen in the light curve with a corresponding gradual brightening toward the end of the reappearence indicating a possible close double star. http://www.youtube.com/watch?v=V1qsU4ysURE

• J. Bradshaw	Samford Valley, QLD	D at 12:56:10.26	**VIDEO**
	Longitude: +152° 52′ 22.68″	R at 12:56:14.86	
	Latitude: -27° 21′ 22.80″	Duration: 4.60 secs	
	Altitude: 95 m	Monitored: 12:48 to 13:00	

Observer's comments: This is the second component of the (possible) double star.

• P. Anderson	The Gap, Brisbane, QLD	D at 12:56:11.2	**VISUAL**
	Longitude: +152° 55′ 57.9″	R at 12:56:14.6	
	Latitude: -27° 27′ 42.3″	Duration: 3.4 secs	
	Altitude: 170 m	Monitored: 12:54:30 to 12:58:00	

Observer's comments: Was checking the field when the star disappeared (silly). When it re-appeared it was about 1/3 brightness for half a second then jumped to full brightness - stepped reappearance. Time quoted is first reappearance. Disappearance is 'certainty 2' only because of distraction.

• T. Napier-Munn	Bellbowrie, QLD	D at 12:56:08.0	**VISUAL**
	Longitude: +152° 53′ 7.52″	R at 12:56:12.3	
	Latitude: -27° 33′ 29.47″	Duration: 4.3 secs	
	Altitude: 52 m	Monitored: ??	

Observer's comments: The event happened between 10:56 pm and 10:57 pm (12:56 UT and 12:57 UT) and only the duration was timed, as approximately 4.3 sec.

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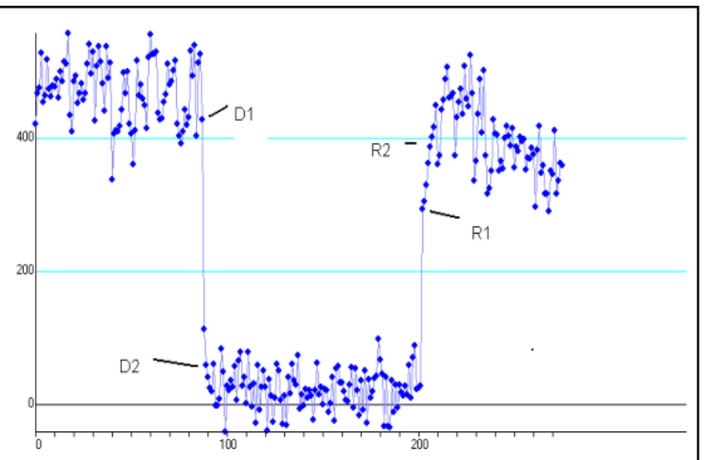
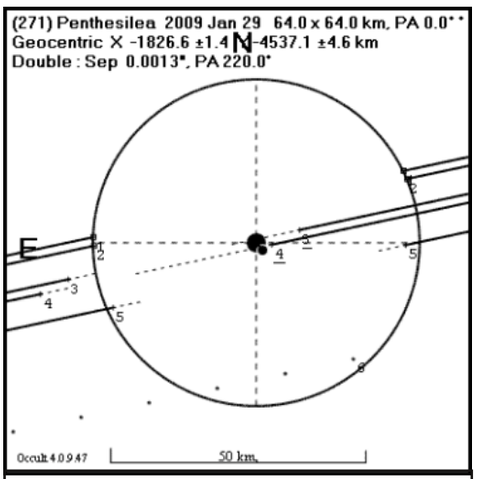


The figure above shows the light curve of Jonathan Bradshaw's observation which shows both D and R being slow and with the points chosen to represent the times labelled 'D1' etc.



Key to plot:

1. J. Bradshaw;
2. J. Bradshaw (secondary star);
3. P. Anderson;
4. P. Anderson (secondary star);
5. T. Napier-Munn;
6. Prediction.

Discussion: Three positive events were observed for this occultation. The circle (above right) is plotted at the expected 64 km diameter of Penthesilea. With three chords it is reasonable to say that the central line of the event was close to Peter Anderson's visual observation. Both Peter and Jonathan Bradshaw reported a slow reappearance. If this was caused by a double star, then from analysis of Jonathan's light curve (above left), the separation would only be 1.3 milliarcseconds and the Position Angle 220°. With the star's magnitude given as 11.8 and the asteroid (the bottom of curve) as 13.9 then the secondary star would be about magnitude 14.2.

(84) Klio	**UCAC2 32381342**	**2009 February 05**	
• B. Loader	Darfield, NZ	16:12 to 16:18	

(444) Gyptis	**UCAC2 31864315**	**2009 February 06**	
• B. Allen	Blenheim, NZ	D at 15:44:21.66	**CCD**
	Longitude: +173° 50′ 21.37″	R at 15:44:30.87	
	Latitude: -41° 29′ 30.05″	Duration: 9.21 secs	
	Altitude: 38 m	Monitored: 15:44:19 to 15:45:04	

Observer's comments: Datum NZ1949 (topographical map). Very good observing conditions, temperature 19.6° with NW breeze. Half moon setting. Automatic synchronisation of beeper box with BeeperSync to msltime1.irl.cri.nz

• D. Gault	Hawkesbury Heights, NSW	D at 15:46:23.94	**VIDEO**
	Longitude: +150° 38′ 27.8″	R at 15:46:33.44	
	Latitude: -33° 39′ 52.0″	Duration: 9.50 secs	
	Altitude: 286 m	Monitored: 15:45:40 to 15:47:10	

Observer's comments: Also tried to observe at a mobile station but messed up finding the target.

• H. Pavlov	Erskine Park, NSW	D at 15:46:23.37	**VIDEO**
	Longitude: +150° 46′ 56.75″	R at 15:46:32.93	
	Latitude: -33° 49′ 54.22″	Duration: 9.56 secs	
	Altitude: 77 m	Monitored: 15:39:45 to 16:48:25	

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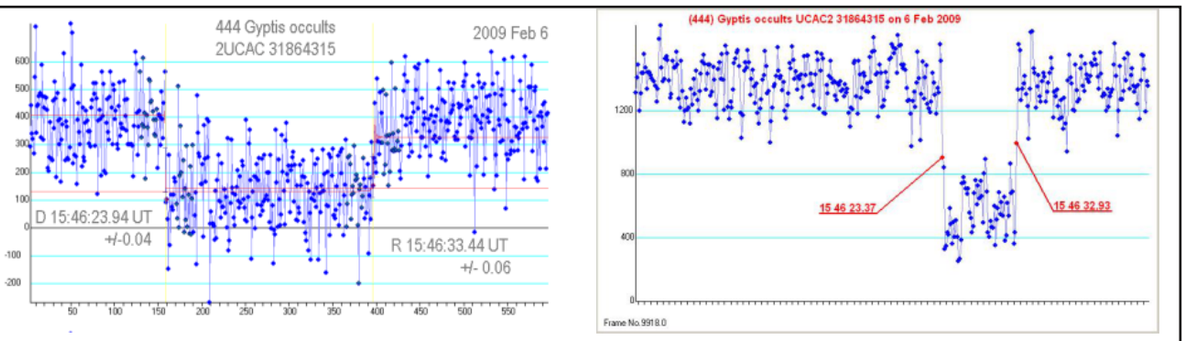
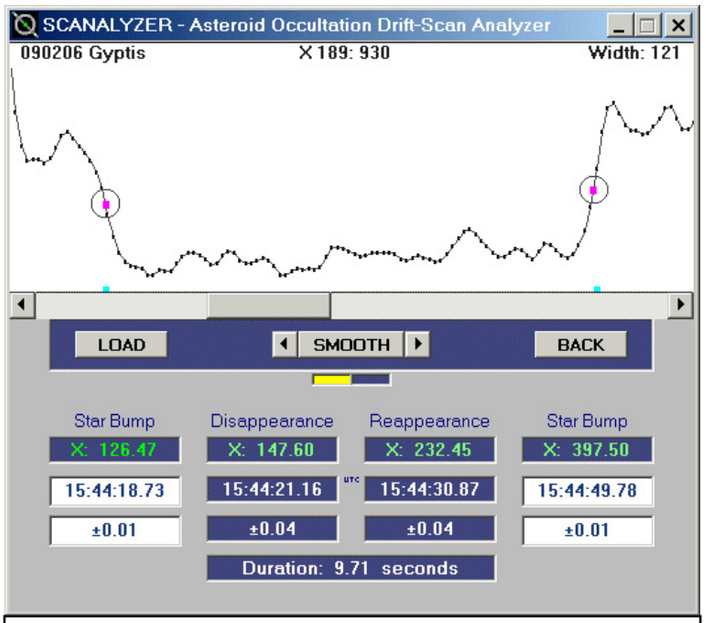
Observer's comments: WAT 120N+ 8 frame integration.
www.hristopavlov.net/Observations/Positives/2009-02-07%20Gyptis/Event.html

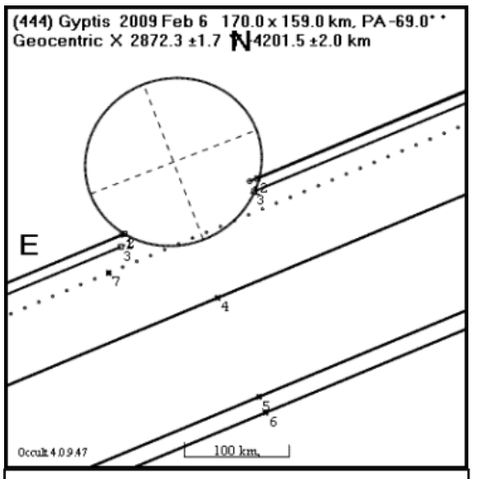
• A. Brakel	Downer, ACT	15:41 to 15:48
• D. Herald	Kambah, ACT	15:45:00 to 15:48:00
• D. Herald	Taralga, NSW	15:45:00 to 15:48:00



The lightcurves above are the Limovie analysis from Dave Gault's observations (left) and Hristo Pavlov's (right).



The lightcurve above is from Bill Allen's CCD drift-scan observation.



Key to plot:
1. B. Allen;
2. D. Gault;
3. H. Pavlov;
4. D. Herald, Taralga (miss);
5. A. Brakel (miss);
6. D. Herald, Kambah (miss);
7. Prediction 22 Jan.

Discussion: Three positive occultations were recorded for this event. The ellipse (above right) is plotted at 170 x 159 km, which has the same area as a circle with the expected 163 km diameter of Gyptis and the ellipse ratio implied by the CoR light curve data (page2cou.html). With three chords plus a constraining miss we can be sure the path was north of the predicted central line of the event.

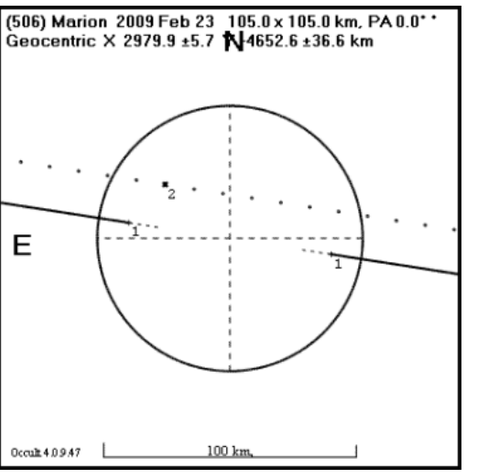
(20628) 1999 TS40	**TYC 1319-00840-1**	**2009 February 14**
• B. Loader	Darfield, NZ	11:21:30 to 11:27:30

(506) Marion | **TYC 0815-01555-1** | **2009 February 23**

- D. Watson | Thornton, NZ | D at 13:27:43.0 | **VISUAL**
  Longitude: +176° 51′ 48.4″ | R at 13:27:50.0
  Latitude: -37° 55′ 30.1″ | Duration: 7.0 secs
  Altitude: 3 m | Monitored: 13:20:00 to 13:35:00

Observer's comments: Did see the planet approaching the star but the light from the star swallowed it up.

Discussion: A 7 second occultation was observed visually by Diana Watson. As only one chord was measured for this event, we cannot tell if Diana was to the north or south of the centre of the asteroid's shadow path.



Key to plot:
1. D. Watson;
2. Prediction 18 Feb.

(222) Lucia | **UCAC2 40338290** | **2009 March 01**

- J. Bradshaw | Samford Valley, QLD | 11:20 to 11:24:57, 11:25:18 to 11:28

Observer's comments: Clouded over for 22 seconds at time of event. Was clearly visible until then.

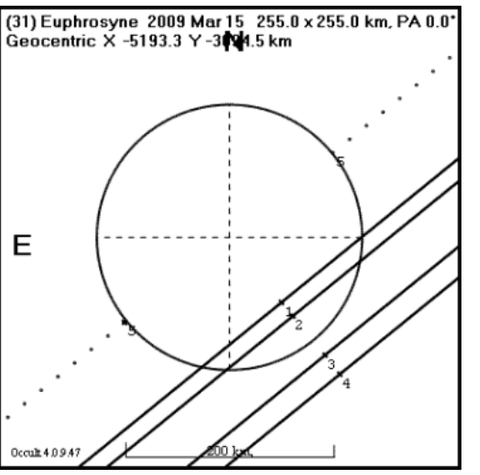
(5681) Bakulev | **TYC 6785-00025-1** | **2009 March 14**

- B. Loader | Darfield, NZ | 15:08:52 to 15:11:52

(31) Euphrosyne | **TYC 7907-00899-1** | **2009 March 15**

- D. Gault | Hawkesbury Heights, NSW | 13:24 to 13:55
- D. Herald | Kambah (home), ACT | 13:50:20 to 13:51:50
- D. Herald | Kambah (mobile), ACT | 13:50:20 to 13:51:50
- H. Pavlov | Marsfield, NSW | 13:40 to 13:53

Discussion: Even with three observers and four stations, no occultations were seen. The circle (right) is plotted on the predicted path and at the expected 255 km diameter.



Key to plot:
1. H. Pavlov (miss);
2. D. Gault (miss);
3. D. Herald (home, miss);
4. D. Herald (mobile, miss);
5. Prediction 05 Feb.

(654) Zelinda **TYC 4830-02507-1** **2009 March 16**

• D. Gault	Hawkesbury Heights, NSW	D at 11:59:17.73	**VIDEO**
	Longitude: +150° 38′ 27.8″	R at 11:59:42.05	
	Latitude: -33° 39′ 52.0″	Duration: 24.32 secs	
	Altitude: 286 m	Monitored: 11:58:54 to 12:00:02	

Observer's comments: Telescope prepointed 1 hour 55 minutes before the event.

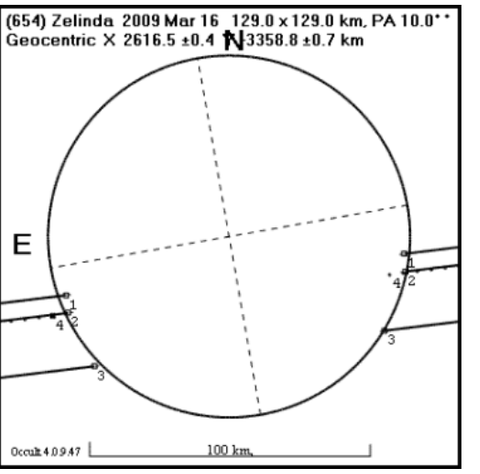
• H. Pavlov	Marsfield, NSW	D at 11:59:24.64	**VIDEO**
	Longitude: +151° 06′ 11.5″	R at 11:59:48.89	
	Latitude: -33° 46′ 13.8″	Duration: 24.25 secs	
	Altitude: 100 m	Monitored: 11:50 to 12:03	

Observer's comments: WAT 120N+ 8 frame integration ± 0.16 sec. Report prepopulated by OW 3.2 Reporting Addin (http://www.hristopavlov.net/OccultWatcher/MoreAddins.html).

• S. Russell	Leppington, NSW	D at 11:59:20.66	**VIDEO**
	Longitude: +150° 48′ 32.42″	R at 11:59:41.50	
	Latitude: -33° 57′ 7.41″	Duration: 20.8 secs	
	Altitude: 88 m	Monitored: 11:45:00 to 12:02:00	

Discussion: All three successful observations were made using video cameras with GPS based timestamps. The circle (right) is plotted with the expected 129 km diameter and positioned to give the best fit to the three chords.

Key to plot:
1. D. Gault;
2. H. Pavlov;
3. S. Russell;
4. Prediction 05 Feb.



(351) Yrsa **UCAC2 29658665** **2009 March 19**

• D. Watson	Thornton, NZ	13:20:00 to 13:30:00

(4204) Barsig **HIP 79910** **2009 March 20**

• T. Butt	Te Horo, NZ	12:02:30 to 12:40

(907) Rhoda **UCAC2 34659910** **2009 March 23**

• S. Kerr	Glenlee, QLD	D at 15:05:47.48	**VIDEO**
	Longitude: +150° 30′ 00.8″	R at 15:05:52.96	
	Latitude: -23° 16′ 09.6″	Duration: 5.48 secs	
	Altitude: 50 m	Monitored: 15:01:00 to 15:10:00	

Observer's comments: Video camera integrating with a exposure period of 120 ms.

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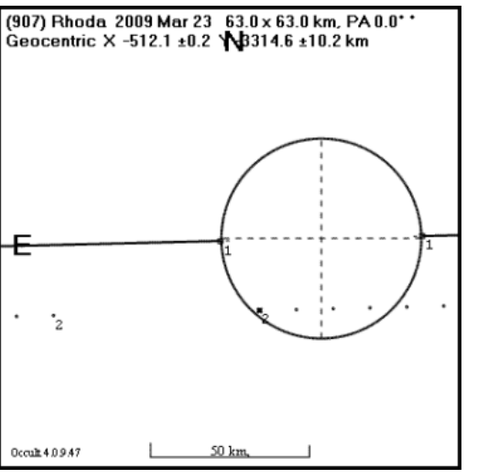
Discussion: A 5.48 second occultation was measured by Steve Kerr using a video camera with a GPS based On-Screen-Display timer insertor. The circle (right) is plotted with the expected 63 km diameter and centred on Steve's observation. With only one chord observed we can't tell if Steve was north or south of the centre of the asteroid's track. However as the length of Steve's chord is close to 63 km, it is likely that he was close to the centre of the track.

Key to plot:
1. S. Kerr;
2. Prediction 06 Feb.



(1003) Lilofee	**UCAC2 39477553**	**2009 March 24**
• J. Bradshaw	Samford Valley, QLD	11:10 to 11:16
(140) Siwa	**UCAC2 23749350**	**2009 March 24**
• C. Wyatt	Walcha, NSW	16:45:00 to 17:00:00
(117) Lomia	**UCAC2 20866163**	**2009 March 28**
• J. Bradshaw	Samford Valley, QLD	09:50 to 10:05
(748) Simeisa	**UCAC2 22295772**	**2009 March 31**
• J. Bradshaw	Samford Valley, QLD	15:20 to 15:30

(788) Hohensteina	**TYC 5187-01774-1**	**2009 April 10**	
• D. Herald	Kambah, ACT	D at 19:25:48.96	**VIDEO**
	Longitude: +149° 03′ 49.0″	R at 19:25:51.44	
	Latitude: -35° 23′ 49.3″	Duration: 2.5 secs	
	Altitude: 580 m	Monitored: 19:25:43 to 19:25:55	

Observer's comments: 4-frame (0.16 sec) integration.

• D. Herald	Michelago South, NSW	D at 19:25:48.42	**VIDEO**
	Longitude: +149° 9′ 41.1″	R at 19:25:52.26	
	Latitude: -35° 50′ 17.6″	Duration: 3.8 secs	
	Altitude: 731 m	Monitored: ??	

Observer's comments: 8-frame (0.32 sec) integration.

• P. Purcell	Michelago, NSW	D at 19:25:48.55	**VIDEO**
	Longitude: +149° 09′ 09.9″	R at 19:25:52.39	
	Latitude: -35° 36′ 34.5″	Duration: 3.8 secs	
	Altitude: 731 m	Monitored: 19:25:30 to 19:26:42	

Observer's comments: Observing location selected was close to predicted central occultation path. Faint star required integration of 16 frames to ensure reasonably stable image. This has reduced the accuracy of the observation.

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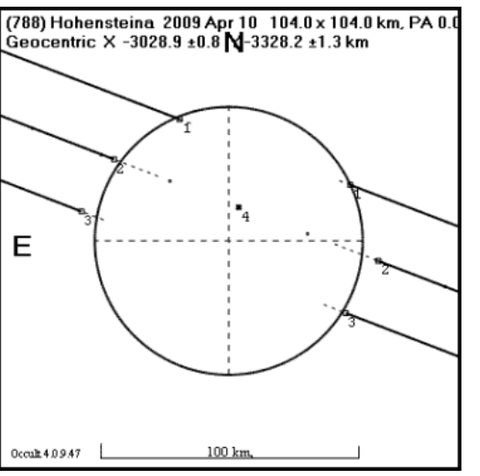
Discussion: All three successful observations were made with integrating video cameras with OSD time stamps derived from GPS. Unfortunately the need to integrate multiple video frames, due to the low magnitude of TYC 5187-01774-1, means there are quite large uncertainties in the event times. As a result we cannot improve our knowledge of the asteroid's diameter or (elliptical) shape but can only fit the position of a circle (right) with the expected 104 km diameter.

Key to plot:
1. D. Herald, Kambah;
2. P. Purcell;
3. D. Herald, Michelago South;
4. Prediction 09 Mar.

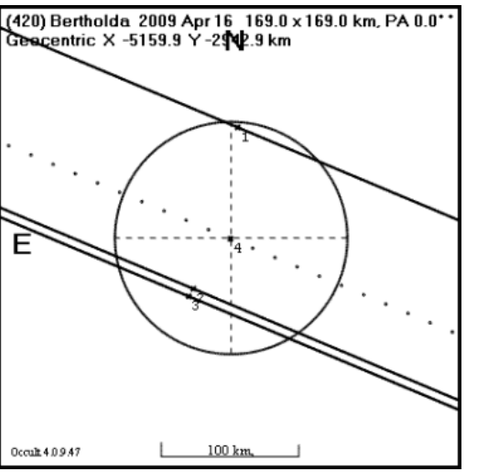


(407) Arachne	**UCAC2 21199049**	**2009 April 13**
• B. Loader	Darfield, NZ	14:42:30 to 14:45
(491) Carina	**UCAC2 31527355**	**2009 April 14**
• B. Loader	Darfield, NZ	16:26:20 to 16:29
(663) Gerlinde	**UCAC2 24113748**	**2009 April 14**
• B. Loader	Darfield, NZ	07:36:30 to 07:40

(420) Bertholda	**UCAC2 26120238**	**2009 April 16**
• D. Gault	Hawkesbury Heights, NSW	15:30 to 15:40
• H. Pavlov	Marsfield, NSW	15:29:00 to 15:38:00
• S. Quirk	Mudgee, NSW	15:35:20 to 15:36:00

Discussion: Despite all being positioned within the predicted path of the shadow, none of the three observers saw an occultation. The circle (right) is centred on the predicted track and plotted with the expected 169 km diameter.

Key to plot:
1. S. Quirk (miss);
2. D. Gault (miss);
3. H. Pavlov (miss);
4. Prediction 09 Mar.

