SPACE

St. Petersburg Astronomy Club Examiner

November 2020 **Editor – Guy Earle**

The St. Petersburg Astronomy Club has been the center of family astronomy in the Tampa Bay Area since 1927. Our 283 adult members are dedicated to promoting and sharing the wonders and science of astronomy. We host dark-sky and local star parties, telescope-making workshops, science lectures, astronomy lectures, educational outreach sessions and much more.

Inside this Issue:

Astronomy Image of the Month

This image was done by SPAC member Jamie Kenas, showing the extremely dense star field around Barnard 142 "Barnard's E nebula." This was taken on 10/15/20 at Withlacoochee River Park with his RASA 11, Celestron CGX mount, ZWO ASI2600MC, 120s X 43 using Idas D1 filter.

Editor's Message

Back in the mid-90's the Dobsonian telescope revolution was in full swing. Most star parties were either light bucket Dobs or coffee grinder SCT's from companies like Meade or Celestron. But over the past couple of years I've noticed another rapid change to our hobby, one that has steadily gained ground that I've tried to reflect in the Examiner—imaging. Astrophotography has always been a wildly popular part of astronomy, but usually involved long and often back-breaking hours staring through a guide scope to get that singular perfect frame. Ten years ago, you had glorified webcams converted over for planetary imaging, and doing a half-way decent job, while CCD cooled cameras were already taking astounding photos and putting film out of use. Ten years ago I was also in my mid-30's, but that's another story.

Now you have planetary cameras taking 250 images a second while some scopes, deceptively looking like the old SCT's of the 90's, are dedicated solely to imaging and don't even have an ability to use an eyepiece! Yes, I'm looking at you, Jamie Kenas, and your RASA 11." It's his photo on the previous page, and I think it is a perfect reflection of the revolution in our hobby these days.

November General Meeting

This month's general meeting will take place on Friday, November 20th at **8:00 PM**. The main program will be by Antonio Paris, who will be presenting, **"An Introduction on How to Photograph the Milky Way."**

This meeting will be held virtually with **GoToMeeting.com.**

Please join from your computer, tablet or smartphone by clicking here.

You can also dial in using your phone.
United States: +1 (786) 535-3211
Access Code: 192-720-429

The club's next **New Moon observing weekend** will be held November 13th-15th at Withlacoochee River Park. December will be the 11th-13th during the Geminids meteor shower.

New SPAC Members

We would like to welcome Lakeisha & Stephen Black, Clark Parry & Lucinda Durkee, Sue Ellen Gehrke & William Burgess, Andy Moore & Christine Bourgoin, and Steven & Joann Bruner to our family of members.

December Astronomical Events

GUY EARLE

We bid farewell to Jupiter and Saturn, but not without one more special event. On the longest night of the year, December 21st, at dusk you will see Jupiter and Saturn in a remarkably close conjunction with a mere 6' separating the two planets. Stay up until 5:02 AM and the winter solstice begins.

Look to the south to find Neptune (see the article a bit later), and Mars continues to blaze overhead, but shrinking rapidly in size. Back in October, Mars was just over 22" but by December 1st it has shrunk to 15" and 11" by New Year's Eve.

Draw a line between Mars and the Pleiades, and about half-way between is Uranus, an easier target than Neptune for its size but more difficult because there aren't easy star patterns to hop. Then again, if your scope has a goto database or something similar then that won't be a problem.

Look to the east just before sunrise on the 8th and you'll see Venus, which has been shining brightly for some time but now rapidly approaching the rising Sun. A waning crescent Moon hangs higher in the sky above Venus.

But perhaps the most spectacular event of December will be the Geminids meteor shower, happening from the 12th to the morning of the 15th. Wildly enough, this shower is occurring during the New Moon observing weekend, so if—IF-the weather cooperates it should be quite a show. The past few years have seen the November and December New Moon weekends occurring right near the holidays.

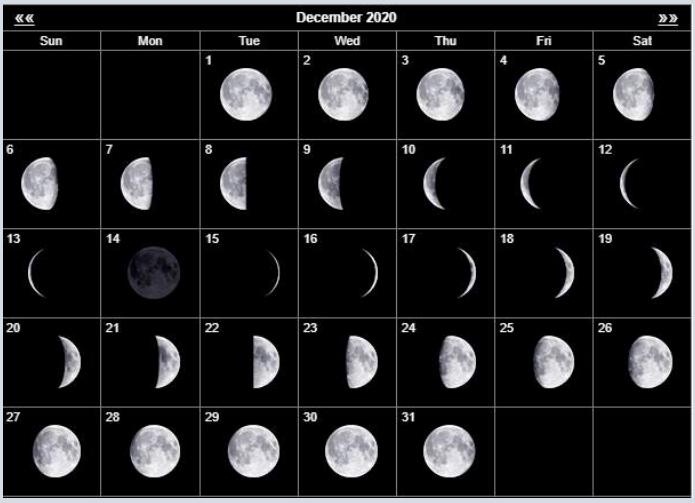
The Moon

Third Quarter – December 7

New Moon – December 14

First Quarter – December 21

Full Moon – December 29



Field Report: New Moon Weekend, October 16-18, 2020

KELLY ANDERSON

At long last there was a promise (not a guarantee) that there might be a few hours of cloudless skies here and there maybe if we were lucky. Given the fairly consistent total overcast since April, that was good enough for a bunch of hopeful astronomers to make the trip to Withlacoochee River Park for a weekend of stargazing … maybe cloud gazing accompanied with miscellaneous grousing … but good enough.

