

# The FBAC Observer

Volume 19, Issue 6

June, 2005

## The CCD Chronicles

Wes Whiddon

## Part III

**One of the first things** I talked about last month was establishing rules for CCD imaging. And the first one I established was to remember to look up. It's easy to get so involved in the mechanics of imaging that we forgot about the sky. All kind of crazy things can happen when we do that.

At the end of my May article, I was still in the throes of trying to focus my first time out with a CCD camera. It's easy to focus a telescope by eye. Just look in the eyepiece, grab the knob, and move it one way or the other. As we do that the star, planet, galaxy, whatever becomes clearer, more concentrated, and brighter in the eyepiece. After a while, according to our experience and eyesight, we become satisfied with the result and stop. But there's still a tiny problem. The human eye/brain combination is quite good at accommodation. The object may actually be somewhat out of focus but it's satisfactory in our mind so we let it go. That won't work for imaging.

So, back to the business at hand, namely getting a focused image on the chip where we can actually shoot something beautiful like M42.

In May I ended with the statement, "And saw... absolutely nothing." That seemed to be happening a lot on that night and here's why it happened then.

I had been focusing on a very bright star, one that saturated the CCD detector, causing giant blooms in the image. Final focus on such a star is impossible so I moved the scope to another part of the sky to find dimmer stars. I saw nothing in my next image because I forgot that I had to increase exposure time. I was probably using exposures of 0.1 second for the bright star. When I moved into another field, I should have immediately increased exposure time to 1 second or longer.

So here's rule #2: **When you make a change, pay attention to what you're doing and think.** It took me several minutes to figure out what was going on. I simply didn't remember that I had to increase exposure. Sounds a little stupid but stranger things will happen I can assure you.

After a while I finally figured out my mistake and when I changed exposure time, I saw some stars in the field. Now I was ready to begin final focus adjustments.

Eventually, after you've done it enough times, you will develop a focusing method that works for you. What follows is not gospel, only a method that works for me. You can adapt it, modify it, or trash it if you find something better. But

for better or worse here's how I do it.

The first thing we typically do is focus by eye. We always, of course, need to do this in the initial stages of focusing. When I spoke last month about a bright blob on the screen, I was talking about an out of focus star in an SCT. A bright, out of focus star will look different in different scopes. In an SCT or reflector, you'll see a large black spot, the shadow of the secondary mirror, in the middle of the image. In a refractor, there'll just be a bright blob.

As you refine focus, the blob becomes brighter and more concentrated and, in reflecting telescopes and SCTs, the central obstruction shadow will start to disappear. Something else happens in a reflector (I know that theoretically a Schmidt-Cassegrain is a reflector but there is a difference as I will note shortly). As you approach final focus, and if a star is bright enough, diffraction spikes will form from the spider vanes that hold the secondary mirror in place. This phenomenon can be used effectively to indicate good focus. The closer you get to focus, the longer and more defined the diffraction spikes will appear. We've all seen beautiful CCD images showing stars with classic spikes surrounding them. This effect is even so desired by some imagers using refractors that they intentionally place thin pieces of tape in front of their objective lens to produce spikes in the final product.

But what about telescopes without spider vanes? Well, as mentioned in the last paragraph, you can produce your own. It's simple to take a couple of pieces of masking tape and stick them on the outside of your dew shield. Try to get them as close to center as possible but they don't have to be perfect. You will then be able to get fairly close to final focus by checking for maximum length spikes.

Focusing masks are another method you can use. These are actually a takeoff on spider vane focusing but can be used very effectively. To make a focusing mask, take a piece of cardboard, plastic, whatever thin material you have, mark it the same size as the diameter of your scope, and cut a couple of 1 inch holes in the mask. Placement of the holes are not critical but should be about 1/2 the distance from the outside of the mask to the center of your scope. For instance an 8" scope would have holes about 2 inches in from the side of the mask.

Place the mask on the front of the scope and start an imaging run with your camera. In an out of focus condition, the star will appear as a double in the image. As you approach focus, the two images will converge and become one—at least

## Astro Happenings In June

**Wednesday, June 1:** Get up early and watch the waning crescent Moon. By the 5<sup>th</sup> day of June Luna sits only 1 degree away from the Pleiades.

