A word from your editor by Sapavith ‘Ort’ Vanapruks

As a person who have never take an astronomy class, I have always puzzled on the terminology used in the astronomy conversation. These terminologies are used to explain how planets move in reference to Earth (Planetary Motions). Those terminologies are opposition, retrograde motion, and stationary point. Before we can discuss those words, we need to understand how all the planets revolve around the Sun. Here is the explanation from Institute for Astronomy Hawaii (IFA of Hawaii - http://www.ifa.hawaii.edu/~mendez/ASTRO110LAB11/planetmotion.html).

As seen from the Earth, the Sun, Moon, and planets all appear to move along the ecliptic. More precisely, the ecliptic is the Sun's apparent path among the stars over the course of a year. (Of course, it's actually the Earth that moves about the Sun, and not the other way around, but because of our orbital motion, the Sun seems to move across the backdrop of distant stars.) The planets don't remain exactly on the ecliptic, but they always stay fairly close to it.

Opposition explains when planet is in on the other side of Earth opposite the Sun when the apparent geocentric longitude of the planet and the
President’s Message
February 2020

Have you heard the buzz about Betelgeuse? This red supergiant in the shoulder of Orion, if centered on the Sun, would extend beyond the asteroid belt! Its magnitude normally varies between 0.0 and 1.3, but in October of last year it began an unusual dimming, dropping from 0.5 to 1.5. With a mass of about 10 to 20 times that of the Sun, Betelgeuse is expected to end its life in a supernova explosion within the next 100,000 years, but the current dimming is not believed to be related to that.

What is responsible is not clear. It may just be an overlapping of its customary dimming and brightening cycles. On the other hand, it may be related to an expulsion of material from the star. Betelgeuse is surrounded by a number of shells of matter in various states, some more opaque than others. A new expulsion of material that was or became opaque enough to reduce the light transmitted from the star would be a simple explanation.

Whatever reason is ultimately decided on, this situation illustrates one of the ways science works. Observations are made, hypotheses are developed to explain the observations, new observations support or refute the hypotheses, and the process continues. With each step we edge a little closer to a complete understanding of the fantastically complex universe we inhabit.

Orion is visible in our night sky now. Consider going outside and seeing for yourself how different it looks than the way you remember it. On the opposite side of the sky, delta Scorpius has also recently changed in magnitude, so you could spend much of the year monitoring changes in these two bright constellations. Your own personal record of these variations would certainly provide an interesting perspective on these phenomena.

(Sourced mainly from Wikipedia).

Secret Guest Speaker Topic.
Our airless neighbor, the Moon, is both simple and mysterious. Human has been observing the Moon for thousands of years, while the first lunar landing and sample return only started about 50 years ago. Since then, series of lunar missions were launched, and numerous of lunar datasets were returned. Based on these datasets, our understanding of the Moon went to another level. I will introduce the exciting lunar missions from past to near future, including the past and planned lunar sample return projects. As a member of the Apollo next generation lunar sample analysis team, I will also show some fresh pictures of a lunar core sample that was opened in last December!
### Planets in February

**Mercury**
- Will be visible very low in the west after sunset the first two weeks of the month.

**Venus**
- Shines brightly high (44°) in the western sky after sunset in February.

**Mars**
- Can be found in the eastern sky before dawn, shining at magnitude +1.4. Occultation by the moon visible from the mainland, but not Hawaii.

**Jupiter**
- Is in the eastern sky at dawn below Mars during February.

**Saturn**
- Reached conjunction with the sun last month, so is low in the eastern sky before dawn after passing behind the sun.

**Neptune**
- Is close to the horizon at sunset, so is very difficult to view in February.

**Pluto (Dwarf Planet)**
- Is low in the eastern sky before dawn so will be difficult to view this month.

#### Planet Close To the Moon

**Observer’s Notebook—February 2020** by Jay Wrathall

#### Times are Hawaii Standard Time

- Feb 18, 04h, Moon 0.80° NNE of Mars (58° from sun in morning sky)
- Feb 19, 10h, Moon 0.94° SE of Jupiter (43° from sun in morning sky)
- Feb 20, 05h, Moon 1.8° SE of Saturn (34° from sun in morning sky)
- Feb 27, 08h, Moon 5.8° SE of Venus (44° from sun in evening sky)
- Feb 28, 06h, Moon 4.0° SE of Uranus (55° from sun in evening sky)

