

# Star Dust

Newsletter of National Capital Astronomers, Inc.

[capitalastronomers.org](http://capitalastronomers.org)

February 2023

Volume 81, Issue 6

**Celebrating 86 Years  
of Astronomy**

## Next Meeting

**When:** Sat. Feb. 11th, 2023

**Time:** 7:30 pm

**Where:** Online (Zoom)

See instructions for joining the meeting on Page 8.

**Speaker:** Dr. Thaddeus Komacek

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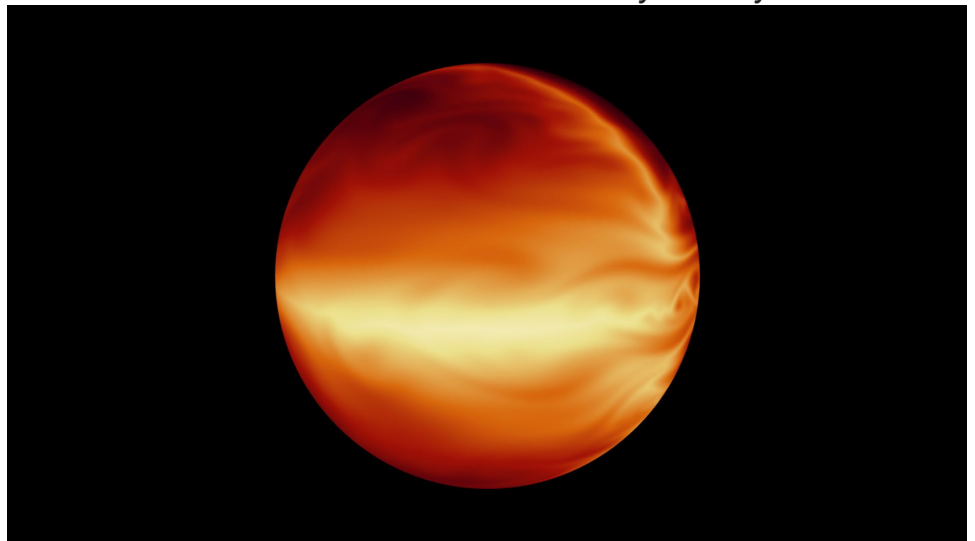
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A bird in the night sky? Not exactly. NCA Webmaster Elizabeth Warner caught this image of the Chinese Shijian 23 rocket launch while on St. Croix on January 8, 2023.

## Characterizing the Atmospheric Circulation and Climate of Exoplanets in the Era of JWST

*Dr. Thaddeus Komacek – University of Maryland*



**Simulation of the turbulent atmosphere of exoplanet HD 80606b based on data received by NASA's Spitzer Space Telescope  
Image Credit - NASA/JPL-Caltech/MIT/Principia College**

Atmospheric characterization is the present frontier for understanding the nature of planets that orbit stars other than the Sun. To date, the bulk of the observational study of these exoplanet atmospheres has been performed on the largest and closest-in gaseous exoplanets, colloquially termed "hot Jupiters." The recent launch of JWST will enable detailed characterization of hot Jupiters, along with a first detailed glimpse at the atmospheric composition and climates of temperate Earth-sized exoplanets orbiting small, cool stars. In this talk, I will discuss the current understanding of the atmospheric circulation of hot Jupiters as determined from interpreting astronomical observations. I will introduce the hottest gaseous exoplanets, "ultra-hot Jupiters," as a novel extreme class of exoplanet characterized by thermal dissociation of molecules and patchy mineral cloud coverage. I will then stretch across the continuum of exoplanet atmospheres to discuss the state-of-the-art of modeling rocky exoplanet climates, the assumptions of which will be confronted by JWST observations of temperate rocky exoplanets. I will finally summarize the promising future of exoplanet characterization, including the push in the coming decades toward constraining the atmospheric composition and climate of Earth-sized rocky planets orbiting Sun-like stars.

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## Recent Astronomy Highlights

### Cosmic Optical Background (COB) Found to be Brighter Than Expected

The Cosmic Optical Background, the visible light from galaxies and other light sources outside of the Milky Way Galaxy, is difficult to measure in the solar system because of light reflected from the Sun, planets and etc.

Fortunately, NASA's New Horizons mission, originally sent to study the dwarf planet Pluto and its moon, Charon, and subsequently used to study Arrokoth, is beyond such interference. Using hundreds of images taken by the Long-Range Reconnaissance Imager (LORRI) aboard New Horizons, scientists have been able to calculate the brightness of the COB. The results show that the light of the COB is between two and three times brighter than what is expected from known light sources. This may indicate heretofore unknown sources of light and could lead to new insights into the formation of the Universe. More info is available at [www.sciencedaily.com/releases/2022/12/221216112842.htm](http://www.sciencedaily.com/releases/2022/12/221216112842.htm) and the paper explaining the results is at [arxiv.org/pdf/2212.07449.pdf](http://arxiv.org/pdf/2212.07449.pdf).

