

Rappahannock Astronomy Club

Minutes, September 16, 2015, Meeting

In attendance:

Bart & Linda Billard
George Clarke
Ron Henke
Jerry Hubbell
Scott Lansdale

Daniel Lien
Melvin McDaniel
Lauren Nicholson
Tim Plunkett
Tom Watson
4 or more unidentified visitors

President Ron Henke called the meeting to order shortly after 7 p.m. Eleven members and at least four unidentified visitors were present.

Program

Bart Billard presented "Chasing Shadows," about measuring faint asteroids with a DSLR camera. He also included a brief update on NASA's Kepler mission. After some attempts to observe and time asteroids occulting stars (briefly blocking them from view), he finally succeeded in August using a DSLR instead of a video camera. His recording equipment for video had given him headaches, and he had decided to try something else for a while. Because a DSLR is something people are more likely to already have, Bart thought it worth explaining how he used his Dobsonian telescope and DSLR for a successful occultation timing observation. Someone with a DSLR could try this method without having to invest in low-light video cameras, camcorders, and video time insertion equipment.

Bart illustrated some of the information contributed by asteroid occultation timing with two asteroid profiles from recent observations submitted to the International Occultation Timing Association (IOTA) by several observers. The profiles show schematically each observer's recorded disappearance and reappearance of the star as the asteroid passed in front from his point of view. The events appear as a gap in a line representing the visibility of the star up to the disappearance time and following the reappearance time. All the observers' timings are adjusted for the speed of the asteroid shadow across the Earth to how it would appear if the observers were lined up perpendicular to the shadow's path. The resulting arrangement of gaps traces a set of chords, or cross sections of the asteroid's shape. In one example profile, Bart noted that it showed the profile shape was consistent with a circular shadow of a 247.3-km diameter asteroid, and the predicted path was off by about half the radius of the asteroid. The observers who missed the occultation provided some limits on how much the asteroid's shape could be extended on one side. (Had the path been on the predicted centerline, the observers' positions would have been suitable for more precise limits on how far the shape could deviate from a circle.) No satellite showed up ahead or behind the asteroid, nor did one show up in the area to the right of the path where five of the observing stations missed the asteroid shadow.

Bart's successful observation was of the asteroid (1197) Rhodessa occulting a 9.6-magnitude star with the catalog designation TYC 0527-01259-1. To time the occultation, he used a scheduling feature supported by his camera. He was able to start a sequence of nine exposures with a spacing of 33 seconds. Each exposure lasted about 32 seconds. Scheduling the beginning of the sequence at 1:42 a.m. according to the camera's clock resulted in a starting time of 1:44:45 for the sixth exposure. Earlier in the evening, Bart had succeeded in calibrating the camera clock against a GPS-based timing device, the IOTA VTI, so he knew that the sixth exposure would be about halfway done at the predicted time of the occultation. He showed the sequence of star trail images that resulted. In the sixth image, the trail of the target star had a gap a little farther along than the middle. Someone asked Bart if he found gaps in any of the other star trails in any of the images, and he said that was the only gap visible. He suggested that if one or more people in the area have a DSLR and would like to try this technique, it would be easy to arrange a meeting ahead of time to do a practice run and use his VTI to calibrate all the camera clocks.

Bart also showed some of the websites and tools available for doing occultation timing. Many of the resources are available through the IOTA website, occultations.org. A free observer's handbook, *Chasing the Shadow*, is available for download as a pdf file via a link from the IOTA publications menu. The

observing menu includes a link for software. Two free software packages available this way are Occult and Occult Watcher. Bart showed lunar occultation predictions made using Occult for the week after the club meeting. The Moon occults Aldebaran on the morning of October 2, and the map produced by Occult showed what part of the Moon to look at for Aldebaran's disappearance and reappearance. It could be an opportunity to see the star in the daytime with binoculars or a telescope. Instead of showing asteroid predictions with Occult, Bart showed two of the websites maintained by more experienced occultation observers. He said these people know how to check for the latest information on asteroid orbits and star positions to improve the uncertainty about the path of the shadows. The drawback of going to the prediction websites is the necessity of sorting through many predictions applicable to other states or even countries. Fortunately, another occultation observer makes a program available, Occult Watcher, to sort through the online predictions and produce a customized list for you. Bart showed some of the Occult Watcher features. It can draw a map view of the predicted path of the asteroid shadow. Observers can mark their location on the map to announce their intention to time the event and coordinate with others to space out their coverage. It offers links to the details available on the web via the prediction websites.

Occult Watcher can also run Occult as an "add-in" and feed it the up-to-date information maintained by the experienced people running the prediction websites. Bart showed how to get an interactive "pre-point" star list from the Occult add-in feature of Occult Watcher. The pre-point stars offer targets to set up a telescope pointed at the right place in the sky at a certain time ahead of the event. The list lets you choose an easy-to-find star or a convenient setup time. The telescope then stays fixed (tracking off, if any) and the target star drifts into view, crossing the center at the predicted occultation time. Bart said the pre-point technique was just the thing for his Dobsonian telescope and was an easy first step in the learning process. He had pointed out one of the pre-point stars in the images he took for the Rhodesia occultation, and he showed how the target star, the pre-point star, and two others in his occultation image matched up with the corresponding stars in the Occult add-in finder chart, as well as with a Stellarium planetarium software view set for the date, time and sky location.

Bart wrapped up his occultation talk with a brief discussion of the results of his measurement. He noted that IOTA people helped him with the analysis, particularly John Broughton, who has a website on drift-scan timing of asteroid occultations, and offers software to help with observing and analyzing with the drift-scan method.