Allen and Betsy Force beat the crowd by arriving on Wednesday afternoon. On

Thursday the rush began with Joe Canzoneri, Jaime Karas and his new trailer, Bob Stelmock, Tom & Michele Sweet, Gary Hutchin (visitor from Safety Harbor), Kyle Brinkman and your Intrepid Field Reporter. This would constitute a quorum on a normal New Moon Weekend, but as it turned out this was just the beginning.

The skies that evening, *mirabile dictu!,* were mostly clear with a couple of bands of clouds moving through from time to time. In my mind I kept returning to that scene in 2001 A Space Odyssey where Dr. David Bowman (played by Keir Dellea) gets sucked into the monolith orbiting Jupiter and saying, "My God, it's full of stars!" You gotta remember, we had been denied a reasonable view of things astronomical for six months and badly needed a cosmic fix, so a little obsessiveness might be forgiven. A great night even though the moisture aloft made everything look soupy and the dew was almost biblical. Mosquitoes weren't too bad, for once.

Joining us on Friday were Mike & Carli Partain, Jack & Roni Fritz, Mark & Sharon Bruns, Jeff Tobergte, Guy Earle, Kelly McGrew, Les & Janet Gatechair, Tim Harris, and Keith & Vickey Carman. It wasn't the greatest night for observing because of a fairly persistent (but thin in places … grasping at straws) overcast, but it cleared around midnight for a couple of hours. The seeing was much better than the previous evening with much lower humidity and more stable air. Mars didn't jump and dance quite so much.

On Saturday our little crowd grew a bit more with Todd Vogt, Omar Rahman, Brett Brennan, Duresh Yemul, Ravi Bsussan, and Lakeisha Black joining the fun. All in all, that brought our population to at least 30. I believe I may have missed a few in my census, and to them I apologize, but it was a great weekend. It might not have been the greatest viewing conditions, but certainly an outstanding gathering.

Saturday night the dew was moderate but manageable, but we were once again subjected to a fairly complete overcast. Since several people brought new scopes, I guess we know who to blame! Wait … Jaime had a new travel trailer … does that count?

This was the largest non-OBS gathering that anyone could remember, and we had five first-timers who we'll be very glad to see again when the Moon sets with the Sun. We look forward to gaggling again next New Moon Weekend, currently scheduled for November 13 – 15. As always, clear skies are guaranteed (but not promised).

Annual Telescope Raffle

The St. Petersburg Astronomy Club **mirror lab** would like to present our 2021 raffle scope to be awarded at our club's 2021 New Moon Super Weekend, February 10th through 14th, 2021. The raffle scope is a tradition here at SPAC and this year's telescope is a club refurbished 12-inch Meade Lightbridge.

Tickets are **$10** donation/each or 3 for $25. All donations go to the St. Petersburg Astronomy Club.

The raffle will be conducted on **February 13th** and the winner will be announced via email to all participants.

Online Raffle

Star Party Apparel

Star Party Apparel: We would like to take a moment to recognize **Doug Sliman**, who was the winner for the 2021 OBS logo design. We instituted a new process involving the club membership to vote for a logo design. We will not be taking orders for the t-shirt since the OBS is cancelled, however, Doug has provided us with a link to order a shirt for those who nonetheless want this ultra-cool design!

T-Shirts must be ordered by January 4th.

Click on this link to order: Apparel Order

OBS Cancellation

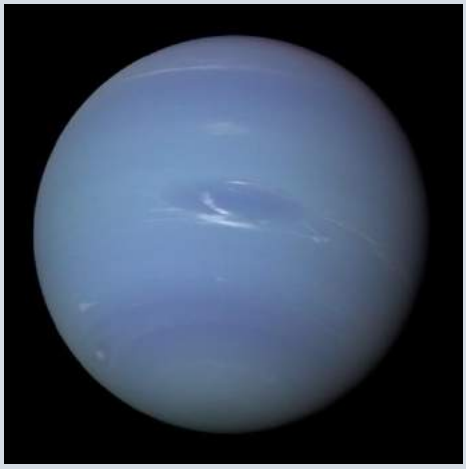
MIKE PARTAIN

With a heavy heart I write this article to inform everyone that our 2021 OBS has been officially cancelled due to ongoing pandemic. In lieu of the OBS star Party, we will have a club member only New Moon Super Weekend between February 10th and February 14th. This event requires no pre-registration and is a first come first served basis subject to park regulations and fees. Please see the club's website for exact details.

I also remind everyone that our 12" mirror lab raffle scope is currently open to purchase tickets and will be raffled on Saturday February 13th 2021.

