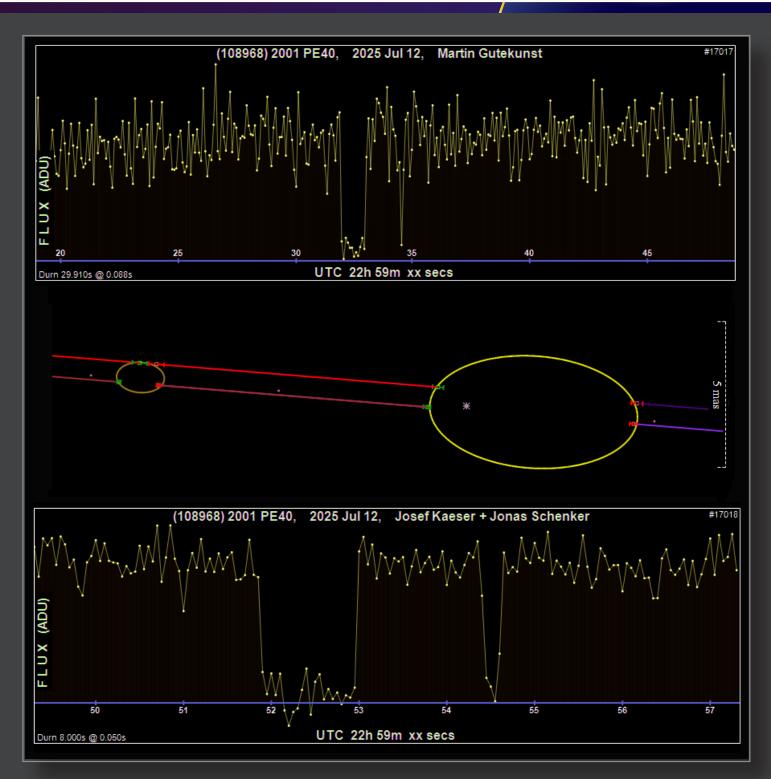
Gournal for Occultation Astronomy



Volume 15 · No. 4 2025-04



Dear reader,

This new issue of our journal marks the completion of our 15th year. Fifteen volumes, each containing scientific articles, observation calls and evaluations, as well as news from all groups within our IOTA family.

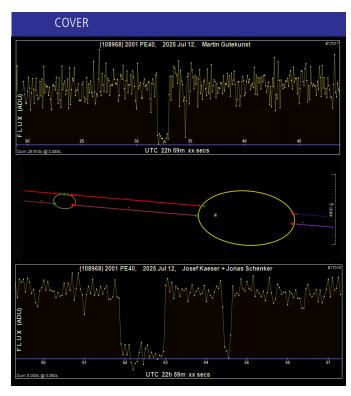
However, upon closer inspection, this issue is not as extensive as usual. It has 24 pages and no scientific articles. Is nothing happening anymore? No – it's just not being finalised and published. I follow e-mail discussions that already have the scope and content of an article for the Journal but are sometimes not completed. Unfortunately, that's the way it is today, but it's not sustainable. The e-mails disappear, the thoughts are made but not saved.

As a young employee at an observatory many years ago, I made an observation and thought it was not important. I told my director and he said, "Write about it – publishing means preserving".

With this in mind, I kindly ask for more contributions to our journal.

Konrad Guhl

IOTA/ES, President



On 2025 July 12 two observing stations measured an occultation by (108968) 2001 PE_{40} with a second drop in brightness after the main event by a previously unkown satellite of the asteroid. Martin Gutekunst (IOTA/ES) recorded a very short drop while Josef Käser and Jonas Schenker (SOTAS) detected the satellite on several frames. The discovery was announced in CBET 5589 on 2025 August 12. (Occult v4.2025.10.2)

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Rules for Authors

In order to optimise the publishing process, certain rules for authors have been set up how to write an article for *JOA*. They can be found in "How to Write an Article for *JOA*" published in this *JOA* issue (2018-3) on page 13. They also can be found on our webpage at https://www.iota-es.de/how2write_joa.html .

CALL FOR OBSERVATIONS:

Duplicity of 75 Leo (SAO 118764) - Right or Wrong?

Konrad Guhl · IOTA/ES · Berlin · Germany · kguhl@astw.de

ABSTRACT: From 1988 to 1990, the author operated a photon-counting photometer on the 500 mm Cassegrain telescope at the Archenhold Observatory in Berlin to observe lunar occultations. Some results have been published, some are still in the archive. Now, attempts are being made to verify an old lunar occultation observation of 75 Leo with the help of the global IOTA network or to declare it as false, or has the separation become too small for observation?

Introduction

Due to the rotation of the Moon's orbit around the Earth in approximately 18 years (Saros cycle), stellar occultations are repeated after this interval. As we can use both, the Moon after the ascending and the descending node with its stellar occultations, the period is halved. This means that an observation can be repeated and verified after about 9 years.

Observation Results from 1989 and 2015

During the occultation of 75 Leo by the Moon on 1989 May 14, a light curve with a time resolution of 1 ms was obtained at Archenhold Observatory in Berlin. The best fit for the light curve, by B. Stecklum, is provided by a double star model (Figure 1), [1]. The Delta m for this model is 0.81m, the possible distance 44 mas. The star was also observed by a lunar occultation in 2015 [2] and is included in a diameter determination based on the spectrum [3]. The observations from [2] and [3] show a measurable apparent diameter of 2.90 +/- 0.03 mas and 2.94 +/- 0.03 mas. So, in 2026 and 2027 we do have the possibility to verify the published diameter or to find an unknown double star.

The Star

The star 75 Leo is a high proper motion star with a visual brightness of 5.18^m. In Occult the star is listed as ZC1635, SAO 118764 and XZ 18965. All identifiers are listed in the SIMBAD data base [4]. It's a red giant at 107 pc distance.

Date	Moon	Visible	Example Location	Time UT
2026 06 21	+41%	North America	New York, US	02h 04m
2026 10 08	-05%	North America	Edmonton, CA	12h 48m
2026 11 04	-20%	Northeast Asia	Tokyo, JP	18h 24m
2026 12 02	-41%	Europe/Asia	Warszawa, PL	00h 04m
2026 12 29	-65%	Middle America	Tampa, US	07h 15m
2027 01 25	-86%	Asia/Australia	Darwin, AU	18h 16m
2027 02 22	-98%	Middle/South America	Mexico City, MX	03h 26m
2027 03 21	+99%	Asia/Australia	Sydney, AU	15h 21m
2027 04 17	+89%	South Africa	Cape Town, SA	23h 32m

Table 1. Possible observing opportunities of lunar occultations of 75 Leo. (Occult)

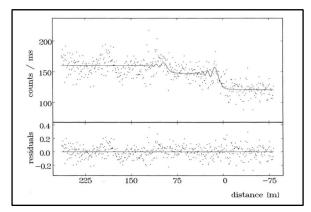


Figure 1. The light curve of the lunar occultation of 75 Leo measured on 1989 May 14. The upper part contains the light curve with fit as a solid line. The lower part shows the residuals normalised to the model. (Screenshot from [1])

Possible Occultations in 2026/2027

This is a provisional list because some occultations occur during the day, others are in inaccessible parts of the world. The observable occultations of this period are shown in Table 1.

