Monthly Meeting July 13th at 7:00 PM, venue TBA
(Monthly meetings are on 2nd Mondays at Highland Road Park Observatory).

PRESENTATION: Our speaker will be Scott Cadwallader, on Basic Planetary Photography.

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Observing Notes: Hercules – The Strong Man & Mythology

Like this newsletter? See PAST ISSUES online back to 2009
Visit us on Facebook – Baton Rouge Astronomical Society
President’s Message

And just like that, we’re halfway through 2020. The past few months have definitely been tough ones for a lot of people but there are a few flickers of normalcy popping up here and there if you look for them and more and more signs of adaptations to the circumstances that might prove worth taking with us going forward. Speaking to the former point, we’re now starting to see operations at the observatory starting back up. Although attendance is being capped for safety reasons, we’ve started showing the public the wonders of astronomy again. Speaking to the latter, observatory staff have started to put in place procedures for new semi-remote live viewings from the observatory grounds. Although patrons aren’t looking through an eyepiece, they are seeing near-real time images being sent to a screen just next to the scope pulling in views. And although that may sound a little disappointing, it’s worth noting that the views of galaxies and nebulae are slightly more satisfying that way, due to the rampant light pollution in the city.

Our club has also started to stir a little bit more over the past month. We managed to have two separate members-only star parties during the last lunar cycle, one from our own dark sky site and one from HRPO, both events were enjoyed by all until well after the cows went home. In addition, with the abundant help of the staff from HRPO, we were able to host our third annual Asteroid Day this past weekend at the observatory. The next major club event should be our next Member’s Only Night night sometime toward the end of summer, and possibly another dark site star party if we get some good weather. As a quick reminder, the dark site is open to members who show up before dark and keep to basic star party etiquette. A letter showing you’re not trespassing can be got by contacting John Nagle.

Coming up in the next few months, with luck, we should be able to enjoy a few more annual favorite events. In July, we should be looking forward to the opposition of Jupiter and Saturn, and then in August we should be able to hold our annual Perseid party, even if it’s a bit smaller than usual. To help with any of these events, you’ll have to be cleared by BREC, so if you haven’t already, contact Chris K to find out how to do so. For the past few months, we’ve been making good use of remote conferencing tools to help keep our meetings together, and as a result, we’ve ended up with some truly awesome speakers from around the country.

**JULY MEETING’S SPEAKER:** This month, we’ve decided to bring it back down to the local level for a bit and I’m going to give a little practical advice on how to do some pretty basic planetary photography using intro equipment and some free programs. It probably won’t get you on the cover of Sky and Telescope, but with the planets coming into position, and it being a mars opposition year, you might be able to get some good pics for your family and friends with relatively little effort. The format for the meeting is still being decided, so watch for information to come through in the next few weeks.

That should be everything that needs saying. Check the rest of the newsletter for details on upcoming events.

**Happy Fourth of July.**

Scott Cadwallader, President 2020
Secretary's Summary of June Meeting

The June meeting was held via Zoom on 6/8/2020, as our city was in quarantine due to Covid 19. There were 20 people in attendance:

➢ President Scott Cadwallader called meeting to order on Zoom and took the notes in Thomas’s absence.
➢ Coy introduced the guest speaker, David Dickinson, from Universe Today. He spoke about his new book, The Backyard Astronomer’s Field Guide: how to find the best objects the night sky has to offer, and fielded questions about the Stellina telescope.
➢ There was a discussion of the AL candidates for President, and a candidate was approved for submission.
➢ There was a brief mention of upcoming observatory opening procedures.
➢ An impromptu star party at the BRAS dark site was announced for that weekend.
➢ Meeting was closed.

Submitted by Scott Cadwallader, for our Thomas Halligan

Link to the meeting: https://www.youtube.com/watch?v=FCeZQ9BiA7U

Coy and Scott C set up their telescopes (with social distancing) at BRAS’s dark sky site in Marangouin, LA.

Upcoming BRAS Meetings:

NSN Training Kit Session, Postponed
Monthly Business Meeting: 7:00 p.m., Wednesday, July 8; via Zoom webinar
Light Pollution Committee Meeting: postponed
Monthly Member Meeting: 7:00 Monday, July 13; venue TBA.
MOON (Members Only Observing Night), TBA
Hi Everyone,

At least in the movie, Groundhog's Day, Bill Murray got to DO lots of stuff each day that he re-lived. It's been quite a boring rut that most of us have been stuck in lately, but hopefully you've been able to make the best of it.

We're trying to do just that as far as amateur astronomy goes. While we're still holding off on trying to schedule any IN-PERSON events (i.e., Sidewalk Astronomy, Libraries, etc.), we do have at least one outreach on the horizon. A fun web conference for the local Boy Scouts!

**BOY SCOUT WEB CONFERENCE . . . COMING UP!**

Over the past couple of months, a few of us have been experimenting with live-streaming our telescope views. Using different filters, apps, cameras and adapters, we've started to get pretty good at showing the Moon, Venus and now even Jupiter and Saturn. Our plan for this outreach is to give a short talk about some Solar System stuff and then switch to LIVE telescope views. The best thing about this concept is the back-up plan. We all know how clouds can wreck any planned observing session (especially when it's planned by Rob for his Scouts! Haha!! Sorry, Rob.) We'll be ready for possible poor weather by having some pre-recorded video footage through the telescopes to show. Because it's video (as opposed to just still images), even if we aren't able to show LIVE views, the feel will be similar. All the way, we'll be on hand to answer any questions about what is being viewed.

There are tons of webinar opportunities out there, but not too many that have telescope views incorporated into them. We're hoping this turns out to be a great event and is something we can start offering regularly.

That is pretty much the news as far as Outreach goes.

One more thing . . . the Night Sky Network recently added the category "Virtual" to their outreach choices when we are setting them up on the calendar. I think we are all recognizing that it may be some time yet before things get back to normal. Things like these webinars will work great. I think we can continue with Sidewalk Astronomy, too, by way of a small projector and a screen. It's not looking through the eyepiece, but it's still a LIVE shot of the Moon (or other object).

**LOOK UP! LOOK UP!**

In the end, our goal is to spark interest and inspire people to start looking up. While getting them to look through our scopes is best, there are lots of other ways and that's what we're working on for the time being.

Clear Skies,

Ben Toman
BRAS Light Pollution Committee Report
This committee meets at 6:15, same day as the 7:00 BRAS Business Meeting
(normally on Wednesday before the Monthly Meeting)
Everyone is welcome to join in..

There was no meeting in June. Meetings will resume in August, either via Zoom or in person.

Submitted by John R. Nagle

Globe At Night
The target for this month’s Globe at Night program is Hercules from July 12th through the 21st.
If you would like to participate in this citizen science program, you can find instructions at
https://www.globeatnight.org

Here is a handy 2020 GlobeatNight Post card, in case you are out and about at night.

