THE

FLINT RIVER 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**; Treasurer, **Roger Brackett** (686 Bartley Rd., LaGrange, GA 30241, 706-580-6476, rdb487@yahoo.com).

Board of Directors: **Larry Higgins; Jessie Dasher;** and **Aaron Calhoun.**

Facebook Coordinators, **Jessie Dasher** and **Laura Harness;** Alcor, **Carlos Flores;** Webmaster, **Tom Moore;** Program Coordinator/Newsletter Editor, **Bill Warren**; Observing Coordinators, **Dwight Harness, Larry Higgins** & **Bill Warren;** NASA Contact, **Felix Luciano.**

Club mailing address: 1212 Everee Inn Rd., Griffin, GA 30224. FRAC web site: 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* from the A. L.

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Club Calendar. Thurs., Feb. 27: Daughtry Elem. School "Family Science Night" observing (Jackson, Ga., 6:30-8:00 p.m.); **Fri.-Sat., Feb. 28-Mar. 1:** JKWMA observings (at dark); **Tues., Mar. 4:** Cowan Rd. Elementary observing (Griffin, 6:30 p.m.); **Sat., Mar. 8:** International Sidewalk Astronomy Night observing (site & time TBA); **Thurs., Mar. 13:** FRAC meeting/public lunar observings (7-10 p.m., The Garden in Griffin); **Fri.-Sat., Mar. 28-29:** JKWMA observings (site TBA, at dark).

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President's Message. In the fall of 1996, **Larry Higgins** had an idea: *Let's start an astronomy club. We'll call it the Flint River Astronomy Club.*

Eighteen people attended FRAC's first meeting. It was held in the boy scout hut in Sunnyside on Thurs., Feb. 13, 1997. All 18 attendees joined that evening, and five of them are still in FRAC: Larry, **Bill Warren, Ken Walburn, Steven "Saratoga Smitty" Smith** and **John Wallace.**

And now, seventeen years later, FRAC is still going strong. I'm honored that you saw fit to re-elect me as your president at the Feb. meeting. Thanks for your support and friendship. I'll work hard to justify your faith in me.

I want to express my appreciation for a job well done to **Mike Stuart.** In February, Mike stepped down from FRAC's board of directors, having served in that post since July, 2011. Mike has always been there for us when we've needed him, and I've enjoyed working with him for the past year.

On behalf of everyone in the club, Mike, thanks for your support, your friendship and your dedication to astronomy and FRAC.

Also, here's a hearty "Welcome a-board!" (pun intended) to new board member **Aaron Calhoun.** Since joining FRAC at our election meeting two years ago, Aaron has been a regular fixture at our meetings and observings. Mike is leaving some very large shoes to fill; I'm 100% confident that Aaron will do a great job in that position.

Congratulations, too, to the rest of FRAC's officers and board members: Bill Warren (vice president), **Carlos Flores** (secretary), **Roger Brackett** (treasurer) and board members Larry Higgins and **Jessie Dasher.** Those guys are fun to be around and easy to work with, and they have made my job as president much easier than it would have been otherwise.

Finally, I want to welcome new members **Dawn Chappell & David, Garrett & Trevor Clay.** Your observing skills are legendary in FRAC, Dawn, and I'm looking forward to observing with you & your guys at JKWMA.

-Dwight Harness

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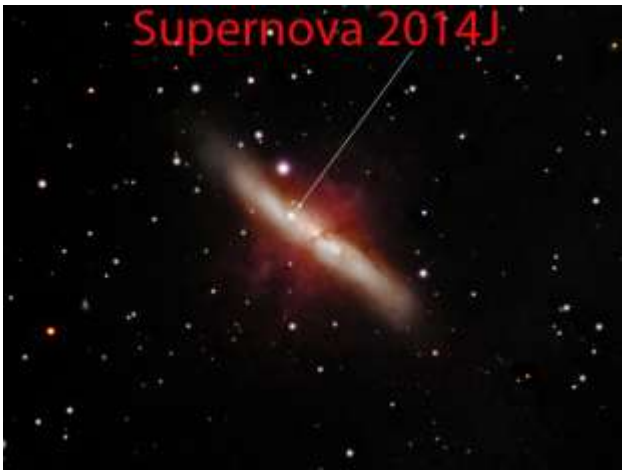
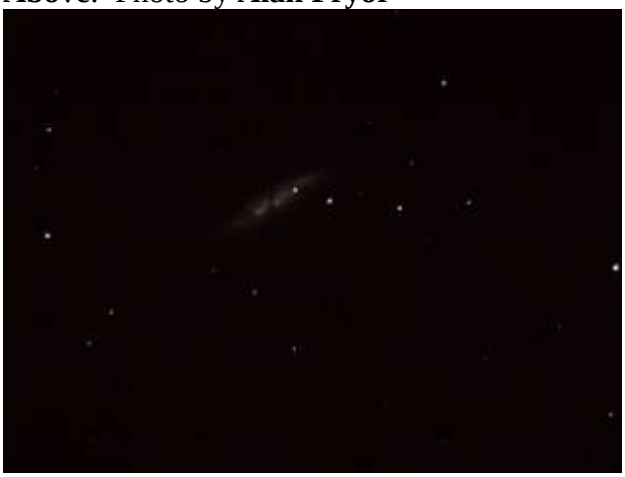


