THE FLINT RIVER OBSERVER

NEWSLETTER OF THE FLINT RIVER ASTRONOMY CLUB

An Affiliate of the Astronomical League

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Officers: President, **Sean Neckel**; Vice President, **Bill Warren**; Secretary, **Aaron Calhoun**; Treasurer, **Jeremy Milligan**; Board of Directors: **Larry Higgins; Cindy Barton;** and **Felix Luciano.** Alcor: **Aaron Calhoun;** Webmaster: **Tom Moore;** Program Coordinator/ Newsletter Editor: **Bill Warren**; Observing Coordinator: **Sean Neckel;** NASA Contact: **Felix Luciano.**

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Club Calendar. Fri.-Sat., May 3-4: JKWMA observings (at dark); **Thurs., May 9th**: FRAC meeting (7:30 p.m., The Garden in Griffin); **Sun., May 19**: "Springfest at The Garden" public solar observing (1-4 p.m., The Garden in Griffin); **Sat., May 25**: "Astronomy in the Park" public observing (High Falls State Park, time TBA); **Fri., May 31-Sat., June 1**: JKWMA observings (at dark).

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President's Message. As FRAC's observing chair, my role in determining club activities was limited primarily to scheduling club and public observing events. Since taking over the role of president, I have realized that there are many more things that we could do as a group to keep our members engaged, increase and improve our outreach activities, and have fun with astronomy. We briefly discussed some suggestions in that regard at our March club meeting.

As I write this on April 23rd, we have a board meeting scheduled on April 27th in Fayetteville to discuss those topics and others. But since the newsletter will be sent out before then, I will report on the board meeting at our May FRAC meeting and in the June newsletter.

Finally, Welcome to FRAC, **Kelly Mallard**! We're extremely happy to have you in our club!

-Sean Neckel

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Last Month's Meeting/Activities. Our April JKWMA observings were clouded out.

Twelve members – **Marla Smith; Dennis Nelson; Erik Erikson; Cindy Barton; Elaine Stachowiak; Mark Grizzaffi; Eva Schmidler; Aaron Calhoun; Alan Pryor; Jeremy Milligan; Sean Neckel**; and **yr. editor** — and two visitors (one of whom, **Kelly Mallard**, joined the club that night), attended our April meeting. (The other visitor was **Steve Hyde**.)

Our April Lake Horton observings were clouded out.

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This 'n That. FYI, **Tom Moore** has added the article, "How to Be a Dyne-O-Mite Participant at FRAC Observings" by **yr. editor, Sean Neckel & Felix Luciano** to the Special Reports section of our Newsletters link on our website for handy reference. (He has also added two other previous Special Editions to the site.)

*Ex-FRAC member **Rich Jakiel** is at it again. His latest article, "Eyeing Jupiter: Get the Most Out of Your Time Observing the Planet King," appears in the May, 2019 issue of *Sky & Telescope* (pp. 52-53).

*After a 26-month, 70 million mi. journey to the tiny asteroid **Bennu**, on Dec. 3, 2018 NASA's Osiris-REX spacecraft entered orbit less than half a mile above the 1,600-ft.-wide asteroid. Bennu thus becomes the smallest object ever to be orbited by a spacecraft.

As if that were not impressive enough, after mapping Bennu's surface and finding a suitable landing site, Osiris-REX will soft-land on the asteroid, collect samples from the surface and return to Earth in 2023.

Bennu is a Near Earth Asteroid that has a 1-in-2,700 chance of impacting Earth between 2175 and 2199. Such an impact would not create a nuclear

winter like the one that wiped out the dinosaurs 65 million yrs. ago, but regional damage to plant and animal life would be immense.

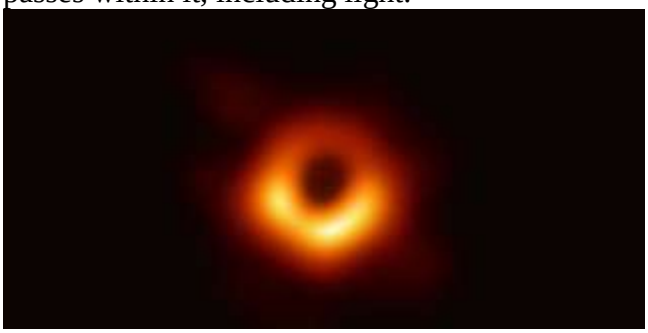
*Closer to home, there was **Elon Musk's** Space-X Falcon Heavy rocket delivering a satellite into geosynchronous orbit around Earth on April 11th. We watched a highlight film at our April meeting; if you missed it, Google "Falcon Heavy." It's about 20 min. long, and well worth watching.