Star-hopping to Neptune

GUY EARLE

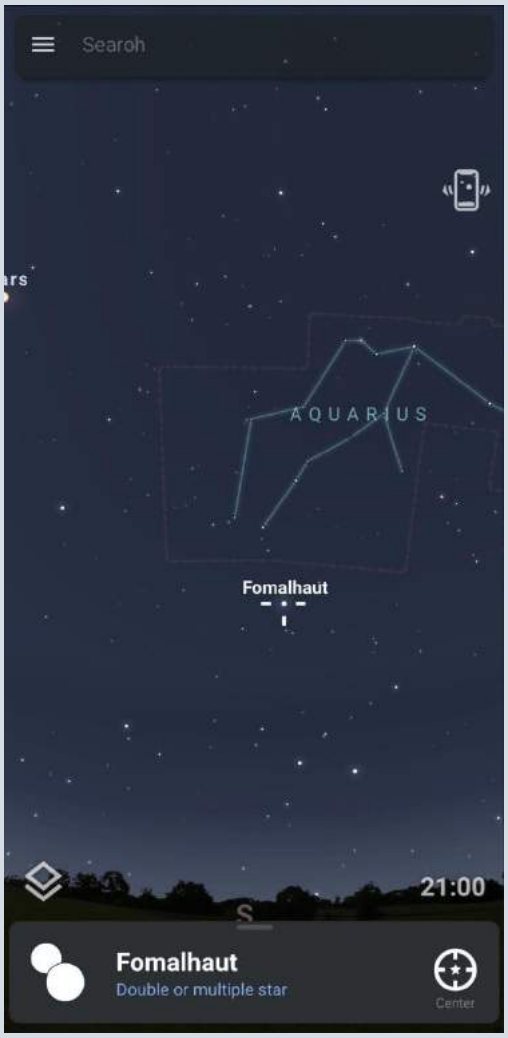


In November we bid farewell to Jupiter and Saturn, the two mighty gas giants of the summer skies, which quickly disappear into the trees after sunset. They first appeared in the eastern morning sky back in March, and steadily grew in size until their opposition back in July and have been shrinking ever since. Unfortunately, the weather has been pretty uncooperative for planetary viewing and imaging for many months, but now all eyes have turned to Mars. Just past its October 13th opposition, it is still the predominant planet this month, hanging high in the east after sunset. However, for those interested in a more elusive target, take a challenge at the furthest planet of our solar system—Neptune.

Sorry, Pluto, you rouge moon, you'll have to discuss the loss of your planetary status with Neil deGrasse Tyson. As the solar system formed, the heavier elements coalesced closer to the Sun, forming the terrestrial planets, while the lighter elements formed the gas giants from Jupiter outward. Last of these is Neptune, at just over 2.7 billion miles away, with an orbit so wide it takes 164 years for this gas giant to orbit the Sun. It was the only planet to be discovered by pure mathematical reasoning, as Uranus, it's inner twin, showed unexpected gravitation changes in its orbit. This led astronomer Alexis Bouvard to deduce Neptune's existence and orbit, finally being observed after his death in 1846. It's largest of fourteen moons, Triton, is about the same size as our Moon.

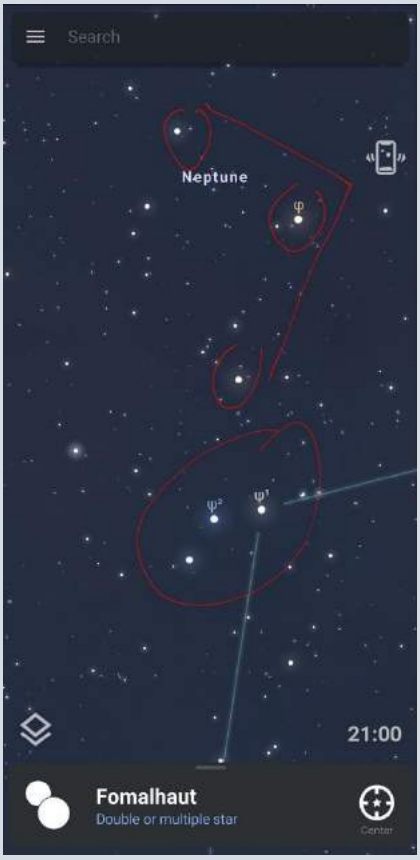
You'll need a moderately steady night to detect Neptune's faintly blue disk using medium-high power in your telescope. If the seeing conditions aren't great and you notice the stars are blurring in and out of focus, so will Neptune. And since this outermost gas giant is only 2.3 arc seconds in size during the month of November, it can be easily confused for a nearby star of similar magnitude; for comparison, Mars is 20 arc seconds at the start of the month.

However, the placement of Neptune is perfect just after sunset, and there are some easily identified guide stars to help you find your way. These screenshots are from the astronomy app, Stellarium, which is available for both Android and Apple in both a free and deluxe version. Follow the four steps on the next page to find Neptune after sunset. Once you think you are in the final star field, put about 120-150X on it, and go from star to star in that field. One of them, if the seeing is steady enough, will appear as a tiny disk. You won't be able to detect Triton without imaging equipment (see my photo in last month's SPACE), but seeing Neptune itself is a very worthwhile target.



Step 1: Locate the star Fomalhaut shining due south.

Step 2: Use a pair of binoculars or finder scope to spot the triangular shape of stars up and to the left, about 50 degrees up.



Step 3: Use the triangle to spot the three bright stars above it, forming a right angle.

Step 4: Neptune is a bit more than half-way between the two top stars, in its own little star field.

