Roanoke Valley Astronomical Society

Amateur Astronomy News and Views In Southwestern Virginia

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October RVAS Meeting Notes

ALMA Matters

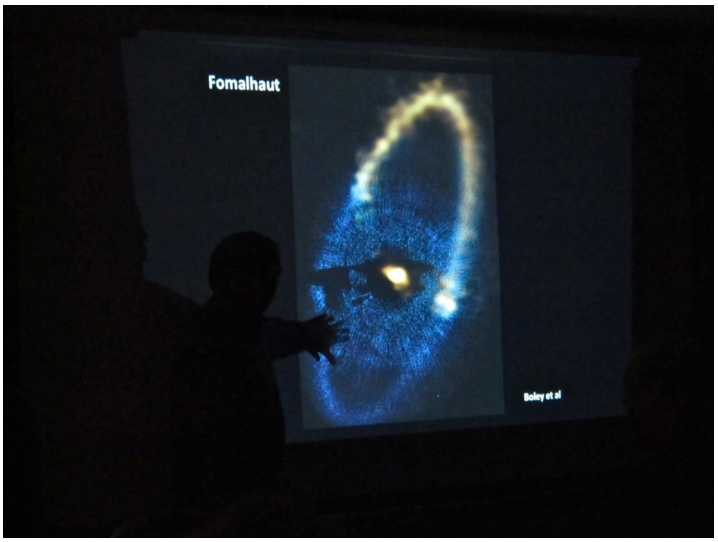
By Dan Chrisman, RVAS Secretary

Prior to the meeting, some members gathered to meet our speaker for dinner at **a local watering hole**. After our meeting, all members dispersed to contemplate the speaker's reference to future images of our galaxy's **supermassive black hole**. Between the gathering and the dispersal, club members enjoyed a wonderful evening of ALMA enlightenment.

Presiding over his first meeting since Comet Siding Spring's near miss of Mars, President **Michael Good** opened our October meeting with an opportunity for members to share their observing reports. A sea of raised hands demonstrated the broad appeal and our great success of observing the October 8 total lunar eclipse. Members displayed less success at observing the aforementioned October 19 comet flyby; however, there was an animated discussion of the event.

Then our President introduced our evening's featured speaker: **Dr. Mark Adams**, a professional astronomer at the National Radio Astronomy Observatory [NRAO] in Charlottesville, Virginia. You may check out last month's newsletter, which contained his brief biography and a presentation preview.

Please consider the drama of a quarter-mile-diameter Oort Cloud comet, traveling at about 120,000 mph, shedding 800,000 pounds of dust per hour, sneaking up on us from below our ecliptic plane and nearly slamming into Mars. Imagine making your presentation after that. Such was the challenge faced by **Dr. Adams**.



Dr. Adams is silhouetted by an optical(blue, Hubble)/radio (yellow, ALMA) composite image of the star Fomalhaut's dust ring from ALMA's early science phase.

Photo by John Goss

His presentation "ALMA: A New Window on Our Cosmic Origins" was a blend of South American landscapes, radio-wavelength-sensitive steel sculptures, atmospherically-threatened humans and the political minefields of fiscal challenges. **Dr. Adams** poured this blend over ice cubes comprising Hercules A, Fomalhaut, R Sculptoris,

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Member Observation

The Big Eclipse of October 8, 2014

By John Goss

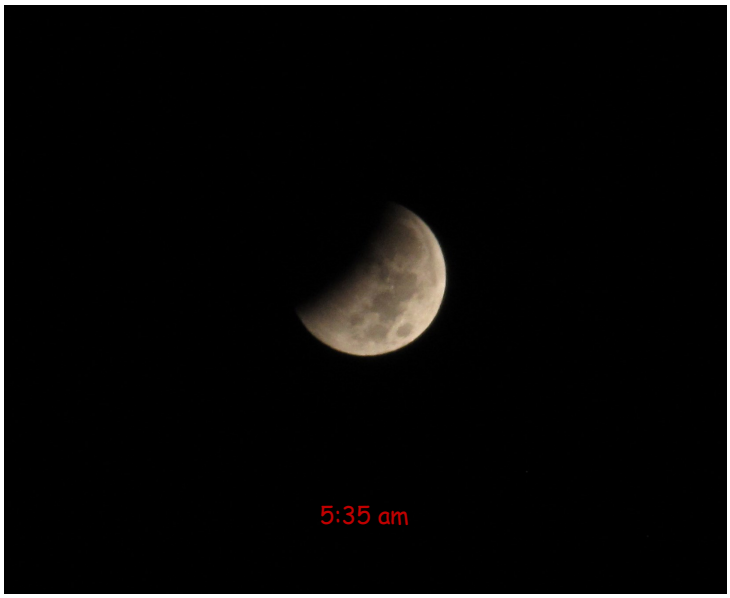
After the heavy rain around 2 a.m. had passed, the skies cleared in time for the total lunar eclipse. By 5:30 the moon had already slid one-quarter into Earth's shadow. The sky was still awash in the remaining bright moonlight, preventing the even moderately bright stars from being visible.