Let's hope for some chances to observe and to answer an ageold question.

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https://doi.org/10.1002/asna.2113120508

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https://iopscience.iop.org/article/10.3847/0004-6256/151/1/10/pdf

[3] Cohen, M. et al: Spectral Irradiance Calibration in the Infrared. X. A Self-Consistent Radiometric All-Sky Network of Absolutely Calibrated Stellar Spectra, The Astronomical Journal, Volume 117, Issue 4, pp. 1864-1889. https://iopscience.iop.org/article/10.1086/300813/pdf

[4] Simbad data base: http://simbad.u-strasbg.fr/simbad/sim-id? Ident=HIP+55137&jsessionid=BBB9969C4C5DEEA222A9819C5CE2340B.new

[5] Herald, D., Software package OCCULT

Beyond Jupiter The World of Distant Minor Planets

Since the downgrading of Pluto in 2006 by the IAU, the planet Neptune marks the end of the zone of planets. Beyond Neptune, the world of icy large and small bodies, with and without an atmosphere (called Trans-Neptunian Objects or TNOs) starts. This zone between Jupiter and Neptune is also host to mysterious objects, namely the Centaurs and the Neptune Trojans. All of these groups are summarised as "distant minor planets". Occultation observers investigate these members of our solar system, without ever using a spacecraft. The sheer number of these minor planets is huge. As of 2025 October 06, the *Minor Planet Center* listed 2014 Centaurs and 3782 TNOs.

In the coming years, JOA wants to portray a member of this world in every issue; needless to say not all of them will get an article here. The table shows you where to find the objects presented in former JOA issues. (KG)

No.	Name	Author	Link to Issue
944	Hidalgo	Oliver Klös	JOA 1 2019
2060	Chiron	Mike Kretlow	JOA 2 2020
5145	Pholus	Konrad Guhl	JOA 2 2016
5335	Damocles	Oliver Klös	JOA 2 2023
7066	Nessus	Konrad Guhl	JOA 1 2024
8405	Asbolus	Oliver Klös	JOA 3 2016
10370	Hylonome	Konrad Guhl	JOA 3 2021
10199	Chariklo	Mike Kretlow	JOA 1 2017
15760	Albion	Nikolai Wünsche	JOA 4 2019
15810	Awran	Konrad Guhl	JOA 4 2021
20000	Varuna	Andre Knöfel	JOA 2 2017
28728	Ixion	Nikolai Wünsche	JOA 2 2018
31824	Elatus	Konrad Guhl	JOA 2 2025
32532	Thereus	Konrad Guhl	JOA 1 2023
38628	Huya	Christian Weber	JOA 2 2021
47171	Lempo	Oliver Klös	JOA 4 2020
50000	Quaoar	Mike Kretlow	JOA 1 2020
53311	Deucalion	Konrad Guhl	JOA 2 2024
54598	Bienor	Konrad Guhl	JOA 3 2018

In this Issue:

(49036) Pelion

Joachim Siegert · IOTA/ES · Amberg · Germany · joachim.siegert@protonmail.com

ABSTRACT: Since 2016, the JOA regularly publishes portraits of objects beyond Jupiter's orbit. This short article on the relatively small Centaur object, (49036) Pelion gives some background information concerning its discovery, the meaning behind its name and its orbit. The latter shows some degree of uncertainty. Known physical properties are pinpointed and the possibility of different diameters depending on the albedo is highlighted. Favourable occultations through till 2027 are detailed.

No.	Name	Author	Link to Issue
55576	Amycus	Konrad Guhl	JOA 1 2021
58534	Logos & Zoe	Konrad Guhl	JOA 4 2023
60558	Echeclus	Oliver Klös	JOA 4 2017
65489	Ceto and Phorcys	Konrad Guhl	JOA 1 2025
90377	Sedna	Mike Kretlow	JOA 3 2020
90482	Orcus	Konrad Guhl	JOA 3 2017
120347	Salacia	Andrea Guhl	JOA 4 2016
134340	Pluto	Andre Knöfel	JOA 2 2019
136108	Haumea	Mike Kretlow	JOA 3 2019
136199	Eris	Andre Knöfel	JOA 1 2018
136472	Makemake	Christoph Bittner	JOA 4 2018
174567	Varda	Christian Weber	JOA 2 2022
208996	2003 AZ ₈	Sven Andersson	JOA 3 2022
229762	G!kún∥'hòmdímà	Konrad Guhl	JOA 3 2025
341520	Mors-Somnus	Konrad Guhl	JOA 4 2022
471143	Dziewanna	Wojciech Burzyński	JOA 3 2024
486958	Arrokoth	Julia Perła	JOA 3 2023
	2004 XR ₁₉₀	Carles Schnabel	JOA 1 2022
541132	Leleākūhonua	Konrad Guhl	JOA 4 2024

The Discovery

The asteroid was discovered on 1998 July 21 at *Mauna Kea Observatory*, Hawaii, USA by R.J. Whiteley and D.J. Tholen. Its provisional name was registered as 1998 $\rm QM_{107}$ and assigned the number and name (49036) Pelion in 2003.

The Name

It was named after the home of the Centaurs in Greek mythology [1]. Geographically, Pelion is a mountain range forming a hook-like peninsula between the Pagasetic Gulf and the Aegean Sea in the south-eastern part of the province of Thessaly in northern Greece (Figure 1). Mount Pelion (which took its name from the mythical king Peleus, father of Achilles) was the homeland of Chiron the Centaur, tutor of many ancient Greek heroes, such as Jason, Achilles, Theseus and Heracles [3].

The Orbit

(49036) Pelion belongs to the Centaur class of solar system bodies. These are objects with an orbit lying between Jupiter and Neptune. Occasional passes close to the giant planets generally make their orbits unstable on time scales of a few million years. (49036) Pelion orbits the Sun every 89.86 years, coming as close as 17.42 au to the Sun and reaching as far as 22.72 au away [4]. This places it at a similar distance as Uranus (perihelion 18.29 au, aphelion 20.10 au) from the Sun but approaching within the planet's orbit at perihelion slightly and travelling further away at aphelion [5].

(49036) Pelion's orbit shows an eccentricity of 0.132 and an inclination to the ecliptic of 9.34° [1].



Figure 1. Satellite view of the hook-like peninsula formed by the Pelion mountain range [2].

Although since 1998 there are 104 observations during 12 oppositions listed in Minor Planet Center's status page for (49036) Pelion [1], the asteroid is included in "Observable Critical-List Minor Planets" which can be found on the MPC website [6]. Thus, there seem to be uncertainties concerning the exact orbital elements. Listed there are objects for which existing measurements of the orbit and position are especially in need of improvement [7]. Stellar occultations are an excellent means for improving our knowledge of its orbit in the future.

As a measure of uncertainty of the orbit, the MPC uses the parameter U (an integer in the range 0 to 9, where 9 is the highest uncertainty). For (49036) Pelion U = 2 [1], i.e. the difference between the observed mean anomaly and the calculated one lying in the range of 4.4-19.6 arcsec after 10 years [8].

