

## Speaker for March

Nienke van der Marel obtained her PhD in astronomy cum laude at Leiden Observatory in the Netherlands in September 2015, with thesis title "Mind the gap: gas and dust in planet-forming disks". She is currently working as Beatrice Watson Parrent Fellow at the Institute for Astronomy at the University of Hawaii.

### Talk Topic :

In recent years, astronomers have discovered thousands of exoplanets: planets around other stars than our Sun. Planets form in disks around young stars: pancake-like structures of gas and dust. How this formation process works is still a mystery. The ALMA telescope, an enormous array of 66 telescope dishes in the Atacama desert at 15000 ft altitude in Chile, gives the opportunity to zoom in to these disks. I will explain how astronomers search for the answers on planet formation and show some of the major discoveries of ALMA in the last few years.

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### Upcoming Events:

The next meeting is on Tuesday, Mar. 1<sup>st</sup> 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](http://www.bishopmuseum.org/calendar)
- The next Board meeting is Sun., Feb. 28<sup>th</sup> 3:30 PM in POST building at UH.

## President's Message March 2016

Gravitational waves resulting from the merger of two black holes 1.3 billion light years from Earth have very likely been detected by separate instruments of the Laser Interferometer Gravitational-Wave Observatory (LIGO) in Louisiana and Washington State. The fact that the two sets of instruments found the same faint signal seven milliseconds apart gives researchers confidence that the result can be trusted.

Albert Einstein predicted the existence of gravitational waves based on his general theory of relativity that he published just over a century ago. Einstein was right! Again!! (Yawn.)

Actually, the big deal is not that Einstein was right. We've come to expect that, and it's no surprise. His theory was so advanced that it has taken many advances in technology over the last century to be able to test its predictions, and the conclusions have always been supported.

The successful detection of these waves, and the promise that holds for the future, is a big deal. Just as Galileo could scarcely have imagined what a revolution in our understanding of the universe would result from use of the optical telescope, we can only guess at what we will eventually learn from gravitational waves. As far as we know, nothing stops the effect of gravity. No dust can block its wavelengths, no galaxy can block it from view.

What will we learn? No one knows. Much of it will be a surprise. That's how science works. Every time we use a new tool or look in a new place, we find surprises. Look how unexpected were the surfaces we have imaged in the Pluto system.

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**Planets Close To the Moon**  
Times are Hawaii Standard Time

- Mar 1, 21h, M 3.6° N of Saturn  
(86° from sun in morning sky)
- Mar 6, 23h, M 3.5° NNW of Venus  
(23° from sun in morning sky)
- Mar 10, 15h, M 1.8° SSE of Uranus  
(28° from sun in evening sky)
- Mar 21, 17h, M 2.0° SSW of Jupiter  
(165° from sun in evening sky)
- Mar 28, 10h, M 4.1° N of Mars  
(122° from sun in morning sky)
- Mar 29, 05h, M 3.5° N of Saturn  
(113° from sun in morning sky)

Mercury and Neptune are closer than 15° from the sun when near the moon in March.

**Other Events of Interest**  
Times are Hawaii Standard Time

- Mar 6, 04h, moon 0.78° S of Asteroid 18 Melpomen  
(34° from sun in evening sky)
- Mar 8, 03h, Jupiter at Opposition
- Mar 8, 15:54h, New Moon  
(Total eclipse of the sun - Partial from Hawaii)
- Mar 11, 12h, Moon 1.4° NNW of Asteroid 4 Vesta  
(40° from sun in evening sky)
- Mar 19, 18:30h, Spring or Vernal equinox
- Mar 23, 02:01h, Full Moon
- Mar 23, 10h, Mercury at superior conj with sun  
(Passes into evening sky)
- Mar 27, Easter Sunday  
(First Sunday after the first full moon after the vernal equinox)

**Planets in March**

<p><b>Mercury</b></p>  <p>too close to the sun to be viewed in March</p>	<p><b>Venus</b></p>  <p>shines brightly low in the morning sky, at about magnitude -3.9.</p>	<p><b>Mars</b></p>  <p>rises before midnight and can be viewed in the morning sky.</p>
<p><b>Jupiter</b></p>  <p>reaches opposition on March 8 and is in the sky all night.</p>	<p><b>Saturn</b></p>  <p>is high in the eastern sky before dawn.</p>	<p><b>Uranus</b></p>  <p>is low in the southwestern sky after sunset.</p>
<p><b>Neptune</b></p>  <p>reached conjunction with sun last month and is still too close to the sun for viewing.</p>	<p><b>18 Melpomene</b></p>  <p>is very close to the moon on March 6. Will reach conjunction with sun later in the year.</p>	<p><b>Pluto (Dwarf Planet)</b></p>  <p>is in the eastern sky before sunrise, but will be better placed for viewing later in the year.</p>

HAWAIIAN ASTRONOMICAL SOCIETY  
GENERAL MEMBERSHIP MEETING  
February 2, 2016

President Chris Peterson called the February 2, 2016 meeting of the Hawaiian Astronomical Society to order at 7:33 p.m. The meeting was held in Planetarium, on the grounds of the Bishop Museum, Honolulu, Hawaii. There were thirty-four members and two visitors in attendance.

