FirstLight
Newsletter of the Alachua Astronomy Club

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

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Member
Astronomical
League

Member
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Dark-Sky Association

Star Party Recap

For those of you fortunate to attend Gary Cook's residence in February, poor weather forecasts were did not come to realization. Clear, chilly weather and low light pollution opened the skies up to fainter dark sky objects. Of the half-dozen scopes at hand, the highlight of the evening was Gary's 10-inch Newtonian, pier mounted on a motorized equatorial. "All of the convenience of a Dobsonian, all of the rock steady tracking of a German equatorial!"

In March, weather was a deterring factor for many, as the Loftus star party attracted a little under a dozen guests. Hazy, cloudy skies left those disappointed as the group called it a night just after it had begun.

On the 23rd of May, we are blessed with an invitation to Bob Duval's residence out by the Chiefland Astronomy Village. Skies don't get much better than this here in Florida.

We are also looking forward to the party at Bob Jacobs' house, Hurricane Harbor. With a 25 minute drive out of Gainesville, it holds a pleasant compromise between dark skies and proximity. Come out on June 20 and view the Summer sky at it's best. Brilliant views of the Milky Way, nebulae, galaxies, open clusters and globulars await! Any type of object can be viewed during this opportunistic period.

Thomas Hettinger
Assistant Star Party Coordinator
Alachua Astronomy Club

Left: Fred and Lucille Heinrich received antique Newtonian reflector replicas from *b. crist miniatures* as a thank-you gift for their contributions to the 2009 Winter Star Party in the Florida Keys.

Photo Credit: Howard Eskildsen

Telescopes of the Future

By: Bill Helms

The President's Corner

A few days ago, I was reminiscing about an instrument we built at Kennedy Space Center to automatically scan the Space Shuttle Orbiter windows for micro-meteor collisions and damage. I realized that some of the technology could be applied to telescopes of the future. That set me off on a mental exploration of what might these future telescopes be like. I thought members of the Alachua Astronomy Club might be interested. The result is this article.

Econo-Dobs of today have come a long way from the old red tube Coulter monsters. The optics, typically from China, are fairly consistent and have a decent figure. The focusers and finders have been upgraded. My biggest complaint is the quality of the altitude bearings. They are usually made of plastic, or sometimes metal, but are grossly undersized. For a six-inch reflector, the bearings are about 4.5 inches in diameter. For a ten-inch, they are less than five inches. For my 12.5-inch Starmaster, the bearings are metal on Teflon and nearly twenty inches in diameter, and this scope moves extremely smoothly. I can track airliners at 30,000 feet, and change from no eyepiece to Barlow plus Paracorr plus 35 mm. Panoptic without the scope moving at all. The first manufacturer who figures out that he could put decent bearings of adequate size on his telescopes for a trivial additional cost will gain an immediate marketing advantage. No more using fishing weights or magnets to balance the tube when you change eyepieces! And while we are at it, let's get rid of those Lazy Susan azimuth bearings, and replace them with Ebony Star laminate on Teflon.

A second change might involve the base itself. The particleboard bases stand up to bumps and wear quite well. They are, for the most part, adequately stiff, and provide a stable base for the telescopes. However, they are heavy. The first manufacturer who finds an inexpensive way to provide a lighter base that retains the low cost and good mechanical qualities of the particle board bases will have an advantage. Perhaps they could substitute aluminum, like Mike Zammet used in his well-regarded line of Starstructure Dobs. Take a look at this link:

(http://www.telescopereviews.com/item.php?arch=1&cy=2004&cm=8&cmn=August&item_id=948).

Starmaster Telescopes has begun delivering the FX series with mirrors that are absolutely amazing. They feature 14.5 f/4 mirrors, and 16.5 to 30-inch mirrors of f/3.7 focal ratio. This means there needs to be less distance between the mirror and the top of the scope. In the 14.5 and 16.5-inch scopes, and are of average height, you can do all your observing without a ladder or step stool. In fact, Mike Lockwood, the craftsman who fabricates these fine mirrors, demonstrated a 20-inch f/3 at Chiefland on his way to the Winter Star Party. Friends tell me the images in the 20-inch f/3 were superb, with tight stars and a very dark sky background. Deep sky treasures like M42, Thor's Helmet, and the Pinwheel Galaxy knock your socks off. In addition, Lockwood's mirrors are extremely thin, 1.25 to 2 inches thick. They equilibrate to ambient temperature more quickly than thicker mirrors. This means that stable, high-power images of planets can be obtained sooner after sundown. Currently, Lockwood is the only one regularly fabricating these mirrors. But once someone shows the way, others eventually follow. I expect, sometime in the future, to see this technology migrate to other high-end Dobs. By the way, expect to see a relatively inexpensive 14 and/or 16-inch truss tube Dobsonian from Orion Telescopes soon.

One can obviously see that telescope automation will continue, and perhaps expand. Many of the medium to large Dobs made by Obsession and Starmaster, are bought with computerized location and tracking capabilities. And Meade has recently introduced their new "ETX-LS WITH LIGHTSWITCH TECHNOLOGY – THIS CHANGES EVERYTHING." According to advertisements, it powers up, initializes itself, sets the time and location, and is ready for you to tell it what to locate, all without operator intervention. It can also give you a guided tour of the sky, audio and video, if you attach a monitor. It even has a built-in astro camera that will take and store wide field astrophotos on an SD card. However, it has an aperture of only six inches, and is priced at $1400, the same as Celestron's well-regarded eight inch computerized SCT, the NexStar 8i. (continued on page 4)