### Milky Way's Most Distant Stars Are Very Distant

Astronomers using data from the Next Generation Virgo Cluster Survey, NGVS, have discovered variable stars, known as RR Lyrae stars, orbiting within the halo of the Milky Way that lie approximately one million light years from the center of the galaxy, nearly halfway to the Andromeda Galaxy. RR Lyrae stars are ancient and metal-poor, i.e. low in elements heavier than hydrogen and helium. They generally have a mass approximately half that of the Sun and have periods of variable brightness often less than a day. The distances of the RR Lyrae stars can be calculated using the amount of light detected and the length of the period. The results match well with the predictions of models indicating that the halo extended approximately a million light years out from the center of the galaxy. More information is at [www.sciencedaily.com/releases/2023/01/230109191622.htm](http://www.sciencedaily.com/releases/2023/01/230109191622.htm).

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*Abstract and Biography – continued from page 1*



**Biography:** Dr. Thaddeus ("Tad") Komacek is an Assistant Professor in the Department of Astronomy at the University of Maryland, College Park. Previously, Tad held a Heising-Simons 51 Pegasi b Postdoctoral Fellowship at the University of Chicago from 2018-2021. He received his Ph.D in Planetary Sciences from the University of Arizona Lunar and Planetary Laboratory in 2018, and bachelor's degrees in Geophysical Sciences and Physics from the University of Chicago in 2013. Dr. Komacek's research focuses on characterizing the atmospheres of exoplanets by developing theoretical and numerical models for their global circulation and climate.

## Schedule of Remaining 2022-2023 NCA Talks

*John Hornstein*

|                 |  |
|-----------------|--|
| <b>March 11</b> | Alex Dittman (UMd) <b>Stars Orbiting Super-massive Black Holes</b>   |
| <b>April 8</b>  | Joe Pesce (GMU and NSF) <b>The Atacama Large Millimeter/submillimeter Array (ALMA) and Game-changing Science</b> |
| <b>May 13</b>   | Dana Louie (GSFC) <b>Exoplanets Viewed by the James Webb Space Telescope</b>                                     |
| <b>June 10</b>  | <b>Science Fair Winners, Astro-photo show-and-tell, election</b>   |

## President's Corner

*Guy Brandenburg*

NCA members have an opportunity next month to strike a small but important blow against light pollution.

As a part of Earth Hour ([www.earthhour.org/](http://www.earthhour.org/)), the DC Chapter of the International Dark Sky Association is asking all DC residents and institutions who care about the environment to turn off all non-essential outdoor lighting for one hour during the evening of March 25th, 2023.

On that Saturday, from 8:30 to 9:30 PM, let's see if we can get a significant fraction of all those many, many outdoor spotlights turned off at private homes, businesses, and institutions – including landmarks like the Capitol and all the monuments on the Mall.

We can start by making and passing a resolution to this effect at the monthly NCA meeting on February 11.

What are the reasons for doing this?

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## Exploring the Sky



The Exploring the Sky program will take a hiatus until April of 2023.

Exploring the Sky is a joint public observing program between the National Capital Astronomers and the National Park Service. We have been holding these sessions for more than 70 years. We supply the telescopes and you supply the eyes. We meet in the field just south of the intersection of Military and Glover Roads, NW, near the Rock Creek Park Nature Center. A parking lot is located next to the field. The sessions will be canceled in the event of rain or cloudy skies.

Although this is not an optimal observing site, many of the objects people are interested in looking at are visible. At times we can see some of the planets, double stars, open clusters, globular clusters, the occasional comet or asteroid, nebulae and fuzzy galaxies. The latter two will never look like the magazine pictures!

More information can be found at NCA's web site, [www.capitalastronomers.org](http://www.capitalastronomers.org) or the Rock Creek Park web site, [www.nps.gov/rocr/planyourvisit/expsky.htm](http://www.nps.gov/rocr/planyourvisit/expsky.htm). You can also call the Nature Center at (202) 895-6070. For general information on local astronomical events visit [www.astronomyindc.org](http://www.astronomyindc.org).

**The article-submission deadline for March's issue of Star Dust, is February 18th.**

**Clear Skies!**

*President's Corner – continued from page 2*

As you probably know, light pollution:

- Interferes with bird migration (and kills millions of them each year who fly into brightly-lit windows at night);
- Prevents people (and astronomers) from seeing the galaxy, planets and universe we belong to;
- Makes it hard for many drivers and pedestrians to see where they are going;
- May be a factor in the recent and massive world-wide decline of insects of all types;
- Messes up human hormones & sleep cycles;
- Wastes a whole lot of money and energy lighting up the undersides of clouds while raising CO2 levels; and
- Doesn't appear to actually reduce crime or road accidents: [www.darksky.org/light-pollution/lighting-crime-and-safety/](http://www.darksky.org/light-pollution/lighting-crime-and-safety/) and [www.bloomberg.com/news/articles/2014-02-12/street-lights-and-crime-a-seemingly-endless-debate](http://www.bloomberg.com/news/articles/2014-02-12/street-lights-and-crime-a-seemingly-endless-debate).

We know that a one-hour lights-out event just in DC is a very small step, but we expect that similar and larger events will follow, both here and elsewhere. Other cities have turned off the lights on iconic structures for events like this in the past. (See [www.earthhour.org/about/milestones](http://www.earthhour.org/about/milestones).)

We are also working in conjunction with the Audubon Society (see [www.audubon.org/conservation/existing-lights-out-programs](http://www.audubon.org/conservation/existing-lights-out-programs)).

