

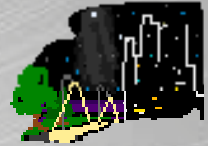


North Central Florida's  
Amateur Astronomy Club  
29°39' North, 82°21' West

July/ August  
Issue 107.1/108.1



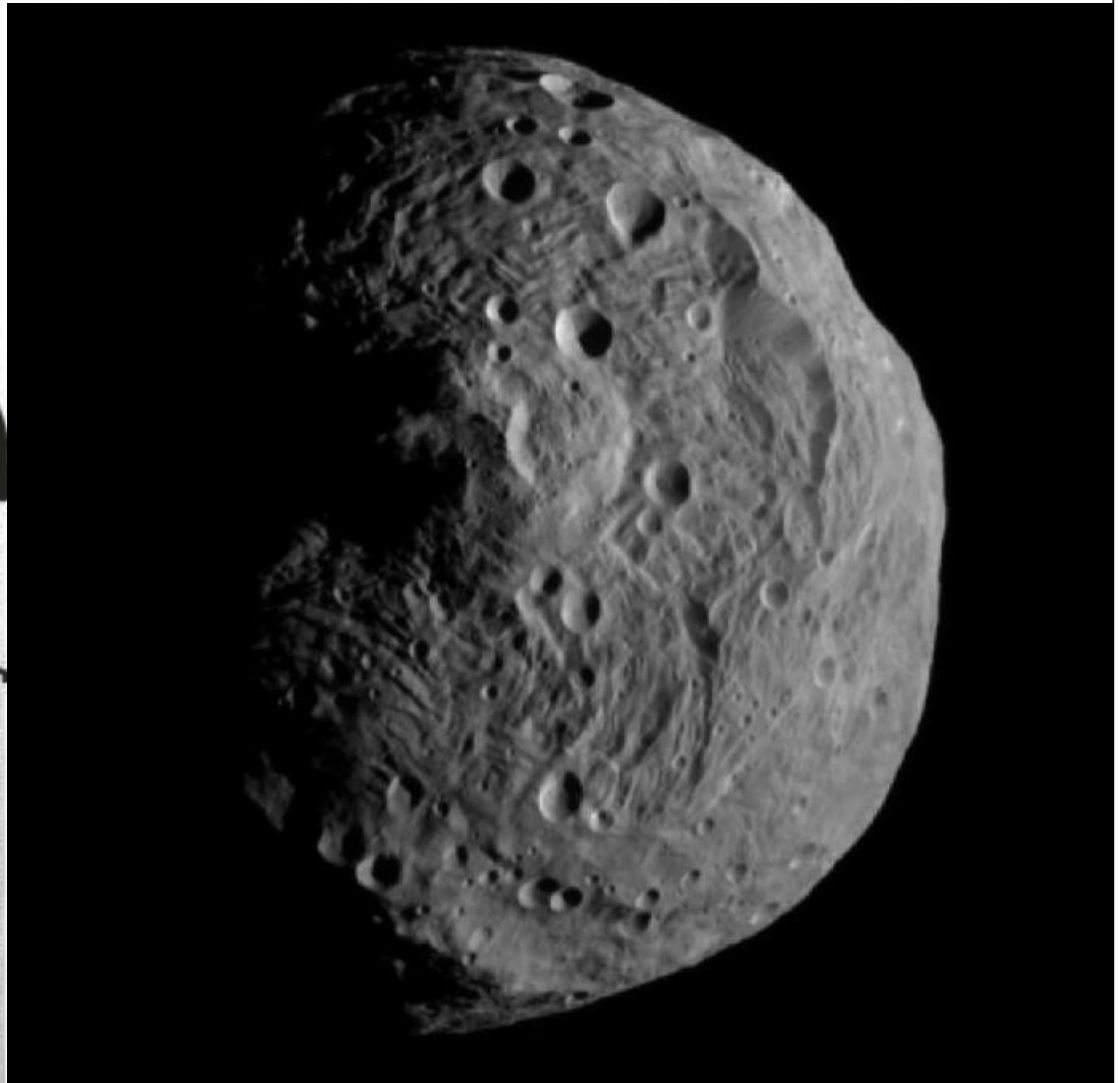
Member  
Astronomical  
League



Member  
International  
Dark-Sky Association

# First Light

Newsletter of the Alachua Astronomy Club



*Image of Vesta Captured by Dawn on July 17, 2011*  
NASA's Dawn spacecraft obtained this image with its framing camera on July 17, 2011. It was taken from a distance of about 9,500 miles (15,000 kilometers) away from the protoplanet Vesta. Each pixel in the image corresponds to roughly 0.88 miles (1.4 kilometers). Image credit: NASA/JPL-Caltech/UCLA/MPS/DLR/IDA

From Wikipedia, the free encyclopedia: Dawn is a robotic spacecraft sent by NASA on a space exploration mission to the two most massive members of the asteroid belt: Vesta and the dwarf planet Ceres. Launched on September 27, 2007, Dawn is scheduled to reach Vesta on 16 Jul 2011, which it will then explore until 2012. It is scheduled to reach Ceres in 2015. It will be the first spacecraft to visit either body.



As we swelter away this hot summer month, wishing for the cooler climate of fall, we should look back on the successful conclusion to yet another chapter of NASA's manned spaceflight scrapbook. The last space shuttle has flown and the book is now closed on an incredible list of achievements. The names, Atlantis, Columbia, Challenger, Endeavour, Discovery and even the Enterprise will be part of the history books. What fantastic things these spacecraft have done! They launched satellites, captured orbiting platforms, built the International Space Station, took over 600 astronauts and cosmonauts into low earth orbit, serviced the Hubble Space Telescope, and helped us develop a better understanding about space and our fragile earth.

Officially known as the Space Transportation System or STS, these space vehicles deployed over 50 satellites for military, governmental and commercial clients. Three interplanetary craft were deployed by space shuttles; Magellan, to Venus, Galileo, to Jupiter and Ulyses, to the Sun. Important scientific observatories were deployed during the space shuttle era; the Hubble Space Telescope, the Gamma Ray Observatory, the Diffuse X-Ray Spectrometer, and the Chandra X-Ray Observatory.

These craft hauled over three million pounds of cargo into orbit and hundreds of scientific experiments. Pretty amazing if you stop to think about it, huh?

If you would fancy a sitting inside of one of these complicated machines, you can have a virtual feel for their complexity by going to:

[http://360vr.com/2011/06/22-discovery-flight-deck-opf\\_6236/index.html](http://360vr.com/2011/06/22-discovery-flight-deck-opf_6236/index.html)

In spite of all of their accomplishments, many of the original goals were never realized. NASA promised that these amazing machines would fly dozens of times per year, yet the most ever flown in one year were nine, with five flights per year as the average. NASA also promised that each orbiter would be good for 100 flights, but none of the remaining museum-bound shuttles came close to that figure.

Atlantis – 33 flights

Columbia – 28 flights

Challenger – 10 flights

Discovery – 39 flights

Endeavour – 25 flights

**The Columbia Accident Investigation Board's 2003 report** was extremely critical of the space shuttle program overall. While the panel acknowledged the shuttle as an "engineering marvel" with a wide range of abilities in Earth orbit, it nevertheless concluded that "the shuttle has few of the mission capabilities that NASA originally promised. It couldn't be launched on demand; did not recoup its costs; stopped carrying national DoD security payloads; and was not cost-effective enough, nor was it allowed by law, to carry commercial satellites. Despite efforts to improve its safety, the shuttle remained a very complex and risky system.

So now, if you want to see one of these incredible machines of the recent past in person, you can find them at the following locations:

The Shuttle Enterprise will be moved to the Intrepid Sea, Air & Space Museum in New York. The Udvar-Hazy Center will become the new home for shuttle Discovery. Shuttle Endeavour will go to the California Science Center in Los Angeles. Finally, Shuttle Atlantis will be displayed at the Kennedy Space Center Visitor's Complex in Florida.

