No.... It is not a misspelling. According to the scientific method we were all taught in grade school, scientists propose a theory and then gather data that has the potential to disprove the theory. Yes, a small change with a nod to Karl Popper (https://en.wikipedia.org/wiki/Karl_Popper). But the point is that data functions as a brake on delusional speculation. My reference is to surreal vs real (Dada was a prime representative of surrealism http://www.oxfordartonline.com/page/dada-and-surrealism) Where is all this coming from? Recently some astronomers tackled a big data problem viz counting craters on the moon https://utsc.utoronto.ca/news-events/breaking-research/new-technique-uses-ai-locate-and-count-craters-moon. Big data is everywhere as is artificial intelligence. Dada is probably having a “last laugh” over the pell mell fashion that AI is being adopted where science is being turned into surrealist art forms. For an in depth look at this dynamic see https://ea-foundation.org/files/ai-opportunities-and-risks.pdf Of course, counting craters is hyper-pedestrian but when machines really think for us, we need to be seriously responsible
President’s Message
April 2018

I recently returned from the Lunar and Planetary Science Conference in Houston. As most of you know, I’m a Moon guy. This was a good year for Moon guys.

The Microsymposium that is held on the weekend preceding the conference (at the same venue) this year featured the Chinese space exploration program. Coming up soon is the Chang-e 4 mission. It will use back-up equipment that was not needed for the Change-e 3 mission that landed in Mare Imbrium. The lander and rover for Change-e 4 will land on the Moon’s farside, a first, in the South Pole-Aitken basin. First, a communication satellite will be placed into a “halo” orbit around the L2 point in line with Earth beyond the Moon’s farside. The satellite will orbit around that point far enough that it can be seen from Earth to relay communications with the spacecraft on the ground.

NASA’s budget for Moon exploration is scheduled to get a big boost as well. There are plans for a “Lunar Gateway” project that will help enable human exploration activities. At this early stage, it is unclear exactly what will happen.

The basic plan is to have a small space station-like facility that will sometimes house a crew and where experiments can be performed. This may also be used as a way station for missions to the Moon and Mars. No specific infrastructure has been approved yet, but the inclusion of such a goal is very encouraging to those of us who have been waiting decades for a return to human exploration beyond low Earth orbit.

As we look ahead, we also took a look back. Last December marked the 45th anniversary of the last crewed mission to the Moon, Apollo 17. A panel consisting

(Continued on page 11)
Planets Close To the Moon
Times are Hawaii Standard Time

Apr 3, 04h, Jupiter 3.7º S of Moon
(about 141º from sun in morning sky)
Apr 7, 03h, Saturn 1.9º S of Moon
(about 105º from sun in morning sky)
Apr 7, 08h, Mars 3.1º S of Moon
(about 100º from sun in morning sky)
Apr 12, 14h, Neptune 1.8º N of Moon
(about 43º from sun in morning sky)
Apr 13, 23h, Mercury 3.6º N of Moon
(about 26º from sun in evening sky)
Apr 17, 12h, Venus 5.2º N of Moon
(about 23º from sun in evening sky)
Apr 30, 07h, Jupiter 3.6º S of Moon
(about 169º from sun in morning sky)
Uranus is closer than 15º from the sun
when near the moon in April.

Other Events of Interest
Times are Hawaii Standard Time

Apr 1, 07h, Mercury at inferior conj.
(Passes into morning sky)
Apr 2, 05h, Mars 1.3º S of Saturn
Apr 15, 15:57h, Moon New
Apr 18, 05h, Uranus at Conjuction
Apr 22, Lyrid meteor shower.
Apr 29, 10h, Mercury at greatest elong.
(27º west of the sun in morning sky)
Apr 29, 14:58h Full moon

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Planets in April

 Mercury
- can be viewed low in the eastern sky before sunrise in mid-month, reaching greatest elongation on April 15
- rises before midnight and shines brightly during the early morning hours.