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

#### Other Events of Interest

#### Times are Hawaii Standard Time

- Feb 1, 23h, Moon 0.5° N of asteroid Vesta (95° from sun in evening sky)
- Feb 8, 21:33h, Full Moon
- Feb 10, 04h, Mercury at greatest elongation (18.2° east of the sun in evening sky)
- Feb 13, 00h, Moon passes 0.6° N of asteroid Juno (125° from sun in morning sky)
- Feb 23, 05:33h, New Moon
- Feb 25, 16h, Mercury at inferior conj. with sun (Passes into morning sky)

**Other Events of Interest**

**1 Ceres (Dwarf Planet)**
- Is near Pluto and so is also difficult to view in February.

**Pluto (Dwarf Planet)**
- Is low in the eastern sky before dawn so will be difficult to view this month.
The meeting commenced at 7:30 pm in the Paki 2 room.

Chris Peterson opened the meeting.

Minutes from last meeting were adopted.

Star party update by Mark Watanabe:
There are four requests:
  - January 21 - Girl Scouts (K-3rd Grade) - Kapilina Beach House
  - January 26 - Hawaii Education Innovation Showcase (Sandbox Kakaako). They want someone to speak about viewing things in the sky and to set up a HASOC booth.
  - February 14 - Hokulani Elementary School
  - March 6 - ‘Iolani (we’ve been going there at least 20 years)
  - March 11 - Christian Academy camping trip at Bellows

Bill Hojnaeke is still trying to verify that the library system will accept the telescopes into their system.

We updated the by-laws last year and the board will be looking at those again in the next couple of months.

Dillingham and Geiger permits are on hand.

April 8-10 we will judge the science fair and we will need judges.

The Hawai’i Sky Tonight maps that the Bishop Museum is now a combined traditional (Greco-Roman)/Hawai’i version. Chris prints it out with the HASOC schedule on the back.

There were four visitors at the Kahala star party. There were no visitors at Geiger this month.

The Royal Astronomical Society is meeting tonight in the Planetarium which is why we met in the Paki 2 room.

Marufa Bhuiyan is a visitor currently living in Nepal and is headed to the Mars Desert Research Station and Mars Academy USA in Hanksville, UT for training in a simulated Mars environment. This is a low-fidelity simulation which doesn’t simulate a real mission to Mars but simulates some of the tasks people would be expected to do when on Mars. Her project is amateur radio on a mission to mars.

Marufa has the ISS-Above (based on the Raspberry Pi) that Chris talked about last month. The ISS orbits the earth once approximately every 92 minutes. If you register the product online you also gain access to the website that has additional information about the ISS, its orbit, its current inhabitants, and other information. Both an ethernet and HDMI cable are required to connect the system.

Marufa

Later this year is a close conjunction with Jupiter and Saturn. They’ll start getting close in June/July and are closest on December 21.

The American Astronomical Society is meeting in Honolulu this week.

(Continued on page 6)
Hawaiian Astronomical Society
Event Calendar

February 2020

1 1st Quarter 3:41 pm
   Public Party 6:22 PM
   Kēhala/Geiger

2 Groundhog Day / Super Bowl
   BoD Meeting 3:30 PM

3 4 Club Meeting 7:30 PM

4 5

6 7

8 Full 9:33 pm

9

10

11

12

13

14 Valentine’s Day

15 3rd Quarter 12:17 pm
    Public Party 6:30 PM
    Dillingham Airfield

16 Presidents Day

17

18

19

20

21

22 Club Party 6:34 PM
    Dillingham Airfield

23

24 New Moon 5:32 pm

25

26 Ash Wednesday

27

28

29

<<Upcoming Star Parties>>

Public Party Geiger/Kahala February 1
Public Party Dillingham February 15
Club Party-Dillingham February 22

Upcoming School Star Parties

<table>
<thead>
<tr>
<th>Time</th>
<th>Date</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>6:30 PM</td>
<td>Fri, Feb 14</td>
<td>Hokulani Elementary School</td>
</tr>
</tbody>
</table>

Volume 70, Issue 2  Page 5
Chris is thinking about asking one of the TMT engineers, Amber, to come speak. She’s a pro-TMT person who might be able to come talk about her work on the TMT.

Jay Wrathall brought old copies of the Astronews and we’ll try to copy those and put onto the website.

Peter showed video of Starlink satellites. There are currently 60 in orbit with plans to launch 12,000 and a possible expansion to 40,000 satellites. He also provided pictures from the Chinese Chang-e lunar-orbiting spacecraft and upcoming events in 2020.

One of the graduate students from HIGP will speak next month.

The meeting was adjourned at 9 pm.