I eagerly await the next chapter. Let's hope the wait is short!

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Enterprise was a test vehicle and was not intended for spaceflight. It is on display at the Dulles Airport outside of Washington,

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**AAC Meeting Location** - AAC regular meetings are held on the second Tuesday of each month at **7:00 p.m.** at the Florida Museum of Natural History, **Powell Hall**, in the Lucille T. Maloney Classroom, on UF campus, unless otherwise announced. All meetings are free and open to the public. Join us for some great discussions and stargazing afterwards. Please visit our website for more information (floridastars.org). There is no monthly meeting in December.



### Submitting Articles to FirstLight

The AAC encourages readers to submit articles and letters for inclusion in *FirstLight*. The AAC reserves the right to review and edit all articles and letters before publication. Send all materials directly to the *FirstLight* Editor.

**Materials must reach the *FirstLight* Editor at least 30 days prior to the publication date.**

Submission of articles are accepted **by e-mail or on a CD**. Submit as either a plain text or Microsoft Word file. (In addition, you can also send a copy as a .pdf file but you also need to send your text or Word file.) Send pictures, figures or diagrams as separate .gif or .jpg file.

### Mailing Address for Hard Copies or CDs

**Note:** Since our mailbox is *not* checked daily, mail materials will be before the deadline date. (Hence, submission by e-mail is much preferred!)

c/o FirstLight Editor  
The Alachua Astronomy Club, Inc.  
P.O. Box 141591  
Gainesville, FL 32614-1591 USA

**By E-Mail:** Send e-mail with your attached files to  
**FirstLight@floridastars.org.**

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**SPECIAL EVENTS - 2011**

See the AAC website for details

<u>Event</u>	<u>Date</u>	<u>Location</u> Check the website for directions	<u>Start/End Time</u>
Fred & Lucille's Potluck Dinner	Saturday, September 24	Stargate Observatory	5:30pm-11:00pm EDT

**STAR PARTY / OBSERVATION SCHEDULE: Upcoming Events - 2011**

<u>Event</u>	<u>Date</u>	<u>Location</u>	<u>Start/End Time</u>
Star Party	Saturday, September 3	Newberry Star Park	7:30pm-11:30pm EDT
Star Party	Saturday, October 8	Newberry Star Park	7:00pm-11:00pm EDT

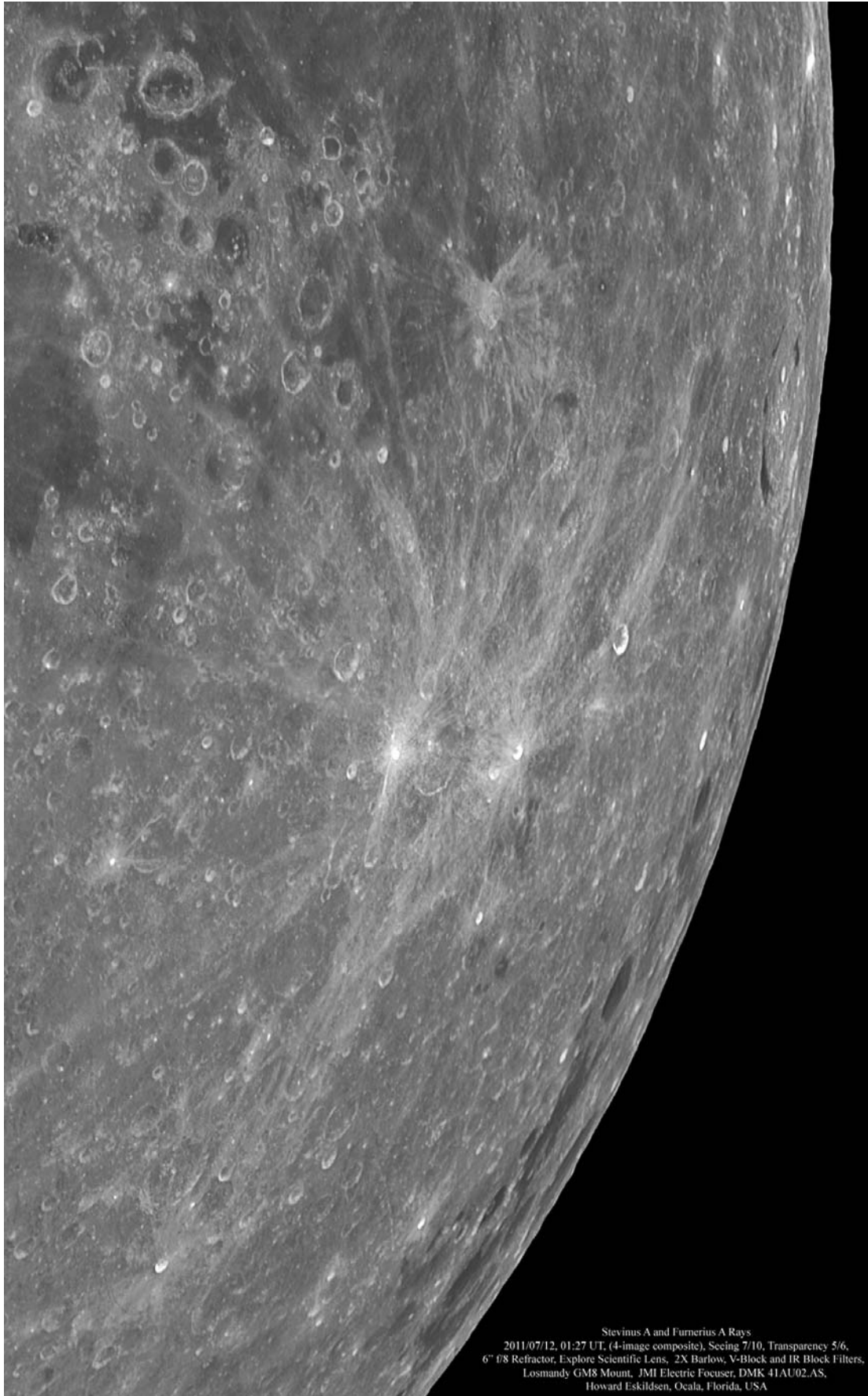
**School Outreach Program: Upcoming Events - 2011**

<u>School</u>	<u>Date</u>	<u>Location</u> Check the website for directions	<u>Start/End Time</u>
TBD	Wednesday, September 7	TBD	Arrival Time: 18:45 Start Time: 20:15
TBD	Wednesday, October 5	TBD	6:00pm-10:00pm EDT

**Aurora Over Greenland**

Image Credit: Copyright: Juan Carlos Casado.





Hi,  
Seeing was good and the focus great as I imaged the Moon last Tuesday night. Notice the strange rays from the two diminutive craters Stevinus A (left of center) and Furnerius A (right of center). At the middle of the top of the image a notched pattern of rays marks the oblique impact that produced Peta-vius B on the south end of Mare Fecun-titatis. On the right limb of the moon about a third of the way down from the top of the image, dark pyroclastics circle the inner crater floor of Hum-boldt, a magnificent crater that is unfortunately located for good observing from Earth. I have several more imaged to process from the evening, and I think the efforts were worth the sleep lost and will be well worth the time in study and processing. I could probably spend the rest of the year doing the all things that I can imagine with those images.  
Regards,  
Howard

Stevinus A and Furnerius A Rays  
2011/07/12, 01:27 UT, (4-image composite), Seeing 7/10, Transparency 5/6,  
6" f/8 Refractor, Explore Scientific Lens, 2X Barlow, V-Block and IR Block Filters,  
Losmandy GMB Mount, JMI Electric Focuser, DMK 41AU02.AS,  
Howard Eskildsen, Ocala, Florida, USA

In April I had the opportunity to image the northern moon during several days of the lunation. Here is my latest composite of the neglected northwestern limb.  
Howard

NW Moon 2011/04/18, 02:58 UT, 2- image Composite, Seeing 7/10, Transparency 5/6,  
6" f/8 Refractor, Explore Scientific Lens, 3X Barlow, Losmandy GM8 Mount  
JMI Electric Focuser, DMK 41AU02.AS, IR-block and V-block Filters  
Howard Eskildsen, Ocala, Florida, USA



## July Club Meeting

**Speaker:**

Michael S. Generale, NASA Test Director at Kennedy Space Center.