The dimmer stars started appearing about 6:10, nearly fifteen minutes before the moon was to enter totality.

The Milky Way became plainly visible running through the "W" shape of Cassiopeia, where a few minutes earlier the moon-lit sky was too bright to see any hint of it.

The area around the moon, at least when viewed through binoculars, showed the star 96 Piscium, just below the darkened and reddened lunar disk, and revealed the planet Uranus to the moon's upper left.

(Lunar Continued on page 9)



The Roanoke Valley Astronomical Society is a membership organization of amateur astronomers dedicated to the pursuit of observational and photographic astronomical activities. **Meetings are held at 7:30 p.m. on the third Monday of each month. See calendar on last page of newsletter for location. Meetings are open to the public.** Observing sessions are held one or two weekends a month at a dark-sky site. Yearly dues are: Individual, $20.00; Senior Individual, $18.00; Family, $25.00; Senior Family, $22.00; Student, $10.00. Articles, quotes, etc. published in the newsletter do not necessarily reflect the views of the RVAS or its editor.

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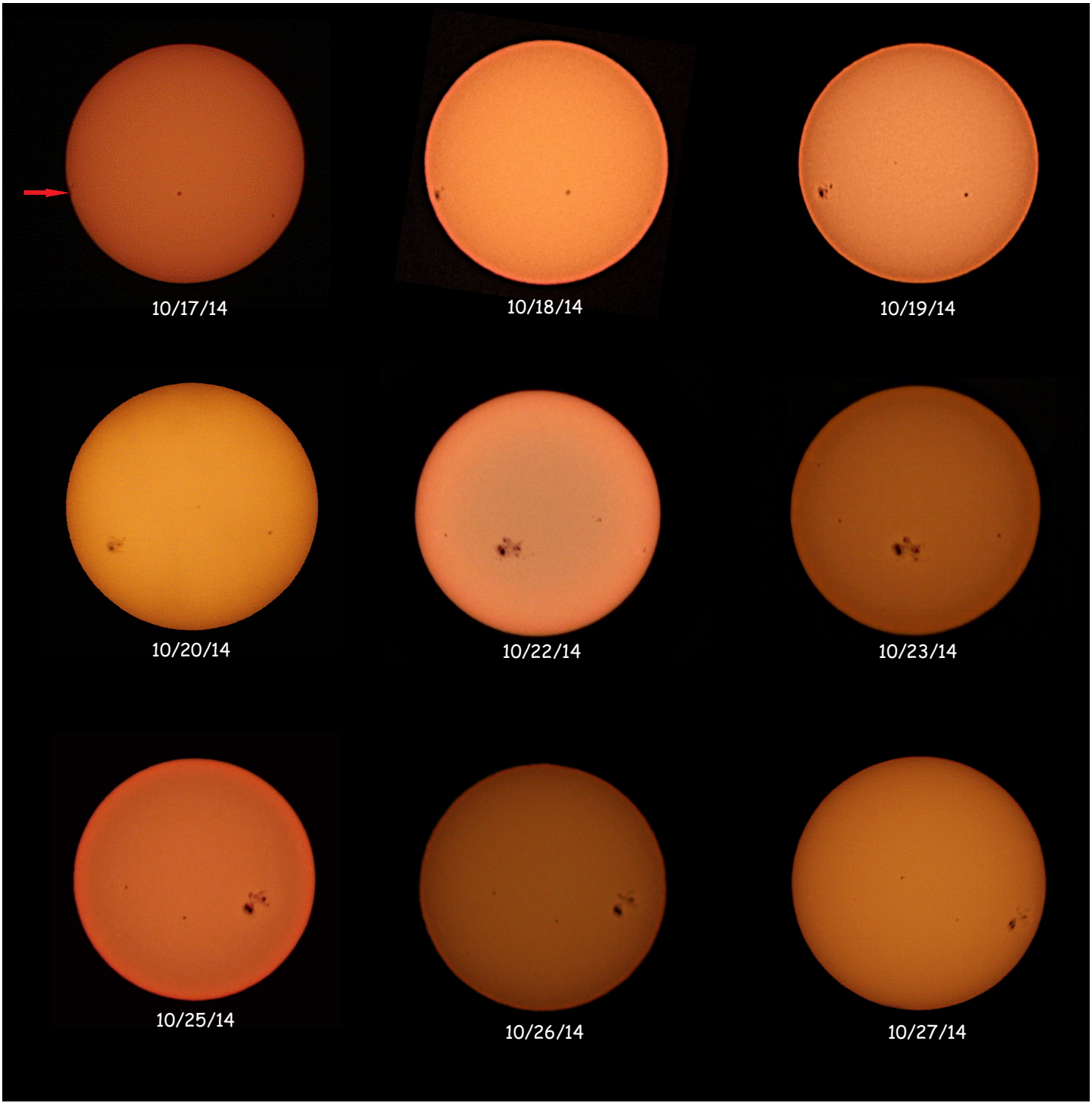
Member Observation