**Thursday, June 2:** Europa and Io cast their shadows across the face of Jupiter. In your telescope look for small black circles on the cloud face of the planet. Europa's shadow appears first in the line up at around 9:42 p.m. CDT.

**Friday, June 3:** Mercury at superior conjunction this morning. Superior conjunction means the planet passes on the far side of its orbit, slightly above the sun's disk. But, magically, Mercury becomes an evening planet next week.

**Saturday, June 4:** Check out a solitary Mars in the morning sky at mag 0 but getting brighter during the month. Unfortunately there's not much to see as the planet is too far away from Earth.

**Sunday, June 5:** Jupiter ends retrograde motion and begins to travel eastward relative to the stars. Making careful position notes each night, note that the Jovian planet begins to move back past the star Gamma in Virgo.

**Monday, June 6:** New moon at 4:55 p.m. CDT.

**Tuesday, June 7:** A skinny moon appears just after sundown. Venus is 7 degrees or so above in the northwest. Use your binoculars.

**Wednesday, June 8:** Luna is 6 degrees above Venus, Saturn rests 14 degrees above and to the left of the Moon. If you're lucky you can spot Mercury 11 degrees below and to the right of Venus. Binoculars are a must. **WARNING! BE VERY CAREFUL WHEN OBSERVING NEAR THE SUN WITH BINOCULARS OR A TELESCOPE.**

**Thursday, June 9:** A beautiful crescent Moon splits the Gemini twins from Saturn. And can there be insects on the Moon? Find out tomorrow night when Luna passes near the Beehive Cluster.

**Friday, June 10:** Not much happening today. Take some time off from observing. Clean your eyepieces. Collimate your scope. Finish building that giant Dobsonian. Look around in the house and find out if you still have a family.

**Saturday, June 11:** A triage of Venus, Mercury, and Saturn begins to form, squeezing from 24 degrees today down to 1.5 degrees by June 25.

**Sunday, June 12:** Regulus and the Moon rendezvous in the heart of Leo. Haul out the scope and take a look. A few nights before 1<sup>st</sup> quarter are the best time to observe lunar craters and mountains.

**Monday, June 13:** Your sundial and your clock agree today...and you won't need the Equation of Time to correct things.

**Tuesday, June 14:** First quarter Moon at 8:22 p.m. CDT. See if you can find mag 13.8 Pluto on the other side of the sun.

**Wednesday, June 15:** Jupiter and the Moon converge.

**Thursday, June 16:** Did you know that Spica is a double with the pair orbiting each other every 4 days at a distance apart of only one-tenth Earth and sun distance.

**Friday, June 17:** And, did you know this: Spica is sort of a variable. The two components of Spica orbit so close that they "pull" each other out of round causing a shift in light levels. But even if you didn't know that, you need to know this: **FBAC CLUB MEETING, 7:30 PM, FIRST COLONY CONFERENCE CENTER, 3232 AUSTIN PARKWAY, SUGAR LAND, TX.** For more info go to <http://www.fbac.org>

**Saturday, June 18:** Mars rides the constellation Pegasus in the southeastern sky before dawn.

**Sunday, June 19:** The Venus, Saturn, Mercury trio are getting closer, spanning only 10 degrees.

**Monday, June 20:** Mars crosses the celestial equator. This is called an equinox when the sun crosses but there's no comparable name for a planetary crossing.

**Tuesday, June 21:** The summer solstice has arrived. Sol reaches his highest point for the year in the northern hemisphere at midday, swinging directly over the tropic of cancer at 1:46 a.m. CDT.

**Wednesday, June 22:** A full June Moon tonight at 14 minutes past eleven o'clock.

**Thursday, June 23:** Go outside one hour after sunset, look to the west-northwest and see Mercury, Venus, and Saturn. Is Mercury brighter than Saturn?

**Friday, June 24:** Go outside one hour after sunset, look to the west-northwest and see Saturn begin to drop away from the group.

**Saturday, June 25:** Go outside one hour after sunset, look to the west-northwest and see the most compact grouping of these three planets.

