Monthly Meeting September 9th at 7PM at HRPO

(Monthly meetings are on 2nd Mondays, Highland Road Park Observatory).

Program: Jim Gutierrez will talk about the relationship between brain waves and gravitational waves!

What's In This Issue?

Messages from the HRPO

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

President's Message

We are moving into fall and longer nights. If you're short on astronomy related equipment for your observing efforts this season, we are selling surplus items again (most of which come to us through donations and are in good condition). Come on by the observatory and take a look. Some items are put up for raffle for those who attend the meetings and buy tickets. $1 usually, sometimes $5.

ALCON (Astronomical League Convention): The ALcon committee had its first meeting on August 17th, 3 p.m., at Coffee Call on College, with 7 members in attendance: Chris K, Craig B, John N, Trey A, Roz R, Russell Poche, Steven T. We have to get a lot of things lined up before we can make our bid. (see August's President's Message for details), so we could use more volunteers to help with the planning. I believe this is something within our reach and we should go for it.

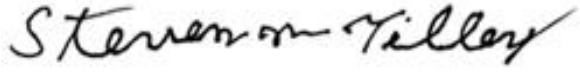
LIGO Picnic Our Annual picnic will on Saturday September 21, 2019 at LIGO Livingston, 19100 Ligo Road, Livingston, LA 70754 at 11AM. Arrivals begin at 11 a.m. This is a family affair, so please invite your people, and bring a a tasty side to share, to accompany the club's main dish.

BRAS ZAZZLE SHOP We opened a shop on Zazzle, with lots of neat items with the BRAS logo. Please consider shopping there for Christmas. The shop can be found at:
https://www.zazzle.com/store/br_astronomical

UPCOMING BRAS MEETINGS:
Light Pollution Committee - HRPO, Wednesday September 4, 6:15 P.M.
Business Meeting – HRPO, Wednesday September 4, 7 P.M.
Monthly Meeting – HRPO, Monday, September 9, 7 P.M.

VOLUNTEER AT HRPO: If any of the members wish to volunteer at HRPO, please speak to Chris Kersey, BRAS Liaison for BREC, to fill out the paperwork..
MONTHLY SPEAKERS: One of the club's needs is speakers for our monthly meetings if you are willing to give a talk or know of a great speaker let us know.
VOLUNTEERS: While BRAS members are not required to volunteer, if we do grow our volunteer core in 2019 we can do more fun activities without wearing out our great volunteers. Volunteering is an excellent opportunity to share what you know while increasing your skills.
SALE: BRAS is having a surplus telescope/equipment.
Articles: I want to invite members to write articles for our newsletter. And, use the Members Corner to share your interesting astronomy related trips, events, awards, and experiences by sending a write-up to Michele at newsletter@brastro.org
Member Pins: If you have not reserved yours yet, please come to a meeting to pick one up.
Outreach: Please check below for Ben's Outreach Requests. Also, be on the lookout for periodic email notices. Remember, Outreach to our community is a lot of what we do.
BRAG: Check below for BRAG's scheduled meeting.

Clear Skies



Steven M. Tilley, President

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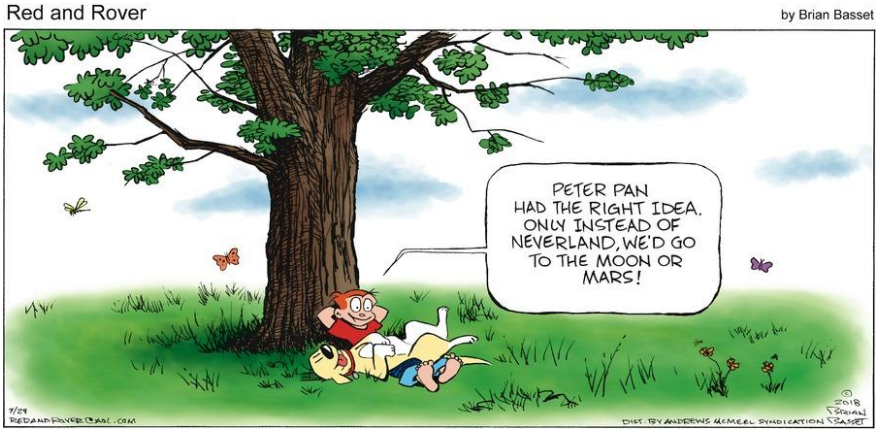
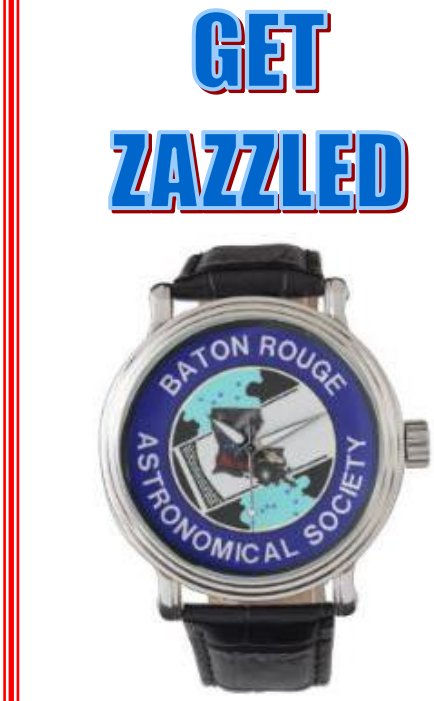
Secretary's Summary of August Meeting

- President, Steven Tilley calls the meeting to order at 7:00PM.
- 33 members in attendance.
- Steven talks about hosting ALCon 2022. He mentions the upcoming meeting Saturday the 17th, and invited those interested to join the committee for planning to attend.
- Steven gives the floor to Vice President, Thomas Halligan, who introduces John Nagle for his talk on his trip to the Texas Star Party.
- John N gives his talk about the star party and his experience while there.
- New members introduce themselves.
- HRPO Manager, Chris Kersey, updated those present about the HRPO 2019 shirts.
- John N awarded the BRAS Moon Watcher certificate to Trey Anding and Scott Cadwallader.
- Outreach chair, Ben Toman gave a recap on the Feliciana Retreat Center event. He also talked about upcoming outreaches.
- Merrill Hess reminded everyone about Astronomy on Tap.
- Trey A is taking pre orders for Astronomy calendars.
- Raffle held.
- Meeting adjourns at 8:30 pm

Submitted by Krista Reed, BRAS Secretary





2019 Officers:

President: Steven M. Tilley
Vice-President: Thomas Halligan
Secretary: Krista Reed
Treasurer: Trey Anding

BRAS Liaison for BREC:
Chris Kersey
BRAS Liaison for LSU:
Greg Guzik

Committees/Coordinators:
Light Pollution:
John Nagle
Newsletter:
Michele Fry
Observing Notes:
John Nagle
Outreach:
Ben Toman
Webmaster:
Frederick Barnett

BRAS Outreach Report

Hi Everyone,

Well, Summer is slipping away and the cooler temps and earlier sunsets of Fall approach. We wrapped up the Summer with a fantastic outreach for the **Louisiana National Guard Child and Youth Program**. Their camp was held at the Felicana Retreat Center this year and Craig B, Annette and Chris R., Scott C. and myself all made it up there to help out. Here are some of our photos

Chris and Annette Raby demo their solor scope.

