A word from your editor by
Sapavith ‘Ort’ Vanapruks

HAS have decided to cancel public HAS events for the time being for both public star party at Dillingham and in town star parties at Kahala and Geiger, as well as the monthly club meeting. These cancellations will continue while we are still in tier level. As we are now in tier 3 on Oahu, we will start back up the club member only star party. We will be limit the club party to the key master and 9 extra members. Please check your email and website for an update.

Twenty Years of Bennu: From Arecibo to Orbit (and Home Again).

The OSIRIS-REx mission successfully obtained a sample of the near-Earth asteroid 101955 Bennu in October 2020, and took post-sampling images in April 2021. I will discuss my experience preparing for the sampling beginning at the Arecibo Observatory, the goals and highlights of the mission and show some of my favorite images of Bennu and what we’ve learned from them.

Michael Nolan is a Research Professor at the University of Arizona Lunar and Planetary Laboratory. He is the OSIRIS-REx Science Team Chief and former director of the Arecibo Observatory.

On Wednesday, May 26, 2021 morning at 1:11 AM, Hawaii will be treated with a Total Lunar Eclipse. The totality will last only 15 minutes. Let’s hope we can stay up until then.

(Continued on page 9)
While new COVID cases have held at levels that could have pushed us back to Tier 2, the authorities have decided to leave things as they are for now. Numbers have varied a lot, so it’s unclear which direction we’re headed, but vaccinations continue at a good pace. We will continue with our club-only star parties at Dil-lingham for now. Any new developments we learn about regarding continued operation of the airfield past June 30th will be reported at our meeting.

Sky and Telescope reports the possible discovery of the “Unicorn”, the closest known black hole to Earth, a three solar mass object in a binary system with red giant star V723 Monocerotis, about 1500 light years away. The black hole reportedly distorts the star into a teardrop shape.

There could be closer black holes, of course. In the absence of nearby visible matter, a small black hole is very hard to detect. Whether or not this one is confirmed to be real, you may get some questions about black holes since many people find them fascinating. Unfortunately, there are many misconceptions about these objects.

Stable Black holes can’t be much less massive than the Unicorn. Neutron stars top out at about two solar masses. The fear of the Large Hadron Collider or a similar facility creating a “mini-black hole” that would consume Earth are unfounded. If a small bit of matter were compressed to black hole density, it would only have its original miniscule amount of mass and would quickly resume its original form once the compressive forces were removed.

Black holes can be much more massive, of course. Most galaxies have supermassive black holes at their centers. The one in our Milky Way is over 4 million solar masses. These black holes may have resulted from primordial density variations at the time of the Big Bang and may be intimately related to galaxy formation.

Much smaller and closer to home is the asteroid Bennu which was visited by the OSIRIS-(Continued on page 4)
### Planets Close To the Moon

**Times are Hawaii Standard Time**

- **May 15, 20h,** Mars 1.50° SSW of Moon; 48° and 49° from the Sun in the evening sky; magnitudes 1.7 and -8.0
- **May 30, 18h,** Saturn 4.1° NNW of Moon; 116° from the Sun in the morning sky; magnitudes 0.6 and -11.0

### Planets in May

<table>
<thead>
<tr>
<th>Planet</th>
<th>Position and Activities</th>
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</thead>
<tbody>
<tr>
<td><strong>Mercury</strong></td>
<td>Well positioned evening planet, setting 90 minutes after sunset on 1 May. Near the Pleiades on 3 May.</td>
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<tr>
<td><strong>Venus</strong></td>
<td>Evening planet, near a thin waxing crescent Moon on 12 May. Very close to Mercury on 28 May.</td>
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<tr>
<td><strong>Mars</strong></td>
<td>Mars struggles in evening twilight. A 14% -lit waxing crescent Moon lies nearby on 15 May.</td>
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<tr>
<td><strong>Jupiter</strong></td>
<td>Morning planet. A 35% -lit waning crescent Moon lies close on the morning of 5 May.</td>
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<tr>
<td><strong>Saturn</strong></td>
<td>Morning planet in Capricornus. The Moon pays it a visit on the mornings of 3, 4 and 31 May.</td>
</tr>
<tr>
<td><strong>Uranus</strong></td>
<td>Not visible this month.</td>
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<tr>
<td><strong>Neptune</strong></td>
<td>Not visible this month.</td>
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<tr>
<td><strong>Pluto</strong></td>
<td>Rises during the evening in May, now about an hour and a half before Saturn.</td>
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<tr>
<td><strong>4—Vesta</strong></td>
<td>(Asteroid) Rise at 5.42am on the 1st and 4.42am on the 31st, so becomes visible in the morning sky. It moves from Pisces to Cetus on May 13.</td>
</tr>
</tbody>
</table>
Meeting called to order at 7:34 pm. By President Chris Peterson.