***NASA Update: Status of Space Shuttle Atlantis mission & the Orion Multi Purpose Crew Vehicle***











Attached is a pix of Clint Mclain and his scope (well, Paula's scope) at Saturday night's starparty at Lisa Eager's ranch near Williston.

Evening started warm and cloudy. Cleared for a bit. then clouded in about 11 pm. Tandy Carter, Paul Griffin, Ivo Rabell, the Grabbe's, Dale Smith and his wife Julia, James Quinlan and others were there.

Dew was a big problem by 10 pm....everything got wet!

73  
Chuck



We visited the Very Large Array Telescope of Jodie Foster and the movie Contact fame.

I have attached several pix. One is of wife Judy standing at the base of one of the 83 foot diameter dish. Other is the cautionary sign about snakes, and another

is a pix of the present feedhorn and receiver assembly. The present feed can simultaneously process a LOT of frequencies all at once...hurray for highspeed digital circuitry.

The array at the desert location has 27 or so operable dishes spread across three legs miles long. All the antennas can be moved by rail.

There are additional dishes located at many points in the US and islands in the Pacific and Atlantic.



Here is an image of NGC 7000 and a photo of Susan and I at the Chiefland Astronomy Village observing field.

The photo and the image were made the evening of July 4. It was great astronomy weather for Florida in the summer – no clouds and average transparency. The photo shows Susan and I and the equipment used that night. The image is a NGC7000 taken with an Apogee U8300 camera on a Takahashi

FSQ106EDX. The image is a “snapshot” one hour exposure made using an Astrodon 5nm hydrogen alpha filter with the camera binned 2x2. I spent most of the night taking images of the Rho Ophiuchus region for a future color astrophoto.

[From Wikipedia, the free encyclopedia:](#)

The North America Nebula (NGC 7000 or Caldwell 20) is an emission nebula in the constellation Cygnus, close to Deneb (the tail of the swan and its brightest star). The remarkable shape of the emission nebula resembles that of the continent of North America, complete with a prominent Gulf of Mexico.







A taste of the Spacefest Event held this past June in Tucson, Arizona. The Mercury, Gemini, and Apollo Astronauts are getting older, and several have already passed on. Marianne Gamble has been spending time getting to meet some of these American Heroes in person before they are gone.

**Spacefest III** was held in Tucson, Arizona, June 2-5, 2011

<http://www.spacefest.info/III>

**Location:**

JW Marriott Starr Pass Resort & Spa  
3800 W. Starr Pass Boulevard  
Tucson, Arizona 85745  
For Reservations call 520-792-3500

Spacefest is a unique gathering of astronauts, space scientists and space artists conceived and organized by Kim Poor and Novaspace to fill a void in the space community. Some of the celebrities included Apollo astronauts, including 6 of the 12 moonwalkers; Over 40 top scientists/managers for various robotic NASA missions, and world-class astronomers, and space artists. Events included Exhibitors, book signings, the world's largest space memorabilia auction, a banquet and luncheons with the celebrities, tours of Kitt Peak Observatory, Titan II Missile Silo, PIMA Space & Air Museum, and golf at the Resort.

This is the first Spacefest that I have attended. It was a bit overwhelming. The Resort was beautiful and the room rates were reasonable. There were Astronauts and Scientists everywhere, several vendors, and lots of lectures and activities to attend.

Friday I had lunch with shuttle astronaut Charlie Walker - STS 41-D, 51-D, and 61-B. He was able to share his thoughts about the space program and what opportunities the future holds.

Saturday I had lunch with three very interesting people. I sat across from Thomas Bopp, co-discoverer of Comet Hale-Bopp, I did not hear much of what he had to say because I was sitting next to Carolyn Shoemaker, co-discoverer of Comet Shoemaker-Levy 9. She was delightful and full of spirit. On the other side of her was Dr. William V. Boynton, professor of Planetary Science at the Lunar & Planetary Lab, University of Arizona, Specializing in Cosmochemistry, geochemistry, and astrobiology. What an amazing person, he was so interesting. Dr. Boynton's **current Spacecraft Involvement includes:**

**Mars Science Laboratory** (Dynamic Albedo of Neutrons) - is part of NASA's Mars Exploration Program, a long-term effort of robotic exploration of the red planet. Mars Science Laboratory is a rover that will assess whether Mars ever was, or is still today, an environment able to support microbial life. In other words, its mission is to determine the planet's "habitability." Launch: Nov. 25, 2011, 10:21 a.m. EST, Expected Arrival: August 2012

**OSIRIS-REx** (Mission Instrument Scientist) NASA has selected the University of Arizona to lead a sample-return mission to an asteroid. The target asteroid – named 1999 RQ36 after the year it was discovered – measures 575 meters (one-third of a mile) in diameter. 1999 RQ36 is a time capsule from the early solar system rich with organic compounds that may have seeded life on Earth.

**MESSENGER** (Gamma-Ray and Neutron Spectrometer and X-Ray Spectrometer)

**Lunar Reconnaissance Orbiter** (Lunar Exploration Neutron Detector)

Saturday evening I had dinner with Alan Bean, Apollo 12 Moonwalker, Skylab 2, Artist, and his wife *Leslie*. *He went step by step over the process of how he constructs his artwork. He is a very soft spoken, gentle soul.*



I really enjoyed meeting Gary Lockwood and Keir Dullea (2001 Space Odyssey) and listening to them recount their Hollywood adventures.

I cannot wait for **Spacefest IV** which is scheduled for May 29 to June 3, 2012 at the JW Marriott Starr Pass Resort & Spa. The 2012 website is pending, but you can follow them on Facebook: <http://www.facebook.com/SpacefestIV?sk=wall>



Marianne Gamble with Carolyn Shoemaker (Jack Lousma -Skylab 2, STS 3, took the photo for me)

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Marianne Gamble is a member of the Alachua Astronomy Club. She is an Adult Nurse Practitioner, Glass Artist, Scuba Instructor (retired), and is owner of a Scuba Repair Facility specializing in Dry suit repair. Marianne Has a Master's of Science Degree from The University of South Florida, Tampa, Florida.





# SPACEFEST 3

## TUCSON, ARIZONA

### JUNE 4, 2011

**Back Row, left to right:** Marianne Gamble, Rusty Schweickart (Apollo 9) Dave Scott (Gemini 8, Apollo 9, 15), Gene Cernan (Gemini 9, Apollo 10, 17), Paul Weitz (Skylab 1, STS 6), Charlie Walker (STS 41-d, 51-d, 61-b), Bruce McCandless (STS 41-b, 31), Rick Searfoss (STS 58, 76, 90, XCOR Test Pilot) **Front row, left to right:** Charlie Duke (Apollo 16), Fred Haise (Apollo 13), Jack Lousma (Skylab 2, STS 3), Gen. Tom Stafford (Gemini 6a, 9a, Apollo 10, Apollo-Soyuz), Walt Cunningham (Apollo 7), Al Worden (Apollo 15), Dick Gordon (Gemini 11, Apollo 12), Jim Lovell (Gemini 7, 11, Apollo 8, 13), Buzz Aldrin (Gemini 12, Apollo 11), Edgar Mitchell (Apollo 14), Alan Bean (Apollo 12, Skylab 2), Ed Gibson (Skylab 3)



This year my wife Millie and I took a few days out of our vacation to participate in the 21<sup>st</sup> Annual Grand Canyon Star Party at the South Rim. The event was held June 18-25. This was Millie's first attendance and my forth; twice as a guest and twice as part of the outreach.