Above: Photo by **Alan Pryor**



Above: Photo by **Andy Hasluem**

Last Month's Meeting/Activities. On Jan. 31st, **Dwight Harness, Erik Erikson, Andy Hasluem** and **yr. editor** each experienced a personal milestone when we observed the supernova in **M82** (above) at JKWMA. We also observed the six stars in the **Trapezium** in **M42:** four of them are easy, the other two tiny and extremely faint. Dwight added **M46-M48, M50** and **M93** to his list of observed Messiers.

Our Feb. meeting was postponed a week due to icy roads and downed power lines. At the meeting on Feb. 20th, Bill Warren presented plaques of appreciation to: **Tom Moore,** who has transformed FRAC's website into one of the club's premier bragging points; and **Larry Higgins,** whose vision of what FRAC should be has inspired us and guided us for seventeen years. Dwight also gave out Basic Outreach pins and certificates to **Jessie Dasher** and **Erik Erikson,** and a Stellar Outreach certificate to his daughter **Laura.** Other attendees included**: Andy Hasluem; Steven "Smitty" Smith"; Tony Quinn; Dawn Chappell; Joseph Auriemma; Carlos Flores; David & Sarah O'Keeffe**; and **yr. editor.**

Our program consisted of seeing who could eat the most slices of our FRAC birthday cake. We ate like we were expecting a famine next week.

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This 'n That. The premiere of the long-awaited tv remake, *Cosmos: A Spacetime Odyssey*, is coming in March.

The original *Cosmos*, written by **Carl Sagan** and his wife **Ann Druyan** and narrated by Sagan, first appeared on tv in 1985. It was easily the finest science documentary ever made. The update, hosted by New York's Hayden Planetarium director **Dr. Neil deGrasse Tyson**, should be as good or even better, given the incredible advances in computer technology and graphics since 1985.

The first installment will be simulcast on Fox Channel, FX, FXX, National Geographic Channel, Fox Sports 1 and Nat Geo Wild at 9 p.m. on **Sun., Mar. 9th**. After the first installment, the other 12 episodes will run on Sundays on Fox and Mondays on Nat Geo. As baseball's **Yogi Berra** once said, "Don't miss it if you can." It should be awesome!

*****During the last week of March (including our JKWMA observings on Mar. 28th-29th), it's possible to observe all 110 Messier objects in a single evening, starting at sundown and ending at sunrise. If you ever want to do a Messier Marathon, buy **Harvard Pennington's** *The Year-Round Messier Marathon Field Guide* (Willmann-Bell, 1997, $19.47 + s&h in used hardback from amazon.com). He tells you the order in which you need to find them as they drift westward across the sky.

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Upcoming Meetings/Activities. We have a "Family Science Night" observing scheduled from 6:30-8:00 p.m. on **Thurs., Feb. 27th** at Daughtry Elementary School in Jackson, Ga. We've been there before, and they always treat us well.

To get to the school from, say, Griffin, take 4-lane Ga. 16 East/Arthur K. Bolton Pkwy. to I-75. After crossing I-75, set your odometer at 0.0 at the BP station and go 5.4 mi. to Shiloh Rd. on the left. Turn left, and Daughtry Elem. will be 0.3 mi. ahead on the right.

We'll have JKWMA observings on **Fri.-Sat., Feb. 28th-Mar. 1st.**

On **Tues., Mar. 4th,** we'll conduct an observing at Cowan Road Elementary School in Griffin. The observing will begin at 6:30 p.m.

To get to the school from Griffin, start at the stoplight at the U. S. 19/41- Ga. Hwy. 92 (Fayetteville Rd.) intersection. Go 0.9 mi. on 92 North toward Fayetteville, and turn right at the stoplight at Cowan Rd. Go 0.5 mi., and the elementary school will be on the left beyond the middle school football field.

