THE

FLINT RIVER ASTRONOMY CLUB

NEWSLETTER OF THE FLINT RIVER ASTRONOMY CLUB

An Affiliate of the Astronomical League

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Club Calendar. Fri.-Sat., March 8-9: JKWMA observings (at dark); **Thurs., March 14:** FRAC meeting (7:30 p.m., The Garden in Griffin).

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President's Message. *"Even today the most jaded city dweller can be unexpectedly moved upon encountering a clear night sky studded with thousands of twinkling stars. When it happens to me after all these years, it still takes my breath away."*

- Carl Sagan

My first telescope was a Christmas gift to myself in 2016. More than anything else, I wanted to see **Orion Nebula** and **Saturn's** rings.

As a beginning astronomer, I found it rewarding to learn about the universe and the optics, gadgets, and techniques that go with being an amateur astronomer – but I also learned something else that was equally important to me: I really enjoy sharing my telescope with others.

I realized it for the first time when I set up my scope in a campground in Tellico Plains, TN on the weekend of the 2017 total solar eclipse. *I had no idea before then what an event a telescope can be, since previously I'd only used it around other astronomers.*

Even before the sun went down, groups of campers came by to ask what I was doing and what I would be looking at. Once it was dark, for hours every night hundreds of people were joining me at the eyepiece, looking at the stars and planets. It was an opportunity for me to enlighten them and give them their first "WOW!" moments while looking at Saturn, **Jupiter** and the stars.

The most amazing thing about that weekend (other than the eclipse) was that every time someone had their "WOW!" moment, it was like I was having that moment again myself! It reminded me of seeing Saturn's rings for the first time, and how unreal they appeared. I remembered seeing Jupiter's moons in my finderscope for the first time: I was so excited that I forgot to look at them through the big scope! And I recalled how I stayed out in the cold for

hours, staring at the delicate structure of the Orion nebula and the newborn stars inside it.

That weekend reconnected me with why I became interested in astronomy -- discovery, exploration and learning about our universe firsthand, and how exhilarating it can be. The opportunity to share this excitement with others is an opportunity to see things for the first time again through others' eyes.

Outreach events are our chance to share these experiences, our knowledge, and our excitement with others, many of whom would not have such an opportunity otherwise. I find the experience of sharing astronomy with others to be as rewarding as seeing a globular cluster for the first time. It compels me to learn, so that I can keep sharing the experience of seeing the universe. If some of our guests decide that they want to explore the universe themselves because I gave them their first look at Saturn, then the investment in my self-gifted telescope has repaid itself in ways that cannot be quantified.

On behalf of all our members, I want to offer a "WELCOME TO FRAC!" to our newest members, who joined the club at our March meeting – **John & Sophie Page, Mark Grizzaffi** and **Eugene Pennisi.** We'll do all we can to help you feel at home with us. Please let us know how we can make your time spent with us as enjoyable and satisfying as you want it to be.

Finally, to everyone in FRAC: As your newly elected president, I promise to work hard to make you proud of your club. I'm new at the job, so I'll need your help and support at every step along the way.

-Sean Neckel

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Last Month's Meeting/Activities. Four members **-- Dwight Harness, Sean & Gianna Neckel** and **Erik Erikson** – attended our JKWMA observing on Feb. 1st.

We had 24 attendees at our Feb. birthday party meeting: new members **Mark Grizzaffi** of Peachtree City, **John & Sophie Page** of McDonough and **Eugene Pennisi** and his daughter **Nyssa**, of Stockbridge; and **Cindy Barton; Daniel Pillatzki; Aaron Calhoun; Tom Moore; Steve Bentley; Truman Boyle; Carlos Flores; Kenneth & Rose Olson; Erik Erikson; Alan Pryor; Felix Luciano; Jon Heard; Gianna & Sean Neckel; Jeremy Milligan; Dwight Harness; Bill Warren;** and **Marla Smith,** whose mouth-watering cake set the tone for the rest of the evening. (Fortunately, Warren's First Law of Physics applied, which states that *You don't gain weight from anything you eat at FRAC parties.*)

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This 'n That. As you can see from our President's Message, the Feb. officer elections brought changes in FRAC's leadership. With **Dwight Harness** and **Carlos Flores** stepping down after 6 yrs. as president and 4 yrs. as secretary, respectively, they were replaced by **Sean Neckel** (president) and **Aaron Calhoun** (secretary). **Felix Luciano** took Aaron's place on the board of directors, and **Cindy Barton** replaced the late **Alan Rutter. Bill Warren** (vice president), **Jeremy Milligan** (treasurer) and **Larry Higgins** (board member) retained in their present posts.