P.S. The “Loss of the Night” app can be used for information and for reporting your observations
Flying “Rocks” and “Dirty Snowballs”:

Asteroid and Comet News

July 2020


Four times in the past, NEOs were observed by observers of asteroids before impact with the Earth’s atmosphere. These four asteroids (2008 TC3, 2014 AA, 2018 LA, and 2019 MO) all were on the safe side when it comes to size.

<table>
<thead>
<tr>
<th>Object</th>
<th>Date of discovery</th>
<th>Date of Impact</th>
<th>Size(M)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008 TC3</td>
<td>2008-10-06</td>
<td>2008-10-07</td>
<td>4.1</td>
</tr>
<tr>
<td>2014 AA</td>
<td>2014-01-01</td>
<td>2014-01-02</td>
<td>2–4</td>
</tr>
<tr>
<td>2018 LA</td>
<td>2018-06-02</td>
<td>2018-06-02</td>
<td>2.6–3.8</td>
</tr>
</tbody>
</table>

One of the programs available to the amateur observers of asteroids and comets is Find_Orb.[By Bill Gray] It is useful for calculating approximate ephemeris, determining approximate orbits, generating virtual asteroids, virtual impactors, predicting impact locations, and many other things. It should be noted IF one uses the wrong setting, one can get an incorrect solution. Find_Orb can generate an “asteroid risk corridor” with the help of Guide 9.1.[By Bill Gray]
An asteroid risk corridor for the impact for the NEO 2018 LA 2018-06-02

There is a low probability, 1 in 240, that the two-meter 2018 VP1 will strike the Earth's atmosphere and create spectacular fireballs on 2020-11-02. A test with the Imperial College London’s Earth Impact Effects Program reports, "The average interval between impacts of this size somewhere on Earth is 0.2 years". In other words, it would be safe to assume objects the size of 2018 VP1 has impacted Earth’s atmosphere since 2018-Nov-03, the date of discovery. The Earth Impact Effects Program also suggests that the fireball is unlikely to do any significant damage. NASA JPL lists kinetic energy at impact from 2018 VP1 (IF ANY) as ∼ 0.00042 MegaTons of TNT. The Chelyabinsk event was 0.4 to 0.5 MegaTons of TNT.

As a test of concept, I obtained the observations of 2018 VP1 for the Minor Planet Center. I loaded the observations into Find_Orb and had it run the Monte Carlo method all night. Find_orb generated the following files MPCOrb.dat, state.txt, and virtual.txt. These files had orbits for 129,659 virtual asteroids 200 were virtual impactors (about 0.15%). I place a copy of the virtual.txt file in the Guide directory along with a copy of impact.tdf.(Project Pluto) Then Guide could generate a map of an asteroid risk corridor.
**My Find_orb Setting**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selecting perturbers</td>
<td>All</td>
</tr>
<tr>
<td>Epoch</td>
<td>2020-11-01.051</td>
</tr>
<tr>
<td>Monte Carlo noise</td>
<td>2</td>
</tr>
<tr>
<td>Physical model Include</td>
<td>SRP</td>
</tr>
<tr>
<td>Filler out</td>
<td>3 worst observations</td>
</tr>
</tbody>
</table>
An asteroid (fireball) risk corridor of potential impact for the NEO 2018 VP1, the orange dots is where 200 virtual impactors strike the Earth’s atmosphere.

Note: Because there were more than 9 observations, I had to edit virtual.txt to do a workaround. I replace "18 of 21" with "U of O" see edited virtual.txt; this keeps the columns in the right place. I also edited impact.tdf(My) file where I can have more than one risk corridor.

**JPL Close Approach Data** from Apr 28, 2020 to Jun 13, 2020 Distance Nominal < 1 Lunar Distance

<table>
<thead>
<tr>
<th>Object</th>
<th>Close-Approach (CA) Date</th>
<th>CA Distance Nominal LD (AU)</th>
<th>CA Distance Nominal KM</th>
<th>If the Earth was the Size of a Basketball (in feet)</th>
<th>H (mag)</th>
<th>Estimated Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>(2020 HS7)</td>
<td>2020/4/28</td>
<td>0.11(0.00029)</td>
<td>4.34E+04</td>
<td>2.29</td>
<td>29.1</td>
<td>4.1 m - 9.2 m</td>
</tr>
<tr>
<td>(2020 JG)</td>
<td>2020/4/30</td>
<td>0.56(0.0014)</td>
<td>2.10E+05</td>
<td>12.57</td>
<td>25.8</td>
<td>19 m - 41 m</td>
</tr>
<tr>
<td>(2020 JA)</td>
<td>2020/5/03</td>
<td>0.62(0.0016)</td>
<td>2.40E+05</td>
<td>14.42</td>
<td>27.2</td>
<td>9.6 m - 21 m</td>
</tr>
<tr>
<td>(2020 JJ)</td>
<td>2020/5/04</td>
<td>0.03(8.94E-05)</td>
<td>1.34E+04</td>
<td>0.43</td>
<td>30</td>
<td>2.7 m - 6.0 m</td>
</tr>
<tr>
<td>(2020 JN)</td>
<td>2020/5/05</td>
<td>0.65(0.00167)</td>
<td>2.50E+05</td>
<td>15.07</td>
<td>27.4</td>
<td>9.0 m - 20 m</td>
</tr>
<tr>
<td>(2020 KF5)</td>
<td>2020/5/28</td>
<td>0.64(0.00165)</td>
<td>2.47E+05</td>
<td>14.89</td>
<td>29.4</td>
<td>3.5 m - 7.9 m</td>
</tr>
<tr>
<td>(2020 KJ4)</td>
<td>2020/5/28</td>
<td>0.37(0.00096)</td>
<td>1.44E+05</td>
<td>8.5</td>
<td>29.9</td>
<td>2.8 m - 6.2 m</td>
</tr>
<tr>
<td>(2020 KC5)</td>
<td>2020/5/29</td>
<td>0.96(0.00247)</td>
<td>3.70E+05</td>
<td>22.48</td>
<td>27.4</td>
<td>9.0 m - 20 m</td>
</tr>
<tr>
<td>(2020 LD)</td>
<td>2020/6/05</td>
<td>0.8(0.00205)</td>
<td>3.07E+05</td>
<td>18.59</td>
<td>22.4</td>
<td>88 m - 200 m</td>
</tr>
<tr>
<td>(2020 ML2)</td>
<td>2020/6/13</td>
<td>0.93(0.00238)</td>
<td>3.56E+05</td>
<td>21.65</td>
<td>28</td>
<td>6.7 m - 15 m</td>
</tr>
</tbody>
</table>

As of 2020-06-28 there is
959,226 discovered asteroids (MPC) ([https://www.minorplanetcenter.net/](https://www.minorplanetcenter.net/))

[546,077 have been numbered]([https://www.minorplanetcenter.net/iau/lists/NumberedMPs.html](https://www.minorplanetcenter.net/iau/lists/NumberedMPs.html))

23,160 discovered Near-Earth Objects (MPC) ([https://www.minorplanetcenter.net/](https://www.minorplanetcenter.net/))