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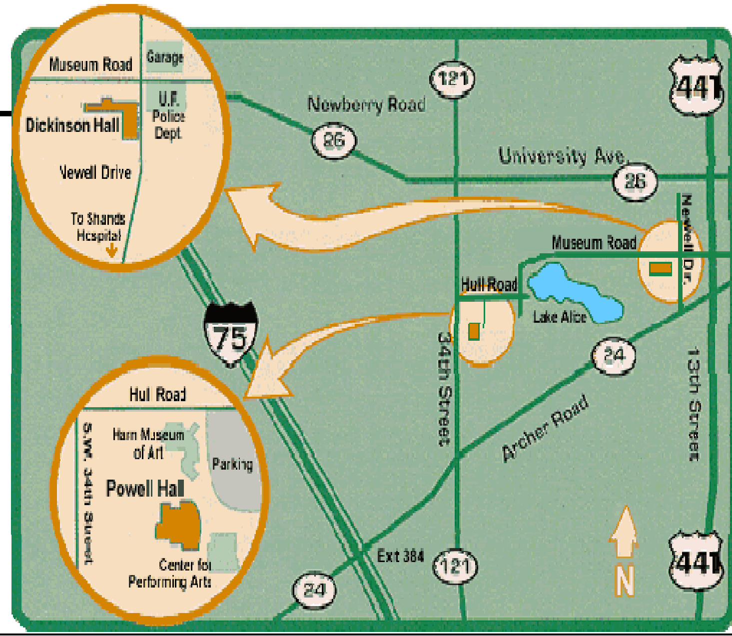
AAC Meeting Location - AAC regular meetings are held on the second Tuesday of each month **at 7:00 p.m.** at the Florida Museum of Natural History, **Powell Hall**, in the Lucille T. Maloney Classroom, on UF campus, unless otherwise announced. All meetings are free and open to the public. Join us for 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 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 too.) 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 well before the deadline date. (Hence, submission by e-mail is much preferred!)

c/o FirstLight Editor
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By E-Mail; Send e-mail with your attached files to **FirstLight@floridastars.org**.

May Club Meeting

Dr. Eric Ford,
Assistant Professor of
Astronomy, UF

Tuesday, May 12 2009, 7:00 p.m. ET

Speakers: **Dr. Eric Ford,** Assistant Professor of Astronomy, UF

Title: ***Recent Results from Extrasolar Planet Searches***

Location: Powell Hall, Florida Museum of Natural History (*Lucille T. Maloney Classroom*) UF Campus, Gainesville, Florida

Preview: Dr. Ford gave an exciting presentation last June, *Searching for Extrasolar Planets: Care to Join the Hunt?*, and is back to report on several observations of extra-solar planets during the past year. This will include images of extrasolar planetary systems, the discovery of transits of the highly eccentric planet HD 80606b, and detection of "super-Earths". As time permits, he will discuss the future prospects for detecting and characterizing extrasolar planets, including NASA's
Kepler mission to search for Earth-like planets and observations being planned for the Gran Telescopio Canarias.

About the Speaker: Dr. Eric Ford is an assistant professor of Astronomy at the University of Florida. His research focuses on studying extrasolar planets and improving our understanding of planet formation. Dr. Ford received bachelor's degrees in Physics and Mathematics from the Massachusetts Institute of Technology in 1999 and his Ph.D. in Astrophysical Sciences from Princeton University in 2003. He continued his research on extrasolar planets as a Miller Fellow at the University of California Berkeley and as a Hubble Fellow at the Harvard-Smithsonian Center for Astrophysics before joining the faculty of the UF Astronomy department in Gainesville. You may read more at Dr. Ford's website: www.astro.ufl.edu/~eford/ . Email: eford@astro.ufl.edu

Telescopes of the Future - continued from page 2

I suspect the initialization and location without operator input will catch on, especially in telescopes within the price range of beginners. Over the years, a number of beginners have contacted me regarding computerized telescopes they could not get to work. Most ended up getting a good eight inch Dob and learning to find things for themselves. But the lure of push button access to the mysteries of the skies will catch on, at least among beginners.

The current generation of young people has grown up staring at CRT's and digital display screens. Laptop computers have become ubiquitous. Almost everyone has one. This and another innovation will usher in another revolution in amateur astronomy. The eyepiece will be replaced by a video camera that will interface wirelessly with your laptop. I have seen a number of near real-time video cameras at Chiefland Astronomy Village. One is the Mallincam that our ATM Group plans to investigate soon. Devotees say these give an aperture gain of a factor of ten to twelve. This means a twelve-inch scope would perform like the Mt. Wilson 120 inch, which was the largest in the world for a time. Having seen them in action, I would not argue with that. Even more amazing, the images can be in color. Some future telescopes are likely to have video cameras at their focal plane instead of eyepieces, wirelessly downloading images to a nearby laptop. The laptop will be discarding blurry images and stacking good ones in near real-time to show faint deep sky objects as well as planets in amazing detail, color, and resolution. And, using fast Fourier transforms and frequency analysis, the telescope will be able to keep itself in focus. You may even be ensconced in your warm study on a cold winter's night, remotely controlling your telescope in your backyard observatory.

However, with all these technological advances, nothing will replace the thrill of sitting at the eyepiece, manually chasing down that last galaxy in Markarian's Chain or Stephan's Quintet, or marveling that the photons streaming through the eyepiece and stimulating your eye have been traveling through space for millions of years

Bill Helms
President@FloridaStars.org
Alachua Astronomy Club

28 Double Stars for Outreach

By: Mike Toomey

Outreach programs often confront us with challenging observing conditions; light pollution, moonlight, trees and clouds often being present. A dearth of bright planets may seem discouraging. Perhaps the greatest adversary: competing with a dozen large-aperture telescopes already trained on the Orion Nebula.

Filling the gaps between planets and bright, deep-sky objects are an abundance of double stars. Accompanied by a little context, these targets provide a myriad of opportunities to share astronomy with any audience. To that end, I am submitting a short list of easily located and resolved double stars (see pages 7 through 10). This is not an observing challenge. All 28 stars are included on the Astronomical League's Double Star Observing Club list. Think of these as the Greatest Hits: there may be more talented stars out there but these have the best publicists.

