

Rappahannock Astronomy Club

Minutes, March 19, 2014, Meeting

In attendance:

- Ben Ashley
- Terry Barker
- Bart & Linda Billard
- Don Clark
- Joe & Sherry Francis
- Ron Henke*
- Glenn Holliday
- Jerry Hubbell
- Scott Lansdale
- Lauren Nicholson
- Tim Plunkett
- Brian Sirnack*

*New members joining at the meeting

President Jerry Hubbell called the meeting to order shortly after 7 p.m. Eleven members were present, along with three guests, who joined the club at the meeting.

Program

Bart Billard presented "Yet another Kepler update." His presentation topic had been about the Kepler space telescope mission each December for the last 3 years, and he had volunteered for this month thinking he might be ready for a new topic. He also noted the disadvantage of talking in December was that new announcements of Kepler results usually occurred shortly after his presentations. (Early January is the date for the annual American Astronomical Association meeting.) However, he had thought he was better off this December because another science conference dedicated to Kepler took place in November. Instead, an unexpected announcement from the Kepler team on February 26 revealed 715 newly confirmed planets, and the total for Kepler reached 961, compared with 167 confirmed planets announced prior to December's presentation.

After reviewing the nature of the Kepler mission for the benefit of newcomers, Bart presented results that became public during the last 3 months. A bar chart showed exoplanet discoveries by year since the first nearly 20 years ago, and colored portions indicated those made by Kepler in two groups: the 5 years starting in 2009 up to the February announcement, and the day of the announcement. This year's bar, with 794 discoveries (including ones announced in January), accounts for more than half of all exoplanets discovered thus far. Another chart of the size distribution of the known exoplanets before and after the Kepler mission began, including the newly announced group, showed that Kepler results are changing the apparent abundance of smaller planets compared with the Jupiter-like planets. One explanation was the dependence of other exoplanet detection methods on mass and size of the planets.

Another discovery features a planet with an odd wobbly orbit around a binary star system that is tilted with respect to its host stars. Because the stars' varying attraction distorts the orbital plane, the planet transits as seen from Earth were affected. Three transits 66 days apart were followed by 500 days with no transits before another five transits occurred. The researchers expected the next transit visible from Earth would not be until 2020. They also concluded that the binary stars' changing gravitational influence on the planet affected its rotation axis, causing it to wobble and precess. Its tilt could vary by as much as 30 degrees over 11 years, much more rapidly than Earth's, leading to rapid and erratic changes in seasons.

Bart also had an update on the concept for a new mission for Kepler. It had ceased data collection on its original mission last year as a result of a second reaction wheel failure. The new concept would keep Kepler pointed in the plane of the ecliptic, allowing an orientation with balanced light pressure for observing campaigns of up to 83 days. NASA's Astrophysics Division director invited Kepler to the Senior Review for astrophysics operating missions, and the team submitted its proposal on January 30. A test of the concept with a known transiting exoplanet showed Kepler could still detect transits in the new mode.

The last part of Bart's presentation was a look at what determines whether a Kepler target becomes a candidate or confirmed planet, and some of the new techniques that led to confirming 715 candidates all together. If a light curve of a star shows regularly repeated dips in brightness of several hours duration, a planet with a certain size and orbit period could be the cause, and with enough repetitions of dips, the

signal can then become a candidate. It means the signal is consistent with a planet transiting the star, but it could also be the result of something else. Bart then discussed other causes of similar signals, meaning that some candidates could be “false positives.” Eclipsing binary systems are an important source of false positives. Their light curves by themselves could be distinctive, but a fainter binary system in the background of the Kepler target, for example, would have its light blended with the target star’s light, which could result in a signal more like a planet’s. To confirm a candidate as a planet, researchers would have to find evidence that such “sources of confusion” are extremely unlikely. They would then be able to say the candidate was confirmed with high confidence. Evidence for confirming candidates could come from ground-based observations that independently detect the planet. Systems with multiple transit signals provide additional possibilities for discounting false positives. One is that so few candidates are seen among the many Kepler target stars, yet so many are in systems with more than one candidate (“multis”). Statistical arguments show false positives could account for only a few of the hundreds of candidates in “multis.” These statistical arguments were first used in 2012 as part of the validation of the Kepler-33 system with five transiting planets. This year’s work refined the arguments and validation methods to confirm hundreds of candidates in “multis.”