Hawaii Space Lecture Series – This month’s lecture at the UH Manoa is scheduled for 7:30 p.m. Tuesday, February 23, 2016. Luke Flynn the Head of Hawaii Space Flight Lab and member of the Space Grant College will be this month’s speaker. 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>.

Reminder – The Bishop Museum parking has instituted a pay-and-park system on the museum grounds. Daytime rates are \$5, and \$3 for nighttime parking. A pay kiosk is located to the left of the steps leading to the Bishop Museum Gift Shop, which accepts both bills and credit cards. Those individuals who are Bishop Museum members do not have to pay, but need to display a museum placard or sticker.

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*(Continued from page 2) President’s Report*

All science begins with observation. New data demand explanation. It is rare for someone like Einstein to come along and produce a theory that predicts so many things that few people had even wondered about. Most of the time, science tries to explain what has been observed.

Now that the technique has apparently been validated, it should become easier to obtain funding for a larger version of LIGO that would operate in space. This would allow longer baselines and greater stability to enhance the sensitivity of the detectors. A new chapter in the history of astronomy has begun.

**Chris Peterson**

# Hawaiian Astronomical Society Event Calendar

March 2016

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
28	29	1 	2	3	4	5
		7:30 PM Club Meeting 8:00 PM Globe at Night	8:00 PM Globe at Night	8:00 PM Globe at Night	8:00 PM Globe at Night	8:00 PM Globe at Night 6:25 PM Club Star Party(D) (Private)
6	7	8	9 	10	11	12
8:00 PM Globe at Night sunset 18:38	8:00 PM Globe at Night	8:00 PM Globe at Night	8:00 PM Globe at Night	8:00 PM Globe at Night		6:25 PM Public Star Party(G) 6:25 PM Public Star Party(K)
13	14 	15	16	17	18	19
sunset 18:40						
20	21	22	23 	24	25	26
sunset 18:43						6:30 PM Public Star Party(D)
27	28	29	30	31	1	2
sunset 18:45			8:00 PM Globe at Night	8:00 PM Globe at Night		

**Upcoming Star Parties**

**Public Party-Dillingham Mar. 26 (Calvin Oliveria)**

**Public Party Geiger Feb. 13**

**Public Party Kahala Feb. 13**

### Upcoming School Star Parties

		No School Parties for March
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*(Continued from page 4) Meeting Minutes*

Help Bishop Museum – Tuesday, March 8<sup>th</sup> 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. However, if you are interested, please contact Chris Peterson.

Permits - Chris Peterson reports that the permits for viewing locations at Kahala Community Park and Geiger Community Park have been obtained. We would like to thank Barry Peckham and John Gallagher for the hard at work they did in obtaining the permits.

Hawaii State Science and Engineering Fair – This year's Hawaii State Science and Engineering Fair is slated to take place March 26, 27, and 28, at the Convention Center. Charlie Rykken will be one of the H.A.S. Special Interest judges for this year's fair. We would like to have others participate in this process. If interested, please contact Charlie Rykken.

I.F.A. Open House – We are still waiting to receive information about the Institute for Astronomy's yearly Open House. It usually takes place in April.

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. We will endeavor 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 –

- Planet X – Through the magic of computers, and the hard work of scientist, the probability of a ninth planet, a Kuiper Belt body, has been theorized. Computer research has looked at the behavior of known objects and theorized that a ninth planet is a possibility. This planet would most probably have a mass of about ten-times that of Earth's.
- Thirty Meter Telescope – Unfortunately, the project has to go through the permitting process once again. H.A.S. hopes that the backers do not go shopping for another project location.
- The Cassini mission has reached an equatorial orbit where it will study the rings and further our understanding of mass of the inner and outer territories these rings inhabit.

Visitors – Chris welcomed our Diane Harrison to the meeting. We welcome all who wish to learn more about the skies overhead.

Tom Giguere – Tom and his team at the University of Hawaii have created a one of a kind calendar, which Tom gave away to the person whose birthday was closest to today's meeting.

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When you think about the new stars forming in the Milky Way, you probably think of the giant star-forming regions like the Orion Nebula, containing thousands of new stars with light so bright it's visible to the naked eye. At over 400 parsecs (1,300 light years) distant, it's one of the most spectacular sights in the night sky, and the vast majority of the light from galaxies originates from nebulae like this one. But its great luminosity and relative proximity makes it easy to overlook the fact that there are a slew of much closer star-forming regions than the Orion Nebula; they're just much, much fainter.