The Grand Canyon Star Party is sponsored by the Tucson Amateur Astronomy Association (TAAA). The TAAA works with the National Park Service (NPS) to insure a quality event. The



**A young visitor wants to know how the scopes works**



**The party is a family affair for this group**

South rim Coordinator is Jim O'Connor. Jim is a high energy, highly knowledgeable, and very entertaining individual. I am fortunate to have gotten to know him over the years.



**Very proud of his custom scope**



**The official welcome banner**

Jim's partner with the NPS is park ranger Ms. Marker Marshall. I can attest to her organization and support for the event. It is a great sensation to drive up to the entrance of the park, explain that you are here for the outreach, and be treated as a truly welcome guest.

This year I was fortunate not to have to bring a scope. Jim allowed me to use his 12 inch Meade SCT on the condition that I work with his 17 year old grand daughter, who was there for her first outreach and determined learn everything she could. That proved to be comical as she was quite versed on the Atlas mount, the scope, and did a fair job of navigating the stars. I'm still uncertain how much help I was as it took until the end of the second night for me to feel comfortable with the scope and navigating the skies.

Of interest, this year's event was moved from Yavapai Point to the main visitor center. At first I was skeptical about the change, but looking back, it was a real improvement. I like the physical layout better and there was a welcomed reduction in bus noise, vibration, and light.



It was too cold and windy for this big scope on opening night



Jim O'Connor enjoying a look at our nearest star



Check in point



Ranger Marshall checking in with the group

I have a lot of warm and lasting memories from the trip. Perhaps my favorite was the full grown elk that paid a visit Sunday night. It literally walked right up to the staging area and was curious about the scopes. A flood of lights eventually discouraged it back to the forest.



Some interesting facts on the party include:

There were 109 registered astronomers that donated 1976 hours of volunteer work with 35-51 scopes set up each night. An estimated 11,000 visitors attended the star party. The astronomers came from around the USA and from as far away as England.

For those of you who are interested, next years event is scheduled for June 16-23<sup>rd</sup>. I am hoping to attend again and would welcome the company of any members of the AAC who would like to participate.

Here are some links about the Grand Canyon Star Party:

<http://www.nps.gov/grca/planyourvisit/grand-canyon-star-party.htm>

<http://www.tucsonastronomy.org/gcsp.html>



Rich and Millie's obligatory vacation picture



Jim and grand daughter Jessica getting ready for the big event

**Howard L. Cohen**

*Twinkle, twinkle, little star,  
How I wonder what you are!  
Up above the world so high,  
Like a diamond in the sky!*

~ Jane Taylor (1806)

**What did you see in the sky last night?** Could you explain what you saw? What do you think of the following story?

Police were called out to a 999 call about an unexplained object in the night sky spotted above an unnamed caller's home. Officers were then sent out to a house in the valleys area south of Wales, UK (BBC NEWS, 2008 July 4):

The following is from a transcript recorded May 2008:

**Control Room:** "South Wales Police, what's your emergency?"

**Caller:** "It's not really. I just need to inform you that across the mountain there's a bright stationary object."

**Control room:** "Right."

**Caller:** "If you've got a couple of minutes perhaps you could find out what it is? It's been there at least half an hour and it's still there."

**Control:** "It's been there for half an hour. Right. Is it actually on the mountain or in the sky?"

**Caller:** "It's in the air."

**Control:** "I will send someone up there now to check it out."

**Caller:** "OK."

**Control:** "Alpha Zulu 20, this object in the sky, did anyone have a look at it?"

**Officer:** "Yes, it's the moon. Over."

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So, have you ever seen a UFO? Do you believe in UFOs?

If others learn you are involved with astronomy, people will likely ask these questions. Belief in UFOs and alien visitations remains high despite years of sensational assertions unaccompanied by any real convincing proof.

You may have tried various answers to the above questions. Unfortunately responses denying the existence of UFOs representing alien spacecraft are often met with unconvincing eyes. Although rebuttals can take many forms, a favorite among some astronomers is to ask how many astronomers, professional or amateurs have reported seeing UFOs out of the tens of thousands



The answer, I am sure, is very few if any.

Why? Because astronomers, including amateurs, watch the sky more than anyone else. So, if UFOs were real phenomena, astronomers should report seeing many more UFOs than others. They don't because astronomers can usually determine what they are seeing in the sky.

That should tell the listener something. But not always. Some retort that astronomers are not interested or concerned with moving lights in the sky just like they are not interested in aircraft. As an astronomer, are you not interested in satellites? In meteors? Fireballs? Would your eye not be caught by moving, blinking or flashing lights?

Others may say astronomers have their eyes glued to their telescope eyepiece. How much time during your observing session are you peering through binoculars or a telescope compared with just looking up? I'll bet you look up a lot. How do you find celestial objects? Even if you have a "GoTo mount," you likely still look at the sky. And what about the thousands of photos taken by astronomers and amateurs? Where are all the UFOs?

Still others may say that astronomers would be reluctant to report UFOs believing ridicule would quickly follow. I believe astronomers, more than any other group, would be thrilled to find evidence of life elsewhere. In fact, a major thrust of modern astronomical research is searching for extrasolar earthlike planets. Would astronomers keep this secret if they had credible evidence for alien life?

Finally, some may think *all astronomers are under the wings of government control*. Amateurs too? If you are questioned about such absurd conspiracies, nothing you can say is likely to convince your listeners otherwise. Move on. Or better, invite them to your next star party.

Certainly, some people may reply that *some astronomers* must have seen things they could not identify? Well, possibly some, but I'll bet the numbers are very small compared with all the professional and amateur astronomers on planet Earth.

So, I am curious. How many of you who avidly watch the heavens have seen sky objects that you could not identify or could not identify upon further investigation?

***Let us know?***

**Write down your accounts and send them to me at [cohen@astro.ufl.edu](mailto:cohen@astro.ufl.edu)**

I will compile your accounts and we will publish them in a future issue of *FirstLight*.

Finally, how strongly do you believe is *the evidence* that UFOs are alien spacecraft from another world? Much of the public and news media apparently believes no evidence is required. Of course, thousands of accounts exist. Here are two recent UFO reports in the news that you might find both amusing and "frightening."

News stories recently appeared about hundreds of “UFO” sighted over New York City on 2010 October 14 during the daytime. However, upon seeing videos of these objects, I immediately said, “balloons.” They moved, floated and clustered for several hours just as balloons would glide. Sure enough, they were apparently escaped helium balloons released earlier that day from the Milestone School in Mount Vernon. The balloons then floated within sight of Manhattan (Benjamin Radford, livescience.com, 2010 October 14). Here, “If it looked like a duck, swam like a duck, and quacked like a duck, then it probably was a duck,” appropriately fitted the bill (no pun intended). But, read on.

Meanwhile, Fox news, broadcasting later that day from an evening Manhattan street, reported the balloons as UFOs with no explanation (the reporter was totally mystified). The Fox news reporter also noted they were now seeing a bright star in the night sky. She said, “Do you see that white thing . . . once my photographer zoomed in . . . you could see there was a tail to it. There was these blue flashing lights, and it looked like it was in a broken pattern. Now was that anything? Was it what people saw earlier. I don’t know, I can’t tell you.”

Yet even a beginning star gazer could have told her the correct explanation (if she had bothered to check). The zoomed in image clearly revealed the object was Jupiter with its four large satellites. But, why check?

On 2010 March 12 MSNBC reported on mysterious, pulsating lights showing up for several days over Lake Erie from Cleveland and Euclid in early evening and lasting a few hours. The reporter (David Shuster) noted the lights sometimes dimmed, sometimes got brighter, sometimes moved up or to the side, and then eventually disappeared.

This incident was also reported by *The Week Magazine*. Their headline read, “The Cleveland UFO: What on Earth? — A strange light over Lake Erie has Cleveland residents nervously eyeing the sky. Is it a conventional aircraft or have our new insect overlords arrived?”