Rocket liftoffs are old hat by now – but have you ever seen booster engines return to Earth and soft-land on the same landing pad they took off from? (The main booster rocket landed on a small platform in the ocean.)

*Farther from home, there was the $72 million photo of the black hole and event horizon at the center of the elliptical galaxy **M87** in *Virgo*. That supermassive black hole is about as large as the solar system, and billions of times more massive than the **Sun**.

The Event Horizon Telescope, consisting of 8 radio telescopes linked together at sites around the world, took the photo in 2017. Researchers spent 2 yrs. compiling and analyzing the data and making sure that everything was correct before releasing the photo.

The doughnut of yellow and orange colors in the photo are hot gases swirling rapidly around the black hole. They will vanish and become part of the black hole when they cross the *event horizon* – the one-way portal beyond which the black hole's virtually infinite gravity devours everything that passes within it, including light.



Above: NASA's black hole photo

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Upcoming Meetings/Activities. We'll begin the month with JKWMA observings on **Fri.-Sat., May 3rd-4th**. The New Moon will be on May 4th, so both nights will be deliciously dark and cloudless if the sky cooperates.

Our FRAC meeting will be held at The Garden in Griffin at 7:30 p.m. on **Thurs., May 9th.** Our program will be the one we were going to show last month: **Alex Filippenko's** "Black Holes: Abandon Hope, Ye Who Enter."

On **Sun., May 19th**, we'll conduct a public solar observing from 1-4 p.m. at The Garden in Griffin as part of their "Springfest Celebration". We'll need solar 'scopes, but we'll also have solar sunglasses available so please make plans to attend and help out.

We'll return to High Falls State Park on **Sat., May 25th** at 7:30 p.m. for another "Astronomy in the Park" public observing. To get there from Griffin, take I-75 South to Exit 198 (High Falls Rd.). Turn left onto High Falls Rd., and the park's Day Use Area will be 1.7 mi. ahead on the left, beyond the main entrance to the park and after you cross the bridge. Turn left into the Day Use Area, pass the pay station and park on the left. The observing site is between the parking area and the pavilion.

See http://goo.gl/maps/RQFN3gmvgTA2.

We'll end the month and begin June with JKWMA observings on **Fri.-Sat., May 31st-June 1st**. The New Moon will be on June 3rd, and therefore will not affect our observing. Now, if the clouds will only do likewise…

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"Were I to write one prescription designed to help alleviate at least some of the self-made miseries of mankind, it would read like this: One gentle dose of starlight to be taken each clear night before retiring."

-Leslie Peltier (*Starry Nights*)

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The Solar System in May. Mars (mag. -1.6) continues its lengthy stay in the night sky in May. It will shine brightly in the W sky until around midnight, at which time **Jupiter** (mag. -2.5) will rise in the E. On May 18th, Mars will share a low-power telescopic field of view with the lovely open cluster **M35** in *Gemini*.

Mercury (mag.-1.1) will make a brief naked-eye appearance low in the WSW sky near the end of the month; look for it 30 min. or more after sunset.)

Two other solar system events merit our attention in May.

First, on May 10th the Waxing Crescent Moon will pass directly through **M44, the Beehive Cluster** in *Cancer*. Whether using binoculars or a telescope, between 10-11 p.m. you'll see stars in the cluster disappear behind the Moon's dark side.

Second, there's the **Eta Aquarids meteor shower**, which will peak during the pre-dawn hrs. of Mar. 6th in a Moonless sky. (We should see some early arrivals at our JKWMA observings on May 3rd-4th.)

Eta Aquarid meteors are remnants from earlier passings of the most famous comet of all time, **Halley's Comet**. The comet won't be there – it's about as far away from the Sun as it ever gets in its wide elliptical orbit – but we can see the dust particles it left behind as Earth passes through their stream.

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Five-Minute Astronomy observing report by Sean Neckel

As most of you are aware, the success rate of our scheduled observing events has been much like the weather of late -- dismal. The last actual event that I attended that had good weather was in January. As **Phil Sacco** so aptly put it after our most recent cancellation, "Sheesh!"

