THE FLINT RIVER OBSERVER

NEWSLETTER OF THE FLINT RIVER ASTRONOMY CLUB

An Affiliate of the Astronomical League

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Club Calendar. Thurs., July 13: FRAC meeting (7:30 p.m. at The Garden in Griffin); Fri.-**Sat., July 21-22**: JKWMA observings (at dark).

Vice President's Message. Let me tell you about yourself.

As a child, you learned in school about the **Sun**, **Moon** and planets. You saw photos and drawings of things like **Saturn's** rings and **Jupiter's** Great Red Spot, and you wanted to become an astronaut. You checked out library books, and they showed you other cool things like comets, asteroids, nebulas and galaxies.

You wished you had a telescope, but if your parents were like mine they couldn't afford to buy you one. (And if they did, it was a small, cheaply made Christmas or birthday present. But you managed to find a few things with it, and you were as excited as a teenager with his first driver's license when you saw Saturn for the first time. It looked just like it did in the photos, only smaller.)

Your appetite for astronomy increased when, as a child, you saw your first lunar eclipse and watched the Moon slowly change color. You thought it was the coolest thing you'd ever seen. You went outside on summer evenings once or twice as a teenager to watch meteor showers, but you didn't see any meteors.

Eventually, life intruded and your interest in astronomy took a back seat to other priorities – dating, getting a job or going to college, working full-time, becoming independent of your parents, and possibly raising a family of your own. If you ever had a telescope, it ended up collecting cobwebs in your parents' garage or attic. But you never outgrew your youthful fascination with the universe and astronomy; you simply put it on a back burner, like memories of your first girlfriend or boyfriend.

You didn't know it at the time, but you were *waiting*, whether for a time when you could afford to buy a telescope or for a spark that would re-ignite your interest in astronomy and the universe.

That day finally came when you bought a telescope or found out that there was an astronomy club in the area. You attended a meeting, and it was thrilling to be around people who shared your interest in astronomy. They were friendly and eager to help you, so you joined the club.

Since then -- well, you didn't become an astronaut, but you're an astronomer now. You may or may not have a telescope, but you're comfortable in FRAC. Regardless of how much or how little you know, you're treated as an equal and nobody in the club expects more time or participation from you than you're able or willing to give.

Respect. Acceptance. Friendships. The opportunity to reacquaint yourself with a subject that fired your imagination as a child. Where else could you get all those things for $15 a year?

-Bill Warren

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Last Month's Meeting/Activities. For the second consecutive month, **Sean Neckel** mowed the weeds at the JKWMA site. **Dwight Harness** sprayed the area for fire ants, and **Marla Smith** baked cookies for the observing that were as heavenly as the stars overhead. **Aaron Calhoun** was there on May 26th, too, and **Elaine Stachowiak,** along with **yr. editor** and two regulars from FRAC's days at Cox Field, **Joe Auriemma** and **Mike Stuart**.

To cap off a great evening, **Comet Johnson** shared the evening with us and the International Space Station flew by to pay its respects. Sean tracked down a bunch of double stars, Aaron added some Messiers and Herschel 400 targets -- and neither dew nor mosquitos were present throughout.

Fourteen members and a visitor – **Kenneth Olson, Dawn Chappell, Tom Moore**, **Felix Luciano, Sean & Gianna Neckel, Joe Auriemma, Carlos Flores, Alan Rutter, Marla Smith, Elaine Stachowiak, Aaron Calhoun, yr. editor, Steve Benton** and his guest from Sun City Peachtree, **Chuck Davis** – attended our June meeting. On that same day, **Truman Boyle** conducted a solar observing for 45 Vacation Bible School children at First Baptist Church in Barnesville.

Felix Luciano did a superlative job of organizing a late-scheduled FRAC public observing at High Falls State Park on June 9th. **Sean Neckel,** his daughter **Gianna** and **Bill Warren** took part in a sunset kayak lake tour, and they talked about the **Moon, Jupiter** and the constellations. After that, they joined Felix, **Truman Boyle** and **Elaine Stachowiak** at the Visitor Center to show the visitors and park employees what a strawberry-colored Full Moon, Jupiter and **Saturn** look like, up close and personal, in telescopes. It was a magical evening that doubtless will lead to other such visits in the future.