An interview by MSNBC with the former chief UFO investigator at the British defense ministry (Nick Pope), called it a “significant sighting.” He also remarked that what struck him was the way it appeared to “change color.” His explanations were no better than Eugene Erlich, a local college student who had been videotaping the lights. He said, “I have absolutely no expertise in this field, but I can guarantee you that it is not human.”

Really!

Erlich wonders, “Why are they there? Why do they keep coming back, the same time, the same area? There is absolutely no reason. You’re gonna say ‘Wow, what’s going on here’.”

I too say, Wow! (What do you say?)

Erlich also noted, “Absolutely nothing we have on this Earth even looks like that.”



He could have been right on this. Possibly the lights were not from Earth. How often have such poor videos been nothing but common celestial objects? Anyone familiar with the sky, especially after viewing the video, would likely make this suggestion. The video and description exactly matched the appearance and characteristics of a bright celestial object low near the horizon, scintillating both in brightness, movement and color. Still, other explanations could be possible, if we ask for *convincing evidence*.

For example, the video images were also similar to distant aircraft lights from incoming airplanes although some say, without proof, that the lights are unlike aircraft. (Why?) Even the Ohio Mutual UFO Network (MUFON) Field Investigator Tom Wertman finally provided significant evidence that the lights were, indeed, incoming jet traffic from Cleveland-Hopkins International Airport (examiner.com National, 2010 March 19). Wertman compared the lights and their movements with airport incoming air traffic and found a match.

This announcement is surprising since MUFON, the largest UFO group in the USA, has often been cited for its uncritical research on UFOs. Kudos to MUFON, at least for now.

So, what did *you* see in the sky last night? Again, if you are an amateur or professional astronomer and have seen a "UFO," send me your detailed report. Unless you are embarrassed to do so.

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**Howard L. Cohen** is an emeritus professor in the University of Florida's Department of Astronomy and a founding member of the Alachua Astronomy Club, Inc.

# Beta Lyrae

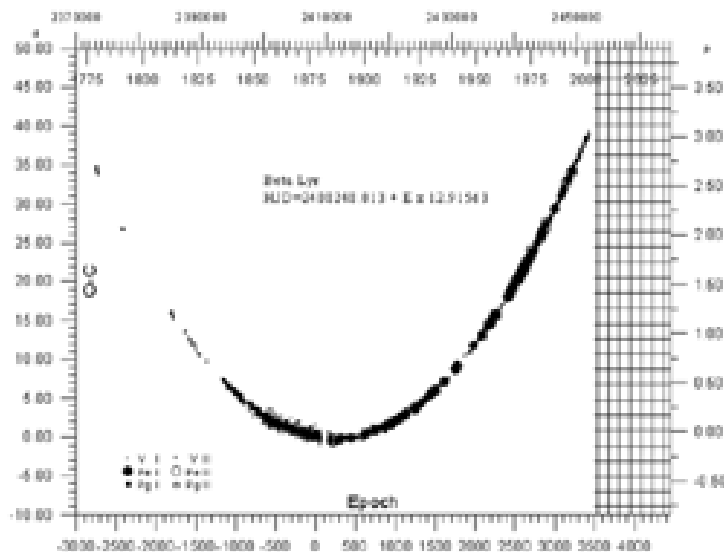
By Dirk Terrell

Reprinted by permission of the American Association of Variable Star Observers (AAVSO)

$\beta$  Lyrae, known as Sheliak to the ancient Arabs and Tsan Tae to the ancient Chinese, was discovered to be a variable star by John Goodricke in 1784, about two years after his successful explanation of the light variations of Algol. In the more than two centuries since its discovery,  $\beta$  Lyrae has played a game of cat and mouse with astronomers attempting to unlock its secrets. Only slowly have some of those secrets been revealed.

We know that  $\beta$  Lyrae is an eclipsing binary system with an orbital period of about 12.9 days and the period is increasing at a rate of about 19 sec/year. The O-C diagram (Kreiner, Kim and Nha, 2005) of eclipse timings seen in Figure 1 shows a beautifully parabolic shape, indicating a constant rate of period change.

## $\beta$ Lyrae O-C Diagram



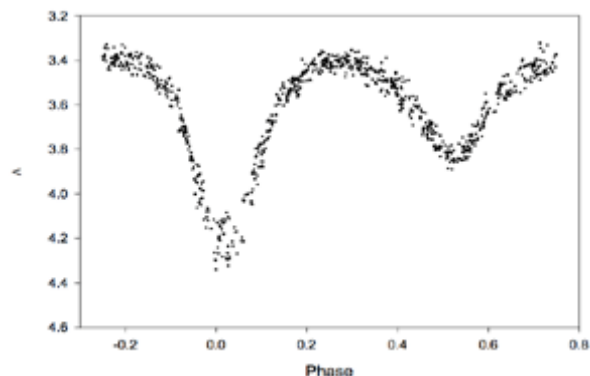
**Figure 1.** O-C diagram for  $\beta$  Lyrae eclipse timings from Kreiner, Kim and Nha (2005).

$\beta$  Lyrae's light curve in the visible part of the spectrum serves as the prototype of the EB light curve classification: rounded maxima and broad minima with different depths. Figure 2 shows the V light curve of the system with data from 1987 to 1994 published by Van Hamme, Wilson and Guinan (1995). Note the rather large scatter in the light curve which, at first, is rather surprising given that the system is rather bright. It turns out that the large scatter is a result of intrinsic



variability and not observational error. The large rate of period change and the intrinsic variability are clues that  $\beta$  Lyrae is a very active system.

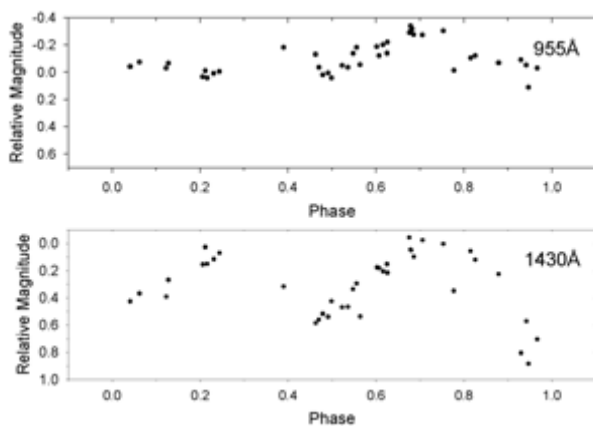
## Visual Light Curve



**Figure 2.** V band light curve of  $\beta$  Lyrae from Van Hamme, Wilson and Guinan (2005).

Observations of  $\beta$  Lyrae in the ultraviolet show a very different behavior: almost no variation in brightness over the orbital period at wavelengths shorter than about 1200 Å. Stated another way, when viewed in the ultraviolet  $\beta$  Lyrae doesn't look like an eclipsing binary at all. Figure 3 shows the light curve of  $\beta$  Lyrae in the ultraviolet at wavelengths of 955 Å and 1475 Å as measured with the Voyager Ultraviolet Spectrometers (Kondo, et al., 1994). At 1475 Å the light curve exhibits a form similar to that of the optical light curve but at 955 Å, the light curve is remarkably flat. That rather strange dependence of the light curve on wavelength is another clue that  $\beta$  Lyrae is not your average eclipsing binary.

## ! Lyrae Light Curves at 955 Å and 1475 Å



**Figure 3.** The light curve of  $\beta$  Lyrae at 955 Å and 1475 Å from Kondo, et al. (1994). Note the lack of eclipses at 955 Å.

$\beta$  Lyrae has long been known to show emission lines in its complicated spectrum (Struve, 1958), yet another indication of activity in the system. Although the spectrum of  $\beta$  Lyrae is quite complicated, consisting of at least six distinct sources (Bisikalo, et al. 1999), one easily recognized source does stand out: the absorption lines of a star with a spectral type of B6II to B8II. This star is the one eclipsed at primary minimum in the optical light curves and I will refer to it as the primary star. The primary is, therefore, a giant with an effective temperature of about 12,000 K. The nature of the primary star is the subject of little dispute. The nature of the secondary object is, on the other hand, still the subject of some debate. Astronomers had struggled without success for decades to explain the secondary component as a star of approximately spectral type F. In 1963, however, came the critical piece of the puzzle.