It's not that there have not been any clear nights; there certainly have been. They have just not coincided with our schedule. On those clear nights, and more often clear mornings, I go out and look at the stars and planets, just to remind me that they are still there.

A week ago I watched **Arcturus** come up through the trees for the first time this summer. Just last night I learned a new constellation, *Hydra*. This morning I was hoping to see **Mercury** and **Venus** appear next to each other over the parking lot at work. I saw Venus, but not Mercury (maybe in a day or two), but I did get to see **Jupiter** less than a half degree from the Waning Moon, with **Saturn** forming the midpoint of a line of planets across the pre-dawn sky.

Maybe it's not as great as a full night in a dark field using a big telescope, but taking 5 minutes to find a constellation or tracking the planets across the sky has its own rewards. Now I know where to start looking for my last two double stars in Hydra -- assuming we can get a clear sky during an observing event!

Here's hoping for some better weather at Joe Kurz on **May 3rd-4th**. But even if it's not, remember this: The stars and constellations you see overhead in the pre-dawn sky are the same ones you'll see in the evening sky three months from now.

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Falsifiability by Bill Warren

"I groan every time I hear or read someone say that scientists "proved" this or that. Scientific knowledge isn't proven by successful attempts to confirm theories – ever! Scientific knowledge comes from unsuccessful attempts to falsify (*i.e.*, *disprove*) theories."

-**Jeff Hester** (*Astronomy*, Jan., 2019), p. 16

Two thousand years ago, people who studied the sky were known as *astrologers*, and people who tried to make sense of what they saw were known as *philosophers*. Because they did not possess telescopes or other modern tools that today's astronomers take for granted, in most cases they relied on opinions, reason and logic rather than testing to support their conclusions.

In other words, "scientific truth" was whatever common sense or commonly held beliefs dictated it to be.

The invention of the telescope and the development of scientific research methods changed all that. The telescope brought new and more sophisticated ways to study the universe, and in all of the sciences research and testing gradually replaced reason and logic as preferred ways of acquiring scientific knowledge.

The Scientific Method. All advances in science result from seeking answers to questions by a process known as the *scientific method*. Here's how it works.

1. Consider some aspect of the universe.
2. Find out what is already known about it, and pose a question about something that presently is unknown, or at least not understood.
3. Create a *hypothesis*, or theory that might answer the question.
4. Predict what the answer will be.

5. Test your prediction by devising an experiment to determine whether your theory was correct. If it was incorrect, you can modify it in light of your findings and repeat Steps 4 & 5. If it was correct, other researchers will repeat your experiment and perhaps attain the same results as yours.

The beauty of the scientific method is that, when done correctly, it erases human bias from the equation. No matter how strongly you believe in your hypothesis, the results speak for themselves. If you were to manipulate your data findings in an attempt to prove that your theory is correct, other researchers would know it when they try to duplicate your experiment.

Falsifiability. As Hester notes, scientists don't prove that theories are correct. They just conduct experiments and observe the results, hoping to provide evidence that a theory is not false. The more often the same test is conducted under the same conditions and found not to be incorrect, the more likely it becomes that the theory is valid.

In astronomy, the ultimate question is how the universe began. As Hester points out, neither creationism nor the Big Bang Theory can be proved as a valid explanation of the origin of the universe. The best we can say is that, so far at least, neither of those conflicting theories has been proven false.

An avowed atheist, Hester's challenge to creationists is to show him a test that might disprove the existence of an all-powerful Supreme Being. Since obviously that is (and always will be) impossible, he considers the question unworthy of scientific discussion. However, he accepts the Big Bang theory as valid because it is rooted in scientific theory, and therefore is capable of being proven false. But that brings up an interesting point: *If the Big Bang theory can never be proven, it will always remain a theory no matter how many times it is found not to be false.*

If it seems oddly backward that scientific knowledge can be verified only by showing that it's not false – and if that seems to be playing games with words – well, it is. But that's how the game is played, in science and elsewhere. Truths are often expressed in sideways terms. For example, a murderer can confess to committing heinous crimes and still be found not guilty by reason of insanity.

Jeff Hester's ongoing anti-religious campaign offends many *Astronomy* subscribers who do not read the magazine to be brow-beaten for their beliefs. In his defense, however, it should be noted that Hester did not invent the falsifiability concept, he simply uses it to support his pro-scientific viewpoint. (And if he'd stop there, everything would be fine.)