Reports on recent “reservation only” club star parties at Dillingham Airfield were given. Most recently, skies were clear, but transparency was not good.

Tom and Peter attended a Zoom townhall meeting on Kawaihapaí/Dillingham Airfield, and the impression was that people were optimistic the Airfield would remain open. Larry Wiss reported that a letter from the FAA was a plus in this regard.

The annual state science fair is taking place, and HAS is planning to award its traditional prizes for astronomy. President Chris, Andy, and Marufa have volunteered to judge the online projects. There was some discussion of the awards, which are a free membership to HAS, a subscription to either Sky and Telescope or Astronomy magazines, and a cash award for the Senior division. Peter Besenbruch make a motion to increase the case award from $50 to $75, seconded by Chris Peterson. Motion passed unanimously.

There has been interest in HAS t-shirts. Questions were raise about what our inventory is, and who is in possession of it. Peter will look into it. Interest in an online HAS store was also expressed.

Our speaker for the evening was Lingzhi Sun, Graduate Student at Hawai‘i Institute of Geophysics and Planetology, UHM, who informed us quite a lot about “Lunar Sample Return Missions”, covering from the Apollo missions through the most recent Chang’E 5 Chinese mission. This presentation will be available via HAS at a later date.

Meeting was adjourned at 8:44pm. There were approximately 26 attendees.

Faithfully submitted, James Andy Stroble, Secretary.

(Continued from page 2) President’s Message
REx mission. Michael Nolan of the Lunar and Planetary Laboratory will give us a talk about the mission at our Zoom meeting in May, so please attend.
Hawaiian Astronomical Society
Event Calendar

May 2021

<table>
<thead>
<tr>
<th>Sunday</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
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<th>Saturday</th>
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<td>Club Party Dillingham Airfield 6:56 PM</td>
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<tr>
<td>BoD Meeting 3:30 PM Zoom</td>
<td>3rd qtr 9:50 AM</td>
<td>Club Meeting 7:30 PM Zoom</td>
<td>Cinco De Mayo</td>
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<td>Club Party Dillingham Airfield 6:59 PM</td>
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<td>10</td>
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<td>14</td>
<td>15</td>
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<tr>
<td>Mother’s Day</td>
<td>New Moon 8:59 AM</td>
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<td>1st qtr 9:12 AM</td>
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<td>Armed Forces Day</td>
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<td></td>
<td>Public Party Kahalā Geiger CANCELLED</td>
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<td>27</td>
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<td>30</td>
<td>31</td>
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<td></td>
<td>Memoral Day</td>
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</tbody>
</table>

<<Upcoming Star Parties>>

Club Party-Dillingham May 1 —6:56 PM (limit 10 people)
Club Party Dillingham May 8 —6:59 PM (limit 10 people)
Public Party Geiger/Kahala May 22 — CANCELLED

Upcoming School Star Parties

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Volume 71, Issue 05
Statements on Passing of Michael Collins

The following is a statement from acting NASA Administrator Steve Jurczyk on the passing of Michael Collins:

“Today the nation lost a true pioneer and lifelong advocate for exploration in astronaut Michael Collins. As pilot of the Apollo 11 command module – some called him ‘the loneliest man in history’ – while his colleagues walked on the Moon for the first time, he helped our nation achieve a defining milestone. He also distinguished himself in the Gemini Program and as an Air Force pilot.

“Michael remained a tireless promoter of space. ‘Exploration is not a choice, really, it’s an imperative,’ he said. Intensely thoughtful about his experience in orbit, he added, ‘What would be worth recording is what kind of civilization we Earthlings created and whether or not we ventured out into other parts of the galaxy.’

“His own signature accomplishments, his writings about his experiences, and his leadership of the National Air and Space Museum helped gain wide exposure for the work of all the men and women who have helped our nation push itself to greatness in aviation and space. There is no doubt he inspired a new generation of scientists, engineers, test pilots, and astronauts.