Dwight and Carlos represented FRAC admirably, and we deeply appreciate their service over such a long period.

*****If you haven't already done so, please send your 2019 dues check made out to FRAC for $15 to: **Jeremy Milligan, 100 Old Mill Way, Senioa, GA 30276.**

*After taking photos of the totally eclipsed **Full Moon** on Jan. 20th (see p. 6), **Alan Pryor** did some computations and came up with the following: At totality, the Moon was 12,800 times dimmer than before the eclipse began.

*The ranger at JKWMA told **Sean** that they are going to cut down the trees to the west of our observing site; when they do, it will dramatically increase our view of the western and northwestern sky.

*An update regarding **yr. editor's** recent "A History of Big Telescopes" Special Edition: As a result of a recent Hawaii Supreme Court decision, construction is slated to begin on Mauna Kea on the Thirty Meter Telescope.

*****In the March, 2019 issue of *Sky & Telescope* (pp. 36-39), **Jerry Oltion** writes about a subject that is literally as old as dirt: *dust*. In his article, "Nurture Your Newt: Bathing Mirrors," Oltion offers advice for (a) keeping dust off the primary mirror of your Newtonian reflector; (b) knowing when enough dust has collected on your mirror to warrant cleaning it; and (c) removing the dust.

Before addressing Step C, though, the author dispels the two myths that cause many telescope owners to dread cleaning their mirrors:

Myth #1: *You need to clean your mirror whenever you can see dust on it by looking down the tube.* Truth is, your mirror collects dust every time you use it, but it takes a *lot* of dust to affect what you see through a clean eyepiece.

Myth #2: *Mirror coatings are so fragile that, unless you have the steady hands of a surgeon, you are likely to damage the mirror's coating.* While it's true that you have to be gentle and careful when cleaning the mirror, Oltion says, "It's not as fragile as you may think. The aluminum coating is overcoated with a layer of silicon dioxide, which is basically glass." (p. 39)

We can't repeat the author's detailed advice for cleaning your primary mirror due to things like violating plagiarism laws – and outlining the steps involved would be useless without the explanations he gives. But it's a terrific article, the best we've seen on the subject, and we strongly recommend it to anyone who wonders if cleaning is necessary, or how to do it.

Oltion will have a follow-up article on collimating your telescope in the April issue of *Sky & Tel*; judging by what he's written so far, it should be well worth reading.

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Upcoming Meetings/Activities. Our next JKWMA club observings will be on **Fri.-Sat., March 8th-9th.**

Our club meeting will be at 7:30 p.m. on **Thurs., March 14th** at The Garden in Griffin. Our program will be *Jupiter and Its Amazing Moons* from the **Alex Filippenko** dvd.

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The Planets in March. Mercury (mag. 0.1) will be up (briefly, 30 min. after sunset) during the 1st week of March. It will be

crescent-shaped, and about 1/3 illuminated. **Mars** (mag. 1.3) will be visible until around midnight all month in the SW sky.

Three other planets will be visible in the pre-dawn sky: **Jupiter** (mag. -2.1) will rise around 2 a.m., **Saturn** (mag. 0.6) around 4 a.m., and **Venus** (mag. -4.0) around 4:30 a.m.).

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Magnitudes
by Bill Warren

Question: *What is the difference between a star's* apparent magnitude *and its* absolute magnitude, *and why is that difference important?*

Answer: First, let's talk about magnitudes.

Even a brief look at the night sky on a clear evening shows that not all stars are equally bright. Some, like **Sirius**, are extremely bright, and others can barely be seen at all. Magnitudes express differences in star brightness via a *magnitude scale*.

Hipparchus. The first magnitude scale was devised by the Greek astronomer Hipparchus in 129 b.c. He grouped the visible stars into six categories, with the brightest stars being "of the first magnitude," the next-brightest being "of the second magnitude," etc., down to the faintest stars visible, those "of the sixth magnitude." *(The word magnitude originally referred to* size*, not brightness. The ancients believed that everything they could see in the sky was the same distance away, and the relative brightnesses of celestial bodies was due to their size, not distance.)*

Galileo Upsets the Applecart. Although far from perfect, Hipparchus's magnitude scale was used by astronomers for 17 centuries, until Galileo saw stars in his telescope that were much fainter than the naked-eye stars. Galileo designated the brightest of those stars as being "of the seventh magnitude," noting that "such a crowd of other (fainter stars) escape natural sight that it is hardly believable."

As telescopes got bigger, additional magnitudes were added to the bottom of the scale. Today, 50mm binoculars will show stars down to 9th magnitude, a 6-in. telescope will reach 13th- magnitude stars, and the 78-in. Hubble Space Telescope has shown objects as faint as 31st magnitude.

