THE

FLINT RIVER OBSERVER

NEWSLETTER OF THE FLINT RIVER ASTRONOMY CLUB

An Affiliate of the Astronomical League

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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* from the A. L.

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Club Calendar. Fri.-Sat., Jan. 27-28: JKWMA observings (at dark); **Thurs., Feb. 9:** FRAC meeting (7:30 p.m. at The Garden in Griffin, with public lunar & planetary observing before and afterward; **Fri.-Sat., Feb. 24-25:** JKWMA observings (at dark).

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Vice President's Message. Thanks for responding to my request for greater member participation in the newsletter. Here's where we stand:

In addition to **Felix Luciano's** NASA articles that Tom sends out with the *Observer* every month – they're too long to fit into the newsletter – **Aaron Calhoun** contributes "Calhoun's Corner" articles and this month marks the beginning of a series of tech-oriented articles by **Jeremy Milligan**. Felix, **Alan Pryor** and other members regularly submit astrophotos that greatly enhance the quality and attractiveness of every issue.

I try to make the newsletter light-hearted whenever possible, but I take the task of shepherding its progress very seriously. I'm glad that other members want to contribute to that progress in such meaningful ways.

Finally, here's a warm "WELCOME TO FRAC!" to our newest member, **Henry Trevino** of McDonough, GA.

-Bill Warren

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Last Month's Meeting/Activities. Seventeen members attended **Dr. Donovan Domingue's** talk on "Galaxy Pairs in Infrared" at our Jan. meeting: **David Haire; Aaron Calhoun; Steve Benton; Steve Hollander; Tom Moore; Felix Luciano; Dwight Harness; Erik Erikson; Ken Olson; Cynthia Armstrong; Jeremy, Sarah, Emily & Delilah Milligan; Alan Pryor; yr. editor**; and **Henry Trevino**, who joined the club that night.

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This 'n That. Ex-FRAC member and current Atlanta Astronomy Club program chairman **Rich Jakiel** has a wonderful article about **Charles Messier**, "The Obsessive Comet Hunter," in the Feb. issue of *Astronomy* (pp. 54-57).

Every amateur astronomer knows about the Messier list – 109 deep-sky objects that might be mistaken for comets. Messier compiled his list during the mid- to late-18th century while searching for comets, not deep-sky objects. He was the most successful comet hunter of the 1700s, discovering 13 comets and co-discovering 7 more. Rich notes that "Perhaps even more incredible is that he made detailed observations of no fewer than 44 of the 50 known comets from 1758 to 1805." (p. 57)

And that, not Messier's famous list and how he compiled it, is the focus of Rich's article. It's a valuable resource for anyone who wants to know more about “The Ferret of Comets,” as **King Louis IV** referred to him.

*****The **Hyades** is a large – 5.5^o – **V**-shaped open cluster of seven naked-eye stars that form the easily recognizable face of *Taurus, the Bull.* The human eye is naturally drawn to the asterism due to the brightness (mag. 0.8) of **Aldebaran (Alpha Taurus)** at the NE corner of the **V**. It is the Bull’s right eye as it looks at us, and it is the 14th-brightest star in the sky.

Aldebaran is only 68 light-years away from us. The other stars in the Hyades are 155 l.y. away, gravitationally bound and traveling through space together, so Aldebaran is not a true member of the group. But without it, the cluster would be far less compelling and colorful, since the other Hyades are white and mag. 3-4 in brightness. Without Aldebaran, the Hyades would resemble a checkmark, or maybe a Nike swoosh with a short arm, not a prominent, highly symmetrical **V.**

In Greek mythology, the Hyades were daughters of **Atlas,** the Titan who carried the world on his shoulders. (They were also half-sisters to the **Pleiades,** who reside nearby in the winter sky.) As **Phil Harrington** points out in the Jan. 2017 issue of *Astronomy* (p. 69), “After the death of their brother **Hyas**, the mourning (Hyades) sisters were transformed into a cluster of stars. The story goes that as the Hyades set in early spring, their tears become our April showers.”