4,173 discovered Comets (MPC) ([https://www.minorplanetcenter.net/](https://www.minorplanetcenter.net/))

546,077 objects listed on JPL’s Sentry: Earth Impact Monitoring (JPL) ([https://cneos.jpl.nasa.gov/sentry](https://cneos.jpl.nasa.gov/sentry))

2,498 objects have been removed from Sentry (JPL) ([https://cneos.jpl.nasa.gov/sentry/removed.html](https://cneos.jpl.nasa.gov/sentry/removed.html))

For more information read Jon Giorgini’s "Understanding Risk Pages" ([http://www.hohmanntransfer.com/by/giorgjon.htm](http://www.hohmanntransfer.com/by/giorgjon.htm)) (i.e. “A risk-page listing is not a prediction of impact”)

The following objects were removed from NASA JPL’s Sentry: Earth Impact Monitoring list from 2020-04-26 to 2020-06-30

<table>
<thead>
<tr>
<th>Object Designation</th>
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<tr>
<td>2020 ML</td>
<td>2020-06-20 14:06</td>
</tr>
<tr>
<td>2020 LG1</td>
<td>2020-06-20 13:58</td>
</tr>
<tr>
<td>2020 KU2</td>
<td>2020-06-13 14:01</td>
</tr>
<tr>
<td>2016 JR38</td>
<td>2020-06-12 14:01</td>
</tr>
<tr>
<td>2018 NF15</td>
<td>2020-06-12 14:01</td>
</tr>
<tr>
<td>2011 BA60</td>
<td>2020-06-12 14:00</td>
</tr>
<tr>
<td>2017 MA9</td>
<td>2020-06-12 13:58</td>
</tr>
<tr>
<td>2020 KB3</td>
<td>2020-06-10 04:28</td>
</tr>
<tr>
<td>2020 JU3</td>
<td>2020-06-05 13:28</td>
</tr>
<tr>
<td>2020 AN3</td>
<td>2020-05-29 13:32</td>
</tr>
<tr>
<td>2020 KO5</td>
<td>2020-05-28 15:13</td>
</tr>
<tr>
<td>2020 KO3</td>
<td>2020-05-26 16:23</td>
</tr>
<tr>
<td>2020 KN3</td>
<td>2020-05-26 16:17</td>
</tr>
<tr>
<td>2020 KU3</td>
<td>2020-05-25 14:27</td>
</tr>
<tr>
<td>2020 KE3</td>
<td>2020-05-24 15:21</td>
</tr>
<tr>
<td>2020 KM1</td>
<td>2020-05-24 15:19</td>
</tr>
<tr>
<td>2020 HU6</td>
<td>2020-05-24 14:57</td>
</tr>
<tr>
<td>2020 HJ4</td>
<td>2020-05-23 14:23</td>
</tr>
<tr>
<td>2020 JC3</td>
<td>2020-05-22 15:02</td>
</tr>
<tr>
<td>2020 KW</td>
<td>2020-05-21 19:38</td>
</tr>
<tr>
<td>2020 JX1</td>
<td>2020-05-18 14:29</td>
</tr>
<tr>
<td>2020 HL6</td>
<td>2020-05-18 14:09</td>
</tr>
<tr>
<td>2015 YC2</td>
<td>2020-05-17 16:02</td>
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<tr>
<td>2020 JU</td>
<td>2020-05-14 14:09</td>
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<tr>
<td>2020 HY8</td>
<td>2020-05-14 14:00</td>
</tr>
<tr>
<td>2018 PP29</td>
<td>2020-05-12 14:00</td>
</tr>
<tr>
<td>2020 JP</td>
<td>2020-05-09 13:26</td>
</tr>
<tr>
<td>2020 HM4</td>
<td>2020-05-06 13:29</td>
</tr>
<tr>
<td>2018 UL</td>
<td>2020-05-05 13:47</td>
</tr>
<tr>
<td>2020 HF9</td>
<td>2020-05-04 13:33</td>
</tr>
<tr>
<td>2020 GK1</td>
<td>2020-05-02 14:29</td>
</tr>
<tr>
<td>2020 HM6</td>
<td>2020-04-30 14:01</td>
</tr>
</tbody>
</table>
Useful Links:

Guide to Minor Body Astrometry (https://www.minorplanetcenter.net/iau/info/Astrometry.html)
New- And Old-Style Minor Planet Designations (https://www.minorplanetcenter.net/iau/info/OldDesDoc.html)
The Tracking News (http://www.hohmanntransfer.com/news.htm)
Accessible NEAs (https://cneos.jpl.nasa.gov/nhats/intro.html)

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Recent Entries in the BRAS Forum

Below are selected additions to the BRAS Forum. There are also nine active polls. The Forum has reached 6700 posts.

Happy Independence Day!
BRARC Mourns Passings of Buddy Brown and Mary McDonald
Inquiry Regarding NASA FY2021 Budget
Inquiry for Light Pollution-Free Astrophotography Site
Prediction for Busier-Than-Average Hurricane Season
InSight Mole Back in Martian Soil!
Perserverance Launch Planned for This Month
Fortieth Anniversary of the Mount St. Helens Eruption
Why Do the Moon’s Near and Far Sides Look So Different?
First Solar M-Class Flare Since October 2017
Perseid Meteor Shower Begins in Two Weeks
Have We Clarified the Link Between Supernovae and GRBs?
The Beloved Eskimo Nebula
Huge Envelope of Hot Gas Surrounds Milky Way
Does the Standard Model Need to be Refined?
Do Planets Form Faster Than Previously Thought?
Is Gravity the Only Force that Interacts with Dark Matter?
Can the Copernican Principle Yield a More Accurate Drake Equation?
FRIDAY NIGHT LECTURE SERIES

All start at 6:30pm. All are for ages fourteen and older.

There will be four lectures (all remote)—one each on the 10th, 17th, 24th and 31st. Speakers and topics will be posted at www.hrpo.lsu.edu.

SOLAR VIEWING

Saturday 11 July from 12pm to 2pm.
For all ages. No admission fee.
(Solar Viewers, $2 each. Add-on Activity: $2.50.)
Phase 2 Guidelines in effect.

The hobby of astronomy immediately brings to mind thoughts of darkened backyards and dimly-lit nighttime activities at HRPO. But patrons also have the option of visiting during daylight hours to see our parent star. Weather permitting, once monthly HRPO personnel offers three views of the Sun...

12pm to 12:30pm - indirect projection onto white viewing surface // Patrons get a sense of the speed of Earth’s rotation as they see the Sun’s image slide on or off the projection device. [Learning Technologies Sunspotter]

12:15pm to 1:15pm - safely-filtered optical light sent through standard telescope // This option allows patrons to spy sunspots both small and large. [Orion 10" Skyquest Dobsonian Reflector]

12:30pm to 2:00pm - hydrogen-alpha light // Flares and prominences are seen easily in this wavelength. [Coronado Solar Max II 90mm]

Edge of Night

Friday 3 July from 8pm to 10pm
No admission fee. For all ages.
It’s not light, it’s not dark. It’s that special time called twilight, and HRPO wants to introduce you to it! Are all sections of the sky the same shade of blue? Which stars are seen first? Are Mercury and Venus or the Moon out? Is that moving object a plane, a satellite or space debris? How much actual darkness should I expect in a light-polluted city when twilight has passed? There is no other time like twilight. Bring it into your life!

