

THE FLINT RIVER OBSERVER

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**; **Aaron Calhoun**; and **Alan Rutter**.

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Club Calendar. Thurs., Aug. 9: FRAC meeting (7:30 p.m., The Garden in Griffin); **Fri.-Sat., Aug. 10-11:** JKWMA club observings (at dark).

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President's Message. I hope you're having a good time this summer, and that you can find time for FRAC among your August activities. **Mars** is still very bright, but all of the other naked-eye planets are up there too, along with the **Perseids meteors** (*see pp. 3-4. -Ed.*) and more Messier objects than at any other time of year. All of them are waiting for you at Joe Kurz, and I hope you'll be able to enjoy them with us on Aug. 10th and 11th.

-Dwight Harness

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Last Month's Meeting/Activities. A brief but violent thunderstorm kept most Fayetteville residents home on June 22nd, the date of our public

observing at Lake Horton. And since the weather forecast for the next day was no better, after the storm passed **Felix Luciano**, **Ken Olsen** and **yr. editor** decided to try something different, i.e., conduct a cloudy night observing for the 8-10 attendees who waited out the storm. We handed out FRAC brochures and the personal cards that **Sean Neckel** had printed up; we talked with the attendees about FRAC and invited them to visit our meeting and website; we showed them our telescopes and explained how they work; and we told them about upcoming events such as the **Mars** apparition and our return visit to Lake Horton on July 27th. Finally, as if to atone for its earlier unruly behavior, the sky opened up enough for us to show them one celestial object: **Venus**.

We had seventeen in attendance at our July meeting: **Erik Erikson**; **Cindy Barton**; **Alfred McClure**; **Truman Boyle**; **John Felbinger**; **Cynthia Armstrong**; **Steven Hollander**; **Felix Luciano**; **Dawn Chappell**; **Chuck Davis**; **Steve Benton**; **Tom Moore**; **Jeremy Milligan**; **Sean & Chelsea Neckel**; **Dwight Harness**; and **yr. editor**.

"Into each life some rain must fall," wrote **Henry Wadsworth Longfellow**. But why should it be on our observing weekends? Like so many others so far this year, our July observings at Joe Kurz were clouded/rained out. Rats.

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This 'n That. We were asked recently, *This is the third month in a row that you've scheduled our club observings on the same weekend as our meeting. Why do you do it that way?* The answer involves the lunar phases.

With rare exceptions, our meetings are held at The Garden on the 2nd Thursday of every month. (That's easy to remember even if you have trouble remembering specific dates.) But since lunar months are not the same as Earth months, if we scheduled our club observings for the same weekend every month there would be occasions when a full or gibbous **Moon** would be up practically all night. We prefer to schedule our club observings for the weekend closest to New Moon, when the Moon is least likely to interfere with observing or astrophotography.

In August, the New Moon will be on Aug. 11th, so there won't be any Moon to bother us at our Joe Kurz observings on the 10th-11th.

**Question: Last month you mentioned sublimation; what's the difference between sublimation and melting?*

Ans.: Matter exists in three states: solids, liquids and gases. *Sublimation* and *melting* are two of the six processes by which matter changes from one state to another due to temperature changes or pressure.

When matter sublimates, it changes from a solid to a gas, whereas melting changes matter from a solid to a liquid. (The other processes are: *condensation* (gas to liquid), *deposition* (gas to solid), *evaporation* (liquid to gas) and *freezing* (liquid to solid).

On Earth, ice is the solid state of water. When heated it melts, becoming a liquid.

On **Mars**, however, the situation is very different. Mars is too cold to contain liquid water at the surface, but water ice exists there in small quantities at the northern polar ice cap in the form of a thick, briny, Slurpee-like sludge that contains salts and dust from martian dust storms. Frozen carbon dioxide (CO₂, or dry ice) is also found there -- and at the southern polar ice cap as well -- in abundance. (Water ice exists at the south polar cap, too -- but not at the surface. It lies buried year-round beneath the permanent layer of dry ice that we see in our telescopes.)