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Upcoming Meetings/Activities. Our JKWMA observings will be at JKWMA on **Fri.-Sat., Jan. 27th-28th**, and again on **Fri.-Sat., Feb. 24th-25th.** They will begin at dark, and the gates will be open all night.

Our club meeting will be held at The Garden in Griffin at 7:30 p.m. on **Thurs., Feb. 9th**, with public observing before and after the meeting. We’ll elect officers for 2017, **Aaron Calhoun** will do a short presentation on “Galileo and The Moons of Jupiter,” and we’ll have refreshments to celebrate FRAC’s 20th birthday.

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<u>Are You Experienced?</u>

tech article by Jeremy Milligan

Guitar great **Jimi Hendrix** was a star, but I don’t know if he ever looked at the stars. His 1967 album, *Are You Experienced,* got me to thinking about whether many of us have had the experience of viewing through wide-field eyepieces. I know it’s one of my favorite ways to see the sky, and it just might be for you too.

What exactly is a wide-field eyepiece? To find out, we need to consider two sky terms. The first one is *true field of view (TFOV).* This is an angular measurement in degrees of the actual slice of the sky that’s being captured by the optics of your telescope. It’s determined by three things: the size of the telescope’s primary lens or mirror; the focal length of both the telescope and the eyepiece; and the *apparent field of view* of the eyepiece.

Apparent field of view (AFOV) is the other term. AFOV refers to the angular size in degrees of the picture that an eyepiece presents to your eye. This can be confusing, since both true and apparent fields are measured in degrees, so here’s an analogy relating it to a familiar concept: the Backyard Window.

Your backyard is the TFOV, i.e., the specific slice of the outdoors that you can see when looking in that direction. The AFOV is the window you look through to see it. A small kitchen window will let you see the backyard, but the view widens and gets more interesting if you have a large floor-to-ceiling picture window in your den. Sure, you’re still seeing the backyard through both windows, but the amount of yard you can see at one time is quite different. This is how true field and apparent field of view are related: you see the same slice of sky, just more of it at once with an eyepiece that has a wide apparent field.

The starting point for an eyepiece to be considered wide-field is a 65^o AFOV. Thus, the old standard eyepieces like Plossls with a 50^o or 52^o AFOV don’t count as wide-field eyepieces.

Using 65^o as a starting point isn’t exactly arbitrary, either. Physiologically, the sharpest part of most people’s vision is a cone about 65^o wide from the center of the pupil. The farther away you get from this point, the more blurred details become. Wide-field eyepieces are more about a larger field of view than detail, so that’s what makes 65^o a good starting point.

We amateur astronomers are fortunate to have a big variety of wide-field eyepieces available today. Take a look at any online astro-shop and you'll see eyepieces ranging from 65° all the way to 120°, with prices ranging from $30 to $1,000. With that amount of choices, I'm certain there's a wide-field eyepiece out there that will fit every budget. The next time you're in the market for a new eyepiece, consider getting a wide-field. You'll love the experience.

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Chicxulub

article by Bill Warren

Dinosaur movies like *Jurassic Park* and **Will Ferrell's** *Land of the Lost* are entertaining and fun to watch, but they leave a false impression of dinosaurs. They show some big dinosaurs and some smaller ones, and leave it at that. But that's not how it was.

Although humans – or at least human-like creatures -- have been around for about four million years, we've been the dominant species for only 10,000 years. Dinosaurs were the dominant land species on Earth for 20,000 times longer than that. Their numbers were anything but small. Some were plant eaters, some were carnivores, and they were everywhere, thriving in our planet's warm, moist, nurturing regions. Their organic remains are part of the fossil fuels that power our cars. (One gas company, Sinclair Oil, used Dino the Dinosaur as its logo.)