On **Tues., Mar. 8th,** we'll conduct a special International Sidewalk Astronomy Night public lunar observing. The site and time are being arranged, and we'll let you know when the details are finalized.

Our FRAC meeting will be held on **Thurs., Mar. 13th** at The Garden, and we'll combine it with public observings before and after the meeting. We'll set up our 'scopes at 7 p.m. for lunar observing, and then move to the building for the meeting at 7:30. Our program will be Part Three, "Using Binoculars and Small Telescopes," from the dvd *Our Night Sky* featuring **Prof. Edward M. Murphy** of the University of Virginia.

After the meeting, we'll go back outside for the rest of our lunar observing, which will conclude at 10 p.m.

We'll wind up March with JKWMA observings on **Fri.-Sat., Mar. 28th-29th.** Since hunting season will be over by then, we'll set up our 'scopes at Site #1, the one located on the right side of the driving path about ¼ mi. from the gate.

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Hubble and the Spiral Nebulae

article by Bill Warren

Introduction. *In ancient times, astronomers were known as* astrologers. *Unlike modern astrologers, they were scientists who used the few primitive tools and research methods that were available to them to study the universe. They were also philosophers who used reason and logic to guide them in their search for knowledge.*

One such man was the Greek philosopher ***Archytas of Tarentum*** *(423-327 b.c.). Living in a time when men thought that the universe consisted of what they saw around them, Archytas proposed that the universe had no boundaries. If it did, he said, a man carrying a spear could approach the boundary, throw his spear, and wherever it landed would create a new boundary. That was sophisticated thinking, coming as it did from someone living more than 2,350 years ago.*

In a single, brilliant leap of logic, Archytas became one of the "giants" that ***Sir Isaac Newton*** *might have been referring to in 1675 when he wrote, "If I have seen farther than most, it is because I was standing on the shoulders of giants."*

About 350 years later, a modern giant of astronomy, ***Edwin Hubble,*** *proved that Archytas was right.*

Much of our modern understanding of the universe, its size, age and composition grew out of the work of American astromer **Edwin Powell Hubble** (1889-1953) in the 1920s.

Using the (then) world's largest telescope, the 100-in. reflector atop Mt. Wilson in California, Hubble showed that the universe is vastly larger than anyone since Archytas imagined it to be. And, as if that were not enough, he offered convincing evidence that the universe is not static or unchanging (as nearly everyone else believed), but is in fact expanding.

Island Universes. Astronomers had long known of the existence of globular clusters and *spiral nebulae* -- concentrations of stars, gases and dust that for the most part appeared as tiny, faint, nebulous objects in telescopes of that era. (Most telescopes in the 1920s – even the ones in observatories -- were no larger than ours in FRAC.) Little was known about those "nebulae," except that they existed by the thousands in the night sky. They were often referred to as "island universes." But astronomers didn't know whether globular clusters and spiral nebulae were part of the **Milky Way**, or how large our galaxy actually was.

Between 1918-1920, another American astronomer at Mt. Wilson, **Harlow Shapley,** showed that globular clusters are in fact part of the Milky Way, which at the time was generally thought to be no more than a few tens of thousands of light-years across. (*See* ***David Eicher's*** *"Harlow Shapley and Globular Clusters,"* Astronomy, *March, 2014, p. 7. –Ed.*)

Shapley's research with globular clusters showed that the Milky Way was considerably larger than previous estimates suggested, and that the solar system was far from its center. Shapley was wrong,

however, when he argued that the small, faint spiral nebulae were part of our galaxy. In limiting the universe to the Milky Way, he massively underestimated the size of the cosmos.

In 1925, using the same 100-in. telescope that Harlow Shapley had used, Edwin Hubble proved conclusively that the spiral nebulae (galaxies) lay millions of light-years from the Milky Way. The giant telescope was capable of resolving individual stars within the nebulae, which permitted him to use existing distance-measuring methods to determine how far away the nebulae were.

Hubble's findings established that matter in the universe is organized into galaxies. It was as fundamental a departure from what was previously known about the universe as earlier astronomers had achieved in disproving the Earth-centered solar system theory.

Red Shift and Hubble's Law. Light is a form of electromagnetic radiation. It travels in measurable wavelengths that change in relation to the observer's position in space. When light is moving toward or away from us, it decreases or increases in wavelength and shifts toward the blue or red end of the spectrum. Those phenomena are known as "blue shift" and "red shift," respectively.

Having determined how far away the distant galaxies are, Edwin Hubble was able to determine how fast they are moving. In studying the light received from distant galaxies, he found that the colors, or spectral lines, emitted by stars in those galaxies aren't exactly the same wavelengths observed in the laboratory, but are shifted to longer wavelengths toward the red end of the spectrum.

