

THE FRAC OBSERVER

NEWSLETTER OF THE FLINT
RIVER ASTRONOMY CLUB

An Affiliate of the Astronomical League

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Officers: President, **Dwight Harness** (1770 Hollonville Rd., Brooks, GA 30205, 770-227-9321, rdharness@yahoo.com); Vice President, **Bill Warren** (1212 Everee Inn Rd., Griffin, GA 30224, warren7804@bellsouth.net); Secretary, **Carlos Flores**; and Treasurer, **Jeremy Milligan**.

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Club Mailing Address: 1212 Everee Inn Rd., Griffin, GA 30224. FRAC website: www.flintriverastronomy.org.

Please notify Bill Warren promptly if you have a change of home address, telephone no. or e-mail address, or if you fail to receive your monthly *Observer* or quarterly *Reflector*.

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Club Calendar. Fri.-Sat., Feb. 24-25: JKWMA observings, at dark); **Thurs., Mar. 9:** FRAC meeting (7:30 p.m., The Garden in Griffin, with lunar & planetary observing for visitors before and afterward); **Fri.-Sat., Mar. 24-25:** JKWMA observings (at dark).

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President's Message. We held officer elections at the Feb. meeting. There were two changes from last year: **Jeremy Milligan** is our new treasurer, and **Alan Rutter** replaces him on the board of

directors. I want to thank them for stepping up when needed – and thanks, too, to **Truman Boyle** for two years of dedicated service as treasurer.

Bill Warren, Carlos Flores and I will continue as vice president, secretary and president, respectively, and **Aaron Calhoun** and **Larry Higgins** will remain on the board. All of us – including Jeremy and Alan, of course – will work hard to make this FRAC's best year ever.

-Dwight Harness

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Last Month's Meeting/Activities. Nine members attended our JKWMA observing on Jan. 28th: **Alan Pryor; Felix Luciano; Henry Trevino; Jeremy Milligan; Dwight Harness; Erik Erikson; Steve Hollander; Aaron Calhoun; and yrs. truly.** It was cold – as one might expect in late January – but not uncomfortably so, due in no small part to the heater that Dwight brought along.

As always when the sky cooperates at JKWMA, we got a lot of astrophotography from Alan and Felix, and a lot of observing from everyone else. Jeremy and Aaron tracked down a bunch of Messiers & other things, and Dwight did whatever he always does at our observings (although no one is sure what that is).

Nineteen members and a visitor attended our Feb. meeting: **Dwight Harness; Kathy & Dan Pillatzki; David Haire; Tom Moore; Sarah, Emily, Delilah & Jeremy Milligan; Rose & Kenneth Olson; Dawn Chappell; Erik Erikson; Alan Rutter; Carlos Flores; Steve Benton; Steve Hollander; Cindy Barton; yr. editor; and Elaine Stachowiak.** We held officer elections and celebrated FRAC's 20th birthday with refreshments.

On Fri., Feb. 10th, **Steve Benton, Cynthia Armstrong** and fellow Sun City Peachtree (SCP) resident and amateur astronomer **Gary Kaping** conducted an observing at the SCP softball field for 30+ SCP homeowners. They showed residents **Venus, Mars, Orion Nebula** and the penumbral eclipse of the **Full "Snow" Moon** that occurred that evening. "Everyone had a good time," Steve said. "I think they will come back for future events."

"I started an Astronomy Interest Group here in SCP on Jan. 21st. Thirty-six residents signed up then, and more have been added since."

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This ‘n That. Not to belabor the point, but your club dues for 2017 are up for renewal at the end of February. If you haven’t already paid, please send your \$15 check made out to FRAC to: **Jeremy Milligan, 100 Old Mill Way, Senoia, GA 30276.**

*In the March issue of *Astronomy*, **Phil Harrington** has an article that is well worth reading: “How to Care for Your Telescope” (pp. 54-57). In it he tells how to clean your ‘scope, lens, corrector plate and/or primary mirror.

***How to Calculate Eyepiece Magnifications.** *Magnification* refers to how many times larger objects appear in your eyepiece than they would appear to the naked eye. For example, if you’re using a zero-magnification Telrad finder, objects will appear the same size as you see them without the Telrad. But if you’re using an 8x finderscope, objects will be eight times larger than that.

