THE

FLINT RIVER OBSERVER

NEWSLETTER OF THE FLINT RIVER ASTRONOMY CLUB

An Affiliate of the Astronomical League

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Club Calendar. Fri.-Sat., July 1-2: JKWMA observings (Site #1, at dark); **Thurs., July 14th**: FRAC meeting/"Welcome Back!" party (7:30 p.m., The Garden in Griffin).

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Vice President's Message. Okay now, say it with me: *Enjoy your trip, Bill? Have a nice fall?*

My fall at JKWMA last month was mostly the result of not paying attention to what I was doing. But it was also partly due to one of astronomy's trade-offs.

If you want dark skies for observing, you have to get far enough away from the glow of city lights to see what the sky has to offer. But the darker the skies are, the harder it is to see at ground level, thereby increasing the chances of losing your balance on uneven ground, stumbling over equipment in the dark – that's what happened to me -- losing accessories or overlooking something important when packing up to go home. A dependable red-beam flashlight can help to avoid such mishaps, but being careful at all times is the best deterrent. I'm FRAC's greatest offender in that regard because I'm always in too much of a hurry. And sometimes, like last month, I've wished that I had slowed down and been more careful.

Alan Pryor and **Felix Luciano** are FRAC's two most prolific photographers of the night sky. They stay at JKWMA until well after midnight because their time exposures require – well, *time*. But neither of them ever comes to JKWMA unless the other one is coming too. They know that, even if other FRAC members are present early, eventually they'll be there alone. What happens if the unthinkable happens and a lone observer needs emergency medical treatment or his car won't start when it's time to go? You're never as alone as when you desperately need help and there isn't any.

That's why I usually send out a group e-mail stating that I'll be at JKWMA on a given evening, and what time I plan to arrive. I want you to know that you won't be alone.

As for losing things…If I drop an expensive accessory and can't find it with my red-beam flashlight, I'll switch to white-beam until I find it. Losing night-adapted vision is a temporary inconvenience for me and everyone else, but it beats stepping on a missing accessory or driving back to JKWMA the next day to look for it in broad daylight and find that a hunter's truck has run over it.

As for forgetting something, the best remedy is to prepare a checklist of everything you want to take to JKWMA. Check off items on the list as you pack them, and then repeat the process before you leave JKWMA. Our website has an equipment checklist in the Downloads section; you can modify it to make your own list.

Finally, here's a hale and hearty "WELCOME TO FRAC!" to our newest members, **Steve Bewton**

and **Angela Knight**. Both of them live in Griffin. We're happy to have y'all on board, folks!

-Bill Warren

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Last Month's Meeting/Activities. Aaron Calhoun; Brendon, David & Sarah O'Keeffe and their guest **Mike Dillard; David Haire;** and **yr. editor** enjoyed perfect observing conditions at JKWMA on June 3rd. The following evening was clouded out.

Talk about rude: one of the visitors at our June meeting slept through the program, and he didn't bother to hide his boredom the rest of the time. **Cherrie O'Keeffe** say it's probably because her grandson **Liam** is only 7 weeks old. Still…the least he could have done was laugh when someone – probably **yr. editor** – said, "Boy, they're making babies small nowadays, aren't they? I can't remember ever being that little."

Others among the 21 attendees incuded members **Felix Luciano; Truman Boyle; David & Sarah O'Keeffe; Steven Hollander; Ken Olson; Dawn Chappell; Tom Moore; Phil Sacco; Vicky Walters**; and **Sarah, Delilah & Jeremy Milligan**. Visitors included: **Steve Bewton**; **Angela Knight;** and three latecomers – a father, son and daughter whose names we didn't get. Steve B. and Angela joined the club that night; Felix and Phil received Zombie Awards; Cherrie and Delilah received Outreach certificates and pins; and Phil received a Globular Cluster certificate and pin – his sixteenth!