 Venus
- can also be seen low in the western sky after sunset during April.

 Mars
- is in Scorpius in the morning sky, as it moves toward opposition in July. It is very close to Saturn on April 2.

 Jupiter
- is in the eastern sky in the early morning hours in March.

 Saturn
- reaches conjunction with the sun and cannot be viewed in April.

 Neptune
- reached conjunction on Mar 4. Appears in the morning just before dawn by the end of the month.

 4 Vesta (Asteroid)
- The brightest asteroid is already about magnitude +7.0 on its way to opposition in June, when it will be visible without a telescope at magnitude +5.3.

 Pluto (Dwarf Planet)
- in the eastern sky before sunrise.
Meeting Minutes

HAWAIIAN ASTRONOMICAL SOCIETY
GENERAL MEMBERSHIP MEETING
March 6, 2018

President Chris Peterson called the March 6 2018 meeting of the Hawaiian Astronomical Society to order at 7:30 p.m. The meeting was held in the Planetarium on the grounds of the Bishop Museum, Honolulu, Hawaii. There were approximately twenty-five members in attendance.

Last month’s meeting minutes were approved.

Chris reported on:
Iolani School party
Geiger Park - Ort left at 6:45 pm, sky was too cloudy.
Kahala Park was cloudy.
Planets Jupiter, Saturn, and Mars will be visible from late April through fall.
Science Fair in late March sent no response to HAS. Chris volunteered as a judge.
Gretchen West reported there was no response to her request for Astronomy Day at Kahala Mall.
Chris submitted a letter to the Dillingham Ranch Development about the lighting and the environmental impact statement. Chris asked about opportunity to make a response, he was “invited to participate”, but was not clear about how.
Chris suggested the club draft a statement: suggesting that street lights be shielded and a permit be required.

Star Party report by Calvin Oliveria:
Iolani School star party was better than expected.
March 16 - the Boy Scouts star party is at Kaneohe Botanical Gardens. We need one more volunteer.
March 27, Tuesday, star party at Kanoelani Elementary School in Waipahu. We need 4 -5 volunteers.

Joann needs a volunteer April 7 to operate the planetarium telescope from 8pm to 10pm.

Chris sent in a request to NASA Lunar nomenclature to have a crater named after his old boss, B. Ray Hicks, who passed away three years ago.
The Moon Mineralogy Mapper, MMM, spectrometer onboard the Chandrayaan-1 spacecraft, detected H2O & OH, indicates that water is found over entire surface of the moon.
ESA's INTEGRAL satellite observed a neutron star brought back to life by its companion, a giant red star, in a burst of x-rays.

(Continued on page 6)
## Hawaiian Astronomical Society

### Event Calendar

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#### Upcoming Star Parties

- **Public Party** - Dillingham, April 7 (Charlie Rykken)

- **Public Party Geiger** - April 21

- **Public Party Kahala** - April 21

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### April 2018

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#### Upcoming Star Parties

- **Public Party Geiger** - April 21

- **Public Party Kahala** - April 21

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### Upcoming School Star Parties

<table>
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<th>Mon</th>
<th>April 16</th>
<th>Punahou School</th>
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<tbody>
<tr>
<td>Fri</td>
<td>April 20</td>
<td>Hokulani Elementary School</td>
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</table>
There was one visitor in attendance: Geraldine Dunn from Makiki.

Leatha Conquest announced Photo Con is the 1st week of September. HAS could have a booth available at no charge, but recommended a donation of $100.00 to cover electricity, etc. Leatha will send out email and put a notice in Astronews and on the HAS website.

Chris said he received a request from a hotel to hold a star party for their guests. Chris said HAS doesn’t do commercial star parties for businesses, but an HAS member could do it and get paid by the hotel.