During the martian summer at the north pole, solar radiation sublimates the dry ice into CO₂ gas and the water ice into water vapor. The salts and dust remain at the surface, but the CO₂ gas and water vapor rise into the martian atmosphere (which, incidentally, is composed of CO₂ gas); they remain there until winter sends them back to the surface as snow to re-form as salty sludge and dry ice.

Sublimation also occurs whenever a comet -- essentially a "dirty snowball" -- enters the inner solar system on its way to the **Sun**. Battered by the relentless pressure and radiation of the solar wind, portions of the comet's icy surface sublimate, changing into not water but gases that are blown away from the comet, along with pockets of dust and gas inside the comet that are released whenever sublimation occurs. (See p. 4. -Ed.)

***A Follow-Up to the "Intelligent Life on Mars" Controversy.** Four years ago, a photo taken by one of the Curiosity rover's cameras showed a bright gleam of light near the crest of a distant crater rim on the martian horizon. (See below.) A photo taken seconds later by another camera that was aimed at the same spot showed no such light beam. The "intelligent life exists on Mars" crowd contended that the beam was an intermittent signal produced by an intelligent (but apparently immobile) alien or indigenous life form that was trying to indicate its presence to us.



Above: The mysterious "light on Mars."

Mission engineers speculated that the light was due to sunlight reflected off a rock, or maybe to sunlight leaking through a vent in the camera's housing or cosmic rays striking the camera's detector. The naysayers claimed that NASA "conveniently overlooked" the signal until it was pointed out to them, and their efforts to explain it by natural causes was a cover-up to hide the fact that they know that intelligent life exists on the Red Planet.

Other "discoveries" since then have included: rocks that apparently moved from one photo to another (maybe they're the martian equivalent of Mexican jumping beans); a fossilized fish; a long-handled spoon; and even a "message" in Morse code that was said to have been composed on a martian sand dune by aliens. (When translated by a NASA technician, the message read: 'NEE NED ZB DEIBEDH SIEF EBEEE SSIEI ESEE SEEE!!' Either the "message" was in an alien language -- in which case, why did the writer use Morse code? Do they teach that in extraterrestrial schools? -- or the author sorely needed a crash course in spelling.)

(Incidentally, the widely distributed photo of a martian rock that was claimed to resemble **Barack Obama's** head was fake, like the "Mars hoax" photo. The rock in the doctored photo didn't look like Obama, and the one in the actual photo taken by the Spirit rover bore no resemblance to a human head or anything else but a martian rock. But hey!, who cares, as long as you can fool some of the people some of the time into believing what you want them to believe?)

P.S.: Not to be outdone, another pseudo-researcher-- probably a Republican -- claims to have discovered a martian rock that looks like **Donald Trump**. Frankly, yr. editor would rather see one that looks like **Melania**.

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Upcoming Meetings/Activities. Our FRAC meeting will be at 7:30 p.m. on **Thurs., Aug. 9th** at The Garden in Griffin. Our speaker, **Felix Luciano**, will show and tell us how to clean eyepieces. We'll have the necessary supplies on hand, so if you bring your eyepieces Felix will guide you through the cleaning process.

Our JKWMA club observings will be held on the following evenings, **Fri.-Sat., Aug. 10th-11th**. Squirrel hunting season begins at JKWMA on Aug. 15th, so Joe Kurz probably will still be closed until then, as it has been since mid-March. So if the gate is locked or closed when you arrive, unlock it if necessary and close but don't lock it after you enter. (And if it was locked, the last one to leave should lock the lock *to the other lock, not to the chain* before leaving.)

If the gate is open when you arrive, leave it open after you enter and leave.

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The Planets in August. **Venus** (mag. -4.45) will be low in the W sky 30 min. after sunset. **Jupiter** (mag. -2.0) will be up all night, as will **Saturn** (mag. 0.3), its rings dramatically open to our view.

Mars (mag. -2.8) will still be unusually bright in August. (*Note: Telescopically, at least, the Red Planet ain't red, it's yellowish-orange.*) If you don't see surface features immediately, don't give up in despair: Earth's atmospheric turbulence can cloud our view of the surface for minutes at a time.

But there will also be occasional pockets of turbulence-free air in which features will pop into view. (Unless, of course, there's a huge dust storm going on, in which case all bets are off.)