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This 'n That. We offer the following message of condolence to **Betty, Laura & Dwight Harness** regarding the recent passing of Betty's mother. (We also dedicate it to **Jessica Calhoun** and **Wayne Gardner**, both of whom lost their mothers recently):

"You will always feel her life touching yours, her voice speaking to you, her spirit looking out through other eyes, talking to you in the familiar things she touched, worked with, loved as familiar friends. She lives on in your life, and in the lives of all who knew her." **-Angelo Patri** (1877-1965)

An open message to everyone in FRAC: If your mom and dad are still alive, call them today and tell them that you love them. And then start doing it regularly if you don't already. You'll be glad you did it – and they will too -- and someday you'll be *very* glad that you did.

***Carlos Flores, Erik Erikson, Cherrie O'Keeffe, Delilah Milligan** and **Emily Milligan** were recognized in the June *Reflector* (pp. 28-29) for earning their Outreach pins.

(By the way: If you haven't received your Reflector *yet, contact* ***Bill Warren*** *at warren7804@bellsouth.net and let him know. You should have received it by now if you paid your 2016 dues.)*

***Dr. Richard Schmude** has an article, "Measuring the Sky Brightness Over Barnesville, Georgia," in the June, 2016 *Reflector* (p. 13). As you'd expect, it shows the careful, thorough manner in which Richard conducts his research.

*If you're planning to do any observing this summer, be sure to read **Smitty's** "Attack of the Martian Mosquitos." It's in the Articles section of our website, and it will tell you everything you need to do to enjoy your summer stargazing in maximum comfort.

***A Follow-Up Question from Last Month**: *You said that astronomers use parsecs to indicate the distance to objects that lie beyond the solar system. Why don't they use it to express distances within the solar system? How are those distances measured?*

Answer: The basic unit of measurement of stellar distances is the parsec, which equals a little more than 19 trillion miles. The basic unit of measurement within the solar system is the astronomical unit (AU), which equals 93 million miles (i.e., the distance from Earth to the **Sun**). One AU equals about 0.000004895 parsecs. That's a lot of zeros to deal with. But there's an even better reason for not using parsecs for solar system distance measurements.

Modern technology offers incredibly precise measurements of distances to objects via a brilliantly simple process: pinging them with radar. Aim a brief laser burst at an object, time how long it takes to get there and back, and knowing the speed of light you'll also know how far away the object is.

In 1962, scientists began using radio telescopes to bounce millisecond-long laser pulses off the **Moon's** surface to determine (among many other things) how far away it is. Thanks to retroreflectors

that were placed on the Moon by Apollo astronauts, NASA scientists can state with certainty that the Moon is moving away from the Earth at a rate of 1-1/2 inches a year. Now, *that's* precise measurement!

Still…The farther away an object is, the longer it takes to measure distances by radar. For example, the Moon is 1.25 light-*seconds* away; **Saturn** is 75 light-*minutes* from us; and **Andromeda Galaxy** is 2.5 million light-*years* away. Send a laser beam to the Moon, and you'll get a remarkably accurate measurement in 2.5 seconds. For Saturn, your answer will take 2-1/2 hours. Send that beam to Andromeda Galaxy, and you'll get a remarkably accurate distance measurement in 5 million years.

***Proper Motion and Barnard's Star**. Last month we mentioned that stars' actual movement through space (called *proper motion*) takes a year or more to determine. Here's why:

If you observe a nearby star and then observe it again six months later, it will appear to have moved against the background of more distant, fixed stars. That movement isn't real: it's the result of a parallax change in Earth's position in its solar orbit.

But if your two observations are a year apart, you'll be viewing the star from the same place in Earth's orbit. Any movement you detect, however small, will be the star's actual motion in space in one year. The longer the interval between two observations of the same star, the farther the star will have moved. In the case of really distant stars, it may take several years to detect any movement at all.

Rather than waiting for years to measure proper motion, astronomers use photos of a star taken years – or even decades – apart to determine its annual movement rate.

In 1916, the American astronome**r Edward Emerson Barnard** used photos taken in 1888 and 1916 to measure the proper motion of a mag. 9.5 red dwarf star in *Ophiuchus*. **Barnard's Star** (as it has become known) is six light-years away, making it the 4th-nearest star to the **Sun**. But that's not the only reason why astronomers are interested in it.