Craig B at the demo table.

Scott C. talks about the sun.

We were treated very well. The cabins were a bit spartan, but they were FREE. The food was good, too. Best of all, both nights we were up there we got lengthy breaks in the clouds and were treated to a glorious Milky Way.

We arrived on Wednesday in time for dinner. I set up my tent and gear on the field and the rest found their way to the cabins. That night we were on our own. It started out cloudy, but they broke up for a while and we got some great observing in. The next day, we did several different demos with multiple squads of campers. We had Solar observing, crater making demos and discussed the scale size and distances of objects in our Solar System and Universe. Finally, that evening, some of the campers came out to see what could be seen. The clouds took pity on us and we were able to show off Saturn and Jupiter at first. As the skies cleared up, we added clusters, nebulae and galaxies. Scott and I ended up observing until around 4am and the sky was awesome!

This camp moves around to different locations so I don't think they'll be up there again next year, but they definitely want to invite us to wherever it is the end up. Hopefully it will have nice dark skies, too.

Now for the upcoming events. We've got Sidewalk Astronomy, of course. Also, our application is in to the Mini Maker Faire. Time to sound off and let me know if you can help out!

Upcoming Outreach Events:

Tuesday, September 3rd
6:30-8:30pm
Sidewalk Astronomy
Perkins Rowe

Tuesday, October 8th
6:30-8:30pm
Sidewalk Astronomy
Perkins Rowe

Wednesday, October 9th
TBD
Baton Rouge Free Thinkers
Goodwood Library
(presentation to be given and discussion)

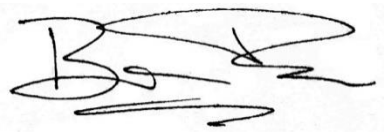
Saturday, October 19th
9am-5pm
Mini Maker Faire
Main Library
(several people needed for demos, info and scopes in shifts)

Louisiana National Guard Child and Youth Program
in August 2019, at the Feliciana Retreat Center

Our weekend Outreach Volunteers:
L to R: Scott Cadwallader, Craig Brenden, Ben Toman, Chris and Annette Raby with their solor scope.

There is also another request that will take place at Lamar Dixon on either October 18th or 19th. (I'll be pushing for the 18th so it doesn't conflict with the Maker Faire.) More details to come as they are nailed down.

Clear skies,



Outreach Chairperson

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BRAS FORUM NOTICE:

The BRAS Forum has a Members Only section, where we post notices or have discussions pertaining to members or the club that the general public can't see. If you would like to join the Members Only section, all you need to do is sign up for the forum (if you haven't already), and then send an email to **fred at eatel dot net** with your forum username and email address, and ask to be added to the members only section. In your User Control Panel, you can set your preferences to receive email notification anytime a post is made.

Thanks, Frederick Barnett, Webmaster

What do the Veil Nebula, Fe-60 Space Dust, and the Antartic have in common?

This month's Night Visions masthead showcases a small section of the Veil Nebula, in honor of the recent discovery in the Antarctic of remnants of a massive star that exploded about 8,000 years ago..This space dust could be 20 million years old, say the German and Austrian scientists who retrieved and are studying it. How do we know this? Read the Washington Post article here:

https://www.washingtonpost.com/science/2019/08/27/remnants-supernova-were-found-antarctic-snow-space-dust-could-be-million-years-old/?wpisrc=nl_science&wpmm=1

Photo taken by NASA's Hubble Space Telescope

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..

Meeting called to order by John Nagle
No new members, with 5 members in attendance
July minutes were published in August newsletter

Old Business:

1. Dark Sky Advocacy (DSA) pages – Chris Kersey has three pages for the website and will send them to Fred.
2. A checklist on "How to Make Your Property Dark for use by BRAS members and the public has been completed by Chris Kersey.
3. Discussed progress on new diorama for light pollution.
4. Got addresses to send a letter to for Entergy and Demco.
5. URL for the Country Roads article on Light Pollution titled Star Light, Star Bright is https://countryroadsmagazine.com/art-and-culture/people-places/star-light-star-bright/ will be added to the DSA pages.
6. Completed list of the city/parish departments to send invitations to for the third annual Natural Sky Conference.
7. Sent an e-mail to the local chapter of the AIA about Light Pollution and the design of lighting.
8. No mention of Light Pollution on any of the LSU School of Architecture web pages. An e-mail was sent to the school asking if there is any mention or training on Light Pollution and Lighting.
9. Still need to draft letter to BREC about the bad lighting at the Burbank Complex.

New Business

Need to draft letter to BREC about their "Environmental Sustainability Policy" and where they are in regards to it.

Minutes of this meeting read and approved
Meeting adjourned.

John R. Nagle

Submitted by John Nagle, Chairman

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Globe At Night

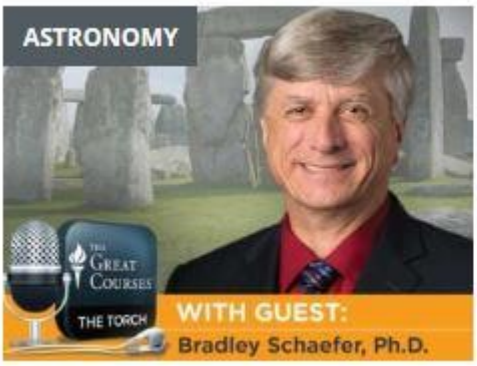
Target for the Globe at Night program is **Cygnus, from September 20th through the 29th.**
If you would like to participate in this citizen scientist program, you can find instructions at
https://www.globeatnight.org/

Ap Share, "for lifelong learning"

Download "The Torch" ap to your phone, featuring FREE 10 to 40 minute interviews with the professors who teach The Great Courses curriculum.

Or, visit this website to stream them on your computer!
https://www.thegreatcoursesdaily.com/category/the-torch-podcast/

One episode of particular interest is long-time BRAS member Dr. Bradley Schaefer's summary of his 24 lecture course:



Ancient Astronomy—From Stonehenge to the Great Pyramids: The Torch Podcast

February 9, 2017

On this episode of The Torch, we examine the pioneering efforts of ancient people, whose inquisitive nature led them to create the science of Astronomy. [...]