Sunspot AR2192

(One of the largest Sunspots in the last two decades)



Above: Photos of Sunspot AR2192 over a period of 11 days. By: **Dave Thomas**

Fowl in the Absence of Foul Skies

By Dan Chrisman

Having slogged through several unrelenting cloudy months, I was deep into indoor activities on a Saturday evening before I remembered that clear skies were still a possibility. I followed my quick glance outside with a rushed telescope deployment. Much to my chagrin, Saturn, the Moon and Antares had already set. Mars was minutes from setting in my predominantly southwestern view. Seduced by my star map's display of so many Messier Objects near 18h right ascension, I began my first Telescopic Messier Marathon training run. Although armed with reasonably accurate angular estimates for my first object, my progress was slow and my success was limited. With so many recent cloudy nights, my star-hopping skills were rusty. After a few attempts, I abandoned the targeted search, took a deep breath and decided to wander. Aiming my telescope just above my porch railing, I began raster-scanning a patch of sky, row on top of row, working my way toward zenith. Words of encouragement inspired me to continue my training: "it takes real skill to avoid each and every Messier Object!" , The obvious masqueraded as Pearls of Wisdom: "Star-hopping with my telescope's one-degree field-of-view is SO much tougher than with my binocular's eight-degree FOV."

Eventually, perseverance paid off, providing a presentation of a plethora of pristine pinpoints of photonic pleasure. At 90x magnification, I had stumbled upon a circular view of about thirty stars with three prominent stars. SkySafari 4 Pro, recently recovered from the Apple Inc. hiccup known as Release iOS 8.0, convinced me that the prominent trio comprised centrally located HD174512 along with a pair of stars to its side: V369 Scuti and SAO 142703. I had stumbled upon Messier 11, the Wild Duck cluster in the constellation Scutum, "the Shield". Three stars, three catalogs:

1. ("HD" designates the Henry Draper Catalogue),
2. ("V" designates a variable star in the General Catalog of Variable Stars),
3. ("SAO" designates the Smithsonian Astrophysical Observatory Star Catalog).

The variable star piqued my interest and reading ensued.

Astronomers categorize the star V369 Scuti in the constellation Scutum as a Delta Scuti variable star. Parsing the taxonomy, "variable" stars vary their brightness (apparent magnitude) with a periodicity that we can measure (for example, minutes, hours, days, months or years). Research in the 1970s reported that V369 Scuti exhibits the following behavior: within 5.4 hours, the magnitude of V369 Scuti brightens from magnitude 9.43 to 9.14 and then darkens to 9.43, thus completing one pulse. However, a better fit of the 320 measurements, taken over two weeks, suggested that V369 Scuti varies with two simultaneous (overlapping) pulses: a pulse occurs every 4.6 hours and another pulse occurs every 3.8 hours (The marching band director at Cave Spring High School frowns upon two mostly-asynchronous percussive beats!). Subsequent research in the 1990s with improved instruments and more data suggests that V369 Scuti is marching to the beat of six different drummers, each drummer contributing their unique frequency and magnitude. Variable stars with more than one pulsating frequency are common.