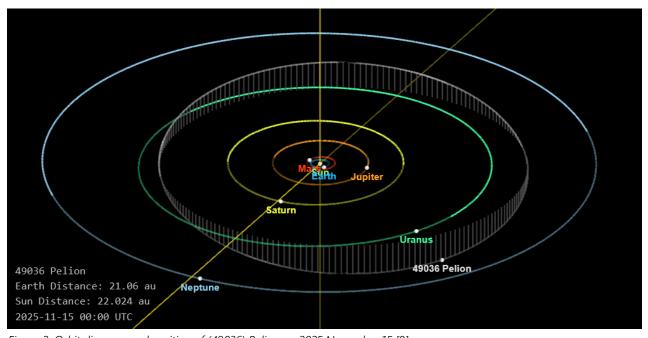


Figure 2. Orbit diagram and position of (49036) Pelion on 2025 November 15 [9].

Physical Characteristics

(49036) Pelion's visual magnitude during opposition is around m = 22 to 23 mag [1]. The absolute magnitude is H = 10.38 mag [4] and its diameter is often given to be around 28 km [10, 11a]. The latter value is dependent on the assumed albedo and is calculated for an albedo of 0.15 [11a]. According to [12], Centaurs are more usually in the range of 0.08 \pm 0.04 which is consistent with other publications [13] [14] [15]. Thus, the diameter may actually be closer to 47 km if we adopt an albedo value of 0.08 [11b]. Concerning the surface colour, (49036) Pelion belongs to the grey Centaur class, i.e. the material on its surface absorbs blue,

yellow and red sunlight with a similar efficiency, in contrast to the red Centaur class where the surface material absorbs a larger part of the blue light causing a redder appearance [16].

Future Occultations

Predictions from *Occult* [10] for 2026/27 list 8 occultations, but only 4 of them are favourable, passing over continental mainland during night time.

Here are the details of the more favourable observing opportunities (Figures 3-6):

• 2025 November 06: Star magnitude 13.9, maximum duration 1.24 s, magnitude drop 9.9 mag

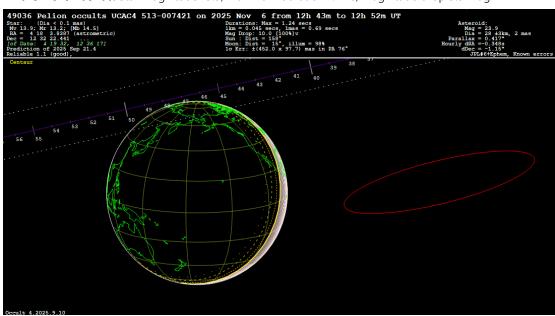


Figure 3. Path map of the possible occultation on 2025 November 6. Occult V4.2025.9.10

• 2026 November 24: Star magnitude 12.0 maximum duration 1.15 s, magnitude drop 11.8 mag

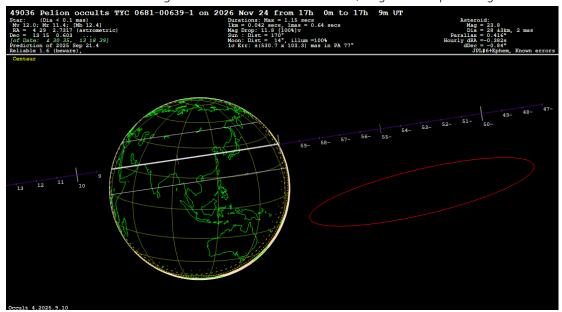


Figure 4. Path map of the possible occultation on 2026 November 24. Occult V4.2025.9.10



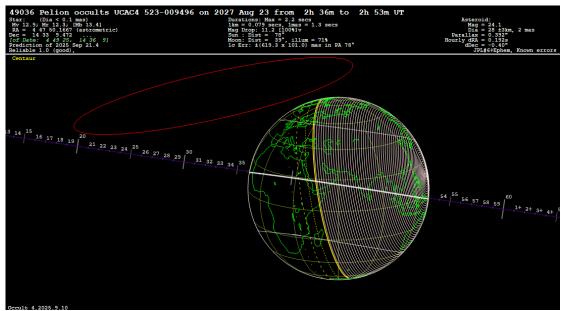


Figure 5. Path map of the possible occultation on 2027 August 23. Occult V4.2025.9.10

• 2027 November 20: Star magnitude 15.6 maximum duration 1.18 s, magnitude drop 8.3 mag

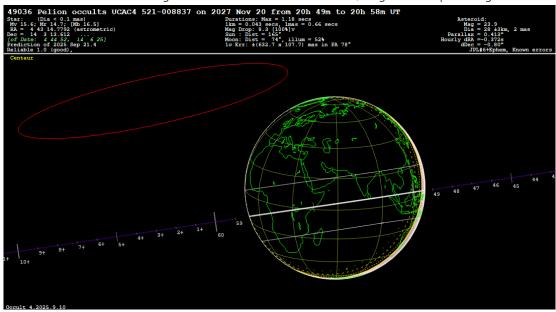


Figure 6. Path map of the possible occultation on 2027 November 20. Occult V4.2025.9.10

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Erratum

An error has crept into the news section of Journal for Occultation Astronomy No. 2025-02 (Vol. 15 No. 2)

In the report on the discovery of asteroid satellites through stellar occultations on page 18, we claimed that Roger Venable and Kai Getrost made the discovery of a satellite of (3927) Feliciaplatt on 2025 January 01.

This is incorrect.

Both observers confirmed the discovery of the satellite, which had already been made by Vince Sempronio on 2024 December 22. This is also noted in CBET 5511.

We apologise for the error.

Oliver Klös Editor-in Chief, JOA

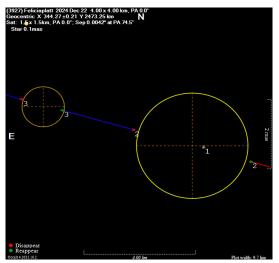


Figure 1. Plot of the chord of the discovery of the satellite of asteroid (3927) Feliciaplatt made by Vince Sempronio on 2024 Dec 22. (Occult V4.2025.10.2)

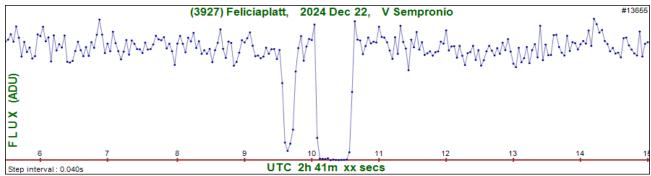


Figure 2. The light curve of the observation. (CBET 5511)

News

Occult Flash Tag Is Available in App Stores Again

Good news for everybody who used the app *Occult Flash Tag* in the past.