Luna Cognita; A Comprehensive Observer's Handbook of the Known Moon, 3 volumes by Robert A. Garfinkle

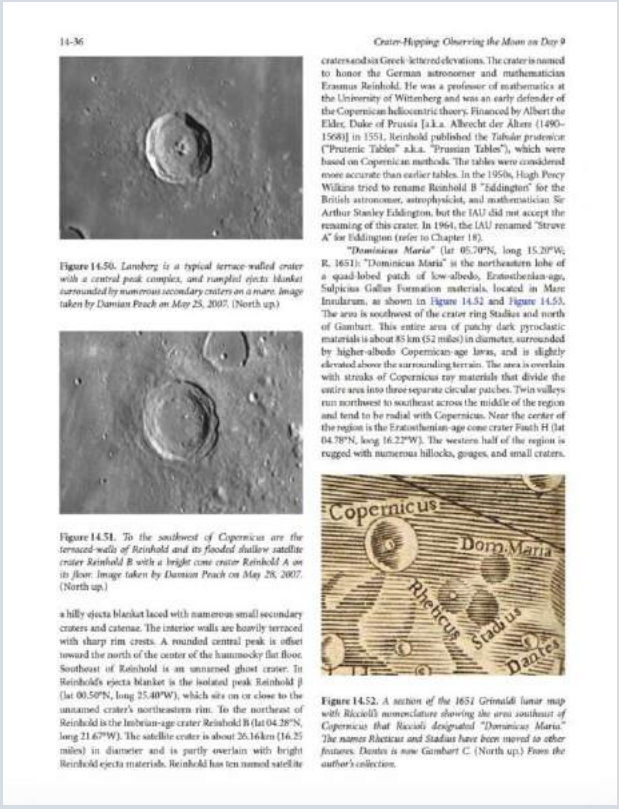
Book Review by SPAC member Kelly McGrew

New York: Springer Verlag, 2020, 1680 pp, ISBN 978-1-4939-1663-4, $89.99.

Robert Garfinkle has achieved the lunar equivalent of what ***Burnham's Celestial Handbook*** did for amateur astronomers in the 1970's and what George Kepple and Glen Sanner did in the late 1990's with ***The Night Sky Observer's Guide***. This comprehensive three volume set covers the moon in a depth and breadth unparalleled in previous books on the moon. The first volume includes several introductory or preparatory chapters—much of which is covered in other books on amateur astronomy—and roughly half-way through begins a series of chapters on day-by-day crater-hopping. This section—the heart of the observer's handbook—covers the remainder of volume one and over half of volume two. But the observer's handbook portion doesn't end there! The remainder of volume two covers a variety of observing topics which I'll list later in this review. Volume three is primarily a large collection of appendixes.

In the first chapter the author covers human history, mythology, and folklore of the moon. Chapters two and three cover the origin of the moon—and earth—and their inter-relationship as well as detailed information on the types of lunar features including descriptions and photos of a variety of different characteristics of the moon. Chapter four describes the multitude of devices used to

observe the moon, including telescopes, eyepieces, mounts, binoculars, and maintenance of astronomy equipment. Chapter five is dedicated to lunar photography. Chapter six, the chapter immediately preceding the day-by-day crater-hopping section, is an introduction to observing the moon and what I consider to be the beginning of the observer's guide. Chapter seven through 12 complete volume one and take the observer from days 1 and 2 to the first quarter on day seven.



14-36 *Crater-Hopping: Observing the Moon on Day 9*

craters and six Greek-lettered elevations. The crater is named to honor the German astronomer and mathematician Erasmus Reinhold. He was a professor of mathematics at the University of Wittenberg and was an early defender of the Copernican heliocentric theory. Financed by Albert the Elder, Duke of Prussia [a.k.a. Albrecht der Alten (1490–1568)] in 1551, Reinhold published the *Tabulae prutenicae* ("Prutenic Tables" a.k.a. "Prussian Tables"), which were based on Copernican methods. The tables were considered more accurate than earlier tables. In the 1950s, Hugh Percy Wilkins tried to rename Reinhold B "Eddington" for the British astronomer, astrophysicist, and mathematician Sir Arthur Stanley Eddington, but the IAU did not accept the renaming of this crater. In 1964, the IAU renamed "Struve A" for Eddington (refer to Chapter 18).

"Dominicus Maria" (lat 05.70°N, long 15.20°W; R. 1651): "Dominicus Maria" is the northeastern lobe of a quad-lobed patch of low-albedo, Eratosthenian-age, Sulpicius Gallus Formation materials, located in Mare Insularum, as shown in Figure 14.52 and Figure 14.53. The area is southwest of the crater ring Stadius and north of Gambart. This entire area of patchy dark pyroclastic materials is about 85 km (52 miles) in diameter, surrounded by higher-albedo Copernican-age lavas, and is slightly elevated above the surrounding terrain. The area is overlain with streaks of Copernicus ray materials that divide the entire area into three separate circular patches. Twin valleys run northwest to southeast across the middle of the region and tend to be radial with Copernicus. Near the center of the region is the Eratosthenian-age cone crater Fauth H (lat 04.78°N, long 16.2°W). The western half of the region is rugged with numerous hillocks, gouges, and small craters.

Figure 14.50. *Lansberg is a typical terrace-walled crater with a central peak complex, and rimplisi ejecta blanket surrounded by numerous secondary craters on a mare. Image taken by Damian Peach on May 25, 2007.* (North up.)

