I was only 3-year old when Apollo 11 mission reached the Moon and Neil Armstrong put his foot on the Moon on July 21, 1969. Although, I would not know about it until I was a little older. When you were young and lived in Thailand, space news is not something you hear about. Luckily, my intermediate school was about 10 minutes’ walk to Bangkok Science and Planetarium. That is where I learned more about astronomy and started my interest in space exploration.

I also grew up around television and watched TV series like Space 1999 & Star Treks. I always daydreaming about being an astronaut because those movies. I never lost interest in space program and astronomy.

Let’s all celebrate the Apollo mission accomplishment and hope that we go back to the Moon soon.

Upcoming Events:

- The next meeting is on Tuesday, July 2nd at the Bishop Museum 7:30 PM.
- Bishop Museum’s planetarium shows are every 1st Saturday of the month at 8:00 PM www.bishopmuseum.org/calendar
- The next Board meeting is Sun., June 30th 3:30 PM in POST building at UH.
President’s Message
July 2019

Fifty years ago, astronomy and space exploration changed in a fundamental way. When the Apollo 11 mission returned from the Moon in July of 1969 with geological samples, humans for the first time were able to study material gathered from what was previously only an object viewed from afar. This merging of astronomy and geology has advanced knowledge in a profound way.

While much can be learned from remote sensing, that can’t compare to the depth of knowledge that can be obtained by analyzing rock and soil samples gathered from known locations. Apollo 11 was followed by five more Apollo missions and three robotic sample-return missions by the Soviet Union. We’ve also collected meteorites that were derived from the Moon, but we don’t know from exactly where, so their value for understanding the geology of the Moon is not as great as for samples from known locations.

Missions have also returned samples of the solar wind and material coming off a comet. Japan successfully returned a small amount of material from an asteroid, and Japan and the U.S. are currently attempting to repeat that feat at other asteroids. Although we also have meteorites from Mars, a sample return from there remains a future goal.

Remote sensing, whether from Earth or from spacecraft, remains the primary way that we gain knowledge of other celestial bodies, but it can sometimes be used in conjunction with returned samples. For example, the Lunar Reconnaissance Orbiter mission has now imaged the locations of the Soviet Luna missions that returned

(Continued on page 4)
Planets in July

**Mercury**
- Can be seen low in the evening twilight early in the month.
- It is close to Mars and on the evening of the July 5th.

**Venus**
- Is closer than 15° from the sun during the entire month.

**Mars**
- Is very low in the southwestern sky during July. Look for it close to Mercury during the first week of the month.

**Jupiter**
- Shines brightly high in the southern sky after sunset at a magnitude of -2.5.

**Saturn**
- Reaches opposition this month, so is the brightest for the year and in the sky all night. Best viewed late in the evening.

**Neptune**
- Is about 85° from the sun in the morning sky.

**18 Malpomene (Asteroid)**
- Reaches opposition on July 1 at a magnitude of about +9.2

**Pluto (Dwarf Planet)**
- Reaches opposition this month and so is closest to earth. It is best viewed near midnight when it is near the meridian.

Venus is closer than 15° from the sun when near the moon in July.

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**Observer’s Notebook—July 2019**

by Jay Wrathall

**Planets Close To the Moon**

**Times are Hawaii Standard Time**

- July 3, 20h, Moon 0.19 ENE of Mars (19° from sun in evening sky)
- July 4, 00h, Moon 3.3° NNE of Mercury (22° from sun in evening sky)
- July 13, 11h, Moon 2.3° NNE of Jupiter (145° from sun in evening sky)
- July 15, 22h, Moon 0.44° ESE of Saturn (174° from sun in midnight sky)
- July 21, 01h, Moon 3.6° SSE of Neptune (130° from sun in morning sky)
- July 25, 01h, Moon 4.5° SSE of Uranus (85° from sun in morning sky)

**Other Events of Interest**

**Times are Hawaii Standard Time**

- July 1, 15h, Asteroid 18 Malpomene at opposition
- July 2, 09:16h, Moon New
- July 4, 13h, Earth at aphelion (94.5 million miles from sun)
- July 5, 13h, Mercury 3.8° SSE of Mars (21° and 19° from sun in evening sky)
- July 9, 07h, Saturn at opposition
- July 14, 05h, Pluto at opposition
- July 16, 11:38h, Full moon
- July 21, 93h, Mercury in inferior conj. with sun (Passes into morning sky)
- July 31, 17:12h, New moon

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**Planets Close To the Moon**

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Venus is closer than 15° from the sun when near the moon in July.
President Chris Peterson called the June 4, 2019 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.