For a long time the app was not available anymore due to restrictions of the provider of the app store. Erick

Couto has now updated his software to fullfill the policies of the store and the app is now available for devices with *Android* again:

https://occult-flash-tag.soft112.com/

In Google play store:

https://play.google.com/store/apps/details? id=br.eti.erickcouto.occultflashtag

An "unofficial" manual for the use of the app was written by Ferran Casarramona for an earlier version:

> https://docs.google.com/document/d/ 1L0BqCerkilj9rdZIBwvMswyd7liEeD65vDtX-Xa6Mok/

> > (O. Klös)

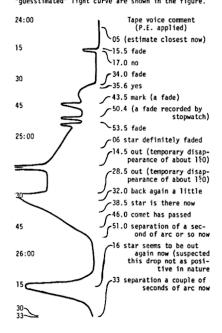


Figure 1. Screenshot of the app (captured at Google play store)

40 Years Ago – Detailed Visual Observation of a Stellar Occultation by Comet 1P/Halley

From Occultation Newsletter Vol. 3 No. 15:

Nov 19, mag. 8.2 B.D. +20° 531: P. Anderson observed substantial dimmings of this relatively bright star for about two minutes while the objects appeared merged together. Sky transparency and atmospheric seeing were good; a 41-cm f/6 Newtonian reflector was used visually at 198 power with VNG time signals and a tape recorder for timing. Anderson estimated that the nucleus passed about 0°.8 south of the star; later astrometric updates to the IHW28 prediction are in good agreement with this, but with considerable uncertainty. Anderson "felt inadequate attempting something as complex as this without a photometer." Anderson's taped remarks and "guesstimated" light curve are shown in the figure.



More exciting stories from the past – The Occultation Newsletter Heritage Project https://www.iota-es.de/on_heritage.html



ESOP XLIV - Report of the 44th European Symposium on Occultation Projects

Oliver Klös · IOTA/ES · Eppstein-Bremthal · Germany · pr@iota-es.de Alex Pratt · IOTA/ES · BAA · Leeds · England · alex.pratt@bcs.org.uk

ABSTRACT: The 44th European Symposium on Occultation Projects (ESOP) took place at Adam Mickiewicz University, Poznań, Poland during the weekend of August 23rd – 24th and it was a hybrid event held simultaneously as an in-person meeting and an online video conference. More than 100 delegates and family members participated in-person or online, representing among others Algeria, Austria, Belgium, Czechia, France, Germany, Greece, Ireland, Italy, Japan, the Netherlands, Poland, Slovakia, Spain, Switzerland, Türkiye, the United Kingdom and the USA. The science meeting was followed by social excursions on the Monday and Tuesday.

Friday, 22nd August 2025

Registration and the welcome reception took place at the Astronomical Observatory Institute (AMU), Poznań. Registration opened at 6 pm where each delegate collected their conference badge and a folder containing travel information, the symposium programme, a notepad and pen. We enjoyed a barbecue with steaks and sausages, salads and homemade cakes as dessert, with soft drinks, beer or wine. It was a first opportunity for the participants and accompanying persons to meet old friends and make new ones close to a bonfire in the garden of the observatory. Anna Marciniak, professor at the Adam Mickiewicz University and lead member of the Local Organising Committee



Figure 2. Anna Marciniak (left) greets the delegates with Wojciech Burzyński (centre) and Konrad Guhl. (O. Klös)

welcomed everyone to the reception and outlined the upcoming programme of events. Guided tours of the main observatory building with some historical instruments on display rounded up the evening (Figure 3).

Saturday, 23rd August 2025

The registration desk opened again at 8:30 am for delegates to collect their name badges and folders, then proceed into the Collegium Minus, Adam Mickiewicz University where the conference would take place.

At the opening ceremony the participants were welcomed by Agnieszka Kryszczyńska, head of the Astronomical Observatory Institute (AOI) of AMU and Anna Marciniak, who also greeted the online attendees, and also by Konrad Guhl, President of IOTA/ES.

Eberhard Bredner recalled the official founding of IOTA/ES as a registered association 40 years ago. He presented Konrad Guhl the original founding document, which is protected behind safety glass in a picture frame (Figure 4). Eberhard also recalled Anna's first steps in occultation work ten years ago and he presented her with a bouquet of flowers.

This was followed by an invited opening talk by Marek Nikolajuk, PhD at AOI about eclipsing X-ray binaries. In these systems one is an ordinary star, and the other is a neutron star or black hole. X-rays are emitted when matter from the accretion disk falls onto the compact star. Marek concluded in his talk that X-ray binaries are a key to understanding compact objects and their accretion physics also links them to active galactic nuclei.

Session 1 – Lunar Occultations chaired by Michael O'Connell

The Current Status of Lunar Occultations in Europe – Dietmar Büttner (presented by Konrad Guhl)

In this brief presentation Konrad Guhl gave an overview of the numbers of total lunar occultation observations and grazes in Europe. The results show that there are still some unresolved O-C residuals in the timings. Additionally, observations of lunar occultations are a perfect tool to measure double stars and discover new ones.

Lunar Occultations of Double Stars - Alex Pratt

High-cadence video photometry (>50 fps) of lunar occultations of close double stars allows us to estimate the magnitudes, position angle and separation of double star components. Alex's talk gave an overview of how to obtain predictions, record an event, analyse the data, and share the observations. He summarised the history of worldwide observing programmes and mentioned new developments such as the OLED project.



Figure 3. Chad Ellington takes a look at photographic plates with a historic blink comparator. (O. Klös)



Figure 4. Eberhard Bredner (right) presents Konrad Guhl the original founding document of IOTA/ES. (O. Klös)

OLED Project – Lunar Occultations of Double Stars – Enrique Velasco

The OLED project, a collaborative initiative between Spanish and French observers focused on measuring lunar occultations of double stars was presented in this talk. The project places particular emphasis on close binaries and unresolved stars known to be double. The project will share the results obtained to date. Enrique discussed future prospects, explained po-



Figure 5. Enrique Velasco presents the OLED project. (O. Klös)

tential technical improvements, and extended an invitation for collaboration.

Session 2 – Lunar Occultations chaired by Alex Pratt

Grazing Occultation of Maia on April 1, 2025 – Björn Kattentidt, Bernd Gährken (presented by Bernd Gährken)

Maia is one of the main stars of the Pleiades. It is an interesting quadruple star whose nearby component, 'Ab,' was discovered in 1988 through a grazing occultation. Since it was not possible to calculate its distance in 1988, it is interesting to take another look. Bernd and Björn Kattentidt used two Seestar Smartscopes for the occultation. Bernd presented some of the results in the lecture and demonstrated the capabilities of the Seestar-S50 in occultation projects.

Grazing lunar occultation on 1. May 2025 near Regensburg using 3 different optical systems for comparison – Björn Kattentidt

A lunar occultation has been very successfully observed by recording three chords with three different astronomical setups. Björn presented the observations and compared the results with a prediction by *GRAZPREP* and an analysis by Mitsuru Soma. The three optical systems and mounts as well as recording systems were compared one against each other concerning effort of installation, system cost and pros vs. cons. Björn constructed a DIY GPS flash timer and after his presentation handed it to the participants for a closer look.



Figure 6. Björn Kattentidt presents his DIY GPS flash timer to the delegates of the symposium. (O. Klös)

47 years of my occultation observations - Janusz Wiland

In the following presentation Polish veteran observer Janusz Wiland gave an overview of his observations of occultations spanning nearly five decades. Beside observing many occultations, Janusz built several technical instruments for timing the events.