To determine the magnifying power of your eyepieces, first find the focal length (f.l.) of your telescope. It’s expressed in millimeters (e.g., 1200 mm), and it refers to the distance from the telescope’s primary mirror or lens where the light is gathered to the point where the image is focused.

Then find out the focal length of your eyepiece. (It’s located on the side of your eyepieces, e.g., 10mm, 25mm, etc.) Divide the telescope’s f.l. by the eyepiece’s f.l., and you have the eyepiece’s magnification.

If your telescope’s f.l. is 1200mm and your eyepiece is 10mm, the magnification for that eyepiece is 120x. A 25mm eyepiece in that same ‘scope will have a magnification of 48x.

A final thought regarding magnification: Telescope manufacturers sometimes boast that their ‘scopes offer magnifications of 400x, 650x, and even higher than that — and it’s true, at least in principle. You can use any magnification with any telescope. But there are broad limits beyond which high magnifications lose contrast with the sky around them, spreading and dimming the same light that produces clear images at lower magnifications. All you’ll see when you use too much magnification is a meaningless blur – sort of like looking at **Tom Moore**.

Those limits are roughly: 50x for a 2.5-in. ‘scope; 100x for a 4.5-in. ‘scope; 150x for a 6-in. or 8-in. ‘scope; 175x-200x for a 10-in. ‘scope; 210x-240x for a 12-in. ‘scope; and 245x-280x for a 14-in. ‘scope. To get clear images beyond those limits, you need exceptionally good seeing conditions and a top-quality (read: *expensive!*) eyepiece such as a Nagler, Televue, Pentax, etc.

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Upcoming Meetings/Activities. We’ll have JKWMA observings on **Fri.-Sat., Feb. 24th-25th**. The gate will be open all night.

Our club meeting will be held at 7:30 p.m. on **Thurs., Mar. 9th**, with public lunar & planetary observing for visitors from 7-7:30 and after the meeting until 10 p.m. **Bill Warren** will explain “How to Find the Messier Galaxies in the Virgo-Coma Cluster.”

We’ll wind up March with JKWMA observings on **Fri.-Sat., Mar. 24th-25th**. ***Please note carefully the following JKWMA procedures, which will remain in effect from March through next August:***

**If the gate is open or unlocked when you arrive, close it behind you but don’t lock it when you enter.*

If the gate is locked, unlock it and close it behind you when you enter. (If you don’t know the combination, call **Dwight at 770-227-9321.)*

When you leave, close the gate. If you’re the last to leave, be sure to close and lock the combination lock **to the other lock before you drive away. (Do **NOT** lock the combination lock to the chain.)*

Remember too: Those changes apply only to our Mar. observings and beyond. The gate will remain open and unlocked all night on Feb. 24th-25th.

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The Sky in March. The ancient Greeks and Egyptians thought there were six planets in the sky, not five: **Mercury, Mars, Jupiter, Saturn** – and the two brightest of all: **Phosphoros**, the “bringer of light,” which sometimes appeared in the pre-dawn sky; and **Hesperus**, the “star of the evening,” which at other times appeared in the W sky before sunset. It wasn’t until the 5th century b.c. that the Greek astronomer and mathematician **Pythagoras of Samos** realized that they were the same planet – **Venus** – seen on opposite sides of the sky.

On Mar. 22nd, Venus (mag. -4.5) will glow brightly as an “evening star,” setting 30 min. after sunset. Twelve hours later, Venus will be a “morning star,” rising 33 min. before sunrise on Mar. 23rd.

Mars (mag. 1.4) will be in the W sky in March, setting about midnight. **Mercury** (mag. -1.4) will be low in the W sky after sundown during the last half of the month. By our JKWMA observations on Mar. 24th-25th, **Jupiter** will rise shortly after sunset.

On Mar. 1st, bright (7th-mag.) **Comet PANSTARRS (C/2015 ER61)** will be located between two bright Messier nebulas in *Sagittarius*: **M8 (Lagoon Nebula)** and **M20 (Trifid Nebula)**. A week later on Mar. 8th, the comet will lie 1°N of another bright Sagittarius Messier, globular cluster **M22**.

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Locating Objects In the Night Sky observing article by Bill Warren

Finding objects in the night sky is both an art and a science. It's a science because gauging distances between objects often involves basic mathematics. It's an art because sometimes you have to be creative in finding where to begin your search.