Huang (1963) proposed that the primary was, in fact, less massive than the secondary which was embedded in a geometrically and optically thick disk. This interpretation was truly a turning point in our understanding of  $\beta$  Lyrae because it explained the shape of the light curve and the absence of the spectral lines of the secondary in the spectrum in a simple and intuitive way.

Wilson (1974) explored the disk model in a quantitative fashion and showed that it must be geometrically and optically thick. Later he produced detailed models of the structure of the disk (Wilson, 1981; 1982).

The Huang model has survived the test of time. After over forty years, the core ideas of the model form the basis of the modern interpretation of the system. Although there are disagreements about the detailed nature of the disk (see Wilson and Terrell, 1992 and Hubeny, Harmanec and Shore, 1994), almost everyone agrees with the idea that the secondary is a stellar object embedded in a thick disk.

So, the obvious question is "How did  $\beta$  Lyrae end up in its current state?" In the past,  $\beta$  Lyrae had been considered a unique object and understanding the evolutionary history of a unique object can be difficult. About 25 years ago, Plavec (1980) showed that  $\beta$  Lyrae was a rare but certainly not unique object. Using the International Ultraviolet Explorer (IUE) satellite, he showed that there were a handful of systems that had similarities to  $\beta$  Lyrae. Now we could begin to see patterns. These systems, which he termed the W Serpentis stars, all showed strong emission lines in the IUE spectra, indicative of large-scale mass transfer between the two stars.

The current view of  $\beta$  Lyrae is that it is nearing the end of the rapid phase of mass transfer (RPMT) that results when the more massive star in a binary reaches its Roche lobe and transfers mass to the lower mass star. Readers familiar with the resolution of the "Algol Paradox" will recognize this explanation. When the more massive star reaches its Roche lobe and begins to transfer matter to the other star, the Roche lobe shrinks because the star is losing mass and the separation between the stars decreases. This, of course, leads to more mass loss and a still smaller Roche lobe. We have a classic runaway feedback situation and the mass loss proceeds on a very rapid time-scale, over thousands of years, as opposed to the much longer nuclear timescales of billions of years on which stars usually evolve.

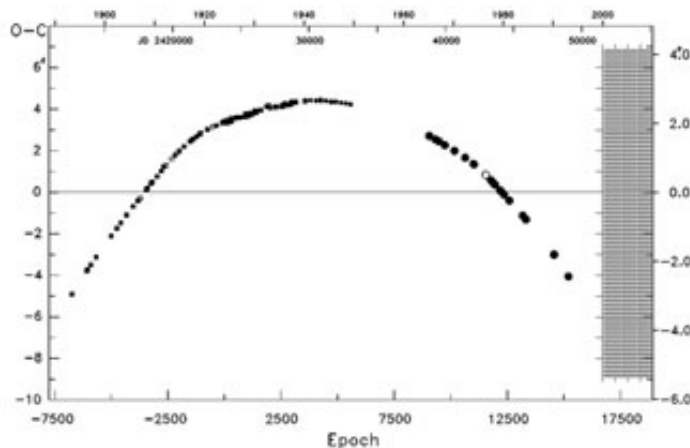
Now consider what happens to the initially lower mass star (let's call it the gainer) as all of this mass comes pouring towards it. If the gainer's radius is small compared to the separation of the two stars, the matter stream will not impact it directly but form a disk around the gainer. Viscosity will cause the disk to spread out and some of the material will accrete onto the gainer while smaller amounts are lost to the system via jets perpendicular to the disk (Harmanec, et al 1996) .

If the gainer's radius is large compared to the separation, the matter stream will impact the surface of the gainer and spin it up, like water sprayed onto a pinwheel. Stars adjust structurally on time-scales larger than the rate at which mass is being transferred in this RPMT stage, so the material tends to build up and form a thick accretion disk that engulfs the gainer. SV Centauri is believed to be a system in this rapid, and hence rare, stage (Wilson and Starr, 1976) and Figure 4 shows that it has a decreasing period as expected.

## SV Cen O-C Diagram

**Figure 4.** O-C diagram of eclipse timings for SV Cen from Kreiner, Kim and Nha (2005).

Note that the parabola is reversed from the one for  $\beta$  Lyrae, indicating that the period is decreasing. Eventually enough mass is transferred that the once lower mass star is now the higher mass star and the mass transfer slows considerably. Since mass is now being transferred from the lower mass star, the period increases.  $\beta$  Lyrae is believed to be at this stage.



As the mass transfer slows, the accretion disk continues to settle onto the gainer. Eventually the disk will disappear (primarily via accretion) and the gainer will reappear as a relatively normal but now much more massive star. It will also be rapidly rotating, perhaps at the centrifugal limit, making it a double contact binary as defined by Wilson (1979). RZ Scuti and U Cephei are probably examples of such systems, frequently referred to as the Rapidly Rotating Algols.

Eventually, tidal forces will synchronize the rotation of the gainer with the orbit and the system will be a classical Algol, like Algol itself. Once the system reaches the Algol stage, its evolution proceeds at the more leisurely nuclear timescale.

Thus  $\beta$  Lyrae, once seen as a unique "freak" among binary stars, is now thought to be an example of one stage in the evolution of certain close binaries. Many details of this evolution remain to be determined and new computer codes capable of modeling stars in three dimensions on massive computing clusters with hundreds or thousands of CPUs are being developed to more fully test our current ideas.



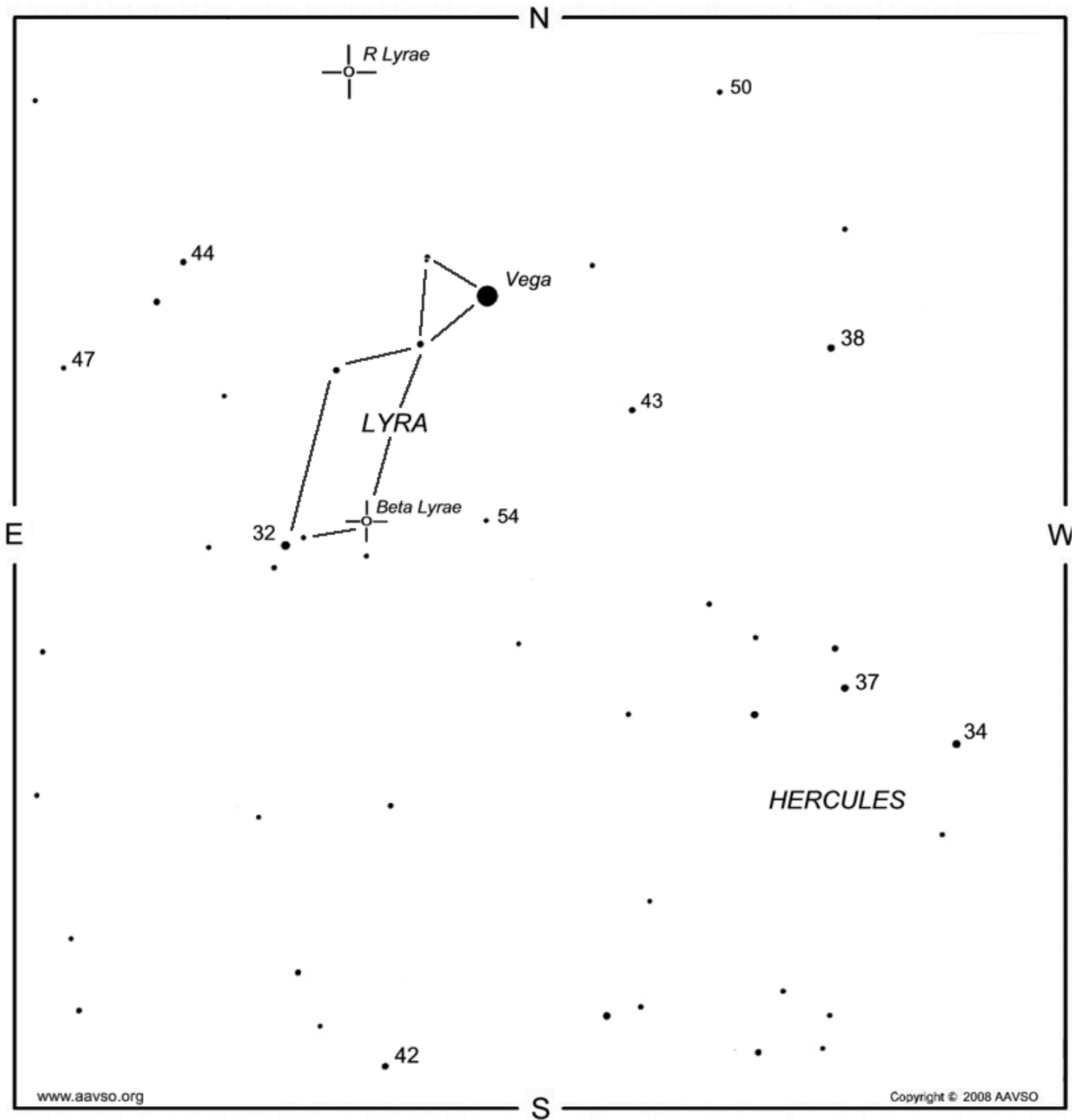
Most importantly,  $\beta$  Lyrae continues to be observed. As the late Brad Wood once told me, "The more a system has been observed, the more it should be observed." The AAVSO is contributing valuable data on  $\beta$  Lyrae, especially the infrared photometry team led by Doug West. Using the Optec SSP-4, we are observing  $\beta$  Lyrae in the J and H photometric bands, providing valuable data at wavelengths rarely used in studying the system. But all observations of  $\beta$  Lyrae are valuable, be they infrared photometry, optical photometry or times of minimum. They will enable astrophysicists a century hence to uncover more secrets about this enigmatic binary that sits high in the northern summer sky and slowly reveals its secrets to those who invest the effort in prying them loose.

