THE

FLINT RIVER ASTRONOMY CLUB

NEWSLETTER OF THE FLINT RIVER ASTRONOMY CLUB

An Affiliate of the Astronomical League

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Officers: President, **Dwight Harness**; Vice President, **Bill Warren**; Secretary, **Carlos Flores**; Board of Directors: **Larry Higgins** and **Aaron Calhoun.**

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Club Calendar. Fri.-Sat., Feb. 1-2: JKWMA observings (at dark); **Fri., Feb. 8:** Lake Horton public observing (6:30 p.m.); **Sat., Feb. 9:** Lake Horton rainout date (same time); **Thurs., Feb. 14:** FRAC meeting (7:30 p.m., The Garden in Griffin).

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President's Message. On behalf of everyone in FRAC, I want to extend our heartfelt sympathies to **Eva** and **Richard Schmidler** on the loss of their son Raymond, age 40, on Dec. 19th. Ray left behind a 10-yr-old daughter and parents who mourn his passing.

We cannot imagine the depth of your grief, Eva and Richard, but God loves you and we love you.

On a more cheerful note, **HAPPY BIRTHDAY, FRAC!!!** Twenty-two years ago, 15 area residents responded to the invitation of FRAC co-founder **Larry Higgins** to attend an astronomy meeting held at the Boy Scout hut in Sunnyside. All 18 attendees joined FRAC that night.

The next night, the group returned to a nearby open field to conduct the new club's first observing. And the rest, as they say, is history.

-Dwight Harness

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Last Month's Meeting/Activities. The new year began the same way that 2018 ended, with rain and clouds dominating the celestial landscape. But after weeks of virtually nonstop bad weather, the skies cleared for our Sat., Jan. 5th JKWMA observing. Six intrepid observers – **Erik Erikson,** his three guests **(Barrett & Sarah Thompson** and **James Camon)** and **Jeremy & Delilah Milligan** – ignored the wet conditions and ventured out to see what clear skies at night look like. Erik says it was one of the best nights for observing that he's ever seen.

An incredible crowd of 21 members -- speaker **Alan Pryor; Sean & Gianna Neckel; Marla Smith; Dawn Chappell; Steve Bentley; Alfred McClure; Felix Luciano; Joseph Auriemma; Steve Benton; Erik Erikson; Kenneth Olson; John Felbinger; Jeremy, Sarah, Emily & Delilah Milligan; Tom Moore; Cindy Barton; Dwight Harness;** and **yr. editor** – and five visitors (**Chris & Jonathan Dupre; Aaron Morris; and Bryan & Trisha Parish**) attended our Jan. meeting. Everyone enjoyed Alan's program, "My 22-Inch Obsession Reflector," which included a brief video and a trip outside to see what **M42 (Orion Nebula)** looks like in his monster Dob. Thanks, Alan, for all the hard work and time that went into making the video and setting up/taking down your new scope for us to see. It was an experience that we will not soon forget.

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This 'n That. It's not like having an article published, but a "Letter to the Editor" from **yrs. truly** appeared in the Feb., 2019 issue of *Astronomy* (p. 8). In case you haven't seen it, here it is:

"I always look forward to reading **Richard Jakiel's** articles in *Astronomy*, and his latest, "Minting a celestial memory," in your Sept. issue did not disappoint. It was intriguing, meticulously researched, and exceedingly well written. Like the

ancient coins that Jakiel writes about, your magazine is multifaceted, and I appreciate your ongoing commitment to exploring astronomy's history as well as its present and future state. -**Bill Warren**, Griffin, Ga."

During our earliest years, Rich Jakiel was a member of FRAC.

***Solar System Trivia. Jupiter's** moon **Ganymede** has 30 times more water than all the water on Earth.

***Saturn's** moon **Titan** contains 300 times more liquid fuel than all the oil on Earth.

*Asteroid **433 Eros** has at least 10,000 times more gold and platinum than all the gold on Earth.

*As **Gianna Neckel** told listeners at a High Falls observing, it rains diamonds on **Neptune.** Intense pressure in Neptune's atmosphere breaks down the bond between hydrogen and carbon molecules, compressing carbon atoms into tiny, non-gem-quality diamonds that rain down onto the surface.