Remember that we also have a chance to further improve (i.e., to make dimmer) the transition planned by the DC Department of Transportation to LED street lighting, if we keep after the powers that be.

Here is an excellent recent opinion piece in the Washington Post on this topic: [www.washingtonpost.com/opinions/2023/02/01/cut-light-pollution-health/](http://www.washingtonpost.com/opinions/2023/02/01/cut-light-pollution-health/)

Don't believe that victory here is impossible. As a nation, we have dramatically cleaner air and water than we did 70 years ago, because individuals and mostly bipartisan legislatures formulated and empowered the EPA, the Clean Air Act, and the Clean Water Act. (See [www.businessinsider.com/what-us-cities-looked-like-before-epa-regulated-pollution-2019-8](http://www.businessinsider.com/what-us-cities-looked-like-before-epa-regulated-pollution-2019-8).) Only a couple of decades after it was discovered that many forms of Freon were destroying our protective ozone layer, every single government in the world signed on to the Montreal Protocol banning them – and the dreaded 'ozone hole' over the Antarctic has begun shrinking again and should be back to normal in a few decades. (See [en.wikipedia.org/wiki/Montreal\\_Protocol](http://en.wikipedia.org/wiki/Montreal_Protocol).)

Victory is possible! Let's turn off those outside lights on March 25!

## Occultations by giant Comet 29P/Schwassmann–Wachmann1 during December 2022

David Dunham

On February 8th last year, two observers in Switzerland and one in Italy recorded an occultation by the nucleus of comet 28P/Neujmin-1; the observations were fit well by a circle with diameter  $19 \text{ km} \pm 1 \text{ km}$ , as described by Stefano Sposetti in Journal for Occultation Astronomy (JOA), issue 2022\_3, pp. 10-13 (available at no cost at [iota-es.de/joafree.html](http://iota-es.de/joafree.html)). This was the first time that multiple observers unambiguously recorded an occultation by the nucleus of a comet. The paper gives references to some previous claims of fadings of stars when comet nuclei passed near them, mainly by the large Centaur object (2060) Chiron that demonstrates occasional cometary outbursts and sometimes appears to have a

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# Sky Watchers

## February/March

Mercury will be lower in the morning sky each morning, beginning to transition to the evening sky in mid-March. Venus will be in the evening sky, having an very close conjunction with Neptune on 2/15 (see below) and a close conjunction with Jupiter on 3/2 (see below). Saturn passes behind the Sun on its way to appearing very low in the predawn sky in March. Jupiter will be viewable in the evening sky, setting before 11:00 p.m. Mars will be viewable much of the night.

|      |  |
|------|--|
| 2/15 | Conjunction of Venus and Neptune. The pair will be within 45 arcseconds of each other (roughly 1/40th the diameter of the Moon) at their closest at 7:19 a.m., not a viewable time in the DC area, but they will be fairly close to each other the nights of 2/14 and 2/15 after sunset. |
| 3/2  | Conjunction of Venus and Jupiter. The brightest two planets will appear within 30 arcminutes of each other (roughly the diameter of the Moon) at 11:15 p.m., well after they have set in the DC area, but they will be close when visible after sunset that night.                       |
| 3/7  | Full Moon – 7:42 p.m.  |

All times are in EST (Eastern Standard Time).

[Occultations by giant Comet 29P/Schwassmann–Wachmann1 during December 2022– continued from page 3](#)

coma. But these events occurred in 2011 or earlier; later occultations by Chiron observed with large telescopes have revealed rings, but not clear-cut fades by material in the inner coma near the nucleus. An earlier observation (visual) where a strong fading was reported when the nucleus of a comet passed near a star was reported by Richard Nolthenius in *Occultation Newsletter* (ON), Vol. 3, No. 4, p. 86, July 1983, available at [iota-es.de/onheritage/ON\\_Vol03\\_No04.pdf](https://iota-es.de/onheritage/ON_Vol03_No04.pdf).

Of special interest is perhaps the grand-daddy of comets, 29P/Schwassmann–Wachmann1 (SW1 for short), discovered in 1927 at Hamburg Observatory in Germany. Its semi-major axis is 6.0 AU, just beyond Jupiter's orbit and also nearly circular, with eccentricity only 0.04 and period 14.6 years. SW1 (not to be confused with SW3, a disintegrating short-period comet that passed near Earth in 2006 and was found by the same astronomers at Hamburg Obs.) is normally around 16th mag., but about 7 times a year, it has a sudden outburst, increasing in brightness by as much as 5 magnitudes. SW1 is in a dynamically interesting "gateway" between Kuiper-Belt/Centaur objects, and Jupiter-family comets, according to G. Sarid et al., *Astrophysical Journal Letters*, 883:L25, 2019 Sept. 20, [iopscience.iop.org/article/10.3847/2041-8213/ab3fb3/pdf](https://iopscience.iop.org/article/10.3847/2041-8213/ab3fb3/pdf). I began looking for occultations by SW1 in the 1990's, publishing some predictions in *ON*, but the available star catalogs and object ephemerides weren't good enough to compute accurate predictions, and no observations of SW1 occultations were reported. But now, thanks to Gaia, we have comprehensive and very accurate star catalogs, and ephemerides have also improved from more good observations, thanks to large survey systems such as PanSTARRS. Spurred by these developments, R. Miles and M. Kretlow published an article about a late 2020 appulse and future occultations for the next 8 years by SW1 in *JOA*, issue 2021\_3, pp. 3-10 that found 20 future occultations, including maps of 7