**Jovian Opposition**  
*Monday 13 July from 9:45pm to 11:45pm*  
*No admission fee; for all ages.*

Jupiter is exactly 180 degrees from the Sun, rising as the Sun is setting. We are now the closest we’ll be to Jupiter this year! Weather permitting viewing of Jupiter will take place.

**Plus Night**  
*Saturday 18 July from 7pm to 10pm.*  
*Theme: “Good Luck to Perseverance”*  
*For all ages. No admission fee. Phase 2 Guidelines in effect.*

During Plus nights sky viewing starts a half-hour earlier and extra features are available to the public…  
*The well-known marshmallow roast commences at the campfire ring behind the building, lasting at least one hour and ending no later than 9:30pm. (The campfire, like the sky viewing, is weather-dependent.)*  
*Four to eight of HRPO’s collection of over fifty physical science demonstrations will be on hand to perplex and amaze. Which demos will it be?*  
*An unaided eye sky tour takes place, showing the public major features of the sky for that month. The tour takes place at 8pm during Standard Time, and at 9pm during Daylight Time.*  
*Filters are inserted into the viewing mechanisms, to show patrons “hidden” details of the Moon, Mars and Jupiter (when they are available).*  
*Reveal your age, and be shown any “birth stars” in the sky at that time.*

**Saturnian Opposition**  
*Monday 20 July from 9:45pm to 11:45pm*  
*No admission fee; for all ages.*

Saturn is exactly 180 degrees from the Sun, rising as the Sun is setting. We are now the closest we’ll be to Saturn this year! Weather permitting viewing of Saturn will take place.
Note: For six years I have been writing these Observing Notes, featuring the 60 constellations we can see before midnight from Baton Rouge, that contain objects above magnitude 10. Beginning with the February 2019 newsletter, I began to recycle and update the constellations, but the Sky Happenings calendar and associated information are new each month.

**Named Stars**

**Ras Algethi** (Alpha Her), from the Arabic “Al Kalb al Rāi”, The Shepherd’s Dog”, “the head of the kneeling one”, and the Chinese “Ti Tso”, is a double star. Alpha¹ Hercules, mag. 3.31, 17 14 38.86 +14 23 24.9, is a red giant star. Alpha² Hercules is also a binary star, mag. 5.39, 17 14 39.20 +14 23 24.0, and consists of a yellow giant star and the secondary is a yellow-white dwarf star with an orbital period of 51.59 days – it’s common name means “the kneeler’s head”. The separation between Alpha¹ and Alpha² Hercules is 4.7”.

Alpha¹ is also known as HD 156014, HIP 84345, 64 Hercules, and ADS 10418. Alpha² is also known as HD 156015, with the rest the same as the primary.

**Korneforos** (Beta Her), “The Club Bearer”, and from the Chinese “Ho Chung”, “In the River”, Mag. 2.78, 16 30 13.26 +21 21 22.7, is a yellow giant binary star with an orbital period of 410 days. Also known as HD 148856, HIP 80816, and 27 Herculis.

**Hejian** (Gamma Her), and in Chinese “Ho Keen”, mag. 3.74, 16 21 55.24 +19 09 10.9, is a double star consisting of a white giant star and a 10th magnitude optical companion. Also known as HD 147547, HIP 80170, h 277, ADS 10222, and 20 Herculis.

**Sarin** (Delta Her), and “Menkib al Jathi al Aisr”, mag. 3.12, 17 15 01.92 +24 50 22.5, is a blue white double star with the companion (magnitude 8.2, and a separation of 25.8”) being optical only. Also known as HD 156164, HIP 84379, ADS 10424, and 65 Herculis.

**Cujam** (Epsilon Her), mag. 3.92, 17 00 17.41 +30 55 34.8, is a spectroscopic binary star – the separation is so small that the two stars almost touch each other - located in the southeast corner of the “Keystone” asterism. Also known as HD 153808, HIP 83207, and 58 Herculis.

**Rutilicus** (Zeta Her), mag. 2.81, 17 39 27.89 +46 00 22.8, is a sub-giant star in a binary system. The primary is a sub-giant star with a yellow tinge, and the secondary is an orange star at magnitude 5.7. The separation between the two is 1.5” (12 au) and an orbital period of 34.45 years. Also known as HD 150680, HIP 81693, ADS 10157, and 40 Herculis.

**Sophian** (Eta Her), “Pure”, mag. 3.48, 16 42 53.74 +38 55 20.9, is a double star with the magnitude 12.5 companion believed to be line-of-sight only. It is located in the northwest corner of the “Keystone” asterism. M13 is 2.5° to the south. Also known as HD 150997, HIP 81833, and 44 Herculis.

**Rukbalgethi Genubi** (Theta Her), and “Rekbet al Jathi al Aisr”, “The Left Knee of the Kneeling Man”, and with adjacent stars it was the Chinese “Tien Ke”, “Heaven’s Record”, mag. 3.86, 17 56 15.18 +37 15 01.9. Also known as HD 163770, HIP 87808, and 91 Herculis.

**Fekhiz al Jathih al Aisr** (Iota Her), mag. 3.82, 17 39 27.89 +46 00 22.8, is a sub-giant star in a
multiple star system. Also in the system is a spectroscopic binary star with a period of 113.8 days, which has two companion stars, one with an orbital period of 60 years, with the other lying further away with a period of about 1 million years. Also known as HD 160782, HIP 86 414, and 85 Herculis.

Marfik (Kappa Her), from the Arabic “Al Marfik”, “The Elbow”, mag.5.0, 16 08 04.55 +17 02 49.2, is a double star. The primary is a yellow star, and the secondary, at magnitude 6.25 at 16 08 04.97 +17 03 16.0, is an orange giant star. The separation between these two stars is 27”. The primary is also known as HD 145001, HIP 79043, Σ 2010, ADS 9933, and 7 Herculis. The secondary is also known as HD 145000, and HIP 79045.

Maasym (Lambda Her), from the Arabic “Mi’sam”, “The Wrist”, also “Chaou”, an early feudal state in China, mag. 4.41, 17 30 44.30 +26 06 38.2, is a deep yellow star. Also known as HD 158899, HIP 85693, and 76 Herculis.

Marfik Al Jathih al Aisr (Mu Her), from the Arabic meaning “The Left Elbow of the Kneeler”, and “Kew Ho”, from the Chinese meaning “The Nine Rivers”, mag. 3.42, 17 46 27.72 +27 43 21.0, is a double star with the secondary, at magnitude 10.35, being a binary star with its companion at magnitude 10.80. The primary and secondary are separated by 266 au. The secondary and companion, both red dwarf stars, has a period of 43.2 years. Also known as HD 161797, HIP 86974, ADS 10786, Σ 2220, and 86 Herculis.