The easiest objects to find in that vast space overhead are those that, like the **Pleiades** and **Orion Nebula**, you can see naked eye. Just point your 'scope at one of them, and there it is in your eyepiece.

The next-easiest objects to find are those that lie very near a bright star or something else that's easy to find. (Star charts will provide that information.) For example, **Beta Andromeda** is a 2nd-mag. star near the Great Square of *Pegasus*. Find that star, and 6.5' (arc-minutes) -- roughly a thumb-width -- away to the NW in your low-power FOV, you'll find **Mirach's Ghost (NGC 404)**, a spiral galaxy.

And if you can find either **M81** or **M82** -- they are galaxies in *Ursa Major* -- you've found both of them. They share the same low-power FOV.

The farther away from a bright star your observing target is, the more search strategies you'll need to find it. Your scanning procedure will be the same no matter where it's located -- but where do

you start? How do you find the point where you should begin scanning?

The Telrad Solution. Okay, I'm biased. I've always preferred to use a Telrad rather than a conventional finderscope. Finderscopes magnify objects, bringing fainter stars into view, but they are harder to collimate and they invert the FOV, which I found confusing. Telrads don't magnify, but for finding objects located 2° or less from a bright object, they can't be beat.

Telrads show three red-light circles measuring ½°, 1° and 2° in diameter. If the object you're looking for is, say, 1° N of a naked-eye star or other bright object, find that star, place it at the S end of the 1° circle, and the object will be in your telescope's field of view. The same procedure holds true for any object within 2° of a naked-eye star.

There are two other zero-magnification finders available, the *Rigel Quikfinder* and *red-dot finders*. Quikfinders are easier to see through than a Telrad since they stand upright, whereas Telrads lie close to the tube. Quikfinders offer two red circles, 1/2° and 2° in dia. Red-dot finders feature a single red dot of light rather than circles.

Of course, not everyone uses a Telrad or Quikfinder, and not every object you'll look for lies within 2° of a bright star. To locate such objects, observers use techniques that are known collectively as *star hopping*. It refers to using one more stars to get you where you want to go. (Those stars are referred to as *guide stars*.)

Naked-Eye Star Hopping. Here are two familiar examples of this process:

***Ring Nebula (M57).** The naked-eye stars **Gamma** and **Beta Lyra** form the S end of the little parallelogram that shapes the constellation *Lyra*. Find those guide stars on the chart on p. 5; the Ring lies exactly halfway between them -- a small, gray smoke ring. (Gamma and Beta are 2° apart, so if you're using a Telrad or Quikfinder place one side of the 2° circle on Gamma and the other side on Beta.)

***The Double Cluster (NGCs 869 & 884).** Find 2nd-mag. **Alpha Persei**. (It's the brightest star in *Perseus*, and it's located about halfway up the left arm of the Atlanta Braves “A” that gives Perseus its shape.) Then find 3rd-mag. **Delta Cassiopeia** to the

N of Perseus. (If you number the 5 stars that form the “Bent W” that shapes *Cassiopeia* from 1-5 starting at the easternmost star, Delta is Star #4 (i.e., the star at the base of the bent part of the W.)

Having located those guide stars, look closely at the area halfway between them and you’ll see a small, faint patch of nebulosity. That’s the Double Cluster. It’s visible to the naked eye, but not large or bright. (Some things you have to work for, and this one is definitely worth the effort.) Aim your ‘scope at that patch, and you’ll see two clusters of stars in your FOV, each containing 50-100 stars, depending on the size of your telescope.

Hand Measurements of Angular Distances in the Sky. (Note: All of these measurements refer to holding your fingers or fist at arm’s length against the sky.)

***One pinky-width equals 1° of sky.** If the object you’re looking for is known to be, say, 1° N of a given bright star, place your pinky on the N side of that star and the object will be on the other side of your pinky. That’s where you should start your scanning. (Yeah, someone who is 6’5” will have longer arms than someone who is 5’7” – but the taller one’s hands will be larger, too, so the differences will equal out. And yeah, the distances aren’t 100% accurate, but they will get you close to where you need to be to start your scanning. If you want better accuracy than that, you need a GoTo or PushTo telescope.)

***Three finger-widths equals 5°.**

***Your closed fist is 10° wide.**

***Your spread index finger-to-pinky width equals 15°.** That’s how far the Sun and the Moon travel across the sky in one hour.