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[Recent Astronomy Highlights – continued from page 2](#)

### JWST Studies the Ringed Centaur Chariklo

Recently JWST confirmed the presence of rings around Chariklo, an asteroid in a class known as centaurs. Named after the part-man-part-horse creatures of mythology, centaurs are asteroids in orbit between Jupiter and Neptune that also show properties of comets, such as sometimes developing tails. The rings were first detected in 2013 when Chariklo occulted, or eclipsed, a star. One theory is that the rings formed after the collision of Chariklo with another object. Back in 2013, a ground-based telescope detected twin dips in the amount of light from the star, both before and after the main body of Chariklo occulted that star. Although JWST did not observe such an occultation of Chariklo itself, it did observe similar twin dips in the light when they passed in front of the star. The results indicate that JWST can successfully observe occultations, allowing for another way for the space telescope to explore objects within the Solar System that are too small to image directly, even for JWST. Meanwhile separate observations of sunlight reflected from the asteroid and its rings allowed for the detection of crystallized water ice. More information about the occultation can be found at [www.space.com/james-webb-space-telescope-chariklo-water-ice](https://www.space.com/james-webb-space-telescope-chariklo-water-ice) and a NASA press release is available at [blogs.nasa.gov/webb/2023/01/25/webb-spies-chariklo-ring-system-with-high-precision-technique/](https://blogs.nasa.gov/webb/2023/01/25/webb-spies-chariklo-ring-system-with-high-precision-technique/).

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# Occultation Notes

- D following the time denotes a disappearance, while R indicates that the event is a reappearance.
- The times are for Greenbelt, MD, and will be good to within +/-1 min. for other locations in the Washington-Baltimore metropolitan areas unless the cusp angle (CA) is less than 30 deg., in which case, it might be as much as 5 minutes different for other locations across the region.
- Some stars in Flamsteed's catalog are in the wrong constellation, according to the official IAU constellation boundaries that were established well after Flamsteed's catalog was published. In these cases, Flamsteed's constellation is in parentheses and the actual constellation is given in the notes following a /.
- Mag is the star's magnitude.
- % is the percent of the Moon's visible disk that is sunlit, followed by a + indicating that the Moon is waxing and - showing that it is waning. So 0 is new moon, 50+ is first quarter, 100+ or - is full moon, and 50- is last quarter. The Moon is crescent if % is less than 50 and is gibbous if it is more than 50. E indicates a lunar eclipse is in progress, and the value is the percent of the Moon's disk that is NOT in the umbra. So 0E means during the total phase.
- Cusp Angle is described more fully at the main IOTA Web site.
- Sp. is the star's spectral type (color), O,B,blue; A,F,white; G,yellow; K,orange; M,N,S,C red.
- Also in the notes, information about double stars is often given. "Close double" with no other information usually means nearly equal components with a separation less than 0.2". "mg2" or "m2" means the magnitude of the secondary component, followed by its separation in arc seconds ("), and sometimes its PA from the primary. If there is a 3rd component (for a triple star), it might be indicated with "mg3" or "m3". Double is sometime abbreviated "dbl". Often, rather than the separation, I give "dTime" or "dT", the time difference of the secondary star occultation relative to the primary star's occultation.
- Sometimes the Axis angle (AA) is given. It is the angle measured around the Moon's disk, from the Moon's axis of rotation. It can be used with a lunar map to tell where a star will reappear relative to lunar features.