“NASA mourns the loss of this accomplished pilot and astronaut, a friend of all who seek to push the envelope of human potential. Whether his work was behind the scenes or on full view, his legacy will always be as one of the leaders who took America’s first steps into the cosmos. And his spirit will go with us as we venture toward farther horizons.”

The following is a statement from the Collins family:

“We regret to share that our beloved father and grandfather passed away today, after a valiant battle with cancer. He spent his final days peacefully, with his family by his side. Mike always faced the challenges of life with grace and humility, and faced this, his final challenge, in the same way. We will miss him terribly. Yet we also know how lucky Mike felt to have lived the life he did. We will honor his wish for us to celebrate, not mourn, that life. Please join us in fondly and joyfully remembering his sharp wit, his quiet sense of purpose, and his wise perspective, gained both from looking back at Earth from the vantage of space and gazing across calm waters from the deck of his fishing boat.”

For more information about Collins and his NASA career, visit: [https://www.nasa.gov/michael-collins/](https://www.nasa.gov/michael-collins/)
May is a good month for fans of galaxies, since the constellation Virgo is up after sunset and for most of the night, following Leo across the night sky. Featured in some ancient societies as a goddess of agriculture and fertility, Virgo offers a bounty of galaxies as its celestial harvest for curious stargazers and professional astronomers alike.

Virgo is the second-largest constellation and largest in the Zodiac, and easily spotted once you know how to spot Spica, its brightest star. How can you find it? Look to the North and start with the Big Dipper! Follow the general curve of the Dipper’s handle away from its “ladle” and towards the bright orange-red star Arcturus, in Boötes – and from there continue straight until you meet the next bright star, Spica! This particular star-hopping trick is summed up by the famous phrase, “arc to Arcturus, and spike to Spica.”

This large constellation is home to the Virgo Cluster, a massive group of galaxies. While the individual stars in Virgo are a part of our own galaxy, known as the Milky Way, the Virgo Cluster’s members exist far beyond our own galaxy’s borders. Teeming with around 2,000 known members, this massive group of galaxies are all gravitationally bound to each other, and are themselves members of the even larger Virgo Supercluster of galaxies, a sort of “super-group” made up of groups of galaxies. Our own Milky Way is a member of the “Local Group” of galaxies, which in turn is also a member of the Virgo Supercluster! In a sense, when we gaze upon the galaxies of the Virgo Cluster, we are looking at some of our most distant cosmic neighbors. At an average distance of over 65 million light years away, the light from these galaxies first started towards our planet when the dinosaurs were enjoying their last moments as Earth’s dominant land animals! Dark clear skies and a telescope with a mirror of six inches or more will reveal many of the cluster’s brightest and largest members, and it lends itself well to stunning astrophotos.

Virgo is naturally host to numerous studies of galaxies and cosmological research, which have revealed much about the structure of our universe and the evolution of stars and galaxies. The “Universe of Galaxies” activity can help you visualize the scale of the universe, starting with our home in the Milky Way Galaxy before heading out to the Local Group, Virgo Cluster and well beyond! You can find it at bit.ly/universeofgalaxies. You can further explore the science of galaxies across the Universe, along with the latest discoveries and mission news, at nasa.gov.

(Continued on page 10)
The η-Aquariids (ETA) stream is associated with Comet 1P/Halley, as are the Orionids of October. Shower meteors are only visible for a few hours before dawn essentially from tropical and southern hemisphere sites. The radiant culminates near 8h local time. The shower has a relatively broad maximum, sometimes with a variable number of submaxima, and occurs around May 5/6 which is after last quarter Moon on May 3. These are swift meteors that produce a high percentage of persistent trains, but few fireballs. Observing conditions are favorable this year. IMO analyses of visual data collected since 1984 have shown that ZHRs are generally above 30 in the period May 3–10. An often claimed variability of the peak rates associated with Jupiter’s orbital period close to 12 years has not been confirmed in a recent study (Egal et al., 2020) using optical and radar data. Recent peak ZHRs were: 2008, 2009, 2017 - 2020. So, if the trend continues, 2021 may be a peak year as well. Information credit to International Meteor Organization (IMO).