Barnard's Star has by far the greatest proper motion of any star in the sky. Every year, it moves 10.31 arc-seconds against the background of more distant stars. (Most other stars' annual proper motion is less than one arc-second.)

Barnard's Star is moving through space at a speed of 103 miles per second. Even at that rate, though, it takes *351 years* to move 1^{o} across the sky. Still, that movement is so much greater than any other star's proper motion that Barnard's Star is commonly referred to as "the runaway star."

(Incidentally, the concept of *proper motion* arose in 1718, when the English astronomer **Edmund Halley** noticed that the bright stars **Sirius, Aldebaran** and **Arcturus** had moved 1/2^{o} away from the positions charted by the Greek astronomer **Hipparchus** in his star catalog of 129 b.c.) That's why modern star charts are updated periodically.

***Cosmic Coincidence**. While we're rehashing last month's articles, here's something yr. editor missed in his reply to a question regarding impacts: In 1971, a small meteorite smashed into a home in Wethersfield, CT (pop: 26,000). No one was injured.

On Nov. 8, 1982 another home in Wethersfield was struck by another small meteorite. Again, no one was injured. What are the odds that two meteorites would strike two homes in the same town in Connecticut 11 yrs. apart?

***Trivia Questions About the Solar System**. 1. What is the brightest comet in the past 25 years? 2. How much does the solar system weigh? 3. How large is the **Sun** compared to the **Milky Way**? (Answers on p._.)

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Upcoming Meetings/Activities. The summer months offer a stark contrast to the chills and discomforts that winter brings. For FRAC, though, it's a mixed blessing because attendance at our meetings and observings tends to decline in July and August due to things like vacations, members and their children (or grandchildren) involved in recreational activities, etc.

Regardless, we hope you'll be able to attend our "Welcome Back!" reunion (with refreshments) for FRAC's five remaining charter members at our club meeting at 7:30 p.m. on **Thurs., July 14th** at The Garden. Only two of the original 18 charter members – **Steven "Saratoga Smitty" Smith** and **Bill Warren** – are still actively involved in FRAC. **Larry Higgins, Ken Walburn** and **John Wallace** are no longer able to participate in club activities on a regular basis, but unlike the other 13 charter members they have remained in FRAC continuously since 1997. (It was Larry who came

up with the idea of starting an astronomy club in the Griffin area. Ken and Bill, the other two co-founders who knew far less about astronomy than Larry did, went along with the idea reluctantly.)

Earlier in the month, our JKWMA observings will be held at Site #1 on **Fri.-Sat., July 1st-2nd**.

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"Is There Life Out There in Space?"

article/opinion by Bill Warren

About 15 years ago, **Keith Cox** and I conducted an observing for counselors-in-training at a religious summer camp near Griffin. When a teenage counselor asked me if I thought there was life on other worlds, I didn't stop to consider the religious nature of my audience. Instead, I brashly replied that, since there are more stars in the universe than blades of grass on Earth, the odds greatly favor life existing somewhere besides Earth. No one questioned me about it, and we went on from there.

After the observing, though, the lady in charge let me have it. She was furious that I had expressed an opinion that was contrary to her faith. And she was right: the only opinion I should have expressed that night was how lovely **M13** and **Ring Nebula** were.

FRAC has never been invited back to Camp Calvin.

Our two purposes in conducting public observings are to show people the wonders of the universe in ways that most of them have never seen it before, and to educate them about what they are seeing. FRAC members are very good at doing those things, and our visitors rightfully regard us as expert astronomers because we know so much more about the universe than they do.

Opinions are a different matter. My reply to the counselor was honest and well-intended -- but it was still an opinion.

People are entitled to their opinions, of course – and in the case of religion and politics, everyone has them and they usually are strongly held. We can't change people's minds, regardless of what we – or they -- say. We aren't going to convince people who believe that the Earth is flat, or that men never walked on the Moon, that they are wrong. And we shouldn't try to do so. That's not our purpose, and it's not what we do best. We're astronomers, not debaters.

Normally, questions are asked innocently by people who are interested in what an astronomer has to say. But over the years a few visitors have had other agendas. Some have tried to start arguments with us in order to air their personal opinions or show everyone how much they know (or don't know, in most cases).