# Mid-Atlantic Occultations

David Dunham

| Asteroidal Occultations                                    |     |         |             |      |           |      |        |       |                  |  |  |
|--|-----|---------|-------------|------|-----------|------|--------|-------|------------------|--|--|
| 2023 Date  | Day | EST/EDT | Star        | Mag. | Asteroid  | dmag | dur. s | Ap. " | Location         |  |  |
| Feb 7  | Tue | 20:29   | 4UC60239253 | 15.6 | Didymos   | 3.1  | .7     | 14    | eOH,WV,CVA,eNC   |  |  |
| Feb 11   | Sat | 3:09    | TYC08161634 | 10.1 | Franklina | 5.2  | 2      | 4     | se+CVA,SOH,CIL   |  |  |
| Feb 13   | Mon | 20:48   | TYC12370938 | 10.8 | Bunin     | 7.8  | 0.5    | 5     | nAZ,nOK,nTN,nNC  |  |  |
| Feb 15   | wed | 20:27   | TYC06930729 | 10.0 | Bilkis    | 4.5  | 6      | 4     | eTX,seOH,sw-nePA |  |  |
| Feb 16   | Thu | 18:25   | TYC23901330 | 11.7 | 1988 BC   | 4.9  | 2      | 5     | wNC,CVA,CMD,sNJ  |  |  |
| Feb 18   | Sat | 23:12   | 4UC55145702 | 11.9 | Xenia     | 3.1  | 2      | 5     | CVA,WV,COH,nIL   |  |  |
| Feb 22   | wed | 1:49    | TYC08320428 | 9.7  | Kutaisi   | 5.1  | 1.6    | 3     | neNC,cwVA,swOH   |  |  |
| Feb 24   | Fri | 5:22    | HIP 58521   | 8.6  | Ahti      | 7.2  | 4      | 2     | se-CVA,WV,c-nwOH |  |  |
| Feb 26   | Sun | 22:22   | 4UC52048581 | 13.2 | Aeolia    | 1.7  | 4      | 8     | sDE,CMD,nDC,nVA  |  |  |
| Feb 27   | Mon | 4:30    | 4U364123301 | 13.1 | Tanya     | 4.1  | 1.3    | 9     | OH,nVA,DC,c-seMD |  |  |
| Feb 28   | Tue | 21:11   | 4UC49052488 | 13.2 | Lumen     | 0.6  | 8      | 8     | SPA,nMD,nWV,COH  |  |  |
| Mar 4  | Sat | 0:10    | 4UC49251046 | 13.1 | Melete    | 0.9  | 10     | 8     | MD,DC,nVA,WPA    |  |  |
| Mar 9  | Thu | 21:28   | 4UC49456901 | 10.6 | Painlevs  | 3.7  | 1.8    | 4     | neNC,sVA,SKY,nOK |  |  |
| Mar 11   | Sat | 3:34    | TYC09270734 | 11.0 | Elektra   | 2.6  | 15     | 4     | CNC,wCVA,WPA,eOH |  |  |
| *** Dates and times above are EST, those below are EDT *** |     |         |             |      |           |      |        |       |                  |  |  |
| Mar 12   | Sun | 23:48   | TYC08131352 | 9.6  | Elpis     | 3.2  | 23     | 3     | CNC,wVA,WV,c+SOH |  |  |

| Lunar Grazing Occultations |     |       |         |     |       |    |                 |                               |  |  |  |  |
|----------------------------|-----|-------|---------|-----|-------|----|-----------------|-------------------------------|--|--|--|--|
| 2023 Date                  | Day | EST   | Star    | Mag | % alt | CA | Location, Notes |                               |  |  |  |  |
| Feb 14                     | Tue | 5:40  | ZC 2317 | 6.6 | 41-   | 24 | 15S             | Kutztown,N.Phily,PA;Berlin,NJ |  |  |  |  |
| Feb 23                     | Thu | 20:00 | ZC 226  | 6.5 | 18+   | 21 | 7S              | nAshbrnVA;sRockvl,Fairland,MD |  |  |  |  |
| Feb 25                     | Sat | 19:40 | ZC 467  | 6.5 | 36+   | 49 | 7S              | nColonial Hgts& New Point, VA |  |  |  |  |

