

# SPECTRUM

Northern Cross Science Foundation Newsletter

July 2012

## LOOKING UP

### July 5, Thursday

#### General Meeting

7:00 p.m. - Astronomy 101

7:30 p.m. - Main Program

Business Meeting to follow

### July 19, Thursday

#### Board Meeting

7:30 p.m.

Home of Jeff Setzer

### July 21, Saturday

#### Public Viewing

8:00 p.m.

Pike Lake

### July 25, Wednesday

#### Moon Gazing & Twilight Walk

7:30 p.m.

LacLawrann

### July 25, Wednesday

#### Sidewalk Astronomy

7:00 p.m.

Bayshore Towne Center

### July 27, Friday

#### Public Viewing

8:00 p.m.

Harrington Beach

### July 28, Saturday

#### Public Viewing

-8:00 p.m.

Harrington Beach

-8:00 pm

Horicon Marsh

## Optimizing Observations of Deep Space Objects II

*Second of Three part Series by Carl J. Wenning Twin City Amateur Astronomers...2/2009*

### Lowest Useful Magnification

As a result of the exit pupil considerations addressed in the Part I of this Series, there actually is a lowest useful magnification that an observer can use to achieve the brightest possible image for viewing with direct vision – at least if that observer expects to use the entire aperture of the telescope. It is convenient to express the optimal lowest power eyepiece (OLPE) in terms of its focal length, which happens to depend on a telescope's focal ratio and the maximum diameter of the fully dilated pupil of the observer's eye. The expression is:

$$\text{OLPE Focal Length} = \text{Exit Pupil Diameter} \times \text{Focal Ratio}$$

For example, in my case the OLPE focal length for direct vision will be (4.2mm x 10) or 42mm. Using an eyepiece in this range (say a 40mm) will provide me with the brightest views of celestial objects given my telescope's characteristics and my observing eye's maximum dilation. The resulting magnification will allow for the best possible direct-vision views because I am then dealing with the brightest possible image for a given telescope-observer combination. My optimum low magnification with a 40mm eyepiece in my CPC 11" telescope would be 70X.

### A Common Misconception

It is often said that telescopes make celestial objects brighter so the observer can see them. This is a common misconception, and in the vast majority of cases patently false. Almost all astronomical telescopes will *dim* celestial objects rather than make them brighter. Consider that my 11" telescope gathers about 3,500 times more light than my eye (taking into account the presence of the secondary mirror, and the loss of light due to absorption and reflection). Using my telescope at a magnification of 70X will actually *reduce* the brightness of the image by some 4,900 times (70<sup>2</sup>). Hence, when observed with this combination of telescope and eyepiece, the image in the eyepiece is about 70% (3,500/4,900) as bright as it would be seen with the unaided eye. Only some binoculars with larger apertures (e.g., 50mm) and lower powers (e.g., 7X) will actually increase the apparent brightness of an object – assuming, of course, that the exit pupil criterion

is met. Observers see more details in telescopes merely because extended objects appear larger and more resolvable than when observed with the unaided eye.

### Two Highest Useful Magnifications

As any experienced observer knows, the best way to view fainter objects is with the use of averted vision. Direct vision is fine if an object is bright enough to stimulate the cone receptors in the fovea of the eye. If an object is very dim, it is best viewed with the use of averted vision. In such situations the observer views a dim object "out of the corner of the eye." This allows light to fall on the much more sensitive rod receptors located outside the fovea of the retina.

From a practical standpoint, there is a highest magnification one might use with averted vision to see the maximum detail in an extended, non-stellar object. Historically, a general rule of thumb has been given that states that the highest useful magnification is about 50X per inch of aperture. This rule is based on the ability of an observer to visually separate binary stars in close proximity to one another, but it does not take into account other limiting factors such as poor atmospheric steadiness, inferior optics, a shaky mount, or getting an eyepiece with adequate eye relief (the distance from the outer surface of the eyepiece and the focal point of the image). In addition, this 50X rule is too "simplistic" to the extent that it does not apply meaningfully to extended deep-space objects such as nebulas, supernova remnants, and galaxies.