With long lines at our telescopes, we usually spend less than a minute with each visitor. There's no time for us to engage in long discussions even if we wanted to. Anyway, a public observing is hardly the time or place to get involved in a heated discussion that can dampen enthusiasm for the event faster a sudden downpour. FRAC members know that, so we carefully avoid becoming embroiled in arguments or giving direct answers to opinion-based religious questions. I violated that basic rule at Camp Calvin, and FRAC has paid the price for it.

So how should I have responded to the teenager's question?

Well, to borrow a biblical quotation, in Proverbs 15:1 **King David** wrote, "A soft answer turneth away wrath." A good non-confrontational answer to *any* religious question is, "Your guess is as good as mine." Such a response satisfies the questioner by elevating him or her to our level, rather than dragging us down to the level of debating opinions in a public argument that no one can win.

Dwight Harness uses a different approach that keeps the lines moving at his telescope: "I don't have time to discuss that with you now, but if you'll see me when we're finished we can talk about it then."

Strictly between you and me, however, the best answer I've ever seen came from the Greek philosopher **Metodorus of Chios** in the 4th century b.c.: "To consider Earth as the only populated world in infinite space is as absurd as to assert that, in an entire planted field, only one grain will grow."

That statement might have satisfied the lady at Camp Calvin, since "planted field" suggests that the universe was created rather than simply arising spontaneously. But an atheist would argue that the universe was not "planted." Both points of view are open to debate – and that's why the question, *Is there life on other worlds?*, must be handled delicately and with tact, regardless of your own personal view.

*(Note: I sent this article to **Dr. Maynard Pittendreigh**, coordinator of the A. L.'s Outreach awards program. Dr. Pittendreigh is also a Presbyterian minister, and I was interested in his views regarding outreach activities and life on other worlds. Here's what he had to say:*

"As for your summer camp experience, I would have answered just as you did. Your point is well taken, however, about opinions and staying focused on what we are doing at outreach events.

*"As for the possibility of life on other worlds, **Sir William Herschel** discovered so many, many deep sky objects, and as a man of faith he was confident of life throughout the universe. His 1823 obituary reflected his oft-stated positions by saying that Herschel's 'views serve to enlarge our conceptions of the Supreme Being, who, in every star that sparkles in the firmament, has dispersed the blessings of life and intelligence to various orders of animated beings.'*

"I grew up at a time when we wondered if there were planets around other stars. No one asks that question now. I am convinced that my grandson will live in a time when no longer will anyone wonder if there is life in the universe, they will know. I am beginning to believe that that time will come in my lifetime.")

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At Last: Another Interview with Professor Stargazer!

As most of you know, **Prof. Theophilus** (pronounced: The Awfulest) **Stargazer** is the world's foremost authority on astronomy, cosmology and finding ways to avoid taking Zumba classes with your wife. We hadn't heard from him recently, so a group of FRACsters decided it was time for another enlightening interview.

When we caught up with him, the professor was sporting a black eye, two broken arms, and his jaw was wired shut. "What happened to you?," **Andy Hasluem** asked. "You look like you just lost a battle with an 800-lb. gorilla!"

"Not exactly," the professor grunted between clenched teeth. "My wife asked me how she looked in her new dress, and I said, 'Is that a dress? I thought someone was holding a tent service!'"

And with that, our interview began.

Cynthia Armstrong: Why do they say that, when you're looking through a telescope, you should keep both eyes open?

Prof. Stargazer: You get better results that way than observing with both eyes shut.

Tom Moore: My house is on a hillside. If the Earth is round, why doesn't my house slide down the hill?

Prof. Stargazer: If ignorance is bliss, Tom, you must be a very happy man.

Tell me, Mr. Moore: Which do you think is worse, ignorance or apathy?

Tom: I don't know, and I don't care.

Phyllis Bell: I have a question, Sir: Why do binoculars have lens caps? They make it very hard to see.

Prof. Stargazer: Are you any kin to Tom Moore?

Brendon O'Keeffe: Can't they do something about the name of the 7th planet from the **Sun**, Professor? Someone always makes a snide comment every time I say the word **Uranus**.