| Lunar Total Occultations                                   |     |         |    |             |     |       |    |     |                            |  |  |
|--|-----|---------|----|-------------|-----|-------|----|-----|----------------------------|--|--|
| 2023 Date  | Day | EST/EDT | Ph | Star        | Mag | % alt | CA | Sp. | Notes                      |  |  |
| Feb 10   | Fri | 1:51    | R  | ZC 1828     | 6.8 | 82-   | 42 | 86N | A2                         |  |  |
| Feb 12   | Sun | 3:16    | R  | MZ Vir      | 7.4 | 63-   | 31 | 55N | M2 SAO 158493              |  |  |
| Feb 13   | Mon | 4:37    | R  | Iota Lib    | 4.5 | 52-   | 29 | 65N | A* ZC2172,mg2 6, dT +0.24s |  |  |
| Feb 14   | Tue | 3:06    | R  | SAO 184098  | 7.7 | 42-   | 10 | 66N | B9 Az. 132,mg2 10,dT -0.4s |  |  |
| Feb 14   | Tue | 3:15    | R  | ZC 2305     | 5.9 | 42-   | 12 | 33N | B8 Az.134, close double?   |  |  |
| Feb 15   | wed | 6:18    | R  | ZC 2468     | 6.8 | 30-   | 21 | 30N | G8 Sun -9,mg2 9.6 dT +0.3s |  |  |
| Feb 16   | Thu | 5:28    | R  | SAO 186536  | 7.5 | 20-   | 9  | 48S | A3 Az 139, close double??  |  |  |
| Feb 16   | Thu | 6:31    | R  | ZC 2644     | 6.4 | 20-   | 16 | 37N | F8 Sun -6, close double??  |  |  |
| Feb 16   | Thu | 6:37    | R  | ZC 2645     | 6.2 | 20-   | 17 | 61S | A5 Sun altitude -5 deg.    |  |  |
| Feb 17   | Fri | 6:42    | R  | ZC 2831     | 6.0 | 11-   | 11 | 76S | B2 Sun alt. -3, Az. 140    |  |  |
| Feb 22   | wed | 18:52   | D  | SAO 109373  | 7.9 | 10+   | 22 | 74S | F0                         |  |  |
| Feb 22   | wed | 19:50   | D  | ZC 93       | 8.0 | 10+   | 11 | 84S | F0 Azimuth 264 deg         |  |  |
| Feb 25   | Sat | 19:22   | D  | ZC 467      | 6.5 | 36+   | 54 | 34S | K5 Graze, s. Virginia      |  |  |
| Feb 25   | Sat | 20:43   | D  | SAO 93366   | 8.0 | 37+   | 39 | 75S | K0 mg2 9.6, dTime -1s      |  |  |
| Feb 25   | Sat | 23:12   | D  | SAO 93394   | 6.9 | 38+   | 11 | 38N | K0 Azimuth 287 deg.        |  |  |
| Feb 25   | Sat | 23:19   | D  | SAO 93400   | 8.0 | 38+   | 10 | 33S | F5 Azimuth 287 deg.        |  |  |
| Feb 26   | Sun | 18:42   | D  | SAO 76441   | 8.3 | 46+   | 71 | 67N | K0 Sun-10, close double    |  |  |
| Feb 26   | Sun | 21:04   | D  | ZC 612      | 7.6 | 47+   | 46 | 39S | A3 equal dbl, dTime +12s   |  |  |
| Feb 26   | Sun | 21:05   | D  | SAO 76475   | 7.7 | 47+   | 46 | 38S | A3 companion of ZC 612     |  |  |
| Feb 26   | Sun | 23:02   | D  | SAO 76499   | 7.3 | 48+   | 24 | 57N | G6 mmg2 9.9, dTime +1.8s   |  |  |
| Feb 26   | Sun | 23:07   | D  | SAO 76502   | 7.7 | 48+   | 23 | 73N | K2                         |  |  |
| Feb 27   | Mon | 0:09    | D  | ZC 624      | 6.8 | 48+   | 12 | 33N | K0 Az. 291 deg.            |  |  |
| Feb 27   | Mon | 19:03   | D  | ZC 745      | 7.3 | 56+   | 76 | 73N | K0                         |  |  |
| Feb 28   | Tue | 21:05   | D  | SAO 77753   | 7.2 | 66+   | 67 | 84S | G2                         |  |  |
| Feb 28   | Tue | 22:58   | D  | ZC 906      | 6.6 | 67+   | 46 | 84S | K1 close double?           |  |  |
| Mar 1  | wed | 20:04   | D  | ZC 1042     | 6.7 | 75+   | 78 | 20S | A2 close double?           |  |  |
| Mar 2  | Thu | 0:00    | D  | ZC 1056     | 7.2 | 76+   | 44 | 59N | B9                         |  |  |
| Mar 2  | Thu | 2:12    | D  | SAO 78957   | 7.5 | 76+   | 20 | 82S | G8                         |  |  |
| Mar 3  | Fri | 18:45   | D  | upsiln2 Cnc | 6.4 | 89+   | 47 | 22N | G9 Sun alt. -9, ZC 1279    |  |  |
| Mar 9  | Thu | 5:33    | R  | ZC 1808     | 7.0 | 97-   | 22 | 35N | F5 Sun -12, AA 323 deg.    |  |  |
| Mar 11   | Sat | 23:55   | R  | ZC 2119     | 6.6 | 79-   | 12 | 54N | F6 Azimuth 125             |  |  |
| *** Dates and times above are EST, those below are EDT *** |     |         |    |             |     |       |    |     |                            |  |  |
| Mar 13   | Mon | 1:40    | R  | ZC 2249     | 6.7 | 69-   | 8  | 58S | K1 very lose equal double  |  |  |
| Mar 13   | Mon | 4:42    | R  | ZC 2262     | 7.5 | 68-   | 27 | 86S | F5                         |  |  |
| Mar 14   | Tue | 5:30    | R  | ZC 2420     | 7.5 | 57-   | 23 | 72S | A3                         |  |  |
| Mar 14   | Tue | 6:31    | R  | SAO 184724  | 7.5 | 57-   | 24 | 70S | F0 Sun alt. -10 deg.       |  |  |

More information at [iota.jhuapl.edu/exped.htm](http://iota.jhuapl.edu/exped.htm).  
 David Dunham, [dunham@starpower.net](mailto:dunham@starpower.net)

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### Occultations by giant Comet 29P/Schwassmann–Wachmann1 during December 2022– continued from page 4

of them that occur in an only 40-day interval from 2022 Dec. 19 to 2023 Jan. 28. This rich period is due to SW1 being in its relatively slow retrograde loop through the northern Milky Way in Gemini. The maps show two paths; the one marked “JPL” used an older orbit that’s no longer valid, but the more southern “RMMK” paths turn out to be almost spot on. Any occultation observations by SW1’s nucleus, estimated to be 60 km across, would allow precision astrometry that would not only pin down the enigmatic comet’s orbit, but also determine “non-gravitational” parameters that would shed light on the nature of SW1’s frequent outbursts.

