

Turning over a New Leaflet and some Scattered Observations by Charlie Rykken

The club meeting for April will not feature any outside speakers but our own Chris Peterson and Tom Giguere will be able to report on the happenings at the 47th Lunar and Planetary Science Conference.

With this issue, all the contributors are making a commitment on getting the Astronews in the mail at least one full week before the monthly club meeting. For this month, the meeting will be on April 5.

There is an Open Supernova Catalog (<https://sne.space/>) that is very cool. Check it out! Also, for those who might like to actively participate in astronomical research, be sure to take a look at (<http://www.iau.org/public/themes/citizen-science-projects/>)

Since Chris & Tom will be returning from a planetary conference maybe they can weigh in on an online article brought to my attention by a friend. See (<http://www.physics-astronomy.com/2016/03/there-is-something-weird-and-amazing.html#.VvWdSvkrKM9>) also (<http://onlinelibrary.wiley.com/doi/10.1002/2015JA021888/abstract>) for the original article.

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Upcoming Events:

The next meeting is on Tuesday, Apr. 5th at the Bishop Museum 7:30 PM.

- Bishop Museum's planetarium shows are every Saturday of the month at 8:00 PM www.bishopmuseum.org/calendar
- The next Board meeting is Sun., Apr. 3rd 3:30 PM in POST building at UH.

President's Message April 2016

I'm writing this message from Houston where I've come to attend the 47th Lunar and Planetary Science Conference. The Microsymposium hosted by Brown University and the Vernadsky Institute (in Moscow), which precedes LPSC, this year focused on polar volatiles on the Moon and Mercury. Mercury has much more water ice in the permanently shadowed regions near its poles than does the Moon, and it's not clear why. It may just be that a comet delivered water to Mercury recently enough that water from that event has been retained while it has been much longer since the Moon has experienced a similar event. On the other hand, there may be some difference between the two bodies that makes it more difficult for the Moon to accumulate and/or retain water.

More research is planned, including a couple of CubeSat missions to the Moon that are scheduled to be carried by one of the early missions of the Space Launch System now in development. Other planned or proposed missions will continue to look at polar volatiles on both bodies.

NASA's planetary science budget for the current fiscal year got a nice boost. One of the "strings" that Congress attached was a requirement for NASA to develop a mission to Europa. This is something that has been on NASA's wish list for some time, but now it will get a higher priority. Europa (one of the Galilean satellites of Jupiter), with its deep ocean covered by a thick icy crust, has one of the most favorable environments in the solar system for the possible existence of life beyond Earth. It will probably take several missions to gather enough information to learn whether there is life there or not.

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The **Astronews** is the monthly newsletter of the Hawaiian Astronomical Society. Some of the contents may be copyrighted. We request that authors and artists be given credit for their work. Contributions are welcome. Send them to the Editor via e-mail. The deadline is the 15th of each month. We are not responsible for unsolicited artwork.

Planets Close To the Moon Times are Hawaii Standard Time










Apr 4, 14h, M 1.8° NNW of Neptune
(35° from sun in morning sky)
Apr 5, 22h, M 0.66° NNW of Venus
(16° from sun in morning sky)
Apr 13, 03h, M 5.0° SSE of Mercury
(16° from sun in evening sky)
Apr 17, 17h, M 2.1° SSW of Jupiter
(135° from sun in evening sky)
Apr 24, 20h, M4.9° N of Mars
(147° from sun in morning sky)
Apr 25, 10h, M 3.3° N of Saturn
(140° from sun in morning sky)

Uranus is closer than 15° from the sun when near the moon in April.

Other Events of Interest Times are Hawaii Standard Time

Apr 7, 01:24h, New Moon
Apr 9, 11h, Uranus at conjunction with sun
(passes into morning sky)
Apr 18, 04h, Mercury at greatest elong from sun
(19.9 east of the sun in evening sky)
Apr 21, 19:24h, Full Moon
April 22, Lyrid meteors
(Unfavorable because of the full moon)
Apr 26, 10h, Asteroid 3 Juno at opposition

Planets in April

Mercury  makes its best evening appearance of the year in mid-April, reaching maximum elongation on Apr 18.	Venus  shines brightly dawn sky, at about magnitude -3.9.	Mars  rises before midnight and can be viewed in the morning sky.
Jupiter  reached opposition on March 8 and is in the sky most of the night.	Saturn  is about 5° east of Mars in the morning sky.	Uranus  reaches conjunction with the sun this month and cannot be viewed,
Neptune  is still too close to the sun for easy viewing,	3-Juno (Asteroid)  reaches opposition on April 20, so is in the best position to view this year, but is only magnitude +10.0.	Pluto (Dwarf Planet)  is in the eastern sky before sunrise, but will be better placed for viewing later in the year.