Some of the questions Bart was asked were about the future of Kepler and the possibilities of a successor mission. He said another such mission was not planned, but that the proposed K2 mission could help dispel any doubts that the sample of stars Kepler monitored is special by sampling new areas of the galaxy along the ecliptic. A copy of his presentation is available on the Club website on the [programs page](#).

Old Business

- **Treasurer’s Report**—Tim Plunkett presented the February report. It recorded a net increase of \$15.05 in dues collected less cost of Wordpress Theme software for the club website reimbursed to Don Clark. Tim said he checked his records for Scott Lansdale and confirmed Scott had prepaid 2014 dues some time ago. Paid memberships for 2014 are now 17.
- **Star Parties, Events, and Meetings**—The Caledon event for 1 March had marginal weather. Glenn Holliday, Ben Ashley, and Bart and Linda Billard were joined by a group of Scouts and Ron Henke. Glenn said that he arrived a little late, and Ron informed him that he missed a couple of visitors who came early and were also disappointed when a previous star party was cancelled. Linda and Bart had brought their new puppy and left while the sky remained overcast, with hopes the others might then have better luck with the skies. Glenn reported some clearing allowed views of the Pleiades and some other isolated targets. He said he had an email from a Girl Scout group wanting to attend in April. A Cub Scout is looking for support 3 May for a camping outing, but Glenn said he already has a commitment and noted it conflicts with a star party date.
- **Loaners**—Ron and Don had arranged to exchange the Comet Catcher at the meeting. Ben reported receiving two more items from the donor of the Vernon Scope: a 1.25-inch Barlow and a 2-inch diagonal. In a discussion that follows, it was agreed the loaner equipment information on the website needed updating with a list of equipment.
- **Communications Committee Report**—Glenn said the website had accounts set up for the people most likely to need to edit content. He also noted that attacks on the site were way down now. Earlier, as many as 75 spam attempts in a day occurred one week, whereas the latest week had seen none.
Don talked a little more about the Flickr suggestion he brought up last month. He asked some members who do imaging to set up some pictures on Flickr to try out the idea of using it for content members might like to permit public access to while leaving our private site more secure.
Linda reported the newsletter due out at the end of next month had a good number of volunteers writing articles and seemed to be on schedule. She thought she would be able to concentrate on editing and layout this time.
- **Renaissance Faire Outreach Invitation**—Glenn said he wrote up his notes on how we might participate and sent it to a few members for comment. The Faire is set up as an educational foundation. Glenn said we could be present on one or more days with a table or booth and portray or answer questions about Elizabethan astronomy. He said some developments like the first working telescope and Kepler and Galileo’s work came a little late for the Elizabethan period, but the idea of a telescope and efforts to invent one were going on. He found out about Thomas Digges, an interesting figure who worked on inventing a telescope and proposed and answered the dark sky paradox. The Faire is on Lake Anna Winery grounds. Decent interest was expressed by some members present at

the meeting, and Glenn said he would follow up by posting his notes and check with us about how many people want to sign up for how many days.

News/New Business/Announcements

- Star Parties, Outreach Events, and Meetings—Jerry said some members who participated at Astronomy Night at the National Mall last year were planning to go back and additional volunteers were welcome. This year it is scheduled for 6 June. Hofstra University sponsors it and may have information up on their website now.

Jerry said the program for next month would be Myron's talk on star testing. Bart asked if there had been a change from the dates volunteers chose in January when Myron had picked June. It was apparently done to avoid the possibility of Jerry being away at the conference in April so that Ben would not have to fill in for Jerry and do the presentation in the same meeting.

Next Meeting

The next meeting is on Wednesday, April 16, 2014, at the Heritage Center in Fredericksburg.