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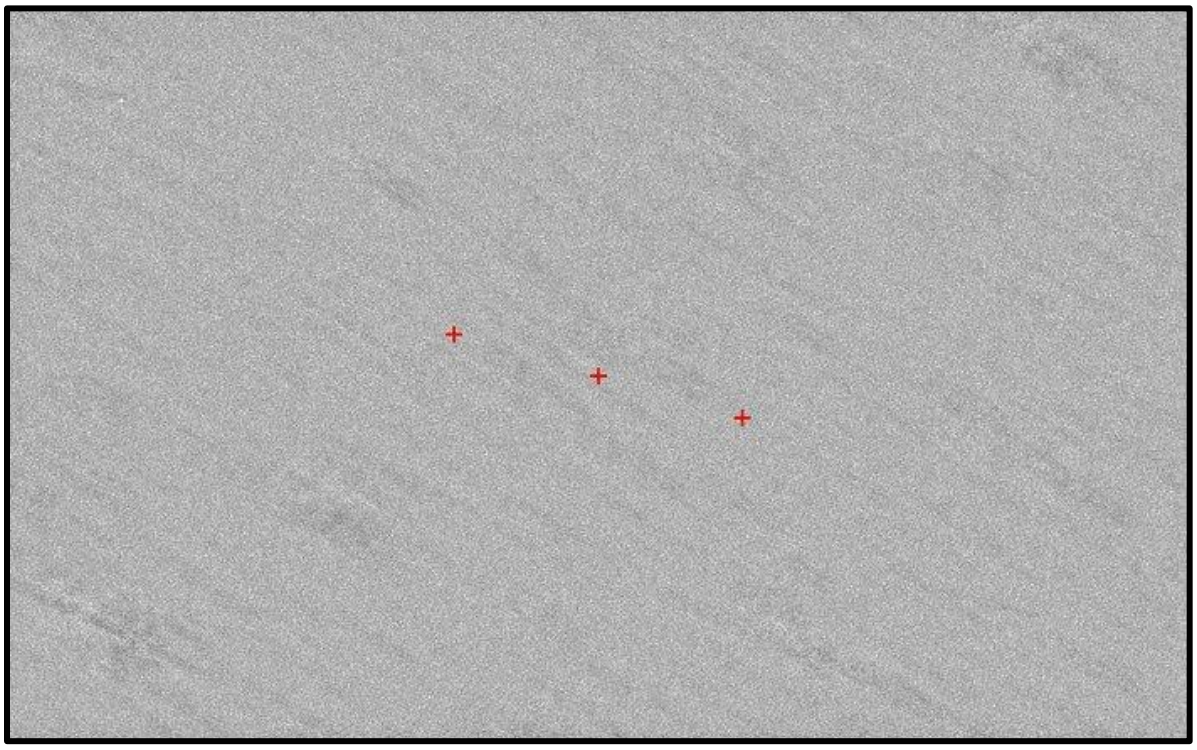
Flying "Rocks" and "Dirty Snowballs":

Asteroid and Comet News

September 2019
Volume 1. Issue 8.



This image shows the region of the sky where asteroid 2006 QV89 would have been seen if on a collision course with Earth in 2019. The three red crosses reveal the specific locations, where the asteroid could have appeared as a single, big black, round source, had it been on a collision course. Nothing was seen. Even if the asteroid were smaller than expected, at only a few metres across, it would have been seen in the image. Any smaller than this and the VLT could not have spotted it, but it would also be considered harmless as any asteroid this size would burn up in Earth's atmosphere caption from Wikimedia Commons Image Credit: ESO/ O. Hainaut/ ESA (https://www.eso.org/public/images/ann19039a/)

The asteroid 2006 QV89 made a stirred in the news over a reported impact risk of 1-in-7000 on 2019-09- 09. This asteroid had only an observation arc of 10 days. A large number of orbits (virtual asteroids) fit the available observations; some of the virtual asteroids for 2006 QV89 impacted Earth (virtual impactors). If one has an "orbit" for a virtual asteroid/impactor one can tell were in the sky I will be.

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On 4 and 5 July ESO and ESA astronomers looked for 2006 QV89's virtual impactors using the Very LargeTelescope in Chile not finding them they able to ruled out any Impact for 2006 QV89. In the weeks that follow observation were taken given a 4730 days (12.95 yr) observation arc to 2006 QV89.

See
ESA confirms asteroid will miss Earth in 2019:
www.esa.int/Our_Activities/Space_Safety/ESA_confirms_asteroid_will_miss_Earth_in_2019
2006 QV89 (Wikipedia): https://en.wikipedia.org/wiki/2006_QV89
JPL Small-Body Database Browser (2006 QV89):
https://ssd.jpl.nasa.gov/sbdb.cgi?sstr=2006QV89
MPC Database Search (2006 QV89):
https://www.minorplanetcenter.net/db_search/show_object?utf8=%E2%9C%93&object_id=2006+QV89
JPL Close Approach Data from June 9, 2019 to Aug 26, 2019 Distance Nominal < 1 Lunar Distance

Object	Close-Approach (CA) Date	CA Distance Nomina (au)	LD H (mag)	Estimated Diameter
(2019 NK1)	2019-Jul-02	0.69 (0.00177)	30.1	2.6 m - 5.7 m
(2019 MB4)	2019-Jul-09	0.82 (0.00211)	26.2	16 m - 35 m
(2019 NF7)	2019-Jul-09	0.98 (0.00253)	28.1	6.4 m - 14 m
(2019 NN3)	2019-Jul-10	0.83 (0.00214)	24.8	29 m - 66 m
(2019 OD)	2019-Jul-24	0.93 (0.00239)	23.5	54 m - 120 m
(2019 OK)	2019-Jul-25	0.19 (0.00048)	23.3	59 m - 130 m
(2019 OD3)	2019-Jul-28	0.49 (0.00126)	26.9	11 m - 25 m
(2019 ON3)	2019-Jul-29	0.56 (0.00143)	27.8	7.4 m - 16 m
(2019 QB1)	2019-Aug-20	0.32 (0.00083)	27.4	8.7 m - 20 m
(2019 QH2)	2019-Aug-20	0.13 (0.00033)	30.4	2.2 m - 5.0 m
(2019 QD)	2019-Aug-22	0.78 (0.00200)	28.8	4.7 m - 11 m
(2019 QQ3)	2019-Aug-26	0.25 (0.00064)	29.3	3.7 m - 8.2 m

As of 2019-08-30 there is
794,832 discovered asteroids (MPC)(https://www.minorplanetcenter.net/)
20,753 discovered Near-Earth Objects (MPC) (https://www.minorplanetcenter.net/)
4,116 discovered Comets (MPC)(https://www.minorplanetcenter.net/)
920 objects listed on JPL's Sentry: Earth Impact Monitoring(JPL)
(https://cneos.jpl.nasa.gov/sentry/)
2,297 2,324 objects have been removed from Sentry(JPL)
(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) (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 2019-06-29 to 2019-08-25