The criteria for this list is as follows:

- Distribute the targets throughout the sky so that one or more would always be visible, even in partly cloudy skies. The pages are divided by season, with 7 stars listed per page. Polaris is included in the Autumn.
- From Gainesville, each star rises at least 30 degrees above the horizon at some point in the evening.
- Each star system is easily resolved in a small telescope – 8" of aperture or less.
- Each star is visible to the naked eye, most from within moderate light-pollution. All but 2 stars (61 Cygni and k Puppis) have a Greek-letter designation. In other words, they are bright!
- Most of these stars are gravitationally bound binary stars or multiple star systems, although the list maintains a few optical favorites.

You can retrieve a no tear, water resistant copy of the list at a club meeting or star party (while supplies last). Updates to the list will be maintained on the club's web site. Look for the version number near the top of the first page (labeled *Winter*). Corrections and suggestions are encouraged!

The Data

Most common names and meanings were taken from *A Dictionary of Modern Star Names* by Paul Kunitzsch and Tim Smart. Based on that text, only the most authentic names and meanings were included (a few nicknames were included in the Fast Facts portion, such as the "Boy Scout Star.")

Coordinates, separation and magnitudes were retrieved from *Double Stars for Small Telescopes (More Than 2,100 Stellar Gems for Backyard Observers)* by Sissy Haas. Rounding was sometimes applied.

Numerical data, such as distances and orbits, as well as many of the suggested talking points were drawn from James B. Kaler's "Stars" web page: www.astro.uiuc.edu/~kaler/sow/sowlist.html

Notably, I did not include position angle in the data since I do not think most audiences would be interested in knowing that, nor would the telescope operator need that information for these easy doubles. I did, however, include the right ascension and declination even though most of these stars are easily found by star-hopping. That data was included for referencing star charts.

Terms and Concepts

There are a number of excellent resources for learning about double stars so I won't repeat what they have to say. For the purpose of the list, however, and to provide a couple of basic talking points, here are some concepts you may encounter:

A **binary star** (see *First Light*, October 2000, H. L. Cohen.) includes any **multiple star system** that does not merit the term **star cluster** (see *First Light*, March 2000, H. L. Cohen). For instance, Castor is comprised of two bright, easily resolved stars. However, the Castor system is comprised of six stars, 3 of which are detected spectrographically. My arbitrary rule: if you have enough fingers to count all the stars in a group, it is a star system, not a cluster. Binary also implies a gravitationally-connected star system. All others are labeled **optical doubles**.

Separation: Most casual observers cannot accurately describe the separation of two stars in terms of arc-seconds; the statistic is only provided for comparison. Do not expect this number to tell the entire story: a close double may be easier to resolve than a wide double depending on the magnitudes of each star.

28 Double Stars for Outreach (continued from page 5)

By: Mike Toomey

Spectral class: Those versed in stellar evolution might employ this information the best. For the rest, just remember that color indicates temperature: blues and whites are hot, reds and oranges are cool.

How do we know?

The most commonly asked question while presenting double stars is, "How do we know that they are together, and not a chance alignment?"

Astronomers suspected that many double stars were associated with one another before we could measure their distances or accumulate orbital measurements. In 1767, John Michell postulated that it was quite likely that these double stars were joined by gravity and that, statistically speaking, so many line-of-sight doubles could not be coincidence. (W.T. Lynn, *The Observatory*, Vol. 30, 1907, p.314). Furthermore, he was the first to apply Newton's laws outside of our own Solar System. (Bob Argyle, editor. *Observing and Measuring Visual Double Stars*. Springer, 2004, pp.10-11.)

Nowadays, we can sometimes determine the distance to each star with reasonable accuracy. We may also be able to measure each components' **proper motion** (the angular motion of a star on the celestial sphere resulting from the star's motion in space) employing careful position measurements. If this motion appears the same for both stars, it's a safe bet that these stars are associated with one another even if they are no longer gravitationally bound. (Stars may have been born from the same stellar cloud but not enough time has elapsed for them to give up the appearance of being binary.)

Finally, with enough observations spread over time (years, decades, or even longer), we can measure the apparent orbit of one star around another. However, of more than 100,000 cataloged binary stars, only 1,745 have known orbital periods (Haas, p. 4).

***Mike Toomey** has served the AAC in many capacities since 1998, including President, Secretary, FirstLight editor and Star Party Coordinator. He won the AAC's Service Award in 2000. Mike resides in Gainesville with his wife Heidi.*

Photo Left

Chuck Broward took this photo of the shuttle launch from Payne's Prairie, March 15th at 7:43pm.

Several members of the AAC were at the prairie to try and capture the moment.