Zhōnghān (Omicron Her), also called “Atia”, mag. 34.84, 18 07 32.55 +28 45 44.9. Also known as HD 161797, HIP 86974, and 103 Herculis.

Fudail (Pi Her), “Excellent In Character”, mag. 3.16, 17 15 02.85 +36 48 33.0, is an orange giant star located at the northeast corner of the Keystone. Also known as HD 156283, HIP 84380, and 67 Herculis.

Rukbalgethi Shemali (Tau Her), “The Northern Knee of the Kneeling Man”, mag. 3.91, 16 19 44.45 +46 18 47.8, is a blue sub-giant star. Also known as HD 147394, HIP 79992, and 22 Herculis.

Cujam (Omega Her), from “Caiam” – the word used by Horace for the “Club of Hercules”, mag. 4.57, 16 25 24.934 +14 02 00.3. Also known as HD 148112, HIP 80463, 24 Herculis, and formerly known as 51 Serpentis.

Ogma, mag. 8.15, 16 30 29.62 +38 20 50.3, has a transiting hot Jupiter planet. Also known as HD 149026, and HIP 80838.

The following stars have been named in various ways, including public contests:

Hunor, mag. 8.71, 16 20 36.36 +41 02 53.1, is a dwarf star with a massive (9 times the size of Jupiter) transiting planet (HAT-P-2b) with an orbital period of 5.6 days. Also known as HD 147506, and HIP 80076.

Irena, mag. 9.42, 16 15 50 +10 01 57, has one transiting planet. Also known as HD 146389, and WASP 38.

Franz, mag. 9.98, 17 20 27.87 +38 14 31.9, has one transiting planet. Also known as HAT-P-14.

Pipoltr, mag. 12.4, 17 52 07.02 +37 32 46.2, has one transiting planet, TrES-3, in a 31 hour orbit that is decaying. Also known as GSC 03089-00929.

Deep Sky:

M13 (NGC 6205), mag. 5.9, 16 41.7 +36 28, 20’ in size, is a globular cluster that is extremely bright, very large, round, and very rich. Three dark rifts radiate outward from near the center, like a dark “propeller”. Contains over 500,000 stars, and is visible with the naked eye from a dark site with no Moon. Located about 2.5° south of Eta Herculis. About 28’ to the north-northeast is NGC 6207, and IC 4617 is 15’ to the north-northeast of Eta Herculis. Also known as “The Hercules Cluster”, “The Great Hercules Cluster”, Mel 150, C1639+365, EQ1639+365, and is part of Abell 2151.

M92 (NGC 6341), mag. 6.5, 17 17.1 +43 08, 14’ in size, is a globular cluster with a high concentration of stars; large, and very bright. Its stars are exceptionally poor in iron and other elements heavier than the basic hydrogen and helium. Located about 6° due north of Pi Herculis, or about ½ the way from
Iota Herculis to Eta Herculis. Contains over 7500 stars. Also known as Mel 168, C1715+432, and EQ1715+432.

DoDz 8, mag. 6.83, 17 26 24 +24 11.6, 14’x14’ in size, contains 6 stars, not a true cluster. Also known as OCL 104, Lund 750, and C1724+242.

NGC 6210, mag. 8.8, 16 44.5 +23 49, 20”x16” in size, is a planetary nebula that is very bright, very small, and has a smooth disk. The nebula is involved in a larger, fainter disk, with traces of a ring structure. The central star is HD 151121 (13.7 in magnitude). The triple star Σ 2094 is 20’ to the south-southwest. Also known as “The Turtle Nebula”, PK 043+37.1, PNG 43.1+37.7, and ARO 05.

NGC 6229, mag. 9.4, 16 47.0 +47 32, 4.5’ in size, is a globular cluster with a high concentration of stars; very bright, large, and round. Located about 1.5” north of 52 Herculis (at magnitude 4.8). Also known as H4-50, C1645+476, EQ 1645+476, and GCL 47.

LeDrew 8, mag. 10.0, 17 49.3 +28 04, 12’ in size, contains 12 stars. Possible asterism or cluster.

Objects beyond magnitude 10 of interest:

IC 4593, mag. 10.7, 16 12.2 +12 04, 13” in size, is a planetary nebula that is small, faint, and stellar; surrounded by much larger, fainter disk. The central star is HD 145649 (11.3 in magnitude). Also known as “The White Eye Pea Nebula”, PK 25+40.1, PNG 25.3+40.8, and ARO 27.

Hercules X-1, mag. 13.83, 16 57 49.834 +35 20 32.6, is an X-ray binary star system consisting of a black hole and a regular star. Also known as 4U1656+35, and HZ Herculis.

AGC 2151, mag. 13.9, 16 05.1 +17 43, 56’ in size, is a galaxy cluster, The Hercules Galaxy Cluster, that is one of the four groups which together comprise the huge Hercules Supercluster. The Hercules Galaxy Cluster contains 87 galaxies. The brightest galaxies are as follows: NGC 6040, 6041, 6042, 6043, 6045, 6047, 6050, and 6054, with IC 1178, 1181, 1182, 1183, and 1185.

ARP 103, mag. 15.2, 16 49.43 +45 27.5, 3.6’x2.8’ in size, is comprised of MCG+08-31-003, 003A, PGC 59061, 59062, and 59065. Located ½ south of 52 Herculis. Also known as Zwicky’s Triplet.

Hercules A, mag. 17.82, 16 51 08 +04 59 35, 0.4’x0.3’ in size, is an active galaxy that appears to be a regular elliptical galaxy. When imaged in radio waves, it shows plasma jets spanning over one million light years. The galaxy at its center, 3C348, has a black hole about 1000 times more massive than the one in our galaxy. Parts of Hercules A are as follows: CGCG 252-003, UGC 10586; 3C348; MCG+01-43-006; PGC 59117; 4C+05.66, and MRC 1648+050.

Asterisms:

The Keystone – It is in the shape of a trapezoid, representing the torso of Hercules. It is comprised of the following stars: Eta, Zeta, Epsilon, and Pi Herculis.

The Butterfly – It is a group of six 3rd magnitude stars near the center of Hercules. The four northern stars of this asterism form the “Keystone” asterism.

Deep Sky Objects in Hercules are as follows: 227 NGC; 60 IC; 355 UGC; 296 MCG; 60 CGCG; 14 Arp; 12 AGC; 5 DoDz; 3 HCG; 12 Radio Galaxies; 20 Quasar Galaxies; 2 PG; 18 PNG; 16 PK; 6 PGC; 37 VV; 33 Herschel; 2 Mel; 1 Abell; 1 Ac; 2 Al; 1 AWM; 1 CTSS; 1 DdDm; 2 GCL; 1 HDS; 1 Hrr; 2 Hu; 5 K; 1 LeDrew; 1 Lor; 1 Mink; 1 Markov; 1 Mrk; 1 NPM1G; 1 Pal; 1 Pat; 6 Ren; 2 Sa; 2 Str, 2 V; 1 Vy; 1 Webb; 1 We; 1 1Zw-1; 1 8Zw-1; 2 3C; 1 IRAS; 1 Teutsch; and 8 MAC. Total of objects in Hercules is 1281.