Neptune (mag. 7.8) will be a tiny but easily identifiable (telescopically, at least) blue-gray disk in *Aquarius* after midnight; blue-green **Uranus** (mag. 5.8) and white **Mercury** (mag. -0.2) will be pre-dawn targets, the latter during the last week of August.

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The August Perseids Meteor Shower

The **Perseids** is the most productive of all the annual meteor showers. During a two-week period in August, Perseids meteors race through Earth's atmosphere at speeds exceeding 125,000 mph, then suffer quick, fiery deaths.

We don't always see all that the Perseids have to offer: sometimes the **Moon's** brightness dims their glowing paths. But this year, the Perseids will produce an anticipated 80-90 meteors per hour at its peak – about 50% higher than most Perseids peaks.

That's good news for us because our JKWMA observings will be on **Fri.-Sat., Aug. 10th-11th**, and New Moon will be on the 11th. The peak will occur around 4 a.m. on Aug. 13th, but there should be enough meteors on Fri. and Sat. evening to send you home happy if the sky cooperates.

Here are the basics of Perseids watching:

1. Unless you are counting and charting meteors to earn an observing pin, watching a meteor shower is the easiest kind of observing you can do. You don't have to look for meteors: they appear suddenly, usually somewhere within your peripheral view, but you'll have no trouble shifting your gaze to view them directly until they burn out in a second or two. The down time between meteors can be spent socializing; let everyone know by calling out and pointing whenever you see a meteor -- especially if it's a fireball – and tell them to do likewise.

2. All you need to enjoy the experience is:
 - *clear skies (here's hoping!);
 - *a lawn chair (preferably one that reclines, so you won't have a sore neck the next day);
 - *insect repellent (think: Bounce laundry pads);

*maybe soft drinks and something to munch on if you plan on being outside long; and

*your eyes. (A telescope would severely restrict your ability to spot those celestial fireflies. They appear, move and disappear so quickly that you'd never be able to follow one if it appeared in your eyepiece -- which is extremely unlikely.)

3. Binoculars are equally useless for the same reason, except in the case of fireballs that leave a visible ion trail behind them. (Not all of them do -- at least, you can't always see it.) If you spot a smoky contrail naked-eye, you can use your binocs to watch it fade away slowly like a jet contrail.

4. If it's a Perseids meteor -- as opposed to a *sporadic* meteor that isn't part of the Perseids -- it will appear to have come from the constellation *Perseus*, no matter where you see it in the sky or what direction it's traveling. That's why they call it the **Perseids meteor shower**.

Some people think that by looking toward the shower's *radiant*, or apparent point of origin -- which this year is located near the **Double Cluster (NGCs 869 & 884)** -- they'll see more meteors. But like the old song says, it ain't necessarily so. In fact, you may see fewer meteors if you look toward Perseus in the north or northeast, because you'll be facing the sky glow of metropolitan Atlanta and/or Clayton and Henry counties. If you're facing N or NE, look at least 45° above the horizon.

Put it this way: wherever you look is fine, as long as you have a good view of a large, dark portion of the sky in that direction. The darker the sky, the more meteors you'll see.

5. Don't expect it to rain meteors at the peak or any other time. At its peak this year, you're likely to see about three Perseids meteors every 2 min. Still... Three meteors every 2 min. is an event worth watching. It's something you won't soon forget if this year's Perseids live up to their expectations.

This is, in fact, why more observers aren't motivated to stay up until the peak begins: They want to see the sky filled with meteors like it was in the **Leonids Meteor Storm of 1966**, when observers in the American southwest (where the sky is clearer, dryer and less light-polluted than it is in the eastern U. S.) saw an estimated 250,000 meteors light up the sky like a fireworks display in a single night. But Leonids storms occur only every 33 yrs.; the rest of the time the annual Leonids meteor showers aren't nearly as productive as the Perseids.

Perseids meteors are dusty debris from **Comet 109P Swift-Tuttle**, a periodic comet that returns every 133 yrs. (The last time was in 1992.) When Swift-Tuttle neared the Sun, portions of its surface heated sufficiently to release dust and gases that previously had been frozen in place. The gases dissipated, but the dust stream followed the comet.