28 Double Stars for Outreach

Bayer + Latin Infinitive	Gr.	Common	R.A.	Dec.	Apparent Sep.	m1	m2	Colors
Distance from Us	Actual Separation		Comparative Distance		Orbital Period	Spectra		How to Find
Beta Orionis	**β**	**Rigel**	**05h 14m**	**-08° 12'**	**9.4"**	**0.3**	**6.8**	
775 ly	2200 AU		55x Sun-Pluto		unknown	B	B	brilliant white w/ slight violet
Rigel translates to "the foot of al-jauza" (perhaps "the Great One"). 6th brightest star in the sky. Most luminous star in the local region of Milky Way. This blue supergiant is 40,000 times more luminous than our sun! Rigel is usually brighter than Betelgeuse (the later being highly variable). The companion star has the same proper motion but no orbital motion has been detected.								Rigel is a bright, white star marking the right foot of Orion. It is opposite (diagonally) from bright, orange Betelgeuse.
Sigma Orionis	**σ**	**-**	**05h 39m**	**-02° 36'**	**11", 13", 42"**	**3.7**	**8.8**	
1150 ly	90 AU (AB)		2.25x Sun-Pluto (AB)		170 yrs (AB)	O	B	straw-yellow w/ white-gray companions
Four stars easily distinguished; a fifth (the brightest) is itself a close pair (AB), just 1/4" apart. The entire system spans about 15,000 AU across. The closest pair (AB) are just 90 AU apart. A-B are gravitationally bound (170 yr orbit) while C,D,E will eventually depart the system. Each of these stars are young, luminous dwarfs; A and B are 30,000 times brighter than our sun.								Small star cluster just below (south) of Alnitak, the eastern-most star in Orion's Belt. Appears as a single star to unaided eye.
Gamma Leporis	**γ**	**-**	**05h 55m**	**-22° 27'**	**97"**	**3.6**	**6.3**	
29 ly	870 AU		22x Sun-Pluto		18,000 yrs	F	K	Sun-yellow + brick-red
No common name for this star. The constellation, Lepus, is the "Hare". A wide pair, easily resolved in binoculars, but a true binary nonetheless. A high priority target for NASA's Terrestrial Planet Finder program owing to its proximity to us.								Lepus is directly south of Orion. γ forms a near perfect backward "L" along with bright stars α and β Leporis.
Theta Aurigae	**θ**	**-**	**06h 00m**	**+37° 13'**	**3.8", 135"**	**2.7**	**7.2, 10.1**	
173 ly	185 AU		4x Sun-Pluto		1200 yrs	A	G	white or blue or purple + silver-gray
No common name despite being the 3rd brightest star in Auriga (4th if counting Elnath). Colors have been described as deceptive, perhaps due to Theta's unusual composition, which is high on metals, especially silicon, chromium and iron. Sometimes referred to as a "silicon star."								Theta is the eastern-most star in the easily recognized "pentagon" that makes up Auriga. Auriga includes the bright star Capella.
Beta Monocerotis	**β**	**-**	**06h 29m**	**-07° 02'**	**7.1", 2.9"**	**4.6**	**5.0, 5.3**	
690 ly	590 AU, 1570 AU		15x/40x Sun-Pluto		4200; 14,000y	B	B, B	trio of pale-white stars
Fantastic triple star! Each component is a blue-white dwarf, a mere 30 – 40 million years old. B and C (the dimmer and spread apart pair) are actually closer (590 AU) than the A component. B-C have a common center of mass while A orbits the pair (14,000 year orbit).								Most difficult target on this list; consult a star chart. β may not be visible to naked eye in city lights. β is slightly brighter than α.
Delta Geminorum	**δ**	**Wasat**	**07h 20m**	**+21° 59'**	**5.8"**	**3.6**	**8.2**	
59 ly	100 AU		2.5x Sun-Pluto		1200 yrs	A	K	amber-yellow + purple
Wasat means "middle", describing a star in the middle of this constellation. Clyde Tombaugh discovered Pluto close to this star in 1930. It also closely marks the spot in the sky where Pluto crosses the ecliptic from south to north.								As the name implies, it is roughly in the middle of Gemini, midway between Pollux and Alhena.
Alpha Geminorum	**α**	**Castor**	**07h 35m**	**+31° 53'**	**4.2", 164"**	**1.9**	**3, 9.8**	
49 ly	68 x 133 AU		2.5x Sun-Pluto		445 yrs	A	A	bright lemon-white pair
Castor, along with Pollux, make up the Gemini twins. There is no physical relationship between Castor and Pollux; Pollux is almost 100 ly away. The distant C companion is part of the system, 25 times the distance between Sun-Pluto. All 3 stars have a spectroscopic binary, making this a sextuple star system.								Discern Castor from Pollux using other bright stars: **C**astor is nearer **C**apella while **P**ollux is nearer **P**rocyon, each beginning with the same first letter respectively.

