



**Greg Smith – editor**

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**October Speaker: Les Hastings  
NASA Ambassador  
NASA Missions Update**

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**Start with Binoculars.**

The weather forecast for the next week is looking to be good for stargazing. In fact the forecast seems to follow the NOAA long range outlook for a dryer and warmer than average fall and winter. This may mean we will get more chances to view the constellations of autumn and winter. I am not making dates to view, but I am hopeful to get out a few more times than I normally do.

Will this mean we will get the opportunity to do some extra sidewalk astronomy or do an extra star party, possibly? Then again the temperatures will be a factor. What does warmer than average mean? Three or four degrees? With temps in the lower 30's and 40's three degrees do not make much difference when standing at a scope and still freezing your legs and arms and backside. More binocular time seems to be more in the outlook. No setup or scope cooling time. Just go out and point the binoculars at the asterisms and star clouds. Maybe even get in a galaxy or two.

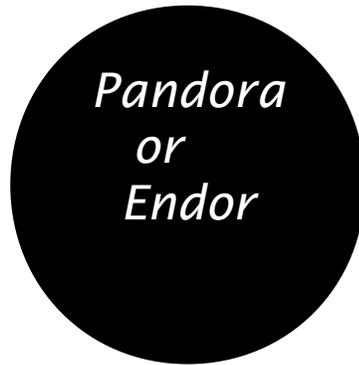
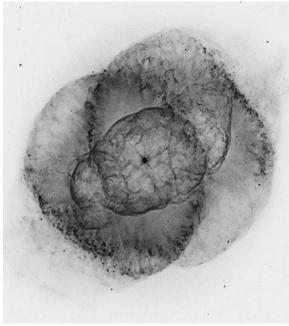
Using binoculars is a good way to introduce someone to the night sky. I have friends that I'd like to show what binoculars can see. In fact I have a book that

will help me guide them to some of the good stuff that telescopes are not needed to see. [Sky & Telescopes 'Binocular Highlights']

The Pleiades are one of the best starting points for a binocular tour of sky. Since it is visible with the naked eye, the view with the binoculars will wow them with the ability to see so much more of the star cluster. Then moving onto the Andromeda galaxy, with a little eye adaptation, you can see a bit more than the bright smudge of the center; you can see faintly the disk of the galaxy. Not to be forgotten is the star nursery in Orion. This is one that surprises new comers as they come to know and understand that stars are in the making at the present. The light from this nursery come to them from the time of the Norman conquest of England.

As you can see, there is so much more to having more clear nights than having to haul out a scope and set it up. A quick tour of the night sky with binoculars can get a new star gazer started.

**Every Day is a Star Filled Day  
Every Night is a Starry Night**



## **Astronomers find first compelling evidence for a moon outside our solar system**

*New Neptune-sized exomoon candidate has been observed around a star some 8,000 light years away*

*Date:* October 3, 2018



*Artist Dan Durda impression of the exoplanet Kepler-1625b, with the candidate exomoon in tow.*

A pair of Columbia University astronomers using NASA's Hubble Space Telescope and Kepler Space Telescope has assembled compelling evidence for the existence of a moon orbiting a gas-giant planet 8,000 light-years away.

In a paper published Oct. 3 in the journal *Science Advances*, Alex Teachey and David Kipping report that the detection of a candidate exomoon -- that is, moons orbiting planets in other star systems -- is unusual because of its large size, comparable to the diameter of Neptune. Such gargantuan moons do not exist in our own solar system, where nearly 200 natural satellites have been cataloged.

"This would be the first case of detecting a moon outside our solar system," said Kipping, an assistant professor of astronomy at Columbia. "If confirmed by follow-up Hubble observations, the finding could provide vital clues about the development of planetary systems and may cause experts to revisit theories of how moons form around planets."

In looking for exomoons, the researchers analyzed data from 284 Kepler-discovered planets that were in comparatively wide orbits, with periods greater than 30 days, around their host star. The observations measured the momentary dimming of starlight as a planet passed in front of its star, called a transit. The researchers found one instance, in Kepler 1625b, that had intriguing anomalies.

"We saw little deviations and wobbles in the light curve that caught our attention," Kipping said.

The Kepler results were enough for the team to get 40 hours of time with Hubble to intensively study the planet, obtaining data four times more precise than that of Kepler. The researchers monitored the planet before and during its 19-hour-long transit across the face of the star. After it ended, Hubble detected a second and much smaller decrease in the

star's brightness 3.5 hours later, consistent with "a moon trailing the planet like a dog following its owner on a leash," Kipping said. "Unfortunately, the scheduled Hubble observations ended before the complete transit of the moon could be measured."

In addition to this dip in light, Hubble provided supporting evidence for the moon hypothesis by measuring that the planet began its transit 1.25 hours earlier than predicted. This is consistent with the planet and moon orbiting a common center of gravity (barycenter) that would cause the planet to wobble from its predicted location.

"An extraterrestrial civilization watching the Earth and Moon transit the Sun would note similar anomalies in the timing of Earth's transit," Kipping said.

The researchers note that in principle this anomaly could be caused by the gravitational pull of a hypothetical second planet in the system, although Kepler found no evidence for additional planets around the star during its four-year mission.