Not shown in the 2021 JOA article was an occultation of a faint star that was recorded with the 4-m SOAR telescope in Chile on 2022 Dec. 4. Although it was only a single chord, it refined the orbit well enough to verify the RMMK paths, and the Lucky Star Project at Paris Observatory, along with R. Miles and M. Kretlow, issued updated predictions and a call for IOTA to try to observe the occultations. The first one would be on Dec. 19, of a 12.9-mag. star with the path directly over San Diego, and the mountains to the east, before the path moved farther south, entirely over Mexico. D. Bruns tried to observe from his home close to the coast, but it was much too wet to observe there. Norm Carlson and Bob Jones found drier sites at higher elevations to the east and both recorded the occultation, with the sky-plane plot of their timings fitted to a 60-km-diameter circle shown in Fig. 1. Joan and I also recorded the event with our 16-in. scope in Fountain Hills, Arizona. Although we were about 200 km from the path, we hoped to record some fading due to coma material near the nucleus, but we didn’t see anything in our light curve suggesting that. Similarly, Carlson and Jones also had nothing unusual that they could tell by visual inspection of their light curves, other than the abrupt D and R events by the nucleus. The occultation was a trans-Pacific event, with the path also crossing Taiwan, but observers there were all clouded out.

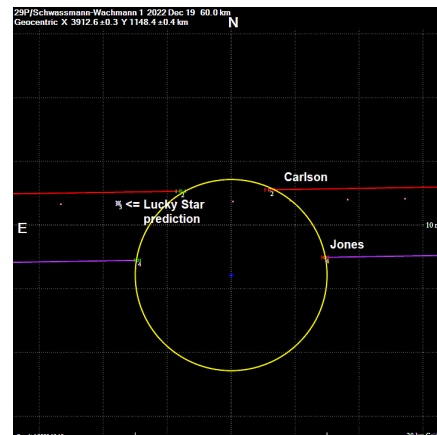


Fig. 1. Sky plane plot of the 2022 Dec. 19th occultation by SW1. Credit: Norm Carlson, IOTA.

We had high hopes for the next occultation, of a 13.8-mag. star the morning of Dec. 27 with the path crossing from central Texas to northern California. But cloudy skies prevented observation from Calif. to western New Mexico; three who tried it in Texas had problems with their equipment that prevented observation. Especially disappointing was Richard Nugent, who saw the brief event on the screen of the camcorder he used to record it, but when he got home, he found no sign of the observation recording on his SD card. Vadim Nikitin drove south from Boulder, first to try an occultation 5 hours earlier by the Lucy Trojan target Leucus in s. Colorado (he was clouded out) but then drove on to near Roswell, NM, where he successfully recorded the SW1 occultation. The next chance in N. America is on Jan. 9 with a 14.5-mag. star, with the path again over San Diego, almost identical to the Dec. 19th path. Unfortunately, none of the mapped paths in Miles and Kretlow’s JOA article cross the eastern USA.

*Recent Astronomy Highlights – continued from page 4*

**Possible Discovery of Magnetar With Solid Surface and No Atmosphere**

The Imaging X-ray Polarimetry Explorer (IXPE) satellite, a mission of NASA and the Italian Space Agency, recently observed the X-rays emitted by a magnetar designated 4U 0142+61 which lies about 13,000 light years from Earth. A magnetar is a neutron star, but one with a magnetic field up to a thousand times as intense as those observed around most neutron stars. The amount of polarization of the X-rays from 4U 0142+61 seems to be less than would be observed if the magnetar had an atmosphere surrounding it. In addition, the changes in directions of polarization of the X-rays, correlated with the amount of energy they contain, seem to indicate that the magnetar has a solid surface. More information about the discovery can be found at [scitechdaily.com/completely-unexpected-scientists-discover-a-magnetized-dead-star-with-a-solid-surface/](http://scitechdaily.com/completely-unexpected-scientists-discover-a-magnetized-dead-star-with-a-solid-surface/).

**Calendar of Events**

**NCA Telescope Making, Maintenance, and Modification Workshop (TM3W) (previously the NCA Mirror- or Telescope-making Classes):** *The Chevy Chase Community Center has reopened and classes have resumed.* Classes will be Tuesdays and Fridays, from 5:00 to 7:30 pm at the Chevy Chase Community Center (intersection of McKinley Street and Connecticut Avenue, N.W.) Please contact instructor Guy Brandenburg at 202-635-1860 (leave message) or at [gbrandenburg@yahoo.com](mailto:gbrandenburg@yahoo.com) if you plan to attend. More info is at [guysmathastro.com](http://guysmathastro.com).

**Open house talks and observing at the University of Maryland Observatory in College Park are temporarily suspended.** When they resume, they will be on the 5th and 20th of every month at 8:00 pm (Nov.-Apr.) or 9:00 pm (May-Oct.). Updates are posted at [www.astro.umd.edu/openhouse](http://www.astro.umd.edu/openhouse).

**Next NCA Meeting: 11 March 7:30 p.m.** Joe Pesce (GMU and NSF) **ALMA and the James Webb Space Telescope: Better Looks at Black Holes**

**The APS Mid-Atlantic Senior Physicists Group: (Zoom Meeting)** February 15<sup>th</sup> at 1:00 p.m., Rich Colarco, U.S. Air Force, Ret., will give a talk entitled “Radio Astronomy”. You can register for the Zoom meeting at [apsphysics.zoom.us/meeting/register/tZYod-yvrjotGtWQwnhXrt5SRwbj47BTcmGS](https://apsphysics.zoom.us/join/74612820000).