Figure 7. Janusz Wiland demonstrates his historic portable voice recording system for occultation observations. Pay attention to the box hanging around his neck, which is protected by body heat under the jacket. (O. Klös)

Session 3 – Software and Procedures chaired by William Stewart

SODIS 2.0 - News and Statistics - Sven Andersson

The Stellar Occultation Data Input System (SODIS) collects and evaluates observations of occultations by asteroids in Europe since 2023. Sven, one of the lead members of the SODIS Team, showed what was accomplished in the last years and what has been improved in the reporting mask in SODIS version 2 to avoid input errors and make it easier to use. Sven advised that Gmail accounts have problems interacting with SODIS.

Optimal exposure time regarding the detectability of small dips (<3.0mag) – Martin Gutekunst

One of the most challenging tasks in occultation observing is to find the correct balance between time resolution and a good signal-to-noise ratio (S/N). Martin's lecture dealt with the question of which exposure time or S/N ratio is optimal for an event with a given brightness and event duration for a given equipment setup. A 0.2 mag drop requires a S/N of 4 or 5. He showed a method for finding the optimum exposure time.

Improvement in VAMOR process – Frank Schaffer, Konrad Guhl (presented by Konrad Guhl)

In 2023, the authors presented the project VAMOR CAD – Validation of Asteroid Models by Occultation Results for the spatial representations of occultation observations events on 3D-models. Especially, the process was complemented with a "drawing" or "design" method for more irregular bodies. This method was tested on the very precisely known (22) Kalliope model. The simpler method, developed first for bodies with a more regular shape, is compared with the further developed method and the results. Konrad showed examples of models of (357) Ninia and (22) Kalliope and compared them with each other.

Optimal exposure time regarding the detectability of small dips (<1.5mag) – Martin Gutekunst

Martin Gutekunst presented his second talk of the session. In this case how to deal with the challenge of detecting small dips in brightness for events with a drop of <1.5 mag.

This talk closed the sessions of the first day of ESOP XLIV.



Figure 8. Sven Andersson shows some statistics from SODIS in the Collegium Minus. (O. Klös)



Figures 9. Martin Gutekunst explains his evaluation of optimum exposure time for best time precision. (O. Klös)

Figure 10. Screenshot from Martin's presentation.

Optimum exposure time for best time precision

What time accuracy we are losing at a Signal with SN 5 compared to S/N of 3?

Scenario 1: SN rises linear with exposure time (limited by seeing)

- → detection limit of dip width is factor 0,63 smaller for SN 5 regarding to SN 3
- → time precision of SN5 is the same regarding SN3
- → Integration time for SN 5 should be chosen regarding overall data robustness combined with sensitivity and dip width behaviour

SN	Integration Time rel to SN(3)	time precision rel to SN(3)		Min dip width in time rel to SN (3)
3	1	1	5	5
4	1,33	1	3	4,0
5	1,67	1	2	3,14

Martin Gutekunst

The IOTA/ES Annual General Meeting was held after the sessions of the first day. The Board reported about the financial situation of the association, member statistics, the scientific results and collaborations, the different activities for public outreach and possible locations of future ESOPs. As every two years a new Board has to be elected, all current members of the Board stood for re-election and were re-elected by the Assembly. The discussion followed about the membership fee and a free membership for persons under 25 years of age. The Assembly decided to keep the membership fee stable at € 20 per year and give it a try to attract younger people to join the association with a free membership.

The social dinner took place at the brewery Brovaria in the centre of the old city of Poznań. During an exquisite buffet the delegates discussed the topics of the first day and made plans for upcoming observations.

Sunday, 24th August 2025

Session 4 – Predictions and Upcoming Events chaired by Konrad Guhl

The Ganymede III Occultation on the 14th of October – Thierry Midavaine

A very special event will be observable from Europe on 2025 Oct 14 but with a small drop of 0.2 mag. The occultation of a 7 mag star by Jupiter's third Galilean satellite, Ganymede can provide important astrometry for the guidance of ESA's space mission *Juice* which will arrive at the Jovian system in 2031. It is also an opportunity to model the target star and to check the accuracy of each observer's setup and give feedback and advice. Thierry presented his talk online at ESOP via Zoom and invited observers in Europe to join the observation campaign. He gave some recommendations to get a successful observation result (see JOA 2025-03, p. 3). He announced a special Zoom meeting in English language ten days before the event.

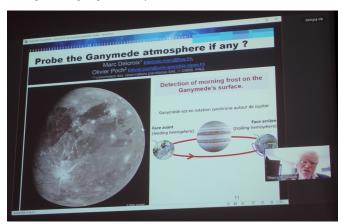


Figure 11. Thierry Midavaine invites to the Ganymede campaign. (O. Klös)

Spanish TSE 2026 from the Edges - Carles Schnabel

Next year's solar eclipse will cross the Iberian Peninsula from northwest to southeast. Carles gave in his presentation some guidelines for observing the event on both edges of the shadow track for Baily's beads measurements. He provided valuable information with topographic maps to find the best observing locations depending on proposed weather situations and terrain.



Figure 12. A possible weather model for the TSE 2026 is predicted by Carles Schnabel. (O. Klös)

The best 2026 occultation opportunities by Didymos before the arrival of Hera (ESA) mission April 16th (France, Sardinia ...) and May 4th (Algeria) – Damya Souami

Although the use of occultations to characterise NEAs had been expected 15 years ago; it has only recently become feasible thanks to the Gaia DR3 stellar catalogues which have revolutionised the use of stellar occultations to the point of successfully predicting occultations by sub-km sized NEAs. This began with the occultation by (99942) Apophis, followed by a series of occultations by the Didymos-Dimorphos system target of the *DART* (NASA) and *Hera* (ESA) planetary defence missions. Damya presented the last good occultation opportunity by the Didymos system on 2026 April 16

which will be observable in Europe, from France and Sardinia; as well as the 2026 May 4th event which will be observable from Algeria. This talk was meant to alert the IOTA community at large and in particular the IOTA/ES community to the importance of these two events.

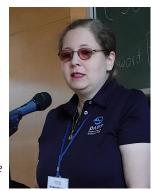


Figure 13. Damya Souami talks about the next occultations by Didymos. (O. Klös)

Occultation by Psyche in Algeria on Oct. 8. 2025 – Bernd Gährken

In this talk Bernd showed the participants impressions from his trip to Algeria in October 2025, inspired by our colleague Djounai Baba Aissa. He joined a group of Algerian amateurs who had organised a large-scale observation campaign near the desert town of Laghouat to observe an occultation of a 6 mag star by (16) Psyche. The asteroid is the target of a NASA space mission with the same name. Neptune's rings occulted an 11 mag star on the same night. With many photos Bernd gave a lively report of this expedition. Additionally, he checked the conditions onsite for the upcoming solar eclipse in 2027.



Figure 14. Maciej Borkowski (left) enjoys the images and videos presented by Bernd Gährken (right). (O. Klös)

Session 5 – Asteroid Sizes and Orbits from Occultations chaired by Marek Zawilski

A comparison of radiometric and occultation-derived diameters of TNOs – Mike Kretlow

Stellar occultations provide (apparent) size measurements of TNOs with kilometre-scale precision and can reveal their shape, binarity and rings. Combined with absolute magnitudes, they also enable accurate albedo estimates. Mike reported about collaborative (pro-am) efforts that have significantly expanded the sample of occultation-based sizes, allowing robust comparison with radiometric results. The analysis by his team shows good overall agreement in diameters, with a mean weighted



Figure 15 .Mike Kretlow during his presentation. (O. Klös)

normalised orthogonal distance of 11.8%, which is consistent with similar studies of main-belt and near-Earth asteroids. He pointed out that albedo estimates show more variation, primarily due to uncertainties in absolute magnitude (H). However, occultations play a key role in validating and refining thermal models, especially for non-spherical or complex bodies. Larger discrepancies, typically when radiometric diameters exceed occultation values by more than ~12%, may indicate unresolved companions or ring systems contributing excess thermal flux.