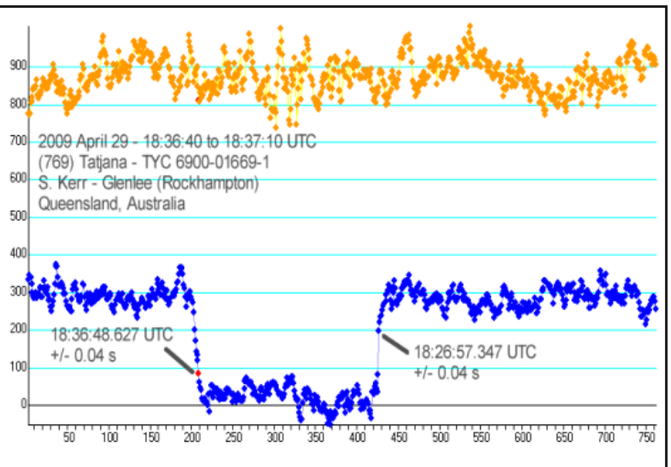


(70) Panopaea	**UCAC2 26465192**	**2009 April 19**
• J. Broughton	Reedy Creek, QLD	13:34:32 to 13:36:40
• S. Quirk	Mudgee, NSW	13:35:20 to 13:37:20
(921) Jovita	**HIP 88165**	**2009 April 19**
• S. Kerr	Glenlee, QLD	18:19:00 to 18:29:00
(14208) 1999 CR64	**HIP 101387**	**2009 April 20**
• S. Quirk	Mudgee, NSW	18:56:02 to 18:58:38

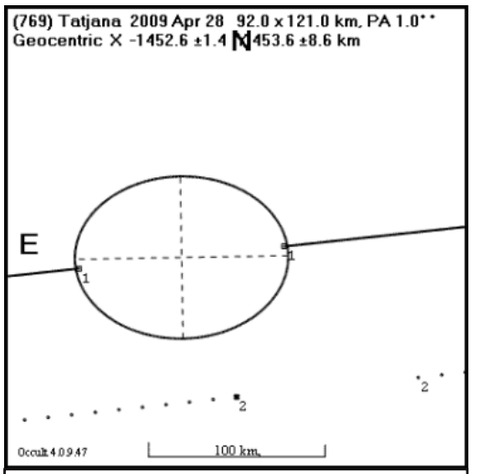
(494) Virtus	**UCAC2 19987486**	**2009 April 21**
• S. Kerr	Glenlee, QLD	15:21:00 to 15:31:00
(693) Zerbinetta	**UCAC2 14723052**	**2009 April 23**
• B. Loader	Darfield, NZ	14:44 to 14:49
(1268) Libya	**UCAC2 19981258**	**2009 April 25**
• D. Gault	Hawkesbury Heights, NSW	15:50 to 16:04
(4155) Watanabe	**TYC 6821-00898-1**	**2009 April 25**
• D. Gault	Hawkesbury Heights, NSW	11:20 to 11:42
(795) Fini	**UCAC2 13468220**	**2009 April 25**
• C. Wyatt	Walcha, NSW	15:19:00 to 15:37:00
(12126) 1999 RM11	**UCAC2 24362529**	**2009 April 27**
• J. Bradshaw	Samford Valley, QLD	10:30 to 10:45
(429) Lotis	**UCAC2 26897221**	**2009 April 27**
• J. Bradshaw	Samford Valley, QLD	11:40 to 11:55
• J. Broughton	Reedy Creek, QLD	11:47:06 to 11:51:03
(337) Devosa	**UCAC2 19290312**	**2009 April 28**
• J. Broughton	Reedy Creek, QLD	19:01:58 to 19:03:04

(769) Tatjana	**TYC 6900-01669-1**	**2009 April 28**	
• S. Kerr	Glenlee, QLD	D at 18:36:48.63	**VIDEO**
	Longitude: +150° 30′ 00.8″	R at 18:36:57.35	
	Latitude: -23° 16′ 09.6″	Duration: 8.72 secs	
	Altitude: 50 m	Monitored: 18:32:00 to 18:42:00	

Observer's comments: Video camera integrating with a exposure period of 40 ms.



The lightcurve above shows the Limovie analysis of Steve Kerr's observations.



Key to plot:
1. S. Kerr;
2. Prediction 20 Mar.

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Discussion: An 8.72 sec occultation was observed by Steve Kerr. Lightcurve data by Robert Stephens (Minor Planet Bulletin **29** (2002)) suggests that Tatjana has a significant eccentricity. Antonini (<CoR>page3cou.html) finds an eccentricity $e = 0.303 \pm 0.004$ (for comparison, a circle has $e = 0$ and a parabola has $e = 1$). The ellipse (previous page, right) is plotted with this eccentricity and with the same area as that of a circle with the expected diameter of 106 km. With only the one observation, we cannot tell if the ellipse should be north or south of Steve's chord, nor what angle the major axis should be.

(1867) Deiphobus	**UCAC2 14888060**	**2009 April 30**
• J. Broughton	Reedy Creek, QLD	16:24:10 to 16:29:45

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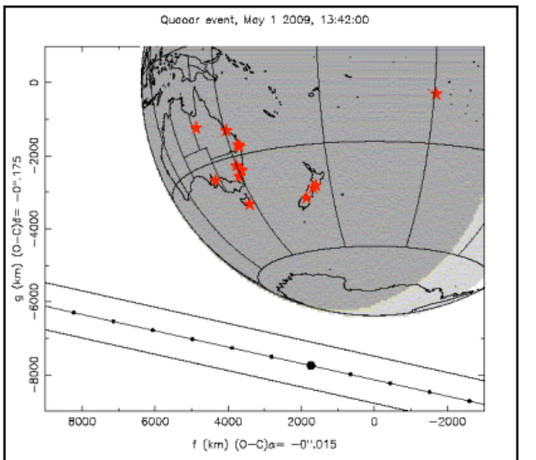
The Occultation by Quaoar on 1 May 2009

(50000) Quaoar **UCAC2 26252549** **2009 May 01**

In the early morning of Saturday 2 May 2009 (approximately 13h UT on 1 May), the trans-Neptunian object Quaoar was predicted to occult the 14th magnitude star UCAC2 26252549. The shadow was expected to just miss the Earth, but given the uncertainty in the prediction it could easily have fallen across Australia and New Zealand. A stellar occultation by Quaoar's satellite (distance of about 0.35 arcsec, with an estimated diameter of 100 km) was also a possibility. The faint magnitude of the star meant 12 inch aperture or larger telescopes would be needed, or an integrating video camera for smaller telescopes. A positive occultation of this rare event would allow our knowledge of Quaoar's orbit to be greatly improved. Bruno Sicardy, a professional astronomer from Paris Observatory, prepared the predictions, worked with all the observers beforehand, collected and analysed the data.



The map above shows the predicted shadow path (just missing the Earth) and locations of the observers (red stars).

Sixteen observations were attempted at fifteen stations, with telescope diameters ranging between 1 metre and 25 cm. Four were clouded out, two were lost to pointing/ timing difficulties, and all ten data acquisitions were negative. A summary of the attempted observations is given below;

(50000) Quaoar	**UCAC2 26252549**	**2009 May 01**
• A. Pennell	Beverly Begg Obs, Dunedin, NZ	13:30 to 14:00
• H. Pavlov	Kariong, NSW	13:45 to 14:12
• S. Kerr	Glenlee, QLD	13:31:40 to 13:59:00
• M. Katona & L. Fulham	Mount Isa Astronomy Group, QLD	13:25 to 14:10
• J. Bradshaw	Brisbane, QLD	
• J. Greenhill	Canopus Obs, Hobart, TAS	13:10 to 13:50
• D. Herald	Canberra, ACT	13:35 to 14:05
• T. Dobosz	Bankstown, Sydney, NSW	13:30 to 14:00

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• S. & J. Quirk	Mudgee, NSW	13:42:01 to 13:55:50
• D. Gault	Hawkesbury Heights, NSW	13:28 to 14:05
• B. Allen	Vintage Lane Obs, NZ	? to ?
• C. Wyatt	Armidale, NSW	clouded out
• B. Loader & A. Gilmore	Mount John, NZ	clouded out
• R. Santallo	Southern Stars Obs, Tahiti	clouded out
• B. Lade, T. Virgo	Stockport, South Aust	clouded out
• J. Talbot	Waikanae Beach, NZ	pointing problem
• J. Broughton	Gold Coast, Australia	delayed, 14:02:11 to 14:30:38

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(57) Mnemosyne **UCAC2 29682609** **2009 May 03**

• B. Loader Darfield, NZ 16:00:50 to 16:06:50

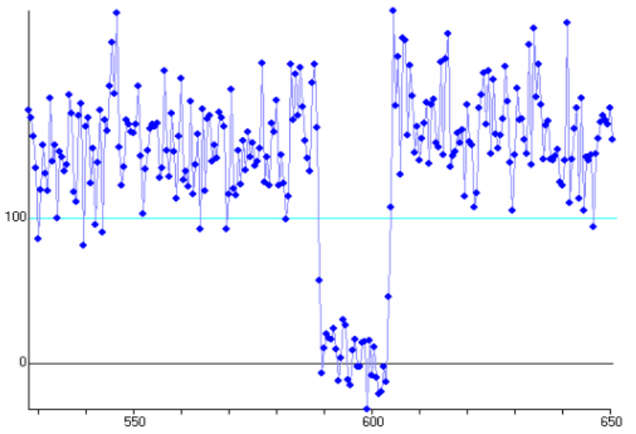
(9347) 1991 RY21 **HIP 73760** **2009 May 03**

• D. Gault Hawkesbury Heights, NSW 12:45 to 13:06

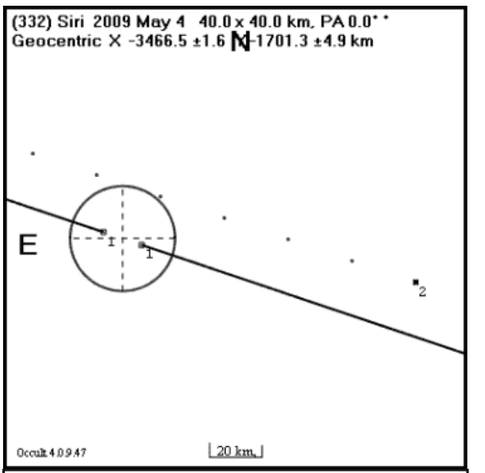
(332) Siri **UCAC2 26584283** **2009 May 04**

• J. Bradshaw Samford Valley, QLD D at 18:35:00.94 **VIDEO**
Longitude: +152° 52′ 22.68″ R at 18:35:01.54
Latitude: -27° 21′ 22.80″ Duration: 0.60 secs
Altitude: 92 m Monitored: 18:30 to 18:40

Observer's comments: Recorded live, so 20 ms subtracted for camera lag.
http://www.youtube.com/watch?v=V1Qf_esDtKA



The figure above shows the lightcurve produced by Limovie from the observations.



Key to plot: 1. J. Bradshaw; 2. Prediction 20 Mar.

(36) Atalante **UCAC2 11636750** **2009 May 06**

• D. Gault	Hawkesbury Heights, NSW	14:25 to 14:33
• H. Pavlov	Marsfield, NSW	14:20 to 14:34
• S. Quirk	Mudgee, NSW	14:28:31 to 14:33:31

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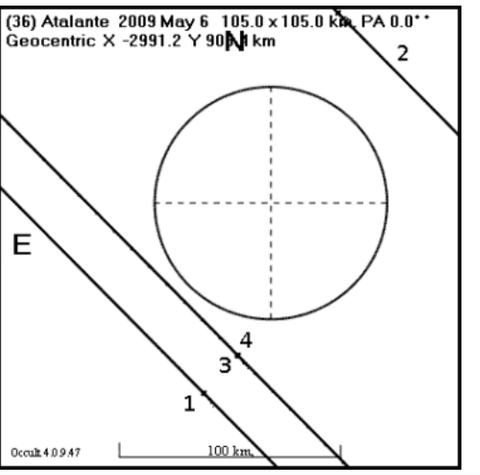
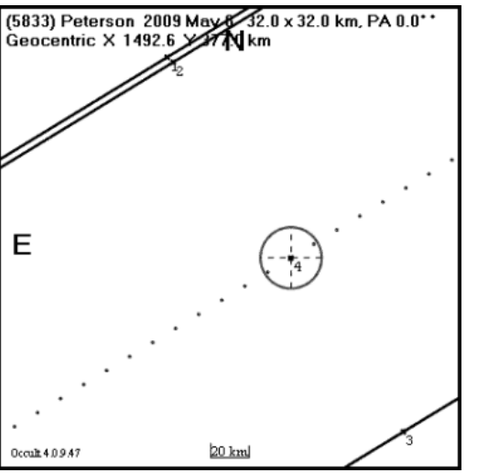
Discussion: All three observers were using video cameras with GPS OSD systems and recorded misses. Dave Gault's location (line #3 in the plot) lies on the predicted path for the centre of the asteroid (line #4 in the plot). The circle (right) is plotted with the expected 106 km diameter of Atalante, and placed in an arbitary position to illustrate why the misses might have occurred.



Key to plot:
1. H. Pavlov (miss);
2. S. Quirk (miss);
3. D. Gault (miss);
4. Prediction TT14 01 Apr.

(5833) Peterson	**TYC 7789-01217-1**	**2009 May 08**
• D. Gault	Hawkesbury Heights, NSW	13:34 to 13:44
• D. Herald	Kambah, ACT	13:41:30 to 13:43:30
• H. Pavlov	Marsfield, NSW	13:33 to 13:44

Discussion: All three observers were using video cameras with GPS OSD systems and recorded misses. The circle (right) is plotted with the expected 20 km diameter of Peterson and centred on the predicted path. Despite all observers being within or near the one-sigma probability limits, the small size of the asteroid and large uncertainty in it's predicted path meant there was always going to be a low probability that an observer would be in the right location to see an occultation.



Key to plot:
1. H. Pavlov (miss);
2. D. Gault (miss);
3. D. Herald (miss);
4. Prediction 04 Apr.

(31) Euphrosyne	**UCAC2 10522522**	**2009 May 10**
• J. Bradshaw	Samford Valley, QLD	22:39 to 22:55

(494) Virtus	**UCAC2 19485472**	**2009 May 10**	
• J. Bradshaw	Samford Valley, QLD	D at 19:24:42.6	**VIDEO**
	Longitude: +152° 52′ 22.68″	R at 19:24:56.8	
	Latitude: -27° 21′ 22.80″	Duration: 14.2 secs	
	Altitude: 95 m	Monitored: 19:13 to 13:30	

Observer's comments: 55 Seconds late! Full moon required 12x (6 Frame) integration. I have subtracted 120 ms which is my estimate of the camera lag, but the margin of error may be as high as ± 120 ms. http://www.youtube.com/watch?v=0wCRtpuTcrQ

• J. Broughton	Reedy Creek, QLD	19:15:00 to 19:25:19

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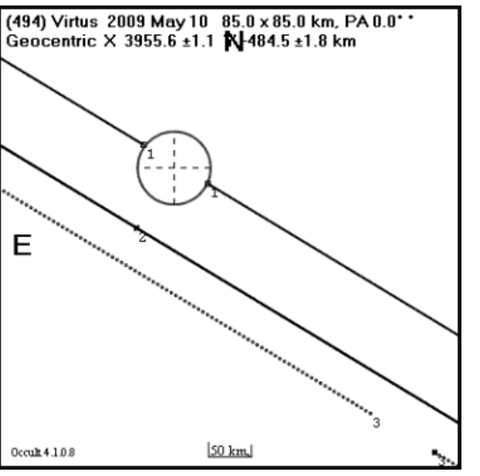
Discussion: Both observers were using integrating video cameras, with Jonathon Bradshaw recording an 14.2 sec occultation and John Broughton recording a miss. The circle (right) is plotted with the expected 85 km diameter, and arbitarily centred on Jonathon's chord. Note that there was a miss reported for Virtus on 2009 April 21 and another positive just a week after this one on 2009 May 17. Both positives had chords close to 85 km, and were late by about 40 seconds in this case and 30 seconds on May 17.



Key to plot:
1. J. Bradshaw;
2. J. Broughton;
3. Prediction TT14 24 Apr.

(7875) 1991 ES1	**TYC 5019-00794-1**	**2009 May 10**
• P. Anderson	The Gap, Brisbane, QLD	18:33:00 to 18:37:00
(895) Helio	**UCAC2 16415921**	**2009 May 10**
• J. Broughton	Reedy Creek, QLD	11:39:25 to 11:44:02
(957) Camelia	**UCAC2 24605105**	**2009 May 10**
• D. Herald	Kambah, ACT	14:13:04 to 14:14:55
(735) Marghanna	**UCAC2 39148528**	**2009 May 12**
• J. Bradshaw	Samford Valley, QLD	08:56 to 09:10
(1266) Tone	**UCAC2 13373410**	**2009 May 13**
• B. Loader	Darfield, NZ	08:31:00 to 08:35:30

(211) Isolda	**TYC 6137-00866-1**	**2009 May 13**	
• P. Purcell	Nimmitabel, NSW	D at 16:50:26.54	**VIDEO**
	Longitude: +149° 17′ 39.7″	R at 16:50:36.18	
	Latitude: -36° 35′ 09.7″	Duration: 9.64 secs	
	Altitude: 1051 m	Monitored: 16:48:00 to 16:52:00	
• D. Herald	Kambah, ACT	16:49:00 to 16:52:00	

Discussion: Patrick Purcell's location (track #2 in the plot on the next page, right) was almost on top of the predicted centre of the shadow's path (track #3). The circle is plotted with Isolda's expected diameter of 143 km, and centred on Patrick's chord. There is a hint of a possible double star in the D of light curve (on the next page, left) but, with only three points in the step this could equally be noise consistent with the pre-occultation data, and would need additional chords to confirm.

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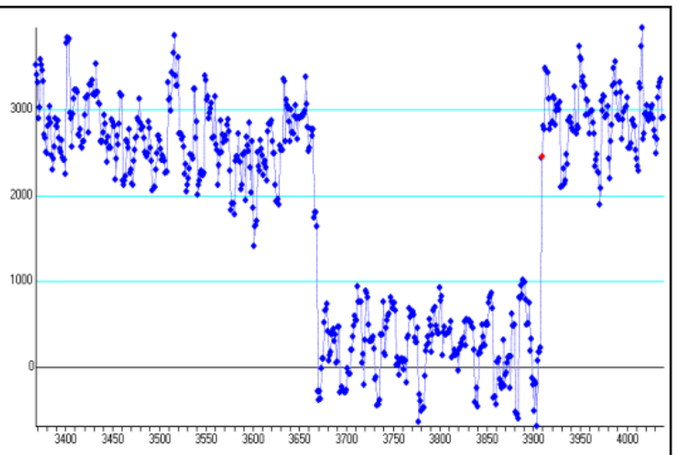
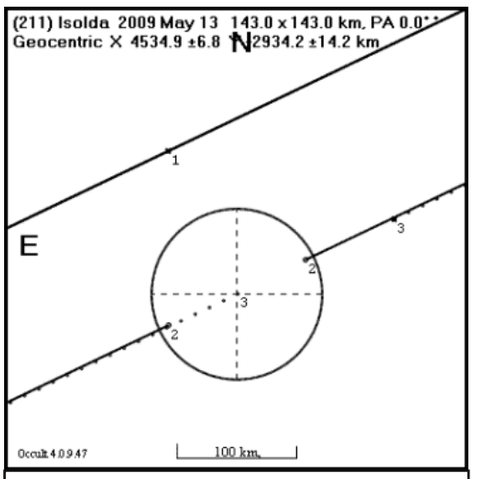


The figure above shows the light curve produced by Limovie from Patrick Purcell's observations.



Key to plot: 1. D. Herald (miss); 2. P. Purcell; 3. Prediction 05 Apr.

(4366) Venikagan **UCAC2 26233575** **2009 May 14**

- J. Bradshaw — Samford Valley, QLD — 11:08 to 11:15

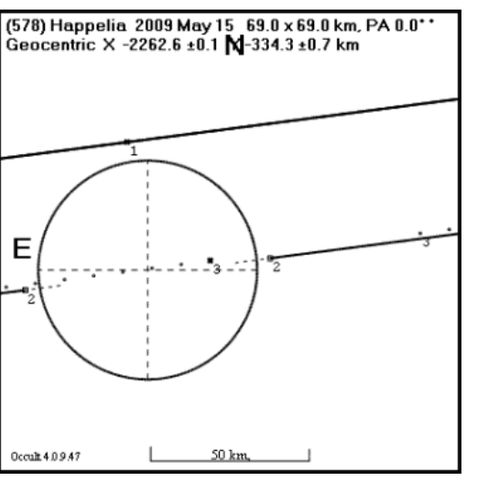
(578) Happelia **UCAC2 20751392** **2009 May 15**

- J. Broughton — Brunswick Heads, NSW — D at 17:03:05.8 — **VIDEO**
  Longitude: +153° 32′ 55.4″ — R at 17:03:14.2
  Latitude: -28° 33′ 04.8″ — Duration: 8.4 secs
  Altitude: 5 m — Monitored: 17:02:38 to 17:03:35

Observer's comments: Mobile observation using a Watec 120N+ at 16X integration (0.64 sec). I overdid the integration as a result of forgeting to attach a focal reducer. Without it, the image scale was different from that of my ScanTracker printout and I couldn't recognize the star patterns until after the drift through. The integration was supposed to be reduced once the target was identified. Not until later in the day when I replayed the video was I able to ascertain that the target did actually drift through the field and was occulted. The times are estimates of where within the 16x integrations D and R occurred.

- J. Broughton — Reedy Creek, QLD — 17:02:53 to 17:03:33

Discussion: An 8.4 second occultation was seen by John at his mobile (Brunswick Heads) site (track #2 in the plot), which was chosen to lie in the centre of the predicted shadow path (track #3). John's home site recorded a miss. The circle is plotted with Happleia's expected 69 km diameter and positioned in the middle of John's 78 km chord. Note: An event with five chords on 2005 May 23 in USA indicated an elongated object 82 km by 57 km.



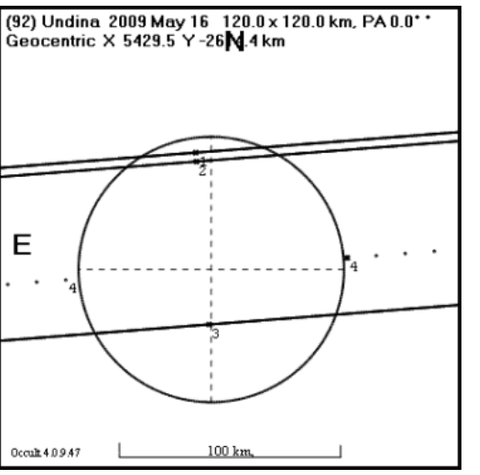
Key to plot:
1. J. Broughton, Reedy Creek (miss);
2. J. Broughton, Brunswick Heads;
3. Prediction 05 Apr.

(36) Atalante	**UCAC2 11409676**	**2009 May 16**
• J. Bradshaw	Samford Valley, QLD	19:45 to 19:55
(593) Titania	**UCAC2 21386590**	**2009 May 16**
• J. Bradshaw	Samford Valley, QLD	14:12 to 14:17
(693) Zerbinetta	**UCAC2 13870045**	**2009 May 16**
• J. Bradshaw	Samford Valley, QLD	11:55 to 12:05

(92) Undina	**UCAC2 27859633**	**2009 May 16**
• D. Lowe	Gatton, QLD	18:00:00 to 19:30:00
• J. Broughton	Reedy Creek, QLD	19:16:40 to 19:18:52
• P. Anderson	The Gap, Brisbane, QLD	19:15:00 to 19:22:00

Discussion: Three misses were recorded for this event, despite all observers being within the predicted shadow path. The circle (right) is plotted at the expected 126 km diameter of Atalante, and arbitarily positioned on the predicted track (as without any positive observations we cannot tell if the path was actually north or south of the observers).

Key to plot:
1. D. Lowe (miss);
2. P. Anderson (miss);
3. J. Broughton (miss);
4. Prediction 05 Apr.



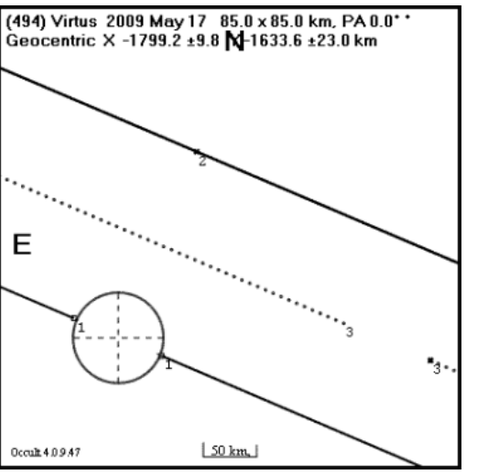
(494) Virtus	**UCAC2 19229799**	**2009 May 17**
• B. Loader	Darfield, NZ	D at 13:09:41.2 **VIDEO**
	Longitude: +172° 06′ 24.4″	R at 13:09:52.4
	Latitude: -43° 28′ 52.9″	Duration: 11.2 secs
	Altitude: 210 m	Monitored: 13:06:45 to 13:11:45

Observer's comments: Watec 120N camera at 16 fold integration. Times partly by visual inspection of video and partly using Limovie.

• B. Allen	Blenheim, NZ	13:03:33 to 13:09:32

Discussion: An 11.2 second occultation was recorded by Brian Loader, while Bill Allen had a miss. The circle (right) is arbitarily centred on Brian's chord and plotted with the expected 65 km diameter. Note that there was a miss reported for Virtus on 2009 April 21 and another positive just a week before this one on 2009 May 10. Both positives had chords close to 87 km, and were late by about 30 seconds in this case and 40 seconds on May 10.

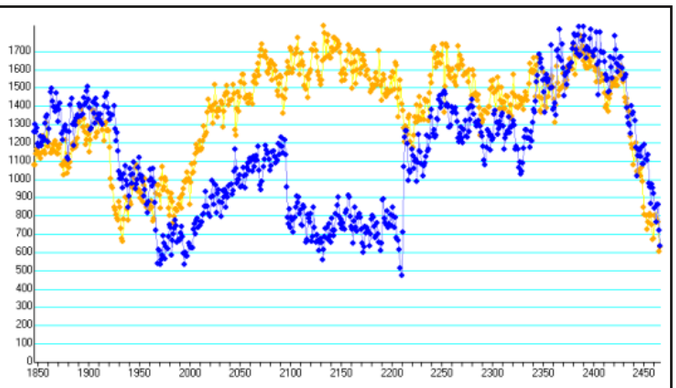
Key to plot:
1. B. Loader;
2. B. Allen (miss);
3. Prediction 05 Apr.