Unchallenged as alpha predators and feeders, the dinosaurs reigned supreme at the top of the terrestrial food chain for 200 million years. They might still be running things on our planet, except for one little thing…

Chicxulub (pronounced: CHICK soo loob) is a little town on the NW coast of Mexico's Yucatan Peninsula, 180 mi. W of Cancun. You won't find Chicxulub on most maps – but the dinosaurs knew where it was. One day 65 million years ago near the end of the Cretaceous Period, an incoming 6-mi.-wide asteroid selected Chicxulub for a suitable landing site.

The awesome impact of that city-sized boulder crashing into Earth blasted out a crater in the Gulf of Mexico that was 110 mi. wide and 12 mi. deep. (By way of comparison, the Wetumpka Impact Crater near Montgomery, AL is only 4-1/2 mi. wide. It was created by an asteroid measuring about 1,100 ft. in dia.) Over the eons since then, geologic forces have raised Chicxulub and the rest of the Yucatan Peninsula to its present elevation and filled the crater with sand. The outer rim of the crater lies about 30 mi. offshore, 2,000 ft. deep in the Gulf of Mexico.

The impact instantly vaporized the Gulf waters for 55 mi. in all directions, killing the dinosaurs and any other animal life within a thousand miles of ground zero. But it was not just a local event. The blast literally shook the entire planet, causing worldwide tsunamis, earthquakes and volcanic eruptions. Most significantly for the dinosaurs, it sent a cloud of ashes and dust into the atmosphere that was so thick that it blocked out sunlight for many years.

Thus began nature's version of the Domino Effect. Deprived of sunlight, plants died. Deprived of their food supply, herbivores died. And deprived of meat, carnivores expired. It was a mass extinction, the last of five that Earth has endured. The animals that survived were small creatures that lived underground or underwater. Large animals such as the dinosaurs didn't have a chance.

One thing you have to say for our planet and its inhabitants: we're *flexible*. Starting over virtually from scratch 65 million years ago, Earth gradually re-populated itself with new life forms large and small after the ashes dissipated and the Sun reappeared. If not for the work of paleontologists, we might never have known that dinosaurs ever existed, or that they populated Earth like visitors to Time Square on New Year's Eve. (I'm exaggerating here, but you can fit a lot of dinosaurs onto a planet as small as ours over a period of 200 million years.)

Three final thoughts:

**The Chicxulub asteroid didn't kill off all the dinosaurs.* In fact, you see their ancestors every day. Beginning around 1996, scientists began finding the remains of feathered dinosaurs, which lent credence to the now-accepted notion that birds are a surviving branch of the dinosaur family tree.

*Mammals -- but not humans -- also existed when dinosaurs roamed the Earth, although they were not as nearly as prevalent as they are today. The largest was *megatherium*, a creature about the size of a water buffalo. (The woolly mammoth and mastodon came later.) About 20% of the mammals survived the Chicxulub event; megatherium wasn't one of them.

*Those facts matter only if you believe in evolution.

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Observing Tips

article by Bill Warren

(Editor's Note: This is the first in a series of articles devoted to finding and observing objects in a telescope or binoculars.)

The following terms will be used in this article.

*__FOV (Field Of View).__ When you look into a telescope's eyepiece, the FOV is the circle you see. What you see in that circle changes as the Earth rotates, or when you move the tube around.

*__Direct and averted vision.__ *Direct vision* refers to looking straight at an object. To see bright objects, all you need is direct vision.

For faint objects, however, you may need to use *all* of your vision, including the area away from where you're looking directly. For example, if you center a bright star in your FOV, you'll still be able to see everything else around it. That "everything else" is your *averted vision* at work. It helps in locating faint objects because the receptors away from the center of your eye are more sensitive to dim light than those near the center where your gaze is focused.

If all you use is your direct vision, you'll miss anything that is too faint to be seen that way.