*You've probably heard that it takes a speed of 25,000 mph for a rocket to escape Earth's gravity. But is it true?

Well…YES, it's true if you're referring to *escape velocity* – the speed necessary to escape Earth's gravitational tug in one violent burst, like firing a pistol into the sky. But bullets generally travel at about the speed of sound (i.e., 760 mph), so gravity eventually overcomes inertia and pulls the bullet back to Earth. We can't fire rockets at 25,000 mph at liftoff for obvious reasons, not the least of which is that it would kill any astronauts aboard the spacecraft.

And NO, it's not true if you apply constant acceleration to the rocket, which is what we do. Our rockets keep firing in several stages after liftoff, gradually building velocity until the spacecraft escapes Earth's gravity pull and coasts the rest of the way to its target in gravity-free space.

Given sufficient fuel, our Apollo astronauts could have traveled to the **Moon** at 1 mph. But they traveled much faster than that (e.g., 23,000 mph on Apollo 8) because it would have taken them more than 27 years to get there at 1 mph. Instead, it took them 2-3 days.

*The ancient Mayans of Central America were primitive, but they were intellectually superior to the ancient Greeks in some respects. For example, both civilizations independently developed the same numbering system in mathematics – but the Mayans included an important feature that the Greeks and Romans overlooked: the number *zero.* (Our history timeline is based on the date of **Jesus's** birth, but it goes from 1 b.c. to 1 a.d. There is no Year Zero.)

Another example, this one from astronomy: **Venus** sometimes appears as a bright "morning star," and at other times as an "evening star". The ancient Greeks thought it was two different stars that they called **Phosphorus** ("the bringer of light") and **Hesperus** ("the star of evening").

Mayan astronomers didn't make that mistake. They recognized Venus as the same star as seen near the eastern and western horizons at different times – but they went much farther than that. They also recorded that Venus rises before the Sun for 236 consecutive days and then disappears for 90 days. Then it appears in the western sky before sunset for 250 days, after which it vanishes for 8 days before returning to the pre-dawn sky.

Those were extremely advanced achievements, especially when you consider that the Mayans offered human sacrifices to their gods and never developed the wheel.

***Question**: *When I look at spiral galaxies in my telescope, all I see is hazy round or oval blurs of light with brighter centers. Why can't I see the spiral arms?*

Answer: Part of the problem lies in *light-gathering power.* Large Dobsonian reflectors like **Alan Pryor's** huge 22-in. Dob are often referred to as "light buckets" because they have extremely wide apertures that gather hundreds of times more light than small backyard telescopes. The more light a telescope receives, the larger images will appear in the eyepiece and the more detail will be visible. Smaller 'scopes produce smaller, fainter images.

Beyond that, while spiral arms are more apparent in face-on galaxies, in most cases they are hard to see because the galaxy's light is spread out over a large area. Our eyes gather light photons, but they don't store them the way a camera does. Unless we're using a large aperture telescope like Alan's, we usually miss the fine detail in spiral galaxies that big telescopes or long-exposure photos taken with even a small 'scope reveal.

That's why *Astronomy's* **Bob Berman** doesn't like to show **M31 (Andromeda Galaxy)** at public observings. Invariably, he says, people will look in the eyepiece and ask, "Is that it? That fuzzy thing?" They've heard of Andromeda Galaxy, and they expect to see its spiral arms and 500 billion stars; instead, all they get is an elongated, oval blur that looks like somebody erased part of the sky.

Spiral arms are visually delicate structures. Seeing them requires dark, transparent skies and little or no air movement. Under those conditions, your best bet for seeing spirality is probably **M51 (Whirlpool Galaxy)** in the spring constellation *Coma Berenices*. Under ideal conditions, you might even see hints of a bridge of light connecting M51 with its companion galaxy, **NGC 5128**. (Or you could do it the easy way and ask Alan to show you M51 in his big light bucket.)

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Upcoming Meetings/Activities. Hopefully, at least, we'll begin February with JKWMA observings on **Fri.-Sat., Feb. 1st-2nd**. We haven't had many clear evenings for observing in recent months, but maybe things will be better this time around.

