THE

FLINT RIVER OBSERVER

NEWSLETTER OF THE FLINT RIVER ASTRONOMY CLUB

An Affiliate of the Astronomical League

Vol. 22, No. 9 November, 2018

* * *

Club Calendar. Fri., Nov. 2: Lake Horton public observing (6:30 p.m.); **Sat., Nov. 3**: Lake Horton rainout date (same time); **Thurs., Nov. 8**: Club meeting (7:30 p.m., The Garden in Griffin); **Fri.-Sat., Nov. 9-10**: JKWMA observings (at dark).

*** * ***

President's Message. I was going to say that having back trouble is a pain in the neck, but that's not where it hurts. My back has bothered me off and on for years, but this time I can't seem to shake it off. The longer it stays, the more surgery looks like my best option. And *that's* a scary thought.

I know you have better things to do with your time than reading about me complaining about my aches and pains. But it's frustrating that I can't use my telescope. Late fall is always fun for observing: the heat, mosquitoes and humidity are gone and the sky is full of fun things to see, whether for the first time or the 100th. Add to that the parade of planets we've been enjoying, and there's a lot to explore in the autumn sky.

Beyond that, here's a hearty "WELCOME TO FRAC! to our newest member, **Dennis Nelson** of Griffin. We hope you'll enjoy your time spent with us, Dennis. Please let us know what we can to help you with any problems you may have.

-Dwight Harness

*** * ***

Last Month's Meeting/Activities. We had perfect skies and three FRACsters – **Sean Neckel, Steve Hollander & Bill Warren** – at our JKWMA observing on Oct. 5th. **Saturn** was photo-sharp in our 'scopes, and Sean pointed out **Titan**, four other saturnian moons and the asteroid **Vesta** as well. The dust storm on **Mars** had cleared up: we saw the polar ice caps and large, dark surface features that probably were **Syrtis Major** and **Mare Tyrrhenum**. Sean looked for Double Stars – by evening's end he had logged 97 of the 100 targets – and Steve & Bill observed *Lyra's* other "Double-Double star, " i.e., **Struves 2470 and 2474**. They aren't as well known as **Epsilon Lyrae**, but they're easier to split into four stars.

Mike Stuart had JKWMA all to himself Sat. evening.

Eighteen members including new member **Dennis Nelson; Dwight Harness; Alan Pryor; Steve Bentley; Alfred McClure; Dawn Chappell & David Clay; Felix Luciano; Jeremy, Sarah, Emily & Delilah Milligan; Steve Hollander; Kenneth Olson; Sean & Gianna Neckel; Cindy Barton**; and **yr. editor**; two visitors (**Chris Witt & Stormye Allen**); and a roomful of scarecrows showed up for our Oct. meeting. (The scarecrows were refugees from the wind and rain that accompanied Hurricane Michael's trek through Ga. Later, they were returned to The Garden to perform their assigned task. (See "This 'n That" below.)

Six FRAC members – **Sean & Gianna Neckel, Elaine Stachowiak, Truman Boyle, Dwight Harness** and **Felix Luciano** – and a guest from the Macon Area, **Stephen Rahn**, showed the sky to visitors at our High Falls State Park public observing on Oct. 12th.

* * *

This 'n That. Thanks, **Scott Barton,** for your hard work in preparing an awesome scarecrow entry for UGa-Griffin's "Scarecrows in the Garden" exhibit.

We're prejudiced, of course, but we think your and **Cindy's** entry was by far the best one in the show.

*Congratulations to **Alan Pryor** for his photo of **Lagoon Nebula** and **Trifid Nebula** that appeared on p. 17 of the Sept. issue of the *Reflector*.

* * *

Upcoming Meetings/Activities. The first part of Nov. will be busy, with four activities between Nov. 2nd-10th.

We'll begin the month with a Lake Horton public observing at 6:30 p.m. on **Fri., Nov. 2nd**. We had about 150 visitors last time, so we'll need a lot of help this time too. (The rainout date will be **Sat., Nov. 3rd**, 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 the stop sign at Antioch Rd. Go 0.4 mi., and continue straight toward Lake Horton at the stop sign where the main road turns 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, then drive our cars back to the parking lot.

Our club meeting will be at 7:30 p.m. on **Thurs., Nov. 8th** at The Garden in Griffin. Our program will be **Alex Filippenko's** "Magnificent Saturn." Hey, folks, this is one you *don't* want to miss!