Consider the **Blinking Planetary (NGC 6826)**. When you look directly at it, all you see is the mag. 11 star at its center. But when you shift your direct vision about ½ in. away to a nearby star, the planetary nebula appears via averted vision and the central star vanishes (or at least diminishes in brightness). The nebula is too faint to be seen in the central star's glow, but shifting your gaze slightly brings it into view. The star brightens and dims, or "blinks" on and off, as it moves in and out of your direct view. The blinking effect is best seen at low magnification. Since all you'll see is the central star via direct vision, you'll have to find the Blinking Planetary via averted vision.

*__Observing Tip #1__. *Before attempting to find a deep-sky object, find out how large and bright it is.* You'll overlook a minnow if you're looking for a whale.

The problem here is, stated sizes and brightnesses can be misleading. Invariably, deep-sky objects are smaller and fainter than the books and magazines say they are.

Size. Back when my eyesight was much better than it is now, faint objects ranged from half to 2/3 as large as their stated sizes. The sizes you see in print indicate how large the objects would appear at a very dark site under ideal conditions, which are rare.

Brightness. The magnitudes of deep-sky objects indicate how bright an object would be if all of its light were condensed to the size of a star. "Low surface brightness" means the object will be faint at any magnification. But galaxies, nebulas and star clusters are much larger than stars, so surface brightness can be deceptive.

For example, **M33 (Pinwheel Galaxy)** is listed at mag. 5.7, so it should be visible to the naked eye under clear skies at a dark site like JKWMA. (And maybe it is, but I've never seen it.) But M33 is nearly 1^{o} in dia., so its brightness is spread out over a very large area. As a result, it is extremely faint visually (i.e., it has very low surface brightness). You won't see M33 at all in your telescope if you're looking for a galaxy that is as bright as a naked-eye star. Look for a large, very faint object. It will be slightly brighter via averted vision.

How do you know this if you've never seen the object before? When you find its listed brightness, check out its size, too. The smaller and more compact the object is, the greater its surface brightness and visibility will be, and vice versa.

*__Observing Tip #2.__ *It also helps to see a photo of the object beforehand, so you'll know what the object will look like (i.e., its shape and structure).* A photo will also indicate the presence and location of nearby bright stars or star patterns to look for in your field of view. (This is especially important if you're looking for a galaxy and there is more than one galaxy in your FOV.)

Small photos are better than large ones because objects will be more like what you'll see in your telescope. Black and white photos are better, too, for the same reason. Drawings are even better than photos: they show you what another astronomer saw when he observed the object.

(Incidentally, the 2-vol. *Night Sky Observer's Guide* by **George Kepple & Glen Sanner** also gives detailed descriptions of what you're likely to see in telescopes of different sizes. I used it with the Herschel IIs to compare what I saw with what they saw.)

*__Observing Tip #3.__ *Unless you're using Goto, don't expect to find an object in your FOV when you aim the telescope at where you think it's located.* It happens occasionally, but finding faint objects usually requires patience and perseverance. (I'll have more to say about perseverance later.)

In order to find objects consistently, you'll need to develop a scanning technique that systematically covers the entire area where you suspect the object is hiding. There is no "right" way to do it, as long as you cover every square inch of that portion of the sky. Murphy's Law dictates that the one place you fail to scan will be where the object is located. The more often you observe, the better and more productive your scanning technique will become.

In case you're interested, here's my scanning technique:

Start by centering the telescope's FOV where you think the object should be. If you don't see the object by direct or averted vision, slowly move the tube straight up until your centering point is out of sight, then move it straight down an equal distance below the center. Scan those areas. Then move the 'scope up again and ½ FOV to the right. Then move it down again slowly, and then another ½ FOV to the right and up again, etc, until you find the object.

If you don't see it after several moves and scans, return to the starting point and do the same thing again, only this time move up, down and to the *left*.