First Light Editor's Note - The original article is available at [http://www.aavso.org/vsots\\_archive](http://www.aavso.org/vsots_archive)

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# Star Chart for Beta Lyrae and R Lyrae



Notes: Lyrae is an easy constellation to recognize in the Summer. Vega is the brightest star in the Summer sky and is usually near the top of the sky in the early to mid evening hours. The constellation looks somewhat like an hourglass and is relatively small compared to most of the other constellations in these charts. Beta Lyrae usually varies from 34 to 44 on our brightness scale. It takes about 13 days to see a complete cycle.

Excerpts from Wikipedia, the free encyclopedia:

A sundial is a device that measures time by the position of the sun. In general, sundials indicate the time by casting a shadow or throwing light onto a surface known as a **dial face** or **dial plate**. Although usually a flat plane, the **dial face** may also be the inner or outer surface of a sphere, cylinder, cone, helix, and various other shapes. In common designs such as the horizontal sundial, the sun casts a shadow from its **style** onto a **dial face** marked with lines indicating the hours of the day. The **style** is the time-telling edge of the **gnomon**, often a thin rod or a sharp, straight edge. As the sun moves across the sky, the shadow-edge aligns with different hour-lines. The **gnomon** is the part of a sundial that casts the shadow.

Sundials indicate the local solar time, unless corrected for some other time. To obtain the official clock time, three types of corrections need to be made:

- ◆ **First**, the orbit of the Earth is not perfectly circular and its rotational axis not perfectly perpendicular to its orbit. The sundial's indicated solar time thus varies from clock time by small amounts that change throughout the year. This correction — which may be as great as 15 minutes — is described by the equation of time.
- ◆ **Second**, the solar time must be corrected for the longitude of the sundial relative to the longitude of the official time zone. For example, a sundial located west of Greenwich, England but within the same time-zone, shows a later time than the official time.
- ◆ **Last**, to adjust for daylight saving time, the sundial must shift the time away from solar time by some amount, usually an hour. This correction may be made in the adjustment plaque, or by numbering the hour-lines with two sets of numbers.

An **analemma** may be added to many types of sundials to correct apparent solar time to mean solar time or another standard time. These usually have hour lines shaped like "figure eights" (**analemmas**) according to the equation of time. This compensates for the slight eccentricity in the Earth's orbit and the tilt of the Earth's axis that causes up to a 15 minute variation from mean solar time. This is a type of dial furniture seen on more complicated horizontal and vertical dials.





So much about sundials from Wikipedia, but why should we think about a sundial for the Newberry Starpark?

I can think of several reasons:

Such a project can bring out the best in our members since it combines various disciplines of science and engineering with art and education.

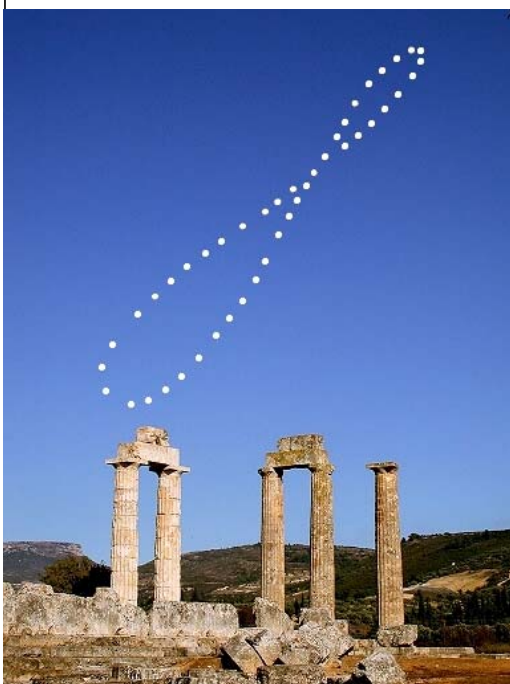
The shadow cast by a sundial's gnomon over the course of the year provides evidence for the eccentricity of earth's orbit around the sun and the inclination of the earth axis. It also provides information about the spherical shape of planet earth and the longitude and latitude for the sundial's location.

Sundials come in an almost unlimited number of shapes and styles. Many of them are very artistic in appearance and often they have a *motto*.

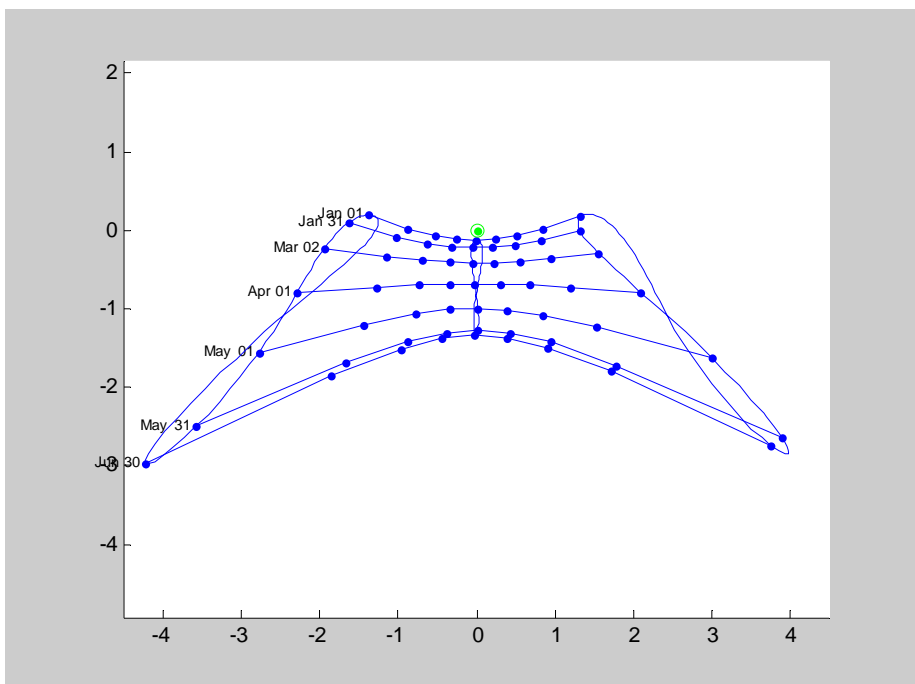
If we decide for a sundial project, we need volunteers willing to devise a scientific, artistic and educational concept for such a project.