Mark updated on previous and future School Star Party

- Punahou ROTC Star Party at Bellow was cloudy.
- Thursday, July 25 at Camp Palehua
- Friday, October 18 at Pearl Harbor Elementary

Chris reported on astronomy news items:

- Discussed Mars’s eroded atmosphere, water, and life of planet.
- Curiosity Rover status (wear on wheels, take longer to charge batteries)
- Update on InSight Probe future option after drill hit rocks.

OSIRIS-REx mission out on Bennu – Citizen Science projects (volunteers)

Questions on TNT and UH status.

Steven have items for sell (Old Meade DSI Pro Camera & Set of LRGB filters, Orion StarShoot Autoguider)

Ort helped setup laptop and showed Dan & Hario visited Maui’s Haleakala Observatory during Memorial Day weekend. He also showed some photos of SpaceX StarLink.

Joann showed us upcoming night sky and Way Finder Video.

As there was no other business, the meeting was adjourned at 9 pm.

Sincerely,
Secretary April Lew

(Continued from page 2) President’s Message

samples (as well as the Soviet rovers and Apollo landing sites). This allows us to match remote sensing observations with the known composition of the source region.

Similarly, we have long suspected that certain meteorites came from the asteroid Vesta. Now that the Dawn mission has orbited and imaged Vesta, those ideas have been reinforced. A sample return from there would still be highly desirable, however.

Although most astronomical targets will remain out of reach for sample return for the foreseeable future, we are making steady progress in sampling our own solar system. For hundreds of years, we could only receive photons (and meteorites) passively. Now we can go and bring samples back to Earth. That was part of Apollo 11’s giant leap.
Hawaiian Astronomical Society
Event Calendar

<<Upcoming Star Parties>>
Club Party-Dillingham July 27
Public Party Geiger/Kahala July 6
Public Party Dillingham July 20

Upcoming School Star Parties
7:00 PM July 25 Kokua Camp Lani Event—Camp Palehua
Bootprint on the Lunar Surface
A close-up view of astronaut Buzz Aldrin's bootprint in the lunar soil, photographed with the 70mm lunar surface camera during Apollo 11's sojourn on the moon.

Credits: NASA

Neil Armstrong on the Lunar Surface
As commander of Apollo 11, Neil Armstrong took most of the photographs from the historic moonwalk, but this rare shot from fellow moonwalker Buzz Aldrin shows Armstrong at work near the lunar module Eagle.

Credits: NASA
Saturn is at opposition this month, beckoning to future explorers with its beautiful rings and varied, mysterious moons. The Moon prominently passes Saturn mid-month, just in time for the 50th anniversary of Apollo 11!

Saturn is in opposition on July 9, rising in the east as the Sun sets in the west. It is visible all night, hovering right above the teapot of Sagittarius. Saturn is not nearly as bright as Jupiter, nearby and close to Scorpius, but both giant planets are easily the brightest objects in their constellations, making them easy to identify. A full Moon scrapes by the ringed planet late in the evening of the 15th through the early morning of the 16th. Some observers in South America will even see the Moon occult, or pass in front of, Saturn. Observe how fast the Moon moves in relation to Saturn throughout the night by recording their positions every half hour or so via sketches or photos.

While observing the Saturn-Moon celestial dance the early morning of the 16th, you can also contemplate the 50th anniversary of the launch of the Apollo 11 mission! On June 16, 1969, Apollo 11 blasted off from Cape Canaveral in Florida on a journey of almost a quarter million miles to our nearest celestial neighbor, a mission made possible by the tremendous power of the Saturn V rocket – still the most powerful rocket ever launched. Just a few days later, on July 20, 1969 at 10:56 pm EDT, Neil Armstrong and Buzz Aldrin set foot on the lunar surface and became the first people in history to walk on another world. The astronauts set up equipment including a solar wind sampler, laser ranging retroreflector, and seismometer, and gathered up almost 22 kilograms (48 pounds) of precious lunar rocks and soil samples. After spending less than a day on the Moon’s surface, the duo blasted off and returned to the orbiting Columbia Command Module, piloted by Michael Collins. Just a few days later, on July 24, all three astronauts splashed down safely in the Pacific Ocean. You can follow the timeline of the Apollo 11 mission in greater detail at bit.ly/TimelineApollo11 and dig deep into mission history and science on NASA’s Apollo History Site: bit.ly/ApolloNASA.