Our club observings will be at JKWMA on **Fri.-Sat., Nov. 9th-10th**. Dress for cool weather observing: it's better to have too many clothes than not enough. (**Smitty's** wonderful article, "Of Mukluks and Messiers" on our website, will tell you all you need to know about dressing properly for cold-weather observing.)

* * *

The Sky in November. Jupiter and **Mercury** will be low in the SW sky 30 min. after sunset during the 1st week of Nov. **Saturn** will be in the SW, too, only higher. **Mars** will still be bright (mag. -0.6) as it travels through *Ophiuchus, Capricornus* and *Aquarius*. Mars will set around 1 p.m. **Neptune** (in *Aquarius*) and **Uranus** (in *Aries*) will be visible as colored "stars" in binoculars and as disks in telescopes. Neptune will be blue-gray color, and Uranus blue-green. (At mag. 5.7, Uranus will almost be bright enough to be seen naked-eye., and will be easy to spot in any binoculars.)

Venus (mag. -4.2) will be a "morning star."

The asteroid **Juno** will be unusually bright as it cruises through the constellation *Eridanus, the River* this month. Since Juno will be opposite the **Sun** in our view and at its closest to us on Nov. 16th, it will shine at mag. 7.4, making it an easy target for binoculars or small telescopes.

To find Juno, you first need to know where to look for it. (*Astronomy* has an excellent day-by-day finder chart on p. 43 of the Nov. issue; a similar chart appears alongside **Felix Luciano's** Nov. NASA article.) Then, using that chart, determine where to look on that date. The easiest ways to find it are when Juno passes near a bright star. Two time periods are ideal for spotting the asteroid quickly and easily near a naked-eye star.

***Thurs., Nov. 1st through Wed., Nov. 7th**. On these dates Juno will be within 1° of 5th-mag. **35 Eridani**. So on those dates all you have to do is locate 35 Eridani and Juno will be the bright (mag. 7) "star" nearby.

***Tues., Nov 16th through Fri., Nov. 19th**. Juno will be within 1/2° of the mag. 4.7 star **32 Eridani**; Juno will be the 2nd-brightest object in your telescopic field of view.

If you want to be sure that what you're seeing is Juno, sketch the four or five brightest stars in your fov, then come back a night or two later and make another sketch. Juno will the the one that moved.

When Juno was discovered in 1804 by German astronomer **Karl Harding**, it was thought to be a planet lying between the orbits of **Mars** and **Jupiter**. It was named for Jupiter's wife, the Queen of the Roman gods. Asteroids were unknown at the time; back then the thinking was, *If it's not a star, a comet or a nebula, it must be a planet*. They didn't know what else to call celestial bodies like Juno, **Ceres, Pallas, Vesta** and others, so they were considered planets until the list reached 15 similarly sized and similarly located objects. **William Herschel's** minister suggested the term asteroids to describe these tiny non-planetary objects.

* * *

Above: Oumuamua (artist's concept)

The Visitor That Didn't Overstay Its Welcome
by Bill Warren

Look! Up in the sky! It's a bird! It's a plane! No, it's –
Well, it wasn't **Superman**. It was faster than a speeding bullet, but it couldn't leap tall buildings at a single bound the way Superman could.

It was **Oumuamua**, the strangest object ever seen in the solar system! (Here's how strange it was: Even today, a full year after it came and went, no one knows exactly what it was, or where it came from.)

(For the record, Oumuamua is pronounced "Ooh MOO uh MOO uh." It's a combination of Hawaiian words that, taken together, roughly mean "scout," or "messenger.")

The Comet That Wasn't – Or Maybe It Was.
Oumuamua was discovered on Oct. 19, 2017, by the Panoramic Survey Telescope and Rapid Response System (PanSTARRS) team in Hawaii. PanSTARRS workers search for Near Earth Objects (NEOs) – asteroids and comets -- that might collide with Earth.

Initially, at least, Oumuamua was thought to be a comet and given the designation C/2017 U1. And that made its discovery a rather ho-hum, *So what else is new?* event because, in solar system terms, comets are a dime a dozen. Practically everything in the **Kuiper Belt** and **Oort Cloud** is a potential comet. But when astronomers studied Oumuamua, they found absolutely no evidence of a coma. (When a comet nears the **Sun**, solar energy heats portions of the icy surface, releasing a cloud of gases and dust – the coma -- that surrounds the comet's rocky nucleus.) Oumuamua had already rounded the Sun and was speeding past Earth at a distance of almost 15 million mi. when it was discovered; if it was a comet, it should have sported a large coma and possibly a long dust tail by then. But it didn't have either of those things.

