

Rappahannock Astronomy Club

Minutes, August 19, 2020, Online Meeting

In attendance:

David Bentz
Bart & Linda Billard
Don Clark
Glenn Faini
Guest speaker: Tom Field
Claire Gardiner

Glenn Holliday
Jerry Hubbell
Troy Major
Rolando Pancotti
Robert Payton
Matt Scott

The meeting began at 7:00 p.m. Twelve members and our guest speaker, Tom Field, were present. During introductions, Tom offered to host the meeting with his unlimited Zoom, but we decided we could get through his program in the time we had and restart for questions about the talk and our business meeting.

Program

Tom's program title was "You can almost touch the stars." He discussed how astronomy helped add to dimensions we knew. Two dimensions were enough for finding places on Earth, but the Moon and planets showed us a third dimension. Later, time was recognized as a fourth dimension. Tom suggested spectra supply a fifth dimension. Some of his suggestions for completing "You might want to capture spectra..." were:

"...if you remember the thrill of your first image."

"...if you want to do some science."

"...if you know you learn more if you 'own' the data."

"...if you don't want to have to rely on going to a dark-sky site."

Starting with Isaac Newton's experiments with splitting sunlight with a prism, Tom sketched the history of spectroscopy in astronomy through Josef Fraunhofer's discovery of dark lines in spectra of the Sun to Robert Bunsen's and Gustav Kirchoff's contributions to explaining them. Bunsen used his burner invention to heat chemical compounds and discover bright lines in the resulting spectra, and Kirchoff helped explain the connection between dark lines (absorption) and bright lines (emission). The line patterns help identify elements in chemical compounds. Tom showed examples of these "fingerprints" for hydrogen, helium, nitrogen, and neon. He also showed a periodic table of spectra with line patterns in each element's box.

Tom continued his history with the story of Annie Jump Canon and the women "computers" at Harvard. Their work on organizing and classifying stellar spectra resulted in the OBAFGKM sequence used today. Beginning with the Bohr model of the atom, quantum theory provided an explanation of emission and absorption lines as results of energy-level transitions in atoms.

Tom turned to the subject of amateur spectroscopy, showing the hydrogen Balmer lines he recorded with a DSLR and one of his Star Analyzer gratings. He showed various types of spectra and explained what they indicated. For example, absorption bands indicate molecules, implying a cooler star. The hydrogen H α line requires a hot star for electrons to reach the upper energy level, but not too hot to cause ionization of the hydrogen. He described H α as the dip in the robin-egg blue region, and said although it was not necessary to use a color camera, it showed off the spectra.

An early problem Tom had when he first tried spectroscopy was getting a graph of the data. He wound up writing his own software, which he showed us how to use for graphing and analyzing spectra. He then showed some examples of data amateurs could obtain. One was a Wolf-Rayet star spectrum made by Janet Simpson with a Canon DSLR and an 85-mm lens. Another was a spectrum of the Orion Nebula, which was done with a slit. Tom asked us for memories of our first view of the Orion Nebula. His experience was going to a star party with a bunch of "cannons." Despite the size of the telescopes, it was

“just a smudge,” and he noted it gets more interesting when you learn about it. Tom also showed comet spectra, including NEOWISE with a sodium emission line, and meteor spectra.

Examples of getting Doppler shifts were the final topic. Tom showed how a spectrum of a supernova had a dip from silicon showing up at 6150 Å instead of 6355 Å. This “blue shift” indicated the shell of the supernova was expanding at 10,000 km/s. Another example was the spectrum of the quasar 3C273, studied by Maarten Schmidt, which seemed to have “mystery lines” until he recognized them as highly shifted Balmer lines.

Jerry Hubbell showed a spectrum of Nova Persei 2018 measured at MSRO with a Star Analyzer donated by Tom. It had a “big H α ” peak. Jerry also said Dave Dowhos was doing spectroscopy work at MSRO and had donated another grating for station 2. Tom was asked about using telescopes with chromatic aberration, and he said it should be avoided. He also said spreading the light into the spectrum costs about 5 magnitudes compared with just imaging stars. Glenn F. asked Tom to say more about why you should try to get spectra when you are not likely to discover something new. Tom suggested there are some discovery opportunities but said he thought it was the satisfaction of seeing how the science works. Jerry said he thought there could be opportunities to help classify new supernovae.

Old Business

- Treasurer’s Report—Glenn F. gave the report from Matt Scott. The payment of \$62.50 sent out in June for Astronomical League dues showed up in the July bank statement. As was the case last month, the number of paid memberships remained at 25, and the total number of members remained at 29.
- Vice President’s Event Report—Glenn F. said a group of prospective members came to the July star party. He asked what anyone knew about the use of meeting rooms at the Library. Linda Billard said she believed nothing would be happening at least through October.
- Secretary’s report—Bart Billard had nothing to report.
- *StarGazer* Report—Linda had nothing to report yet for the next newsletter. She commented on how much fun it was putting together the piece on all the NEOWISE experiences for the newsletter just published.
- MSRO Status—Jerry said a router was replaced to solve recent problems. He said MSRO had three stations for people to learn on, and that maybe he would do a presentation about learning to use MSRO. Glenn H. asked about the MSRO capabilities for virtual star parties. Jerry said there was actually a virtual star party series on YouTube with MSRO participation.
- Communications Committee report—Glenn F. said Groups.io was still working well except for Ron Henke and Tom Watson. He said Tom hasn’t joined.
- Club Equipment Inventory—Scott said he had no report this month. Glenn F. said he wanted to visit Belmont to take some magazines to Scott and would like to borrow the solar telescope. Scott said that was ok with him.

New Business

- Next Star Party—Glenn F. suggested the cost of unlimited Zoom meetings did not seem worthwhile for the club, and no one disagreed. He also said we may be able to have the August star party (weather permitting).

Next Meeting

The next meeting is on Wednesday, September 16, 2020. It is currently planned as an online Zoom meeting.