Hubble also found that, the farther away the galaxies are, the faster they are moving. A galaxy that is twice as far away from us is moving twice as fast. In any direction Hubble looked, the story was the same: the galaxies were always moving away from us. *(Note: This is true only of galaxies that are not gravitationally bound to other galaxies. For example, **Andromeda Galaxy** and the Milky Way are gravitationally bound, so M31 exhibits blue shift. The two galaxies eventually will merge into one mega-galaxy of about half a trillion stars.)*

Those two discoveries – that the galaxies are receding and the speed of their recession is proportional to their distance from the observer – are known collectively as **Hubble's Law.**

But there's more:

Since the Earth is not the center of the universe, why should all of the distant galaxies be moving away from us? Shouldn't some of them besides M31, the **Small** and **Large Magellanic Clouds** and a few other dwarf galaxies be moving toward us? Hubble concluded that the answer must lie in the nature of space itself. Space, he said, is stretching in all directions, and expanding so fast that the galaxies are not merely moving away from us, but they are also moving away from each other as well.

Under Hubble's Law, then, all non-gravitationally bound galaxies will appear to observers in any other galaxy in the universe to be moving away from them.

Hubble's Law supports the theories that the universe began with an explosive Big Bang; that the universe is still expanding; and that that expansion is uniform.

Classifying the Galaxies. Having discovered that the universe contains countless numbers of "extra-galactic nebulae," Hubble set about classifying them in terms of their physical characteristics and structure. He published his classification system in 1926, describing it as "a progressive sequence ranging from masses of unresolved nebulosity to widely open spirals whose arms are swarming with stars. The sequence comprises two sections, elliptical nebulae and spirals."

His diagram took the form of a tuning fork, with the ball-shaped ellipticals at one end and two types of spirals – one with three variations of normal spiral nebulae and the other with three variations of spirals exhibiting a bar of condensed material across the middle (barred spirals) – at the other end.

Admittedly – and understandably, given what little was known about galaxies at the time – Hubble's classifications were overly simplistic. The system presently favored by most of today's astronomers was developed in the mid- to late-1950s by the French astronomer **Gerard deVaucouleurs** and American **Alan Sandage.** It was based on Hubble's original classification model, with classes such as *lenticular* and *irregular* galaxies added along with refinements of all classes. But it all started with Edwin Hubble.

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<u>The Best and the Brightest</u>

<u>article by Bill Warren</u>

If, as I've done, you spend thousands of hours observing the night sky, you're going to see some pretty incredible things along the way. Here are my top six observing highlights over two decades of observing.

6. Seeing the remains of Comet Shoemaker-Levy 9 kamikaze dive into Jupiter between July 16-22, 1994. The comet broke up into more than two dozen pieces as it rounded Jupiter in 1992, and the fragments crashed into the planet, one by one, on their return visit two years later.

I didn't see the comet, the fragments or the explosions, but the black scars were clearly visible in my telescope. They remained visible for at least a month afterward.

(In 2009, an asteroid plunged into Jupiter, creating a similar smudge on the planet's surface – I saw that too -- but we didn't know about it until after it happened. With Shoemaker-Levy, astronomers knew in advance that the fragments were on a collision course with Jupiter, so we had more than a year to prepare for it.)

5. Seeing Comet Hyakutake at Dauset Trails in 1996. Hyakutake was my first comet, so I really didn't know what to expect. **Larry Higgins** showed me where to look, and my telescope and binoculars did the rest.

The coma (round bright part) was impressive, but the tails – a short, bluish ion tail and a longer dust tail – were a sight I'll never forget. The field of view of my 7x35 binoculars was 7^{o}, and Hyakutake's brown dust tail stretched across *seven* binocular fov's!

Larry saw the comet's tail as much longer than that – it actually spanned about 80^{o} – but it didn't matter to me. It was a stunning "Welcome to Astronomy!" for a guy who had never seen a comet.

4. Seeing Comet Hale-Bopp for 1-1/2 years from my back porch and backyard in Griffin in 1996-97. Hale-Bopp was my second comet. It was smaller but brighter and more compact than Hyakutake. I'd find it naked-eye in the NW sky on every clear evening, and then marvel at the little triangular-shaped comet's loveliness and symmetry in my binoculars and telescope. For 18 months, Hale-Bopp was a member of my family.

Larry, **Smitty** and I met **Dr. Alan Hale** and **Thomas Bopp** when they spoke at an Atlanta Astronomy Club meeting. Hale was a self-important snob who seemed to resent having to share finders' honors with Bopp, a likeable, down-to-earth fellow. Meeting them and hearing how they discovered the comet made seeing it even more personal to me.