Peter Besenbruch, treasurer, presented some astronomical news:

- A photo of the Orion Nebula taken by HAS member Steve Chun.
- Scientists have discovered a flare off the sun's closest stellar neighbor, Proxima Centauri. The flare was 10x stronger than our sun’s flares.
- An analysis of data from India's first mission to the moon, Chandrayaan-1, and NASA's Lunar Reconnaissance Orbiter (LRO) has found evidence that the moon's water is distributed across the lunar surface and not confined to a particular region or type of terrain.
- Space Agency Budget for 2019: The Trump administration's proposed budget request for fiscal year 2019 calls for work on a major NASA space observatory and five Earth-science missions to be canceled. NASA's Office of Education would also be terminated.
- Signal picked up radio signal of the 1st star born from 180 million years after big bang.

All of this comes from an experiment that detected a faint radio signal from primordial hydrogen gas in the young universe. An amateur astronomer, Victor Buso from Argentina, using his 16" telescope caught the birth of a supernova in galaxy NGC 613.

Joann showed us the movement of the planets that will be visible in the night sky from March through August.

As there was no other business, the meeting was adjourned at 9pm. Refreshments were served on the rotunda and furnished by Hiroko and Andy Stroble.

Sincerely,

April Lew

H.A.S. Secretary
As far as we know, water is essential for every form of life. It’s a simple molecule, and we know a lot about it. Water has two hydrogen atoms and one oxygen atom. It boils at 212° Fahrenheit (100° Celsius) and freezes at 32° Fahrenheit (0° Celsius). The Earth’s surface is more than 70 percent covered in water.

On our planet, we find water at every stage: liquid, solid (ice), and gas (steam and vapor). Our bodies are mostly water. We use it to drink, bathe, clean, grow crops, make energy, and more. With everything it does, measuring where the water on Earth is, and how it moves, is no easy task.

The world’s oceans, lakes, rivers and streams are water. However, there’s also water frozen in the ice caps, glaciers, and icebergs. There’s water held in the tiny spaces between rocks and soils deep underground. With so much water all over the planet—including some of it hidden where we can’t see—NASA scientists have to get creative to study it all. One way that NASA will measure where all that water is and how it moves, is by launching a set of spacecraft this spring called GRACE-FO.

GRACE-FO stands for the “Gravity Recovery and Climate Experiment Follow-on.” “Follow-on” means it’s the second satellite mission like this—a follow-up to the original GRACE mission. GRACE-FO will use two satellites. One satellite will be about 137 miles (220 km) behind the other as they orbit the Earth. As the satellites move, the gravity of the Earth will pull on them.

Gravity isn’t the same everywhere on Earth. Areas with more mass—like big mountains—have a stronger gravitational pull than areas with less mass. When the GRACE-FO satellites fly towards an area with stronger gravitational pull, the first satellite will be pulled a little faster. When the second GRACE-FO satellite reaches the stronger gravity area, it will be pulled faster, and catch up.

Scientists combine this distance between the two satellites with lots of other information to create a map of Earth’s gravity field each month. The changes in that map will tell them how land and water move on our planet. For exam-
Meteor Log—April 2018  

by Tom Giguere

Chris Peterson and I made our pilgrimage to Houston, TX once again this year to attend the Lunar and Planetary Science Conference (LPSC). Science talks run the gamut from Pluto ices, to Mercury’s carbon and sulfur rich lavas. With five simultaneous presentations it is often a difficult choice to make. I tend to stick to the lunar sessions, but it’s always interesting to venture over to other worlds. I like to keep an eye out for presentations on meteors, they are few and often not apparent by the talk title. To clarify, I should distinguish between meteor and meteorite sessions. Between talks and posters, meteorites literally had hundreds of sessions, where they are sliced, examined and dated in great detail. Meteors had parts of 2 or 3 sessions.