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This 'n That. We're pleased to report that **Dwight Harness** has found the lunar and martian meteorites that he purchased a few years ago and subsequently misplaced. Hopefully, he'll bring them to show off at the July meeting (if he hasn't lost them again by then).

*In an astonishing display of thoughtlessness, **Carlos & Olga Flores** spent a week in Jamaica in June without inviting all of their fellow FRACsters to go along as their guests. If they had invited us to go with them and stay for a month, we could have held our July meeting at an all-inclusive resort in Ocho Rios.

*Here are the six A. L. clubs with the highest number of members who have earned Outreach pins: (1) Fort Bend Astronomy Club (Stafford, TX, a suburb of Houston), 66; (2) **Flint River Astronomy Club** (Griffin, GA), 47; (3) Northeast Florida Astronomy Society (Jacksonville, FL), 45; (4) Omaha Astronomical Society and Oklahoma City Astronomy Club (both have 40); and (6) the Astronomical Society of Kansas City, 39.

***Hearing Meteors**. Over the years, various FRAC members past and present (including **yr. hearing-challenged editor**, **Dwight Harness**, **Larry Higgins** and others) have reported having seen a fireball flash by overhead, accompanied by a hissing, popping or crackling sound. But in theory that's not possible because (a) meteors burn when they enter Earth's upper atmosphere where sound transmission is weak, and (b) due to their distance from us when they begin to burn (i.e., about 50 mi. high), any sound generated by fireballs' passage should occur *after* we see them, not while we're watching them zip across the sky.

Sound travels much more slowly than light. Sound waves travel in air at 767 mph. So if the sound is produced 50 mi. away, it should take 10-11 seconds to reach us. That principle holds true even if a fireball is closer than 50 mi. away when we hear it: there should be a time lag between seeing and hearing it. But that hasn't been the case.

Scientists now think they know why. It's due, they say, to a couple of unlikely culprits: our hair and the clothing we wear.

According to this theory, a fireball's intense light can generate tiny amounts of heat radiation in our clothing or hair, momentarily heating up the air around our heads to produce pressure oscillations that we perceive as sounds. People with long hair (or wearing a stocking cap or balaclava) are most likely to hear those sounds.

To paraphrase **Shakespeare's Julius Caesar**, "The fault, dear **Brutus**, is not in our (shooting) stars, but in our hair."

Of course, there is another way of hearing meteors, regardless of whether they're fireballs or not. It works best during meteor showers. You can hear them on your car radio whether the sky is cloudy or clear.

As meteors pass through Earth's atmosphere, they leave behind a trail of ionized gas molecules. If you tune your radio to a commercial FM station you can't normally pick up that's about 600 mi. away – say, 91.7 FM (WMKL in Miami) or 91.5 FM (WBJC in Baltimore) – you'll hear static. But whenever a meteor zips through the atmosphere, the radio waves will bounce off the meteor's ion trail and the station will come in loud and clear until the signal fades back to static in a second or two.

(Hey, it happened to yr. editor once when he was driving home from Kentucky late one December night: he tuned his radio to an FM station in New Orleans during the Geminids meteor shower, and every minute or so the static would be replaced briefly by music or the deejay's voice. You can try it yourself next month when the Perseids meteor shower makes its annual August appearance.)

*Speaking of meteors, scientists estimate that 100 billion micrometeorites fall to Earth each year. (Micrometeorites are exceedingly small: most are about the size of grains of pepper.)

We've told you before that you might find iron micrometeorites in your rain gutters by passing a magnet over the surface. Some meteorite collectors have scoffed at that idea, but a team of British scientists showed recently that it does indeed occur. They collected 600 lbs. of sediment from urban rain gutters, spread out the material and used a magnet to collect 500 particles that contained a high iron content. Then they studied them under a microscope for signs of deformation caused by burning when they entered Earth's atmosphere at thousands of mph. Of the selected particles, about 50 were identified as micrometeorites.