So if Oumuamua wasn't a comet, what was it? Astronomers decided that it was an asteroid, and the IAU's Minor Planet Committee quickly changed its designation to A/2017 U1. (**A** for asteroid, **C** for comet.)

Asteroids litter the solar system like trash along a roadside. But no one had ever encountered an asteroid like Oumuamua. It was small (about a football field in length), but since it was never brighter than mag. 20 in our telescopes, estimates of its shape varied considerably. It was first thought to be cigar-shaped, i.e., ten times longer than its width. But it was spinning rapidly and tumbling wildly as it moved through space, and extreme variations in its light reflectivity suggested that it might be pancake-shaped.

In light of Oumuamua's diminutive size and revised estimate of its shape – one artist's rendition of it looked very much like the *Millennium Falcon* starship in "Star Wars" -- SETI's **Seth Shostak** wondered humorously if it was a rock or a rocket. (**Stephen Hawking** also thought it might be a rocket.) Astronomers took their comments seriously enough to use the Green Bank (W.Va.) radio telescope to look for radio transmissions from Oumuamua. They found no evidence of alien presence.

An Interstellar Intruder. When astronomers discover something new in the solar system, the first thing they do is determine its orbital path around the Sun. (In Oumuamua's case, it might have been one of the NEOs that the PanSTARRS folks were searching for.) But when they plotted the rock's present and future trajectory to find out where it was going, they also plotted its past trajectory to figure out where it came from. What they found was startling:

Oumuamua didn't come from the Kuiper Belt, the Oort Cloud, the asteroid belt or anywhere else in the solar system! It was a first-time visitor, and based on its trajectory path through and out of the solar system it will not return. Its pre-solar system trajectory indicated that it had come from the

general direction of the constellation *Lyra*. But further refinement of its past trajectory failed to reveal a single star or star system that Oumuamua might have come from. Astronomers think it probably wandered through space for billions of years before it arrived in our solar system. It might even have been older than our solar system. And now, having zipped through and out of the solar system it is, in **Willie Nelson's** words, "on the road again," bound for who knows where?

Oumuamua's discovery was lucky, to say the least. Its path into and out of the solar system was so broad and rapid that (a) we could not have spotted it before it rounded the Sun, and (b) by Oct. 25th – six days after its discovery – Oumuamua was almost as far from the Sun as **Mars**. As a result, astronomers at many of the world's foremost observatories were given priority time on those huge telescopes to study it. And that was fortunate, too, because by the end of 2017 it had dimmed to a barely visible mag. 27.

Curiouser and Curioser. Astronomers now believe that Oumuamua may in fact have been a comet as originally thought, and not an asteroid. They base that conclusion on precise measurements of its exit velocity, which was greater than it should have been.

As expected, Oumuamua's speed increased when it passed Earth and Mars on its way out of the solar system, due to what is known as the "slingshot effect." But something else gave it an added velocity boost, and astronomers believe it may have been the outgassing of dust and gases from vents in Oumuamua's surface that did not occur when it rounded the Sun. (Asteroids are rocks, not "dirty snowballs," so they do not undergo outgassing the way that comets do.)

Scrambling to find reasons why outgassing did not occur earlier when Oumuamua was closest to the Sun, they believe that during the comet's eons of interstellar travel its surface may have collected particles that covered the icy shell and acted as a thermal insulator against exposure to the Sun's relatively brief but intense heat. Further, they theorize, its wildly chaotic tumbling motion might have prevented any particular portion of the surface from overheating to the point of sublimating its submerged ice into gases.

That doesn't explain the outgassing that occurred later, of course. But Oumuamua is, like **Winston Churchill's** 1939 description of Russia, "a riddle wrapped in a mystery inside an enigma." We've encountered nothing like it before, and every answered question raises many more questions. It's likely that we'll never know exactly what it was. It is now classified neither as a comet nor an asteroid, but rather as an interstellar object. Its official designation is now 1I (for Interstellar)/2017 U1.

So now you know as much about Oumuamua as anyone else. The one thing we know for sure about it is that it was *not* the alien invasion force that a crackpot amateur astronomer claimed to have photographed hiding behind **Comet Hale-Bopp** in 1997.