Have you ever wanted to see the flag on the Moon left behind by the Apollo astronauts? While no telescope on Earth is powerful enough to see any items left behind the landing sites, you can discover how much you can observe with the Flag on the Moon handout: bit.ly/MoonFlag

You can catch up on all of NASA’s current and future missions at nasa.gov
In this month’s Meteor Log I continue the story (AstroNews July, 2018) by Toshi Kasuga et al. “A Fireball and Potentially Hazardous Binary Asteroid (164121 2003 YT1, preliminary report. Toshi provided background on meteors, this month we examine the detection network in Japan. The SonotaCo Network (http://sonotaco.jp/) is a volunteer system that detects various sky phenomenon via optical and lightning detection stations across the country (Figure 3).

The network has more sensors in urban settings and is designed to provide multiple simultaneous observation in coordination with the public. Automatic detection and analysis software has been set up to capture and analyze images, then determine the orbit of the imaged object.

(Continued on page 11)

New Moon
July 02

First Quarter
July 9

Full Moon
July 16

Last Quarter
July 24

<table>
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<tr>
<th>Shower</th>
<th>Activity</th>
<th>Maximum Date</th>
<th>Radiant α</th>
<th>Radiant δ</th>
<th>$V_\infty$</th>
<th>$r$</th>
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<tbody>
<tr>
<td>Piscis Austri-</td>
<td>Jul 15-Aug 10</td>
<td>Jul 28</td>
<td>125°</td>
<td>341°</td>
<td>-30°</td>
<td>35</td>
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<td>nids (183 PAU) South.</td>
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<tr>
<td>δ-Aquariids (005 SDA)</td>
<td>Jul 12–Aug 23</td>
<td>Jul 30</td>
<td>127°</td>
<td>340°</td>
<td>-16°</td>
<td>41</td>
<td>2.5</td>
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<td>α-Capricornids (001 CAP)</td>
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This will be a good time to view the South. δ-Aquariids! For more info contact: Tom Giguere, 808-782-1408, Thomas.giguere@yahoo.com; Mike Morrow, PO Box 6692, Ocean View, HI 96737.
Your fearless treasurer is currently in Wisconsin, doing what he lives for: The HAS treasurer’s report for May.

Welcome to all new members. We hope you bring nothing but good weather with you. That said, the Hawaiian weather is better than the Wisconsin weather (cloudy, rain, highs near 60 degrees).

Some big expenses coming up in the next months, as the Astronomical League dues and liability insurance payments will come due.

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### Treasurer’s Report

#### Cash Flow - 4/10/2019 to 5/09/2019

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
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<tr>
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Money into selected accounts comes from:

- **Donation**: $170.03
- **Membership - Electronic**: $80.00
- **Membership - Family**: $6.00
- **Membership - Paper**: $25.00
- **Subscription - Astronomy**: $34.00
- **Subscription - Sky & Tel**: $32.95
- **Telescope Rental**: $40.00

**Money In**: $387.98

Money out of selected accounts goes to:

- **AstroNews**: $37.50
- **Snacks**: $12.60
- **Award**: $50.00

**Money Out**: $100.10

**Difference**: $287.88

**Ending Balance**: $2907.29
Caption: Observe the larger details on the Moon with help from this map, which also pinpoints the Apollo landing site. Full handout available at bit.ly/MoonHandout

Caption: Earth-based telescopes can’t see any equipment left behind at the Apollo 11 landing site, but the cameras onboard NASA’s Lunar Reconnaissance Orbiter (LRO) can. This is Tranquility Base as seen from the LRO, just 24 kilometers (15 miles) above the Moon’s surface, with helpful labels added by the imaging team. Image Credit: NASA Goddard/Arizona State University. See more landing sites at: bit.ly/ApolloLRO
Observations are stored in a Meteor Database along with the trajectory, radiant point, velocity, orbital elements, and magnitude. On April 28, 2017 (15:58:19 UT) a fireball was detected by 12 cameras over Kyoto (Figure 4). Imaging the same fireball from multiple locations allows accurate computation of the orbital parameters for the database and to determine the source location of the object (Figure 5).

This fireball has an absolute magnitude of -4.10, mass of ~100g, diameter of ~5cm, and altitude range of 85 – 45 km above the Earth. To be continued…

The South. δ-Aquariids shower can be more active than the Orionids. During the maximum there are numerous bright meteors visible. In the past there were outbursts observed by Australian observers and an observer in Crete. New Moon on August 1 provides optimal conditions for the showers in the Aquarius-Capricornus region at the end of July.
From the International Space Station, NASA astronaut Christina Koch (@AstroChristina) snapped and posted this image of the planet Venus at sunrise.

The blue glow of Earth’s atmosphere shimmers as the station orbit our planet.

Image Credit: NASA