After Swift-Tuttle rounded the Sun, the stream responded to the Sun's immense gravitational tug and established a closer orbit of its own that brings it back to cross Earth's path every summer. That stream, called the *Perseids Cloud*, is 9 million mi. wide and presently about 75 million mi. long.

That explains why more Perseids meteors are seen near the peak: that's where the Cloud is densest. And since it is millions of miles wide, there's plenty of room overhead for Perseids to enter Earth's atmosphere anywhere.

Meteor showers normally peak shortly before dawn because that's when Earth's leading edge rotates into the path of the stream. It's like driving in the rain: more rain falls on the front windshield than on the back window because you're driving into the rain.

Beyond that, since the Cloud crosses Earth's orbital path every summer, Earth's gravity stretches the stream longer every year. That's why we see Perseids meteors a week or more before and after the peak. We see the early arrivals, latecomers and everything in between, anywhere along the Cloud's length, that enters the atmosphere at night and burns up. The sky is too bright for us to see the daylight Perseids.

Space rocks are called *meteoroids* until they enter our atmosphere, at which point they become visible as *meteors*. Meteoroids that are associated with comets and meteor showers are too small to reach the ground. (The ones that do are called *meteorites*, and they come from asteroids, planets or solitary space rocks that wander into Earth's upper atmosphere. No meteorite has ever been identified as having come from a comet.)

Perseids meteors usually burn up at an altitude of 50 mi. or higher; they range in size from dust particles to the size of a pea, and the fact that we see them at all means they must be within around 250 miles of us. The largest ones appear as bright fireballs that can last for several seconds before disappearing. Occasionally they will explode like a skyrocket, in which case they are referred to as

bolides. Their brightness and length of duration depends on their size. The bigger they are, the longer they burn.

If I've piqued your interest in watching the Perseids this year, you can find out everything you could possibly want to know about comets, meteors, meteor showers and meteorites in an earlier Special Edition of the *Observer*, "Fire in the Sky." It's on our website. Here's an example of the tidbits of information it contains. (I was first told about this fascinating phenomenon by **Larry Higgins**, who taught me practically everything I know about astronomy.)

"Tuning In to Meteor Showers. What if it's cloudy (during the peak or whenever you want to look for Perseids)? Well, you can *listen* to the meteors on your car radio regardless of whether the sky is cloudy or clear.

"As meteors pass through Earth's atmosphere, they leave behind a trail of ionized gas molecules. If you tune your radio to a commercial FM station you can't normally pick up that's about 600 miles away – say, 91.7 FM (WMKL in Miami) or 91.5 FM (WBJC in Baltimore) – you'll hear static. But whenever a meteor zips through the atmosphere, the radio waves will bounce off the meteor's ion trail and the station will come in loud and clear until the signal fades back to static in a second or two."

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The Zoomable Universe Revisited by Bill Warren

I just can't get **Caleb Scharf's** *The Zoomable Universe* out of my head. Wherever I turn in the book, I find mind-boggling facts and fascinating stuff. For example:

What will happen when the **Andromeda and **Milky Way** galaxies collide 4.5 billion years from now?* There will be a massive, cataclysmic explosion of epic proportions, right? Well...No.

"Gravity," Scharf explains, "will distort and disrupt their shapes and stellar orbits, but the stars are so small compared with the gulfs of space between them that it's very improbable that any (of those 800 billion or more stars) will actually collide. It will be as if two swarms of bugs or birds are

crossing paths: the tiny stars will simply slip through all the gaps between them." (p. 26)

**"Go outside on a clear night and wave a flashlight at the sky. Then go get a good night's sleep. The next morning, the photons you released into the universe will have traveled 6.2 billion mi."* (p. 69)

(And that brings up an interesting question: Would an alien civilization see my flashlight beam? No, because it's too weak. But weak as they are, those photons will still travel undetected through space. -Ed.)