***Your spread thumb-to-pinky width equals 20°.** Nine of these measurements side-by-side will take you all the way across the sky.

As noted earlier, Telrad and Quikfinder measurements are more precise for distances of 2° or less. But if the object you seek is, say, 8° from the nearest naked-eye star, it will be 4/5ths of a fist-width from that star. And if it’s 5° from that star, it will be three finger-widths away. That’s where you’ll begin scanning.

Triangulation. This star-hopping technique is the one I’ve used most often to determine where to begin scanning for objects. It involves creating an

imaginary triangle consisting of two bright stars and the place where star charts show that the object I’m looking for is located.

*Example: **Dumbbell Nebula (M27).** It lies at the S border of *Vulpecula, the Fox*, and just N of *Sagitta, the Arrow*. To find the Dumbbell, I first locate the tiny naked eye four-star asterism that forms the arrow. Two close 3rd-mag. stars aligned N-S (**Alpha & Beta**) form the feathered end of the arrow, 4th-mag. **Delta** forms the center, and 4th-mag. **Gamma** forms the arrowhead.



Above: Finding M27 and the Coathanger

As you’ll see on the chart, M27 lies as far N of Gamma as Delta and Gamma are apart, forming slightly more than a right triangle above them. So I position the Telrad’s center circle to form that right triangle, then push the tube slightly away from that line and begin scanning.

I’m often asked, “How will I know when I find it if I’ve never seen it before?” In the case of Dumbbell Nebula, my answer is always the same: “Trust me: You’ll know.” The Dumbbell is the finest planetary nebula in the sky. It’s large -- about a thumb-width in dia. in your low-power FOV -- and it has very high surface brightness. You’ll recognize its “apple core” or “dumbbell” shape as soon as it enters your FOV.

Incidentally, you can use the same four stars to find **The Coathanger (Collinder 399)**. It’s shown (but not identified) in the chart above, located above the word *Sagitta*.

Find Sagitta. **Cr 399** is the same distance from Alpha & Beta as Gamma is. Form a right triangle up and to the right from Alpha & Beta, then open the triangle to slightly more than a right triangle. *Presto!*, you have the Coathanger! You can see it naked-eye under dark skies as a faint blur to the upper right of the Arrow. It’s large, so use

binoculars to see the coathanger shape. Six stars form the bar, and four stars form the hook.

Finally, note that (a) the Messier globular cluster **M71** is located halfway between Gamma & Delta Sagitta; (b) another Messier globular, **M56**, lies about 40% of the way from **Beta Cygnus (Albireo)**, the star at the base of the Northern Cross) to Gamma Lyra; and (c) the little open cluster of 8 stars that form H-shaped **M29** lies just 2° SW of the center of the Cross.

*Another example: **M33 (Pinwheel Galaxy)** in *Triangulum*, which is located SE of the Great Square of Pegasus. In studying the star charts, I saw that there are two ways to find M33.

First, if you imagine a line between 3rd-mag. **Alpha Tri** and 2nd-mag. **Mirach (Beta Andromeda)**, M33 is about 40% of the way from the former to the latter, and just S of the line between them.

The other way – and the way I prefer because the margin of error in scanning is smaller – is to use the stars **Gamma, Beta** and **Alpha Tri** that shape that constellation. They form an elongated right triangle with Alpha at the SW end. (See chart below.) If you imagine a line parallel to Gamma and Beta extending NW from Alpha for twice as far as Gamma & Beta are apart, M33 lies slightly S of that line, face-on to us and very large. As a result, it can be difficult to see clearly, but patience will be rewarded.

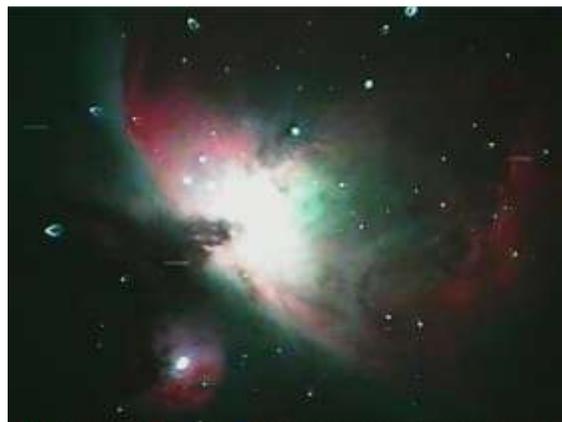


Above: Finding M33

Triangulation isn't always easy. The farther apart your guide stars are, the larger the triangle (and the area you'll need to scan) will be. You also have to remember the shape of the triangle you're

forming. I'll tell myself, *The object is 40% (or 1/3, etc.) of the way from Star A to Star B and at an angle of 45° to them*, or something like that. Imagining the triangle takes a lot of the guesswork out of where to start scanning.