**Sunday, June 26:** Ditto but Mercury and Venus are above Saturn. Venus and Mercury are an incredible 0.2 degrees apart.

**Monday, June 27:** Ditto again. But wait there's more! Venus and Mercury have virtually converged and are only 0.8 arcminutes apart. Did you know that this is called an appulse. I didn't.

**Tuesday, June 28:** Last quarter Moon.

**Wednesday, June 29:** Mercury lingers in the vicinity of Venus because it's reached the turnaround in its orbit.

**Thursday, June 30:** Saturn goes bye-bye in the next few days but Venus and Mercury continue their rendezvous until mid-July.

**All the above via the Adler Planetarium**

**(continued from page 1)**

In reality they may not exactly converge for long according to what kind of seeing the sky offers for that particular night. As the atmosphere gyrates, seeing changes and focus becomes harder to accomplish and the double star might look kind of like Saturn.

There's a whole subset of focusing mask methods. You can make one with 3 holes, you can make one with triangles rather than holes, ad infinitum and I've tried most of the with what I consider to be less than optimal results. Bottom line: I gave up on focusing masks and just go for plain old eyeball focusing to go along with the final step: Software.

Unless you're doing video astronomy, you will be using somebody's software to run your camera and maybe your telescope, too. Final focus has to be done with the software at hand whatever it may be. I have tried most of them: Maxim DL, CCDSoft, CCDOps, AstroArt, and some I don't even remember. For focusing, the best of the bunch, hands down, is MaximDL. Second in line, believe it or not, is CCDOps. CCDSoft, for me, is hard to use mainly because of the tiny little on screen graph. The only reason I have AstroArt is because it will interface with my video frame grabber. Other than that, it's virtually useless.

Let's see then how we do final focusing with my favorite (oh, and by the way, ridiculously expensive) program, MaximDL.

We've gone through the eyeball focusing. After a lot of tweaking, the star(s) of interest have been reduced to their smallest on the screen. It's time now to bring the software into action.

For Maxim, you would have already been in focus mode, with images being continuously downloaded to the screen. It's time to isolate one star for final focus.<sup>1</sup>

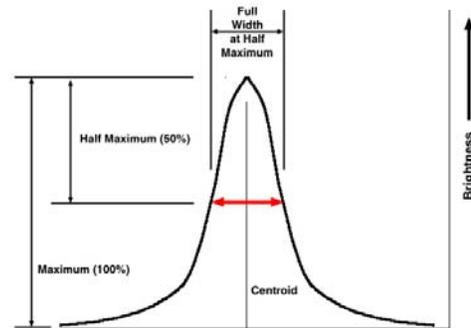
On screen you should have an image of several stars of varying brightness. Maxim has a very slick method for using just one star to finalize focus. First, using the cursor, you draw a small box around the star of interest. You then click resume on the focus box and the full image is replaced with just the focus star in a sub-frame. Now the fun begins.

Maxim uses what I call a composite method for focusing. Once the sub-frame is downloaded and focusing resumes, there are two indicators of best focus (well actually three and the third is the best in my opinion). The first two are brightest pixel and FWHM.

Brightest pixel is probably the most intuitive of the bunch. As you bring a star into focus, it brightens and is more concentrated on the screen. More photons are squeezed together (can one squeeze photons? I'm not really sure) so the software measures the brightest pixel in the image. But there's a problem. The sheath of air that envelopes our planet is hardly ever still. Seeing on any given night can vary from good to bad to worse complicating brightest pixel focusing. As seeing changes the focus star will twinkle and image spread will cause errors. Combining visual and brightest pixel focusing is the way to go, though. It keeps your eyeballs bouncing between the focus box where the pixel level readout is displayed and the star image but it works. Using this method you will reach a point where the

level readout jumps around a lot. This is usually an indication that you have reached best focus. A good way to check is to go past this focus area, check to see if the brightest pixel level drops, then go back if necessary.