Prof. Stargazer: It's funny you should mention that, Brendon. Just yesterday I e-mailed the International Astronomical Union to suggest a new name for Uranus.

Steve Bentley: What name did you suggest?

Prof. Stargazer: Urectum.

Vicky Walters: Some astronomers believe that the universe will expand forever; others think it will reverse itself like a movie playing backward. What do you think, Sir?

Prof. Stargazer: I think I'll have another frozen margarita. Bartender? Bring it with an extra-long straw.

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Answers to Trivia Questions on p. 3: 1. In terms of naked-eye visibility, **Comet Hale-Bopp** takes the prize as the brightest comet in the last 25 years. It was visible to the unaided eye for 18 months, from May, 1996 through Dec., 1997. Until Hale-Bopp's arrival, the longest that any comet in recorded history remained visible to naked-eye viewing was nine months (**The Great Comet of 1811**). In both cases, their unusually long periods of visibility were

due to their unique angles of approach and departure from the **Sun** as seen from Earth.

In terms of actual brightness, Hale-Bopp was the 3rd-brightest comet in the 20th century, surpassed only by **Comet Ikeya-Seki** (1965) and **Comet West** (1976). During its lengthy visit, Comet Hale-Bopp was seen worldwide by more than a billion people.

In March, 1997, 39 members of a San Diego, CA religious cult, Heaven's Gate, committed mass suicide because they believed an alien spacecraft was hiding behind the comet. The cult's leader, **Marshall Applewhite**, convinced his followers that, after their deaths, their souls would be transported to heaven by the UFO. (One wonders how the aliens would have known where heaven is, and why they would know better than we do how to get there. Maybe he told his followers that the aliens were angels were sent by God -- but if so, how did Mr. Applewhite know it? And why did they need a spaceship? A terrible tragedy might have been avoided if someone in Heaven's Gate had asked those kinds of questions.)

2. The solar system contains four septillion pounds of material. *(That's a 4 with 24 zeros after it. –Ed.)* Over 99% of that is the Sun's weight, with **Jupiter** accounting for 73% of what's left. (Source: **Frances Reddy** [*Astronomy*, Dec. 2015, p. 24].)

3. If the Sun were the size of a grain of sand, the Milky Way would be a flattened disk 40,000 mi. in dia., and the 400 billion stars within it would be four miles apart. (Source: **David Eicher** (*Astronomy*, Dec. 2015, p. 20).

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Upper Right Corner: M100, a face-on spiral galaxy in *Coma Berenices*. Photo by **Alan Pryor**. **M100** was discovered in 1781 by **Pierre Mechain**, **Charles Messier's** assistant. The galaxy's spiral structure was first noted by **Lord Rosse** in 1851, using his massive 6-ft. reflector, the "Leviathan of Parsonstown." Lord Rosse described M100 as a smaller version of **M51** (a.k.a **Whirlpool Galaxy)** in *Canes Venatici*.

The two smaller galaxies in Alan's photo are **NGC 4328** (to the lower right of M100), and NGC **4322,** to the lower left of M100.

It takes a clear night at a dark site and a telescope of 10" or larger to see M100's two brightest spiral arms. In a 'scope of that size, NGCs 4328 and 4322 appear as tiny circular spots.

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The new Earth, freshly torn from its parent **Sun**, was a ball of whirling gases, intensely hot, rushing through the black spaces of the universe in a path and at a speed controlled by immense forces. Gradually, the ball of flaming gases cooled. The gases began to liquefy, and Earth became a molten mass. The materials of this mass eventually became sorted out in a definite pattern: the heaviest in the center, the less heavy surrounding them, and the least heavy forming the outer rim.

-Rachel Carson
The Sea Around Us (1951)

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It has always seemed to the author that **J. R. R. Tolkien**, in his delightful fantasy, *The Hobbit*, unwittingly created an exquisite description of (the globular cluster) **M22** when he spoke of the fabulous jewel called The Arkenstone of Thrain: "It was as if a globe had been filled with moonlight and hung before them in a net woven of the glint of frosty stars."

-Robert Burnham Jr.
Burnham's Celestial Handbook (Vol. 3, p. 1596)

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