* * *

Target: Earth (Part One)

by Bill Warren

Introduction. When I've written in the past about possible asteroid or comet impacts with Earth, I've emphasized the worst-case scenarios for two reasons.

First, I know it will get your attention. You may or may not be interested in an article about how scientists think life might have begun on Earth – but you'll sure as heck be interested in how our lives might end in a cosmic heartbeat!

Second, unless you've been hiding under a rock since 1980, you're aware that 65 million yrs. ago a 6-mi.-wide asteroid plunged into the Gulf of Mexico near the Yucatan peninsula, ruining the weekend plans of the dinosaurs and 95% of everything else alive on Earth at the time.

That wasn't a once-in-a-cosmic-lifetime event, either. There have been many thousands of impacts since then – gratefully, they were smaller, but damaging nonetheless. For example, in 1908 something large and deadly exploded over the remote Tunguska region in Siberia, leveling trees and forests for 40 mi. around in all directions. And in Feb., 2013, a 65-ft.-wide meteor exploded over Chelyabinsk, Russia, injuring 1,600 residents and costing $30 million in damages.

So there are deadly rocks out there. (The largest ones are referred to as "planet killers.") But how many are there? And what are the chances of one of them hitting us?

NEAs. Planet killers have existed ever since the planets in our solar system began forming about 4.5 billion yrs. ago; it's surprising, then, that we didn't start looking for them or counting them until 1996.

Our wakeup call came when, in July, 1994 huge chunks of the wrecked **Comet Shoemaker-Levy 9** plowed into **Jupiter**, one after another, over several days. The flood of publicity attending that event resulted in Congress assigning NASA the task of identifying at least 90% of the near-Earth asteroids (NEAs) that are ½ mi. in dia. or larger and orbit the Sun at a distance of 300 million mi. or less. Rocks smaller than ½ mi. in dia. might cause severe regional damage, but it wouldn't be a global catastrophe or wipe out human civilization.

By 2011, a bevy of NEA search organizations such as LINEAR, NEAT, Catalina, PanSTARRS and others had identified 887 asteroids that are ½ mi. in dia. or larger – 95% of the estimated 940 or so asteroids of that size. For all intents and purposes that survey is complete, since the missing 5% are on the opposite side of the **Sun** from us**,** or at least locked into an orbital path that will keep them away from us.

Better still: *None of those nearly 1,000 NEAs is on a present or future collision course with Earth.* So if something really big comes a-calling, it probably won't be an asteroid. We already know about them and where they are.

What would it be, then?

A comet. And not just any old comet, either: A planet-killing comet would come from far out in the **Oort Cloud,** where comets tend to be very large and move very fast. (Comets from the **Kuiper Belt** are typically smaller and slower-moving, which would limit their damage and give us more time to prepare for them.) In both cases, the chances of one impacting our planet are slim – about once in every 1,500 yrs.

Having virtually completed their survey of large NEAs, the researchers have set their sights on a more difficult goal, i.e., cataloging the ones that are 150 yds. in dia. or larger.

The bad news: Smaller objects are harder to find than large ones; there are more of them; and Congress has not fully funded such an undertaking. *The good news:* While large objects can plow through Earth's atmosphere like a knife through hot butter and explode on contact, small objects burn up or else explode in the atmosphere, as was the case with the Chelyabinsk meteor and the Tunguska object. That doesn't mean they can't be deadly, of course; it just limits the amount of damage they can do.

At any rate, scientists believe that there are about 24,000 small NEAs out there that are at least 150 yds. in dia., and they've discovered more than 8,000 of them. There is a good chance that, armed with new search programs, techniques and telescopes, they will locate the rest of them.

(*Part Two will appear next month.)*

* * *

<u>The A-Team</u>

humor by Bill Warren

(adapted from the Aug. 2001 *Observer*)

As a member of FRAC, you are part of a small but elite group of amateur astronomers whose skills, talents and accomplishments are unmatched anywhere on Earth. The A. L. president himself has described FRAC as "The A-Team." ("That's **A** as in *asinine*, he said, "not *astronomy*.")

Loved by some, admired by many and envied by all, FRAC sits rather painfully astride the cutting edge of astronomy today. As our Great Silver-Tongued Leader, High Muckety-Muck and Grand Guru **Dwight Harness** told a CNN reporter at JKWMA recently, "FRAC represents a unique amalgam and confluence of theoretical cosmology and hands-on observational astronomy. Or something like that. Bill wrote it down for me when we heard you were coming, but I lost it. Whatever. Anybody got a breath mint I can borrow?"