If you get a collapsing molecular cloud many hundreds of thousands (or more) times the mass of our sun, you'll get a nebula like Orion. But if your cloud is only a few thousand times the sun's mass, it's going to be much fainter. In most instances, the clumps of matter within will grow slowly, the neutral matter will block more light than it reflects or emits, and only a tiny fraction of the stars that form—the most massive, brightest ones—will be visible at all. Between just 400 and 500 light years away are the closest such regions to Earth: the molecular clouds in the constellations of Chamaeleon and Corona Australis. Along with the Lupus molecular clouds (about 600 light years distant), these dark, light-blocking patches are virtually unknown to most sky watchers in the northern hemisphere, as they're all southern hemisphere objects.

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*Image credit: NASA and ESA Hubble Space Telescope. Acknowledgements: Kevin Luhman (Pennsylvania State University), and Judy Schmidt, of the Chamaeleon cloud and a newly-forming star within it—HH 909A—emitting narrow streams of gas from its poles.*

March is a one shower month, at least according to one official source. The International Meteor Organization (IMO) specifies the Gamma Normids (GNO) as the lone event, peaking on March 14<sup>th</sup>. With a maximum of six meteors per hour, this shower is barely above the background. The two positives going for this shower is that it peaks under a 6 day old Moon, so the light interference is small, and also the radiant of the shower is quite far south at 50 degrees, which gives us an advantage over mainland observers.

Let's switch gears a bit and discuss the most exciting type of meteors that we can observe, fireballs! Fireballs are very bright meteors, that light up the sky, and generally elicit loud oh's and ah's when seen. I suppose we can say that you'll know it when you see one, but to be more specific a meteor is generally classified as a fireball when it has a magnitude of -4 or brighter. Thus a meteor would have to be brighter than Jupiter and actually be at the brightness of Venus or more to reach fireball status. Another characteristic that helps with the characterization, although I haven't read it, would be the

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<b>First Quarter</b>	<b>Full Moon</b>	<b>Last Quarter</b>	<b>New Moon</b>
March 15	March 23	March 1/31	March 9

Shower	Activity	Maximum		Radiant		$V_{\infty}$	$r$	ZHR
		Date	$\lambda_{\odot}$	$\alpha$	$\delta$	km/s		
Gamma Normids (GNO)	02/25→ 03/22	Mar 14	354°	239°	-50°	56	2.4	6

Meteors faint or bright, tell us about your plight and any views that you might have had! Tom Giguere, 808-782-1408, [Thomas.giguere@yahoo.com](mailto:Thomas.giguere@yahoo.com); Mike Morrow, PO Box 6692, Ocean View, HI 96737.

# Treasurer's Report

by April Lew

HAS Financial Report January 16 –February 15 2016			
Beginning Balance			1889.06
Income:			
	Dues Received	164.00	
	Astronomy Magazine	34.00	
	Sky & Telescope Magazine	32.95	
Total Income			230.95
Expenses:			
	January Astronews printing & mailing	171.86	
	Postage	9.80	
	Astronomy Magazine	34.00	
	Snacks for Feb. 2 Club meeting	14.06	
	State of Hawaii GE taxes for 2015	16.00	
Total Expenses			245.72
Ending Balance			1874.29

We welcome seven new members this month. They are **Alan, Su Yun, & Gordon Asato**

Many thanks to those renewing their membership (Mike Baylog, Kayoko Calef, Yoshiyuki Inoue, Barry Peckham, Buzz Willauer, and Andre and Daunna Yanoviak).

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

*(Continued from page 8) Meteor Log*

length and duration of the train. The greater the length of the train, and the longer that it remains visible the more impressive that it is.

The American Meteor Society (AMS) at <http://www.amsmeteors.org/articles/>, focuses a lot on fireballs with the latest news, recent fireballs viewed and where, predictions as to whether a fireball produced a fall, and tools to facilitate reporting your own fireball observations. It's a really nice site.

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*(Space Place Continued from page 7)*

In visible light, these clouds appear predominantly as dark patches, obscuring and reddening the light of background stars. In the infrared, though, the gas glows brilliantly as it forms new stars inside. Combined near-infrared and visible light observations, such as those taken by the Hubble Space Telescope, can reveal the structure of the clouds as well as the young stars inside. In the Chameleon cloud, for example, there are between 200 and 300 new stars, including over 100 X-ray sources (between the Chamaeleon I and II clouds), approximately 50 T-Tauri stars and just a couple of massive, B-class stars. There's a third dark, molecular cloud (Chamaeleon III) that has not yet formed any stars at all.

While the majority of new stars form in large molecular clouds, the closest new stars form in much smaller, more abundant ones. As we reach out to the most distant quasars and galaxies in the universe, remember that there are still star-forming mysteries to be solved right here in our own backyard.