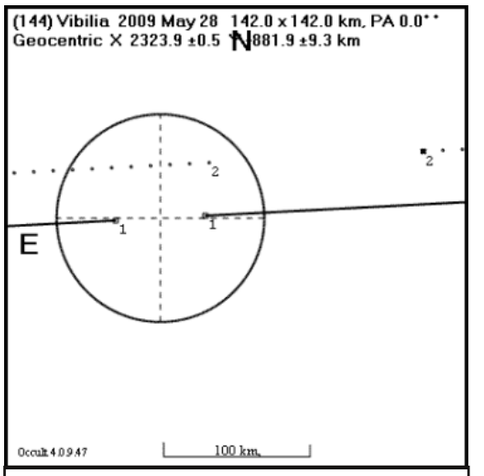
(247) Eukrate	**UCAC2 6930110**	**2009 May 24**
• S. Quirk	Mudgee, NSW	16:56:05 to 16:59:22

(144) Vibilia	**TYC 6215-01219-1**	**2009 May 28**	
• J. Bradshaw	Samford Valley, QLD	D at 15:29:50.08	**VIDEO**
	Longitude: +152° 52′ 22.68″	R at 15:29:54.68	
	Latitude: -27° 21′ 22.80″	Duration: 4.60 secs	
	Altitude: 95 m	Monitored: 15:25 to 15:33	

Observer's comments: A hole in the cloud!



The figure above shows the lightcurve produced by Limovie from Jonathon Bradshaw's observations. The upper (yellow) lightcurve is a comparison star, while the lower (blue) is TYC 6215-01219-1.



Key to plot: 1. J. Bradshaw; 2. Prediction 17 Apr.

Discussion: A 4.60 second occultation was measured by Jonathon Bradshaw. The circle (above right) has been plotted with the expected diameter of 142 km. As only one chord was observed for this event, we cannot tell if Vibilia was north or south of Jonathon's track so we have arbitarily placed the circle on the middle of the chord.

(31) Euphrosyne	**UCAC2 9596956**	**2009 May 28**
• C. Wyatt	Mullaley, NSW	14:54:00 to 15:22:00

(331) Etheridgea	**TYC 6379-01473-1**	**2009 June 02**	
• B. Loader	Darfield, NZ	D at 16:10:28.0	**VIDEO**
	Longitude: +172° 06′ 24.4″	R at 16:10:37.1	
	Latitude: -43° 28′ 52.9″	Duration: 9.1 secs	
	Altitude: 210 m	Monitored: 16:08:50 to 16:12:50	

Observer's comments: Watec 120N at 4 fold integration. The faint image remained for three groups of frames, i.e. about 0.5 seconds. Visually it was brightest in the middle set of the three when it was quite definite, although not shown up well by Limovie.

Discussion: Brian Loader observed a 9.1 second occultation, with a possible fade during the disappearance. The ellipse (next page, right) is plotted using the ellipse parameters given by the Geneva Observatory (<CoR>page1cou.html) and with the same area as that of a circle with the expected 75 km diameter. As Brian's chord is slightly longer than the major axis of the ellipse, it is likely that he was close to the central track of the shadow path.

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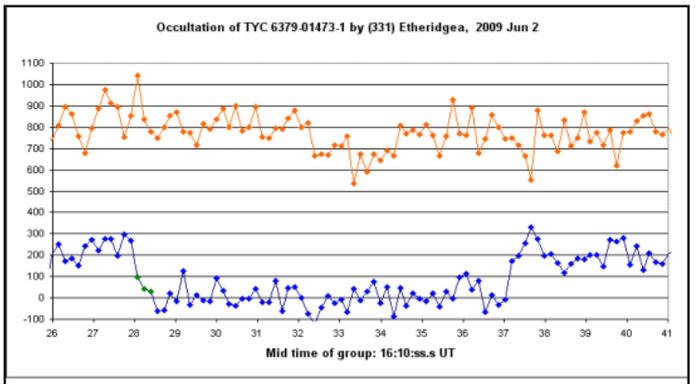
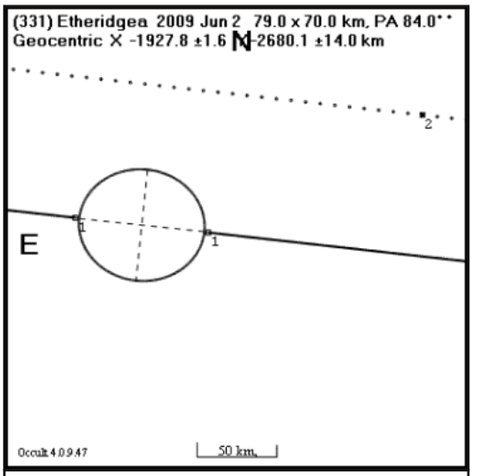


The lightcurve above is the Limovie analysis of Brian's observations made using in-camera integration of every four consecutive frames. The top (orange) lightcurve is from a brighter star, made for comparision purposes. The lower lightcurve is of TYC 6379-01473-1, the star that was occulted by Etheridgea.



Key to plot:
1. B. Loader;
2. Prediction 28 Jan.

(499) Venusia	**UCAC2 22738168**	**2009 June 03**
• D. Watson	Thornton, NZ	12:11:00 to 12:23:00
(103) Hera	**UCAC2 29844471**	**2009 June 04**
• B. Loader	Darfield, NZ	08:30:00 to 08:36:00

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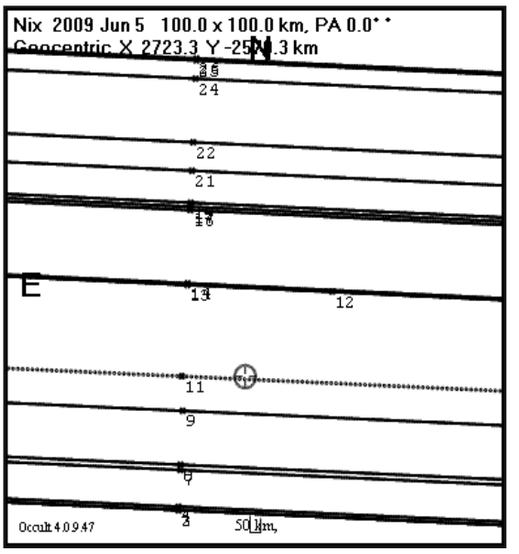
The Occultation by Pluto's Moon Nix on 05 June 2009

Nix **UCAC2 25152757** **2009 June 05**

One of Pluto's moons, Nix, was predicted to occult a faint (12th magnitude) star UCAC2 25152757 on Friday 5th June 2009 (early morning Saturday 6 June for New Zealand observers). With Nix having an expected diameter of 100 km, the uncertainty in the star's position meant that the shadow could fall within a 500 km error band of the predicted path. For this reason the event organisers, Thomas Widemann and Bruno Sicardy of the Paris Observatory, encouraged all observers from La Reunion Island, Australia and New Zealand to attempt to observe the occultation.

Twenty-seven stations made the attempt; seventeen had definite misses, five were clouded out and five had other problems that prevented an observation.



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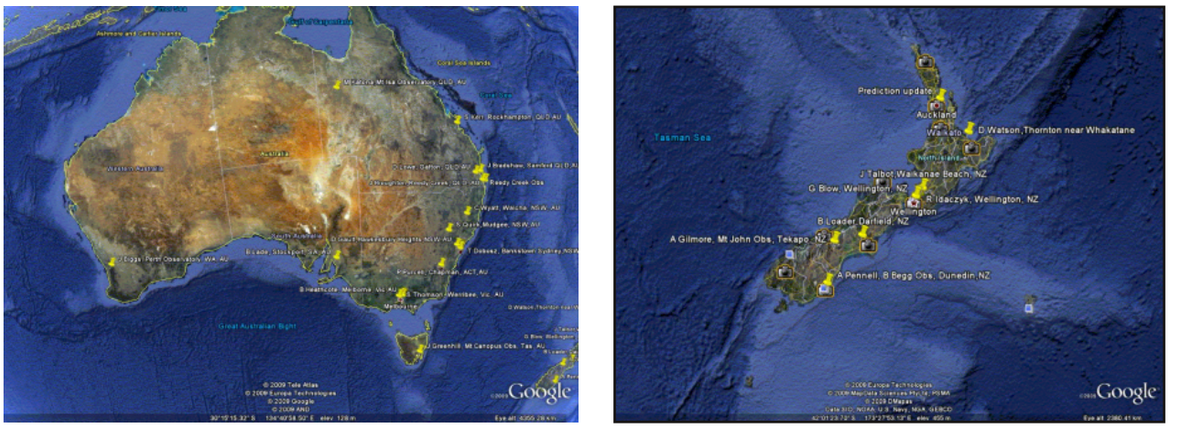
Key to plot (previous page):

1. A. Pennell (clouded out);	2. A. Gilmore;
3. P. Kilmartin;	4. B. Loader;
5. G. Blow (unable to see target);	6. R. Idaczyk (obstructed);
7. G. McKay (beyond limiting mag);	8. J. Talbot;
9. D. Watson (possible wrong field);	10. J. Greenhill and S. Mathers (clouded out);
11. Prediction;	12. B. Heathcote;
13. S. Thomson;	14. D. Herald, J. Pascal, A. Johansson and C. Ioannou;
15. P. Purcell (clouded out);	16. T. Dobosz;
17. H. Pavlov;	18. J. Byron (computer failure);
19. D. Gault;	20. B. Lade (clouded out);
21. S. Quirk;	22. C. Wyatt;
23. J. Biggs (field not found);	24. J. Broughton;
25. D. Lowe;	26. J. Bradshaw;
27. S. Kerr (clouded out);	28. M. Katona;



The maps above the locations of the stations in Australia (left) and New Zealand (right).

The circle (previous page) is plotted at the expected 100 km diameter of Nix on the predicted path. Only those paths with clearly observed misses are plotted. With no positive chords we cannot say where Nix slipped through the net, but it is obvious that we would have needed many more stations to have left no gaps greater than say 70 km.

Thanks to all who attempted this important observation and lets hope for better luck next time.

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(371) Bohemia	**UCAC2 30701168**	**2009 June 05**	
• D. Gault	Hawkesbury Heights, NSW	D at 08:38:26.31	**VIDEO**
	Longitude: +150° 38′ 28.00″	R at 08:38:27.11	
	Latitude: -33° 39′ 52.00″	Duration: 0.80 secs	
	Altitude: 286 m	Monitored: 08:20 to 08:40	

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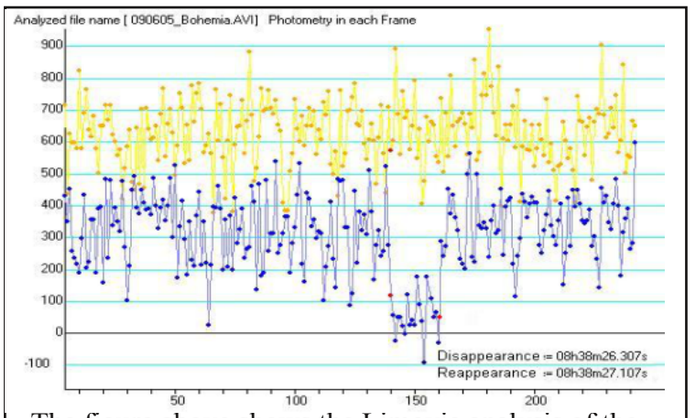
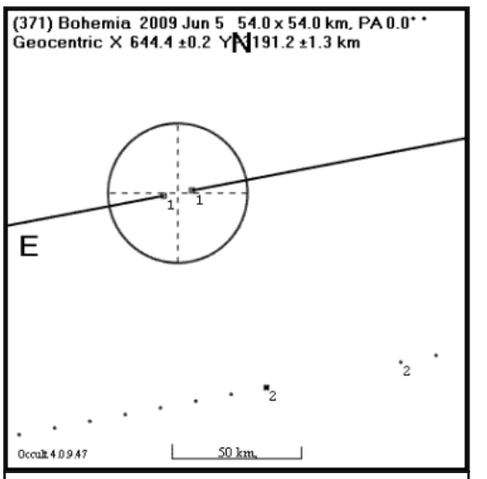


The figure above shows the Limovie analysis of the occultation, where the lower (blue) trace is the occulted star and the upper (yellow) trace is a comparison star.



Key to plot: 1. D. Gault; 2. Prediction 04 May.

Discussion: Dave Gault observed a 0.8 second occultation. As only one chord was measured, we cannot tell if the centre of the asteroid passed north or south of Dave's position and so a circle has been plotted (above right) at the expected 54 km diameter in the middle of Dave's chord.

(1180) Rita	**TYC 1409-01560-1**	**2009 June 09**
• S. Kerr	Glenlee, QLD	09:56:00 to 10:06:00
(13978) 1992 JQ	**TYC 0352-00311-1u**	**2009 June 09**
• D. Lowe	Stanthorpe, QLD	12:55:00 to 13:20:00
(536) Merapi	**UCAC2 19194734**	**2009 June 09**
• J. Bradshaw	Samford Valley, QLD	17:00 to 17:15
(31) Euphrosyne	**UCAC2 9363041**	**2009 June 10**
• B. Loader	Darfield, NZ	13:08:15 to 13:14:15
(406) Erna	**UCAC2 20226218**	**2009 June 10**
• B. Loader	Darfield, NZ	12:52:20 to 12:55:40
(1805) Dirikis	**UCAC2 25327075**	**2009 June 15**
• G. Mckay	Papakowhai, Porirua, NZ	12:20:00 to 12:35:00
• J. Talbot	Waikanae Beach, NZ	12:27:32 to 12:23:00

(240) Vanadis	**UCAC2 25778854**	**2009 June 15**	
• G. Mckay	Papakowhai, Porirua, NZ	D at 10:15:57.65	**VIDEO**
	Longitude: +174° 51′ 48.3″	R at 10:16:02.93	
	Latitude: -41° 07′ 07.6″	Duration: 5.28 secs	
	Altitude: 55 m	Monitored: 10:10:00 to 10:18:00	

Observer's comments: Star was almost at limit of visibility/detectability in PC164 camera. Analysed using LiMovie.

• B. Allen	Blenheim, NZ	10:11:20 to 10:16:49
• D. Herald	Kambah, ACT	10:19:29 to 10:20:10

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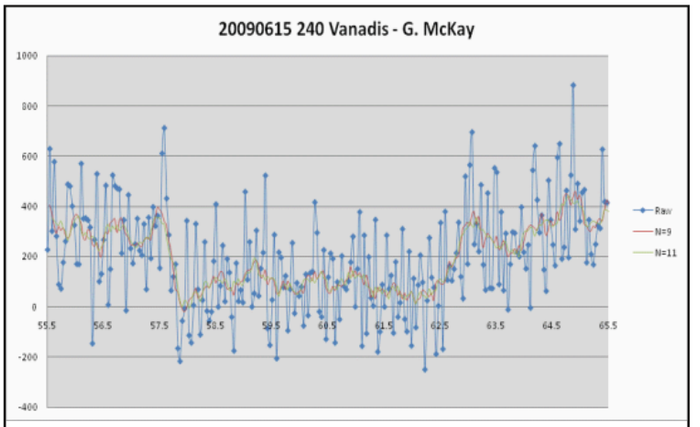
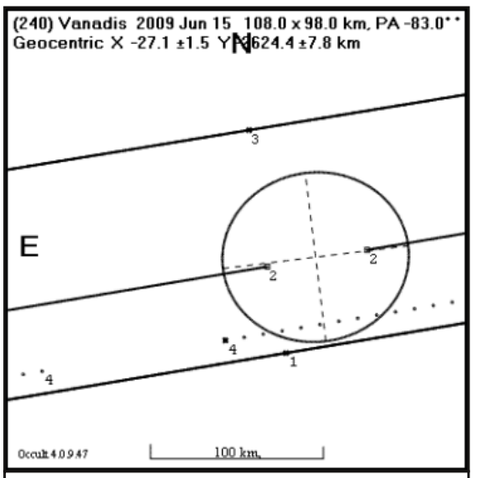


The figure above is Graeme McKay's Limovie analysis of the light-curve, including two different smoothed curves using running averages (the blue curve is the unsmoothed data, the red curve is averaged with N=9, and the green curve with N=11).



Key to plot:
1. B. Allen (miss);
2. G. McKay;
3. D. Herald (miss);
4. Prediction 11 Jun.

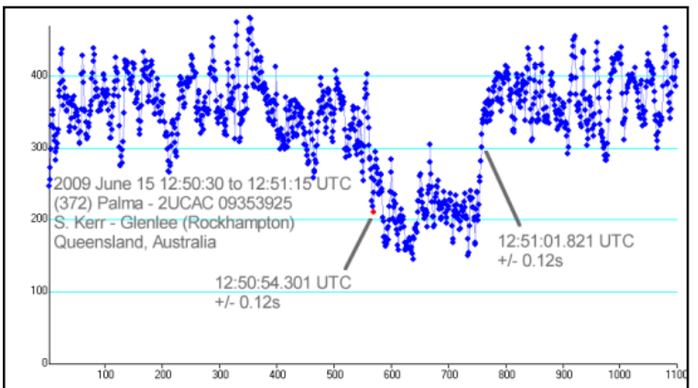
Discussion: Graeme measured a 5.28 second occultation, while the other two observers recorded misses. The ellipse (above right) is plotted at 108 x 98 km which gives the same area as a circle with the expected 103 km diameter of Vanadis. The ellipse parameters are taken from the Geneva Observatory (<CoR>page1cou.html).

(372) Palma **UCAC2 9353925** **2009 June 15**

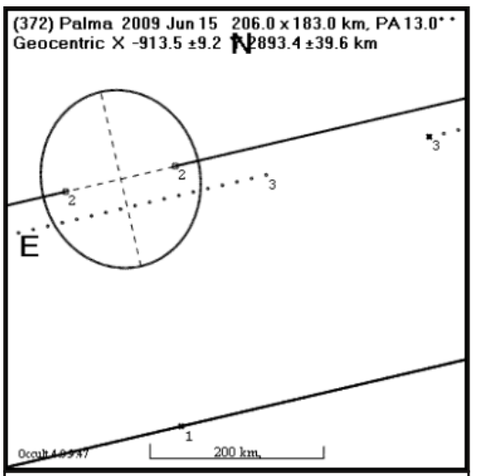
- S. Kerr — Glenlee, QLD — D at 12:50:54.3 — **VIDEO**
  Longitude: +150° 30′ 00.80″ — R at 12:51:01.8
  Latitude: -23° 16′ 09.60″ — Duration: 7.5 secs
  Altitude: 50 m — Monitored: 12:46:30 to 12:55:00

Observer's comments: Camera integrating at 120 ms period.

- J. Bradshaw — Samford Valley, QLD — 12:45 to 12:52



The lightcurve above is the Limovie analysis of Steve Kerr's observation.



Key to plot:
1. J. Bradshaw (miss);
2. S. Kerr;
3. Prediction TT14 01 May.

Discussion: Steve Kerr observed a 7.5 second occultation. The ellipse (above right) is plotted at the previously observed dimensions from a 39 station occultation of Palma on 2007 Jan 26.

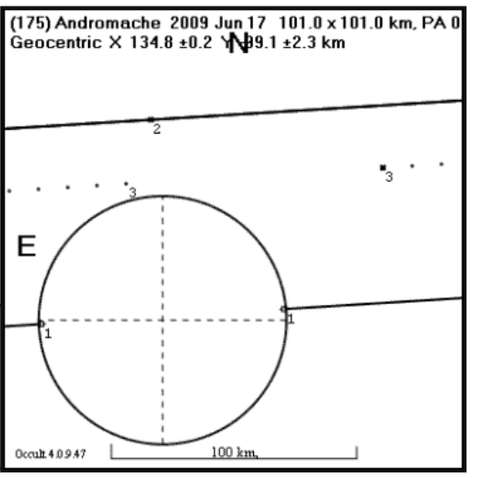
(469) Argentina	**UCAC2 14888603**	**2009 June 16**
• B. Loader	Darfield, NZ	07:02:30 to 07:06:30
(146) Lucina	**TYC 0305-00664-1**	**2009 June 17**
• A. Brakel	Downer, ACT	12:30 to 12:40
• D. Herald	Kambah, ACT	12:33:00 to 12:37:00

(175) Andromache	**UCAC2 20673001**	**2009 June 17**
• J. Broughton	Reedy Creek, QLD	D at 13:11:33.72 **VIDEO**
	Longitude: +153° 23′ 52.9″	R at 13:11:42.04
	Latitude: -28° 06′ 30.4″	Duration: 8.32 secs
	Altitude: 66 m	Monitored: 13:06:42 to 13:13:32

Observer's comments: Watec 120N+ at 4X integration.

• J. Bradshaw	Samford Valley, QLD	13:00 to 13:15

Discussion: John Broughton observed an 8.32 second occultation while Jonathan Bradshaw had a miss. The circle (right) is plotted at the expected 101 km diameter of Andromache. As John's (99 km) chord is close to the maximum expected chord length, it is likely that he was close to the centre of the asteroid's track.



Key to plot:
1. J. Broughton;
2. J. Bradshaw (miss);
3. Prediction 17 May.

(22) Kalliope	**UCAC2 20434257**	**2009 June 17**
• D. Herald	Kambah, ACT	10:19:00 to 10:21:03
• J. Bradshaw	Samford Valley, QLD	09:40 to 10:30
• S. Kerr	Glenlee, QLD	10:15:00 to 10:25:00
(372) Palma	**UCAC2 9581428**	**2009 June 17**
• B. Loader	Darfield, NZ	14:02:00 to 14:07:00
(469) Argentina	**UCAC2 14887970**	**2009 June 17**
• J. Bradshaw	Samford Valley, QLD	10:34 to 10:42
• J. Broughton	Reedy Creek, QLD	10:37:52 to 10:40:22
(895) Helio	**UCAC2 18436529**	**2009 June 17**
• D. Herald	Kambah, ACT	12:19:20 to 12:22:50
(20665) 1999 UQ8	**TYC 5755-02089-1**	**2009 June 18**
• B. Loader	Darfield, NZ	15:07 to 15:11:30
• S. Quirk	Mudgee, NSW	15:14:00 to 15:17:00

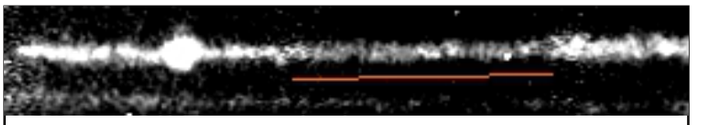
(309) Fraternitas	**TYC 6808-00947-1**	**2009 June 18**
• D. Watson	Thornton, NZ	10:04:00 to 10:24:00
• J. Bradshaw	Samford Valley, QLD	10:10 to 10:25

(372) Palma	**UCAC2 9580800**	**2009 June 18**
• S. Quirk	Mudgee, NSW	13:52:05 to 13:55:01

(179) Klytaemnestra	**UCAC2 25880613**	**2009 June 19**	
• B. Allen	Blenheim, NZ	D at 10:54:00.5	**CCD**
	Longitude: +173° 50′ 21.37″	R at 10:54:07.5	
	Latitude: -41° 29′ 30.05″	Duration: 7.0 secs	
	Altitude: 38 m	Monitored: 10:51:42 to 10:54:48	

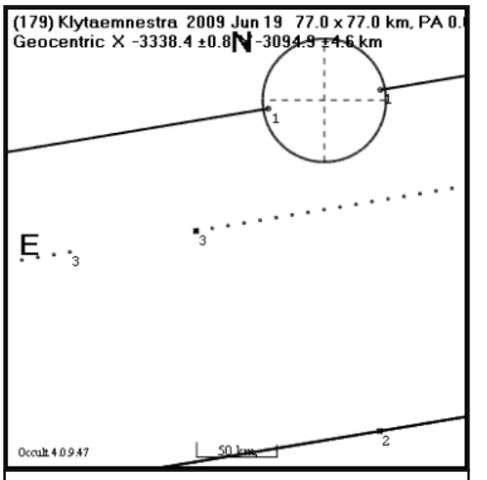
Observer's comments: Datum NZ1949 (topographical map). Very good observing conditions, Temperature 1.3°C, no wind. Automatic synchronisation of beeper box with BeeperSync to msltime1.irl.cri.nz

• B. Loader	Darfield, NZ	13:02:00 to 13:06:30



The figure above shows Bill Allen's drift-scan image of the occultation.