HAWAIIAN ASTRONOMICAL SOCIETY GENERAL MEMBERSHIP MEETING March 1, 2016

(Prior to the call to order, Joanne Bogan, master of the Planetarium sphere, allowed us to see the updated version of the new video, Eyes on Island Earth, being produced for the Bishop Museum Planetarium show.)

President Chris Peterson called the March 1, 2016 meeting of the Hawaiian Astronomical Society to order at 7:32 p.m. The meeting was held in Planetarium, on the grounds of the Bishop Museum, Honolulu, Hawaii. There were thirty-two members and four visitors in attendance.

Hawaii Space Lecture Series – There is no lecture currently scheduled. Regular lectures usually take place at the NASA Pacific Regional Planetary Data Center, room 544 in the Pacific Ocean Science and Technology Building on the Manoa campus of the University of Hawaii. Should you be interested in upcoming lectures or for information you can contact NASA PRPDC at 808-956-3132 or on the Web go to <http://www.higp.hawaii.edu/prpdc>.

Happy Leap Year – President Chris Peterson gave a short explanation of the astronomical aspects of what has come to be known as Leap Year.

Star Party Report – Calvin Olivera reported on the February school star parties. They were as follows:

February 5 - Waialua Elementary and Intermediate School – this event was sadly cancelled

February 11 – Waipahu Elementary - 4 astronomers with their scopes shared the night sky with appreciative students

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(Continued from page 2) President's Report

Results continue to pour in from the dwarf planet missions. Dawn is in its final mapping orbit at Ceres. New Horizons has now returned about half of the data from its flyby of the Pluto-Charon system, and the team will soon formally request an extension of its mission to visit another Kuiper belt object.

I will have more to report at our April meeting.

Chris Peterson

Hawaiian Astronomical Society

Event Calendar

April 2016

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
27	28	29	30	31	1	2
					8:00 PM Globe at Night	9:00 AM Waialae School Fun Fair 6:30 PM Star Party(D)(Private) 8:00 PM Globe at Night
3	4	5	6	7	8	9
8:00 PM Globe at Night sunset 18:47	8:00 PM Globe at Night	7:30 PM Cub Meeting 8:00 PM Globe at Night	7:15 PM Punahou Star Party 8:00 PM Globe at Night	8:00 PM Globe at Night	8:00 PM Globe at Night	
10	11	12	13	14	15	16
sunset 18:49					5:30 PM Waikiki School 7:00 PM Star Party Ka'ala Elementary Family Outing	6:35 PM Public Star Party(G) 6:35 PM Public Star Party (K)
17	18	19	20	21	22	23
sunset 18:52					7:00 PM Starry Night	
24	25	26	27	28	29	30
sunset 18:49					7:00 PM Birthday Star Party 8:00 PM Globe at Night	6:45 PM Public Star Party(D) 8:00 PM Globe at Night
1	2					

Upcoming Star Parties

Public Party-Dillingham Apr. 30 (April Lew)

Public Party Geiger Apr. 16

Public Party Kahala Apr. 16

Upcoming School Star Parties

Sat	Apr 2, 2016	Waialai School
Wed	Apr 6, 2016	Punahou School
Fri	Apr 15, 2016	Waikiki School
Fri	Apr 15, 2016	Ka'ala Elementary
Fri	Apr 22, 2016	Gus Webling Elementary School

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February 26 – Iolani School 3rd Grade Space Night – 6 astronomers helped 72 Iolani third graders and their parents view the bright Waikiki night sky. Groups of 6 students rotated among the scopes during twelve-minute sessions.

During the month of April, H.A.S. will present the night skies to the following schools:

April 2 – Waialae Fun Fair – A Saturday daytime display booth needs manning. Call Calvin if you are interested.

April 6 – Punahou School Astronomy Night - Wednesday – Punahou Academy's Astronomy Club.

April 15 – Wahiawa - Astronomers needed.

April 22 - Astronomers needed.

Calvin will have further announcements about the latter two viewing events.

Help Bishop Museum – Tuesday, March 8th will have a partial solar eclipse that can be seen here in Hawaii. Bishop Museum is hosting a viewing opportunity, which will start at 4:30 pm on the back lawn. 5:37 pm is listed as the time of deepest darkness. Members in attendance offered to help.

Hawaii Stat Science and Engineering Fair – I would like to apologize for the inaccurate dates reported in last months ASTRONEWS minutes. The 2016 Hawaii Stat Science and Engineering Fair takes place March 28, 29, and 30, 2016 at the Hawaii Convention Center. Charlie Rykken and Gretchen West will be the H.A.S. Special Interest judges for this year's fair.