*(Continued from page 6) Meeting Minutes*

Peter Besenbruch again provided a narrated power point compilation.

Sloan Digital Sky Survey (SDSS) – Peter spoke of the information that the SDSS has given researchers as they look at quasars and black holes.

Scope Donation – Peter spoke of a Maksutov telescope available on-line.

Cheap sale for the cool 7” Russian catadioptric telescope. Only \$3000.

Virtual Telescope – There was a brief discussion of interferometry, or seeing with multiple scopes.

.Milky Way collision - Are you ready? Well you only have to wait 1.2 million years for our Milky Way galaxy to collide with the Andromeda galaxy. Peter is just thinking ahead.

Another collision – Cloud Smith in Aquila – Peter provided members a view of this gas cloud that probably originated in the Milky Way but is boom-eranging back toward us. It should return in about 30 million years. Be ready.

The Planetarium – Once again, Joanne Bogan, master of the Planetarium sphere, allowed us to see the yet-to-be finished video program, Eyes on Island Earth, being produced for the Bishop Museum Planetarium show.

Mahalo – As there was no further business, the meeting was adjourned at 9:02 p.m. Post meeting goodies were available in the rotunda.

*Respectfully Submitted*

*Gretchen West*

*H.A.S. Secretary*

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The AMS does a good job with addressing viewer questions, here are two that I found interesting.

How bright does a meteor have to be before there is a chance of it reaching the ground as a meteorite?

Generally speaking, a fireball must be greater than about magnitude -8 to -10 in order to potentially produce a meteorite fall. Two important additional requirements are that (1) the parent meteoroid must be of asteroidal origin, and (2) the meteoroid must enter the atmosphere as a relatively slow meteor.

Can a meteorite dropping fireball be observed all the way to impact with the ground?

No. At some point, usually between 15 to 20 km (9-12 miles or 48,000-63,000 feet) altitude, the meteoroid remnants will decelerate to the point that the ablation process stops, and visible light is no longer generated. This occurs at a speed of about 2-4 km/sec (4500-9000 mph).

### *Upcoming School Star Parties* by Calvin Oliveria

The season for school star parties has started! On February 11th, D-Mack, John, Ort, and I went to Kanoelani Elementary in Waipahu for their 3rd grade star night. We were able to get great views of the moon, the Orion Nebula, and a few other objects.

Then on 26 February, we again made an appearance at 'Iolani School, for their 14th year of stargazing! Lastly, we do not have any star party requests for March, but for April we have three requests in, and as soon as they are finalized, I will send out the call for volunteers. The three dates for the parties are 6, 15, and 22 April. But those are currently tentative pending coordination.

Thank you to all of our volunteers! I have had absolutely NO issue trying to get enough volunteers for all of the parties. As one of the core missions of HAS, this is a great way to reach out to hundreds of children and get them interested in science. If you are interested in helping with the star parties (current HAS members only), then please contact me at [calvin.oliveria@gmail.com](mailto:calvin.oliveria@gmail.com), and I will add you to my school star party supporter list. Additionally, I will make announcements for future parties, and pass around a sign-up sheet, during the monthly meetings.



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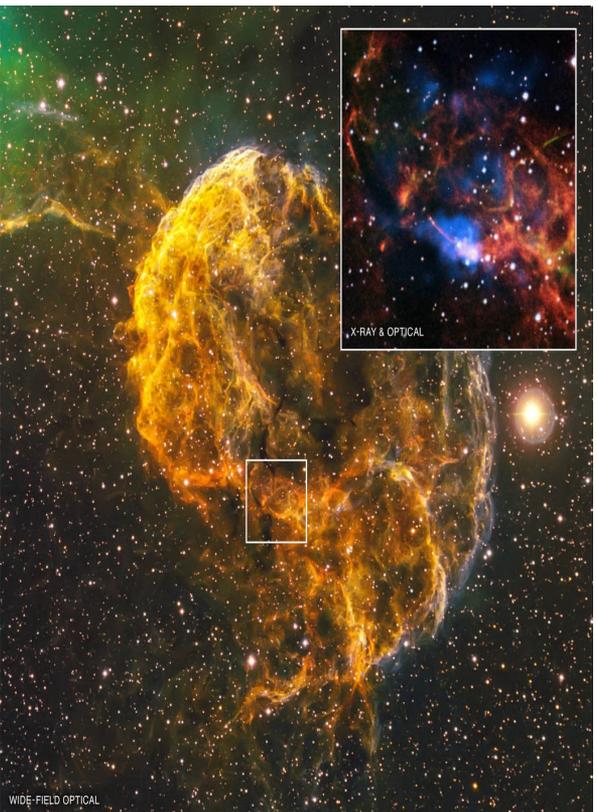


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