Discussion: A 7.0 second occultation was recorded by Bill Allen using a CCD drift-scan observation. The circle (right) is plotted at the expected 77 km diameter of Klytaemnestra. As only one chord was measured, we can not tell if the centre of the asteroid's track was to the north or south of Bill's position so it has been placed on the middle of Bill's chord.



Key to plot: 1. B. Allen;
2. B. Loader (miss);
3. Prediction 11 Jun.

(269) Justitia	**UCAC2 30205357**	**2009 June 19**
• B. Loader	Darfield, NZ	07:04 to 07:10

(469) Argentina	**UCAC2 15110010**	**2009 June 23**
• D. Watson	Thornton, NZ	14:18:00 to 14:30:00

(1199) Geldonia	**TYC 5742-01550-1**	**2009 June 24**
• B. Loader	Darfield, NZ	19:13:15 to 19:17:00

(303) Josephina	**UCAC2 21437975**	**2009 June 24**
• B. Loader	Darfield, NZ	13:22:30 to 13:27:00

(31) Euphrosyne | **UCAC2 9128919** | **2009 June 26**

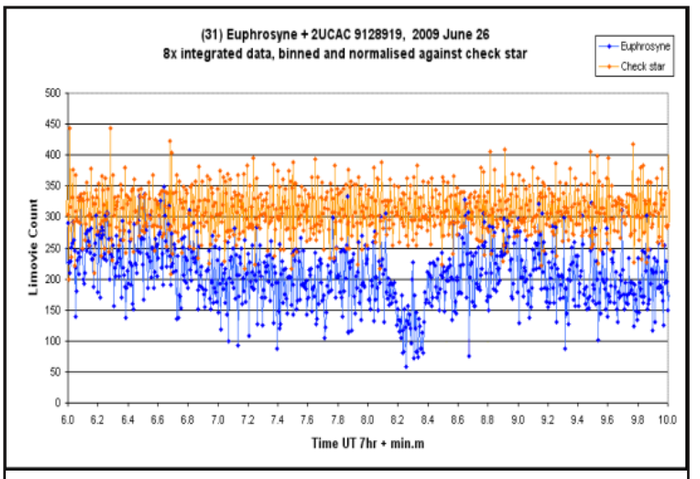
- B. Loader

Darfield, NZ
Longitude: +172° 06′ 24.00″
Latitude: -43° 28′ 53.00″
Altitude: 210 m

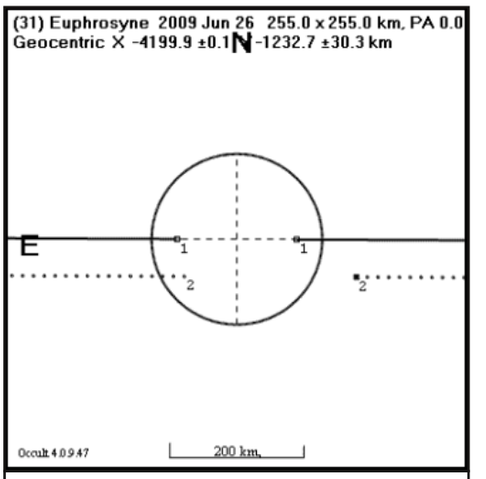
D at 07:08:11.4
R at 07:08:22.5
Duration: 11.1 secs
Monitored: 07:06 to 07:10

VIDEO

Observer's comments: A possible flash in the middle of the disappearance lasting 0.7 seconds from 7:08:17.4 to 7:08:18.1. Watec 120N camera used at 8x integration. Report prepopulated by OccultWatcher's Reporting Addin ver.1.2.



The lightcurve above is the Limovie analysis of the occultation observed by Brian Loader. The lower (blue) curve is the occulted star, while the upper (yellow) is a check star.



Key to plot:
1. B. Loader;
2. Prediction.

Discussion: Brian Loader observed a 11.1 second occultation of UCAC2 9128919 by Euphrosyne. The circle (above right) is plotted with the expected diameter of 255 km, and placed in the middle of Brian's chord. The lightcurve above has an interesting spike during the event. However a careful review suggests that this is most likely a noise spike.

(585) Bilkis | **TYC 5664-00159-1** | **2009 June 28**

- J. Broughton — Reedy Creek, QLD — 13:53:03 to 13:53:43
- J. Broughton — Brunswick Heads, NSW — 13:52:32 to 13:54:36

(190) Ismene | **TYC 6234-02090-1** | **2009 June 30**

- S. Kerr — Glenlee, QLD — 16:32:00 to 16:41:00

(1724) Vladimir | **UCAC2 29715802** | **2009 July 01**

- J. Broughton — Reedy Creek, QLD — 14:22:20 to 14:24:26

(107) Camilla | **UCAC2 28401617** | **2009 July 02**

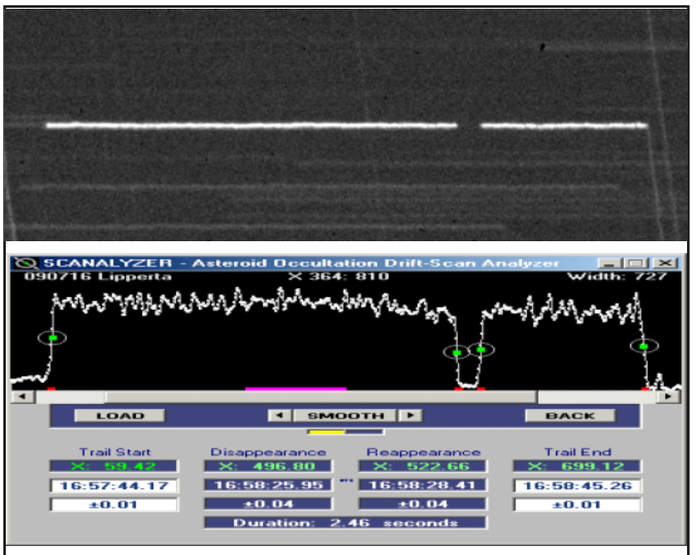
- J. Broughton — Reedy Creek, QLD — 10:16:39 to 10:18:46

(1040) Klumpkea | **TYC 6758-00151-1** | **2009 July 04**

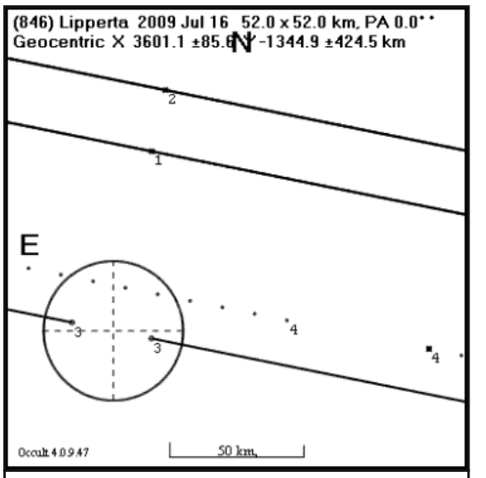
- J. Broughton — Reedy Creek, QLD — 11:11:19 to 11:12:50

(655) Briseis	**UCAC2 24912622**	**2009 July 09**
• J. Bradshaw	Samford Valley, QLD	10:46 to 10:56
(573) Recha	**UCAC2 17386416**	**2009 July 10**
• S. Kerr	Glenlee, QLD	17:27:00 to 17:37:00
(467) Laura	**TYC 7361-00247-1**	**2009 July 14**
• B. Loader	Darfield, NZ	09:34 to 09:38
(551) Ortrud	**UCAC2 24853317**	**2009 July 15**
• S. Kerr	Glenlee, QLD	09:22:00 to 09:37:00

(846) Lipperta	**TYC 6323-01363-1**	**2009 July 16**	
• J. Broughton	Reedy Creek, QLD	D at 16:58:25.95	**CCD**
	Longitude: +153° 23′ 52.9″	R at 16:58:28.41	
	Latitude: -28° 06′ 30.4″	Duration: 2.46 secs	
	Altitude: 66 m	Monitored: 16:57:44 to 16:58:45	
• D. Lowe	Brisbane, QLD	16:45:00 to 16:15:00	
• J. Bradshaw	Samford Valley, QLD	16:57:00 to 16:59:30	



The lightcurves above are the CCD drift-scan image and analysis respectively.



Key to plot:
1. D. Lowe (miss);
2. J. Bradshaw (miss);
3. J. Broughton;
4. Prediction 08 Jul.

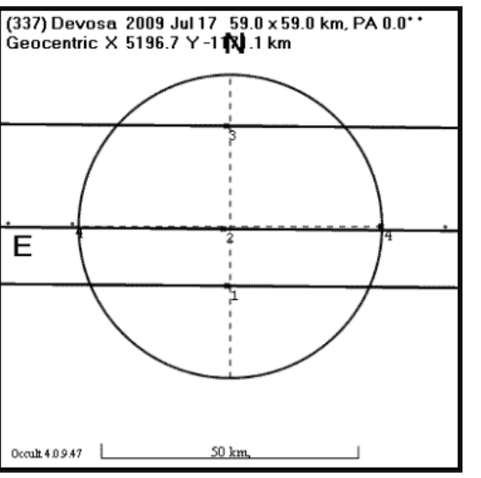
Discussion: John Broughton observed a 2.46 second ocultation using the drift-scan technique with a CCD. As only one chord was seen, the centre of asteroid's shadow could have passed either north or south of John's position, so the 52 km diameter circle (above right) has been plotted in the middle of John's chord.

(1724) Vladimir	**UCAC2 29327076**	**2009 July 17**
• J. Bradshaw	Samford Valley, QLD	13:19 to 13:23
• J. Broughton	Reedy Creek, QLD	13:19:48 to 13:23:48

(337) Devosa **UCAC2 17837555** **2009 July 17**

• D. Lowe	Gatton, QLD	17:44:30 to 18:09:00
• F. Adamson	Toowoomba, QLD	17:45:00 to 18:15:00
• J. Bradshaw	Samford Valley, QLD	17:55 to 18:00

Discussion: All three observers were using video cameras and recorded misses. A circle (right) has been arbitrarily centred on the predicted track and drawn with the expected 59 km diameter of Devosa.



Key to plot:
1. J. Bradshaw (miss);
2. D. Lowe (miss);
3. F. Adamson (miss);
4. Prediction 08 Jul.

(499) Venusia **UCAC2 22948434** **2009 July 17**

• D. Herald	Kambah, ACT	15:05:24 to 15:09:00

(12052) Aretaon **TYC 5586-00705-1** **2009 July 20**

• D. Watson	Thornton, NZ	07:32:00 to 07:52:00

(2259) Sofievka **TYC 6793-00690-1** **2009 July 20**

• B. Loader	Darfield, NZ	14:38:40 to 14:42:40

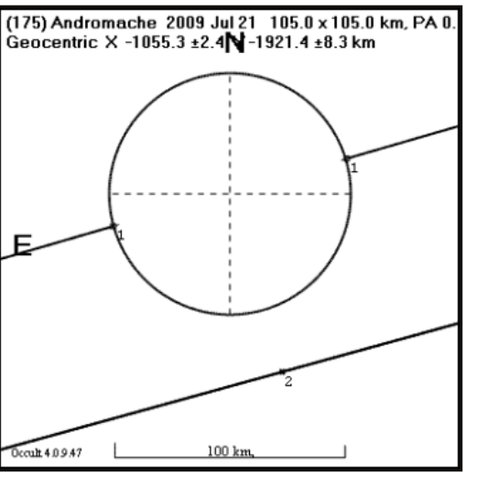
(175) Andromache **UCAC2 21121157** **2009 July 21**

• B. Loader	Darfield, NZ	D at 08:23:10.8	**VIDEO**
	Longitude: +172° 06′ 24.4″	R at 08:23:36.4	
	Latitude: -43° 28′ 52.9″	Duration: 25.6 secs	
	Altitude: 210 m	Monitored: 08:22:30 to 08:24:30	

Observer's comments: Watec 120N camera at 16x integration.

• D. Herald	Kambah, ACT	08:29:10 to 08:34:00

Discussion: Brian Loader observed a 25.6 second occultation using a video camera set to integrate over 16 frames. The circle (right) has been plotted with the expected 101 km diameter of Andromache and centred on the middle of Brian's 105 km chord. As only one chord was observed, we cannot be sure of the actual path of Andromache.



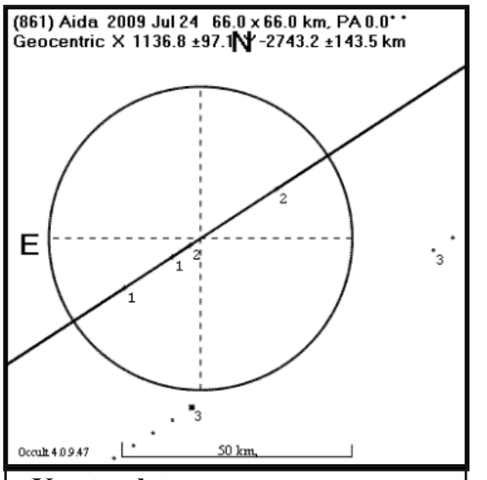
Key to plot:
1. B. Loader;
2. D. Herald (miss);
3. Prediction TT14 01 Jun 2009.

(686) Gersuind	**UCAC2 36917876**	**2009 July 22**
• J. Bradshaw	Samford Valley, QLD	14:11 to 14:20
• J. Broughton	Reedy Creek, QLD	14:17:47 to 14:18:28

(861) Aida	**TYC 4671-00495-1**	**2009 July 24**	
• C. Wyatt	Walcha, NSW	D at 18:59:28.2	**VISUAL**
	Longitude: +151° 32′ 00.2″	R at 18:59:36.0	
	Latitude: -31° 20′ 58.3″	Duration: 7.8 secs	
	Altitude: 1228 m	Monitored: 18:35:00 to 19:05:00	

Observer's comments: The star DIMMED at 18:59:28.240 (PE Applied) and DISAPPEARED at 18:59:28.527 (PE applied), I then observed a FLASH, "Back" at 18:59:30.697 (PE applied) then "Gone" at 18:59:31.600 (PE applied), with REAPPEARANCE at 18:59:36.035 (PE applied), the star did not seem to reappear gradually, it was instantaneous.

Discussion: Chris reported a 7.8 second occultation, with a flash of approximately 0.9 seconds duration near the middle of the observation. For an experienced visual observer seeing an occultation under good conditions, their accuracy is about 0.1 s. However Chris was observing a faint (V = 11.9) star, presumably using averted vision, so his accuracy is more likely to be about 0.5 s and we have rounded his reported times accordingly. A possible explanation for the 'flash' could be that Chris saw a grazing occultation with the flash being the star briefly re-appearing in a valley. Another possibility is the asteroid could be a close binary, with the flash being the gap between the components but there are no previous indication of binarity (this seems to be the first occultation of Aida). A final possibility is a false observation due to bad seeing and/or averted vision. Without any other observations of this event we can't choose between these possibilities. The circle (right) has been drawn with the expected diameter of 67 km.



Key to plot:
1. C. Wyatt;
2. C. Wyatt (after the flash);
3. Prediction 08 Jul.

(386) Siegena	**UCAC2 32905464**	**2009 July 25**
• J. Bradshaw	Samford Valley, QLD	08:18 to 08:26

(732) Tjilaki	**TYC 5186-00724-1**	**2009 July 28**	

Both observers saw evidence of a double star for this event.

• B. Loader	Darfield, NZ	D at 12:42:38.54	**VIDEO**
	Longitude: +172° 06′ 24.00″	R at 12:42:41.84	
	Latitude: -43° 28′ 53.00″	Duration: 3.30 secs	
	Altitude: 210 m	Monitored: 12:41 to 12:44	

Observer's comments: Star appears to be double. The above times are for the primary star.

• B. Loader	Darfield, NZ	D at 12:42:38.66	**VIDEO**
	Longitude: +172° 06′ 24.00″	R at 12:42:42.00	
	Latitude: -43° 28′ 53.00″	Duration: 3.34 secs	
	Altitude: 210 m	Monitored: 12:41 to 12:44	

Observer's comments: Secondary star.

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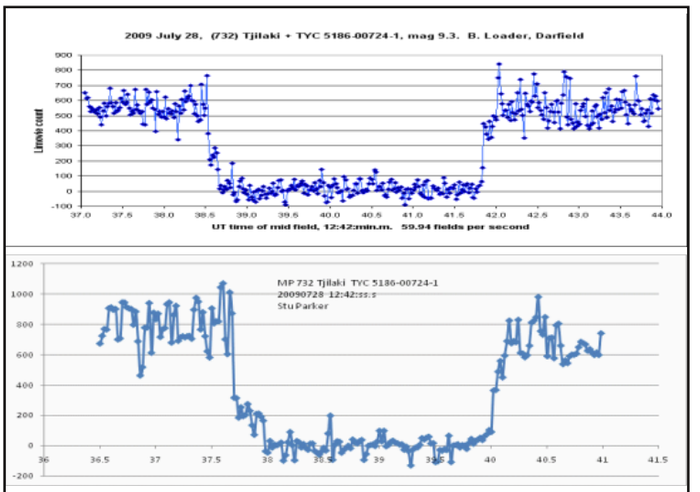
- S. Parker — Oxford, NZ — D at 12:42:37.70 — **VIDEO**
  Longitude: +172° 13′ 7.95″ — R at 12:42:40.02
  Latitude: -43° 18′ 36.78″ — Duration: 2.32 secs
  Altitude: 221 m — Monitored: 12:33 to 12:43

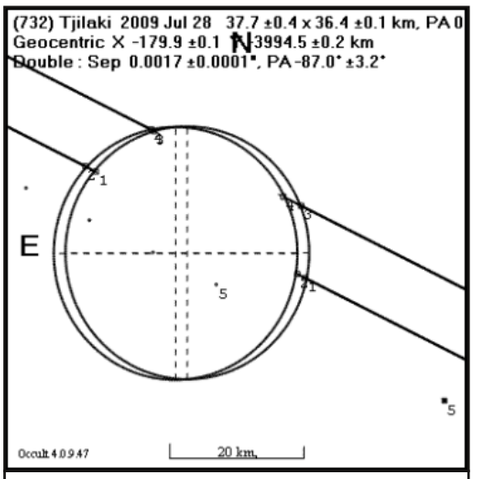
Observer's comments: Double Star - primary component.

- S. Parker — Oxford, NZ — D at 12:42:37.98 — **VIDEO**
  Longitude: +172° 13′ 7.95″ — R at 12:42:40.06
  Latitude: -43° 18′ 36.78″ — Duration: 2.08 secs
  Altitude: 221 m — Monitored: 12:33 to 12:43

Observer's comments: Double Star - secondary component.



The lightcurves above are the Limovie analysis of Brian Loader's (top diagram) and Stu Parker's observations (bottom diagram). The observers found a step in both the ingress and egress of the occultation.



Key to plot:

1. B. Loader;
2. B. Loader (secondary star);
3. S. Parker;
4. S. Parker (secondary star);
5. Prediction 23 Jul.

Discussion: The prediction gives the asteroid's diameter as 37 km. However the Geneva University's database (<CoR>page2cou.html) has provisional data indicating a 37.7 x 36.4 km ellipse, which has been used in the plot (above right) here. Fitting this ellipse to the chords for both the primary and secondary components of the double star give a separation of 1.7 milli-arcseconds and Position Angle of -87° between the components. No references to this star being a double were found, so it appears Brian and Stu are the first to discover this.

(694) Ekard — **TYC 1085-01152-1** — **2009 July 31**

- S. Kerr — Glenlee, QLD — D at 13:44:36.04 — **VIDEO**
  Longitude: +150° 30′ 00.80″ — R at 13:44:50.00
  Latitude: -23° 16′ 09.60″ — Duration: 13.96 secs
  Altitude: 50 m — Monitored: 13:40:00 to 13:49:00

Observer's comments: Camera integrating at 40 ms period.

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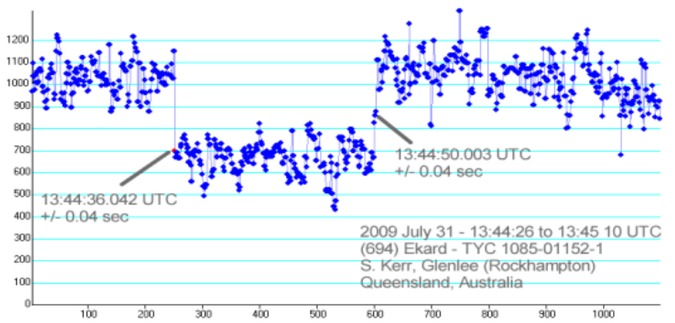
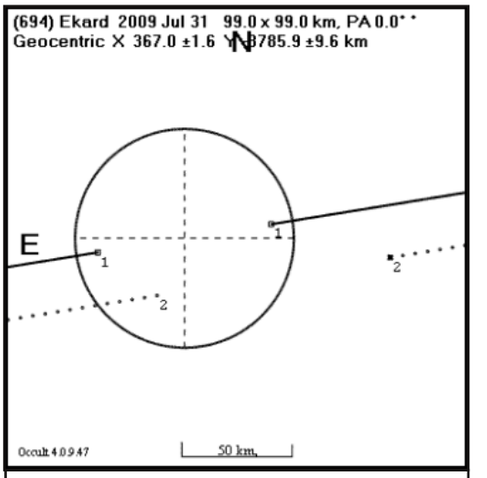


The lightcurve above is the Limovie analysis of Steve Kerr's observation of the occultation of TYC 1085-01152-1 by Ekard.



Key to plot:
1. S. Kerr;
2. Prediction 23 Jul.

Discussion: Steve Kerr observed an occultation of 13.96 seconds using a video camera set to integrate at 40 ms intervals. The circle (above, right) is plotted with the expected diameter of 99 km. As only the one chord was observed for this event, we cannot tell if the centre of the asteroid passed to the north or south of Steve's location.

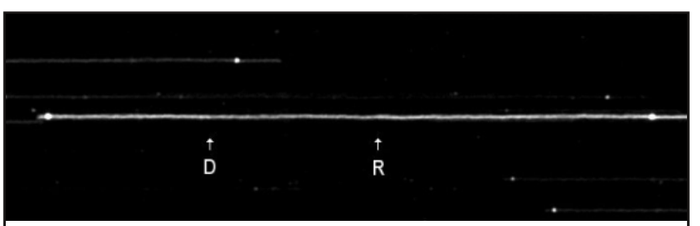
(7) Iris **UCAC2 24430236** **2009 July 31**

- J. Broughton — Reedy Creek, QLD — D at 14:38:40.66 — **CCD**
  Longitude: +153° 23′ 52.9″ — R at 14:38:56.69
  Latitude: -28° 06′ 30.4″ — Duration: 16.03 secs
  Altitude: 66 m — Monitored: 14:38:25 to 14:39:23

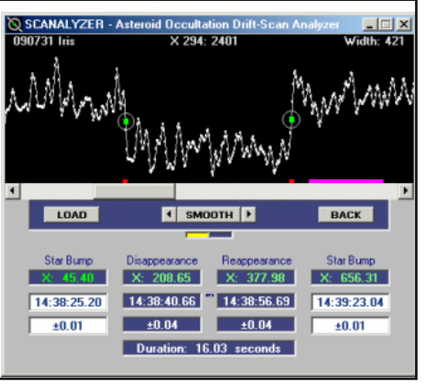
Observer's comments: The magnitude drop derived from the levels in the drift scan is 0.18

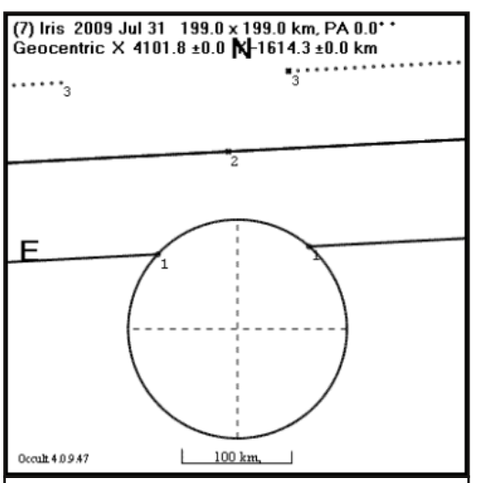
- J. Bradshaw — Samford Valley, QLD — 14:28 to 14:48

Observer's comments: This was a cert! But somehow still managed to miss… :(



The top picture is the CCD drift-scan image, while the other picture (right) is the analysis of the image using John's scanalyser software.





Key to plot:
1. J. Broughton;
2. J. Bradshaw (miss);
3. Prediction 23 Jul.