Expanding Results from Asteroid Shape Modelling Driven by Archival Stellar Occultation Data – Julia Perla and Anna Marciniak (presented by Julia Perla)

With high-quality, multichord results of occultation observations it is possible to determine an asteroid's size, it is possible to fit a sphere, ellipsoid, or spin and shape model. As is known from multiple space missions, asteroid shapes are mostly irregular. Therefore, the most accurate method for determining asteroid sizes is through the fitting of complex shape models, rather than ellipsoids. Therefore, accurate diameters provide better density constraints. Julia reported that there is a significant number of asteroids with valuable stellar occultation data, but no shape model. The primary reason for the absence of a spin and shape model is typically an insufficient amount of photometric data. Therefore, her team conducted an observing campaign to collect rotational lightcurves in additional apparitions of these targets. They modelled asteroids using a convex inversion method and then scaled it with rich stellar occultation data. With this method, Julia and her team were able to model spins and shapes of a few main belt asteroids. This permitted the precise determination of the asteroids' diameters, narrowing the range of diameters determined by the infrared studies. Moreover, for some targets they resolved the mirror-pole ambiguity.

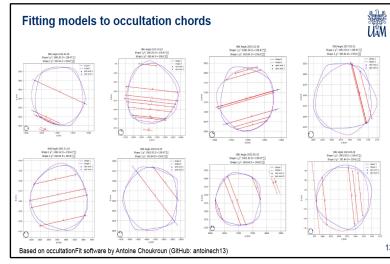


Figure 16. Eight examples of models fitted to chords measured during occultations - presented by Julia Perla. (Screenshot from presentation)

Asteroid sizes constrained by thermophysical model and stellar occultations – Antoine Choukroun

Antoine demonstrated that multi-chord stellar occultations remain the gold standard for asteroid diameter determination. The goal of his team was to determine precise diameters for fifteen

slowly rotating, lowamplitude main-belt asteroids using occultation fitting, and to compare them with values obtained through advanced thermophysical modelling. They derive convex 3D shape and spin models from dense, multi-appariphotometric tion lightcurves using lightcurve inversion. These shape models are then scaled using multi-chord stellar occultations with shape model silhouettes projected and



Figure 17. Antoine Choukroun compares thermo-physical models with occultation results (O. Klös)

fitted to the observed chords in the fundamental plane. These results confirm the robustness of the occultation-fitting method and its continued importance for validating and constraining asteroid size estimates obtained by indirect means. Larger discrepancies are found only for poorly covered events (few chords or asymmetric coverage of the body).

Antoine concluded that despite the improving quality of thermal data and modelling techniques, multi-chord stellar occultations remain a critical benchmark for size determinations, asteroid densities and internal structures.



Path shifts - Robert Purvinskis

Everybody who observes occultations has experienced a frustrating path shift. Robert presented in his talk some recent examples and explained why observers have to expect shifts in the future, despite high-quality astrometry from Gaia. He discussed stars with high RUWE values, accuracy of solar system orbits and uncertainties in predictions.

Figure 18. Robert Purvinskis talks about path shifts. (O. Klös)

Session 6 – Asteroids and TNOs chaired by Wolfgang Beisker

Stellar Occultations by Asteroids Observed with the Unistellar Network: The Case of (16583) Oersted – Josef Hanuš

A stellar occultation by asteroid (16583) Oersted across the Czech Republic and Latvia was observed on 2024 March 3. The resulting multi-chord dataset enabled precise reconstruction of Oersted's silhouette, which Josef and his team combined with archival sparse photometry and thermal infrared measurements to derive its shape, spin state, and surface thermal properties. One chord was contributed by the Unistellar Citizen Science Network. His talk demonstrated that citizen science can reach the quality needed for high-precision shape scaling and offers a new path to robust asteroid characterisation when integrated with professional datasets.

Contribution of Amateur Astronomers from Béjaïa to the Observation of Stellar Occultation by Asteroids in Algeria - Lamine Mohamed Allik

Lamine reported in his talk about the activities of amateur astronomers from Béjaïa, Algeria. Since their initial participation in the First Algerian Meeting on Occultations in December 2016 in Algiers they have gradually established themselves in the field of stellar occultation observations by small Solar System bodies. Notably, they organised the second edition of this meeting in Tichy (Béjaïa) in August 2017, on the occasion of the stellar occultation by asteroid (5247) Krylov. Their involvement continued through regular participation in national meetings in the following years. Their progress culminated in two major international contributions: the observation of the occultation of Betelgeuse by asteroid (319) Leona on 2023 December 12 in Alicante (Spain), and the total solar eclipse on 2024 April 8 in Dallas (USA), during which successful imaging of Baily's beads was achieved.

Scientific Achievements of Suhail Astronomy Association in Laghouat in Observing Stellar Occultations by Asteroids in Algeria - Andane Saouli

Andane presented the work of another Algerian association. The Suhail Association for Astronomy and Space Sciences, based in Laghouat has been actively engaged in astronomy outreach and citizen science since 2016, with a particular focus on stellar occultations by asteroids. Initially centred on visual observations, the association's members have gradually developed technical expertise that has significantly improved the precision and quality of their data. The organisation of the three national meetings on asteroid occultations has further consolidated its role as a key player in this field within Algeria. Notably, the meeting held in October 2020, set a national record with the participation of 120 amateur astronomers from across the country, using a total of









Figures 19 - 22. The Algerian occultation team at ESOP: Lamine Mohamed Allik, Andane Saouli, Ghoulam Imad Eddine Boudiba and Djounai Baba Aissa (left to right) reported about the strong community in Algeria and their successful observations. (O. Klös)

54 telescopes. Among its major scientific contributions is the observation of the stellar occultation by asteroid (283) Emma in 2020 November 24, which led to the discovery of a binary star system with the widest angular separation ever recorded during a stellar occultation. The association has also taken part in international campaigns, including the observation of the occultation of the star Betelgeuse by asteroid (319) Leona on 2023 December 12, in Alicante, Spain, and the total solar eclipse in Dallas, United States, in 2024, during which high-resolution images of Baily's Beads were captured. Finally, observations of the near-Earth asteroid (2212) Hephaistos in 2024 November 08 and the trans-Neptunian object 2013 LU₂₈ in 2025 February 18 have provided valuable data to the international scientific community.

Preliminary results of four stellar occultations by the Trojan (4709) Ennomos - Ghoulam Imad Eddine Boudiba

Ghoulam reported about the analysis of four positive occultation events by the Jupiter Trojan (4709) Ennomos. The observations took place in February 2018 and April 2020 in Australia, in November 2021 in the US and in August 2022 in Europe. His team developed Python code to perform aperture photometry and used the SORA Python package to fit the ellipses at the times of the occultations. He presented his analysis of the physical dimensions of (4709) Ennomos based on the four occultations as a work in progress.