I.F.A. Open House – The Institute for Astronomy's yearly Open House will take place Sunday, April 17th. We will man a table and provide an activity for kids. Help is gratefully accepted

Astronomy Day 2016 – This year International Astronomy Day will occur on May 14, 2016. We will be looking into utilizing the area directly in front of Ross' (formerly Barnes and Noble) at the Ewa end of Kahala Mall, upper level. Gretchen West is working to obtain permission from Kahala Mall Management and Ross' to use the parking area for daytime observations, as we have done in years past.

Astronomy News –

Einstein's Gravitational Waves Theory has been proven correct. In February, scientists reported that the LIGO, Laser Interferometer Gravitational Wave Observatory, have detected gravitational waves, ripples in the fabric of space-time, confirming Albert Einstein's Theory of 100 years ago.

Guest Speaker – Nienke van der Marel, from the Institute of Astronomy, a Beatrice Watson Parrent fellow at the Institute for Astronomy at the

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Imagine a world very different from our own: permanently shrouded in clouds, where the sky was never seen. Never had anyone see the Sun, the Moon, the stars or planets, until one night, a single bright object shone through. Imagine that you saw not only a bright point of light against a dark backdrop of sky, but that you could see a banded structure, a ringed system around it and perhaps even a bright satellite: a moon. That's the magnitude of what LIGO (the Laser Interferometer Gravitational-wave Observatory) saw, when it directly detected gravitational waves for the first time.

An unavoidable prediction of Einstein's General Relativity, gravitational waves emerge whenever a mass gets accelerated. For most systems -- like Earth orbiting the Sun -- the waves are so weak that it would take many times the age of the Universe to notice. But when very massive objects orbit at very short distances, the orbits decay noticeably and rapidly, producing potentially observable gravitational waves. Systems such as the binary pulsar PSR B1913+16 [the subtlety here is that binary pulsars may contain a single neutron star, so it's best to be specific], where two neutron stars orbit one another at very short distances, had previously shown this phenomenon of orbital decay, but gravitational waves had never been directly detected until now.

When a gravitational wave passes through an objects, it simultaneously stretches and compresses space along mutually perpendicular directions: first horizontally, then vertically, in an oscillating fashion. The LIGO detectors work by splitting a laser beam into perpendicular "arms," letting the beams reflect back and forth in each arm hundreds of times (for an effective path lengths of hundreds of km), and then recombining them at a photodetector. The interference pattern seen there will shift, predictably, if gravitational waves pass through and change the effective path lengths of the arms. Over a span of 20 milliseconds on September 14, 2015, both LIGO detectors (in Louisiana and Washington) saw identical stretching-and-compressing patterns. From that tiny amount of data, scientists were able to conclude that two black holes, of 36 and 29 solar masses apiece, merged together, emitting 5% of their total mass into gravitational wave energy, via Einstein's $E = mc^2$.

During that event, more energy was emitted in gravitational waves than by all the stars in the observable Universe combined. The entire Earth was com-

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The Lyrids are a medium strength shower that usually produces good rates for three nights centered on the maximum. These meteors also usually lack persistent trains but can produce fireballs. These meteors are best seen from the northern hemisphere where the radiant is high in the sky at dawn. Activity from this shower can be seen from the southern hemisphere, but at a lower rate. This year the Lyrids will coincide with the full moon – making observing very difficult.



First Quarter	Full Moon	Last Quarter	New Moon
April 14	April 22	April 30	April 7

Shower	Activity	Maximum		Radiant		V_{∞}	r	ZHR
		Date	$\lambda \odot$	α	δ	km/s		
Lyrids (LYR)	04/16→ 04/25	Apr 22	32.32°	271°	+34°	49	2.1	18
π - Pup- pids (PPU)	04/15→ 04/28	Apr 23	33.5°	110°	-45°	18	2.0	Var

The Lyrid meteors will have to be bright this year to overpower the full moon!
 Tom Giguere, 808-782-1408, Thomas.giguere@yahoo.com; Mike Morrow,
 PO Box 6692, Ocean View, HI 96737.

Treasurer's Report

by April Lew

HAS Financial Report February 16 – March 15 2016			
Beginning Bal- ance	1874.29		
Income:			
	Dues Received	114.00	
	Astronomy Magazine	34.00	
Total Income	148.00		
Expenses:			
	February Astronews printing & mail- ing	119.74	
	Astronomy Magazine	34.00	
Total Expenses	153.74		
Ending Balance	1868.55		

We welcome five new members this month. They are **Nalu, Fumie, Anderson, & Nana Clemons and Jake Arakawa.**

Many thanks to those renewing their membership (Lenore Hansen-Stafford, Gerald, Rebecca, & Jonathan Miyasato, Lisa F. Ota, and John Spurlock).

As a reminder, please check your membership anniversary date listed on the Astronews address label. Clear skies to all!