Object Designation	Removed (UTC)
2018 YQ2	2019-08-30 12:36:17
2019 QE	2019-08-28 13:32:20
2019 OV3	2019-08-26 13:14:58
2008 DB	2019-08-19 13:23:56
2019 LR4	2019-08-14 13:02:06
2019 NW2	2019-08-13 13:15:29
2019 OR1	2019-08-12 13:09:33
2019 OU3	2019-08-12 13:02:24
2006 QV89	2019-08-11 23:49:11
2019 OE4	2019-08-05 13:46:56
2016 JO38	2019-08-01 19:43:04
2017 SE33	2019-08-01 13:27:37
2012 DW60	2019-07-28 21:02:05
2019 OD	2019-07-26 19:59:53
2019 NJ7	2019-07-21 13:32:27
2010 UZ7	2019-07-19 13:14:54
2014 HS197	2019-07-19 13:13:42
2016 EU84	2019-07-18 15:29:04
2019 MF3	2019-07-15 13:32:46
2012 UE34	2019-07-14 19:42:30
2019 NO3	2019-07-12 13:56:21
2019 MB4	2019-07-10 13:35:14
2019 NN3	2019-07-10 13:23:00
2019 MN2	2019-07-10 13:20:26
2019 MZ3	2019-07-10 13:19:18
2019 JD8	2019-07-09 13:31:18
2017 EA	2019-07-08 14:13:01
2016 RQ41	2019-06-29 13:29:24

Useful Links:

Guide to Minor Body Astrometry (https://www.minorplanetcenter.net/iau/info/Astrometry.html)
How Are Minor Planets Named? (https://www.minorplanetcenter.net/iau/info/HowNamed.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)

Messages from HRPO

Highland Road Park Observatory

FRIDAY NIGHT LECTURE SERIES

all start at 7:30pm

13 September: "Exoplanets" In an update of his first two presentations, BREC Center Supervisor Jordan Cobbs will survey the various manners in which we search for planets around other stars, and he will provide notable examples! (For ages fourteen and older.)
20 September: "Astrophotography for Youth" Judah Santiago has attended several programs at HRPO. He was inspired to image the sky any way he know how, and now he's imparting that information to the audience in this special lecture aimed at adolescents. (For ages twelve to twenty.)
27 September: "Our Birth Stars" What exactly is a "birth star"? It is that star whose light produced around the time your were born is just reaching Earth. Of course, as we age the star changes. Introduce yourself to a lifetime of birth stars and learn how to see them! (For ages fourteen and older.)

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SCIENCE ACADEMY

Saturdays from 10am to 12pm
For ages eight to twelve. $5/$6 per child.

7 September: "Uranus & Neptune" As the oppositions of these planets approach, Cadets will review the Voyager data transmitted back to Earth in the late 1980s and investigate the possible plans to return to one of them in the 2020s.
14 September: "Airplane Design" There's a reason the first "A" in NASA stands for "aeronautic". Stories, songs and poems have archived our personal experiences...aircraft have transformed the way Cadets vacation and the way adults work.
28 September: "The 'Wave' Universe" The session will build a view of the Universe from all the different waves present around us; it forgoes the standard SA format for a higher-speed rotation of demonstrations and hands-on experiments for the Cadets. *Unlike other SA session topics, this is a one-time-only opportunity on the SA calendar.*

Solar Viewing

Saturday 14 September from 12pm to 2pm.
For all ages. No admission fee.

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Stem Expansion

Saturday 28 September from 3:30pm to 7:30pm
Primary Topic: Astrobiology
Secondary Topic: The Dragonfly Mission
For ages twelve to sixteen. $15/$18 per kid.

This program offers advanced topics, topic extensions and all-new games and activities to an older crowd. Certificates will be earned, and a section of archived experiments, some not seen in over fifteen years (and some *never* performed on site) take place.

Neptunian Opposition

Monday 9 September from 8:45pm to 10:45pm
No admission fee; for all ages.

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

Expedition 61 Launch Coverage

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Wednesday 25 September
8:15am to 9:15pm = Launch
2:15pm to 3:15pm = Docking
4:15pm to 5:45pm = Hatch Opening
No admission fee; for all ages.

Join us as we help send off Christina Koch, Jessica Meir, Andrew Morgan, Luca Parmitano, Oleg Skripochka and Alexander Skvortsov.

Plus Night

Saturday 28 September from 7pm to 10pm
For all ages. No admission fee.
Binoculars recommended.

Sky Viewing Plus takes place about a half-dozen times per calendar year. It is the same program as "Evening Sky Viewing", with the following additions—
--marshmallow roast
--filtered views of the Moon, Mars and Jupiter (when those objects are available)
--physical science demonstrations
--unaided eye sky tour
--binocular sky tour
--quiz/scavenger hunt/task game for kids to earn prizes

13th Annual Spooky Spectrum

Saturday 12 October from 6pm to 10pm
No admission fee. For all ages.

Come visit on this moonless night—if you dare—as HRPO delves into the eerie side of astronomy, physics and aeronautics *for the eleventh consecutive year*. We'll have creepy science demonstrations, some of which we've never used. And don't forget the stories. Strange sky phenomena…extra dimensions… extraterrestrials. Be warned—we want to make you think!

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SPECIAL ANNOUNCEMENT:
2019 HRPO T-Shirt Available

The new T-shirt is here! White and blue on black, the design (created by HRPO Education Curator Amy Brouillette and BREC's Marketing Department) takes its inspiration from the legendary Apollo 8 "Earthrise" photo. The cost is $7.00 (tax included) per shirt. Sizes can be ordered at this time if necessary. To have a size and quantity held, call 768-9948 or email observatory@brec.org.

Observing Notes: September

by John Nagle

Aquarius – the Water Bearer

Position: RA 23, Dec. -15°

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 will be new each month.

Named Stars

Sadal Melik (Alpha Aqr), from the Arabic "Al Sa'd al Malik", "The Lucky One Of The Kingdom", sometimes called "Ruchbah", mag.2.95, 22 05 47.03 _00 19 11.4, is a yellow supergiant star and a double star. The companion star is at magnitude 12.2 and has a separation of 110" to the northeast. It may be just an optical double. Also known as **HD 209750**, **HIP 109074**, **34 Aquarii**, **BD-01 4246** and **WDS J22058-0019A**.

Sadalsuud (Beta Aqr), from "Al Sa'dal Su'ud", "The Luckiest Of The Lucky", mag. 2.90, 21 31 33.32 -05 34 16.2, is a pale yellow supergiant star (a twin to **Alpha Aquarii**), and part of a triple star system. **Companion B** is at magnitude 11.0 and has a separation of 37" from the primary. **Companion C** is at magnitude 11.6 and has a separation of 60" from the primary. Also known as **HD 204867**, **HIP 106278**, **22 Aquarii**, **BD-06 5770**, and **WDS J21316-0534A**.

Sadachbia (Gamma Aqr), from "Al Sa'd al Ah'biyah", "The Lucky Star of Hidden Things (or Hiding Places)", mag. 3.86, 22 21 39.30 -01 23 14.5, is a spectroscopic binary star with the secondary star at 12th magnitude and having a separation of 28" with a period of 58.1 days. Also known as **HD 212061**, **HIP 110395**, and **48 Aquarii**.