If this article has accomplished nothing else, it has allowed me to use a 14-letter word in the title. My next goal is to find a way to work it into a conversation, maybe by saying something like "Speaking of falsifiability…"

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Call 'Em As You See 'Em – and Leave It at That!

by Bill Warren

(Italians) spell it **da Vinci**, but they pronounce it "da Vinchy." Foreigners always spell better than they pronounce.

-**Mark Twain** (*Innocents Abroad)*

One of the things that makes astronomy so difficult to talk about is that many astronomers' names – and the constellations and stars as well – are not of English origin. Regarding astronomers' names, there's da Vinci, of course; another familiar example is **Charles Messier**.

Technically, Messier should be pronounced "MESS ee yay." Does that mean you're wrong if you pronounce it "MESS ee ur"? (Answer: No, it just means that you're not French. And don't even think of asking how Charles is pronounced in French: It sounds something like "Shaw," or maybe a sneeze.)

It gets even more complicated with star and constellation names. Some of them (e.g., **Sirius**, *Leo* and *Ursa Major*) are easy to pronounce, while others such as **Betelgeuse, Aldebaran**, *Camelopardalis* and *Ophiuchus* look like spilled alphabet soup and can be difficult to pronounce if you don't already know how.

But here's my point. Instead of worrying about how to pronounce names correctly, there's a more important question: *Does it matter how we pronounce them?* I don't think so, because in many cases the "experts" don't agree on pronunciations.

(As I've often pointed out, an "ex" is a has-been and a "spurt" is a drip that fizzled.) For example, the *National Audubon Society Field Guide to the Sky* says that the constellation *Canes Venatici* should be pronounced "KAY neez Ve NAT eh see," while *Astronomy's* **Michael Bakich** prefers "Ven ah TEE see." (I've always pronounced it "Vih NAT ih SIGH.") Obviously, two of us are wrong – but which one is correct? Who cares? As far as I'm concerned, *all* of them are correct.

We aren't astronomy experts. We should not avoid using astronomy names or terms because we're unsure how to pronounce them. We should pronounce them however is comfortable to us. For example, "BET ul jooz" is correct, but people understand BEETLE juice" because of the movie of that name, so that's how I pronounce it.

In that spirit, I'll tell you below how the other constellations and star names I've used here should be pronounced, but it really doesn't matter. However you pronounce them is acceptable. But one star merits special attention, if for no other reason than to show you why correct pronunciations don't matter.

Consider **Vega**, the 5th-brightest star in the night sky. According to *Astronomy's* **Bob Berman**, the correct pronunciation is "VEE guh." But when's the last time you heard anyone pronounce it that way? It's been "VAY guh" since 1970 when Chevrolet came out with a car of that name. People know what you're talking about when you pronounce the star like the car.

When it comes to astronomy pronunciations, we would do well to remember the way that the entertainer **William Saluga** began his comedy routines. Someone would say, "I don't believe I got your name," and he would reply, "You can call me Ray. Or you can call me Jay. Or you can call me Ray Jay. Or you can call me Ray Jay Johnson. Or you can call me Ray Jay Johnson Jr. Just don't call me Johnson."

Regarding the stars and constellations I mentioned earlier: They're pronounced "Al DEBB uh run," "Kuh MELL oh PAR duh liss," and "Oh fee YOO kus." But you can call them Ray, or you can call them…

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<u>A Stellar Question</u>
by Bill Warren

According to *Astronomy* editor **David Eicher** (Mar., 2019, p. 6), there are something like 40,000 billion billion stars in the universe. And that, he points out, is probably a very conservative estimate.

One of those stars is our **Sun**. It's the brightest star we can see, so everyone knows about it.

Most people are aware, too, that **Sirius** is the brightest star in the night sky. And they know that **Polaris** is the North Star. But here's your question – and it's one that you'll know the answer to, if you give it some thought before reading the answer: *What is the 4th-best-known star?*

Need a hint? It's the 10th-brightest star in the night sky.

Need another hint? Ask yourself, *What is there about the 10th-brightest star in the night sky that would make it more well-known than all of the 9 brighter stars except Sirius?* (Polaris isn't one of the 10 brightest stars, it's the 49th-brightest.)

Answer: The star that attracts so much attention is, of course, Betelgeuse, a red giant star in *Orion*. Its claim to fame is that it is as close to becoming a supernova as a star can get without actually exploding. (In fact, Betelgeuse may already have exploded but we don't know about it because the light from the blast hasn't reached us yet. Or maybe not.)