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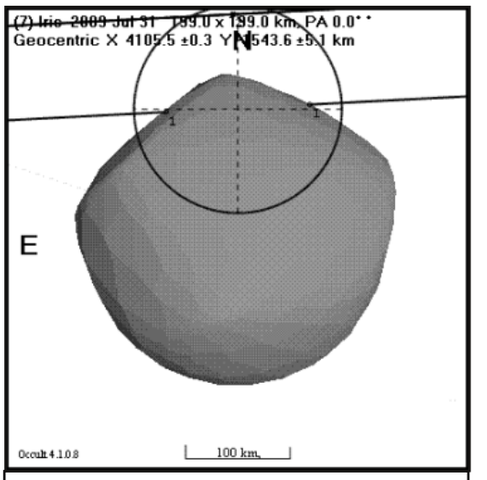
Discussion: John Broughton observed a 16.03 second occultation using a CCD in drift-scan mode, while Jonathon Bradshaw had a miss. This combination means the centre of the asteroid's shadow passed south of John's location, approximately 230 km south of the predicted path. The circle (previous page, right) is plotted with the expected 199 km diameter of Iris.

Previous occultations of Iris suggest that it is elliptical. A profile from a 3D shape model of Iris, taken from <DAMIT>data/archive/1-1000/A105.M108.shape.png, shows another possible fit. Unfortunately without further chords, there is no way to choose between the possible profiles.

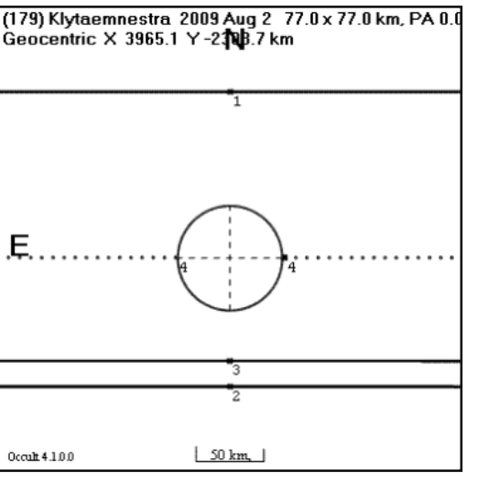


Key to plot:
1. J. Broughton;
2. J. Bradshaw (miss);
3. Prediction 23 Jul.

(690) Wratislavia	**UCAC2 3142273**	**2009 August 01**
• S. Kerr	Glenlee, QLD	09:11:00 to 09:19:00

(179) Klytaemnestra	**UCAC2 26086225**	**2009 August 02**
• C. Wyatt	Nowendoc, NSW	14:54:00 to 15:05:00
• D. Gault	Hawkesbury Heights, NSW	14:45 to 15:10
• H. Pavlov	Marsfield, NSW	14:51 to 15:02

Discussion: All three observers recorded misses for this event. The circle (right) is plotted at the expected 77 km diameter of Klytaemnestra. With no positive chords we cannot say where the actual path was, so the circle has been plotted on the predicted path.



Key to plot:
1. C. Wyatt (miss);
2. H. Pavlov (miss);
3. D. Gault (miss);
4. Prediction 25 Jun.

(12929) 1999 TZ1	**UCAC2 41043029**	**2009 August 02**
• J. Broughton	Reedy Creek, QLD	09:40:38 to 09:42:40
• C. Wyatt	Walcha, NSW	09:35:00 to 09:48:00
• D. Herald	Kambah, ACT	09:41:00 to 09:43:00
• H. Pavlov	Marsfield, NSW	09:39 to 09:43

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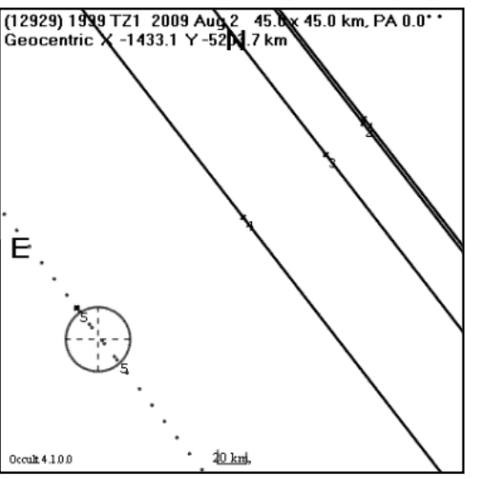
Discussion: All four observers recorded misses for this event. The circle (right) is plotted at the expected 45 km diameter of 1999 TZ1. With no positive chords we cannot say where the actual path was, so the circle has been plotted on the predicted path.



Key to plot:
1. J. Broughton (miss);
2. C. Wyatt (miss);
3. D. Herald (miss);
4. H. Pavlov (miss);
5. Prediction 25 Jun.

(18868) 1999 TD101	**TYC 6239-01696-1**	**2009 August 05**
• B. Loader	Darfield, NZ	13:28:30 to 13:34:30
(7607) Billmerline	**TYC 0013-00477-1**	**2009 August 05**
• B. Loader	Darfield, NZ	13:02:50 to 13:09
(818) Kapteynia	**TYC 7963-00865-1**	**2009 August 05**
• P. Anderson	The Gap, Brisbane, QLD	09:11:00 to 09:15:00
(480) Hansa	**TYC 1075-02956-1**	**2009 August 06**
• C. Wyatt	Nowendoc, NSW	09:00:00 to 09:23:00

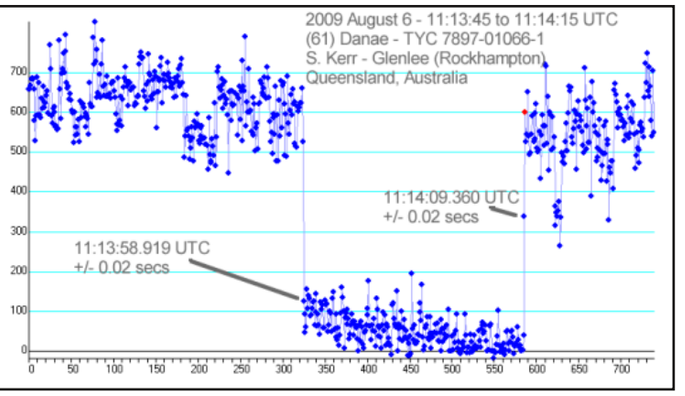
(61) Danae	**TYC 7897-01066-1**	**2009 August 06**	
• J. Broughton	Marburg, QLD	D at 11:13:09.69	**VIDEO**
	Longitude: +152° 35′ 41.5″	R at 11:13:16.33	
	Latitude: -27° 33′ 55.7″	Duration: 6.64 secs	
	Altitude: 88 m	Monitored: 11:12:06 to 11:16:37	

Observer's comments: Watec 120N+ running at 25 fps.

• S. Kerr	Glenlee, QLD	D at 11:13:58.92	**VIDEO**
	Longitude: +150° 30′ 00.80″	R at 11:14:09.36	
	Latitude: -23° 16′ 09.60″	Duration: 10.44 secs	
	Altitude: 50 m	Monitored: 11:09:00 to 11:19:00	
• J. Bradshaw	Samford Valley, QLD	21:07 to 12:15	
• P. Anderson	The Gap, Brisbane, QLD	11:01:30 to 11:19:00	

Discussion: Two observers recorded occultations while three had misses. The ellipse (next page) is plotted with the same area as a circle of the expected 76 km diameter of Danae. With two chords we have confidence that the path

The lightcurve (right) is the Limovie analysis of Steve Kerr's observation.



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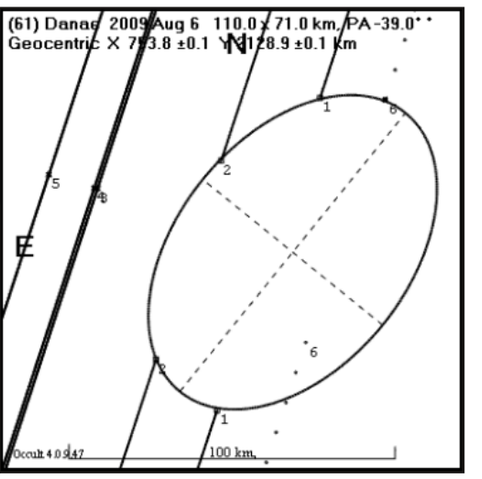
centre was close to Steve Kerr's location. There are no previous observations of Danae with multiple chords and no data on the shape from asteroid lightcurve measurements.



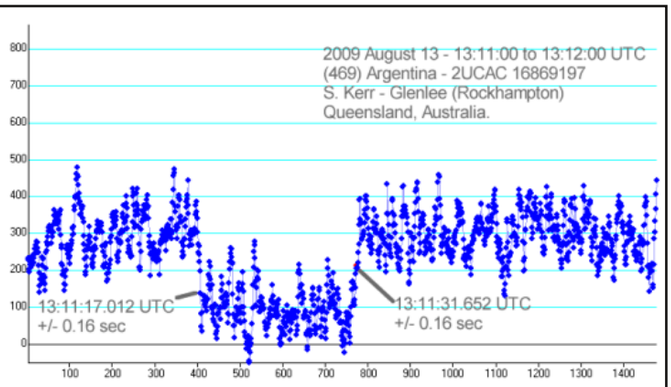
Key to plot:
1. S. Kerr;
2. J. Broughton;
3. J. Bradshaw (miss);
4. P. Anderson (miss);
5. J. Broughton (secondary star) (miss);
6. Prediction 25 Jun.

(337) Devosa | **UCAC2 18059433** | **2009 August 13**

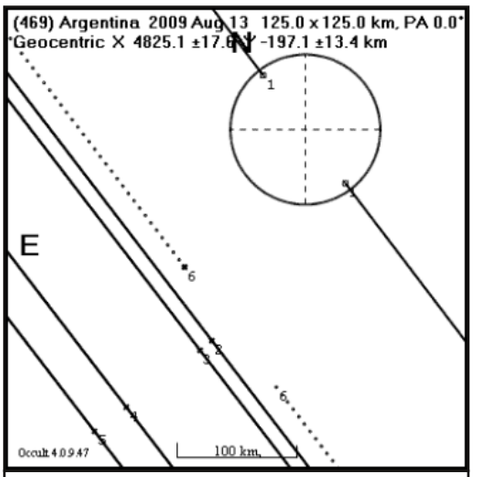
- C. Wyatt — Walcha, NSW — 12:23:00 to 12:28:00

(469) Argentina | **UCAC2 16869197** | **2009 August 13**

- S. Kerr — Glenlee, QLD — D at 13:11:17.0 — **VIDEO**
  Longitude: +150° 30′ 00.80″ — R at 13:11:31.6
  Latitude: -23° 16′ 09.60″ — Duration: 14.6 secs
  Altitude: 50 m — Monitored: 13:06:00 to 13:16:00
- D. Gault — Hawkesbury Heights, NSW — 13:02 to 13:15
- D. Herald — Kambah, ACT — 13:06:20 to 13:09:50
- H. Pavlov — Marsfield, NSW — 12:57 to 13:11
- S. Quirk — Mudgee, NSW — 13:07:57 to 13:11:57



The lightcurve above is the Limovie analysis of Steve Kerr's observations.



Key to plot:
1. S. Kerr;
2. S. Quirk (miss);
3. D. Herald (miss);
4. D. Gault (miss);
5. H. Pavlov (miss);
6. Prediction 06 Aug.

Discussion: Steve Kerr observed a 14.6 second occultation, four other observers recorded misses while two other observers (not listed) were clouded out. The circle (above right) is plotted at the expected 125 km diameter of Argentina.

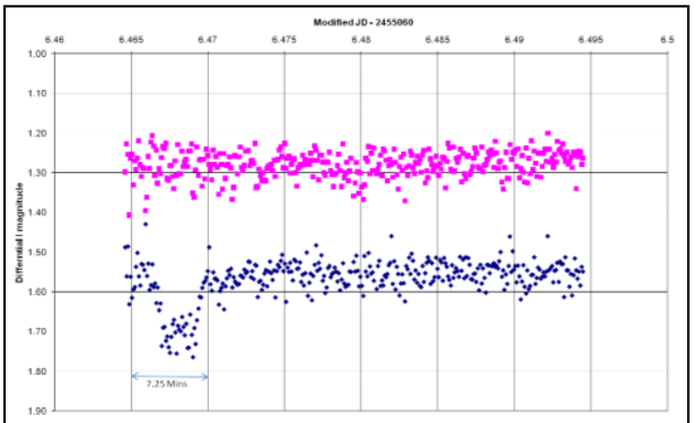
(407) Arachne	**UCAC2 22555961**	**2009 August 15**
• D. Herald	Kambah, ACT	14:17:27 to 14:21:00
(498) Tokio	**UCAC2 23162544**	**2009 August 18**
• D. Gault	Hawkesbury Heights, NSW	09:01 to 09:16
• H. Pavlov	Marsfield, NSW	09:07:00 to 09:16:30
(50925) 2000 GW64	**TYC 7928-01374-1**	**2009 August 18**
• B. Loader	Darfield, NZ	15:20 to 15:26
(490) Veritas	**UCAC2 28459740**	**2009 August 21**
• B. Loader	Darfield, NZ	09:58:30 to 10:04:00

(134340) Pluto
- J. Greenhill

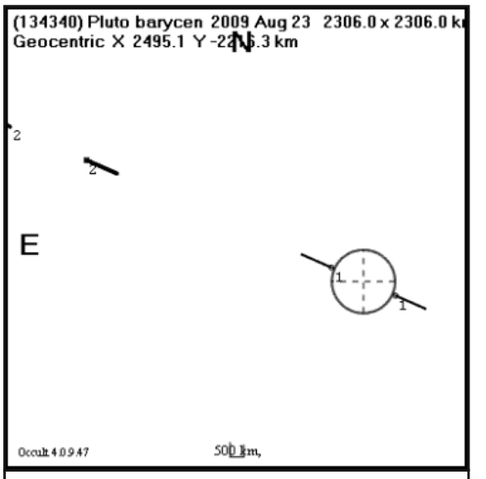
Unknown faint star
Mt Canopus Obs, TAS
Longitude: +147° 25′ 52.6″
Latitude: -42° 50′ 49.4″
Altitude: 1000 m

2009 August 23
D at 11:12:12.0
R at 11:16:01.0
Duration: 229.0 secs
Monitored: 11:09 to 11:52

CCD PHOTOMETRY



The lightcurves above are the analysis of John Greenhill's measurements. The (differential magnitude) measurements are all relative to a brighter comparison star. The upper lightcurve is of a fainter comparison star, while the lower lightcurve is of the star being occulted by Pluto.



Key to plot:
1. J. Greenhill;
2. Prediction 01 Jul 2009.

Discussion: Bruno Sicardy (Paris Observatory) predicted that Pluto would occult this very faint star (which is 'unknown' in the sense that it isn't listed in any of the star catalogs that we use) with a track running along the south-eastern corner of Australia. John Greenhill observed a five minute occultation of this star using a CCD as a photometer taking a series of 8 second exposures (rather than a drift-scan single exposure that is normally needed for the majority of occultations that only last a few seconds), with the differential magnitudes measured using DoPhot software. UCAC2 25150324, which is close by, has been used for the further analysis in Occult software. The disappearance and reappearance times have been taken when the occulted star's brightness is at the 50% level between the un-occulted and fully occulted intensity levels. The circle (above right) is plotted at the expected 2306 km diameter of Pluto. The slow disappearance and reappearance is caused by the attenuation of the star's light by Pluto's atmosphere.

(3730) Hurban	**TYC 6331-00798-1**	**2009 August 24**
• B. Loader	Darfield, NZ	11:14:30 to 11:17:00
• S. Parker	Oxford, NZ	? to 12:00

(675) Ludmilla	**UCAC2 28281783**	**2009 August 24**
• S. Kerr	Glenlee, QLD	15:36:00 to 15:45:00

(247) Eukrate	**UCAC2 9577346**	**2009 August 26**	
• D. Gault	Hawkesbury Heights, NSW	D at 11:44:10.74	**VIDEO**
	Longitude: +150° 38′ 28.00″	R at 11:44:21.08	
	Latitude: -33° 39′ 52.00″	Duration: 10.34 secs	
	Altitude: 286 m	Monitored: 11:39 to 11:47	

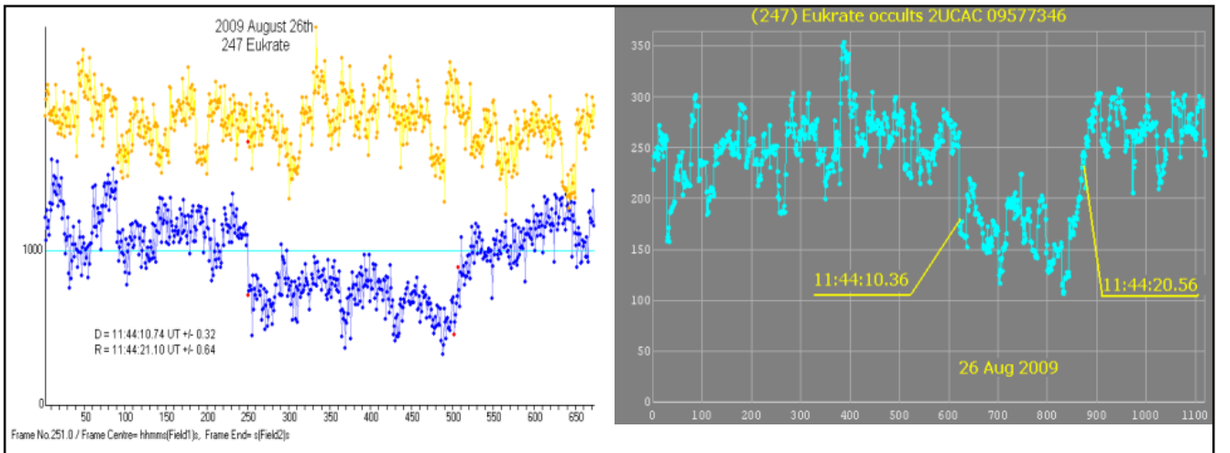
Observer's comments: Camera - Watec 120N.

• H. Pavlov	Marsfield, NSW	D at 11:44:10.36	**VIDEO**
	Longitude: +151° 06′ 16.80″	R at 11:44:20.56	
	Latitude: -33° 46′ 11.50″	Duration: 10.20 secs	
	Altitude: 100 m	Monitored: 11:42 to 11:46	

Observer's comments:
http://www.hristopavlov.net/Observations/Positives/2009-08-26%20Eukrate/Event.html.

• S. Russell	Oatlands, NSW	D at 11:44:09.82	**VIDEO**
	Longitude: +151° 00′ 56.1″	R at 11:44:20.03	
	Latitude: +33° 47′ 49.32″	Duration: 10.21 secs	
	Altitude: 65 m	Monitored: 11:35:00 to 15:40:00	

• J. Bradshaw	Samford Valley, QLD	11:35 to 11:48
• S. Kerr	Glenlee, QLD	11:41:00 to 11:50:00



The left diagram is the Limovie analysis of Dave Gault's observations, with the top light curve being a comparison star and the lower the occulted star. The right diagram is the Tangra analysis of Hristo Pavlov's observation.

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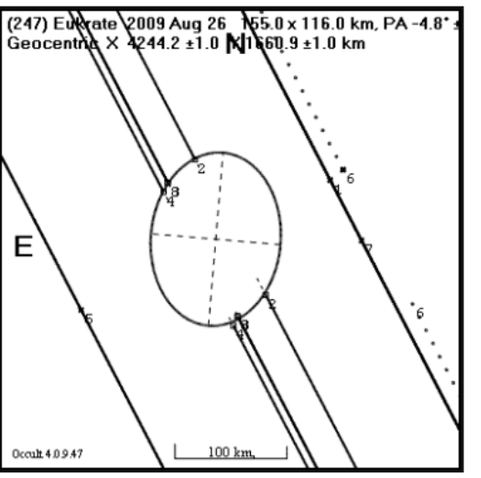
Discussion: Three positive occultations and two misses were recorded for this event. The ellipse (right) is plotted with the same area as a circle of the expected 134 km diameter of Eukrate. There is no data in the Geneva Observatory's database on the shape of Eukrate, nor any previous events with multiple chords, so the ellipse is the best shape of the asteroid that can be derived.

Key to plot:
1. S. Kerr (miss);
2. D. Gault; 3. S. Russell;
4. H. Pavlov;
5. J. Bradshaw (miss);
6. Prediction 07 Aug.



(747) Winchester	**UCAC2 24231961**	**2009 August 27**
• J. Bradshaw	Samford Valley, QLD	10:20 to 10:28
• J. Broughton	Eumundi, QLD	10:23:43 to 10:25:33
(1101) Clematis	**UCAC2 35849023**	**2009 August 28**
• B. Loader	Darfield, NZ	10:54:30 to 10:58:00
(2060) Chiron	**UCAC2 29201987**	**2009 August 28**
• B. Loader	Darfield, NZ	13:24 to 13:29:15
• J. Bradshaw	Samford Valley, QLD	13:25 to 13:29
• S. Kerr	Glenlee, QLD	13:22:00 to 13:33:00
(2207) Antenor	**UCAC2 25800678**	**2009 August 28**
• B. Loader	Darfield, NZ	09:40 to 09:45
(15519) 1999 XW	**TYC 7460-01433-1**	**2009 September 01**
• D. Herald	Kambah, ACT	16:52:30 to 16:54:30
(33800) Gross	**HIP 91740**	**2009 September 02**
• B. Loader	Darfield, NZ	09:47 to 09:50:30
(1867) Deiphobus	**TYC 7346-00177-1**	**2009 September 04**
• B. Loader	Darfield, NZ	10:55:00 to 10:58:00
(693) Zerbinetta	**UCAC2 15603141**	**2009 September 05**
• B. Loader	Darfield, NZ	13:51:30 to 13:55

(747) Winchester **UCAC2 23750990** **2009 September 05**

This was one of the year's most successful events, with six observers recording occultations, four observers with five misses and another five (Ted Dobosz, Jonathan Bradshaw, Hristo Pavlov, Darren Corbett and Bernard Heathcote) registering for the event but being unable to observe.

• C. Wyatt	Narrabri, NSW	D at 11:10:54.0	**VISUAL**
	Longitude: +149° 41′ 33.4″	R at 11:11:16.0	
	Latitude: -30° 13′ 54.7″	Duration: 22.0 secs	

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	Altitude: 210 m	Monitored: 10:54:00 to 11:25:00	

Observer's comments: There is a little uncertainty about the disappearance and reappearance times as the star dimmed gradually and reappeared gradually. I was about one second late calling the R and 2-3 seconds late calling the D as it surprised me in as much as I was expecting a rapid drop off of brightness, not a gradual dimming.

• D. Gault	Macquarie Woods, NSW	D at 11:11:35.2	**VIDEO**
	Longitude: +149° 18′ 50.45″	R at 11:11:48.6	
	Latitude: -33° 24′ 30.73″	Duration: 13.4 secs	
	Altitude: 954 m	Monitored: 10:23:14 to 11:40	
• D. Herald	Bowning, NSW	D at 11:12:00.64	**VIDEO**
	Longitude: +148° 50′ 57.4″	R at 11:12:07.15	
	Latitude: -34° 44′ 52.7″	Duration: 6.51 secs	
	Altitude: 556 m	Monitored: 11:09:00 to 11:13:00	
• D. Lowe	Leyburn, QLD	D at 11:10:01.2**5**	**VIDEO**
	Longitude: +151° 34′ 4.17″	R at 11:10:20.77	
	Latitude: -27° 58′ 57.83″	Duration: 19.53 secs	
	Altitude: 413 m	Monitored: 11:00 to 11:20	

Observer's comments: Bright Moon. Camera integrating at x16 so 0.32 sec subtracted from times to correct for this.
Editor's comments: Dennis was using a WAT120+ camera, which should have a 0.35 s subtraction at a x16 setting. This correction has been used in the times given above.

• S. Quirk	Mudgee, NSW	D at 11:11:17.36	**VIDEO**
	Longitude: +149° 39′ 45.6″	R at 11:11:34.08	
	Latitude: -32° 27′ 21.3″	Duration: 16.72 secs	
	Altitude: 508 m	Monitored: 11:10:25 to 11:14:03	

Observer's comments: Lost the GPS signal just before the event (11:10:58). Did frame count back from when GPS re-established at 11:11:44.009.

• S. Russell	Orange, NSW	D at 11:11:28.52	**VIDEO**
	Longitude: +148° 51′ 03.12″	R at 11:11:52.0	
	Latitude: +33° 14′ 30.50″	Duration: 23.5 secs	
	Altitude: 565 m	Monitored: 10:40:00 to 11:12:30	

Observer's comments: Magnitude drop too small. Double star?