Skat (Delta Aqr), from either "Al Shi'at", "Awish", or "Al Säk", The Shin Bone", mag. 3.27, 22 54 39.04 -15 49 14.7. Also known as **HD 216627**, **HIP 113136**, and **76 Aquarii**.

Al Bali (Epsilon Aqr), from "Al Sa'd al Bula", "The Good Fortune of the Swallower", mag. 3.78, 20 47 40.53 -09 29 44.5. Part of **al Bula – the Swallower**. Also known as **HD 198001**, **HIP 102618**, and **2 Aquarii.**

Sadaltager (Zeta¹ Aqr), from an Arabic derivation meaning "luck of the merchant", mag. 3.65, 22 28 49.80 00 01 12.2, is a close binary star. **Zeta² Aquarii**, mag. 4.42, 22 28 50.10 -00 01 12.0. The stars, with a separation of 2.2" to 2.3", are hard to split and have a period of 486 years. The primary is a yellow-white main sequence dwarf star while its companion is a yellow-white subgiant star. There is an invisible third component in the **Zeta Aquarii** system. Multiple attempts through the years have resulted in two suspected companions to **Zeta¹ Aquarii** – one with a separation of 0.33 arc seconds (9au) with a period of 25 years. All in all, the official status is that **Zeta¹ Aquarii** is a triple star, and the whole **Zeta Aquarii** system is a quadruple star. **Zeta¹ Aquarii** is also known as **HD 213051**, **HIP 110960**, **55 Aquarii**, and **Struve 2909**. **Zeta² Aquarii** is also known as **HD 213052**, and **150 Aquarii**.

Ancha (Theta Aqr), "The Hip", mag. 4.17, 22 16 49.97 -07 46 59.7. Also known as **HD 214376**,

HIP 110003, and **43 Aquarii**.
Situla (Kappa Aqr), from the classical Latin term for a water-jar or bucket, mag. 5.04, 22 37 45.42 -04 13 39.9. Also known as **HD 214376**, **HIP 111710**, and **63 Aquarii**.
Hydor (Lambda Aqr), sometimes called Ekkhysis, mag. 3.73, 22 52 36.86 -07 34 46.8, is a re3d irregular variable star. Also known as **HD 216386**, **HIP 112961**, and **73 Aquarii**.
Albulaan (Mu Aqr), mag. 4.73, 20 52 39.2 -08 58 39.7, is a double star, a spectroscopic binary star, and a part of **al Bula – the Swallower**. Also known as **HD 198743**, **HIP 103045**, and **6 Aquarii**.
Albulaan (Nu Aqr), mag. 4.50, 21 09 35.59 -11 22 18.0, is a part of **al Bula – the Swallower**. Also known as **HD 201381**, **HIP 104459**, and **13 Aquarii**.
Banda (Xi Aqr), also "Thanih Saad al Saaoud", mag. 4.68, 21 37 45.04 -07 51 14.9, is a double star. Also known as **HD 205767**, **HIP 106786**, and **23 Aquarii**.
Kae Uh (Omicron Aqr), "The Roof", associated with Alpha Aquarii under the title "Al Sa'd al Mulk", mag. 4.74, 22 03 18.83 -02 09 19.2, is an emission line star. Also known as **HD 209409**, **HIP 108874**, and **31 Aquarii**.
Seat (Pi Aqr), mag. 4.80, 22 25 16.61 +01 22 38.6, is an emission line star. Also known as **HD 212571**, **HIP 110672**, and **52 Aquarii**.

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Deep Sky:

M2 (NGC 7089), mag. 6.5, 21 30 09 -01 04 00, 16' in size, has a high concentration of stars; very bright, very large, very well resolved. The compact core will need an 8" or larger telescope to resolve. Contains between 100,000 and 150,000 stars. Located 4.8˚ north of **Beta Aquarii**. Also known as **Mel 225**, **EQ2130-010**, and **C2130-010**.
M72 (NGC 6981), mag. 9.27, 20 53 15 -12 32 00, 5.9' in size, has a low concentration of stars; pretty bright, pretty large, round, and very well resolved in large (13 inch or larger) telescopes. Contains at least 42 variable stars. **M72** belongs to a stream of globular clusters that were formed billions of years ago (**NGC 4590**, **5824**, **6229**, **6544**, **6584**, **6934** in **Delphinus**, **7492** in **Aquarius**, **Terzan 3**, and **Palomar 10** in **Sagittarius**). Located 3˚ west-southwest of **NGC 7009** (**Saturn Nebula**). Also known as **Mel 238**, **EQ2050-127**, **B 125**, and **C2050-127**.
M73 (NGC 6944), mag. 9.7, 20 59 00 -12 38 00, 2.8' in size, is an asterism of four stars in a "Y" shape. It is just a chance alignment of stars that are unrelated physically. Located 80' east of M72. Also known as **Cr 426**, **Lund 972**, **OCI 89**, and **C2056-128**.
NGC 7293, Helix Nebula, Eye of God Nebula, Sunflower Nebula, mag. 7.3, 22 29 39 -20 50 14, 769" in size (16'x12'). This nebula has hundreds of narrow, comet-like streamers (or filaments) that run from the inner ring to the central star (**GC 4795**, magnitude 13.5). The main ring consists of an inner disk, with a diameter of 499", surrounded by an outer torus of 742" in size. The plane of the outer torus is nearly perpendicular to the plane of the inner disk. An outer ring, 1500" in diameter (or 1.76 parsecs) surrounds both structures. Located 1˚ west of **Upsilon Aquarii**. Also known as **C63**, **Ben 126**, and **PK36-57.1**.
NGC 7009, Saturn Nebula, mag. 8.0, 21 04 11 -11 21 48, 44"x23" in size, is small and very bright; central star is magnitude 12.8. In dark skies, this nebula will exhibit a distinct green to cyan color, with a halo of 40". This nebula has "fast low-ionization emission regions", or "Fliers", that are bow shock waves that are literally pointing toward the central star. To date, there is no explanation for this. Also known as **C55**, **H 1-4**, **Ben 126**, and **PK37-34.1**.
Beyond magnitude 10 of interest:
NGC 7392, mag. 11.9, 22 51 44 -20 36 29, 2.1'x1.3' in size, is pretty bright, pretty small, and slightly elongated; twin arms; dark lanes; very small, very bright nucleus. Has "feather" like structures, and the arms are loosely wound. Exhibits a chain of hot OB stars and HII regions parallel to the arms. **IC 5261** Is 39' to the east-northeast and **NGC 7365** is 1.7˚ to the northwest. Also known as **ESO 603-22**.
NGC 7252, Atoms for Peace Galaxy, mag. 12.1, 22 20 45 -24 40 42, 1.9'x1.6' in size, is faint, small, and round; extremely bright nucleus; faint filaments and loops around the main body. The spiral