Figure 14.51. *To the southwest of Copernicus are the terraced-walls of Reinhold and its flooded shallow satellite crater Reinhold B with a bright cone crater Reinhold A on its floor. Image taken by Damian Peach on May 28, 2007.* (North up.)

a hilly ejecta blanket laced with numerous small secondary craters and catenae. The interior walls are heavily terraced with sharp rim crests. A rounded central peak is offset toward the north of the center of the hummocky flat floor. Southeast of Reinhold is an unnamed ghost crater. To Reinhold's ejecta blanket is the isolated peak Reinhold β (lat 00.50°N, long 25.40°W), which sits on or close to the unnamed crater's northeastern rim. To the northeast of Reinhold is the Imbrian-age crater Reinhold B (lat 04.28°N, long 21.67°W). The satellite crater is about 26.16km (16.25 miles) in diameter and is partly overlain with bright Reinhold ejecta materials. Reinhold has ten named satellite

Figure 14.52. *A section of the 1651 Grimaldi lunar map with Riccioli's nomenclature showing the area southeast of Copernicus that Riccioli designated "Dominicus Maria." The names Rheticus and Stadius have been moved to other features. Dantes is now Gambart C.* (North up.) *From the author's collection.*

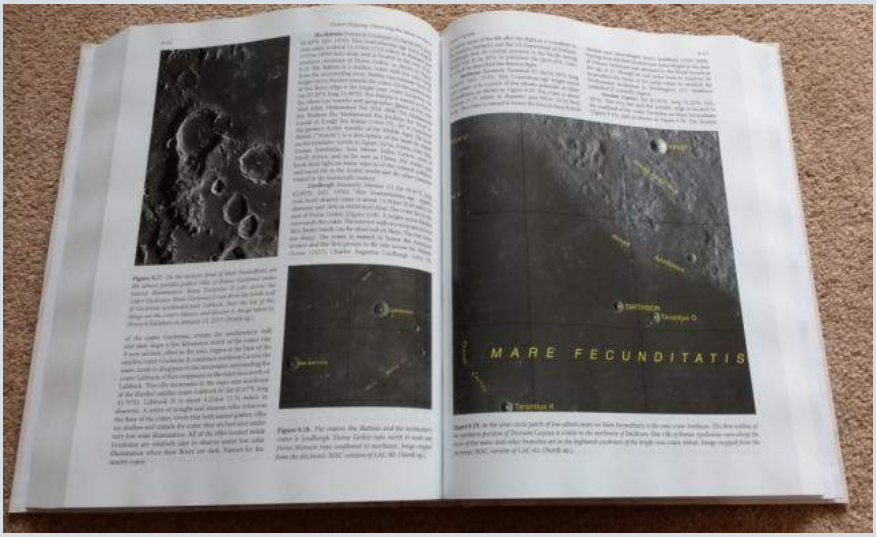
Volume two continues the day-by-day guide through day 15—full moon—which is covered in chapter 20. Chapter 21 covers the remaining 14 days of the lunar cycle. There follow a series of chapters on how to observe a variety of lunar features, including lunar dark halo craters (Chapter 22); bright and light rays, bright spots, and banded craters (Ch. 23); flooded, ghost, breached, tilted, floor-fractured, and fractured floor craters (Ch. 24); rilles, rupes, and vallis (ch. 25); nearside lunar domes (Ch. 26); and transient phenomena (Ch. 27). Chapter 29 describes how to measure a variety of lunar features including heights, elevations, diameters, albedo, brightness, temperature, and the distance to the moon. There are several formulas listed to illustrate in the common language of mathematics. Chapter 30 is a tutorial on how to make a drawing of the moon to capture one's view of the moon. Lunar occultations are covered in chapter 31and eclipses—lunar and solar—in chapter 32, completing volume two.

The appendixes in volume three include ephemerides of lunar data, a variety of formulas related to optical instruments and more; calculating libration; several catalogues of lunar features; lunar systems from Chinese, Hindu, Buddhist, Arabic, and Hebrew systems; publishers and observing organizations; an updated lunar atlas of Edmund Neison (originally published in 1876 in ***The Moon: and the Condition and Configuration of its Surface***). The author has updated the original hand-drawn maps of the moon made by Neison with the updates in red. Volume three concludes with an extensive glossary, bibliography, and index.

First, let's get what I consider to be the 'bad' out of the way: The book is destined to last—like Burnham's—for 20 or 30 years. Mr. Garfinkle did not write this book to become wealthy—it is a labor of love which took him years. The binding is not sewn signatures but rather perfect bound. For those not familiar with the difference, perfect bound is single sheets of paper all glued to a cloth which forms the spine of the book. Sewn signatures are large sheets of paper which are then folded and trimmed on three sides, with the remaining folded edge then having thread sewn through to hold

all of the sheets—each having a total of four pages—into a 'signature'. Those signatures are then sewn to the strip of cloth which forms the spine of the book. As glue hardens over the years—and decades—it become brittle, cracks, and eventually single pages fall out. The second characteristic of this set which I do not care for is the 'slick glossy' paper on which it is printed. The third—and final—drawback for me is that the pages are number in the fashion chapter-page, such as 3-22. I prefer sequentially numbered pages. Those are my opinions and I expect not all of you may agree with me and that's fine.

The chapters on day-by-day crater-hopping include extensive discussion of the features which are highlighted by the terminator that that day or, in the case of chapter seven, days one and two. Chapter seven is 90 pages and includes several pages of material which describes the standards used by the following day-by-day chapters. Chapter eight, cover only day three, is 21 pages while chapter nine on day four is 31 pages long.