**Outer space isn't the only place that is largely empty. Consider, Scharf says, the atoms in your body. "If your fist were the size of an atom's nucleus, the entire atom would extend to about three miles in all directions. Atoms are 99.999999999999% empty space. (A typical atomic nucleus takes up one-trillionth of its atom's volume but holds 99.9% of the mass.) Consequently, you could crush all 7+ billion humans into a single mass the size of a sugar cube simply by squeezing out all that empty atomic space." (p. 59)*

But if that happened, that shrunken mass of humanity would become a black hole. "Why? Because the gravitational pull (of all those atoms on one another) would be irresistible." (p. 23)

Finally (for this trip into *The Zoomable Universe*, anyway), consider this, from the book's Preface. It's Scharf's answer to the questions, *Where did I come from? How did I get here?

"A long time ago the atoms in your body were spread across trillions of kilometers of otherwise empty space. Billions of years in the past there was no hint that they would eventually come to be configured as your eyes, your skin, your hair, your bones, or the eighty-six billion neurons of your brain.

"Many of these atoms came from deep inside a star – perhaps several stars, themselves separated by many trillions of kilometers. As these stars exploded, they hurled matter outward in a flood of scorching gas that filled a small part of one galaxy out of hundreds of billions of other galaxies..."

"Despite being scattered in the cosmos, these atoms eventually became part of a world, our world,

Earth. They cooled and condensed together, drawn by gravity, becoming new stuff, a billion trillion times denser than when they were just floating in space. For four and a half billion more years they shape-shifted into lots of different guises.

“Some of these atoms were part of the very first microscopic bubbles of living complexity in otherwise empty oceans and continents. And many of the very same atoms have been discarded and picked up a billion or more times as they’ve traveled through Earth’s environment.

“They’ve been in the shell of a trilobite, perhaps thousands of trilobites. They’ve been in tentacles, roots, feet, wings, blood, and trillions, quadrillions of bacteria in between. Some have floated in the eyes of creatures that once looked out on the landscapes of a hundred million years ago. Yet others have nestled in the yolks of dinosaur eggs, or hung in the exhaled breath of a panting creature in the depths of an ice age. For other atoms this is their first time settling into a living organism, having drifted through eons in oceans and clouds, part of a trillion raindrops or a billion snowflakes. Now, at this instant, they are all here, making you.” (pp. ix, x)

That’s what the late, great **Carl Sagan** meant when he said, “We are all star stuff.” The carbon and other atoms in our bodies once resided in exploding stars.

(FYI: Amazon.com sells *The Zoomable Universe* for as low as \$10.49 (used) + \$3.99 shipping.)

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Above: M99 (a.k.a. the **Coma Pinwheel** or **Virgo Cluster Pinwheel**), a spiral galaxy in *Coma Berenices*. (Photo by **Alan Pryor**.) M99 is a member of the Virgo Cluster, along with 12 other Messier objects that are located roughly between

Vindemiatrix (Epsilon Virginis) and **Denebola (Beta Leonis)**. Indescribably lovely in Alan’s photo, face-on M99 is less impressive visually, appearing telescopically as a bright but hazy ball of light with a brighter center.

M99 was discovered (along with nearby **M98**) by **Pierre Mechain** on May 15, 1781. M99 lies 55.7 light-years away; it is moving away from us faster than any other Messier object, i.e., at a rate of 5.38 million mph.

Four supernovas have been detected in M99 since 1967, the latest being **SN 2014L** on Jan. 26, 2014.



Above: NGC 1245, an open cluster in *Perseus*. (Photo by **Felix Luciano**.) NGC 1245 contains about 200 loosely scattered stars in an area about 1/3 the size of the Full Moon.

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I told my wife, “At a walking pace it would take me *20 trillion years* to walk across the Milky Way. But if I run, I could do it in half the time.” She said, “With that much extra time on your hands, why don’t you fix the screen on the porch?”

I used to say that my favorite ’60 folk song, *Four Strong Winds*, was written by a guy living near a sewage treatment plant, a slaughterhouse, a garbage dump *and a fertilizer plant*. Well, here’s one to add to the list: It’s a good thing **Uranus** isn’t our nearest neighbor in space. Its atmosphere contains a healthy dose of hydrogen sulfide (H₂S), which smells like rotten eggs.

Saturn and **Neptune** are considering moving to a neighborhood that doesn’t smell so bad.

-**Bill Warren**

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