If you still don't find the object, check your star chart to make sure you're looking in the right place. Remember: *The object is located where the chart says it is*. When I can't find something, usually it's because I've miscalculated the starting point.

(Next month, I'll examine ways to find that starting point.)

At any rate, whatever scanning technique you develop, *do it the same way every time you look for anything*. After a few attempts, you'll find yourself doing it that way without having to think about it.

*__Observing Tip #4.__ *The biggest mistake that observers make in scanning is going too fast.* When I was starting out, I was in a hurry to find things. One of the most brilliant observers I've ever known, **Art Russell**, once told me, "Always take at least two seconds to search each FOV before moving on. If you go faster than that, you'll miss any object that is small or faint."

***Observing Tip #5.** *Regardless of what you're looking for, **if you haven't found it within ten minutes, look for something else**.* Make it something easy that you've found many times before. You can always go back and look for the other one later.

If you can't find, say, **Hubble's Variable Nebula (NGC 2261** in *Monoceros*) within 10 min., stop and look for **Orion Nebula**. **M42** is easy to find, it's always beautiful, and finding it may give you confidence to go back and look for 2261 again (or to look for something else on your observing list). But DON'T spend an entire evening looking for something you can't find. You'll be miserable throughout, and observing is supposed to be fun.

Failure is inevitable in observing, at least occasionally. But it shouldn't define your evenings spent observing, or you as an observer. And it won't do that if you'll do the following:

On any evening in which you've had trouble finding things, finish the observing by going back to the easiest thing you can find. It's one of your favorites, or else you wouldn't be able to find it. Finding it again will end your evening on a positive note, and it will remind you of how far you've come since the days when you couldn't find anything at all except the sky above you.

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Next Page, Center: The Trapezium in **Orion Nebula** (photo by **Jeremy Milligan)**. Jeremy writes, "I was doing a little light reading of some past *Observer* issues and I came across your winter challenge in the Nov. 2015 issue about imaging **M42** without losing the **Trapezium** stars. I thought it would be fun to try with my video astronomy camera (the Revolution Imager, it's a great product!) just to test out what it could do…I made my way over to *Orion* once he got high enough. I changed the camera settings several times trying to find the best combination, and I think my final one is pretty good.

"I took this through my 8-in. Meade SCT with the analog video feed from the camera running into Sharpcap software on my laptop. The picture is three 2-sec. exposures stacked internally by the camera, and I just grabbed a single snapshot of the combined image using the computer software with no post-processing at all."

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Above: NGC 1275, a.k.a. **Perseus A Radio Source.** All of the yellow objects in **Alan Pryor's** dazzling photo are galaxies at the center of the massive **Perseus I Galaxy Cluster**, which is roughly 300 million l.y. away and almost 10 million l.y. in dia.

The three brightest galaxies – **NGCs 1270, 1275 & 1278 –** form an arc above the center of the photo. NGC 1275, the one in the middle of the three, is actually two galaxies that are merging, the way **Andromeda Galaxy** and the **Milky Way** will do four billion years from now to form the supergalaxy **Milkomeda**. A supermassive black hole with a mass equal to 340 million **Suns** lies at the center of 1275.

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Above: NGCs 1532/1531, a pair of interacting galaxies in *Eridanus.* (Photo by **Alan Pryor.**) Edge-on spiral galaxy **NGC 1532** is in the process of devouring its tiny neighbor, dwarf galaxy **NGC 1531.** Although they look rather serene at first glance, the faint, wispy arcs above 1532's upper right edge and below its lower left edge reveal the effects of the gravitational struggle that is going on there. It's a battle that little 1531 cannot win.

(Editor's Note: Both of Alan's photos were taken via remote imaging. NGC 1532 was taken using the 20-in. telescope at the Siding Springs Observatory in Australia. NGC 1275 was imaged using a 150mm refractor in New Mexico.

Alan says he's probably not going to do any more remote imaging, though, because "Using those nice 'scopes is addictive!")

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