Each entry includes the name of the feature, in quotes if the name is not the officially adopted name by the International Astronomical Union (IAU), the latitude, longitude, who named and described the feature, and when the name was officially adopted by the IAU. Many entries include one or more photos of the feature, a detailed description of the feature, and information related to naming of the feature.

Throughout the book there are copious footnotes. The author is clearly an intelligent, articulate, and knowledgeable person. He is an amateur astronomer who is also a Fellow of the Royal Astronomy Society (FRAS), a noteworthy achievement for an amateur. The author has been a professional writer for several decades and has written, co-authored, or edited several books and has been published in at least 10 periodicals.

Whether one is an armchair astronomer who enjoys reading and learning about celestial objects, an observational astronomer who enjoys viewing the moon with binoculars or a telescope, or one who practices astrophotography there is something in this set for you. Given the nature of our hobby, I wouldn't hesitate to buy if you're interested—there may never be a second printing.

The publisher's page for this book includes previews of several chapters and is available here.

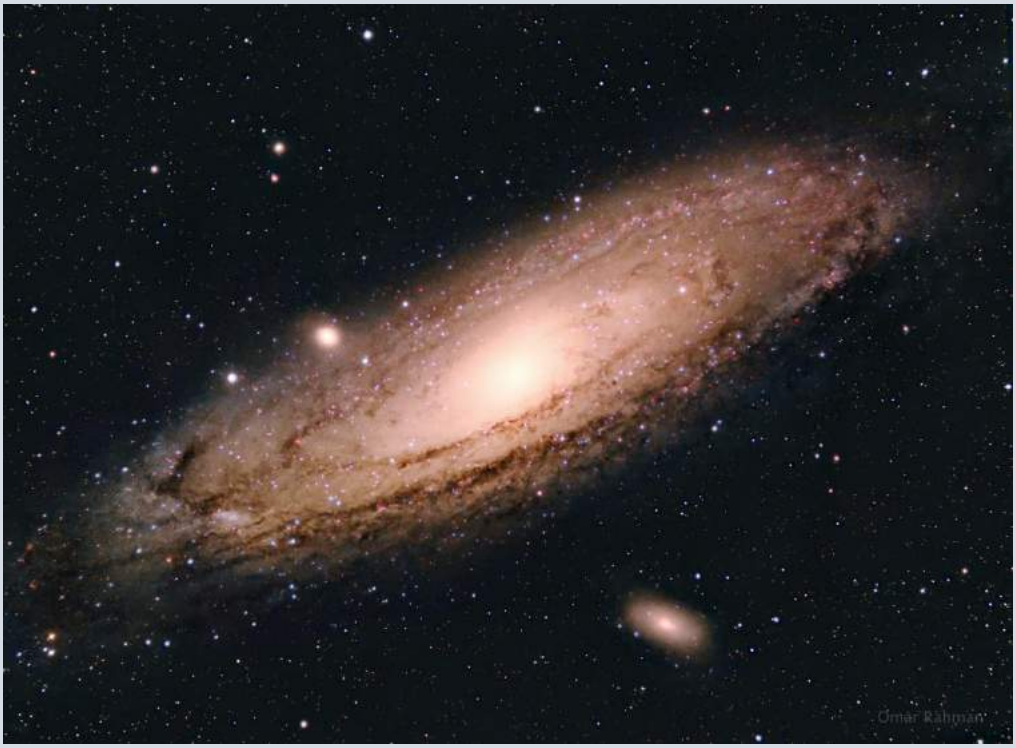
Clear skies and good viewing!

SPAC Astrophotography

Here are some fantastic astrophotography highlights from our fellow SPAC members. Anyone who would like to share his or her work, I encourage you to email the editor to submit for future newsletters or share them on our SPAC Facebook page.

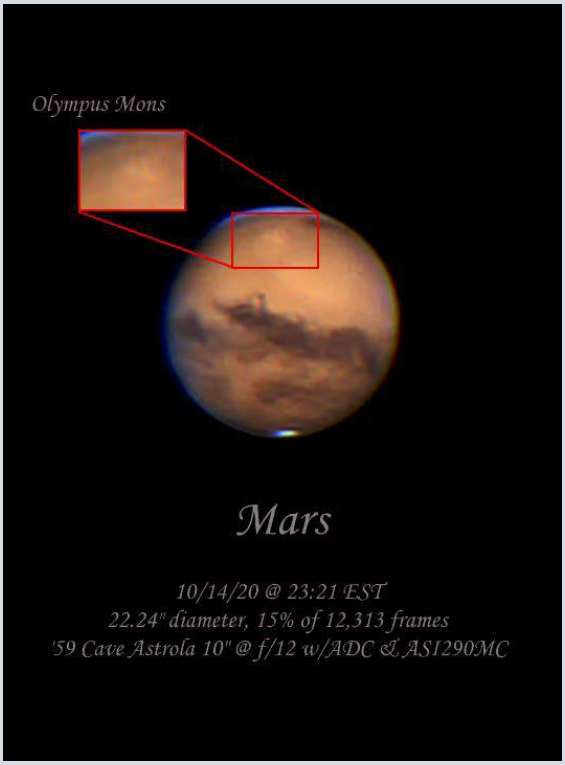
Left: **The Milky Way** over Lake Unicoi in north Georgia with Canon 6D MkII and Rokinon 14mm
by **Allen Force**