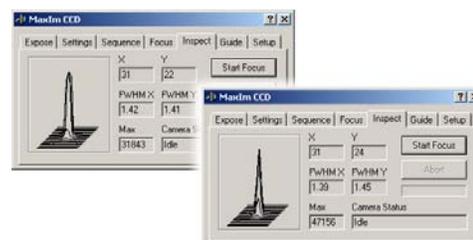
The second method is called Full Width Half Maximum, FWHM for short. This sounds complicated but actually isn't. Imagine a bell (actually a Gaussian curve but bell is easier to imagine) curve or brightness profile of a star where the x-axis is width and the y-axis brightness. Well, actually you don't have to imagine it because I borrowed the one below from Ron Wodaski's web site.



Now imagine that your focus star has somehow magically deposited this curve on a piece of paper and, using your magical measuring device, you could measure halfway down and then across the light curve of the star. You are now measuring the full width of the curve at half its maximum. But since this isn't middle earth and there are no convenient wizards around we'll have to dispense with the magic and use software. Or maybe MaximDL uses magic to perform this operation. Whatever, FWHM is the best way to decide when you are in focus.

Here's how it works. As the star becomes better focused, the FWHM measurement drops. Looking at the graph above proves the case. The nearer we get to focus, the brighter the star becomes and the skinnier the central part of the curve becomes. As the vertical profile narrows, the FWHM number decreases and we use the minimum number to indicate focus.

But I said there's a third way didn't I. Why, yes, there is. Maxim has a dandy little 3D graph that looks kind of like what you see up above. It's a visual representation that gives all the information you need in one place. Once again I helped myself to Mr. Wodaski's web site and the image below demonstrates the pertinent screen. I rather abruptly leave you with this because I'm running out of space and time. We'll continue the discussion next month.



<sup>1</sup>There is no way in the scope of this article that I can cover everything involved with CCD imaging, mainly because I'm still a neophyte myself. In the course of writing this, I will skip many necessary steps. You are encouraged to beg, borrow, or steal a good imaging book before embarking on a CCD adventure. I disclaim any and all boo-boos, lack of sleep, family disputes, or other personal tragedies you might suffer in the course of shooting CCD images through a telescope or any other optical device.

# GOING DEEP

Keith Rivich

When I sit down to pen these observing articles I usually ask myself “what theme will I use to bind together the article”. Well, this month I could not think of an interesting theme so my theme this month is no theme, a la Seinfeld!

I perused some of my old observing notes for this time of year and came up with a few easy and some challenging objects you can add to your observing list. First up are the interacting galaxies **NGC 4038/39** in Corvus, the Crow. AKA the “Antenna”, this pair is the nearest example of a colliding pair of galaxies at the reasonable distance of 63m LY.

Originally classified as a planetary nebula by W. Herschel in 1785 this pair can be found by imagining a line drawn from Algorab and Gienah, the top two stars of Corvus, and continuing an equal distance until you find the 5<sup>th</sup> mag star 31 Crv. Bounce NE about 48’ and the pair should be in your FOV. At first you will see a slightly heart shaped blob that quickly takes on character as you view. The northern most galaxy, **NGC 4038**, has a distinctive ring inside the main body of the galaxy created by the runaway star formation resulting from the collision. Under ideal conditions the tidal “tails”, hence the “Antenna” can be traced for quite a distance before fading out into nothingness.

While in Corvus take a minute to look at **NGC 4361**, a nice planetary nebula inside the square of Corvus. Easily found by putting the top edge your outer Telrad circles on Algorab and Gienah and pulling your scope slightly east. At low power it takes on a mostly roundish appearance with some mottling. Use higher powers to scan the inner regions and you will be rewarded with a nice, irregular ring around the 13<sup>th</sup> mag central star.

Lets move northeast a bit into Hercules. **NGC 6210** is a high surface brightness planetary nebula that is a good target for moderate sized scopes. Expect to see a small, round blue-green disk. Larger scopes and an OIII filter may be able to pick up the faint outer halo which surrounds to smaller disk. The central star, at 12.7mag, will be a challenge in small scopes. While in the area give **Abell 39** a shot. This large, diffuse planetary will give most scopes a run for their money but should be do-able in a 16” or large mirror with an OIII. Under very dark skies this one may be glimpsed in scopes as small as 8”.

Next month we will journey into the far reaches of the cosmos in search of distant galaxy clusters to observe!