Bart finished with a short update on the Kepler mission. Kepler's primary mission ended last year when failure of a second reaction wheel made it incapable of pointing at its target stars with sufficient precision to be sensitive to tiny changes in brightness of stars transited by small exoplanets. It had exceeded the goal of 3-1/2 years of transit observations by more than 6 months. The data acquired are still being analyzed, and the number of candidate planets announced as of the last report is 4,696, with 1,030 of them confirmed so far. Twelve of the confirmed discoveries are small planets in the habitable zone of their stars. A chart of the orbital periods and sizes of planet candidates as of July 23 shows that as data analysis progresses to cover longer periods of observation, the new candidates include a larger proportion of smaller sizes than previous discoveries.

Last year, a new mission called K2 was approved. Kepler now spends about 80 days at a time in observing campaigns targeting single fields along the ecliptic. These campaigns allow it to maintain sufficient pointing precision with the two remaining reaction wheels and the help of balanced sunlight pressure on its solar panels. The confirmed planet count for K2 is 22. Its sixth observing campaign started on July 14 and ends in September. Bart showed some sample K2 images, including a visit from Comet Siding Spring to the K2 Campaign 2 field of view last October. His presentation is on the club website [monthly programs](#) page.

Old Business

- Update on the next Newsletter Status and Communications Committee Report—Linda Billard said she had enough people promising articles for the next issue, and she would be sending them reminders. Glenn Holliday was unable to attend the meeting and report on the website.
- University of Mary Washington (UMW) STEM Summit—Ron said the event does not involve any competition and awards. However, a booth was a possibility because booths are free to nonprofits and educational groups.
- Recent Club Events—Ron reported on the Perseid meteor shower event at Shenandoah National Park. It drew a large crowd—many more than expected. We set up on the helipad area and found

moving around was like tiptoeing around a crowded beach. He said the program that was planned had to be repeated three times to accommodate the crowd wanting to see it. The club picnic also went very well with great viewing in the evening. Ron said the cameraman from Voice of America stayed to enjoy the star party well into the evening. Tom Watson reported he and Scott saw a meteor with a trail halfway across the sky after most people had left.

- Treasurer's Report—Tim reported a “boring” month for July, with no receipts or expenditures. His August report had a dues payment from Dave Bentz and an expenditure for Astronomical League dues. The current number of paid members for 2015 is 20, and we have one paid membership for 2016.

New Business and Astronomy News

- Upcoming Schedule—Ron showed a table of events and meeting programs listed by month from September 2015 through December 2016. The columns listed meeting program topics, (Caledon) star parties, and other events, as far as they were determined. September had Bart's occultations program, a Caledon star party, and two outreach events—Observe the Moon Night on the 19th and Freedom Middle School for the eclipse on the 27th. Ron said he and David Abbou would support the first at Porter Library, and he and Jerry Hubbell would support the second (Jerry would try setting up his computer to display the view through his telescope and let more people see at the same time). Scott Lansdale thought he could also help.

For October, he only listed Caledon, and for November he listed Caledon, Northumberland on the 7th, and George Washington Foundation on the 13th. Jerry and Ron were working on a presentation for Northumberland. The George Washington Foundation request was for an event at the Kenmore Inn. When Ron said that date offered no suitable objects to show in the sky, he was asked for a presentation on astronomy. No programs were listed. The club officers' election takes the place of a program at November meetings.

December, January, and February listed a collimation program by Myron Wasiutta, and then two meetings for a project to try remote astronomy with the Sierra Stars Online Network. Jerry would volunteer to lead discussions on what we might like to observe so that the January meeting could be for planning and scheduling observations, and the February meeting would be for seeing the results. Those 3 months included Caledon star parties, but no outreach events so far. Bart is scheduled for a Kepler update program in March, which is a traditional month for a Messier Marathon star party, listed for March 5. A Marine Corps Museum outreach is scheduled for March 13. The request is for us to supplement a Museum event on the history of astronomy and the Marine Corps.

Ron listed the April program topic as “Rare Earth,” which he said he would present. The rest of the program schedule for next year was to be determined, except for August (picnic) and November. The star Caledon star party listing for August was “N/A” because we hold our picnic at Scott's that month. Ron also had April, May, and October listed as N/A because of our extensive list of outreach events planned already or under consideration. Ron said he was proposing the Stafford County Parks event listed for April as a substitute for a star party at Caledon. Jerry commented that we should probably treat Caledon as the public event it is and not schedule it for deep-sky-type nights. Ron said Freedom Middle School requested another event for May. He had it listed there as a public outreach event because he had told them that was the stipulation for us to consider supporting. Ron thought it was a good idea to try to get groups requesting outreach events to make them public events (as many groups do).

Ron had listed repeat events for June (Astronomy Night), August (picnic), October (Stratford Hall, planned for the 6th or 22nd), and November (Northumberland). He also had four more possibilities listed below the table. Kettle Run High School made a request, but Ron has not seen a response to follow-up email from us. He said he would like to contact Shenandoah National Park to get on their schedule for a 2016 date. He also listed England Run Library and the FredTech/UMW STEM event as possibilities. Ron said he was leaving the discussion of this schedule open because he wanted Glenn Holliday included in our discussion of skipping more Caledon events.

Ron suggested adding a “Help us help you” item under Outreach on the club website to try to guide outreach requestors to pick suitable dates when we can show something interesting in telescopes. He also told us the Marine Corps Museum contact estimated about one-third of the

usual 150 visitors because the event would be outside with cold weather likely. Jerry said he thought we should be prepared for more.

Next Meeting

The next meeting is on Wednesday, October 21, 2015, at the Central Rappahannock Heritage Center.