So micrometeorites actually *do* collect in places like rain gutters – but the odds of your finding one are considerably less than the chances of your falling off your ladder or roof (in which case you'll encounter another astronomically large figure, i.e., your hospital bill.)

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Upcoming Meetings/Activities. Our FRAC meeting will be held at The Garden in Griffin at 7:30 p.m. on **Thurs., July 13th**. Our program will be "The Sagittarius Star Cloud" from the *Experiencing Hubble* dvd featuring **Prof. David Meyer** of Northwestern University analyzing the HST's most famous images.

Our JKWMA observings will be on **Fri.-Sat., July 21st-22nd**, at dark.

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The Sky in July. Jupiter (mag. -2.0) will be in the SW sky all month, as will **Saturn** (mag. 0.2) in the S. **Mercury** (mag. -1.0) will shine low in the WNW sky 30 min. after sunset. **Neptune** (mag. 7.8) and **Uranus** (mag. 5.8) will be after-midnight visitors in *Aquarius* and *Pisces*, respectively.

Other things you might want to look for:

*Cloudy nights are the observer's bane. As a beginning observer, **yr. editor** took out his telescope on a summer evening, noticed a large, wide N-S cloud overhead and thought: *Just my luck: I'm ready to observe, and the sky is clouding over!* But it wasn't a cloud, it was our home galaxy, the **Milky Way,** as seen from our vantage point on one of its spiral arms.

You won't have any trouble seeing the Milky Way naked-eye from a dark site on any clear summer night. (In fact, it's hard to miss.) Having found it, look for the **Great Rift,** a large N-S elongated dark void composed of molecular dust clouds. Extending lengthwise through about 1/3 of the Milky Way, it divides the star cloud into two arms stretching northward.

*If you own a telescope and use it more often than seldom, you've doubtless aimed it at the incredible globular cluster **M13** many times. It's always a joy to see, with more stars than you could possibly count. But have you ever seen it naked-eye? M13 is a small, hazy patch of light on the W side of the **Keystone**, a trapezoid of four bright stars in *Hercules*; it lies 1/3 of the way from 4th-mag. **Eta Her** to 3rd-mag. **Zeta Her.**

Beyond that, have you seen the **Propeller?** In telescopes, it's a **Y**-shaped trio of dark lanes that intersect just SE of M13's core.

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Next Month's Total Solar Eclipse

by Bill Warren

As you doubtless know by now, there's going to be a total solar eclipse on Aug. 21st. Unless **Betelgeuse** finally decides to go supernova, the eclipse likely will be the biggest event in astronomy this year. Here, in Q&A form, are some things you need to know about solar eclipses, and the Aug. 21st total eclipse in particular. *(Note; if you already are familiar with these things, consider this a guide to what to tell other people when they ask you about the eclipse.)*

**What is a solar eclipse?*

It's when, during some New Moon phases, the **Moon's** orbital path takes it directly between Earth and the Sun, blocking all or part of the Sun's light from our view for a brief period. That happens between 2-5 times every year, but we seldom get to see them.

**Why not? Why isn't there an eclipse every month?*

The Moon orbits the Earth, and Earth orbits the Sun. But the Moon's orbital path is not in the same plane as Earth's orbital path, so most of the time they are not properly aligned with the Sun to produce an eclipse. As I've noted many times, it's a big sky out there; there's plenty of room for the Earth and Moon to pass each other without producing a lunar or solar eclipse.

Even when they are aligned properly, though, we don't see most of them.

**Again, why not?*

Earth is six times larger than the Moon, so when Earth's orbital path takes it between the Moon and the Sun in a *lunar eclipse*, Earth's dark shadow (called the **umbra**) is large enough to cover the entire lunar surface.

In a solar eclipse, however, the shadow cast by the Moon onto Earth is much smaller. Unless you're inside that lunar umbral shadow – which in the case of the Aug. 21st eclipse is about 67 mi. in dia. – you won't see a total eclipse. (That 67-mi.-wide path across the U. S. is called the **area of totality.**)

Griffin is not in the area of totality.