Sincerely,
Secretary Tammy Weese

(Continued from page 4) Meeting Minutes

Sun differ by 180°. This word can only be use with superior planets (Mars, Jupiter, Saturn, Uranus, & Neptune). The interior planets (Mercury & Venus) will never be on the other side of Earth away from the Sun.

The way Earth and other planets travel around the Sun, observer on Earth would see other planets move backward. This movement is called retrograde motion. Copernicus gave the correct explanation: all planets, including the Earth, move around the Sun in the same direction; retrograde motion is an illusion created when we observe other planets from the moving planet Earth.

Image from: https://starchild.gsfc.nasa.gov/docs/StarChild/questions/question46.html

An outer planet's apparent motion is always retrograde for a month or more before and after opposition. The duration of retrograde motion depends on the planet; it's shortest for Mars, and generally longest for Pluto. The moment when a planet's apparent motion changes direction is called a stationary point, because at that instant the planet appears to be more or less stationary with respect to the stars. An outer planet always has one stationary point before opposition, and another stationary point after opposition. Hopefully, when you look at the planet, you will know how to call the planet movement. If that planet is in the middle of the sky in the middle of the night, we could say that it is close
What happens when a star dies? Stargazers are paying close attention to the red giant star Betelgeuse since it recently dimmed in brightness, causing speculation that it may soon end in a brilliant supernova. While it likely won’t explode quite yet, we can preview its fate by observing the nearby Crab Nebula.

Betelgeuse, despite its recent dimming, is still easy to find as the red-hued shoulder star of Orion. A known variable star, Betelgeuse usually competes for the position of the brightest star in Orion with brilliant blue-white Rigel, but recently its brightness has faded to below that of nearby Aldebaran, in Taurus. Betelgeuse is a young star, estimated to be a few million years old, but due to its giant size it leads a fast and furious life. This massive star, known as a supergiant, exhausted the hydrogen fuel in its core and began to fuse helium instead, which caused the outer layers of the star to cool and swell dramatically in size. Betelgeuse is one of the only stars for which we have any kind of detailed surface observations due to its huge size – somewhere between the diameter of the orbits of Mars and Jupiter – and relatively close distance of about 642 light-years. Betelgeuse is also a “runaway star,” with its remarkable speed possibly triggered by merging with a smaller companion star. If that is the case, Betelgeuse may actually have millions of years left! So, Betelgeuse may not explode soon after all; or it might explode tomorrow! We have much more to learn about this intriguing star.

The Crab Nebula (M1) is relatively close to Betelgeuse in the sky, in the nearby constellation of Taurus. Its ghostly, spidery gas clouds result from a massive explosion; a supernova observed by astronomers in 1054! A backyard telescope allows you to see some details, but only advanced telescopes reveal the rapidly spinning neutron star found in its center: the last stellar remnant from that cataclysmic event. These gas clouds were created during the giant star’s violent demise and expand ever outward to enrich the universe with heavy elements like silicon, iron, and nickel. These element-rich clouds are like a cosmic fertilizer, making rocky planets like our own Earth possible. Supernova also send out powerful shock waves that help trigger star formation. In fact, if it wasn’t for a long-ago supernova, our solar system - along with all of us - wouldn’t exist! You can learn much more about the Crab Nebula and its neutron star in a new video from NASA’s Universe of Learning, created from observations by the Great Observatories of Hubble, Chandra, and Spitzer: bit.ly/ CrabNebulaVisual

Our last three articles covered the life cycle of stars from observing two neighboring constella-

(Continued on page 10)
The only recognized shower in February, the Centaurids (102 ACE) must compete with the full Moon on Feb 8th. This is a good time to discuss other meteor shower observing opportunities.

At a past LPSC conference a colleague, Tomoko Arai, mentioned that she was working on an innovative way to observe meteors. Instead of looking up from Earth in the conventional manner, she and the team from Planetary Exploration Research Center - Chiba Institute of Technology (also CASIS, SwRI), planned to observe from above the shower on the International Space Station (ISS). The ISS is an ideal platform for continuous meteor observation without distortion caused by weather and atmospheric disturbances. Observations of meteor showers is important in understanding the physical and chemical properties of not only meteoroids, but their parent comets or asteroids.

Their Meteor observing system (from Chitech Observatory) uses a super sensitive color high definition TV (HDTV) camera and a lens (F 0.94, f=17.5mm, FOV 46 deg) in the pressurized US Lab module (Destiny). The system images meteors through the Window Observational Research Facility (WORF), which is the highest optical-quality window ever installed on a human space vehicle. The camera has a diffraction grating to gather spectra to determine the abundance of several elements (Fe, Ca, Mg, Na) in the meteoroids or meteor dust.