Summer **28 Double Stars for Outreach**

Bayer + Latin Infinitive	Gr.	Common	R.A.	Dec.	Apparent Sep.	m1	m2	Colors
Distance from Us	Actual Separation		Comparative Distance		Orbital Period	Spectra		How to Find
Zeta Ursae Majoris	**ζ**	**Mizar**	**13h 24m**	**+54° 56'**	**14.3"**	**2.2**	**3.9**	
78 ly	500 AU		13x Sun-Pluto		5000 yrs	A	A, A	bright green-white pair; Alcor = white
Mizar and Alcor are misapplied titles. Mizar means "the groin;" Alcor, "the Black Horse." Together, "the horse and rider." Mizar, by itself, is the 1^{st} known telescopic double star (1650?). Mizar A & B are both spectroscopic binaries. Alcor, 3 ly away, shares the same proper motion.								The second star from the end of the handle of the Big Dipper. Alcor (80 UMa) lies just $1/5^{th}$ of a degree from Mizar.
Epsilon Boötis	**ε**	**Izar**	**14h 45m**	**+27° 04'**	**2.9"**	**2.6**	**4.8**	
200+ ly	185+ AU		5x Sun-Pluto		1000+ yrs	K	A	pale-orange + sea green
While the name is Arabic, the name Izar ("girdle" or "loin cloth") was applied in recent times. Since revealed as a double star, it has also been known as Pulcherima, "the Most Beautiful." The class K giant is 4 times the mass of our Sun; the class A dwarf is twice the mass of our Sun.								Boötes is a kite-shaped figure. Izar is the first bright star to the northeast of Arcturus.
Beta Scorpius	**β**	**Graffias**	**16h 05m**	**-19° 48'**	**13.6"**	**2.6**	**4.5**	
530 ly	2200 AU		56x Sun-Pluto		16,000 yrs	B	B	pale white + cobalt-blue or lilac
Graffias means "the claws." The name Acrab ("The Scorpion") is also often used. There are several spectroscopic companions in this system. Jupiter's moon Io occulted this system in 1971, teaching us a lot about this system's properties.								A prominently positioned star in the head (or claws) of Scorpio, north ("above") Antares. It is also north of δ, about the same brightness.
Alpha Herculis	**α**	**Rasalgethi**	**17h 15m**	**+14° 23'**	**4.8"**	**3.5**	**5.4**	
380 ly	550 AU		14x Sun-Pluto		3000 yrs	M	G	orange-red + turquoise
This difficult name means "the Kneeler's Head", owing to an even earlier portrayal of the stars in Hercules. α^1 is a supergiant with a surface temp of just 3300° K. With the help of solar wind, a cloud of ejected gas has enveloped the distant companion star (α^2). α^1 star may have just enough mass to produce a supernova. α^2 has a spectroscopic companion (class F).								The 5^{th} brightest star in Hercules, it can easily be miscast to nearby Ophiuchus. Also be forewarned, Alpha is highly variable (1 full mag.) Use Rasalhague (α Oph) as a guide star.
Epsilon^1 Lyrae	**ε^1**	**"Double-**	**18h 44m**	**+39° 40'**	**2.1"**	**5.0**	**6.1**	straw-yellow + arctic-blue
Epsilon^2 Lyrae	**ε^2**	**Double"**			**2.4"**	**5.3**	**5.4**	amber-yellow pair
160 ly	80 AU, 140 AU ?		2x, 5x Sun-Pluto ?		700y, 1700y ?	A, A	A, A	
No known classical name; now aptly titled "The Double-Double". Each star has a very close companion that many observers may miss on first inspection. ε^1 and ε^2 are at least 10,000 AU apart. An observer in one system would see the other binary separated by about a degree and shining with the light of a quarter moon!								Epsilon is the closest naked-eye star to Vega, a little more than 1 degree to the northeast. ε^1 and ε^2 are a naked-eye double (210") but are more readily resolved in binoculars.
Beta Cygni	**β**	**Albireo**	**19h 31m**	**+27° 58'**	**35"**	**3.4**	**4.7**	
380 ly	4,400 AU ?		113x Sun-Pluto ?		75,000+ yrs ?	K	B	citrus-orange + royal blue
Albireo roughly translates to "the Bird", though it is often described as "the Beak." It has also earned the nickname, "the Boy Scout Star", attributed to the pair's gold-blue combination. While similar in distance, these stars might not be gravitationally bound to one another.								Albireo is the base of the asterism "the Northern Cross."
Alpha Capricornus	**α**	**Algedi**	**20h 18m**	**-12° 30'**	**46"**	**3.7**	**4.3**	
690 ly, 109 ly	n/a		n/a		n/a	G	G	whitish-gold pair
Algedi, "the Kid", refers to the constellation, "The Sea Goat." This naked-eye double is optical only, each having very different distances. While such bright alignments are rare, these stars are rarer still: both are dying, yellow class G stars. A dim 9^{th} magnitude star lies 6' to the WNW.								An obvious naked-eye double in the most northwestern part of the constellation Capricorn. Brighter β lies 2 degrees south.

Spring **28 Double Stars for Outreach**

Bayer + Latin Infinitive / Distance from Us	Gr. / Actual Separation	Common	R.A. / Comparative Distance	Dec.	Apparent Sep. / Orbital Period	m1 / Spectra	m2	Colors / How to Find
Epsilon Canis Majoris	**ε**	**Adhara**	**06h 59m**	**-28° 58'**	**7”**	**1.5**	**7.5**	
430 ly	920 AU		24x Sun-Pluto		7500 yrs	B	A	bright white + deep yellow
Name adopted from an asterism formed by 3 (or 4?) southern stars of CMa; means “the Virgins.” The companion star is 250 times dimmer than Adhara so it may not be immediately obvious. 5 million years ago, this star was just 34 ly away. At that distance, it was as bright as Venus.								Despite the Bayer designation Epsilon, this is the 2nd brightest star in CMa. It is the lower-right star in an obvious triangle below (south of) Sirius.
k Puppis	**-**	**-**	**07h 39m**	**-26° 48'**	**9.8”**	**4.4**	**4.6**	
450 ly, 470 ly	20 ly (not binary)		4.5x Sun-α Centauri		n/a	B	B	bright white, perfectly matched
Note: This star is designated “k” and <u>not</u> Kappa. It is still a Bayer designation. Puppis was once part of the constellation Argo Navis (now divided into 4 constellations), hence the low order. The name Markeb was applied to this star (and others) in the past but is now just “k Puppis.” These stars are 450 and 470 ly away and are not physically related (optical double).								Star chart may be necessary. Kappa is a relatively modest star near “the Virgins” of Canis Major (the 4 bright stars below Sirius). Aludra (η CMa) is the nearest bright star.
Iota Cancri	**ι**	**-**	**08h 47m**	**+28° 46'**	**31”**	**4.1**	**6.0**	
300 ly	2800+ AU		72x Sun-Pluto		65,000+ yrs	G	A	sun-yellow + royal-blue
Despite being the 2nd brightest star in Cancer, it is one of only a few naked-eye stars in this constellation without a known name. Decapoda (“ten footed”) has been applied (in astrology?). The primary component (yellow) is a class G giant; the companion (blue) is a class A dwarf. The stars have the same proper motion but may not orbit one another (loose-knit binary).								Difficult in twilight and light pollution. Directly north of the Beehive cluster (which lies near center of the constellation Cancer). It forms the base of an upside-down “Y”.
Gamma Leonis	**γ**	**Algieba**	**10h 20m**	**+19° 50'**	**4.6”**	**2.4**	**3.6**	
126 ly	15 x 180 AU		2.5x Sun-Pluto		620 yrs	K	G	orange/gold + greenish-?
Algieba means “forehead”, in this case, of the lion. Both stars are giants, twice as massive as our sun and many times larger (diameter-wise). The radiant of the famed Leonid meteor shower (and occasional storms) is nearby.								Algieba is the 2nd brightest star in the “Sickle” or “Backward Question Mark”, a famous asterism. The dot in the Question Mark is Regulus.
Delta Corvi	**δ**	**Algorab**	**12h 30m**	**-16° 31'**	**25”**	**3.0**	**8.5**	
87 ly	650 AU		17x Sun-Pluto		9400 yrs	B	K	straw-yellow + gray or purple
An abbreviated name meaning “the Raven's wing.” The B component is noteworthy in that it is only 110 million years old and has just begun its long period as a main sequence star. There is still evidence of some dust in its disk.								The “top” or sometimes “upper-left” star in the easily recognizable, square-shaped constellation Corvus.
Gamma Virginis	**γ**	**Porrima**	**12h 42m**	**-01° 27'**	**0.4” + + +**	**3.5**	**3.5**	
38 ly	3 x 70 AU		Sun-Ceres/2x Sun-PL		169 yrs	F	F	silver-white + yellow-white
Porrima (Latin) is a Roman goddess of future (along with Postverta). These stars reached their closest approach to each other (periastron) in 2005. The ability to resolve this system in small telescopes is uncertain but it should be closely monitored. The two components are of nearly equal brightness and similar color.								Porrima lies along a line between Denebola (the tail of Leo) and Spica... and a little bit closer to Spica.
Alpha Canun Venaticorum	**α**	**Cor Caroli**	**12h 56m**	**+38° 19'**	**19”**	**2.9**	**5.5**	
110 ly	650 AU		200x Sun-Pluto		7900 yrs	A	F	white + sea-green
A recently introduced star name (1673) meaning Heart of Charles after King Charles I of England. α^2, the brighter star in this system, is a prototype variable. Its strong magnetic field produces enormous sunspots, altering the brightness of this star as it rotates (about once every 5.5 days).								The brighter of two stars lying between the handle of the Big Dipper and the tail of Leo.