3. Seeing Venus crossing the face of the Sun on June 6, 2012. Actually, I saw it twice, having traveled to Atlanta Speedway in Hampton to see it on June 8, 2004. But I only saw it for about 15 seconds that time in someone else's telescope on a cloudy morning. Our special Venus Transit public observing at The Garden in 2012 was clear throughout, and we watched it for about 45 minutes.

It was just a pencil eraser-sized black dot crossing the **Sun's** face – but how often do you see something like that? **Stephen Ramsden** often sees airplanes crossing the Sun – and he even imaged the International Space Station as it transited the Sun. **Mercury,** lying closer to the Sun than Venus and orbiting faster, transits the Sun 13-14 times a century. (I've seen it once.) But the next Venus solar transits will be in 2117 and 2125 a.d. I'm glad I got the chance to see it. Twice.

2. Seeing Supernova 2014J in M82 at JKWMA on Jan. 31, 2014. I knew beforehand that the supernova was shining at mag. 10 -- but since I'd never seen a supernova in two decades of observing, I assumed that I wouldn't see this one, either. Supernovas are events that other astronomers see, not me. I was wrong.

The supernova was instantly recognizable in my 12-1/2" reflector: it glowed like a bright star superimposed on the galaxy. By an incredible stroke of fortune, a mag. 10 star lay just south of M82's WSW tip, so comparing their brightnesses was easy. (See **Alan Pryor's** and **Andy Hasluem's** photos of the supernova on p. 2.) And I thought: *I've seen thousands of mag. 10 stars and deep-sky objects in the night sky over the years, but none of them has ever stood out in my mind the way this supernova does!*

1. Hearing a bolide (fireball) speed by as I stood on my back porch in Griffin one evening in 1996. The hissing sound that the meteor made as it flew by was so loud that, even with my impaired hearing -- I hadn't yet purchased hearing aids -- I heard it clearly during its brief passage.

Visually, it looked like someone had attached a sparkler to an arrow and shot it across my backyard and beyond. It left behind a vapor trail that lingered for 7-10 minutes afterward. But I can't imagine how loud it would have sounded to someone with normal hearing. Unfortunately, I was alone at the time, waiting for the sky to get dark enough to see Comet Hale-Bopp again.

Other events that didn't quite make my Top Six observing experiences list include: seeing a bolide burst apart like a fireworks display while I was observing one evening at Cox Field; seeing a bright new naked-eye comet that was discovered by Larry Higgins (it turned out to be the out-gassing of a NASA rocket); and finding the mag. 12.5 spiral galaxy **NGC 5523** in *Bootes* after searching for it unsuccessfully for 25 nights during my Herschel II quest.

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Above: Orion Nebula. North is at the bottom center of **Andy Hasluem's** photo.

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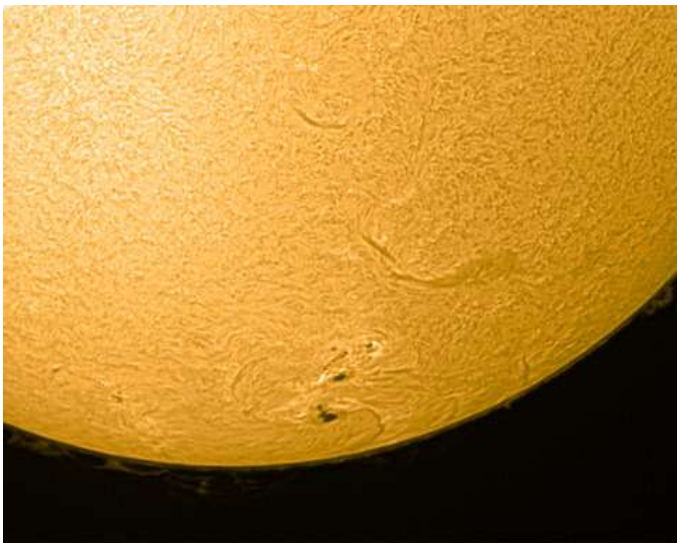
Opposite: Sharpless 2-188, a.k.a. **Semeis 22**. (Photo by **Felix Luciano.)** It looks like a supernova remnant, but actually Sharpless 2-188 is a planetary nebula in *Cassiopeia.*



Above: Sunspot Active Region (AR) 1944, Jan. 2, 2014. Photo by **Alan Pryor.**

Above: **Jupiter** on Jan. 19th. Photo by **Alan Pryor**.