The ISS orbits the Earth for 90 minutes at an altitude of 400 km with an orbital inclination of 51.6 deg. The Sun is below the horizon for 35 minutes during each orbit, which provides a total of 560 minutes of observing time over the 16 orbits/day. Software provides autonomous detection and extraction of

(Continued on page 11)

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

<table>
<thead>
<tr>
<th>First Quarter</th>
<th>Full Moon</th>
<th>Last Quarter</th>
<th>New Moon</th>
</tr>
</thead>
<tbody>
<tr>
<td>February 01</td>
<td>February 08</td>
<td>February 15</td>
<td>February 23</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Major Shower</th>
<th>Activity</th>
<th>Maximum</th>
<th>Radiant</th>
<th>$V_\infty$</th>
<th>$r$</th>
<th>ZHR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centaurids (102 ACE)</td>
<td>Jan 31 – Feb 20</td>
<td>Feb 8</td>
<td>319.2°</td>
<td>210°</td>
<td>-59°</td>
<td>58</td>
</tr>
</tbody>
</table>

The groundhog (Feb 2nd) may see his shadow, but is unlikely to see any meteors! There is only one minor shower this month! Tom Giguere, 808-782-1408, Thomas.giguere@yahoo.com; Mike Morrow, PO Box 6692, Ocean View, HI 96737.
Here are the financials up through the first part of January.

$140 for Office Supplies?! That was for the post office box renewal for another year. It went up $20.

Thanks to all the people who have renewed. Welcome to the newcomers. Thanks especially to those who donated extra.

The last public star party had just enough sucker holes for some folks to hang around until 10:00 p.m. The following club star party was better. It was clear the entire time. Astrophotographers matched the visual folks in number and the turnout was pretty good. I'm hoping to have a few images to show at the meeting.
The Astronews

Page 10

(Continued from page 7) NASA’s Night Sky Notes

tions: Orion and Taurus! Our stargazing took us to the "baby stars" found in the stellar nursery of the Orion Nebula, onwards to the teenage stars of the Pleiades and young adult stars of the Hyades, and ended with dying Betelgeuse and the stellar corpse of the Crab Nebula. Want to know more about the life cycle of stars? Explore stellar evolution with “The Lives of Stars” activity and handout: bit.ly/starlifeanddeath.

Check out NASA’s most up to date observations of supernova and their remains at nasa.gov

This image of the Crab Nebula combines X-ray observations from Chandra, optical observations from Hubble, and infrared observations from Spitzer to reveal intricate detail. Notice how the violent energy radiates out from the rapidly spinning neutron star in the center of the nebula (also known as a pulsar) and heats up the surrounding gas. More about this incredible "pulsar wind nebula" can be found at bit.ly/Crab3D  Credit: NASA, ESA, F. Summers, J. Olmsted, L. Hustak, J. DePasquale and G. Bacon (STScI), N. Wolk (CfA), and R. Hurt (Caltech/IPAC)

Spot Betelgeuse and the Crab Nebula after sunset! A telescope is needed to spot the ghostly Crab

This image of the Crab Nebula combines X-ray observations from Chandra, optical observations from Hubble, and infrared observations from Spitzer to reveal intricate detail. Notice how the violent energy radiates out from the rapidly spinning neutron star in the center of the nebula (also known as a pulsar) and heats up the surrounding gas. More about this incredible "pulsar wind nebula" can be found at bit.ly/Crab3D  Credit: NASA, ESA, F. Summers, J. Olmsted, L. Hustak, J. DePasquale and G. Bacon (STScI), N. Wolk (CfA), and R. Hurt (Caltech/IPAC)
(Continued from page 8) Meteor Log by Tom Giguere

meteors in the acquired image data to minimize data volume.

The mission plan is to conduct continuous meteor observations through the window for two years. The camera is scheduled to record all 12 known major showers. Secondary targets include minor meteor showers and periods with little or no identified regular activity. Observation of de-orbiting spacecraft and other targets also will be made. New minor meteor showers may be identified. The camera made its first observations on July 7, 2016 of a meteor over the North Pacific Ocean (~173.9E, 48.5N). I hope to obtain an update from Dr. Arai at the next Lunar and Planetary Science Conference in March, 2020.

(Continued from page 6) Parting words from your editor

to opposition. It may even be at stationary point before it starts to retrograde. Take some photos and compare them.
In the northern Mexican state of Coahuila lies the Curio Cienegas Basin. Dotting the landscape are small pools formed by natural springs in which are found live stromatolites.