By studying many variable stars, astronomers categorize and subcategorize them. V369 Scuti is a member of the Delta Scuti category of variable stars. The prototype star for this category is Delta in the constellation Scutum. Its brightness varies by magnitude 0.19 with a period of 4.7 hours. Although the definition evolves as astronomers complete more research, Delta Scuti variable stars are

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(Fowl *Continued from page 4)*

1) intrinsic (variability results from physical changes to the star and not due to another stellar object eclipsing it (extrinsic)),

2) pulsating (variability results from the star's contraction and expansion and neither eruptive or cataclysmic or x-ray),

3) a spectral type within the range of the A0 (hottest) to F8(coolest),

4) displaying pulse amplitude(s) ranging between 0.003 and 0.9 magnitude and

5) exhibiting period(s) ranging between 0.25 hours and 7.2 hours.

V369 Scuti fits in the Delta Scuti variable star category. It is an intrinsic pulsating F8 star with a pulse amplitude of 0.29 (i.e. varying between 9.14 and 9.43) and with periods within the aforementioned range.

Tangentially, astronomers conclude that V369 Scuti, while residing in the constellation Scutum, does not reside among the star field of the Wild Duck cluster. The cluster is 6,100 light years from Earth and V369 Scuti resides 860 light years from Earth. This concludes my wild goose chase.

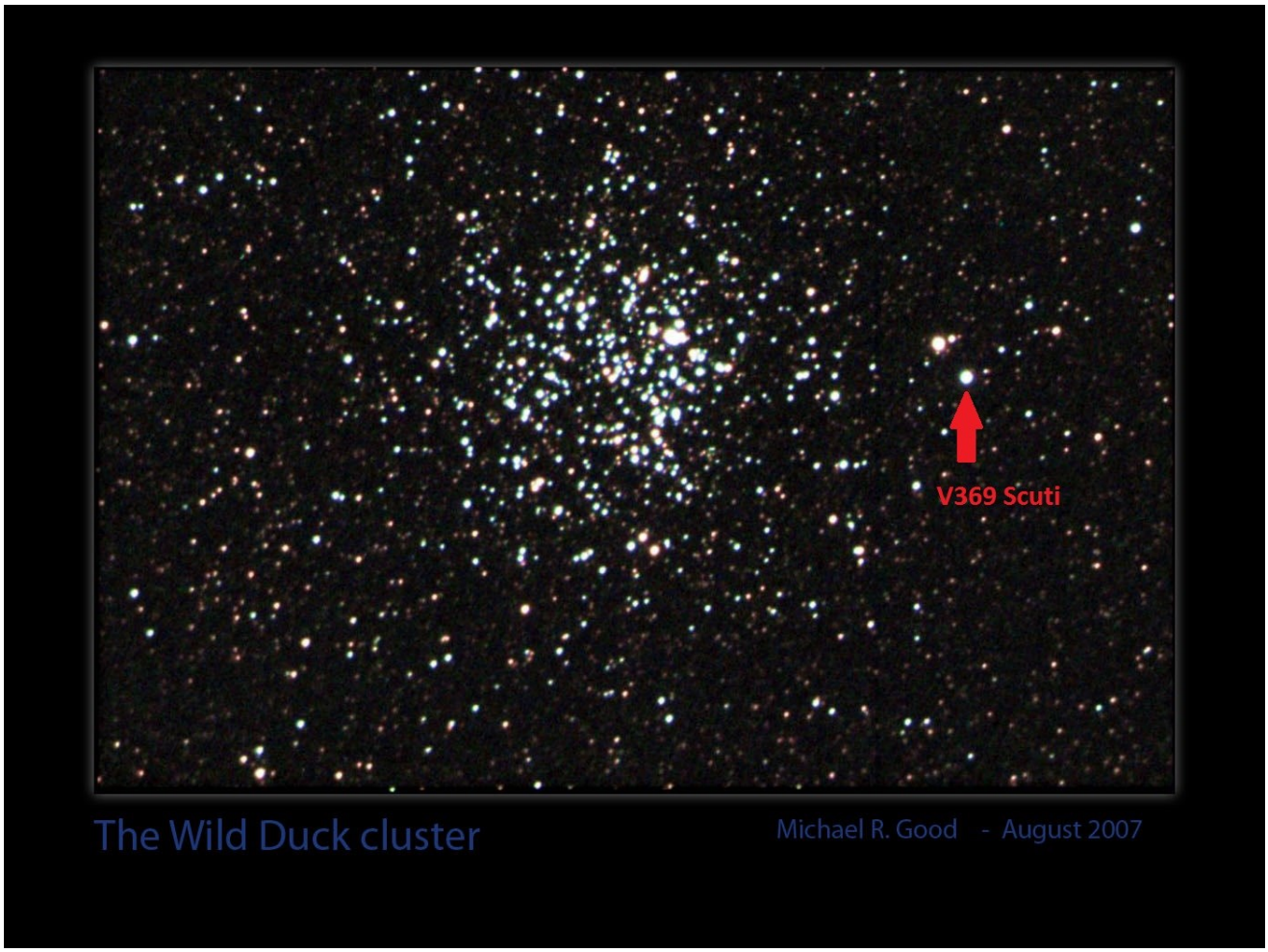
For further reading:

1. See www.aavso.org for many tutorials and other resources from the American Association of Variable Star Observers [AAVSO].

2. "BD -6° 4932: A New Delta Scuti Variable", Hall, D. S., & Mallama, A. D., *Publications of the Astronomical Society of the Pacific*, Vol. 82, No. 488, p.830.

3. "Pulsation Frequencies for V369 Scuti", (Volk, V. A., & Milone, E. F., (2000), *Delta Scuti Star Newsletter*, **14**, 19).

(Thanks to **Frank Baratta** and **Michael Good** for their contributions to this article. D.C.).



Member Observation

Total Lunar Eclipse of October 8, 2014

(From the Western slope of Candler's Mountain, Lynchburg, Virginia)

By Dave Thomas

5:34 AM EDT 5:56 AM EDT 6:07 AM EDT 6:25 AM EDT

(All photos by **Dave Thomas** —- Canon T3i f/5.6, 300 mm lens)

Eclipsed Moon at 6:37 AM EDT——— Object above and left of the Lunar image is the planet Uranus

Partial Solar eclipse of October 23, 2014

6:05 pm

Partially eclipsed Sun from Roanoke, Virginia

Sun and moon partially enveloped in a wispy cloud bank just before they set below the western mountains.
Tripod mounted Canon PowerShot 130, hand held white light solar filter, ASA 400, f/5.6, 1/15 sec, 12x optical zoom.

Photo by John Goss

Click on graphic for movie clips of the October 23rd Partial Solar eclipse

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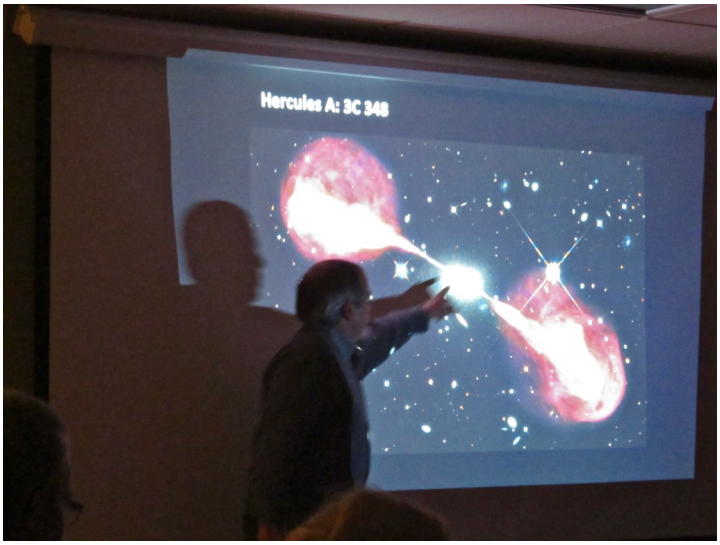
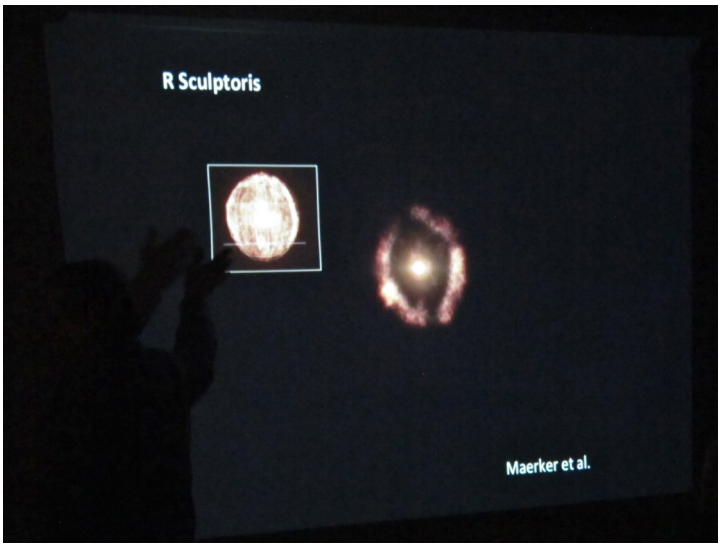


Dr. Adams emphasizes the relative size of the Hercules A elliptical galaxy to its optically-invisible, radio-emitting jets of plasma and subatomic particles.