**So if I stay home on Aug. 21st, will I miss the eclipse?*

No, you'll still see it – but as a partial eclipse. Less than 10% of the Sun's light will remain visible throughout the eclipse – but that's enough to be harmful to your eyes if you aren't careful.

Elsewhere in the U. S., how much of the Sun remains visible during the eclipse will depend on how close you are to the area of totality. Most of the U. S. will see between 40-90% of the Sun covered by the Moon.

**Where will the path of totality be?*

The Moon is a sphere, so the umbral shadow it casts on Earth is small and round. As the Moon travels across the sky on Aug. 21st, the umbra will enter the U. S. in Oregon and forge a path through 12 states before heading out to sea near Charleston, S. C. (Those states are: Oregon, Idaho, Wyoming, Nebraska, Kansas, southern Illinois, Missouri, western Kentucky, Tennessee, western North Carolina, northeast Georgia and South Carolina.)

**Georgia?*

Yep. If you get a Ga. map and draw a line from Cleveland, Ga. to Cornelia and extend it to the NW and SE, everywhere north of that line in Ga. lies in the area of totality. That area includes 4 state parks (Vogel, Unicoi, Moccasin Creek and Black Rock Mtn.); Brasstown Bald (at 4,784 ft. in elevation Ga.'s highest mtn.); and towns such as Blue Ridge, Blairsville, Helen, Hiawassee, Clarkesville, Toccoa and Clayton.

Of those towns, Clayton will have the longest period of totality – 2m 34s. At the other extreme, Cleveland and Cornelia will have about 1m 30s of totality. The greatest period of totality anywhere along the umbral path will be 2m 40s near Hopkinsville, Ky.

**Why should I drive to the area of totality just for a minute or two of eclipse? What's the big deal?*

First, the eclipse doesn't begin or end with totality; there's also the periods of partial eclipse on either side of it. For example, in Atlanta – which

isn't in the path of totality -- the partial eclipse will begin at 1:05 p.m.; maximum darkness will be at 2:36 p.m.; and the eclipse will end at 4:01 p.m. (Those times also apply to Griffin, Fayetteville, McDonough, Barnesville and the rest of our area.)

More importantly, total eclipses are rare: the chances of Griffin (or any other specific location in the U. S.) lying in the path of totality are once in every 330 years – and this isn't one of those years. (The state of Delaware hasn't experienced a total solar eclipse in 539 years.)

Beyond that, this will be the first total solar eclipse to be visible in the continental 48 states of the U. S. since 1979. (Totality occurred in only 5 states in the northwest.) And the last time one was visible from coast to coast was in 1918. So from a historical perspective, this one really *is* a big deal.

**What should I do if I want to experience totality?*

There are numerous eclipse route maps on the web; Google one. (**Erik Erikson** handed out copies at the May meeting. Thanks, Erik.)

Since travel to and from anywhere along that path will involve several hours of driving each way, you might want to stay somewhere overnight.

You can pretty much forget the state parks, and maybe even the small towns in NE Georgia as well. There will be hundreds of thousands – and maybe even millions -- of eclipse enthusiasts from all over the U. S. and abroad coming to see it. (It's a big deal for them, too.) They won't all be coming to Ga., of course, but camping sites at the state parks undoubtedly have already filled their reservation quotas, and the small towns don't have much in the way of motel accomodations. They may fill up around eclipse day, too.

Your best bet might be to select a city such as Knoxville or Chattanooga (which lie slightly outside the area of totality), and drive a short distance from there to see it.

Another suggestion might be to try to find a motel vacancy in Nashville, TN, or in Greenville, Columbia or Charleston, S. C. – all of which are within the area of totality. (On the other hand, those cities are the closest ones to millions of Americans living along the East Coast, so they may fill up on eclipse day, too.)

**Does FRAC have any plans for caravaning to a site within totality?*

No. We talked about it as early as 2 yrs. ago, but we were stymied by the fact that nobody takes reservations that far in advance. We probably could have reserved campsites in a state park with the promise of conducting a solar eclipse observing, but we didn't want to spend those precious minutes of totality showing other people that once-in-a-lifetime event; we wanted to watch it ourselves.