We'll return to Lake Horton for a public observing on **Fri., Feb. 8th**. It will begin at 6:30 p.m. These events are always well attended, so please make every effort to join us on that evening. (The rainout date will be **Sat., Feb. 9th**, at the same time.)

To get to Lake Horton from, say, Griffin, go 10.6 mi. toward Fayetteville on Ga. 92 from the stoplight at U. S. 19/41 and turn left at Woolsey Rd. (It's just past a gas station on the right.) Go 0.7 mi., and turn left at Antioch Rd. Go 0.4 mi., and continue straight toward Lake Horton at the stop sign where the main road bends to the right.

The park entrance is 1.0 mi. ahead. After passing through the gates, turn right at the black asphalt road about 50-100 yds. beyond the entrance. That winding road through the woods leads to a large parking lot; that's where we'll meet. We'll set up our 'scopes on the grassy hill between the parking lot and the main road.

Our club meeting will be held at The Garden in Griffin at 7:30 p.m. on **Thurs., Feb. 14th**. (And yeah, we know, it's Valentine's Day, but except for our summertime pool party and Christmas dinner party we try to stick with the familiar Thursday meeting dates format.) Take your spouse or significant other out for an early dinner, then bring him/her to our meeting for dessert. (We'll be celebrating FRAC's 22nd birthday. We'll also elect officers for 2019, but that won't take but 5-10 min. and we can do it between forksful of birthday cake.)

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The Sky in February. Mercury (mag. -1.1 to -0.5) will shine brightly, low in the SW sky, throughout the last half of February. **Mars** (mag. 0.9 to 1.2) will be up until about 11 p.m., but will be too small for us to see the surface feaures that were visible last summer. **Uranus** (mag. 5.8) will be an easy binocular target in *Aries*; on Feb. 10th, the tiny blue-green disk of Uranus will lie just 1.5° from Mars. Bluish-gray **Neptune** (mag. 8.0) will be low in the WSW sky during the first half of the month.

Venus, Jupiter and **Saturn** will be up in the pre-dawn SE sky, and **Comet 46P/Wirtanen** will be up at night and best seen during the first week of February. (It will be considerably fainter by the end of the month.)

Beyond those events, from Feb. 21st to the end of the month you can see, naked-eye, *zodiacal light* forming a cone-shaped wedge extending upward from the W horizon after darkness falls.

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Variable Stars
by Bill Warren

Stars are both stable and unstable. They are stable in the sense that they are held together by the awesome force of gravity throughout most of their lifetimes. But they are also unstable in the sense that sometimes they undergo dramatic changes between their births and deaths. We see those changes as changes in their brightnesses.

Question: *Does that mean that every star is a variable star?*

Answer: Yes and No. All stars evolve. Most if not all of them at some time or another experience instabilities that affect their light emissions at least temporarily. Every star evolves at its own pace, so we don't always see the brightness variations when they occur. Those that we see we call *variable stars*.

Just because we don't see variability right now does not mean that a star hasn't been variable in the past, or that it won't become variable at a later stage in its evolution.

There are three basic types of variable stars, with numerous sub-headings within each group.

***Intrinsic, or Pulsating, Variables**. These are stars that experience changes in brightness due to contractions or expansions of their outer layers. The changes are seen as pulses of light that may be of long or short duration, and at regular, semi-regular or unpredictable intervals.

There are 13 different types of pulsating variables, the most noteworthy being classical Cepheid variables. The regular, clockwork-like pulsation periods of these extremely bright supergiant stars enabled the American astronomer **Edwin Hubble** to determine in the mid-1920s that the "spiral nebulae" in which he found them were actually distant galaxies that lay millions of light-years beyond the **Milky Way**. (Until then, everything in the night sky was thought to be part of the Milky Way.)

***Eruptive Variables.** These stars exhibit explosive behavior. Some of them – novas -- experience temporary outbursts that increase their brightness by as much as 3 to 15 magnitudes, and in some cases novas have erupted more than once. In virtually all cases, however, the stars' brightnesses eventually fade back to roughly what they were before the outburst.