• D. Herald	Kambah, ACT	11:08:00 to 11:14:30
• J. Betts	Hawkesbury Heights, NSW	11:11:09 to 11:12:24
• J. Broughton	Reedy Creek, QLD	11:09:50 to 11:10:32
• J. Broughton	Goodna, QLD	11:09:11 to 11:12:28
• P. Purcell	Weston Creek, ACT	11:11:00 to 11:13:00

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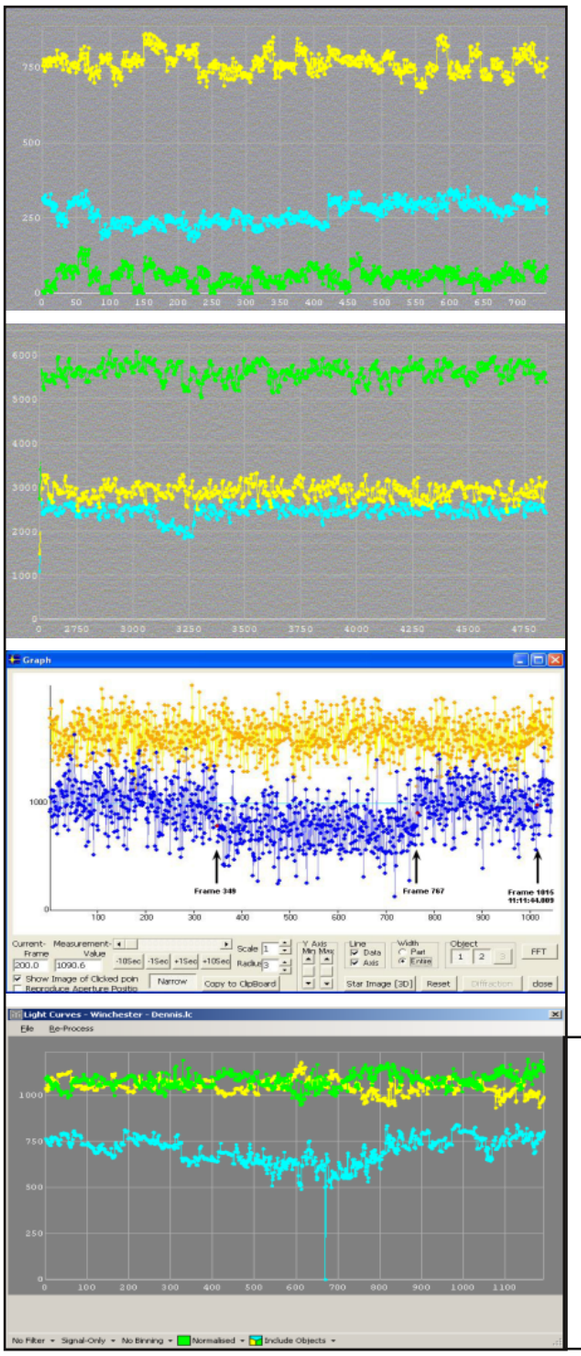
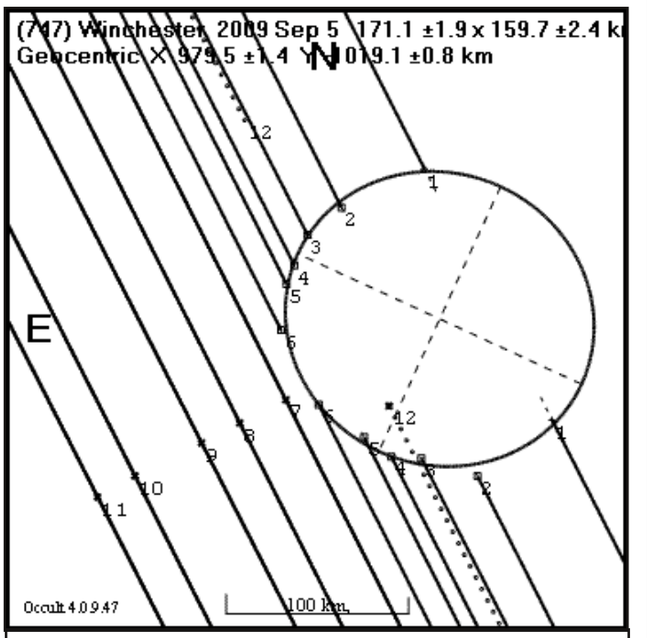




Key to plot:

1. C. Wyatt; 2. S. Russell;
3. D. Lowe; 4. S. Quirk;
5. D. Gault; 6. D. Herald, Bowning;

Misses:

7. P. Purcell; 8. D. Herald, Kambah;
9. J. Broughton, Goodna;
10. J. Betts; 11. J. Broughton, Reedy Creek;
12. Prediction 20 Aug.

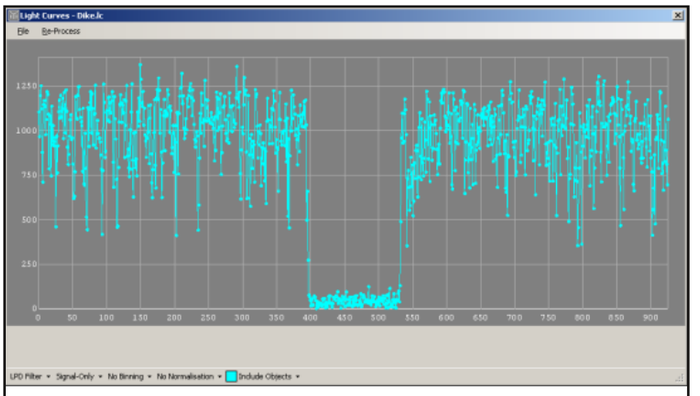
The lightcurves (left) are the analysis of Dave Gault's (upper diagram, using Tangra), Dave Herald's (second from top, using Tangra), Steve Quirk's (third from top, using Limovie) and Dennis Lowe's (bottom diagram, using Tangra) observations of the occultation. The yellow and green lightcurves are of comparison stars, while the blue lightcurve is that of the occulted star.

Discussion: The ellipse (above) is plotted as the best fit to the video observations of Winchester. The times of Chris Wyatt's visual observation have been offset by -12 s to agree with that shape but his duration is retained. The gradual disappearance and reappearance seen by Chris may be due to a graze on a limb. All of the other positive (video) observations saw instantaneous changes. However none were on the same side of the profile as Chris, so their observations can not be used to confirm or rule out Chris seeing a graze. With six chords we have very high confidence that the central line of the event had moved about 50 km to the west of its predicted position.

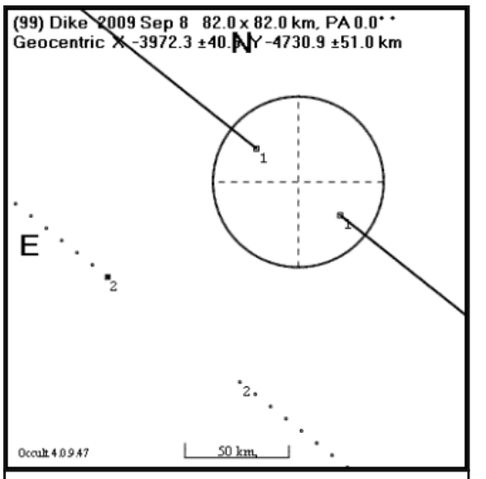
(99) Dike **TYC 1815-01949-1** **2009 September 08**

• D. Herald	Kambah, ACT	D at 15:53:33.96	**VIDEO**
	Longitude: +149° 03′ 48.90″	R at 15:53:39.42	
	Latitude: -35° 23′ 49.30″	Duration: 5.46 secs	
	Altitude: 582 m	Monitored: 15:52:30 to 15:53:55	

Observer's comments: Minor obstruction by a tree.



The lightcurve above is the Tangra analysis of Dave Herald's observations.



Key to plot: 1. D. Herald; 2. Prediction 06 Aug.

Discussion: A 5.46 second occultation was recorded by Dave Herald. The circle (above right) is plotted at the expected 82 km diameter of Dike. As we cannot tell if the central line of the asteroid is north or south of Dave's location, it has been arbitarily placed on Dave's chord. Although there is a hint of a step in the disappearance, this could easily be due to noise rather than a double star.

(1609) Brenda **TYC 6835-00082-1** **2009 September 09**

• D. Herald	Kambah, ACT	11:19:00 to 11:20:30

(372) Palma **UCAC2 13408389** **2009 September 10**

Four occultations were measured for this event, with two misses that bracket the chords.

• C. Wyatt	Walcha, NSW	D at 09:54:59.2	**VISUAL**
	Longitude: +151° 33′ 13.6″	R at 09:55:09.7	
	Latitude: -31° 00′ 23.4″	Duration: 10.5 secs	
	Altitude: 1166 m	Monitored: 09:50:00 to 09:58:00	

Observer's comments: Timing was done visually, with a Beeper Box and voice recording and monitoring a TV screen with GSTAR-EXC camera on 8" SCT @ f/6.3, working equivalent to a 7 mm eyepiece (x180) ; The GSTAR integration (x16) = 0.32 second delay was added to my PE of 0.4, giving a total delay of 0.72 seconds.

• D. Gault	Hawkesbury Heights, NSW	D at 09:54:46.97	**VIDEO**
	Longitude: +150° 38′ 28.00″	R at 09:54:51.73	
	Latitude: -33° 39′ 52.00″	Duration: 4.76 secs	
	Altitude: 286 m	Monitored: 09:28 to 09:57	

• D. Herald	Kambah, ACT	D at 09:54:33.35	**VIDEO**
	Longitude: +149° 03′ 48.90″	R at 09:54:40.23	
	Latitude: -35° 23′ 49.30″	Duration: 6.88 secs	
	Altitude: 582 m	Monitored: 09:53:00 to 09:55:00	

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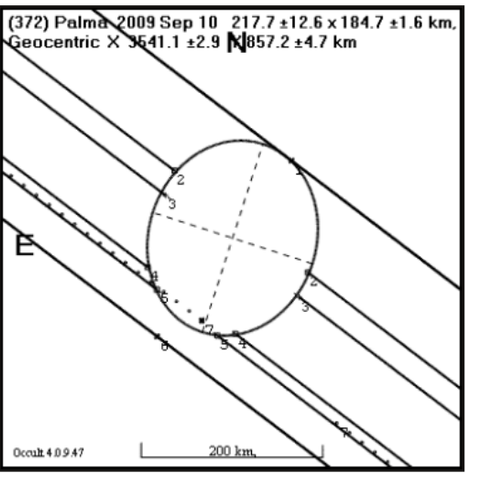
• J. Broughton	Reedy Creek, QLD	D at 09:55:16.9	**VIDEO**
	Longitude: +153° 23′ 52.9″	R at 09:55:27.4	
	Latitude: -28° 06′ 30.4″	Duration: 10.5 secs	
	Altitude: 66 m	Monitored: 09:50:00 to 09:57:06	

Observer's comments: Watec 120N+ at 8x integration.

• H. Pavlov	Marsfield, NSW	09:46 to 09:56
• J. Bradshaw	Samford Valley, QLD	09:48 to 09:58

Discussion: The ellipse (right) is plotted as the best fit for the four chords of Palma. It appears to have shifted about 100 km northwest of the predicted path. The ellipse has an axis ratio of 1.18, which is similar to the 1.14 ratio found from analysis of the asteroid's lightcurve data (Bernasconi and Antonini, <CoR>page2cou.html).

Key to plot:
1. J. Bradshaw (miss);
2. J. Broughton;
3. C. Wyatt;
4. D. Herald;
5. D. Gault;
6. H. Pavlov (miss);
7. Prediction 09 Aug.

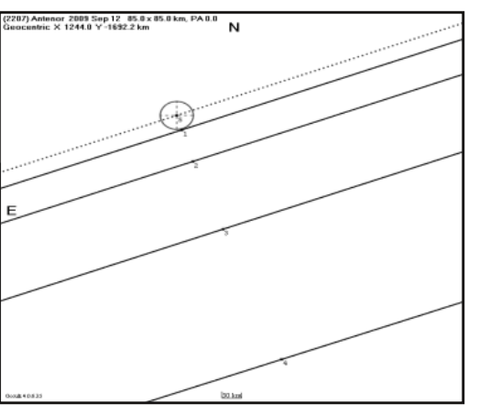


(156) Xanthippe	**UCAC2 29742996**	**2009 September 11**
• B. Loader	Darfield, NZ	11:40:30 to 11:42:30
(838) Seraphina	**UCAC2 27341834**	**2009 September 11**
• B. Loader	Darfield, NZ	11:09:30 to 11:14
(1725) CrAO	**HIP 114204**	**2009 September 12**
• B. Loader	Darfield, NZ	08:25 to 08:27:30

(2207) Antenor	**UCAC2 25575141**	**2009 September 12**
• B. Loader	Darfield, NZ	08:58:05 to 09:00:35
• D. Gault	Hawkesbury Heights, NSW	08:28 to 09:05
• D. Herald	Kambah, ACT	08:56:02 to 08:58:44
• S. Quirk	Mudgee, NSW	08:55:05 to 08:58:59

Discussion: All four observers recorded misses for this event. Without any positive results, we cannot tell where the asteroid was, so in the plot (right) it has been placed on the predicted path and shown as a circle with the expected 85 km diameter.

Key to plot:
1. S. Quirk (miss);
2. D. Gault (miss);
3. D. Herald (miss);
4. B. Loader (miss);
5. Prediction 20 Aug.



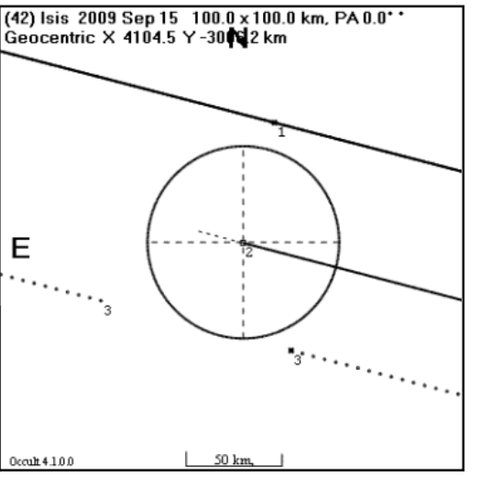
(337) Devosa	**UCAC2 19023553**	**2009 September 15**
• B. Loader	Darfield, NZ	08:02 to 08:06

(42) Isis	**TYC 6409-00179-1**	**2009 September 15**	
• B. Loader	Darfield, NZ	D at 16:08:57.0	**VIDEO**
	Longitude: +172° 06′ 24.4″	R not observed	
	Latitude: -43° 28′ 52.9″	Duration: 13.0 secs	
	Altitude: 210 m	Monitored: 16:07 to 16:09:10	

Observer's comments: Thickening cloud forced use of Watec 120N camera; integration had to be increased from 32x to 64x at 16:08:21. A probable disappearance recorded. Timing accuracy ±2 seconds at 64 fold integration. Star image lost at ca 16:09:10 as cloud thickened, so any reappearance unobserved.

• G. Blow	Khandallah, Wellington, NZ	16:05:09 to 16:11:56

Discussion: Brian Loader was only able to observe the disappearance of this event (due to cloud), while Graham Blow had a miss. The circle (right) has been plotted with the expected 100 km diameter of Isis and arbitarily centred on Brian's disappearance location.



Key to plot:
1. G. Blow (miss);
2. B. Loader;
3. Prediction 02 Sep.

(605) Juvisia	**UCAC2 22126363**	**2009 September 18**
• J. Bradshaw	Samford Valley, QLD	12:50 to 12:57

(15871) 1996 QX1	**TYC 6311-00619-1**	**2009 September 19**
• D. Herald	Kambah, ACT	09:38:00 to 09:40:50

(78) Diana	**TYC 5797-00170-1**	**2009 September 21**
• G. Blow	Khandallah, Wellington, NZ	08:22:06 to 08:32:37
• R. Idaczyk	Ngaio, NZ	08:23:56 to 08:30:32

(283) Emma	**TYC 1775-01459-1**	**2009 September 22**	
• D. Lowe	Gatton, QLD	D at 16:13:18.1	**VIDEO**
	Longitude: +152° 21′ 28.43″	R at 16:13:31.6	
	Latitude: -27° 30′ 55.08″	Duration: 13.5 secs	
	Altitude: 95 m	Monitored: 16:06:00 to 16:20:00	

Observer's comments: Some smoke haze. Telescope fitted with GSTAR-EX video camera and focal reducer. Integrating at x12 so 0.24 seconds deducted from time to compensate for delay.

• J. Broughton	Ballina, NSW	D at 16:12:43.83	**VIDEO**
	Longitude: +153° 33′ 46.9″	R at 16:13:03.59	

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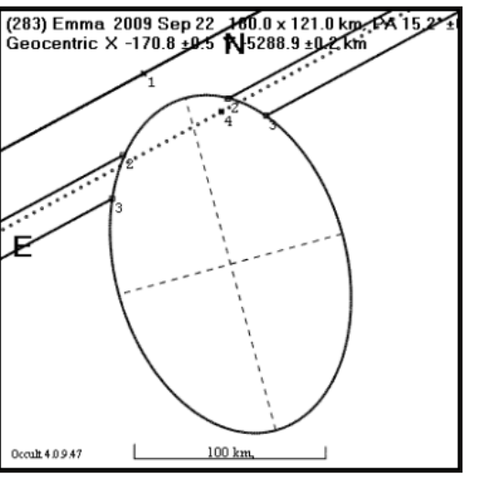
Latitude: -28° 50′ 26.4″ Duration: 19.76 secs
Altitude: 3 m Monitored: 16:11:17 to 16:16:10

Observer's comments: Watec 120N+ at 2x integration.

- J. Bradshaw Samford Valley, QLD 16:10 to 16:15

Discussion: Two occultations were observed by Dennis Lowe and John Broughton respectively, while Jonathon Bradshaw recorded a miss. The ellipse (right) is plotted with the same area as a circle with the expected 148 km diameter of Emma. The combination of two chords and a nearby miss means we can be confident that the observers were north of the centre of the asteroid's path.

Key to plot:
1. J. Bradshaw (miss);
2. D. Lowe;
3. J. Broughton;
4. Prediction 16 Sep.



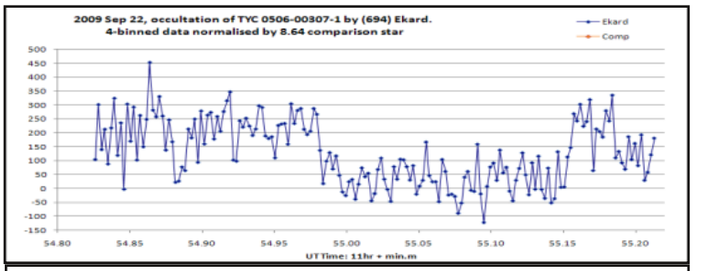
(694) Ekard **TYC 0506-00307-1** **2009 September 22**

- B. Loader Darfield, NZ D at 11:54:58.9 **VIDEO**

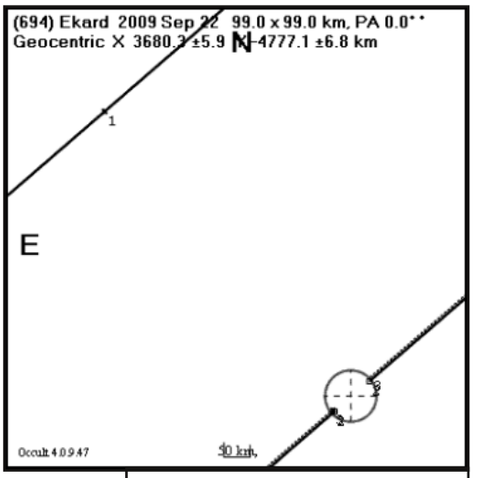
Longitude: +172° 06′ 24.40″ R at 11:55:09.2
Latitude: -43° 28′ 52.90″ Duration: 10.3 secs
Altitude: 210 m Monitored: 11:54:00 to 11:55:40

Observer's comments: Variable thin cloud.

- D. Watson Thornton, NZ 11:50:00 to 12:01:00



The lightcurve (above) is the Limovie analysis of Brian Loader's observations, with the data four-binned and normalised to the magnitude 8.64 comparison star.



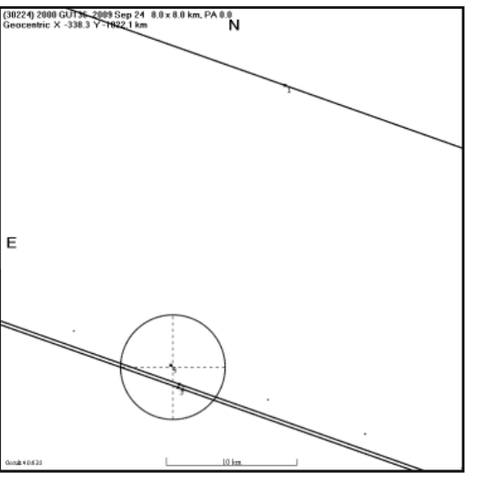
Discussion: Brian Loader observed a 10.3 second occultation while Diana Watson had a miss. The circle (right) is plotted at the expected 99 km diameter of Ekard. As usual with only one chord, the central position of the asteroid can not be deduced and so has been placed in the predicted position.

Key to plot:
1. D. Watson (miss);
2. B. Loader;
3. Prediction 06 Aug.

(30224) 2000 GU136 | **HIP 4656** | **2009 September 24**

- D. Gault — Hawkesbury Heights, NSW — 12:17 to 12:32
- H. Pavlov — Marsfield, NSW — 14:22 to 14:30
- S. Russell — Oatlands, NSW — 00:20:00 to 00:35:00

Discussion: All three observers recorded misses for this event, despite two of them being within the predicted shadow path. The circle (right) has been centred on the predicted position, and plotted with the asteroid's expected 8 km diameter.



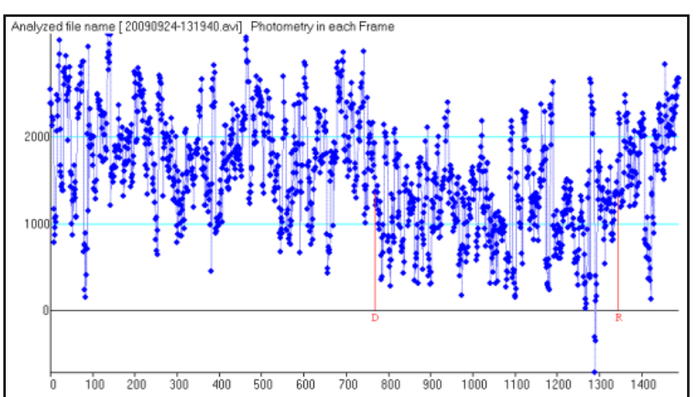
Key to plot:
1. D. Gault (miss);
2. H. Pavlov (miss);
3. S. Russell (miss);
4. Prediction OZNZ 01 Sep.

(675) Ludmilla | **UCAC2 28103901** | **2009 September 24**

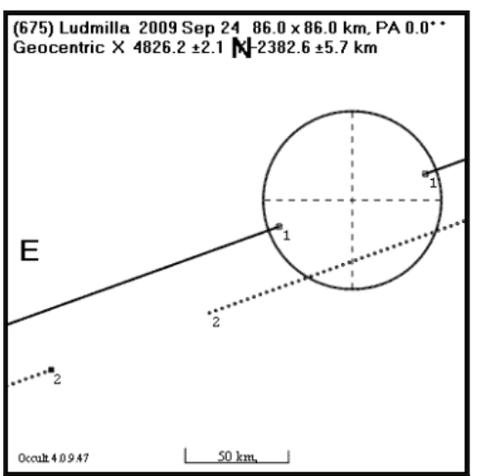
- J. Broughton — Reedy Creek, QLD — D at 13:20:10.5 — **VIDEO**

Longitude: +153° 23′ 52.9″ — R at 13:20:33.5
Latitude: -28° 06′ 30.4″ — Duration: 23.0 secs
Altitude: 66 m — Monitored: 13:18:55 to 13:22:55

Observer's comments: Watec 120N+ running at 8-frame integration. This lengthy 13th-magnitude occultation was a difficult one to analyse. I called it positive initially on the basis there was a noticeable drop in light when running the tape on the VCR in 7x picture-search mode lasting 23 seconds. Limovie reveals an intensity drop from 1900 to 1000. Due to the event being 38 seconds late, the plot ends shortly after reappearance when the drift-through target was approaching the edge of the frame. A plot from after the target was shifted shows an intensity level of 1900 and supports the conclusion that R did occur a few seconds before the shift. Noise levels however make the exact time for reappearance somewhat debatable.



The lightcurve above is the Limovie analysis of John Broughton's observations.



Key to plot:
1. J. Broughton;
2. Prediction 16 Sep.