Research conducted by H. Richard Blackwell (Contrast thresholds of the human eye, *Journal of the Optical Society of America*, Vol. 36, No. 11, November 1946) showed that there are better ways to maximize the human ability to see fainter objects using averted vision, and this is subject to both illumination and image size. Work using Blackwell's data, represented graphically by Roger N. Clark in *Visual Astronomy of the Deep Sky*, 1990, can be summarized with a simple formula that takes into account the use of averted vision in relation to optimal highest power (OHPE). It is given by the following formula: (*Cont'd onto pg. 4*)

## June Meeting Minutes

By Kevin Bert

The June Business meeting of the Northern Cross Science Foundation was held at Unitarian Church North. President Jeff Setzer opened the meeting at 7:50 pm and welcomed 27 members and guests. Jeff then asked for standard reports.

Treasurer Gene Dupree reports that the balance in the checkbook was \$9,530.65. The topic of the clear sky clock came up as it was noted that we now have paid to sponsor the Harrington Beach site.

Secretary Kevin Bert reminded members of the Astronomical League National Convention, (ALCon), and our regional convention, (NCRAL), on July 4 – 7 in Chicago. The latest member to join was Jane Ryan just earlier in the meeting. She is the mother of Jennifer Ryan.

Under new business Joyce Jentges said that next month's newsletter material should be directed to her because Rick Kazmierski will be out of town.

Charlotte Dupree had information on telescopes for sale. Members interested should contact her.

Jeff continued with a list of upcoming NCSF events. June 9<sup>th</sup> was a public viewing night at Pike Lake State Park. June 27<sup>th</sup> is the second Sidewalk Astronomy of the year at Bayshore.

With no further business Jeff closed the meeting at 8:10 pm.

Respectfully submitted by Secretary  
Kevin Bert

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## Things to See In the July 2012 Night Sky *By Don Miles*

**Mercury:** Is on its way around the front side of the Sun, but early in the month, can be seen trailing right behind the Sun at sunset. Mercury (mag 2.0) will appear furthest away from the Sun on the first (Greatest Eastern Elongation), and will continue to slide closer and closer to the sun, until about mid-month, will be too close to the Sun to be comfortably seen. By mid-August, Mercury will have passed in front of the Sun, and then will be a morning object again, rising right before the Sun.

**Mars & Saturn:** Mars will be highest in the sky at sunset in the constellation Leo, and sets about (11:30 / 11:15pm). Mars (mag -1.0) starts the month about 14 degrees below Denobola (the star that locates the back of the hind leg of Leo), and will drift to the East throughout the month to ultimately finish the month a little over 8 degrees to the right of both the star Spica in Virgo, and Saturn. Saturn (mag 0.7) starts and finishes the month in Virgo, about 4.5 degrees above Spica with very little movement. Saturn sets by about 1:45am / 11:45pm), and is also best viewed a little after sunset.

**Pluto & Neptune:** Pluto (mag 14.0) is highest in the southern sky about midnight, and hasn't moved any perceivable distance from last year's position. It's still about 7 degrees above and to the left of the top of the teapot of Sagittarius. Neptune (mag 7.8) is best to see right before sunrise, and can be found in the constellation Aquarius. Neptune rises about (11:30 / 9:30pm), and is easy to spot using generic charts, but you'll need much more specific charts, dark skies and at least an 8" scope to pick out Pluto optically.

**Uranus:** Rises about (1am / 11pm) on the border of the constellations Cetus and Pisces. It is a naked eye object in descent skies, as it's at (mag 5.8). It's highest around sunrise, and in a small telescope, you can see a tinge of blue, or even a little greenish.