structure in the center of this galaxy is rotating in a direction opposite the rest of the galaxy. This galaxy has a population of young globular clusters that were created when two spiral galaxies collided about 1 billion years ago. It has a mass of 80 million solar masses. One of the most luminous clusters is **W3**. Located 40' west-northwest of **49 Aquarii**. Also known as **H 3-458**, and **ARP 226**.
Aquarius Dwarf, MCG-02-53-03, mag. 13.9, 20 46.8 -12 51, 2.2' in size.
Aquarius Void, a region of very few galaxies that was identified in 1998. **NGC 7252** and **NGC 7392** bound the **Aquarius Void**.
SCL 205, the Aquarius Supercluster contains 19 galaxies. Located at 23 07 -20 02. Contained within the Supercluster are 19 Abell clusters representing 1135 galaxies.
In Aquarius are the following objects: 143 NGC; 53 IC; 32 UGC; 1 UGCA; 202 MCG; 3 Mel; 1 Ced; 58 ESO; 2 HCG; 10 Arp; 4 O'Neal; 9 C; 1 Abell; 1 Kro; 1 Ho; 1 Sh; 1 B; 2 Pat; 1 Mrk; 1 HN; 1 PGC; 1 NPM1G; 1 MR, 1 IRAS; 1 Al; 1 [AO84}; 2 Radio galaxies; 2 Quasar; 39 Herschel; and 196 Abell Galaxy Clusters.

Other Stars:

Psi¹ Aqr, mag. 4.24, 23 15 53.28 -09 05 15.7, is an orange giant star and the brightest component of a triple star system. Its companion is a binary star with both at 10th magnitude. One planet is in orbit around the primary star. Also known as **HD 219449**, **HIP 114855**, and **91 Aquarii**.
Psi²Aqr, mag. 4.41, 23 17 54.20 -09 10 57.0, is a Be class star. Also known as **HD 219688**, **HIP 115033**, and **93 Aquarii**.
Psi³Aqr, mag. 4.99, 23 18 57.65 -09 36 38.6, is a triple star. Also known as **HD 219832**, **HIP 115115**, And **95 Aquarii**.
R Aqr, mag. 6.36, 23 43 49.50 -15 17 04.0, is a red giant star with a symbiotic white dwarf star with a nebula formed about the system. The primary is a **Mira** variable star (magnitude 5.8 to 12.4) with a period of 390 days. Also known as **HD 222800**, **HIP 117054**, **Ced 211**, and **Harvard 2338-15**.
114G. Aqr, mag. 6.63, 22 09 29.87 -07 32 55.2, has one planet in orbit. Also known as **HD 210277** and **HIP 109378**.
HD 212771, mag. 7.60, 22 27 03.07 -17 15 49.2, has one planet in orbit at a separation of 1.22au. Also known as **HIP 110813**.
HD 222582, mag. 7.70, 23 41 51.53 -05 59 08.7, has one planet in orbit. Also known as **HIP 116906**.
HD 220689, mag. 7.77, 23 25 53 -20 36 58, has one planet in orbit. Also known as **HIP 115662**.
HD 215152, mag. 8.13, 22 43 21 -06 24 03, has two planets in orbit, with separations of 0.0652 au and 0.8852 au. Also known as **HIP 112190**.
HD 206610, mag. 8.34, 21 43 24.90 -07 24 29.7, has one planet in orbit with a separation of 1.68 au and a period of 610 days. Also known as **HIP 107251**.
Stars of interest beyond magnitude 10 are as follows:
Gl 876, mag. 10.17, 22 53 16.73 -14 15 49.3, is a red dwarf star with four planets in orbit. The orbits of the three outer planets are locked in a Laplace resonance (1:2:4) between their orbital periods. This is the first dwarf star with a planetary system ever discovered. Also known as **HIP 113020**.
Gl 849, mag. 10.42, 22 09 40.35 -04 38 26.6, is a red dwarf star with one planet in orbit at a separation of 2.35 au. Also known as **HIP 109388**.
WASP 47, mag. 11.9, 20 40 09.16 -00 52 15.0, has one transiting planet with an orbital period of 4.15 days and a separation of 0.052 au.
EZ Aqr, mag. 12.18, 22 38 33.62 -15 17 59.2, is a triple star, a flare star, and is the 12th closest star system to **Earth**.
Other stars in Aquarius are as follows: 23 Σ; 1 Σll; 9β; 3 S; 1 H; 2 h; 1 Hu; 1 See, over 80 double and multiple stars; and over 35 variable stars.

Sky Happenings:September, 2019

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

Sept. 2nd - **Mars** is in conjunction with the **Sun** at 6 AM CDT.

Sept. 3rd - **Mercury** is in superior conjunction with the **Sun** at 9 PM CDT.

Sept. 5th - Evening: The first quarter **Moon** and **Jupiter** (3˚ east of the **Moon**) are in the south-southwest above **Antares** after sunset. They will sink below the horizon before midnight,
First Quarter Moon occurs at 10:10 PM CDT.

Sept. 6th - **Neptune** will be 34 arc seconds to the southeast of **Phi¹ Aquarii** at 12:00 AM CDT,
Asteroid **Hertha** is at opposition at 1 AM CDT,
The **Moon** passes 2˚ north of **Jupiter** at 2 AM CDT,
Neptune passes **Phi¹ Aquarii** (4.2 magnitude) by 13 arc seconds to the southeast at 7:30 AM CDT.
Dusk: The **Moon**, **Jupiter**, and **Saturn** are above the tail of **Scorpius**.

Sept. 7th - Dusk: **Saturn** is to the upper right of the waxing gibbous **Moon** above the **Teapot** in **Sagittarius**,
Neptune is 1 arc minute southwest of **Phi¹ Aquarii**.

Sept. 8th - The **Moon** passes 0.04˚ south of **Saturn** at 9 AM CDT,
Dusk: **Saturn** is 7˚ to the right or lower right of the **Moon**, with both hovering above and to the left of the **Teapot**'s handle in **Sagittarius**,
The **Moon** passes 0.08˚ north of **Pluto** at 10 PM CDT.

Sept. 10th - **Neptune** is at opposition at 2 AM CDT.

Sept. 13th - The **Moon** is at apogee (252,511 miles or 406,377 km from **Earth**) at 8:22 AM CDT,
The **Moon** passes 4˚ south of **Neptune** at 1 PM CDT,
Sunset: The **Harvest Moon** rises,
Full Moon occurs at 11:33 PM CDT and will be the smallest **Full Moon** of 2019.

Sept. 17th - The **Moon** passes 4˚ south of **Uranus** at 3 PM CDT.

Sept. 18th - **Saturn** is stationary at 1 AM CDT.

Sept. 20th - Dawn: High in the southern sky in **Taurus**, the waning gibbous **Moon** is in the **Hyades**, not far from **Aldebaran**.

Sept. 21st - **Last Quarter Moon** occurs at 9:41 AM CDT.