By the mid-1800s, astronomers had determined that a mag. 1 star was 100 times brighter than a mag. 6 star. Accordingly, in 1856 the English astronomer **Norman Pogson** proposed that each magnitude should be the 5th root of 100 (i.e., 2.512) times brighter than the one immediately below it. Pogson's 2.5x logarithmic progression quickly replaced Hipparchus's brightness scale. It is still in use today, with additional revisions as shown in the next paragraph. Under Pogson's scale, a mag. 1 star is about 2.5x brighter than a mag. 2 star, 6.25x brighter than a mag. 3 star, 15.6 times brighter than a mag. 4 star, about 40x brighter than a mag. 5 star, 100x brighter than a mag. 6 star, and so on down the magnitude scale.

Science Marches On. Astronomers also noted that not all stars of the same magnitude are equally bright. (For example, Sirius is considerably brighter than any of Hipparchus's other 1st-magnitude stars.) So they assigned fractions to each star's

magnitude as necessary. They also changed the scale at the upper end, setting mag. 0.03 **Vega** as the standard against which other star brightnesses are judged -- and they added other, even brighter magnitudes with negative values. Thus, **Rigel** is now mag. +0.18, **Antares** is brighter at mag. -0.3 and at mag. -1.46 Sirius is the brightest star in the night sky. **Venus** is mag. -4.5, the **Full Moon** is -12.5 and the **Sun** is -26.7. (Translation: The Sun is 400,000 times brighter than the Full Moon – which explains why you shouldn't look at the Sun without adequate protection for your eyes – but it's also 13 billion times brighter than Sirius appears to us.)

Apparent and Absolute Magnitudes. Finally, we're addressing the original question. All of the magnitudes cited above refer to brightnesses *as seen by observers on Earth* – **apparent magnitudes**. But those numbers don't take into account the fact that stars lie at different distances from Earth. Some of them appear bright because they are closer to us than other, more distant stars that may in fact be brighter but appear faint to us because they are farther away.

The term **absolute magnitude** refers to how bright stars actually are, i.e., how bright they would appear if they were 10 parsecs (32.6 light-years) away.

Bottom line: We don't use absolute magnitudes in observing. All you need to know is how bright celestial objects appear in our view. (Which doubtless leaves you wondering: *Why have you wasted so much time telling us something we don't need to know?* Two reasons: First, six newsletter pp. is a lot of space to fill, and we try to avoid using reprints of earlier articles whenever possible; and second, the magnitude scale is one of the tools and measures that astronomers use.)

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Above: M31, a spiral galaxy in *Andromeda.* (Photo by **Vencislav Krumov**.) **Andromeda Galaxy** is one of the best-known and most popular galaxies in the night sky. The largest member of the **Local Group** of galaxies (which also includes the **Milky Way**), M31 is about twice as large as our galaxy and contains more than a trillion stars. It is traveling through space on a collision course with the Milky Way: about 5 billion years from now, the two galaxies will merge to form a single supergalaxy called **Milkomeda**. Although the gases and dust will produce unimaginably bright and violent fireworks when the collision occurs, the vast spaces between the combined 1.4 trillion stars will make it extremely unlikely that any two stars will collide.

Andromeda Galaxy can be seen faintly without optical aid from a dark site such as JKWMA on a clear evening in the fall and early winter. It was the 31st object in the French comet hunter **Charles Messier's** 18th-century catalog of deep-sky objects that might be mistaken for comets. M31 is a target in five A. L. observing programs:

Messier, Binocular Messier, Two in the View, Urban and Universe Sampler.

If you are pursuing a Messier pin for finding and observing all 110 of the Messier objects, M31 is a treasure trove: Find M31, and you'll be able to mark *three* Messiers off your list because two of Andromeda's companion galaxies, **M32** and **M110**, lie virtually within the same low-power field of view.

M32 is the circular glow located to the left of M31's core in Venci's lovely photo.

M110, located to the lower right of Andromeda's core, will appear much fainter than the photo indicates: it will be a faint, oval blotch of light located about twice as far from Andromeda as M32 is.

(About the photographer: Venci, a lawyer from Bulgaria, joined FRAC while working on a hydroelectric project in the area. He has maintained his FRAC membership since returning home, and from time to time he sends us his astrophotos. His membership makes FRAC an international astronomy club.)

FRAC MEMBERS' JAN. 20TH LUNAR ECLIPSE PHOTOS

Photographer: Jon Heard

Photographer: Alan Pryor

Photographer: Carlos Flores

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The universe is the ultimate recycling mechanism: Stars die, and their remains furnish the raw materials from which new stars are born.

-Bill Warren

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