Left: **Sculptor Galaxy** at Withlacoochee River Park by **Joe Canz**



Above: **Andromeda Galaxy** in LRGB plus H-alpha. Exposure 266 frames, total 4 hours. Explore Scientific ED102 with 0.6x reducer (@460mm), ASI1600mm Pro, EQ6-R. Taken Friday and Sunday nights from the backyard between clouds by **Omar Rahman**

Above: **The Triangulum Galaxy M33** by **Joe Canz**



Left: **Mars and Olympus Mons** by **the editor**
Above: **M13 the Hercules Globular Cluster** taken with 8" Edge and ZWO183 by **Kyle Brinkman**

Annual Elections

Congratulations to the 2021 SPAC officers below:

President, *Brad Perryman*
Vice President, *Paul Krahmer*
Secretary, *Shirley Vuille*
Treasurer, *Jim Hunter*
2021 Director, *Jack Fritz*
2020 Director, *Steven Gaber*
2019 Director, *Kyle Brinkman*

SPAC Mirror Lab Report

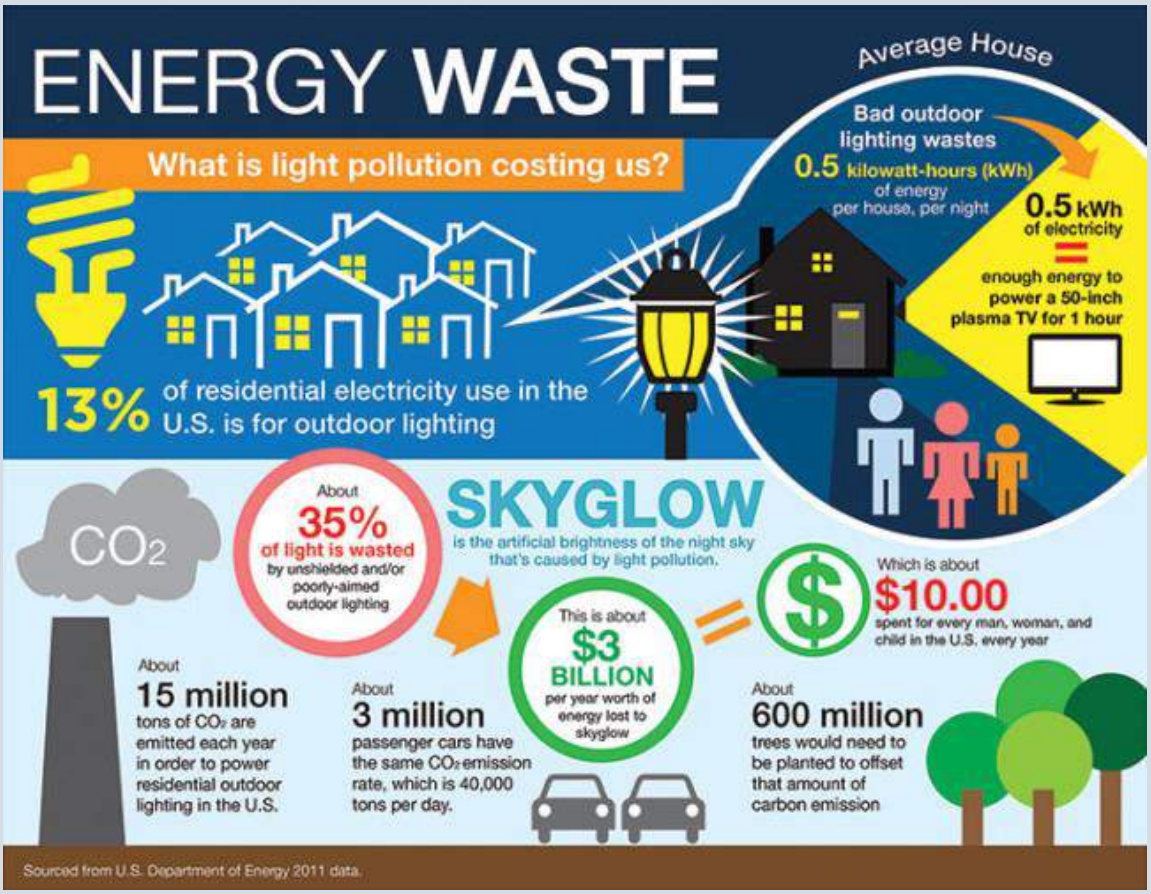
ALLEN MARONEY

If you have a decent size telescope moving it around can be a challenge. For my 18" Dobsonian with a 40+ pound mirror I needed a way to move it from the garage to the back yard. The tried and proven method was to add wheelbarrow handles to the rocker box. Armed with some Ace Hardware coupons the wooden handles and eye bolt hardware cost me under five dollars. The Harbor Freight non-inflating wheels were another $30. An evening with a drill press and drill, priceless.