Sept. 22nd - The **Moon** is 2˚ south of **M35** at 4 AM CDT.

Sept. 23rd - The **Autumnal Equinox** occurs at 2:50 AM CDT, signaling the official start of **Autumn** for the **Northern Hemisphere**,
Morning: The **Moon** is in **Gemini** forming a triangle with **Castor** and **Pollux**.

Sept. 24th - Morning: The waning crescent **Moon** is to the upper right of the **Beehive Cluster** (**M44**).

Sept. 25th - Asteroid **Vesta** is stationary at 12:00 AM CDT,
Morning: The waning crescent **Moon** is to the lower left of the **Beehive Cluster** (**M44**).

Sept. 26th - Dawn: The thin sliver of the **Moon** is in **Leo** just 3˚ to the left of **Regulus**.

Sept. 27th - The **Moon** is at perigee (222,328 miles or 357,802 km from **Earth**) at 9:24 PM CDT,
Asteroid **Lutetia** is at opposition at midnight CDT.

Sept. 28th - **New Moon** occurs at 1:26 PM CDT,
Mercury passes 1.4˚ north of **Spica** at 6 PM CDT.

Sept. 29th - The **Moon** passes 6˚ north of **Mercury** at 5 PM CDT.

Oct. 2nd - **Pluto** is stationary,
Venus is 3˚ north of **Spica**.

Oct. 3rd - Dusk: The waxing crescent **Moon** and **Jupiter** are about 1½˚ apart in the southwest shortly after sunset, with **Antares** being some 10˚ to the pair's lower right.

Oct. 4th - Dusk: **Saturn**, the **Moon**, **Jupiter**, and **Antares** extend along a shallow arc 34˚ long stretching from the south to the southwest as evening falls.

Planets:

Mercury – Mercury is in superior conjunction with the **Sun** on the night of September 3rd/4th. On the evening of September 28th, one might, with optical aid, catch a fainter **Spica** a little more than 1˚ southwest of **Mercury**. On September 30th, **Mercury** (at magnitude -0.2) will be one binocular field to the upper left of **Venus**, which stands 1˚ above the western horizon 30 minutes after sunset.

Venus – Venus reappears after sunset in the second half of the month, but will be difficult to catch (even though it is at magnitude -3.9) because it sets in the western sky about 30 minutes after sunset. On September 13th, **Venus** has a close conjunction (0.3˚) with **Mercury** when they are only 8˚ from the **Sun**. Both will be bright enough to be visible in a single field of view of a carefully aimed telescope during daylight.

Mars – Mars is in conjunction with the **Sun** on September 2nd, only 1½ days before **Mercury**. **Mars** will return to view before dawn about the third week of October.

Jupiter – Jupiter stands 25˚ high in the south-southwest an hour after sunset in early September, and 20˚ high in the southwest at the same time at month's end. **Jupiter** will dim from magnitude -2.2 to -2.0 during the month, but will still be bright in southwest **Ophiuchus**. The planet's angular diameter will decrease from 39" to 36" during September. **Jupiter** reaches eastern quadrature (90˚ east of the **Sun**) on September 8th. By the end of the month, the planet will set not long after 10 PM local daylight time. On the evening of the 19th, **Ganymede** will pass 30" due north of **Callisto**. For a listing of the phenomena of **Jupiter**'s moons, see page 51 of the September issue of ***Sky and Telescope***, or see pages 235 and 236 of the ***RASC Observers Handbook for 2019, USA Edition.***

Saturn – Saturn lies about 30˚ east of **Jupiter**, and trails some two hours behind. **Saturn** culminates in the south not long after 9 PM local daylight time as the month opens, but only a little more than ½ hour after sunset as the month ends. The planet is in **Sagittarius**, just south of the **Teaspoon** asterism. The planet will fade from magnitude +0.3 t0 +0.5 this month and will be stationary on September 10th. The apparent equatorial diameter will decrease to less than 17" late in the month, while the rings span 39" and tilt 25˚ to our line of sight. Amateur telescopes reveal six saturnian moons. **Titan**, at 8th magnitude, can be seen through any telescope. It can be found due south of **Saturn** on the 7th and 23rd, and due north of the planet on the 16th. The three 10th magnitude moons –**Tethys**, **Dione**, and **Rhea** – orbit the planet inside the orbit of **Titan** and appear through a 4-inch or better telescope. **Enceladus**, at 12th magnitude, will require a bigger telescope to see it. This moon orbits so close to the outer edge of the rings that it is often lost in the glare. Look for it on the 4th of September when it lies 5" southwest of **Tethys**. **Iapetus** is glowing at 11th magnitude when it passes 1.4' south of **Saturn** on the 11th.It will brighten in the following weeks reaching 10th magnitude when it lies 8.5' from **Saturn** at the end of the month.

Uranus - Uranus, at magnitude 5.7, will be hard to find because it lacks a nearby star to guide you. The planet rises among the background stars of southern **Aries** by 10 PM local daylight time in early September and two hours earlier by month's end. It is easier to find once it climbs high in the south after midnight. To locate **Uranus**, start at 2nd magnitude **Hamal** (**Alpha Arietis**). **Uranus** is 11˚ south of this star in a sparse region slightly south of the 6th magnitude star **19 Arietis**. The planet appears less than 2.5˚ south of this star all month. To verify sighting, only **Uranus** shows a blue-green disk that spans 3.7".

Neptune – Neptune reaches opposition on the night of September 9th/10th, and will be visible all night long. The planet will pass within 1' of the magnitude 4.2 star **Phi Aquarii** on the 6th. You will need binoculars or a telescope to see the fainter glow of magnitude 7.8 **Neptune**. First, locate **Phi Aquarii** in eastern **Aquarius**. The star appears 30˚ high in the southeast by 11 PM local daylight time on the 1st, and reaches a similar altitude by 9 PM at month's end. The planet lies 7' east of the star on the 1st, but the gap will close each night. At 10 PM CDT on the 5th, the planet stands 47" east of **Phi Aquarii**, and the separation narrows by about 4" with each passing hour. Their closest approach, 13" apart, comes shortly after daybreak on the 6th. **Neptune**, blue-grey in color, shows a 2.4" diameter disk. The planet's westward motion will carry it 6' west of **Phi Arietis** at opposition and 40' away by the end of September.

Pluto – On September 15th, **Pluto** will be located at 19 28.8 -22 23, with a magnitude of 14.3 and an angular size of 0.1".

Sun – The **Sun** arrives at the September **Equinox** at 2:50 AM CDT on September 23rd for the official start of **Autumn** in the **Northern Hemisphere**.