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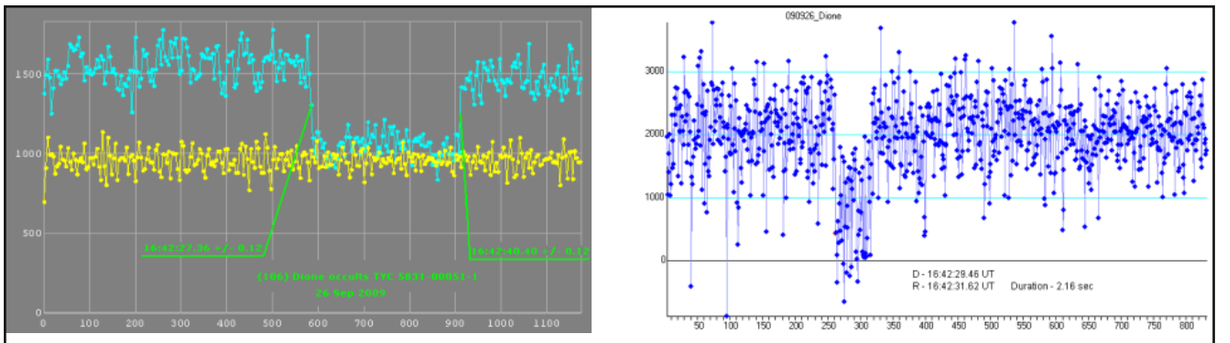
Discussion: John measured a 23.0 second observation, using the pre-point/drift-through technique (with a integrating video camera and GPS based time insertor equipment) to locate the very faint (13th magnitude) star - see his "Observer's comments". The circle (previous page, right) is plotted at the expected 87 km diameter of Ludmilla.

(106) Dione **TYC 5831-00051-1** **2009 September 26**

• D. Gault	Hawkesbury Heights, NSW	D at 16:42:29.46	**VIDEO**
	Longitude: +150° 38′ 28.00″	R at 16:42:31.62	
	Latitude: -33° 39′ 52.00″	Duration: 2.16 secs	
	Altitude: 286 m	Monitored: 16:20 to 16:47	

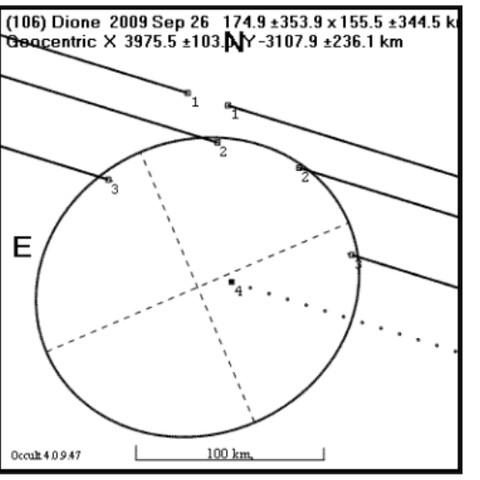
Observer's comments: VERY jumpy sequence due to the wind, but good light curve.... I think!

• H. Pavlov	Braemar, NSW	D at 16:42:27.36	**VIDEO**
	Longitude: +150° 28′ 56.38″	R at 16:42:40.4	
	Latitude: -34° 25′ 49.72″	Duration: 13.0 secs	
	Altitude: 615 m	Monitored: 16:32 to 16:45	
• S. Russell	Oatlands, NSW	D at 16:42:23.95	**VIDEO**
	Longitude: +151° 00′ 56.05″	R at 16:42:28.33	
	Latitude: +33° 47′ 49.25″	Duration: 4.38 secs	
	Altitude: 60 m	Monitored: 15:46:15 to 16:45:00	



The lightcurves above are the Tangra and Limovie analyses of Hristo Pavlov's (left) and Dave Gault's (right) observations of the occultation.

Discussion: Two definite occultations were observed for this event, with another possible occultation by Dave Gault. The reason for the uncertainty about Dave's observation is that his comparison star also showed a very similar drop in brightness at the same time as the target star (due to cloud?). The ellipse (right) is plotted with the same area as a circle with the expected 146 km diameter of Dione, and fitted to Steve Russell's and Histro Pavlov's chords while ignoring Dave's result. The asteroid shape databases (CoR and DAMIT) don't have any shapes derived for Dione.

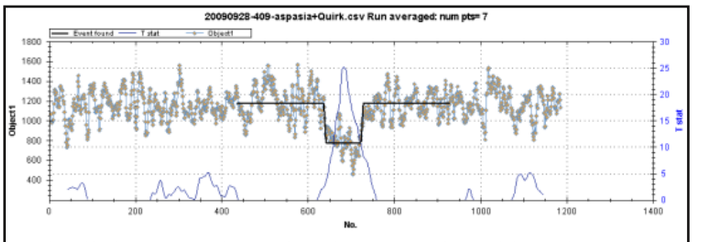


Key to plot: 1. D. Gault (miss?); 2. S. Russell; 3. H. Pavlov; 4. Prediction 16 Sep.

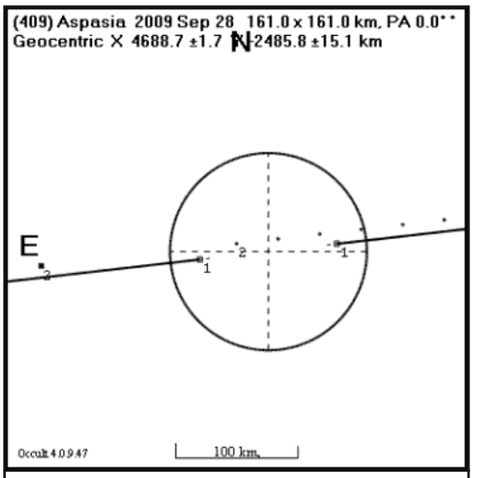
(2086) Newell	**TYC 4678-00270-1**	**2009 September 26**
• B. Loader	Darfield, NZ	08:16:46 to 08:18:10
(360) Carlova	**UCAC2 25360375**	**2009 September 26**
• B. Loader	Darfield, NZ	07:38:36 to 07:40:30
(471) Papagena	**TYC 6820-00473-1**	**2009 September 27**
• H. Pavlov	Mt Thorley, NSW	10:36 to 10:49

(409) Aspasia	**UCAC2 25333032**	**2009 September 28**
• S. Quirk	Mudgee, NSW	D at 09:48:51.8 **VIDEO**
	Longitude: +149° 39′ 45.6″	R at 09:48:55.1
	Latitude: -32° 27′ 21.3″	Duration: 3.3 secs
	Altitude: 508 m	Monitored: 09:47:26 to 09:50:45

Observer's comments: The reappearance had a slight step up, so is not clearly defined. Data confirmed using Occular sliding average with n=7 (John Talbot).



The lightcurve above has been produced by Limovie and further analysed by John Talbot using Occular.



Key to plot: 1. S. Quirk; 2. Prediction.

Discussion: Steve Quirk observed a 3.3 second occultation by Aspasia of the faint (12.8 magnitude) star. The circle (right) is plotted at the expected 161 km diameter of Aspasia and centred on the predicted path.

Occular is occultation analysis software (available from the IOTA website at www.asteroidoccultation.com/observations/#OccularV4) that is intended to provide an objective (statistically based) measure of whether an occultation actually occurred or not (as well as the usual times of disappearance and reappearance), and is particularly useful for small magnitude and/or short duration events that are buried in the background noise.

(2725) David Bender	**TYC 5845-00513-1**	**2009 September 30**
• J. Bradshaw	Samford Valley, QLD	D at 11:40:34.17 **VIDEO**
	Longitude: +152° 52′ 22.68″	R at 11:40:38.21
	Latitude: -27° 21′ 22.80″	Duration: 4.04 secs
	Altitude: 95 m	Monitored: 11:30 to 11:44

Observer's comments: At last, the drought is over… (and with a very unlikely event too). I have subtracted 20 ms which is my estimate of the camera lag.
http://www.youtube.com/watch?v=oYyzuCMDlL4

• D. Lowe	Applethorpe, QLD	11:35:00 to 11:45:00
• J. Broughton	Reedy Creek, QLD	11:39:52 to 11:40:52

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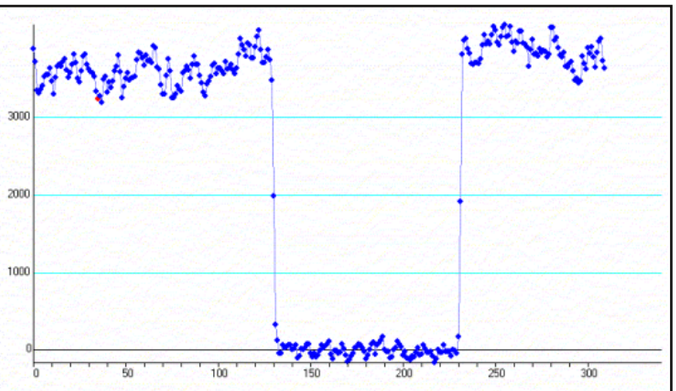
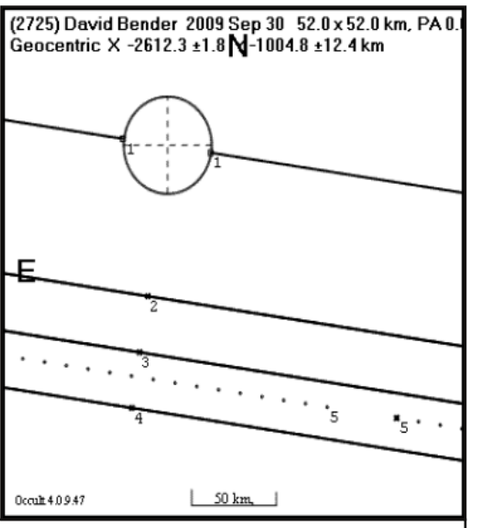
- J. Broughton — Pottsville, NSW — 11:39:20 to 11:42:31



The lightcurve above is the Limovie analysis of Jonathon Bradshaw's observations.



Discussion: Jonathan Bradshaw observed a 4.04 second occultation while the other three observers had misses, despite being closer to the predicted track. The circle (right) has been plotted with a 52 km diameter, which is significantly larger than the expected 40 km diameter of the asteroid.

Key to plot:

1. J. Bradshaw;
2. J. Broughton, Reedy Creek (miss);
3. J. Broughton, Pottsville (miss);
4. D. Lowe (miss);
5. Prediction 16 Sep.

(45502) 2000 BZ8 — **TYC 0079-00656-1** — **2009 October 03**
- B. Loader — Darfield, NZ — 12:51 to 12:55

(55636) 2002 TX300 — **UCAC2 41650964** — **2009 October 09**
- J. Bradshaw — Samford Valley, QLD — 10:20 to 11:00
- J. Broughton — Reedy Creek, QLD — 10:32:29 to 11:00:18

(3995) Sakaino — **HIP 6537** — **2009 October 10**
- J. Bradshaw — Samford Valley, QLD — 09:47 to 10:00
- P. Anderson — The Gap, Brisbane, QLD — 09:56:10 to 09:59:00

(488) Kreusa — **UCAC2 20007888** — **2009 October 10**
- B. Loader — Darfield, NZ — 09:30 to 09:32:28

(554) Peraga — **UCAC2 23498841** — **2009 October 10**
- J. Bradshaw — Samford Valley, QLD — 11:40 to 11:55

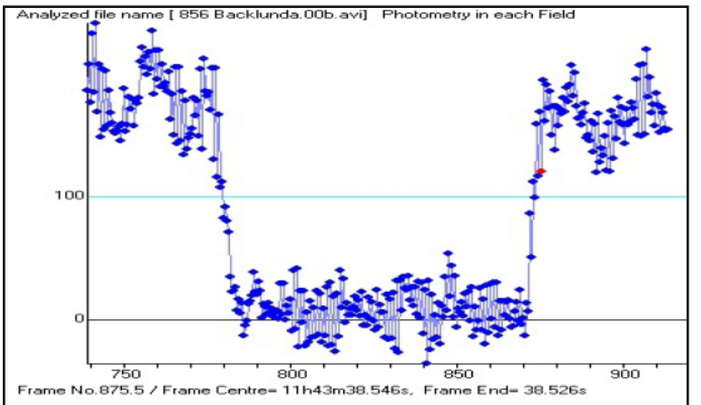
(36) Atalante — **UCAC2 14889639** — **2009 October 11**
- J. Bradshaw — Samford Valley, QLD — 10:23 to 10:36
- J. Broughton — Reedy Creek, QLD — 10:32:00 to 10:34:20

(1093) Freda — **UCAC2 13480173** — **2009 October 13**
- S. Russell — Oatlands, NSW — 15:33:00 to 15:35:30

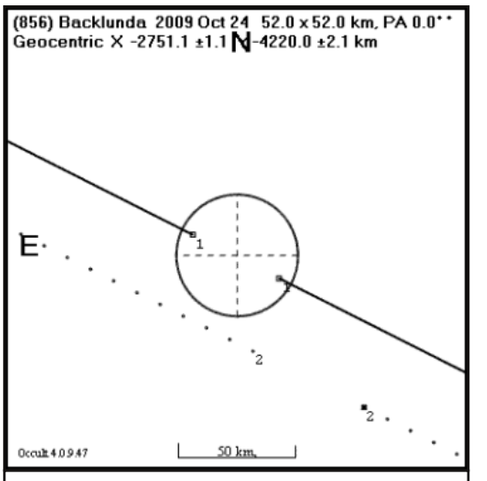
(1093) Freda	**UCAC2 13682012**	**2009 October 16**
• H. Pavlov	Marsfield, NSW	12:47 to 12:57
• S. Russell	Towrang, NSW	12:30:00 to 12:58:00
(1708) Polit	**TYC 0791-00547-1**	**2009 October 18**
• J. Broughton	Reedy Creek, QLD	17:58:58 to 17:59:50
(469) Argentina	**TYC 7378-01562-1**	**2009 October 20**
• J. Broughton	Mudgeeraba, QLD	12:38:05 to 12:40:13
(51) Nemausa	**UCAC2 34398177**	**2009 October 23**
• B. Loader	Darfield, NZ	14:15:15 to 14:17:25
(7) Iris	**UCAC2 24959627**	**2009 October 24**
• J. Broughton	Reedy Creek, QLD	09:57:57 to 09:59:51

(856) Backlunda	**TYC 4718-00935-1**	**2009 October 24**	
• S. Parker	Oxford, NZ	D at 11:43:34.75	**VIDEO**
	Longitude: +172° 13′ 7.82″	R at 11:43:38.47	
	Latitude: -43° 18′ 36.78″	Duration: 3.72 secs	
	Altitude: 221 m	Monitored: ? to 11:50	

Observer's comments: Very slow D and R. Possible double. This event was easily visible and the seeing was good.



The lightcurve above is the Limovie analysis of Stu Parker's observations.



Key to plot: 1. S. Parker; 2. Prediction 20 Sep.

Discussion: Stu Parker observed a 3.72 second occultation for this event, while three other observers were clouded out or had technical problems. The circle (above right) is plotted at the expected 52 km diameter of Backlunda. It was noted that the disappearance and reappearance were both very slow at around 180 ms and the possibility of a double star was discussed. However the consensus was that the step in the lightcurve was not clear enough and that the more likely explanation is a low angle of incidence and large star diameter.

(4014) Heizman	**HIP 89468**	**2009 October 25**
• B. Loader	Darfield, NZ	08:31:25 to 08:33:10

(686) Gersuind	**UCAC2 34202796**	**2009 October 27**
• J. Broughton	Jacobs Well, QLD	11:51:51 to 11:53:42
(41) Daphne	**UCAC3 167-333378**	**2009 November 04**
• P. Anderson	The Gap, Brisbane, QLD	13:09:00 to 13:21:00
(596) Scheila	**UCAC2 39095777**	**2009 November 09**
• D. Herald	Kambah, ACT	15:42:00 to 15:46:00
(3728) IRAS	**TYC 5902-00123-1**	**2009 November 14**
• B. Loader	Darfield, NZ	13:34:46 to 13:36:16
(162) Laurentia	**TYC 6378-01407-1**	**2009 November 19**
• S. Kerr	Glenlee, QLD	12:16:00 to 12:26:00
(3394) Banno	**HIP 7210**	**2009 November 27**
• D. Gault	Hawkesbury Heights, NSW	10:16:25 to 10:17:10
• D. Gault	Yellow Rock, NSW	10:02 to 10:19
(225) Henrietta	**UCAC2 30964577**	**2009 November 28**
• D. Herald	Kambah, ACT	16:02:55 to 16:05:03
(442) Eichsfeldia	**UCAC2 37521680**	**2009 December 06**
• J. Bradshaw	Samford Valley, QLD	12:20 to 12:30
(121) Hermione	**TYC 1832-00278-1**	**2009 December 08**
• J. Bradshaw	Samford Valley, QLD	10:45 to 11:10
• S. Kerr	Glenlee, QLD	10:53:00 to 11:03:00

(111) Ate	**TYC 1876-01888-1**	**2009 December 11**	
• D. Gault	Hawkesbury Heights, NSW	D at 17:32:48.9	**VIDEO**
	Longitude: +150° 38′ 28.00″	R at 17:33:02.5	
	Latitude: -33° 39′ 52.00″	Duration: 13.6 secs	
	Altitude: 286 m	Monitored: 17:12 to 17:40	

Observer's comments: Target was very low (16 deg Alt) in the north west and twilight was starting. Co-located with telescope B.

• D. Gault	Hawkesbury Heights, NSW	D at 17:32:49.1	**VIDEO**
	Longitude: +150° 38′ 28.00″	R at 17:33:03.2	
	Latitude: -33° 39′ 52.00″	Duration: 14.1 secs	
	Altitude: 286 m	Monitored: 17:32:20 to 17:33:40	

Observer's comments: Aperture of telescope half obscured by nearby building. Co-located with telescope A.

• H. Pavlov	Canyonleigh, NSW	D at 17:32:57.32	**VIDEO**
	Longitude: +150° 13′ 52.25″	R at 17:33:06.88	
	Latitude: -34° 34′ 57.95″	Duration: 9.56 secs	
	Altitude: 728 m	Monitored: 17:27 to 17:35	

Observer's comments: Event recorded with WAT-902H and then used 4 frame software integration to

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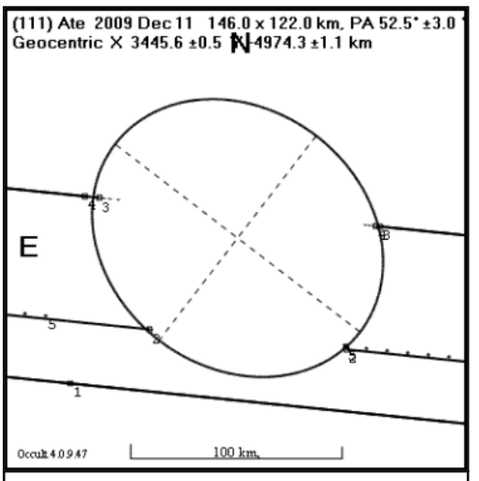
process the video. Light curve available at:
http://www.hristopavlov.net/Observations/Positives/2009-12-12%20Ate/Event.html

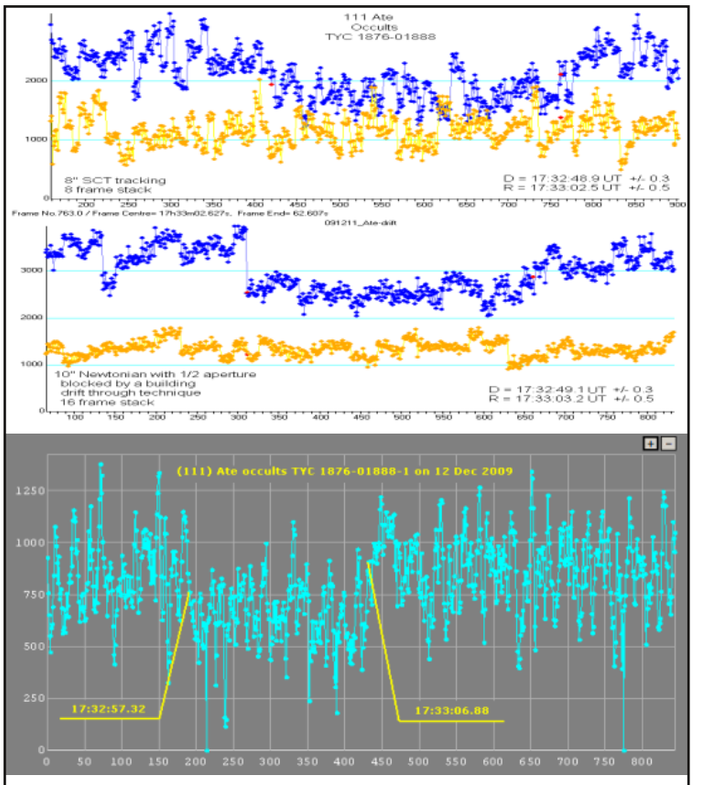
• D. Herald	Breadalbane, NSW	17:30:30 to 17:35:10



Key to plot:

1. D. Herald (miss);
2. H. Pavlov;
3. D. Gault (telescope A);
4. D. Gault (telescope B);
5. Prediction IOTA 15 Nov.

Discussion: Three chords and one miss were recorded for this event. Dave Gault had two telescopes at the same location for testing purposes and it is comforting to see that both recorded essentially the same result. However this means we effectively only have two chords to show the asteroid's shape. The ellipse (above) is plotted with the same area as a circle with the expected 134 km diameter of Ate.



The top two lightcurves are the Limovie analysis of Dave Gault's observations made using two telescopes at the same location (upper lightcurve is telescope A - 8" SCT using 8 frame stacking, lower is telescope B - 10" Newtonian using 16 frame stacking), while the bottom lightcurve is the Tangra analysis of Hristo Pavlov's observations.

(89) Julia	**TYC 1733-00767-1**	**2009 December 12**	
• D. Herald	Cooma (Polo Flat), NSW	D at 10:56:55.57	**VIDEO**
	Longitude: +149° 08′ 44.70″	R at 10:57:03.57	
	Latitude: -36° 14′ 18.30″	Duration: 8.00 secs	
	Altitude: 826 m	Monitored: 10:55:07 to 10:58:00	

Observer's comments: Event was non-instantaneous. Assumed stellar diameter.

• P. Purcell	Bibbenluke, NSW	D at 10:56:53.17	**VIDEO**
	Longitude: +149° 19′ 17.8″	R at 10:57:06.77	
	Latitude: -36° 50′ 9.1″	Duration: 13.60 secs	
	Altitude: 860 m		
• P. Bobroff/L. Kinsley	Micheago, NSW	10:55:00 to 10:59:00	

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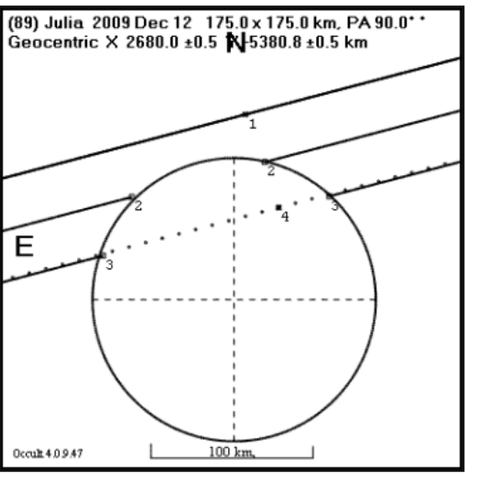
Discussion: Two chords and a miss were observed for this event. The spacing of these means we can be confident that the centre of the asteroid's shadow travelled to the south of the observers. The circle (right) is plotted at the expected 175 km diameter of Julia.



Key to plot:
1. P. Bobroff & L. Kinsley (miss);
2. D. Herald;
3. P. Purcell;
4. Prediction 26 Nov.