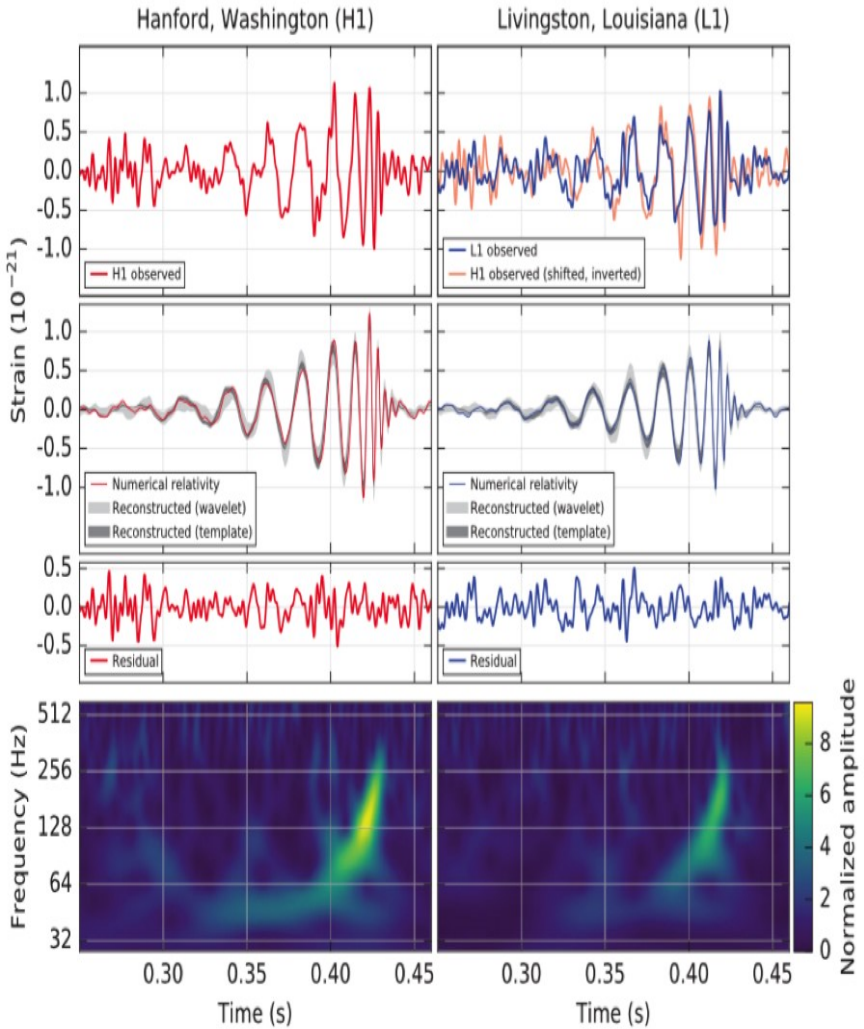
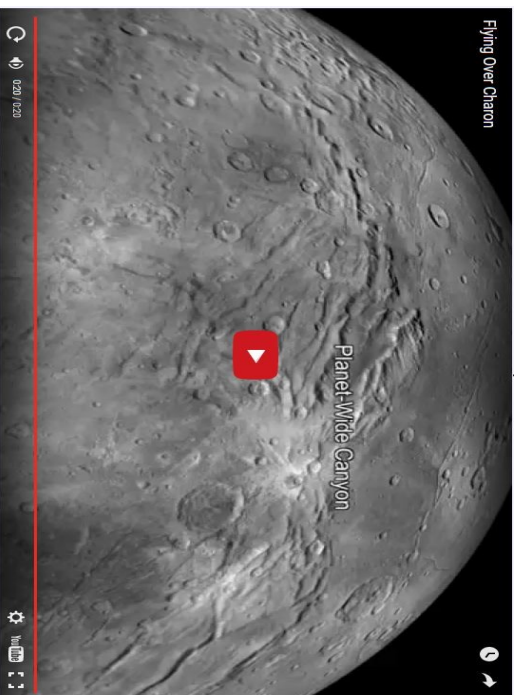


Image credit: Observation of Gravitational Waves from a Binary Black Hole Merger B. P. Abbott et al., (LIGO Scientific Collaboration and Virgo Collaboration), Physical Review Letters 116, 061102 (2016). This figure shows the data (top panels) at the Washington and Louisiana LIGO stations, the predicted signal from Einstein's theory (middle panels), and the inferred signals (bottom panels). The signals matched perfectly in both detectors.

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Flying Over Pluto's Moon Charon
Video Credit: [NASA](#), [Johns Hopkins U.](#), [APL](#), [SwRI](#), Stuart Robbins
see <http://apod.nasa.gov/apod/ap160222.html>