Photo by John Goss



With star R. Sculptoris, Dr. Adams explains how radio waves provide three-dimensional insights similar to a CAT scan.

Photo by John Goss

the Whirlpool Galaxy and the Horsehead Nebula to produce a mesmerizing effervescence of optical, infrared and radio splendor. Sipping **Dr. Adam's** Elixir, he shared the history of the Atacama Large Millimeter/sub millimeter Array [ALMA] from a 1985 science workshop to the present. He discussed ALMA's Level 1 science goals and their astronomical importance. As the youngest of the NRAO instruments, ALMA is already forging new science, similar to the successes of ALMA's ancestors.

To the neophytes among us (of which I am one), **Dr. Adams** introduced these ancestors by hanging a mobile of acronyms above our crib. The NRAO telescope suite comprises four radio observatories:

- GBT (Robert C. Byrd Green Bank Telescope in Green Bank, WV),
- VLA (Karl G. Jansky Very Large Array in Socorro, NM),
- VLBA (Very Long Baseline Array comprises ten observatories within a polygon defined by Mauna Kea, HI, Brewster, WA, Hancock, NH and St. Croix, US Virgin Islands) and
- ALMA (Altiplano de Chajnantor, Chile).

The NRAO website **www.nrao.edu** contains dossiers for the suite members. While we are fortunate to have GBT nearby, we will have the opportunity to visit other suite

members during ALCON 2015 in Las Cruces, NM: **www.astroleague.org**.

No honest discussion by adults concerning telescopes can exclude the fiscal realities of Big Science. In cooperation with the Republic of Chile, a partnership of ESO (Europe), NAOJ (Japan and Taiwan) and NRAO (U.S.A., Canada and Taiwan) financed ALMA's $1.3 Billion construction. Last September marked the completion of the construction of ALMA's sixty-six high precision antennas; however, astronomers began performing early science with fewer antennas years earlier.

If the aforementioned acronym-rich financials implies a dry academic presentation, the only arid portion of the talk was the atmosphere at Llano de Chajnantor Plateau, the 16,500-foot high Atacama Desert site of the antennas. Instead, **Dr. Adams** shared his experiences from site visits to ALMA and other observatories during his career. During seven ALMA visits, he survived five earthquakes in fault-rimmed Chile: "the window shades were swinging back and forth but the nearby Chileans were unconcerned". Among the five local volcanoes, Lascar erupted as recently as July 2007, with clouds of ash reaching an elevation of over 9 kilometers. Like all of

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the personnel at the 10,000-foot ALMA Operations Support Facility, he flirted with hypobaropathy (altitude sickness): "I learned to move slowly". Earlier in his career, he nearly played the role of a crash-test-dummy while locked in a telescope's camera cage with a slipping clutch: "The operator assured me that all was well, that he had submitted a Trouble Ticket…"

Considering ALMA's progeny, he tantalized the membership with the Event Horizon telescope. This radio telescope will provide high-resolution images at the apparent event horizon of a hypothesized supermassive black hole at our galaxy's center: Sagittarius A*.

Dr. Adams invited us to attend the October 27 Jansky lecture at Charlottesville's Paramount Theater by **Dr. Jill Tarter**, currently of the SETI Institute (She is scheduled for subsequent public lectures at other NRAO observatories and similar lectures are available on YouTube).

With the conclusion of his formal presentation, **Dr. Adams** fielded more questions from the audience, piquing their interest for further consideration. For example, the configuration of ALMA's two hundred thirty concrete pads allows astronomers to arrange the sixty antennas in multiple variations of a "logarithmic spiral" (maybe a consideration for our meetings' seating arrangement!).

Dr. Adams graciously accepted an honorary RVAS club membership. Additionally, he welcomed a coveted RVAS coffee mug filled with chocolate to keep him awake during his return to Charlottesville.