One talk that mentioned meteors was on the LADEE mission to the moon (LADEE NMS Observations Of Exospheric Water Events at the Moon, Hurley et al.). LADEE examined the dust concentration above the surface of the Moon. The mission instruments were designed to identify a tenuous atmosphere if it existed. Specifically, The LADEE NMS data provide a measurement of water in the lunar exosphere resulting from the impact of meteoroids on the surface of the Moon. It is always interesting to me that even if a mission doesn’t have complete success with the stated primary goal, other unanticipated discoveries are invariably made. An instrument on LADEE detected spikes of water, see the figure. Some of these spikes were associated with known showers, (QUA, Quadrantids; GEM, Geminids; etc.) while other spikes identified three new showers (see the blue arrows), numbered 17, 32, and 33/35. The authors aren’t specific about the dates of the new showers, however, each abstract includes the first authors email address, so I can find out!

For 2018 there are no predictions for any Lyrid activity increase from theoretical modelling.

As the radiant rises during the night, observations can be carried out usefully after about 22h30m local time from mid-northern sites, and just a few minutes later for our latitude. Moon’s first quarter on April 22 leaves just the morning

<table>
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<th>Shower Activity</th>
<th>Maximum Date</th>
<th>Radiant λ⊙</th>
<th>α</th>
<th>δ</th>
<th>V∞ km/s</th>
<th>r</th>
<th>ZHR</th>
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<td>Apr 22</td>
<td>32.32°</td>
<td>271°</td>
<td>+34°</td>
<td>49</td>
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<tr>
<td>Pop-pids (137 PPU)</td>
<td>Apr 15 – Apr 28</td>
<td>Apr 23</td>
<td>33.5°</td>
<td>110°</td>
<td>-45°</td>
<td>18</td>
<td>2.0</td>
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</table>

Meteors can be observed from virtually any location, even the Moon! 
Tom Giguere, 808-782-1408, Thomas.giguere@yahoo.com; Mike Morrow,
Treasurer’s Report

Cash Flow - 02/11/2018 to 03/11/2018

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I’m trying a new report format that is a bit more automated. It’s your basic income and expense report for “Subscription – Magazine” in both the income and expense sections. I credit payments made to Sky and Telescope, and Astronomy to the same account that people paid into when they requested a subscription. Eventually, every “Subscription – Magazine” account will balance at zero dollars. They won’t balance exactly at zero every month, but over time, the balance will be zero.

Again, thanks to all who signed up or renewed.
(Continued from page 7) Space Place

ple, a melting glacier will have less water, and so less mass, as it melts. Less mass means less gravitational pull, so the GRACE-FO satellites will have less distance between them. That data can be used to help scientists figure out if the glacier is melting.

GRACE-FO will also be able to look at how Earth’s overall weather changes from year to year. For example, the satellite can monitor certain regions to help us figure out how severe a drought is. These satellites will help us keep track of one of the most important things to all life on this planet: water.

You can learn more about our planet’s most important molecule here: https://spaceplace.nasa.gov/water

An artist's rendering of the twin GRACE-FO spacecraft in orbit around Earth. Credit: NASA
hours undisturbed. Based on video data, the IMO gives a slightly extended activity period for the Lyrids. There were several reports particularly from the end of April including recognizable numbers of shower meteors.

Some of these spikes were associated with known showers, (QUA, Quadrantids; GEM, Geminids; etc.) while other spikes identified three new showers (see the blue arrows), numbered 17, 32, and 33/35. The authors aren’t specific about the dates of the new showers, however, each abstract includes the first authors email address, so I can find out!

(Continued from page 2) President’s Message

of Gerry Griffin, the Apollo 17 flight director, Harrison (Jack) Schmitt, the only geologist to walk on the Moon, and Jim Head, my academic “grandfather” (my advisor’s advisor), who was involved in the science planning for Apollo missions gave us an insider’s view of the mission.

Speaking of my late advisor, B. Ray Hawke, I’ve mentioned that a crater would be named for him. That naming of Hawke crater, on the rim of Grotrian on the farside, was announced at the meeting.

Chris Peterson
Image Credit: NASA/GSFC/Arizona State University named after Elisabetta "Betty" Pierazzo (1963-2011) for detail see https://moon.nasa.gov/resources/163/?category=images