The observation of quadruple-chords stellar occultation on February 18th, 2025 by the trans-Neptunian object (468861) $2013LU_{28}$ in the far southern of Algeria - Djounai Baba Aissa

The lecture by Djounai gave an insight about a scientific expedition led by Algerian researchers from CRAAG (Algiers Observatory), in collaboration with amateur astronomers and local teams, to observe an occultation by the trans-Neptunian /

Centaur / Damocloid (468861) 2013 $\rm LU_{28}$ on 2025 February 18. The Algerian team achieved four positive observations of this event. These results represent a major milestone in the study of trans-Neptunian objects, paving the way for better understanding of the orbital and physical parameters of (468861) 2013 $\rm LU_{28}$ and distant icy bodies in the Solar System.

Session 7 – Observations and Results chaired by Oliver Klös

The beginning of observations occultation events at University of Białystok Astronomical Observatory – Wojciech Burzyński



Figure 23. Wojciech Burzyński (O. Klös)

Firstly, Wojciech talked about the main focus of the University of Białystok Astronomical Observatory on photometric observations with the webbased system Black Hole Target and Observation Manager (BHTOM). This system manages and coordinates astrophysical observations, enables researchers to efficiently track, prioritise, and monitor a wide range of transient and variable

phenomena. The team successfully observes quasars, active galactic nuclei, variable stars: novae, symbiotic and cataclysmic, the effects of gravitational microlensing, tidal disruption events and X-ray binaries. Secondary but equally important observational goals are occultation events, which were observed successfully since Autumn 2024. Wojciech showed some examples of these observations.

Observation of the partial solar eclipse on March 29, 2025 on La Palma – Peter Stolzen

Peter presented with a slideshow of images and an animation of his observation of the partial solar eclipse on 2025 March 29 on La Palma, Canary Islands, including the one-day-old crescent Moon. The images were obtained with a 500 mm telephoto lens. He described his setup and the settings for the image acquisition.

Historical occultation phenomena observed from the Greater Poland region - Marek Zawislki



Figure 24. Marek Zawilski (O. Klös)

region of Greater Poland. Therefore, Marek took a closer look at eclipses and occultations which had happened in this region in the past. The total solar eclipse of 878 October 29 was probably observed, but no written document about it has survived. But solar eclipses in the 15th century were observed. Especially, the total solar eclipse of 1424 June 26

Poznań, the location of ESOP XLIV, lies in the

was widely documented across Europe. Solar eclipses in 1706 and 1764 were observed in Poznań. In 1919, after the establishment of an astronomical observatory in Poznań, many local astronomers regularly performed observations of lunar occultations. In total, over 800 such phenomena were recorded in the period 1923-1959. Astronomers from the Poznań Observatory also took part in several expeditions to total solar eclipses around the world. In 1974-1975 amateur observations of lunar occultations were continued at Poznań. Finally, a valuable contribution to the observations of the grazing occultation of Aldebaran on 1998 April 28 was made at two stations in Poznań.

This concluded the sessions of ESOP XLIV and the delegates waited for the announcement for ESOP XLV in 2026.

Patrick Martinez and Andre Pascal invited the participants to come in 2026 to Toulouse, France on August 21-26. This would give observers enough time to travel from an observation site for the total solar eclipse in Spain on 2026 August 12 to the location of the symposium. The day before the Symposium, Friday 21st, will be a special pre-excursion to visit the world-famous Pic du Midi observatory complex in the Pyrenees. ESOP XLV will be held at the Observatoire Midi-Pyrénées, Toulouse on August 22nd and

23rd. Following the symposium, two days with excursions are planned to Cité de l'Espace and Carcassonne, and Airbus and Aeroscopia Museum.



Figure 25. Patrick Martinez (left) and Pascal Andre invite participants to ESOP XLV in August 2026 in Toulouse, France. (O. Klös)

The official part of ESOP was closed and the participants got some fresh air on a guided tour around the historic and picturesque Poznań Old Town.



Figure 26. The guided tour through the Old Town started at the monument for the founder of the university. (W. Burzyński)

Excursions

Monday, 25th August 2025

Many of the delegates and their partners were staying in hotels and guest houses in Poznan Old Town, ensuring a relatively short walk to the car park of the Mercure Hotel for our pick-up point. A 90-minute coach drive through scenic countryside took us to the Chalin Observatory of the Astronomical Observatory of Adam Mickiewicz University, situated in the forested Nature Education Centre, a dark-sky reserve. We were given a guided tour of Poznań



Figure 27. The domes at the Poznań SST Telescope 3 site. (O. Klös)

SST (Space Surveillance and Tracking) Telescope 3, part of their GATS Project (Global Astrophysical Telescope System) to survey and track Earth's artificial satellites (Figure 27). It's a cluster of five instruments housed in three futuristic-looking ScopeDome clamshell domes with a central one hosting the computer cluster, NAS servers, GNSS timing and UPS support.

The instruments comprise a couple of 0.3m f/1.0 survey telescopes, a couple of 0.32m f/5.3 tracking telescopes and a 0.7m f/4.5 tracking telescope, each equipped with an Andor Zyla 5.5 camera and on Planewave mounts capable of slewing across the whole sky within 10 s (Figures 28-30). The tracking 'scopes are modified Dall-Kirkhams; the survey 'scopes implement a Mangin mirror and lens group [1].

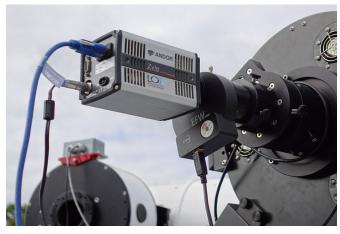


Figure 28. Andor Zyla 5.5 camera attached to one of the survey telescopes. (O. Klös)



Figure 29. The two 0.3m f/1.0 survey telescopes. (O. Klös)



Figure 30. The 0.7m f/4.5 tracking telescope. (O. Klös)



Figure 31. The largest pond in the Morasko Meteorite Reserve. (O. Klös)

We then walked through an orchard of apple trees whilst a member of staff from the Centre for Nature Education told us about the work involved in caring for this popular fruit. Our coach then took us to the town of Sieraków for a leisurely lunch.

After a 90-minute drive we arrived at the Morasko Meteorite Reserve, a woodland area which was targeted by an iron meteorite about 5,000 years ago. It fragmented as it ploughed through the atmosphere and created seven craters which are now scenic water-filled ponds. The largest one has a diameter of 100 m and is 13 m deep (Figure 31). There is a walking route through the area with numerous information boards for visitors [2]. More than a tonne of meteorites has been found on the site and more are being excavated. A 34 kg specimen was found during the filming of the science documentary "Meteorite Men" [3].

To complete our tour, we returned to Poznań to visit the Museum of the Earth (Faculty of Humanities, Adam Mickiewicz University). As well as housing an extensive collection of minerals, rocks and fossils, it also displays an impressive collection of Poland's meteorites, including fragments of the Morasko meteorite, the largest weighing 150 kg and 261 kg; the latter is on a sack-cart, allowing close inspection (Figure 32), [4].