After a comprehensive presentation, Dr. Adams hosts a Q&A session with an engaged membership.

Photo by Frank Baratta

We were pleased to have several visitors join us for the meeting. Our newest members are **Rene'**, **Ray** and **Alexander Bradley**. We also welcomed new visitor **John Pero**. In addition, it was wonderful to chat with **Lynn Slonaker** after too long of an absence.

(Thanks to **Clark Thomas**, **Frank Baratta, Michael Good** and **John Goss** for their contributions to this article. D.C.).

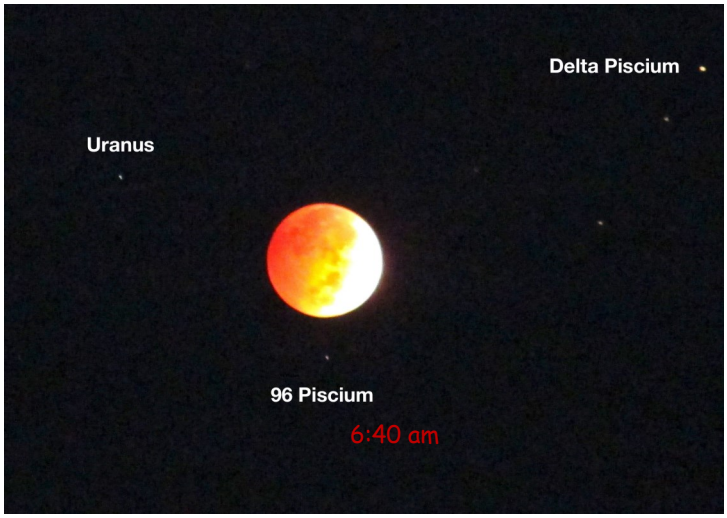
(Lunar Continued from page 2)

These views of stars and distant planet disappeared twenty minutes later due to the brightening morning twilight.

As the eclipsed moon sank toward the western ridge line, the approaching sunrise obliterated all the remaining stars and caused the moon to exhibit an eerie washed-out darkened ball. It quickly dropped from view.

It was a marvelous experience!

I used a Canon PowerShot SX130 to capture these images.



Monthly Calendar

MONTHLY MEETING: November 17th, 7:30 p.m., Center on Church, Downtown Roanoke. After several talks by professional astronomers, November's meeting returns to our more amateur focus, with members speaking about what's up in the current night sky, deep sky objects to observe, and individual and group club activities.

RVAS WEEKEND OBSERVING OPPORTUNITIES: Unless otherwise indicated, observing is held at Cahas Knob Overlook, milepost 139 on the Blue Ridge Parkway.

-- **Friday and Saturday, November 14th and 15th.** Sunset is at 5:10 p.m. Astronomical twilight ends at 6:40 p.m. The Moon rises at 12:18 and 1:13 a.m., respectively.

-- **Friday and Saturday, November 21st and 22nd.** Sunset is at 5:06 p.m. Astronomical twilight ends at 6:37 p.m. The Moon sets at 4:48 and 5:34 p.m., respectively.

-- **Future Sessions:** December 12th and 13th; December 19th and 20th.

ROANOKE CITY PARKS and RECREATION PUBLIC STARGAZE: Saturday, November 15th, 6:00 p.m., Cahas Knob Overlook, milepost 139 Blue Ridge Parkway. Nonmembers must register with Parks & Rec. at 540-853-2236. Members can call 540-774-5651 for information. (Next session: December 13th, 5:45 p.m., Cahas Knob Overlook.)

Astro-Quiz

From the Old English for "leading, drawing, magnetic," this term can be applied to any guide-star, most often specifically to Polaris. It's also the name of an early planetarium software program. What's the term?

Answer to Last Month's Astro-Quiz: Over the course of a year the Sun makes a 360-degree circuit of the constellations through which its path (the ecliptic plane) passes. These constellations comprise the Zodiac, known since ancient times. Among four points of particular importance along the Sun's path are the equinoxes, the others being the solstices. As seen from Earth, at the March equinox the Sun is located among the background stars of Pisces, while at the September equinox, it's among those of Virgo. From the Sun's perspective, it's the reverse: at the March equinox Earth is located in Virgo, while at the September equinox Earth is in Pisces. (Have an answer to this month's quiz [or a question and answer to suggest]? E-mail it to astroquiz@rvasclub.org!).