Part of Betelgeuse's fame undoubtedly stems from the 1988 movie *Beetlejuice*, starring **Michael Keaton**. But that's not why people – especially astronomers, professionals and amateurs alike – are talking about the star 31 yrs. after the movie appeared. (Hey, the movie wasn't that good!) And it's not just that Betelgeuse is sitting on Go, ready to blast off into stellar oblivion in the most violent form of death in the universe. There are two other reasons why it matters to us.

First, Betelgeuse lies just 700 light-years from us. In cosmic terms, that's just a stone's throw away. And the term <u>red giant</u> does not begin to describe how large Betelgeuse really is: It is 1,000 times larger than our Sun, and 10 times more massive. If Betelgeuse were located where the Sun is, its chromosphere – the atmospheric layer between the visible photosphere and the corona – would reach beyond **Jupiter**. The five planets nearest to the Sun would be Krispy Kritters.

Putting those facts together – that Betelgeuse is incredibly large; that it's ready to go supernova (if

it hasn't already done so); and that it's relatively close to us – has caused many people to worry for Earth's safety when it finally decides to go *bang!* When that happens, a vast amount of deadly X-rays, ultraviolet radiation and stellar debris will be hurled into space in all directions, including toward Earth.

The good news: In order to pose a threat to us, a supernova would have to occur within 30 light-years of Earth. At a distance of 700 light-years away, Betelgeuse going supernova will not affect us.

The second reason for Betelgeuse's appeal to astronomers is that, while more than 10,000 supernovas have been recorded in the last 7,000 yrs., only two have occurred within our galaxy or even near it. (Neither of them had any effect on Earth.)

In 1987, **Supernova 1987A** suddenly appeared in the **Large Magellanic Cloud**, a satellite galaxy of the Milky Way. The star that exploded was 163,000 light-years away.

As for our galaxy…On Oct. 8, 1604, the German astronomer **Johannes Kepler** recorded the appearance of a bright new star in the constellation *Ophiuchus*. Glowing at mag. -2.5, it was a full magnitude brighter than Jupiter and remained visible naked-eye at night for a year and a half.

That star was, of course, a supernova – **SN 1604**, or **Kepler's Supernova** – a white dwarf/red giant double star that was 22,000 light-years away when it exploded. Today, it remains the only supernova in our galaxy in mankind's recorded history.

Betelgeuse will change all that. It's not a question of "Will it occur?," but "When?"

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Lower Left Corner: NGC 2440, a planetary nebula in *Puppis*. Photo by **Alan Pryor**. In astrophotography and observing, FRAC's credo has always been, *What you see is what you get. Do the best you can with whatever the sky gives you.* Sometimes you strike it rich, and sometimes – well, read on.

When **yr. editor** observed **NGC 2440** for the Herschel 400 program, he described it as "a bright, green oval disk that showed up well at high magnification." So when he saw Alan's photo, his reaction was, *Why is the green so washed-out?* It was a dumb question that had an obvious answer, but we'll let Alan explain it.

"It had been a long time since I'd had a chance to do any astrophotography, so on Mar. 23rd I went to Deerlick Astronomy Village. It was dark by 9 p.m. and the **Moon** would rise at 11:30, so I took a chance that those 2.5 hrs. would be good.

"The sky was clear at first, but within 15 min. ground fog rolled in. It was so thick that the sky was barely tolerable. **Sirius** was dingy gray, and the other photographer on the observing field gave up trying to image **Running Man Nebula**.

"I was still collecting photons, though, so I kept at it. I got enough data to get an image of NGC 2440, but the haze messed up the LRGB color balance in my 7 sets of 5 min. exposures. I did the best I could to correct the balance, but under the circumstances I was lucky to get anything at all."

Circumstances aside, here's how good Alan's photo is: The purplish gas pockets to the left of 2440's bright center – and the delicate arcs of gases extending outward on the right side above and below the center – appear in Hubble photos, but not in the overexposed photo of 2440 in **Kepple & Sanner's** *Night Sky Observer's Guide, Vol.* 1 (p. 350). Great work, Alan!

(Editor's Note: LRGB refers to the photographic technique used in amateur astronomy to produce good quality color photographs by combining the brightness, or luminance, of high-quality black-and-white images with the lower-quality colors of red, green and blue images.)

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