Autumn **28 Double Stars for Outreach**

Bayer + Latin Infinitive	Gr.	Common	R.A.	Dec.	Apparent Sep.	m1	m2	Colors
Distance from Us	Actual Separation		Comparative Distance		Orbital Period	Spectra		How to Find
61 Cygni	**Piazzi's Flying Star**		**21h 07m**	**+38° 45'**	**31"**	**5.3**	**6.1**	
11 ly	85 AU		2x Sun-Pluto		650 yrs	K	K	amber-yellow pair
This star has a large proper motion (movement in relation to other background stars) partly due to its proximity. Besides our Sun, this was the first star to have its distance calculated (1838). These are the dimmest class K stars visible to the unaided eye. Each is half a solar mass and shine only 15% and 9% as bright as our Sun, respectively.								61 lies to the northwest of Sadr, the star at the intersection of the Northern Cross. 61 forms a parallelogram along with Deneb (α), Sadr (γ) and Gienah (ε).
Xi Cephei	**ξ**	**Kurhah**	**22h 04m**	**+64° 38'**	**7.9"**	**4.4**	**6.4**	
100 ly	273 x 445 AU		9x Sun-Pluto		3800 yrs	A, F	F	lemon-white + royal-blue
Kurhah may mean "the white spot on the forehead of a horse." It is also sometimes referred to as the "heart of the King (Cepheus)". ξ-A is a spectroscopic double. 13th mag ξ-C is not assoc.								Like its namesake, Kurhah is a conspicuous star near the center of Cepheus.
Zeta Aquarii	**ζ**	**-**	**22h 29m**	**-00° 01'**	**2"**	**4.3**	**4.5**	
103 ly	95 x 210 AU		3.5x Sun-Pluto		760 yrs	F	F	white-citrus orange pair
A"southern star" until 2003, it crossed the celestial equator due to precession (the 26,000-year wobble of the Earth's axis). A pair this close may not ordinarily be resolved in a small telescope but these can owing to their very similar magnitudes.								Part of the asterism "Water Jar" or "Urn". The second star from the left (east) in the Urn.
Eta Cassiopeiae	**η**	**-**	**00h 49m**	**+57° 49'**	**13"**	**3.5**	**7.4**	
19 ly	70 AU		1.75x Sun-Pluto		480 yrs	G	K	yellow + copper-orange
In most respects, the primary star (η Cas A) is a Sun-like star. It is a yellow-white, hydrogen-fusing, class G dwarf, just a tad cooler than our Sun. It is 28% more luminous, 15% larger and 7% more massive than our Sun. Its companion is a class K dwarf, half the mass of our Sun.								Within the figure "3" or "E" created by Cassiopeia but does not contribute to that figure, η is a moderately bright star near Schedar (α).
Gamma Arietis	**γ**	**Mesarthim**	**01h 53m**	**+19° 18'**	**7.5"**	**4.5**	**4.6**	
204 ly	500 AU		13x Sun-Pluto		5000 yrs	B	A	bright white match
The name has been corrupted, lacking a clear meaning. It has also been known as "the first star of Aries" since it was the closest bright star to the vernal equinox. Due to precession, that point now lies in Pisces. This pair of perfectly matched white stars has also earned the nickname "the Ram's Eyes". γ^2 has a strong magnetic field created by an abundance of metals.								Mesarthim is the 3rd bright star in the 3-star pattern forming Aries. Visualizing these 3 stars as a gun or rifle, γ represents the butt or handle.
Gamma Andromedae	**γ**	**Almach**	**02h 04m**	**+42° 20'**	**9.7"**	**2.3**	**5.0**	
355 ly	1000 AU?		?		?	K	B, A	citrus-orange + deep blue
Almach was originally Alamak, which referred to a mid-eastern cat called a Caracal. It was erroneously transcribed to Almaq meaning "the boot" or "the buskin". γ^1 and γ^2 are among the best contrasting doubles in the sky. The fainter blue companion is also a double but is near impossible to resolve with a small telescope (¼ – ½" separation) with an orbital period of 64 yrs.								γ is the last in a string of 3 bright stars forming the constellation Andromeda. α joins a corner of the Great Square of Pegasus; β sweeps past M31, then γ lies an equal distance west.
Alpha Ursae Minoris	**α**	**Polaris**	**02h 32m**	**+89° 16'**	**18.6"**	**2.1**	**9.1**	
430 ly	2400 AU		62x Sun-Pluto		42,000 yrs	F, F	F	amber-yellow + pale white
Often known as the North Star, it is about the 50th brightest star in the sky. Polaris has two dwarf companions, one near (spectroscopic), and one far (as seen in a small telescope). Polaris is the brightest Cepheid variable in the sky, although the variation is almost indiscernible At low power, Polaris forms a jewel among a ring of dimmer stars called the "Engagement Ring."								Polaris is a relatively isolated star, forming the tail of the Little Dipper (an asterism that forms most of the constellation Ursa Minor).