Next, we would need facilitators capable of preparing a site at the star park and constructing the sundial and adjacent components like educational panels.

Any takers?

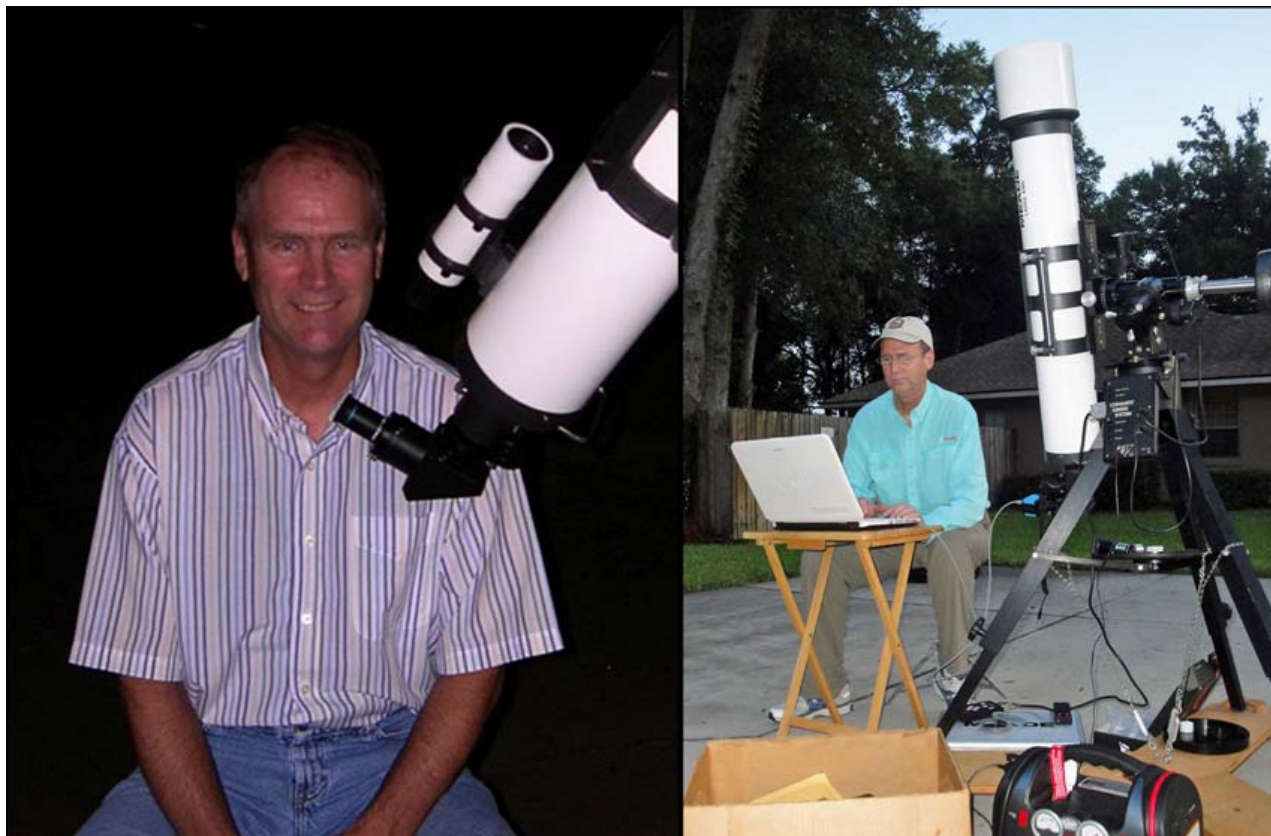


The analemma is the figure traced in the sky when the position of the Sun is plotted at the same time each day over a calendar year from a particular location on Earth



Author's Simulation of a sun dial face plate at the star park location, assuming a plane surface tilted up by 60°. Shown are the shadow traces over the course of a year and the effect of the analemma on the true time of the sundial.

## A LUNAR STAR



Chuck Wood writes: In more than 2000 LPODs there have been only a dozen or so devoted to the people who study the Moon. Yet not a single image would exist, nor would any spacecraft orbit, nor discovery be announced without the hundreds of people since Galileo who have been passionate about the Moon. Howard Eskildsen is a good representative of the professionals in other fields - Howard is a physician - who bring an intelligent and methodical approach to their study of the Moon. Here is an introduction to how he became a lunatic, in the best sense of the word, and more information is available. Howard writes:

Along with the stars and Moon, I was also fascinated by rocks, microscopes and telescopes. The later two were portals through which I could see the "invisible," and my rock collection led to a strong interest in geology. I read everything I could get my hands on about geology, stars and microbes, but eventually it was the microbes that picked my interest in medicine. Through the course of time I became a physician and completed a family practice residency, and am currently practicing in central Florida.

In high school I did manage to salvage a sadly abused 4.25" Dynascope and get it back in working order. Later, while in medical school I finished the 6" mirror that I had started in junior high and spent whatever free time I could watching the sky. Professional and family responsibilities, however, allowed little time for observing, so it was put on the back burner for over 25 years. In 2001 I decided to get a better scope that would be easier to grab and go out to observe when possible, with the Moon as the primary target in mind at the time. I had seen an 80 mm refractor in a local store, but my wife suggested spending a little more money for a better one and bought me an ETX-125 for Christmas. It worked well for my needs at the time. One night I had to heartily agree with a grade-schooler who had looked at Venus and the Moon through it, asked where I got the telescope, then exclaimed. "Wow, you sure are lucky to have a wife who buys you luxury telescopes!" In the years that have followed I have observed and photographed the Moon with a 6" refractor that I purchased from Jose Olivarez and have read as much as possible about the Moon. I have submitted over 1,000 images to the Lunar section of the Association of Lunar and Planetary Observers and have written articles and provided images for Selenology, Selenology Today, The Lunar Observer, and the Strolling Astronomer. I have given lunar presentations at the Winter Star Party as well as at the Alachua Astronomy club, and the Kika Silva Pla Planetarium in Gainesville, and have met several other talented observers. The Moon is a wonderful friend and companion to the Earth and its residents. Hardly a day goes by that someone does not hear me say, "Oh! Look at the Moon." It is like Earth's little brother, and a rocky soul mate to all who dwell here.

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### **Perseid Below**

Credit: Ron Garan, ISS Expedition 28 Crew, NASA

Denizens of planet Earth watched this year's Perseid meteor shower by looking up into the moonlit night sky. But this remarkable view captured by astronaut Ron Garan looks down on a Perseid meteor. From Garan's perspective onboard the International Space Station orbiting at an altitude of about 380 kilometers, the Perseid meteors streak below, swept up dust left from comet Swift-Tuttle heated to incandescence. The glowing comet dust grains are traveling at about 60 kilometers per second through the denser atmosphere around 100 kilometers above Earth's surface. In this case, the foreshortened meteor flash is right of frame center, below the curving limb of the Earth and a layer of greenish airglow. Out of the frame, the Sun is on the horizon beyond one of the station's solar panel arrays at the upper right. Seen above the meteor near the horizon is bright star Arcturus and a star field that includes the constellations Bootes and Corona Borealis. The image was recorded on August 13 while the space station orbited above an area of China approximately 400 kilometers to the northwest of Beijing.

From: APOD <http://apod.nasa.gov/apod/ap110817.html>