(535) Montague	**UCAC2 40496498**	**2009 December 18**
• S. Kerr	Glenlee, QLD	12:44:06 to 12:53:00
(479) Caprera	**TYC 0741-01173-1**	**2009 December 19**
• B. Loader	Darfield, NZ	15:23 to 15:25:30
(4911) Rosenzweig	**TYC 0123-00331-1**	**2009 December 23**
• A. Brakel	Downer, ACT	14:05 to 14:20
(943) Begonia	**UCAC2 38417062**	**2009 December 31**
• B. Loader	Darfield, NZ	11:47:30 to 11:50:20

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Total Lunar Occultation Timings Reported to the Section, for the Period 2009 January 1 to December 31

Brian Loader

Observer	Place	Disappearance	Reappearance	Total
Peter Anderson	The Gap, QLD	41	0	41
David Gault	Hawkesbury Heights, NSW	77	31	108
David Herald	Canberra ACT	173	54	227
Brian Loader	Darfield, NZ	176	60	236
Dennis Lowe	Brisbane, QLD	0	9	9
Jim Palfryman	Hobart, TAS	1	0	1
Steve Russell	Sydney, NSW	71	0	71
John Talbot	Waikane Beach, NZ	48	0	48
Diana Watson	Whakatane, NZ	4	0	4
Alan Yates	Christchurch, NZ	2	0	2
Total (10 observers)		**593**	**154**	**747**

Lunar Grazing Occultation Timings Reported to the Section, for the Period 2009 January 1 to December 31

Brian Loader

Organiser/ Observer	Location	Date 2009	Star	Mag	%lit	CA	#Sites	#Events
D. Gault & D. Herald	Cowra, NSW	Jan 18	SAO158384	7.7	43%-	14.7S	2	14
D. Gault & D. Herald[1]	Sutton, NSW	Mar 22	ZC3108	5.3	15%-	-1.6S	6	39
D. Gault & D. Herald[2]	Manilla, NSW	Apr 15	ZC2672	2.8	67%-	8.2N	9	36
D. Herald[3]	Gundaroo, NSW	May 1	SAO97883	7.8	45%+	16.0N	4	22
D. Gault[4]	Blackheath, NSW	Jun 11	ZC2987	4.9	86%-	15.7N	1	3
D. Gault[5]	Gosford, NSW	Jul 25	ZC1611	5.6	14%+	5.4N	5	24
B. Loader[6]	Ward, NZ	Jul 31	ZC2349	2.9	75%+	9.8S	3	25
G. Blow[7]	Martinborough, NZ	Jul 31	ZC2349	2.9	75%+	10.0S	10	38
D. Gault[8]	Penrith, NSW	Aug 01	ZC2478	7.6	83%+	10.1S	5	5
D. Herald	Boorowa, NSW	Aug 01	ZC2478	7.6	83%+	9.5S	1	8
J. Talbot[9]	Kapiti Coast, NZ	Oct 20	SAO183290	9.2	5%+	19S	6	10

[1]Observers: A. Brakel, J. Blank, P. Purcell, D. Herald (two sites), D. Gault.

[2]Observers: D. Gault, H. Pavlov, D. Herald (two sites), S. Russell, D. Lowe, C. Douglass, C. Wyatt, J. Broughton.

[3]Observers: A. O'Neil, M. Nelmes, A. Brakel, D. Herald. Double event observed, not a predicted double.

[4]Strong twilight, Sun altitude -2 degrees.

[5]Observers: H. Pavlov (two sites), D. Gault, B. McMillan, W. McMillan.

[6]Observers: L. Field, M. Unwin, B. Loader. Double star, stepped events observed.

[7]Observers: G. Blow, M. Forbes, F. Andrews, P. Graham, G. McKay, R. Idaczyk, R. Skilton, V. Irons, B. Parkin, L. Parkin, J. Homes, A. Homes, J. Field, M. Head, G. Hudson. Double star, stepped events observed.

Note: This event was also observed as a Total Lunar Occultation by J. Talbot (Waikanae Beach, NZ), D. Watson (Whakatane, NZ) and G. Smith (Sydney, Australia), D. Gault (Hawkesbury Heights, Australia), D. Herald (Australia)

[8]Successful observers: D. Gault, S. Russell.

[9]Observers: J. Talbot, R. Butland, M. Forbes & F. Andrews, G. McKay, G. Hudson

The Graze of ZC2039 on 2 Jan 2008, Canyonleigh, NSW, AUSTRALIA

The things we do at 3 am!

Dave Gault's Report

We had um'd and ah'd about attempting this event due to less than ideal weather prospects. Dave H and I were in telephone contact a few times during the day and it was not until 10 pm that the graze was given the green light. This meant a hasty packing of the car and a 130 km drive south for the Sydney observers and a 120 km drive north for the Canberra observer.

The plan was to meet at the Roadhouse just south of the Canyonleigh turnoff about 1:45 am. Alas by the time we all arrived the sky was totally overcast.

2:18 am: An hour from the first event! There was nought except sit in the Roadhouse, drink coffee, eat chips and look glum.

2:30 am: Stephen wandered outside and came back to report that a couple of stars had appeared. We all moved as one and sure enough, the Pointers were out (alpha and beta Centaurus) and a moment later The Cross was in the clear too.

2:35 am: Action stations. Dave H says "I have my site programmed into my (in car) GPS, you lot, just spread out south of me when I stop". We all follow Dave H for the 5 km drive to the site. I'm tail-end Charlie. Dave H brakes to a halt, we all overtake him and start looking for a likely site and one by one the cars stop.

2:50 am: I have to sync Brett and Wendy's beeper boxes so I start my KIWI PC. Luckily I ran it the night before to give the GPS sky time. It still takes 10 minutes to get a fix, start beeping and sync two beeper boxes and pack it all away.

3:00 am: I leave for my site.

3:12 am: I find a site and glance at the clock on the dash - 6 minutes to the first event! Sheish... -Tripod out - no time to level. LX90 on top - no time to adjust the legs to make the spreader fit nicely, just tighten the screw - battery out and connected, hand controller connected, power on, enter date and time, select easy align. Level (ish) the scope and point north(ish). The scope chooses Sirius, I don't argue, and the scope slews. While it's slewing I screw on the focal reducer and camera. It stops slewing and beeps, and I think "Scope, if you say that's Sirius that's good enough for me." I press enter. It chooses Canopus as the second alignment star and slews. While it's slewing I get the video gear out and put the box on the tripod, deploy the GPS mast and the GPS. I acknowledge the scope's slew to Canopus and tell it the slew to Spica (about 15° from the moon). While it's slewing I fit the red dot finder and connect the cables to the camera and power up the video and GPS. The scope stops about 30° from the moon. I loosen the clutches and point at the moon looking through the red dot finder and at the monitor. Ah, there's the moon, tighten the clutches. Adjust focus and pan along the terminator, Ah, there's the star, well past the terminator but not yet up close and personal with the dark limb.

3:18 am: I hit record, I see that the GPS and KIWI OSD have started OK.

3:19:49.65 am (16:19:49.65 UT): The star disappears

3:22:31.68 am (16:22:31.98 UT): The star reappears….only two events but I'm happy.

3:23 am: I am clouded out.

I pack up and meet the others.

Stephen Russell's Report

We were cutting it fine, weren't we? As we were leaving the roadhouse, I was thinking "there isn't enough time left".

I started setting up at 02:47. Didn't bother to level the tripod too much, but did get it pointing close to south. Popped the scope on, connected battery, QuikFinder, hand controller, remote focus etc, inserted alignment eyepiece. I'd pre-programmed my hand-controller the night before, so it knew everything except the local time. It's 02:55 at this stage.

I did a one-star align on Acrux. The slew was only a couple of degrees out, so quickly centred and then slewed to the moon. Close enough to slew the last bit just with the eyepiece, and to see a nice bright star well away from the southern limb. It's 02:58 by now. My panic is starting to subside. The rest was easy. Open the gear case, put the GPS on the boot, apply power, insert the camera in the scope, tweak the focus with the remote buttons, connect the camcorder, and I'm ready to go at 03:02. Didn't even bother rolling the tape until 03:10. Time to relax and find the Coke on the front seat and could sip while watching the 8 events.

We were very lucky. There was a one hour window of opportunity, and we happened to be in the right place at the right time.

Some comments:

- One advantage of an equatorial mount such as my HEQ5 is that I could have skipped the alignment phase completely. Even with rough polar alignment, my field of view at f/4 means tracking is not critical for a graze.

- Pre-programming the hand-controller ahead of time not only saves time, but reduces the chances of a data entry error during the panic phase.

- Having the gear nicely cased-up and ready to go saves a LOT of time and mistakes.

- The fact that we are able to set up and be operational in a handful of minutes is due to three things: practice, practice, and more practice. We know our gear so well now that setup is second nature. And it's not hard to get this practice: go out and observe the half-dozen or more minor planet events that occur each month...So endeth the sermon :-)

Yep, the things we do at 3 am!

The Crew: Dave Herald, Stephen Russell, Chris Douglass, Brett and Wendy McMillian and Dave Gault.

****

Roses are red, the sky is blue...
Dave Herald

Last weekend (September 2008) I had planned to observe a daylight graze of Antares - but aborted because of weather. I had bought a deep red filter (Wratten 25) to increase the contrast with the Moon (Antares is red, sky is blue...). However I did observe the D and R from home (at 12 noon) and was very happy with the clarity of the star.

Tonight we had two groups observe a graze of the carbon star RT Cap (XZ47994), which fortunately was near maximum. The star was very red. I tried recording it using the same Wratten 25 filter (using a 20 cm SCT). The results were surprisingly good. Extremely well-defined star standing out from the background light scatter, even within a few arcsecs of the illuminated limb of the 84% Moon. Far easier to see in the video than I had expected.

The advantage of a red filter is based on the fact that most CCD's are more sensitive in the red than the blue. If the star is 'red', it is brighter in the red relative to moonlight (which has a spectral type of G, based on our Sun). Inserting a red filter has the effect of increasing the brightness of the star relative to the Moon.

In comparison, I tried to observe the same graze visually through a 20 cm scope, using a deep orange filter (Wratten 23A). The star was not clear enough for me to record any events - probably because of reduced eye sensitivity in the red.

My conclusion: If you are observing a graze via video and the star is of spectral type K or later, seriously consider putting a red filter in front of the video camera...(I just used an ordinary eyepiece filter, which is quite cheap).

I also tried using a blue filter with a type B star. There was no improvement in visibility - which is unsurprising. Any advantages from broadband filtering will occur at the red end of the spectrum.

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The Lunar Graze of 29 Capricorni on 23rd March 2009
Dave Gault

Monday morning 23rd March: A waning crescent Moon, a conjunction of Jupiter and a lunar grazing occultation of 29 Capricorni. Quite good prospects for a wonderful morning of astronomical observation. The spot to be to observe the graze was just north of the hamlet of Sutton, near Canberra.

A batch of emails sent out seeking team members brought out a few willing recruits. The plan was to meet near the bridge on the outskirts of Sutton at 2:15 am. The weather the night before didn't look too promising, however the APanel[1] of 7-Timer told us that the sky would clear after midnight at the graze site. The drive

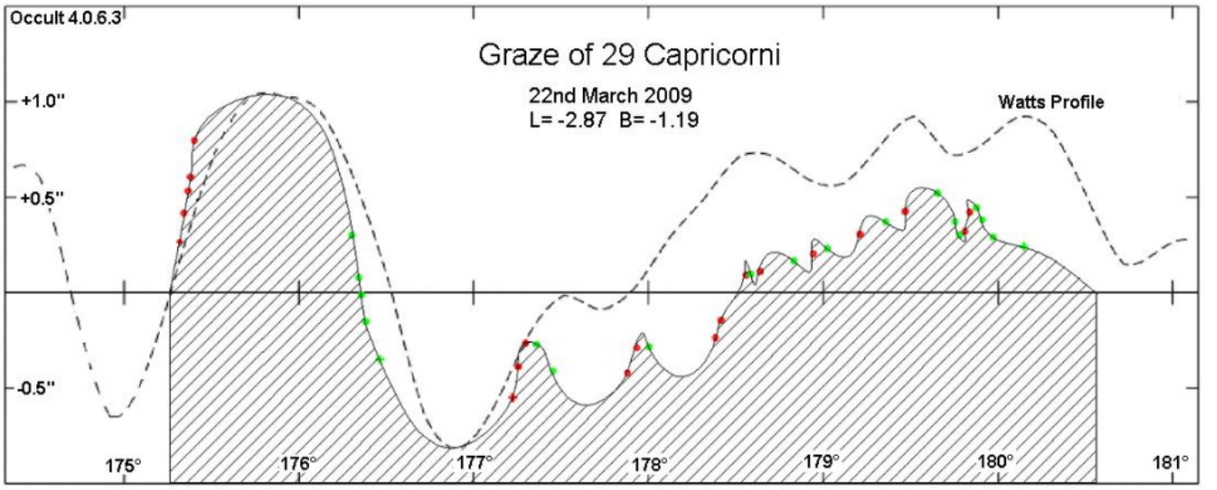
from The Blue Mountains started under cloudy skies and the occasional star peeking through kept my spirits up, and by the time I reached Collector at 1 am, the skies were perfectly clear. Another successful prediction for 7Timer! I arrived at the meeting point at 1:30 am and managed a quick nap in the car while waiting for the crew to arrive.

By 2:20 am the crew had exchanged greetings, synchronised Beeper Boxes and set off to deploy along the Sutton-Gundaroo Road. Dave Herald planned on running two video equipped stations, Patrick Purcell also used video, Albert Brakel and John Blank were visual observers and I attempted two stations, one video and one visual.

My video station site was at a gap between two rows of Poplar trees and the rising moon and Jupiter conjunction was indeed a beautiful sight[2]. I setup the video site first and had a quick peek at Jupiter before slewing to 29 Capricorni. The moon at this stage was just out of the field of view of the video camera. I then attended to setting up my visual site, 100 m south of the video site. This was equipped with my new (second hand) C5 telescope I had only acquired the previous afternoon, but alas it had collimation issues and the star had terrible coma and I didn't have the time or tools to correct the problem. I returned to the video station to find the star still centred and the moon had moved significantly into the FOV. I had to rotate the camera to avoid the KIWI-OSD timestamps being washed out in the glare of the sunlit lunar limb. I had a quick cup of coffee before it was time to press the record button on the camcorder, restart KIWI-OSD, wish the telescope good luck and set off for the visual station. Alas the out-of-collimation C5 telescope would not reach good focus and I lost the star in the glare of the moon about a minute before the first event was due. So I quickly returned to the video station to watch the spectacle of 12 events[3].

The tally of events observed were (north to south);

Albert Brakel	8"SCT	visual	5 events recorded
John Blank	8" Dobsonian	visual	no events recorded
Patrick Purcell	8"SCT	video	6 events recorded
Dave Herald	8" SCT	unattended video	10 events recorded
Dave Herald	5" Maksutov	video	6 events recorded
Dave Gault	8" SCT	video	12 events recorded
Dave Gault	5" SCT	visual	no events recorded



The plot of the observation defining the new lunar limb profile shows a considerable improvement over the older Watt's Profile. The true shape of the lunar mountains and valleys can only be further

improved by future observations and the author wishes to encourage new observers to join the team. If you wish to receive information about future lunar grazing occultations, please contact a Dave[4].

It was a great morning to be an astronomer!

Notes
1) APanel - 7Timer- An online 72 hour astronomical weather forecast application.
2) Mike Salway has a wonderful photo of the conjunction online at http://tinyurl.com/ct5ejn
3) My video is available on YouTube at http://tinyurl.com/djhfkd
4) Dave's (Gault or Herald) emailaddy is dave4gee@yahoo.com.au or drherald@bigpond.net.au

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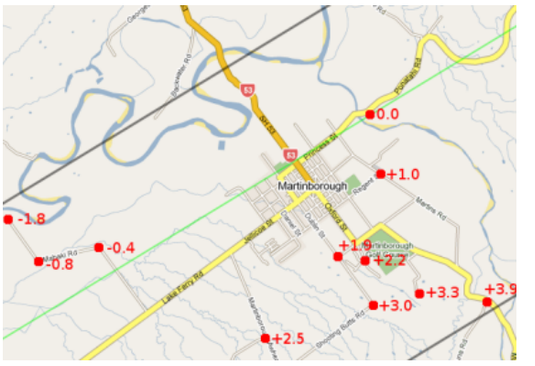
The lunar graze of sigma Scorpii on 31st July 2009 in Martinborough.

Murray Forbes

It was a dark and stormy winter night when a posse of intrepid astronomers from Wellington ventured forth to witness the Scorpion do battle with the Moon. Okay, enough with the purple prose - this was a grazing lunar occultation that ticked all the right boxes; it was a bright, easy to find, double star (Sigma Scorpii, V=2.9), due on the weekend (1 am Saturday 31 July 2009) so I didn't need to go to work the 'next' day, and not far from home (just an hour's drive over to Martinborough, in the Wairarapa), and one of our group (Peter Graham) lived in Martinborough and offered the use of his house as a home base. The only downside was that it truly was a stormy night, with gale force winds, 90% cloud and occasional rain.

For this event, I worked with Frank Andrews as he had the car and telescope while I had the occultation equipment (GPS timing unit, 7" TV, video camera & recorder etc). We arrived at Peter's place about 9 pm where we had some tucker while Graham Blow planned the assignment of observers & locations (which he had earlier scouted for suitability, see the map) to get a good coverage of the lunar profile (see the diagram on Page 1), synchronised Beeper Boxes, distributed equipment (for instance, I had a spare Beeper Box which could be lent to a visual observer) etc. After that there was nothing further to do except watch the rugby until about 11:30 pm, when it was time to set out to our locations. Frank and I found ours after only one false turn (one of the streets had been renamed since the map we were using had been printed). It was part of a new sub-division and so there weren't many street lights yet - we set up on the side of the road behind our car in a (failed) attempt to provide some shelter from the wind and safety from any passing traffic. We were a well oiled machine (okay, slightly rusty) with Frank setting up his scope while I got the GPS system going (it's a good idea to get the GPS going at least 15 minutes before any event, in case it needs to update its almanac). As the cloud and wind hadn't abated, one advantage of a lunar occultation over a minor planet occultation became clear - it's dead easy to find the star if you can see the Moon.



Map of possible locations in Martinborough for the graze. The green line is the shadow corresponding to edge of a hypothetical smooth lunar limb. The locations are labelled with the offset distance (in kilometres) from this limb.

Once the scope was centred on the star and the digital video recorder going, we spent the next fifteen

minutes anxiously watching the star creep across the dark limb of the Moon winking on and off in between fleeting gaps in the cloud. Even though we positioned ourselves to try to further shelter the scope from the wind, the camera shake was enormous - during my subsequent analysis of the video using LiMovie, I had to manually position the LiMovie aperture on each individual frame. Nevertheless, we found some events with the two brighter components of the star separately disappearing and reappearing.

The team;

- Graham Blow, at +2.5 km
- Murray Forbes & Frank Andrews, at +2.2 km
- Ross Skilton, at +0.0 km
- Graeme McKay, at -0.4 km
- Roland Idaczyk, at -0.8 km
- Vicki Irons, Bill Parkin & Lesley Hughes at +0.5 km
- John & Aline Homes, at +1.0 km
- Gordon Hudson, at +3.5 km
- John Field & Marilyn Head, at +3.0 km
- Peter Graham, at +3.3 km

Other observers in the South Island;

- Brian Loader
- Martin Unwin
- Larry Field

Other observers (who saw this event as a total lunar occultation) were;

On the Kapiti Coast

- John Talbot

The Far North

- Diana Watson

Australia

- George Smith
- Dave Gault
- Dave Herald
- Steve Kerr

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The lunar graze of SAO 183296 on 20th Oct 2009 at Waikanae Beach.
John Talbot

This event had been well publicised and we had five stations ready to go on the night. It was interesting for two reasons a) it was a graze very close to John's observing site and within reasonable drive from Wellington and Levin; and b) the star SAO 183296 had previously been reported as a non-instantaneous occultation implying it may be double.

The team reported to John Talbot's place and were assigned locations that had been scouted to have low western horizons as the altitude was about 10 degrees, and away from street lighting that might shine into the telescopes.

Observers were spaced:

- John Talbot at -850m with Ron Fisher, Mike White & Dave Rumsey from Levin as assistants;
- Roger Butland at 0m right on the predicted line;
- Murray Forbes and Frank Andrews at +740m;
- Graeme McKay at 1500m;
- Gordon Hudson at 2100m;

The sky had cleared during the afternoon and by sunset the wind was dropping and at 7:30pm there was only about 20% cloud. Everyone was away in plenty of time for setting up but then a very slow moving black cloud hanging over Paraparaumu represented our old friend Murphy and prevented all but one site from observing. John was lucky when it let its guard down for a few minutes and he just

managed to get about three minutes recorded before the cloud spotted him again and quickly hid the moon until we had packed up the telescope. Visually on the monitor we saw two Disappearances and one Reappearance.

Analysis of the recording found 10 events and many more of very short duration which have been treated as cloud effects and not included in the official report sent to Mitsura Soma.

No double star step functions were noted.

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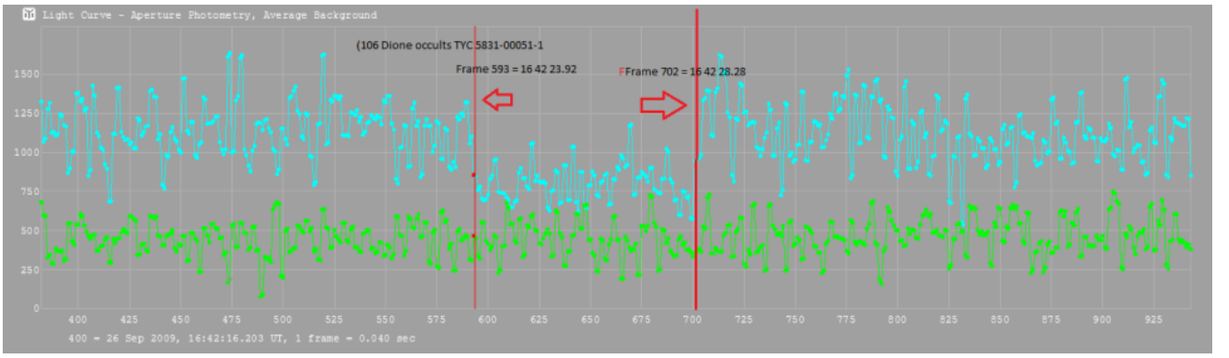
Corrigenda



The lightcurve above is Steve Russell's observation and subsequent analysis using Tangra of the occultation of TYC 5831-00051-1 by (106) Dione on 26 September 2009. This image was received too late to be included in its proper place within the report given on page 49.

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PROJECT RECON:
Recruiting Citizen Scientists to Explore the Outer Solar System!

For those involved with recent Pluto and other deep solar system occultations the name of Dr Marc Buie will be well-known. Based at the Southwest Research Institute (SwRI) in Boulder, Colorado, and previously of the Lowell Observatory in Arizona, Marc has been at the forefront of research into Pluto and the other more than 1000 Trans Neptunian Objects (TNOs) now recorded.

Recognising the considerable difficulty in obtaining any qualitative information about these far-off objects, and in particular their subset known as “cold, classical Kuiper Belt Objects” (KBOs), Marc has instituted the RECON Project. RECON aims to harness the enthusiasm and research potential of committed non-professional astronomers to gather data about these objects via the co-ordinated observation of their occultations. Initially involving 10, and eventually 40 linked sites across the western USA, RECON teams comprise between 2 and 6 personnel each and make co-ordinated observations of KBO occultations using 11” Celestrons and MallinCam JRs supplied by the NSF.

For more information please visit the exceptionally well laid-out and very informative RECON website at http://tnorecon.net/ .

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RASNZ Occultation Section Information

The RASNZ Occultation Section is an Observing Section of the Royal Astronomical Society of New Zealand. More information about the section can be obtained from its Director:

Graham Blow, P.O. Box 2241, Wellington, New Zealand
E-mail : Graham@occultations.org.nz

The URL for the Occultation Section website is: **http//www.occultations.org.nz/**. The site contains much useful information on coming occultation events, including charts, observing techniques, recent successful observations and much else.

Observation Reports

Observation reports should be sent to coordinators at regular intervals.
Addresses and E-mail contacts are shown below.

Minor Planet Occultations and Appulses

Reports of successful observations of Minor Planet occultations should be forwarded to **John Talbot, with a copy to Graham Blow** as soon as possible after the event. Reports of appulses where no event was observed should be sent to **John and Graham** on a regular basis, and certainly at intervals of no greater than 3 months, preferably near the beginning of January, April, July and October in time for publication in the Circular.

John Talbot: john.talbot@xtra.co.nz Graham Blow: Graham@occultations.org.nz

If you are reporting by email, observers are particularly encouraged to send their reports to John and Graham immediately after each event using the Excel report form available on the Section's website. Your observation of a 'miss' might link with another observer's successful observation to provide information as to the path and limits of the occultation.

Lunar Occultations

Observations of both total and grazing lunar occultations should be reported on a regular basis, again preferably at the end of each three months. Please send them to:

for New Zealand observers:	for Australian observers:	for all grazes:
Brian Loader	**Dave Gault**	**Mitsura Soma**
moonocc@gmail.com	**dave4gee@yahoo.com.au**	**Mitsura.Soma@nao.ac.jp**

RASNZ Occultation Section Circular

Occultation Section Circulars are edited by Murray Forbes. The editor is delighted to receive articles about occultations or related fields of astronomy for publication, especially accounts of interesting or unusual observations. Please send contributions (preferably by email) as ASCII text files without formatting, pictures as png files (or other lossless compression formats) and charts/diagrams/maps preferably as a vector graphic format such as svg (failing that, as a gif file). Contacts for the editor are:

6 Mary Huse Grove
Manor Park
Lower Hutt 5019, Wellington
New Zealand

Email: **Murray@occultations.org.nz**
Phone (+64)(4) 5635007

Next Issue

The next circular will appear shortly. Please send any items for publication immediately.

Thanks ...

The editor would like to thank all contributors of observations, articles, diagrams, maps and tables, editing expertise and time.