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Above: M42 with satellites passing through. (Photo by **Jeremy Milligan**.) On Dec. 26th Jeremy wrote, "I was trying out my new Revolution Imager video camera on **Orion Nebula**, and I noticed streaks passing through the video. They were satellites. As I watched two satellites going through, all of a sudden a third satellite appeared behind them. I knew I'd probably never get another opportunity like that, so I took a quick shot and nailed it – **M42, M43** and three satellites. I really like how it came out!

"Who says there's nothing new under the stars?!!"

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Above: NGC 1421, an edge-on spiral galaxy in *Eridanus*. (Photo taken via remote imaging by **Alan Pryor**, using a 20-in. 'scope in Australia.)

In yr. editor's Herschel 2 observing notes he described **NGC 1421** as a "saucer-shaped elongation of mottled brightness oriented N-S...I found it by triangulating with 3rd-mag. **Gamma Eri** and 5th-mag. **Pi Eri**. 1421 formed a right triangle with those stars, 1-1/2° SW of Pi."

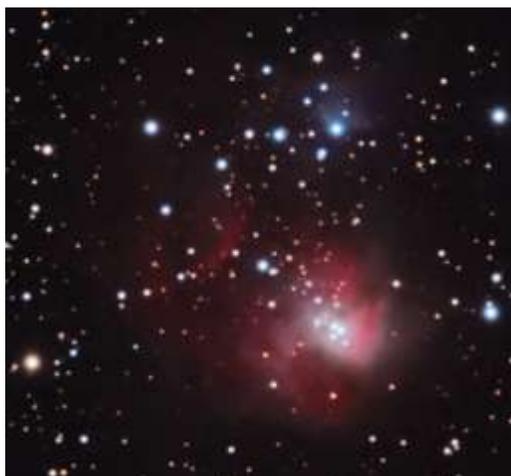
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Above: NGC 2359 (Thor's Helmet), an emission nebula in *Canis Major*. **Felix Luciano** took this photo at JKWMA in late Jan. The nickname "Thor's Helmet" refers to its resemblance to a Viking helmet.

NGC 2359 is best seen using a narrowband nebula filter, in which it appears moderately bright and clearly defined. (In yr. editor's H2 pin quest he saw it, not as a helmet but as an upside-down, compressed version of the state of Florida, with the prominent "panhandle" and a 9th-mag. star ("Jacksonville") at one end and a sprinkle of bright stars representing south Fla.'s urban sprawl at the other end.

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Bottom Left Corner: NGC 1931 (a.k.a. **Sharpless 2-231**). Photo by **Alan Pryor**. This tiny pink emission/reflection nebula in *Auriga* is sometimes referred to as "Little Orion" for colorful reasons that are apparent in Alan's photo. To carry the **M42** comparison even further, **NGC 1931** contains a **Trapezium**-like quartet of hot young stars at its center. (The small blue patch of nebulosity near the top of the photo is part of 1931.)

NGC 1931 is 7,000 light-years away, about 4-1/2 times farther from us than **M42**.

Alan took this photo from the pasture at his home in Lithia Springs, Ga.

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Above: Lynd's Bright Nebula 782 in *Taurus*. Photo by **Felix Luciano**. **LBN 782** is the dense, blue nebula at the center of the photo below the fainter of two yellow stars.

Also in the photo are two dark nebulas cataloged by **Edward Emerson Barnard: B10** is the dark void to the left of the two faint stars in LBN 782, and **B7** is above those stars and to the upper right of the dimmer yellow star. (If Barnard had found three more nebulas there, he could have shouted "Bingo!")

Dark nebulas are large, dense clouds of dust and gases that do not reflect light. They block our view of bright objects behind them. We see them as black silhouettes against their illuminated backgrounds; otherwise, we do not see them at all.

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