In all, there are seven kinds of eruptive variables, one of which – supernovas – are the most violent of all. Supernova explosions annihilate their stars, leaving behind enormous clouds of gases and debris around the stellar corpses, which may be neutron stars or black holes.

***Eclipsing Variables.** These are stars in which the brightness changes result from one star in a binary star system totally or partially eclipsing the other star. We see such stars as eclipsing variables only when they happen to be properly aligned to our line of sight.

There are five types of eclipsing variables, the differences being the relative sizes of the stars, their brightnesses and orbital periods, and whether they exchange mass from one star to the other.

Algol (Beta Persei, the "Demon Star") is the best-known eclipsing binary star.

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A FRAC BIRTHDAY PRESENT:

A DOUBLE DOSE OF PROF. STARGAZER

1. Prof. Stargazer and the Nobel Prize

Prof. Stargazer was in a foul mood when **Mike Stuart** and **Larry Higgins** interviewed him recently.

"What's the matter?," Larry asked. "You look like your wife just found out that you bought her wedding ring at Ace Hardware."

"You're close," the professor said. "It's my wife, all right. Because she's dyslexic and doesn't read very well, I'm out $200 for something she bought me."

"How did that happen?," Mike asked.

"She came running to me one day waving a letter she had received in the mail. 'Wait till you see this!,' she said breathlessly. 'You're going to receive a Nobel Prize in physics! I just ordered it for you.'

"I was instantly suspicious, because that's not how Nobel Prizes are given. *Let me see that letter,* I said.

"Nobel Prizes are awarded annually by the Royal Swedish Academy of Sciences in Stockholm," the professor explained. "But this letter came from a company in Cleveland, Ohio. That was Clue #2 that something was rotten in Cleveland.

"***This is your lucky day!,*** the message proclaimed. *For just four easy monthly payments of $49.99 (plus shipping & handling), you can be the proud owner of a* ***Noble Prize*** (Clue #3) in ***Psychics*** (Clue #4), *suitable for framing. It comes with a genuine certificate of authenticity. Buy now, and you'll be the envy of everyone in your astrology club!* (That was Clue #5)

"But wait!, the letter went on. *If you act today, we'll double our offer and send you not one, but TWO award certificates -- one to hang on your wall at home and another to proudly display at work!*

"That's not all: If you order in the next two hours, you'll also receive a free set of ginsu steak

knives and a coupon worth $100 off an order of aluminum siding for your house!

"*We accept Visa and American Express. Sorry, no personal checks.*

"'Isn't that great?,' my wife asked. 'You've always thought you deserve a Nobel Prize in Physics. Well, now you'll have one. And you know how I've always wanted a set of ginsu steak knives. They stay sharp forever, and they come with a lifetime guarantee! We can discuss the aluminum siding later.'

"*Actually*, I thought dismally, *I'll receive two 'Noble' Prizes in 'Psychics'. I won't have to travel to Sweden to receive them – but I won't get the $1,100,000 that Nobel Prize winners receive, either.*

"I didn't have the heart to tell my wife what a mistake she'd made, because it was a very thoughtful gesture on her part. So I forced a smile onto my face, hugged her and said 'Thank you, dear. It's a dream come true for me.'

"The other reason I didn't scold her for wasting our money was that I was afraid she might find out someday that I bought her wedding ring at Home Depot."

"So I was almost right about Ace Hardware after all," Larry said.

"That's true," Prof. Stargazer said, scowling. "But your mistake didn't cost you $200."

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2. A MAJORITY OF ONE: The Most Ridiculous Prof. Stargazer Interview of All Time

Prof. Theophilus (pronounced: The Awfulest) **Stargazer** is, to put it mildly, an eccentric character. We never know what to expect when we interview him. But when a dozen FRAC members visited the professor recently, he began the interview with a statement that was shocking even by his standards:

"Neither **Bill Warren** nor I are who you think we are."

Dwight Harness: What do you mean?

Prof. Stargazer: For two decades now, I've been portrayed in the ***Observer*** **as** a petty crook who spends more time behind bars (or *in* bars, if you get my drift) than behind a telescope. I'm the world's greatest scientific authority on everything from Astronomy to Zoology, but anyone who reads the newsletter probably thinks I belong in an asylum for the criminally ignorant. But that's not me, it's not who I am.