**I understand that the Sun won't be visible during totality, and that it's important to wear solar sunglasses or use a solar filter on my telescope to protect my eyes while any part of the Sun is still visible. But what about ordinary sunglasses? Will they protect my eyes?*

Only if you stack 13 pairs on top of each other. (But you won't see anything.) Otherwise, your retinas are in for a big – and very dangerous – shock if you look at the Sun through regular sunglasses.

**Is there any other safe way to view the eclipse?*

You can buy a pane of #14 welder's glass for about $25. (Be sure it's *#14;* others aren't safe for an eclipse.)

The simplest, cheapest and safest way of all, however, is *pinhole projection.*

Lay an index card on the ground, then use a pencil point to punch a hole in a second index card. Hold the second card about 3-4 ft. above the one on the ground and align it with the Sun. (Don't look at the Sun while you're doing that.) The eclipsed Sun will project onto the card on the ground. The larger the hole, the larger the Sun will appear.

**What will I see during the eclipse?*

If you stay home, you'll see the Moon eat a very large chunk out of the Sun, and the sky will darken considerably.

You'll see the same thing during the partial eclipse if you travel to the area of totality, but during totality the sky will be as dark as midnight. The Sun won't be visible at all, so you won't need your solar sunglasses until it reappears a minute or so later. During that time, you'll see stars that you can't normally see during the daytime.

(Incidentally, even if the sky is completely overcast, you'll know when the eclipse is occurring: you'll see sunset, the darkness of night and sunrise

compressed into three hours between 1-4 p.m. Birds and farm animals will bed down for the night, and roosters will crow during the false dawn.)

Telescopically, you'll see the Sun's *corona*, or outer layer, which we don't normally see. And just before and after totality, you'll see tiny beads of sunlight called *Baily's beads* in gaps in the lunar surface along the Moon's leading or trailing edge. When only one bead is left before or immediately after totality, that single ray of sunlight is known as the *diamond ring*. Those effects don't last but a couple of seconds, but they're lovely. Most telescopic observers regard seeing Baily's beads and the diamond ring as one of the highlights (pun intended) of their total solar eclipse experience.

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Above: NGCs 4567 & 4568 (the Siamese Twins, or **the Butterfly**), a pair of interacting galaxies in *Virgo*. Photo by **Alan Pryor.** Located about 3/4^{o} SSW of **M58,** this fetching couple are joined at their E end. **NGC 4567**, the longer and leaner member, is also the brighter of the two visually.

The galaxy to the left of the Butterfly is **NGC 4564**, an elliptical galaxy.

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Above: Antares (Alpha Scorpii), M4 and the **Rho Ophiuchi Complex.** Photo by **Alan Pryor**. **Antares** (top center) is a red giant star located 600 light-years from Earth. It is so large that, if it were where the **Sun** is, it would extend beyond the orbit of **Mars**.

Two degrees E of Antares (and below it in the photo), **M4** is a spectacular globular cluster in *Scorpius.* But what elevates Alan's photo to a new level of excellence is the exquisitely delicate interplay of colors he captured along the edge of the **Rho Ophiuchi Complex** and its clouds of dust and gases that conceal a frenzy of star formation. Many of the (unseen) emerging young stars are scarcely 300,000 years old. (To put that in perspective, consider that dinosaurs roamed the Earth 60 million years ago.)

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The **Pleiades**, the seven beautiful sisters, once attracted the attention of the handsome giant **Orion**, but although six of them had passionate affairs with various gods, they all rejected Orion's advances and fled. Orion and his trusted dog **Sirius** followed the sisters and pestered them for five years without managing to conquer any of them. At last they grew so weary of his pursuit that they begged the great god **Zeus** to hide them. Zeus responded with the ironic trick of changing the sisters into stars; he also placed Orion and Sirius in the heavens. The Pleiades, Orion and Sirius are now fixed in eternal pursuit.

-Jimmy Buffett

Where Is Joe Merchant?, p. 153

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