June Club Meeting

Tuesday, June 9 2009, 7:00 p.m. ET

Speaker: **Bob Duvall**

Email: telescopemaker@yahoo.com

Title: *Re-Discovering the Moon*

Location: Powell Hall, Florida Museum of Natural History
Lucille T. Maloney Classroom,
UF Campus, Gainesville, Florida

Mr. Bob Duvall

Preview: Next to the Sun, The Moon is one of the most prominent objects in the sky. Like the Sun, it interferes with study of deep space objects; but it also presents many exciting opportunities for using your telescope. Join Bob as he gives a tour of the latest in Lunar Observing, focusing on computer-assisted observing, which will make the Moon come alive for you. ind why more and more amateurs are turning to to study what some have called the nearest planet. Learn how to get the most enjoyment out of observing our Moon and how you can even make valuable contributions to science in the process!

About the Speaker: Bob started his pursuit of the universe at age 15 with a homebuilt 6 inch Newtonian. His interest in the Moon has always been great- the Gemini and later Apollo missions to land man on the Moon spurred that interest. Add his favorite movie 2001: A Space Odyssey, with men living on the Moon, on the Clavius basin, and the fascination only grew.

Bob graduated from Cornell University as an Aerospace engineer. While there, he studied celestial mechanics, jet and rocket propulsion systems and modeled supersonic airflow on computers. Personal computers were just taking off at that time and he was swept up in its advance. Bob has worked as a professional software developer for over 30 years. He has worked and consulted for many major companies including IBM, Apple Computer, Lotus, Northop. His professional interests include imaging, digital signal processing and computer graphics. As an amateur astronomer, Bob has always been a telescope maker - creating affordable telescopes on a shoestring. This led to his becoming an amateur optician, making over three dozen telescope mirrors, ranging from 4 1/2 to 18 inches. He currently owns several telescopes: 6, 8, and 12.5 inch telescopes that he's made and he is now in the process of building a 22.5 inch and a permanent observatory for his instruments.

Bob is an active imager, beginning in film and now digital. He imaging is primarily focused on Shallow Sky, High Resolution, Lunar and Planetary digital photography.

The desire to share his love and interest for the Moon led him to a 5 year long project to develop two Lunar software products: *Lunar Discoverer* and *Lunar Pronouncer*. Other strong interests are writing and performing music and scuba diving.

Equality on the Equinox?

— Howard L. Cohen

On equinox or solstice dates news media usually print articles about the onset of the new season. For example, a *Gainesville Sun* article, "Spring is in the air" (March 20, 2009) noted correctly that “Spring will officially blow into town today on northerly winds at 7:44 a.m.”

However, most articles on this topic also usually state, “It is the first of two days when daylight and dark are equal lengths.”

This is incorrect and propagates a common mistake!

For example, daylight in Gainesville, Florida on March 20, 2009 exceeded darkness by approximately fifteen minutes. One can see this by looking at sunrise and sunset times for Gainesville on this day, 7:33 a.m. and 7:40 p.m. EDT respectively.

In fact, equal days and nights for Gainesville occurred about March 16, four days before the equinox, when the Sun rose and set at 6:38 a.m. and 6:38 p.m. From this date until about September 27, and not this year’s September 22nd equinox, daylight will exceed darkness. The actual dates depend on latitude with people on the equator always having more daylight than darkness.

Several effects cause this. Two important ones relate to the Sun’s apparent size and our atmosphere. The Sun is not a point on our sky but a disk. We define sunrise when the Sun’s upper edge first appears above the horizon and sunset when the Sun’s bottom edge last disappears. These times determine the moments of first and last sunlight. Therefore, duration of daylight is not when the Sun’s center is on the horizon but with the first and last appearance of the Sun’s upper edge.

In addition, atmospheric refraction or bending raises the Sun’s disk by slightly more than the its own apparent diameter when the Sun is near the horizon. Thus, we see the Sun for a few minutes before actual sunrise and see the Sun for a few minutes after it sets.

The result? In the Northern Hemisphere we get more sunlight than darkness from several days before the March equinox until several days after the September equinox.

Equinox may imply “equal” but its acceptance as truth is based more on constant repetition rather than fact.