Object	Type	RA, Dec	Size	Magnitude
NGC4038/39	Gxy	12 01 54, -18 52 58	4’x2.2’	10
NGC4361	PN	12 24 30, -18 47 02	118”	9.3
NGC6210	PN?	16 44 29, 23 47 58	30”	8.3
Abell 39	PN	16 27 33, 27 54 33	3’	12.5



**FBAC Club Meeting**  
**Friday, June 17, 2005**  
**7:30 PM**  
**First Colony Conference Center**  
**3232 Austin Parkway**  
**Sugar Land, TX**

# AQUARIUS

## the water bearer

**J**OHAN FLAMSTEED'S star map shows Aquarius as a young man pouring water from a jar, though the story goes that this was a mixture of nectar and water, the drink of the gods. The stream ends in the mouth of the Southern Fish, Pisces Austrinus.

Aquarius is the second of our 'water' constellations, the first is Pisces, both of which are constellations in the Zodiac. As with Pisces, when the Sun passed through Aquarius, it heralded the rainy season, an extremely important time for all cultures depending on agricultural activities for survival.

You will find Aquarius almost directly beneath the Western Fish in Pisces and to the right of Cetus, the Whale. Like Pisces, Aquarius is an old constellation. As the Water Carrier he is carved on stones of the Babylonian Empire and probably is still older than that period. In Egyptian mythology he pours water into the Nile at the season when the Nile normally overflows its banks and brings the much-needed water to the farmlands bordering that great river. The Arabs, also depending on water of the rainy seasons, adopted Aquarius from an earlier time. But because their religion forbids them from showing pictures of any living form, they show this constellation simply as a water bucket alone.

In Ancient Greece, Aquarius was at one time associated with Zeus, as the basic force giving rise to life. In another Greek myth Aquarius is identified with a man and his wife known as Deucalion and Pyrrha. According to the myth, in 1500 B.C. Aquarius (possibly representing Zeus) caused a great flood to wash over Earth. Deucalion's father, Prometheus, advised his son and wife to build a great boat and stock it with provisions. They did and the two floated in the world-sea for nine days and nine nights. Eventually they ran aground on Mount Parnassus.

Safe but lonely, the two sole survivors of Earth walked about as the waters became lower and exposed more of the land. What were they to do? They appealed to an oracle and were told to .."throw over your shoulders the bones of your mother." "But what does that mean?" Deucalion asked of his wife. Pyrrha did not know either. At first she said that she refused to dig up the bones of her mother, but Deucalion guessed that the key to the message was different. "The bones of Mother Earth," said Deucalion, "must be stones." So as the two walked along they picked up stones and kept tossing them over their shoulders. After a while they looked behind them and there were people. The stones that Deucalion had thrown had become men, and those thrown by his wife, Pyrrha, had become women.

And so the Water-Carrier, in the guise of Zeus, became the taker-away of life. This myth of a world flood and then a rebirth of life on Earth is a common one and can be found in many myths. Our only interest here is that the constellation Aquarius is the significant figure in this Greek myth.

As mentioned earlier, Aquarius is just one constellation in the area associated with water. The ancient Babylonians saw this part of the sky as the sea which includes Pisces, The Fishes, Cetus The Whale, Capricornus the Sea Goat, and Pisces Austrinus the Southern Fish.

# PICTURES IN THE SKY

Aquarius continued:

The Sun's passage through the region during the rainy season is, no doubt, the origin of this water mythology.

The "Age Of Aquarius", heralded by astrologers, will not take place for another 800 years when the vernal equinox will be located in Aquarius.

Aquarius lies far away from the plane of the Milky Way and is naturally lacking in star clusters and diffuse nebulae. Its most notable objects are the famous Planetary nebulae the Helical and the Saturn Nebula. There are 3 globular clusters in Aquarius, two of which made Messier's famous list, M2, M72, and a third Messier object, M73 which is nothing but an asterism.

## **CONSTELLATION FACTS**

Aquarius is 980 square degrees in size and ranks number 10. Aquarius has 3 Messier objects, M2, M72, and a third object, M73, that is only an asterism.