I used 5/16" eye bolts and brass inserts to attach the handles to the rocker box. The handles were clamped together and drilled using a drill press and a Forstner bit. I wanted symmetry so that each handle could be used on either side of the rocker box. Before assembly every hole was coated with urethane using a Q-tip brush to prevent moisture from damaging the wood. The wheels were given about 1" clearance from the rocker box and the ground. The handles have felt pads to prevent marring of the rocker box. The wheels should be installed so if the telescope is assembled it will tilt in the rocker box away from the handles and the person using the handles. Now all that I need is a clear night without tropical storm winds.

International Dark Sky Association

LEEANN MUSZYNSKI



Light Pollution affects more that our skies.
Learn how you can take action at:
www.darksky.org

For Sale

A non-SPAC member is looking to sell his Celestron PowerTank Pro. "Brand new, bigger version, never used took out of box for photo and to make sure it turned on. For all you Celestron mount people! My Pre-Black Friday deal is $180." If interested, please email wizard1325@aol.com

SPAC Business Meeting

Our next business meeting is Wednesday, December 2nd, at 8:00 PM via conference call; details upon request.

All interested members are invited to attend. All club business decisions are made at the business meeting so as not to encumber the general meeting.

Officers & Directors

President	Brad Perryman	727 420-1957
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Outreach Chair	Jim Hunter	813 507-8415
Star Party Chair	Mike Partain	859 339-0828
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Club Webmaster	Jack Fritz	813 508-5680
Dark Sky Chair	Leeann Muszynski	813-601-0986

Click on the name to send email

Recognition of Patrons & Benefactors:

Clifford B. Benham	Benefactor
Lakeisha & Stephen Black	Benefactor
Walter Brinkman	Benefactor
Andy Demartini	Benefactor
Jack & Roni Fritz	Benefactor
Hosn, Ricky & Hala	Benefactor
David Knowlton	Benefactor
David & Tara Pearson	Benefactor
Rath, Damon & Jean Futch	Benefactor
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Corey Lynch	Patron
Robert Myers	Patron
Stephen Oros	Patron
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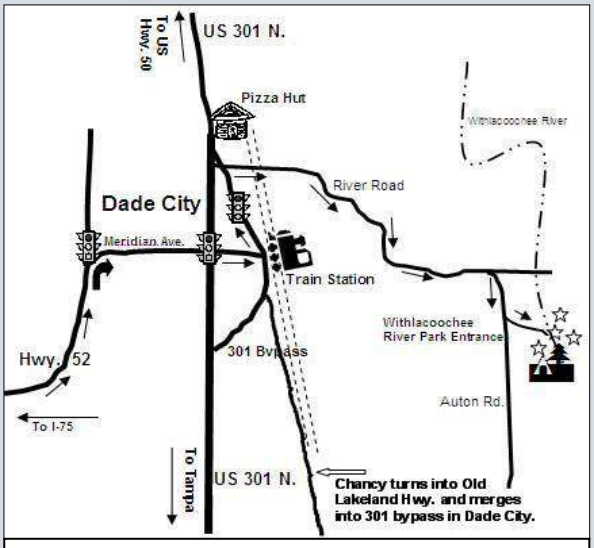
Mirror Lab	Ralph Craig	727 384-2086

Withlacoochee New Moon Weekends

There's no need for reservations. However, the park closes at sundown, so you will need to arrive before then. The park rangers will give you the gate-code once you're inside the park. Please do not call for the gate code as they are not allowed to give it out over the phone.

Reservations are not necessary. Please print and display our Friends-Of-The-Park Pass on your dashboard.

Please join us! All astronomy enthusiasts are welcome. You do not need to be a club member to attend. Please refer to our Club Calendar for details and scheduled dates.



Withlacoochee River Park – Dade City, FL

St. Petersburg Astronomy Club Membership Form

Membership in St. Petersburg Astronomy Club, Inc. (SPAC) is open to anyone, regardless of age, who is interested in astronomy. Benefits of membership include a monthly subscription to the SPAC Examiner newsletter, reduced camping rates and use of the club's bunkhouse at our dark sky site at Withlacoochee River Park, the ability to serve on the SPAC board and voting privileges. Dues are considered donations and are non-refundable. Membership options are available as listed below.

You are now able to choose how you wish to join or renew your membership:

- **Preferred On-line Website Option: New instructions as our website has been updated.**

Go to https://www.stpeteastronomyclub.org/Sign_In.php on the SPAC website where you can join, view and update your membership profile, provide payment, and **print your membership card**.

- **US Mail Option: Takes more time to process manually because we are all volunteers.**

Complete the attached membership form and send it along with your payment to:

Jim Hunter
17316 Oak Ledge Drive
Lutz, FL 33549.
(Checks should be made payable to SPAC, Inc.)

Adult 1: _____ Adult 2: _____

Street: _____

City, State, Zip: _____

Home Phone: _____ Cell Phone: _____

Email Address: _____

Number of Children under 18: _____

Memberships:

Single: [ ] $ 30.00/YR. Includes one adult, minor children, the "SPACE" newsletter, and all the rights and privileges of membership.

Family: [ ] $ 35.00/YR. Includes two adults, minor children and the above rights and privileges.

Patron: [ ] $ 50.00/YR. A Patron member is entitled to the above rights and privileges.

Benefactor: [ ] $100.00/YR. A Benefactor member is entitled to the above rights and privileges.

Student: [ ] FREE. SPAC offers free membership to full time high school and college students.
Expected date of graduation: _____

Total Submitted: $_____

Your SPAC Membership Card is required for reduced fees at the campground.