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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.*

2009 Winter Star Party - Florida Keys

Photos by: Howard Eskildsen

Clockwise from top left: Lucille and Fred Heinrich—registrars for the Winter Star Party; Gay Haldeman, Chuck Broward and guest; Scott Roberts, former Meade executive and founder of Explore Scientific displays his wares while Howard Eskildsen, Tippy D'Auria and Dr. Mike Reynolds take it all in; Tippy D'Auria, a new AAC member and founder of the Winter Star Party, introduces Howard Eskildsen's lecture entitled "*Hooked on the Moon*;" Winter Star Party sign and Layout; Howard, Terry Mann, president of the Astronomical League and Dr. Bard Harris who owns the Coronado 90 H-alpha solar scope.

The Swiss Army Knife of Weather Satellites

Spotting volcanic eruptions, monitoring the health of crops, pinpointing distress signals for search and rescue teams. It's not what you might expect from a weather satellite. But these are just a few of the abilities of NOAA's newest polar-orbiting weather satellite, launched by NASA on February 6 and turned over to NOAA for full-time operations on February 26.

Formerly called NOAA-N Prime and now renamed NOAA-19, it is the last in its line of weather satellites that stretches back almost 50 years to the dawn of the Space Age. Over the decades, the abilities of these Television Infrared Observation Satellites (TIROS) have gradually improved and expanded, starting from the grainy, black-and-white images of Earth's cloud cover taken by TIROS-1 and culminating in NOAA-19's amazing array of capabilities.

"This TIROS series has become quite the Swiss army knife of weather satellites, and NOAA-19 is the most capable one yet," says Tom Wrublewski, NOAA-19 Satellite Acquisition Manager at NASA's Goddard Space Flight Center in Greenbelt, Maryland.

The evolution of TIROS began in 1998 with NOAA-K. The satellites have carried microwave sensors that can measure temperature variations as small as 1 degree Celsius between Earth's surface and an altitude of 40 kilometers—even through clouds. Other missions have added the ability to track large icebergs for cargo ships, monitor sea surface temperatures to aid climate change research, measure the amount of ozone in Earth's protective ozone layer, and even detect hazardous particles from solar flares that can affect communications and endanger satellites, astronauts in orbit, and city power grids.

NOAA-19 marks the end of the TIROS line, and for the next four years it will bridge the gap to a new series of satellites called the National Polar-orbiting Operational Environmental Satellite System. NPOESS will merge civilian and military weather satellites into a single system. Like NOAA-19, NPOESS satellites will orbit Earth from pole to pole, circling the planet roughly every 100 minutes and observing every location at least twice each day.

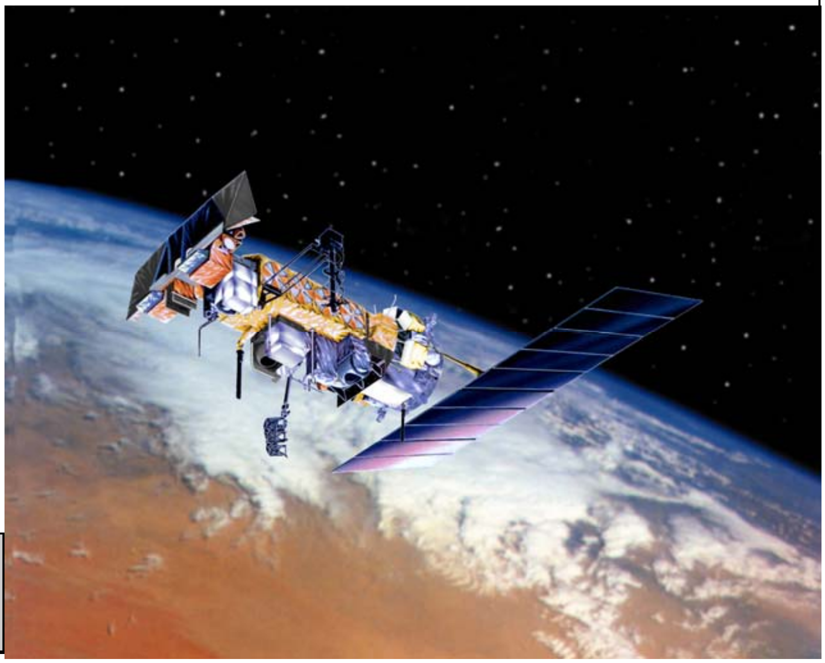
NPOESS will have yet more capabilities drawn from its military heritage. Dim-light sensors will improve observations of the Earth at night, and the satellites will better monitor winds over the ocean — important information for ships at sea and for weather and climate models.

"A lot more capability is going to come out of NPOESS, improving upon the 161 various environmental data products we already produce today," Wrublewski says.

Not even a Swiss army knife can do that many things, he points out.

For more on the NPOESS, check out http://www.npoess.noaa.gov. Kids can find out about another NOAA satellite capability—tracking endangered migrating species—and play a fun memory game at http://spaceplace.nasa.gov/en/kids/poes_tracking.

This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.



The new NOAA-19 is the last and most capable in the long line of Television Infrared Observation Satellites (TIROS).

SFC Planetarium Lecture

Photos by: Rich Russin

Top left: Laurent Pellerin, Director, Kika Silva Pla Planetarium;

Top right: Kristin Fiaccato and Tim Malles outside the Planetarium;

Bottom left:: AAC members inspecting the Chronos Projector;

Bottom right: Kristin Fiaccato at the Chronos control console

STAR PARTY / OBSERVATION SCHEDULE: Upcoming Events - 2009

Star Party Event	Date	Location Check the website for directions and map	Start/End Time
Astronomy Day at Santa Fe College	May 2nd	Santa Fe College	Sunset approx 8:05 pm EDT
AAC May Star Party	May 23rd Saturday	Chiefland Astronomy Village /Duval Residence	Sunset approx. 8:15 pm EDT
AAC June Star Party	June 20th, Saturday Rain date: 27th	Hurricane Harbor (Bob Jacobs Residence)	Sunset approx. 8:30 pm EDT
No Star Party in July			

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