On September 23, 1846, the planet Neptune was discovered within the borders of this constellation, about  $1^{\circ}$  north of  $\iota$  Aqr. by the German astronomer Galle at the Berlin Observatory. Its position had been predicted by a French astronomer, Urbain Leverrier. Later, the English astronomer John Couch Adams was also given credit for predicting the location of Neptune.

The oft-mentioned 'Age of Aquarius' will occur when the vernal equinox moves from its present position in Pisces into Aquarius. This movement is caused by the Earth's precessional motion. Don't look for world peace and understanding to soon, however—this momentous event is still about 800 years away.

Leonard Pattillo, FBAC  
JANUARY, 2005

**Fort Bend Astronomy Club**  
**P.O. Box 942**  
**Stafford, TX 77497-0942**

*Dedicated to the acquisition and dissemination of information pertaining to the science of astronomy*

**FBAC Officers and Phone Numbers**

- President: David Jenkins 281-392-5009
- Vice-Pres: Terry Hiserodt 281-495-4012
- Secretary: Jim Ellis 281-265-7159
- Treasurer: Joe Dellinger 281-531-5417
- Alcor: Tracy Knauss 409-798-7917
- Astronomy On Wheels:  
Leonard Pattillo 281-980-1175
- East Dome Coordinator:  
Keith Rivich 281-468-8491
- NL Editor: Wes Whiddon 281-265-7614
- Librarian: Alex Cruz 713-702-9064
- George Observatory: 281-242-3055
- Loaner Scopes-Keith Rivich:  
281-468-8491

**The Fort Bend Astronomy Club** meets on the third Friday of every month except for those months when special meetings are called. The next regular meeting will be at 7:30 PM on June 17, 2005 at the First Colony Conference Center, 3232 Austin Parkway, Sugar Land, TX. Dues are \$30/year for the first member, \$5 per additional household member. Student dues are \$15/year.

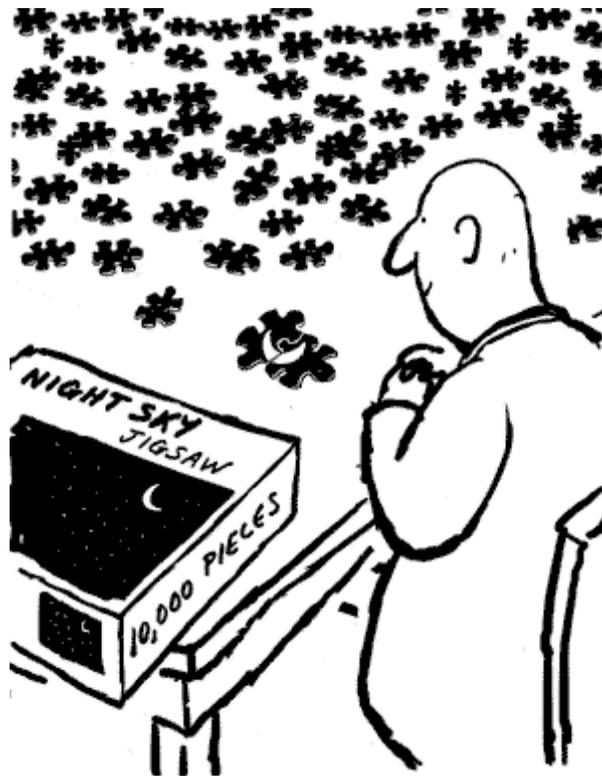
The **Houston Astronomical Society** meets the first Friday of the month in room 117 of the University of Houston Research Building. The novice program begins at 7:00 PM and main meeting at 8:00 PM.

For the **Johnson Space Center Club**, refer to the JSCAS web site for meeting times and sites. There is a link on the FBAC web site.

**North Houston Astronomy Club** meets on the 4th Friday of the month at Kingwood College. The meeting starts at 6:45 PM, main meeting at 7:30 PM.



You are invited to submit your opinions for inclusion on this page. Please be thoughtful and respectful of others in your comments. Rants will not be published. All articles should be 450 words or less and are subject to editing for clarity and length before publication. Please submit in Word format to:  
 stargazer411@earthlink.net



**CHRIS MADDEN**  
**CARTOONS**