Other Stars:

14 Herculis, mag. 6.61, 16 10 24.21 +43 49 06.1, is an orange dwarf star with two planets in orbit, b and c. The b planet has a 4.9 year orbital period, and a separation from the star of 2.8 au. Also known as HD 145675, and HIP 79248.

HD 154345, mag. 6.74, 17 02 36.40 +47 04 54.8, is a dwarf star with one planet in orbit, an orbital period of 9.095 years, and a separation of 4.18 au. Also known as HIP 83389, and Gliese 651.

HD 164972, mag. 7.01, 18 02 30.86 +26 18 46.8, has three planets in orbit. One of the planets is Saturn-like and has a separation from the star of 2.11 au. Also known as HIP 88348.

HD 164595, mag. 7.10, 18 00 39.0 +29 34 19, has one planet in orbit. Also known as HIP 88194.
**Sky Happenings: July, 2020**

*(what follows pertains ONLY to the current month. Material above is good year after year.)*

**July 1st -** Evening: July opens with Jupiter and Saturn shining at 6° apart above the southeastern horizon, and toward the south the waxing gibbous Moon is less than 2° from Beta Scorpii.

**July 2nd -** Asteroid Hercculina is at opposition at 9 AM CDT.

**July 4th -** Earth is at aphelion (94.5 million miles or 152,095,295 km from the Sun) at 7 AM CDT, Full Moon occurs at 11:44 PM CDT, penumbral lunar eclipse. It will be visible for North American observers only in the northwest of the United States, Canada, and Alaska.

**July 5th -** Asteroid Vesta is in conjunction with the Sun at 1 AM CDT, The Moon passes 1.9° south of Jupiter at 5 PM CDT, Evening: The Moon, just past full, joins Jupiter and Saturn to form a triangle between Sagittarius and Capricornus.

**July 6th -** The Moon passes 2° south of Saturn at 4 AM CDT.

**July 10th -** The Moon passes 4° south of Neptune at 2 AM CDT, Venus is at greatest brilliancy (magnitude -4.7) at 3 AM CDT.

**July 11th -** Dawn: High above the southeast horizon, the waxing gibbous Moon and Mars are less than 6° apart, while lower on the eastern horizon Venus and Aldebaran are only 1° apart, The Moon passes 2° south of Mars at 3 PM CDT.

**July 12th -** Venus passes 1° north of Aldebaran at 2 AM CDT, Mercury is stationary at 2 AM CDST, The Moon is at apogee (251,158 miles or 404,199 km from Earth) at 2:27 PM CDT, its disk will span 29°34” in size,

**Last Quarter Moon** occurs at 6:29 PM CDT, Dwarf planet Ceres is stationary at 9 PM CDT, Asteroid Pallas is at opposition at 9 PM CDT.

**July 14th -** Jupiter is at opposition at 3 AM CDT, The Moon passes 4° south of Uranus at 7 AM CDT.
July 15th - Pluto is at opposition at 2 PM CDT.
July 17th - The Moon passes 3° north of Venus at 2 AM CDT,
Dawn: In the east the waning crescent Moon, Venus, and Aldebaran form a shallow arc 6° long.
July 18th - The Moon passes 4° north of Mercury at 11 PM CDT.
July 20th - New Moon occurs at 12:33 PM CDT (Lunation 1207),
Saturn is at opposition at 5 PM CDT.
July 22nd - Mercury is at greatest western elongation (20°) at 10 AM CDT,
Dusk: The very thin waxing crescent Moon is 3° from Regulus, low on the western horizon.
July 25th - The Moon is at perigee (228,889 miles or 368,361 km from Earth) at 12:02 AM CDT, its disk will span 32°26” in size.
July 27th - First Quarter Moon occurs at 7:33 AM CDT.
July 28th/29th - All Night: The Southern Delta Aquariid meteor shower is expected to peak. Best viewing is in the early hours of the morning after the waxing gibbous Moon has set.
July 29th - Dusk: The waxing gibbous Moon is 5° from Aldebaran.
Aug 1st - Dawn: Venus and Zeta Tauri are less than 2° apart. To their lower left, Mercury is rising in the east-northeast with Pollux to its upper left,
Dusk: The waxing gibbous Moon, Jupiter, and Saturn form a triangle above the southeast horizon,
Jupiter is 1.5° north of the Moon at 7 PM CDT.
Aug 2nd - Pluto is 1.1° north of the Moon at 1 AM CDT,
Saturn is 2° north of the Moon at 8 AM CDT.
Aug 3rd - Full Moon occurs at 12:59 PM CDT.

Planets:

Mercury – Mercury is in inferior conjunction on the evening of June 30th, and does not reappear in the dawn sky until around July 17th, when it will shine at magnitude 1.1, and will rise 1¼ hours before the Sun. On the 19th, the planet will shine at magnitude 0.8 and stand 5° to the right of the waning crescent Moon – both will rise soon after 4:30 AM local time, and should be visible above the northeast horizon 30 minutes later. On the 22nd, the planet reaches greatest western elongation (20°), at magnitude 0.3, with it being 37% illuminated with an angular diameter of just 7.8”.
On the 25th, the planet has brightened to magnitude -0.1 in Gemini. On the 31st, the planet is at magnitude -0.7, and forms a nice trio of objects with Pollux (7° to the northeast) and Castor (nearby).

Venus – Venus rises two hours before the Sun at the star of July, and 3½ hours before the Sun by month’s end. The planet’s sunrise altitude leaps from 21° to 35° during the month and its crescent will wax from 19% to 43% during the month. On the 1st of July, the planet (at -4.6 magnitude) will stand 8° high, adjacent to the Hyades star cluster. The Pleiades (M45) are 10° directly above the planet. The planet will reach greatest brilliancy (magnitude -4.7) on the 10th. On the 12th, the planet will pass 1° north of Aldebaran. On the 16th, in the pre-dawn sky, the waxing crescent Moon is located 5° above the Hyades, and then 3.5° northeast of the planet in the pre-dawn sky of the 17th. By the 31st, the planet will stand 2.3° southeast of Zeta Tauri.

Mars – Mars opens the month at magnitude -0.5 in southwest Pisces, rising soon after midnight local time. It will brighten to magnitude -1.1 by the 31st, rising just after 11 PM local time. Its disk will grow from 12” to 15” this month. In the hour before dawn, the best time to view the planet, it will stand 30° high in the southeast in early July, and on the 31st, the planet will reach 45° altitude. The planet starts the month in Pisces, 17° south of Algenib in the Square of Pegasus, and will then move through the northwest corner of Cetus between the 8th and 26th. The planet will cross the celestial equator into the northern half of the sky on the 11th. The same morning, the planet will stand 6° northeast of a waning gibbous Moon. The planet’s illuminated disk will increase from 84% to 86% lit during the month, enabling fine details on the surface to be observable with smaller telescopes.