Erik Erikson: What does any of that have to do with Bill?

Prof. Stargazer: Many of you who read the newsletter seem to think that Prof. Stargazer doesn't exist. But the truth is, *Bill Warren* doesn't exist. He's a character I invented for the newsletter.

Everyone: What???!!!

Steve Hollander: Aw, c'mon, Professor! If Bill doesn't exist, who is the old geezer who calls himself Bill Warren at our meetings?

Prof. Stargazer: It's me, in disguise. (Actually, I'm much younger and handsomer than that. Without the disguise, you'd mistake me for **Keanu Reeves**.)

Tom Moore: Wait a minute! I'm confused!

Prof. Stargazer: What else is new? You've always been confused, Tom.

Tom: But -- If you're Bill Warren – and if Bill doesn't exist – then *you* don't exist, either!

Alan Pryor: And if you don't exist, Professor, how could you invent Bill Warren?

Prof. Stargazer: Now you're getting it! That's my point: neither of us is real. I use the pseudonym "Bill Warren" for the articles you see in the newsletter.

Steve Bentley: That's a lot of writing. Where do you get your ideas?

Prof. Stargazer: I don't write the articles, or anything else in the newsletter. I get everything from a little store in Atlanta called "Newsletters 'R Us." The mistakes and typing errors you sometimes see are their way of reminding me that my monthly payment is overdue.

Truman Boyle: Let's get back to what you were saying earlier, Professor. If you aren't real, how are we having this conversation? Am I talking to myself?

Prof. Stargazer: Those are good questions, Truman. But you aren't talking to yourself because you aren't real, either. (Or maybe you *are* talking

to yourself, whether you're real or not. A lot of people do that.)

Tom Moore (again): That's right. Sometimes I talk to myself.

Prof. Stargazer: Yes, but in your case, Tom, it's because nobody cares what you have to say.

Here's my point, ladies and gentlemen: *Almost everyone in FRAC is an illusion.* In fact, only one person in the club is real; no one else actually exists.

David O'Keeffe: And who might that one person be, Sir?

Prof. Stargazer: Someone who is reading this right now. Everyone else in FRAC is a product of that person's imagination.

Dawn Chappell: Are you telling us that FRAC has only one member? If that's so, then that person is writing this newsletter to himself or herself. That doesn't make much sense.

Larry Higgins: Neither does anything else in this interview.

Felix Luciano: Or maybe the newsletter doesn't exist either, because nobody is writing it. Who's right, Professor? Dawn, or me?

Prof. Stargazer: I'd answer that, Felix – but since I don't exist, you'd have to ask that member. But you can't do that because you don't exist either. Unless you're FRAC's only real member, that is.

Ken Walburn: How do I know if it's me that's real?

Prof. Stargazer: Pinch yourself. If it hurts, either you're real or someone else is imagining that they're pinching you. I can't imagine who'd want to do that, Ken.

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Above Right: NGC 1300, a barred spiral galaxy in *Eridanus*. (Photo by **Alan Pryor**.) Visually, a small telescope shows **NGC 1300** as a small, elongated patch of light. An 8" to 10" scope shows the bar of stars that bisect the galaxy, albeit faintly. It takes a 'scope of 14" or larger to see hints of the two small spiral arms that form a backward **S** at the ends of the bar.

NGC 1300 is about 61 million light-years away and 110,000 mi. in dia. (i.e., about the same size as the **Milky Way**). Its core contains a black hole that is 13 million times as massive as the **Sun**.

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Below: LBN 534, a molecular cloud in *Andromeda*. (Photo by **Felix Luciano**.) LBNs are bright nebulae from the Lynds Catalogue of Bright Nebulae, a list composed in the 1960s by Univ. of Arizona astronomy professor **Beverly T. Lynds**. (She also published a companion volume, the Lynds Catalogue of Dark Nebulae.)

Bright nebulae are visible because they either produce their own light (emission nebulae) or reflect light from nearby stars (reflection nebulae). Dark nebulae are areas where clouds of interstellar dust block the light from stars lying beyond them in our view.

LBN 534 is the rectangular bar of light that contains the three bright stars at the center of Felix's photo.

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