**Venus & Jupiter:** After last months' transit of Venus (where it had passed across the front side of the Sun), Venus now appears as a morning object as it leads the Sun. Jupiter is on the back side of the Sun, but it also appears as a morning object (as the Earth continues its orbit around the Sun, outer planets seem to move from one side of the Sun to the other as our perspective changes). Venus (mag -4.5) rises about 45 minutes after Jupiter (mag -2.1), but both will rise before the Sun by about 2.5 hours. The morning of the 5th will be a treat as there will be a beautiful alignment of these two planets and two star clusters. Venus will be the lowest of the two planets, and will be inside the star cluster Hyades (the "V" that forms the head of "Taurus the Bull" in the constellation Taurus. Above and to the right of Venus by 5 degrees, will be Jupiter. Seven degrees above and to the right will be the cluster Pleiades. Look with a pair of binoculars if you can, as these clusters are beautiful to look at by themselves...then add two bright planets to the mix...Should be memorable.

### **Moon:**

July 3rd: Full Moon  
July 10th: Last Quarter  
July 19th: New Moon  
July 26th: First Quarter

### **Special Events:**

There are two meteor showers this month, and those are the Southern Delta Aquarids, and the Capricornids. They both happen to peak the same couple of nights, but the Aquarids has a longer window of start/end dates. They start as early as mid-July and end around mid-August peaking the night of the 28th around 20/hour. These are moderate speed (25.5 miles per second) showers that are yellowish in color. The Capricornids are also yellowish, peak the night of the 29th at 15/hr, and are slower than the Aquarids (15mps). The thing that makes this shower worth watching (even though the quantities aren't that large), is that these are frequently known to include fireballs. The Moon will set around 1:30am, so may be a factor early in the evening.

## May General Meeting

### 101 Class... by Kevin Bert

The Astronomy 101 class for July is taken from The Universe Sampler manual and entitled "Angular Measures of Distance & Stating the Location of Objects" presented by Kevin Bert. This is lesson 4 & 5 giving you the basic information on how objects are measured and located in the sky. A manual of the Universe Sampler is available for \$10.00 The Constellation of the month is Draco.

*The Constellation of the month:*

### Main Program...

The Main Program for the July meeting will be a episode of Carl Sagan's Cosmos, called "A Voice In the Fugue."



## June Events

### Solar Viewing June 3

An excellent crowd of people showed up to look at the Sun during the park free day. Gene, Charlotte, Jeff, Joyce and Carol attended. Clouds were pesky at times, but most people were able to get a glimpse of the beautiful prominences on the Sun. We estimated about 150—200 visitors came by to look through out telescopes.

### Venus Transit - Harrington Beach June 5

There were 8 club members with 10 solar equipped scopes. Steve, Joyce, Kevin, Dan, Jeff, Gene, Charlotte, and Carol. Nolan had the observatory open for the public to see the big scope. We estimated 200 visitors stopped by to see this once in a life time event. Anyone that had a camera or a phone with a camera were putting them to the eye piece, and trying to hold them steady enough to get some pictures. The observatory was opened at 8:30 for public viewing. Thirteen people returned after dark to view through the 20".

### Venus Transit - Pike Lake June 5

*No report given.*

### Public Viewing - Pike Lake June 9

There was a very good turn out of club members. Al Steinberg was leader with two scopes, Tyler - two scopes, Gene and Charlotte - four

scopes. Rick and Georgine - one scope, Harvey, Gail with one scope, Terry - one scope, and one visiting scope. The park ranger, on his rounds, walked around the campground, and told the campers where we were set-up. About 100 people stopped, including some visiting public.

### Bayshore Towne Center June 27

Jeff Setzer reported that there were about 200 people who showed up to look at the Moon and Saturn through our telescopes.

**Wanted:** News Clippings of any Northern Cross events. If you find any printed publicity of our events, please clip them out, note the date and paper, and give them to Joyce Jentges. I'd like to put these together for an award sponsored by Astronomy Magazine. I'd also appreciate pictures of events. Thanks!