Jupiter – On July 1st, at 11 PM local time, Jupiter will stand 15° high in the southeast, in the eastern part of Sagittarius, shining at magnitude -2.7, roughly midway between the 2nd magnitude star Sigma
Sagittarii (Nunki), and the 3rd magnitude star Beta Capricorni (Dabih). The planet moves 4° westward in Sagittarius during July. The planet will reach opposition on the 14th, and will reach its peak elevation, near 30° in the south around 1 AM local daylight time. The planet’s disk is 48” across. The Galilean satellites – Io, Europa, Ganymede, and Callisto – will now shine their brightest at opposition.

**Saturn** – Saturn lies 6° east of Jupiter on July 1st, and nearly 8° east by the 14th. Saturn’s disk spans 19”, and the rings stretch nearly 42”. The planet’s polar axis tilts 21° toward us, revealing the northern side of the ring system. The planet reaches opposition on the 20th. The planet’s wide ranging moon Iapetus will reach inferior conjunction with the planet on the 28th, as it moves from its fainter eastern elongation. Early in the month, the moon will brighten to magnitude 11. On the 27th and 28th, the moon will lie 1° south of the planet while Titan, the planets largest and brightest moon, will stand 3° west of the planet. Titan can be found due north of the planet on the 15th and 31st, and due south of the planet on the 7th and 23rd.

**Uranus** – Uranus will rise two hours before dawn on July 1st in Aries, located midway between Alpha Arietis (Hamal) and Alpha Ceti (Menkar), shining at magnitude 5.8 with a greenish-colored disk spanning 3.5”. On the 14th, the planet stands 4.8° due north of a waning crescent Moon.

**Neptune** – Neptune is in northwest Aquarius, shining at magnitude 7.9. On July 1st, the planet will rise shortly after local midnight. In the pre-dawn sky of the first week of July, the planet will stand between 11° and 15° west of Mars. To locate Neptune, find 4th magnitude Phi Aquarii – the planet is about 4° east-northeast of this star. On the 10th, the planet will be nearly 5° north of the gibbous Moon, with a tiny 2” wide bluish disk.

**Pluto** – Pluto reaches opposition, in Sagittarius, on July 15th, glowing at magnitude 14.3. On July 1st, the planet is 41° south of Jupiter. In late July, Pluto is 3.2° due east of Jupiter.

**Earth** – Earth reaches aphelion, its greatest distance from the Sun, at 6:35 AM CDT on July 4th, at a distance of 94,507,635 miles from the Sun.

**Moon** – The nearly full Moon will undergo a penumbral eclipse too slight for the eye to detect. Mid-eclipse occurs at 11:30 PM CDT on the 4th. The Full Moon will occur at 11:44 PM CDT on July 4th,

Favorable Librations: Mare Australe on July 2nd; Mare Smithii on July 4th; Mouchez Crater on July 13th, and Pascal Crater on July 14th.

Greatest North declination is on July 19th (+23.9°)

Greatest South Declination is on July 5th (-24.1°)

Libration in Longitude: East limb most exposed on July 6th (+5.0°)

Libration in Latitude: North limb most exposed on July 11th (+6.8°)

South limb most exposed on July 25th (-6.7°)

**Asteroids** – Asteroid 1 Ceres is in Aquarius, 13.5° due south of Neptune on July 1st, and 16° south of Neptune on the 31st. On the 31st, the dwarf planet, at magnitude 7.3, is only 0.8° northwest of the 3rd magnitude star 88 Aquarii. According to the RASC Observer’s Manual, 2020 USA Edition, Ceres locations are as follows: On July 10th -23 15.80 -18 31.9, at magnitude 8.4; on the 20th – 23 15.35 -19 25.4, at magnitude 8.2; and on the 30th – 23 12.58 -20 29.3, at magnitude 8.1.


**Asteroid 7 Iris’** positions, according to the RASC Observer’s Manual, 2020 USA Edition, are as follows: On July 10th – 18 15.22 -20 23.8, at magnitude 9.1; on July 20th – 18 05.71 -20 11.6, at magnitude 9.5; and on July 30th – 17 58.34 -20 01.0, at magnitude 9.5.

**Asteroid 56 Melete’** positions, by my estimates, are as follows: On July 1st – just over 2° north-northeast of Zeta Scuti, or about ½° west and north of LDN 453; On July 5th – just under 2° due north of Zeta Scuti; on July 10th – just over 2° north-northwest of Zeta Scuti (it is now in the Serpens Cauda constellation- all the rest of the positions are in this constellation); on July 15th – just over 2.5° northwest of Zeta Scuti; on July 20th –about 3° west-northwest of Zeta Scuti at LDN 431; on July 25th – about 3.4° west and a little north of Zeta Scuti; and
on July 30th – about 3.8° due west and a touch north of Zeta Scuti.

**Comets – Comet 2P/Encke** positions, according to ALPO, are as follows: On July 1st – 08 03.8 +17 43, at magnitude 7.3 in Cancer; on July 11th – 09 13.9 +08 19, at magnitude 7.8 in Cancer; on July 21st – 10 29.3 -03 23, at magnitude 9.0 in Sextans; and on July 31st – 11 58.0 -16 04, at magnitude 10.4 in Corvus.

**Comet 88P/Howell** positions, according to ALPO, are as follows: On July 1st – 12 55.7 -05 31, at magnitude 11.1 in Virgo; on July 11th – 13 08.4 -07 26, at magnitude 10.8 in Virgo; on July 21st – 13 24.3 -09 36, at magnitude 10.4 in Virgo; and on July 31st – 13 43.2 -11 59, at magnitude 10.1 in Virgo.

**Comet C/2019 U6 (Lemmon)** positions, according to ALPO, are as follows: On July 1st – 10 25.4 -02 11, at magnitude 6.6 in Sextans; on July 11th – 11 34.4 +05 59, at magnitude 6.9 in Leo; on July 21st – 12 33.1 +12 29, at magnitude 7.4 in Virginia; and on July 31st – 13 21.3 +16 54, at magnitude 8.0 in Coma Berenices.

**Comet C/2020 F3 (NEOWISE)** positions, according to ALPO, are as follows: On July 1st – 05 55.7 +26 08, at magnitude 4.4 in Taurus; on July 11th – 06 43.8 +41 49, at magnitude 4.3 in Auriga; on July 21st – 09 43.9 +47 13, at magnitude 5.3 in Ursa Major; and on July 31st – 12 22.6 +29 58, at magnitude 6.5 in Coma Berenices.