Figure 32. The large fragment on the sack-cart. (O. Klös)

We also 'experienced' the Morasko meteorite impact for ourselves. A multimedia presentation using VirtualReality headsets took us back 5,000 years to see the blinding flash of the incoming fireball, the detonation on impact, the resultant shockwave and the effects across the region, and its evolution to the present day (Figure 33).



Figure 33. The participants experience the impact with VR googles. (O. Klös)

Tuesday, 26th August 2025

Our coach departed the Mercure car park for the hour's drive to Kórnik Castle, which was originally constructed in the 14th century and remodelled in 1845 (Figure 34). It is a National Historic Monument of Poland. After dividing up into two groups of 25 for our guided tours in English and German, we approached the impressive façade of the castle up some wide stairs and walked across the stone bridge over the moat. Our host led us through various rooms and by describing the paintings, furniture and art collections, he described the lives of the owners and occupants of the castle throughout the many decades. To protect the wood mosaic floors, we were asked to keep to the carpeted areas.



Figure 34. Kórnik Castle combines various architectural styles. (O. Klös)

Amongst the numerous items in the castle, we encountered a Roman mosaic from Pompeii. Lying on a round table protected by a sheet of glass it depicts a dog on a chain, baring its teeth – ready for any unwelcome visitors. There was no inscription, although it resembles the so familiar warnings: 'cave canem' – 'Beware of the dog!' It was purchased by Jan Działyński (1829-1880) during a trip to Italy (Figure 35).



Figure 35. The mosaic from Pompeii. 'cave canem' – 'Beware of the dog!' (A. Pratt)

We then had free time in the gardens of the castle Arboretum, from which we had great views of the castle and moat. We enjoyed a lovely lunch in Kórnik, then the coach took us back to Poznań, where we climbed the 185 steps of the 43 metre-high Royal castle tower to reach the observation deck. It was yet

another sunny day and it afforded us views across the city and out to Morasko, where we could imagine the fireball coming in...

Returning to the ground floor we perused the displays in the Museum of Applied Arts - ceramics, clothing, furniture, glass, metal, weapons and the history of the castle. After a very enjoyable ESOP small groups of us said our goodbyes and we agreed to meet again next year, either in Spain for the total solar eclipse and/or in Toulouse France for ESOP XLV.



Figure 36. Maciej Borkowski and Julia Perła of the LOC show the written "Thanks" from the participants for a perfect ESOP. (O. Klös)

Further Reading and References

The PDFs with the charts and the Zoom video recordings of the lectures are available here:

https://esop44.iota-es.de/programme

- [1] https://www.astro.amu.edu.pl/~chrisk/gats/index.php?n=PST3.PST3
- [2] https://regionwielkopolska.pl/en/katalog-obiektow/the-morasko-meteorite-reserve/
- [3] https://www.youtube.com/watch?v=-i10oYQlkel
- [4] https://muzeumziemi.amu.edu.pl/kolekcja-meteorytow/

Stephen (Steve) Russell



Stephen Russell (F. Andrews)

The Australian amateur astronomical community is in mourning for the unexpected loss of one of its more prominent leaders in Steve Russell.

While Steve's personal observing activity was heavily focussed on pursuing total solar eclipses all over the world, he has always remained close to the Australian occultation observing community participating in a range of lunar grazing activities over several decades.

Steve was however better known across the Australian amateur astronomical community in his pivotal role as secretary to NACAA (National Australian Convention of Amateur Astronomers) – the biennial meeting of amateurs covering all aspects of astronomy. And while the burdens of this role were significant, his engaging and entertaining speaking style meant he was a natural at engaging with the wider community.

Steve always ensured that occultation astronomy had a place in NACAA and I am eternally grateful for his support in ensuring that the Trans-Tasman Symposia on Occultations were seamlessly and professionally integrated into the wider NACAA programme.

His support will be sorely missed.

Steve Kerr Trans-Tasman Occultation Alliance Director

Journal for Occultation Astronomy

Brian Loader 1935 – 2025

Pauline Loader



Pauline and Brian Loader. (D. Herald)

It is my unfortunate duty to report the passing of one of New Zealand's most important astronomical couples – Brian and Pauline Loader.

Brian had been a significant part of the RASNZ (Royal Astronomical Society of New Zealand) Occultation Section/TTOA from the very early days. One of the early projects he managed through the 1980's and 90's was the visual timing of the disappearances and reappearances of Jovian Galilean satellites as they passed in and out of eclipse to support a program at JPL run by Dr Jay Leiske in anticipation of the *Galileo* mission. That simple project was my entry into the world of occultations and Brian's encouraging words were key to founding my life-long interest in citizen science astronomy. At the time, Brian was working at the USNO station at Black Birch, near Blenheim on the South Island of New Zealand after a career as a science teacher.

With retirement, Brian and Pauline moved south to Darfield near Christchurch and established their backyard observatory. Over the years, Brian has contributed a significant volume of both lunar and planetary occultation observations and in time became first the New Zealand, then Australasian and then global coordinator of lunar occultation observations of double stars. As well as acting as the reference point on these topics, Brian was listed as either the lead or significant co-author on 10 papers published in the Journal of Double Star Observations (JDSO). Brian regularly presented talks on the techniques and results of his work to both RASNZ conferences as well as to Trans-Tasman Symposia on Occultations (TTSO's) and his support for new observers and the TTOA's activities and administration were always deeply appreciated.

Brian's efforts and achievements were recognised when he received the Homer F. DaBoll award in 2014 and was made a Fellow of the RASNZ in 2017.

Pauline's contributions to New Zealand astronomy are also of significance. Pauline has served as secretary and treasurer to the RASNZ as well as stepping into the role of director of the RASNZ Variable Star Section at a critical point in its history as it was reformed into Variable Stars South. Many occultation observers will also be familiar with Pauline's 'Beeper Boxes' – devices that she designed and produced that mimicked shortwave time signals for visual observers at a time when shortwave time services were being discontinued across Australasia.

TTOA members were successful in advocating for two minor planets discovered by John Broughton to be named in their honour – (22649) Paulineloader and (22650) Brianloader.

They will be dearly missed ...

Steve Kerr Trans-Tasman Occultation Alliance Director

Journal for Occultation Astronomy



IOTA's Mission

The International Occultation Timing Association, Inc was established to encourage and facilitate the observation of occultations and eclipses It provides predictions for grazing occultations of stars by the Moon and predictions for occultations of stars by asteroids and planets, information on observing equipment and techniques, and reports to the members of observations made.

The Journal for Occultation Astronomy (JOA) is published on behalf of IOTA, IOTA/ES and RASNZ and for the worldwide occultation astronomy community.

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www.occultations.org www.iota-es.de www.occultations.org.nz

These sites contain information about the organisation known as IOTA and provide information about joining.

The main page of occultations.org provides links to IOTA's major technical sites, as well as to the major IOTA sections, including those in Europe, East Asia, Middle East, Australia/New Zealand, and South America.

The technical sites hold definitions and information about all issues of occultation methods. It contains also results for all different phenomena. Occultations by the Moon, by planets, asteroids and TNOs are presented. Solar eclipses as a special kind of occultation can be found there as well results of other timely phenomena such as mutual events of satellites and lunar meteor impact flashes.

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