Moon – The **Moon** reaches its first quarter phase on September 5th, forming a triangle with **Antares** 7˚ or

less below it and **Jupiter** much closer to its left. The waxing gibbous **Moon** is 5˚ to6˚ to the right of **Saturn** at nightfall on the 7th, and on the 8th is also 5˚ to 6˚ to the planet's lower left. The full **Moon** (at apogee) on the night of the 13th/14th is also the **Harvest Moon**. The waning gibbous **Moon** is near **Aldebaran**, in the **Hyades**, high in the south at dawn on the 20th. A very thin waning lunar crescent is just a few degrees to the left of **Regulus** at dawn on the 26th. Greatest North declination (+22.7˚) on the 23rd. Greatest South declination (-22.5˚) on the 8th. Libration in longitude: East limb most exposed (+7.9˚) on the 5th, West limb most exposed (-7.1˚) on the 22nd. Libration in latitude: North limb most exposed (+6.6˚) on the 16th, South limb most exposed (-6.5˚) on the 29th.

Asteroids **– Ceres**, at 9th magnitude, will be visible through a 3-inch telescope this month, but will be a challenge to see it through binoculars. The dwarf planet lies near the 1st magnitude star **Antares** in **Scorpius**. During September **Ceres** traverses through star-poor dust lanes. On September 15th, **Ceres** passes 2.9˚ north of **Antares** with the closest star brighter than **Ceres** lying 1˚ away. To verify sighting of **Ceres** by its movement night to night will be nearly impossible. To do so requires some nice reference stars. The best would be **Rho Ophiuchi** itself which stands 12' south of **Ceres** on the 11th. **Ceres** position, ***by my estimates***, is as follows: On September 1st –about 2˚ northwest of **Omicron Scorpii**; on the 6th – about 1⅓˚ west-northwest of **Rho Scorpii**; on the 11th – less than 0.2˚ northwest of **Rho Scorpii**; on the 16th – about 1.2˚ due east and a little south of **Rho Scorpii**; on the 21st – about 3˚ northeast of **Antares**; on the 26th – about 4˚ northeast of **Antares**; and on October 1st – about 5˚ northeast of **Antares**.

Psyche – Positions for **Psyche**, ***by my estimates***, are as follows: On September 3rd – about 4.6˚ due west of **Theta Capricorni**; on the 9th – about 5.2˚ slightly south of due west of **Theta Capricorni**; on the 15th- about 5.6˚ slightly south of due west of **Theta Capricorni**; and on the 24th – just shy of 6˚ and slightly south of due west of **Theta Capricorni**, and just north of a 5th magnitude field star.

Eunomia – Positions for **Eunomia**, ***by my estimates***, are as follows: On September 3rd – about 1.6˚ east and a little south of 4 Aquarii; on the 9th – just under 1˚ southeast of **4 Aquarii**; on the 18th – about 0.6˚ south-southwest of 4 **Aquarii**; and on the 27th – about 1˚ southwest of **4 Aquarii**.
northeast of **18 Aquarii** or 3.6˚ northeast of **29 Capricorni**; on the 9th – about 0.2˚ southwest of **18 Aquarii** or 2.6˚ northeast of **29 Capricorni**; on the 15th - 1.2˚ southwest of **18 Aquarii** or 1.7˚ northeast of **29 Capricorni**; on the 18th – 1.5˚ southwest of **18 Aquarii** or 1.5˚ northeast of **29 Capricorni** by a 7th magnitude field star; and on the 27th - ½˚ east and a little north of **29 Capricorni**.

Comets **–** Comet **Africano** (**C/2018 W2**) will brighten to 9th magnitude this month. In early September the comet will glow at 11th magnitude against the backdrop of **Perseus**, remaining visible all night and climbing nearly overhead shortly before dawn. At the **New Moon** in September's final week the comet will grow brighter. The orbital plane of the comet will be passed through by **Earth** on the 29th. On the 28th, the comet will share the same low-power field as the 11th magnitude spiral galaxy **NGC 7743** in southern **Pegasus**. **ALPO** says that the position of the comet is as follows: On September 9th – RA 02 28.71 Dec +50 53.6; on the 19th – Ra 01 07.64 Dec +37 17.5; and on the 29th – Ra 23 43.42 Dec +09 31.1. The comet's position, ***by my estimates***, is as follows: On the 22nd – about 5½˚ east and slightly south of **Alpha Andromedae** or about 4˚ northwest of **Zeta Andromedae**; on the 24th – about 1˚ due north of **Chi Pegasi**; on the 26th – about 3½˚ due west of **Gamma Pegasi**; on the 28th – about 1˚ south of **NGC 7743** or 1½ southeast of **77 Pegasi** or 4˚ northwest of **Omega Piscium**.

Meteor Showers **–** There are no major meteor showers in September, with only four minor showers during the month. The **Epsilon Perseids** peak on the 7th of September; the **Northern Taurids** peak on the 19th; the **Northern Piscids** peak on the 25th; and the annual **Andromedids** peak on the 25th also.

When to View the Planets:

Evening Sky		Midnight		Morning Sky	
Mercury	**(west)**	**Saturn**	**(southwest)**	**Uranus**	**(southwest)**
Venus	**(west)**	**Uranus**	**(east)**	**Neptune**	**(west)**
Jupiter	**(southwest)**	**Neptune**	**(south)**		
Saturn	**(south)**				
Neptune	**(east)**				

DARK SKY VIEWING - PRIMARY ON SEPTEMBER 28TH , NO SECONDARY.

Mythology

Aquarius – The Water Bearer or Cup Bearer

Star maps show Aquarius as young man pouring water from a jar, though Ovid, in his "*Frasti*", says it is a mixture of water and nectar, the drink of the gods. The stream from the jar ends in the mouth of the southern fish, Piscis Austrinus, at the star Fomalhaut. But who is Aquarius?

The most popular identification is that he is Ganymede or Ganymedes, said to have been the most beautiful boy alive. He was the son of King Tros, who gave Troy its name. One day, while watching his father's sheep, Zeus became infatuated with the shepherd boy and swooped down on the Trojan plain in the form of an eagle, carrying Ganymede up to Olympus. The eagle is commemorated in the neighboring constellation of Aquila.

In another version of the myth, Ganymede was first carried off by Eos, goddess of the dawn, who had a passion for young men, and Zeus then stole Ganymede from her. Ganymede became the wine-waiter to the gods, dispensing nectar from his bowl, to the annoyance of Zeus's wife Hera. If this myth seems insubstantial to us, it is perhaps a result of the Greeks imposing their own story on a constellation adopted from elsewhere. The constellation of the water pourer originally seems to have represented the Egyptian god of the Nile.

Germanicus Caeser identifies the constellation with Deucalion, son of Prometheus, one of the few men to escape the great flood. 'Deucalion pours forth water, that hostile element he once fled, and in so doing draws attention to his small pitcher' wrote Germanicus. Hyginus offers the additional identification of the constellation with Ceccops, an early king of Athens, seen making sacrifices to the gods using water, for he ruled in the days before wine was made.

The constellation immemorially has been represented, even on very early Babylonian stones, as a man, or as a boy, pouring water from a bucket or urn, with an appropriate towel in the left hand.

Poster, "Aquarius", by Serge M, Digital Artist