**Comet C/2017 T2 (PANSTARRS)** positions, according to ALPO, are as follows: On July 1st – 12 30.6 +41 38, at magnitude 8.8 in Canes Venatici; on July 11th – 12 50.9 +33 56, at magnitude 9.1 in Canes Venatici; on July 21st – 13 08.9 +26 44, at magnitude 9.3 in Coma Berenices; and on July 31st – 13 25.3 +20 11, at magnitude 9.7 in Coma Berenices. Comet T2, by my estimates, will be located at the following positions: On July 1st – less than ½° from Beta Canum Venaticorum (Chara) and the NGC 4485/4490 pair; on July 5th – about 3° west of Alpha Canum Venaticorum (Cor Coroli); on July 10th – just under 5° due south and a touch west of Alpha Canum Venaticorum; on July 15th – about 4° southwest of Beta Comae Berenices; on July 20th – about 1° due south and a touch west of Beta Comae Berenices; on July 25th - 5° south-southeast of Beta Comae Berenices; and on July 30th – about 4.5° northwest of Alpha Comae Berenices, and about 3.5° east-northeast of M53, or about 3.7° northeast of NGC 5053.

**Comet C/2020 F8 (SWAN)** positions, according to ALPO, are as follows: On July 1st – 06 16.7 +31 47, at magnitude 7.7 in Auriga; on July 11th – 06 26.1 +28 19, at magnitude 8.5 in Auriga; on July 21st – 06 33.5 +25 16, at magnitude 9.1 in Gemini; and on July 31st – 06 39.4 +22 30, at magnitude 9.6 in Gemini.

**Meteor Showers** – There are two Class I meteor showers in July.

The **Southern Delta Aquarids**, active from July 21st to August 23rd, peaking on July 29th with a maximum zenith hourly rate of 20.

The **Perseids**, active from July 17th to September 1st, peaking on August 12th with a maximum zenith hourly rate of 100.

There are 2 Class II showers in July.

The **Alpha Capricornids**, active from July 3rd to August 11th, peaking on July 26th with a maximum zenith hourly rate of 4.

The **Piscis Austrinids**, active from July 30 to August 11th, peaking on August 8th with a maximum zenith hourly rate of 5.

There are 11 Class IV – weak - showers in July. All of them have a maximum zenith hourly rate of less than 2.

**When to View the Planets:**
**Evening Sky**
- Jupiter (southeast)
- Saturn (southeast)

**Midnight**
- Mars (east)
- Jupiter (south)
- Saturn (south)
- Neptune (southeast)

**Morning Sky**
- Mercury (northeast)
- Venus (east)
- Mars (south)
- Jupiter (southwest)
- Saturn (southwest)
- Uranus (east)
- Neptune (south)

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**Dark Sky Viewing - Primary on July 18th, Secondary on July 25th**

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**Mythology:**

**Hercules – The Strong Man (aka The Kneeling Man)**

The origin of this constellation is so ancient that its true identity was lost even to the Greeks, who knew the figure simply as Engoriasin, literally meaning “The Kneeling One”. The Greek poet Aratus described him as being worn out with toil, his hands upraised, with one knee bent and a foot on the head of Draco, the Dragon. ‘No one knows his name, nor what he labors at’, said Aratus. But Eratosthenes, a century after Aratus, identified the figure as Heracles (the Greek name for Hercules) triumphing over the dragon that guarded the Golden Apples of the Hesperids. The Greek playwright Aeschylus, quoted by Hyginus, offered a different explanation. He said that Heracles was kneeling, wounded and exhausted during his battle with the Ligurians.

Hercules was the son of Zeus and Alcmene, a mortal woman. When he was an infant, Zeus laid him at Hera’s breast while she was slept. Having suckled her milk, Heracles became immortal. Hera was enraged, both at this and at her husband’s infidelity, and while she could not kill Heracles, she made his life difficult at every turn. She cast a spell that made him insane and kill his wife and children. Once he regained his senses and realized what he had done, he visited the Oracle at Delphi to see how he could atone for his deed. The Oracle sent him to serve Eurystheus, King of the Mycenae, for a period of 12 years. It was then that he got the name of Heracles, which means: The Glory of Hera”. His given name at birth was Alcides, Alcacus, or Palaemon according to different sources.

King Eurystheus gave Heracles a series of tasks, known as the Labors of Heracles. The first was to kill the Nemean Lion, a beast whose hide was impervious to any weapon. After Heracles had strangled the lion to death, he used its claws to cut off the skin and later used the pelt as a cloak and the gaping mouth as a helmet, which both protected him and made him look even more frightening. The Nemean Lion is represented by the constellation Leo.
The second task was to destroy the Hydra, represented by the constellation Hydra, a monster with multiple heads. As he fought with the wild beast, Hera sent a crab to distract him. Heracles killed the crab, and Hera placed it in the sky as the constellation Cancer, the Crab.

Heracles was then sent to catch a deer with golden horns and, after that, a ferocious boar. The fifth task was to clean the stables of King Augeias of Elis. The sixth was to kill a flock of marauding birds, and the eighth labor was to bring the horse of King Diomedes of Thrace, which ate flesh, to King Eurystheus. The ninth was to bring the belt of Hippolyte, the Queen of the Amazons. The tenth labor was to steal the cattle of Geryon, a monster that lived on the island of Erytheia. On his way back, he was attacked by local forces, which outnumbered and nearly overcame him. He sank to his knees and prayed to Zeus. The god helped him by sending rocks, which Heracles threw at his attackers. This is the event that, according to Aeschylus, was commemorated by the constellation Engonasin (The Kneeler).

Even though Eurystheus and Heracles had originally agreed on ten tasks, when Heracles came back the king refused to release him from his service and set two additional tasks. The first was to steal the Golden Apples from Hera’s garden on Mount Atlas. The garden was guarded by the Hesperides, daughters of the Titan Atlas, and the Hesperides were guarded by the dragon Ladon, whose task was to make sure that they did not steal any of the apples. The dragon is represented by the constellation Draco, The Dragon. Hera herself placed the dragon in the sky after Heracles had killed it.

The final labor was the most difficult one. Heracles was sent to the gates of the Underworld to fetch Cerberus, the dog that had three heads and was tasked with guarding the entrance and making sure that those who had crossed the river Styx did not try to escape. Heracles used his pelt to protect himself and dragged the dog to Eurystheus. The king, who had not expected to see Heracles again, had no choice but to release him from his service.

After completing the twelve labors, Heracles married Deianeira, daughter of King Oeneus. While the two were traveling together, they came to the river Evenus, where the centaur Nessus ferried people across. Heracles swam the river, but Deianeira needed to be carried and Nessus, who offered to do it, fell in lust with her and tried to ravish her. Heracles shot the centaur with an arrow that was tipped in the Hydra’s poison. As he lay dying, Nessus offered Deianeira some of his blood, saying it can act as a love charm. Deianeria kept the blood, poisoned by Heracles arrow. Much later, she became worried that Heracles attention was wandering to another woman and she gave him a shirt on which she had smeared Nessus’s blood. When Heracles put the shirt on, the Hydra’s poison started burning his flesh and, once he realized what was going on, he built himself a funeral pyre on Mount Oeta and lay on his pelt ready to die. The fire burned the part of him that was mortal, and the immortal part joined Zeus and the other gods on Mount Olympus. Zeus placed Heracles in the sky as the constellation now known by his Roman name, Hercules.
The End