Words of wisdom from a leader for the ages.

And these are the "crème de la crème" – the individuals whose accomplishments have led to FRAC's forming the vanguard of modern astronomy:

***Nov. 17, 1997**. Shortly after the club's inception, **Bill Warren** learns the hard way why astronomers don't clean their mirrors with Clorox, Brillo pads and elbow grease.

***July 21, 2000**. **Katie Moore** receives the **Jack Horkheimer 2000 Young Astronomer Award** at AstroCon in Ventura, Calif. From her acceptance speech (that she never told you about): "Finally, I'd like to thank the man whose generosity made this possible, Mr. Jack Hookhammer." (Katie laughs

nervously.) "Excuse me, of course I meant Mr. Hank Jackhammer – Jork Hookheever … Hicklehoover." (Weakly) "Hack Jerkwater?"

*__Mar. 5, 2007. Felix Luciano__ discovers that perfect happiness and contentment are unattainable at a star party unless one also has the key to the men's restroom.

*__Feb. 3, 2012__. When __Ken Walburn__ proudly unveils his new home-made 18-in. truss tube Dobsonian reflector at a public observing, __Larry Higgins__ spoils the festivity of the occasion by pointing out just before it topples over and crashes to the pavement that the 80-lb. primary mirror cell is at the wrong end.

*__Nov. 9, 2015__. __Sean Neckel__ and his family enjoy one of their greatest observing nights ever while camping out at Clingman's Dome in the Great Smoky Mtns. Natl. Park. "The stars were so close you could almost reach out and touch them," Sean remembers fondly. Later, while they sleep in the wee hours of the morning, rangers close the park and lock them in for the next six months.

*__July 15, 2017__. After vacationing in Alaska, __Erik Erikson__ is asked if he took any photos of the Northern Lights. "I tried," he said, "but the film was defective. All I got was this shimmery, blue-green and purple stuff where the sky should have been. So I threw the photos away."

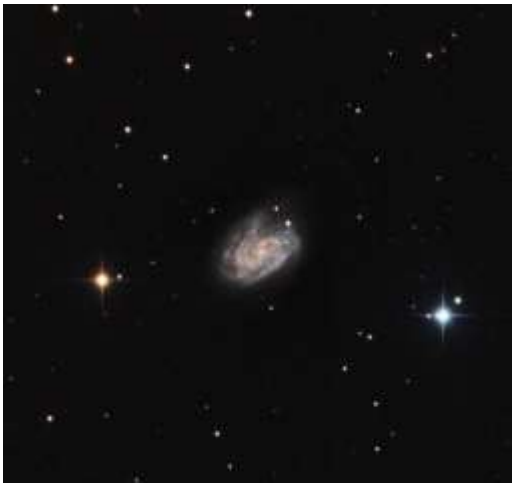
*__Jan. 11, 2018__. Upon hearing comments at a FRAC meeting by a guest speaker regarding the albedo of __Mars__, __Tom Moore__ raises his hand. "I had an albedo mouse," he announces proudly. "It had white fur and beady little red eyes. But then my brother stepped on it."

"I loved that mouse," he added, wiping a tear from his eye.

* * *

Lower Left Corner: NGC 7822 (a.k.a. **Sharpless 171, 2-171**), an emission nebula and star-forming region in *Cepheus*. (Photo by **Alan Pryor**.)

* * *



Above: NGC 157, a spiral galaxy in *Cetus*. (Photo by **Alan Pryor**) This lovely little galaxy is bookended by mag. 8 (left) and 9 (right) stars.

* * *

We'll wind up things this month with a little math puzzler about a double star.

The larger of two binary stars is 40 million years old – very young in celestial terms except in relation to its smaller companion that is only 10 million years old. The big star is *four* times older than the smaller star, right?

Okay, so five million years pass in the blinking of a cosmic eye. Now the large star is 45 million years old, the small one 15 million years old, and the larger star is only *three* times as old as its companion.

Fifteen million more years pass. Now the larger star is 60 million years old, the small one 30 millon years old. The big star started off four times older than its companion, but now it's only *twice* as old.

So here's my question: *How many years will have to pass before the two stars are the same age?*

P. S.: Don't tell **Tom Moore** the answer, make him figure it out for himself. *(Hmmm, let's see: Divide by three, carry the two – Wait a minute! How can it have a remainder of seven?)*

##