### Jim and Gwen Plunkett Observatory



Observatory Director:  
Dan Bert: 262-375-2239

## RELATED INFO

### NEW MEMBERS

#### **NCSF Welcomes New Members**

Jane Ryan and Rick Dusenbery

### Leaders for Public Viewing

July 21

#### Pike Lake

Al Steinberg

July 25

#### LacLawrann

Mickey Kazmierski

July 25

#### **Bayshore Towne Center**

Jeff Setzer

July 27

#### **Harrington Beach**

July 28

#### **Harrington Beach**

### STAR PARTIES - 2012

#### **NCRAL\ALCon2012**

July 4 - 7th

Chicago, IL

[www.alcon2012.astroleague.org](http://www.alcon2012.astroleague.org)

#### **Wisconsin Observers Weekend**

July 19 - 22nd

Hartman Creek State Park

[www.new-star.org](http://www.new-star.org)

#### **Northwoods Starfest**

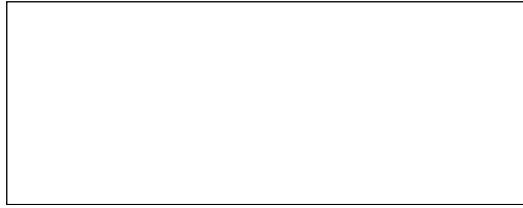
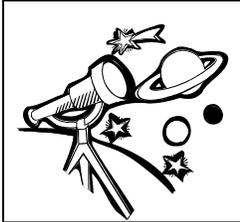
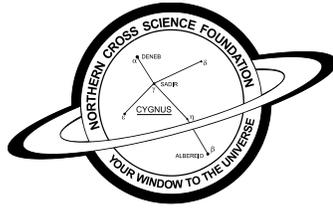
August 17-19th

Hobbs Observatory

Fall Creek, WI

[www.cvastro.org](http://www.cvastro.org)

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(Cont'd from pg. 1)

$OHPE = 6.2 \times \text{Aperture} + 35$  ( $4'' \leq \text{Aperture} \leq 16''$ )

So, by this criterion the optimal highest power for my 11" telescope will be approximately 103X ( $6.2 \times 11 + 35$ ). Converting this into focal length of the eyepiece using the first equation in this article series, the OHPE focal length for me would be approximately 27mm ( $2800\text{mm}/103\text{X}$ ) when viewing extended objects using averted vision. While this is the highest power for seeing maximal detail using averted vision, it is not necessarily the highest power one might want to use. One may safely double this optimal magnification with a minimal reduction in the averted vision visibility index according to Blackwell's work. The increased magnification might dim the object, but the trade-off is acceptable. It will make extended objects larger and more resolvable to the human eye as a result even with the loss of brightness.

When I'm observing certain planetary nebulae on the AL observing club list, I must push the magnification far beyond the OHPE condition so that I can resolve a nebula's near stellar image. Higher powers will allow me to distinguish the nebula from field stars that do not grow in size with increasing magnification (unless the seeing is poor). Because telescopes, observers, and observing conditions vary so much, it's really up to the observer to decide when a certain magnifying power is too much. When increasing the magnification makes an image worse rather than better, then an observer knows that he or she really has surpassed optimum highest power.

Next month I will provide additional information about other ways of improving views of extended deep space objects. I will touch upon five simple approaches: (1) observing only with well dark-adapted eyes, (2) observing from a location with a darker sky, (3) observing with the use of filters that transmit only certain wavelengths of light while blocking others, (4) observing only when the sky is very transparent, and (5) observing objects only when they are higher up in the sky. Stay tuned!

Our club has a "Discussion Group on Google"  
See our website: <http://www.ncsf.info/> for details.

## SPECTRUM

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This Issue, along with back Issues of SPECTRUM, can be found on the NCSF Web Site.  
<http://www.ncsf.info>

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