"A companion moon is the simplest and most natural explanation for the second dip in the light curve and the orbit-timing deviation," said lead author Teachey, NSF Graduate Fellow in astronomy at Columbia. "It was a shocking moment to see that light curve, my heart started beating a little faster and I just kept looking at that signature. But we knew our job was to keep a level head testing every conceivable way in which the data could be tricking us until we were left with no other explanation."

The moon is estimated to be only 1.5 percent the mass of its companion planet, which itself estimated to be several times the mass of Jupiter. This value is close to the mass-ratio between the Earth and its moon. But in the case of the Earth-Moon system and the Pluto-Charon system -- the largest of the five known natural satellites of the dwarf planet Pluto -- an early collision with a larger body is hypothesized to have blasted off material that later coalesced into a moon. Kepler 1625b and its satellite, however, are gaseous, not rocky, and, therefore, such a collision may not lead to the condensation of a satellite.

Exomoons are difficult to find because they are smaller than their companion planet and so their transit signal is weak; they also shift position with each transit because the moon is orbiting the planet. In addition, the ideal candidate planets hosting moons are in large orbits, with long and infrequent transit times. In this search, the Neptune-sized moon would have been among the easiest to first detect because of its large size.

The host planet and its moon lie within the solar mass star's (Kepler 1625) habitable zone, where moderate temperatures allow for the existence of liquid water on any solid planetary surface. "Both bodies, however, are considered to be gaseous and therefore unsuitable for life as we know it," Kipping said.

Future searches will target Jupiter-sized planets that are farther from their star than Earth is from the Sun. There are just a handful of these in the Kepler database. NASA's upcoming James Webb Space Telescope could really "clean-up" in the satellite search, Kipping said. "We can expect to see really tiny moons."

**Story Source:** Materials provided by [Columbia University](#).

***[Space.com has an excellent post on this article with very detailed videos on this research. <https://www.space.com/42023-possible-exomoon-discovery-pandora-endor.html>]***

## Minutes of the September Meeting

President Greg Smith called the meeting to order. We have received a donation check for \$250 from the Mt. St. Helen's Institute for our help at the Mt. St. Helen's Star Party this summer.

We want to thank Roy Gawlick for all his work on our new website. Roy would like club photos for the website. Not everyone was able to open the newsletter from the website.

We will have Sidewalk Astronomy this Friday, weather permitting.

We discussed the November meeting. The meeting would be the day before Thanksgiving. It was voted to reschedule it to the 14th instead. Mark Morris has been reserved for the year. Thank you Bill Norvell for reserving the Canterbury for tonight's meeting.

Steve Powell is taking calendar orders next month. he will be checking on prices.

Mark Thorson has a Thank You card for members to sign for both Kori Quatermass and for the Mt. St. Helen's Institute.

Ted Gruber gave the Sky Report. Venus is visible low in the WSW sky just after sunset through very early October. It is only visible for about 30 minutes after sunset. It will return to the morning sky in early November. Jupiter is visible in the SW at dusk. It now remains visible for about two after sunset and only an hour after in mid-October. Saturn appears in the SSW for about 4 hours after sunset. Mars is visible in the SE sky and remains visible until it sets in the SW around 1:00 am. The Orionid Meteor Shower is active from October 2nd through November 7th, peaking during the early morning hours of October 21st. The Messier of the Month is M27 the Dumbbell Nebula. It is a planetary nebula in Vulpecula. It was the first planetary nebula discovered and is the brightest of the four planetary nebulae in the Messier catalog. It is magnitude 7.5, 1350 light years away, and its estimated age is anywhere from 9,800 to 14,600 years old. Through binoculars it appears as a smudge of gray light. Ted would also like to have a star party around the new moon in October.

After the Sky Report we took a small break for refreshments.

Our program tonight is a DVD, The Fall Sky, by Edward Murphy PhD of University of Virginia. The lecture navigates around the autumn sky from the Northern Hemisphere, discovering how the classical myth of Andromeda ties together the stores of nearby constellations of Cassiopeia, Perseus, Cepheus, Pegasus, and Cetus.

Mtg adjourned

☞ **October 2018 Meeting** ☞

DATE: **Wednesday, October 17, 2018**

TIME **7:00 pm**

PLACE: **Mark Morris High School  
Large Group Learning Center  
Use back Parking Lot on 17<sup>th</sup>**

PROGRAM: **Les Hastings  
NASA Ambassador  
NASA Missions Update**

SNACKS: **Tom Meek**  
DRINKS: **Ripp family**

**Friends of Galileo  
Club Officers**

PRESIDENT	Greg Smith
VICE-PRESIDENT/PROGRAM CHAIR	Ted Gruber
SECRETARY	Becky Kent
TREASURER	Steve Powell
WEBSITE	Roy Gawlick
NEWSLETTER ED.	Greg Smith
ALCOR	Tom Meek

**Next Month's  
Newsletter Deadline**

The deadline for items in next month's newsletter is:

**Wednesday, October  
10th.**

**Please feel free to send in your thoughts and experiences about your astronomical adventure.**

Submit your material by E-mail to:

[gryth@msn.com](mailto:gryth@msn.com)