While checking for information on meteor showers in May, I came upon an unlikely source of information. According to “martha stewart, Life”, (https://www.marthastewart.com/8087794/eta-aquariid-meteor-shower-may-2021#:~:text=%22Eta%20Aquarii%22%20is%20a%20star,before%20or%20the%20day%20after) Eta Aquariid meteors radiate from the constellation Aquarius and can be viewed about one hour before dawn, the meteors will radiate over the east-southern horizon. As for how this sight got its name in the first place? It's actually not because of the constellation itself, but a star

(Continued on page 11)

The radiant of the Eta Aquarid meteor shower. AN Graphic by Greg Smye-Rumsby. Credit: AstronomyNow.

### Phases of the Moon (courtesy timeanddate.com )

<table>
<thead>
<tr>
<th></th>
<th>First Quarter</th>
<th>Full Moon</th>
<th>Last Quarter</th>
<th>New Moon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
<td>May 19</td>
<td>May 26</td>
<td>May 03</td>
<td>May 11</td>
</tr>
</tbody>
</table>

### Shower Activity Maximum Radiant \( V_\infty \) \( r \) ZHR

<table>
<thead>
<tr>
<th>Shower (ETA), 031 ETA</th>
<th>Date</th>
<th>( \lambda )</th>
<th>( \alpha )</th>
<th>( \delta )</th>
<th>( km/s )</th>
<th>( ZHR )</th>
</tr>
</thead>
<tbody>
<tr>
<td>η-Aquariids (ETA)</td>
<td>Apr 19–May 28</td>
<td>May 05</td>
<td>45.5°</td>
<td>338°</td>
<td>-01°</td>
<td>66</td>
</tr>
<tr>
<td>η-Lyrids (ELY), 145 ELY</td>
<td>May 03–May 14</td>
<td>May 08</td>
<td>48.0°</td>
<td>287°</td>
<td>+44°</td>
<td>43</td>
</tr>
</tbody>
</table>

Observe the η-Aquariids, it’s a free show! Tom Giguere, 808-782-1408, Thomas.giguere@yahoo.com; Mike Morrow, PO Box 6692, Ocean View, HI 96737.
Here are the financials up through April 9.

I want to thank everyone for renewing. Welcome to new members. Thanks to all who donated.

Covid news remains a bit dicey, with positivity rates and infections on Oahu at tier 2 levels. Given the city’s reluctance to clamp down, this shouldn’t affect our May 1 star party. E-mail your treasurer at peter@besenbruch.info if you want to attend either May star party. Thanks also to those who also notified me that they couldn’t come after they signed up.

Our only star parties currently are at Dillingham and are for members with their own equipment only. Please do not share views through the eyepiece, and maintain your distance. CDC guidelines do say you do not need to wear a mask to chat with someone if you’ve been vaccinated.

Finally, congratulations to our science fair winners: Wilson Chau, Holden Suzuki, and Kenta Sakamoto. Aside from HAS memberships and Astronomy Magazine subscriptions, Kenta receives a check for $75 as the senior group astronomy winner. This will be reflected in next month’s numbers.

(Continued from page 1)
The first image of a black hole’s event horizon was taken in the center of one of the most prominent galaxies in Virgo, M87! This follow up image, created by further study of the EHT data, reveals polarization in the radiation around the black hole. Mapping the polarization unveils new insights into how matter flows around and into the black hole - and even hints at how some matter escapes! More details: apod.nasa.gov/apod/ap210331.html
Credit: Event Horizon Telescope Collaboration

Find Virgo by “arching to Arcturus, then spiking on to Spica.” Please note that in this illustration, the location of the Virgo Cluster is approximate - the borders are not exact.
(Continued from page 8) Meteor Log

within it. "Eta Aquarii" is a star that forms a water carrier's jar.

It's nice to have a new source of meteor shower information, and possibly, in a future Meteor Log, I can add a pie recipe courtesy of Martha! Happy observing.

Almost Every Galaxy Has One – A Black Hole, That Is
jets are powered by the gravitational energy of a supermassive black hole in the core of the elliptical galaxy Hercules A
Image Credit: NASA, ESA, S. Baum and C. O'Dea (RIT), R. Perley and W. Cotton (NRAO/AUI/NSF), and the Hubble Heritage Team (STScI/AURA)

Constant Gardening on the Space Station
Plants grown on the ISS
Astronauts on the International Space Station recently enjoyed a fresh supply of leafy greens, thanks in large part to the efforts of Expedition 64 crew member Michael Hopkins.
Image Credit: NASA
This image from April 24, 2021, shows the SpaceX Crew Dragon Endeavour as it approached the Interna-
tional Space Station less than one day after launching from Kennedy Space Center in Florida.

Image Credit: NASA