**National Capital Astronomers Membership Form**

**Name:** \_\_\_\_\_ **Date:** \_\_\_/\_\_\_/\_\_\_

**Address:** \_\_\_\_\_ **ZIP Code:** \_\_\_\_\_

**Home Phone:** \_\_\_-\_\_\_-\_\_\_ **E-mail:** \_\_\_\_\_ (necessary for delivery of Star Dust)

**Membership (circle one):** Student..... \$ 5; Individual / Family.....\$10; Optional Contribution.....\$\_\_

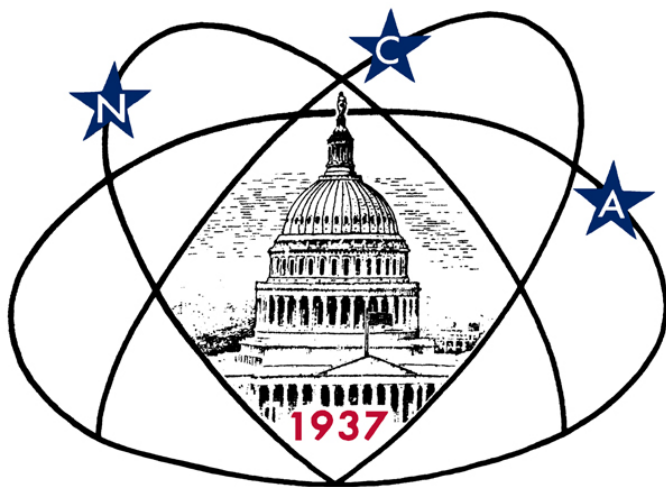
**Please indicate which activities interest you:**

- Attending monthly scientific lectures on some aspect of astronomy \_\_\_\_\_
- Making scientific astronomical observations \_\_\_\_\_
- Observing astronomical objects for personal pleasure at relatively dark sites \_\_\_\_\_
- Attending large regional star parties \_\_\_\_\_
- Doing outreach events to educate the public, such as Exploring the Sky \_\_\_\_\_
- Building or modifying telescopes \_\_\_\_\_
- Participating in travel/expeditions to view eclipses or occultations \_\_\_\_\_
- Combating light pollution \_\_\_\_\_

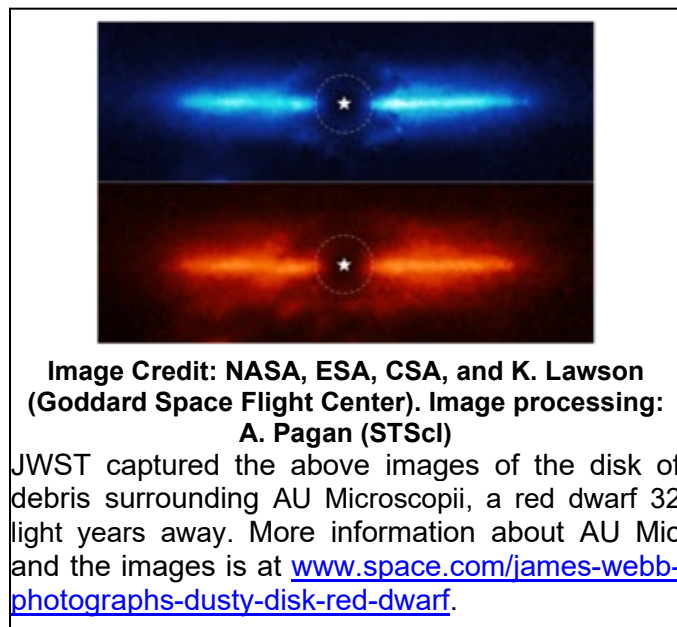
Do you have any special skills, such as videography, graphic arts, science education, electronics, machining, etc.?

Are you interested in volunteering for: Telescope making, Exploring the Sky, Star Dust, NCA Officer, etc.?

Please mail this form with check payable to **National Capital Astronomers** to:  
 Jim Simpson, NCA Treasurer; 3845 Wayson Road, Davidsonville, MD 21035



*Celebrating 86 Years of Astronomy*



*To join or renew online, visit [capitalastronomers.org](http://capitalastronomers.org) and look in the right column for the Membership Form and PayPal links.*

**Next NCA Meeting:**  
**2023 February 11<sup>th</sup>**  
**7:30 pm**  
**(On Zoom)**  
**Dr. Thaddeus Komacek**

To join the Zoom meeting, use the following link:  
[umd.zoom.us/j/98702044833?pwd=UTg1bFJpMmxvcXpEUtUcDNmZnNrdz09](https://umd.zoom.us/j/98702044833?pwd=UTg1bFJpMmxvcXpEUtUcDNmZnNrdz09)

Please download and import the following iCalendar (.ics) files to your calendar system: [umd.zoom.us/meeting/tJwqd-uoqj8iGdfUoJKHH8U2tt2u7IPmVFFS/ics?icsToken=98tyKuCgqTsoGtCRuBqERow-B4iga\\_TwiCIHjadbqRDPKAh7OjaklvYQJ-VzINXm](https://umd.zoom.us/meeting/tJwqd-uoqj8iGdfUoJKHH8U2tt2u7IPmVFFS/ics?icsToken=98tyKuCgqTsoGtCRuBqERow-B4iga_TwiCIHjadbqRDPKAh7OjaklvYQJ-VzINXm)

Please note that NCA Zoom meetings are often recorded.

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