ECLIPSE NEWSLETTER

The Eclipse Newsletter is dedicated to increasing the knowledge of Astronomy, Astrophysics, Cosmology and related subjects.

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JULY – AUGUST 2017

PLEASE SEND ALL PHOTOS, QUESTIONS AND REQUST FOR ARTICLES TO
pestrattonmcag@gmail.com

PLEASE NOTE: IN THE NEAR FUTURE I WILL BE USING A NEW EMAIL ADDRESS.

eclipseastronews@gmail.com

I WILL SEND PRIOR NOTIFICATION

MCAO PUBLIC NIGHTS AND FAMILY NIGHTS.

The general public and MCAO members are invited to visit the Observatory on select Monday evenings at 8PM for Public Night programs. These programs include discussions and illustrated talks on astronomy, planetarium programs and offer the opportunity to view the planets, moon and other objects through the telescope, weather permitting. Due to limited parking and seating at the observatory, admission is by reservation only.

Public Night attendance is limited to adults and students 5th grade and above. If you are interested in making reservations for a public night, you can contact us by calling 302-654-6407 between the hours of 9 am and 1 pm Monday through Friday. Or you can email us any time at KimGreenmcao@gmail.com or mtcuba@physics.udel.edu. The public nights will be presented even if the weather does not permit observation through the telescope. The admission fees are $3 for adults and $2 for children. There is no admission cost for MCAO members, but reservations are still required. If you are interested in becoming a MCAO member, please see the link for membership. We also offer family memberships.

Family Nights are scheduled from late spring to early fall on Friday nights at 8:30PM. These programs are opportunities for families with younger children to see and learn about astronomy by looking at and enjoying the sky and its wonders. It is meant to teach young children from ages 6-12 about astronomy in simple terms they can really understand. Reservations are required and admission fees are $3 for adults and $2 for children.

MCAO WEB SITE IS

mountcuba.org

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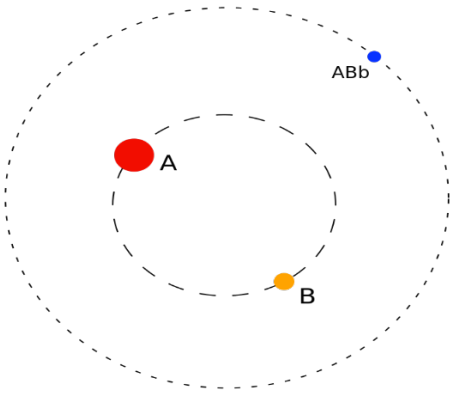
Astronomical Terms Defined.

Below, is a list of words you will come across in these articles. Hopefully, it will help some new readers have a better understanding of the articles.

Circumbinary - A circumbinary planet is a planet that orbits two stars instead of one. Because of the short orbits of some binary stars, the only way for planets to form is by forming outside the orbit of the two stars.



Circumbinary Planet

Typical configuration of circumbinary planetary systems (not to scale), in which A and B are the primary and secondary star, while ABb denotes the circumbinary planet.

Mass - In physics, mass is a property of a physical body. It is the measure of an object's resistance to acceleration (a change in its state of motion) when a net force is applied.[1] It also determines the strength of its mutual gravitational attraction to other bodies. The basic SI unit of mass is the kilogram (kg).

Mass is not the same as weight, even though mass is often determined by measuring the object's weight using a spring scale, rather than comparing it directly with known masses.

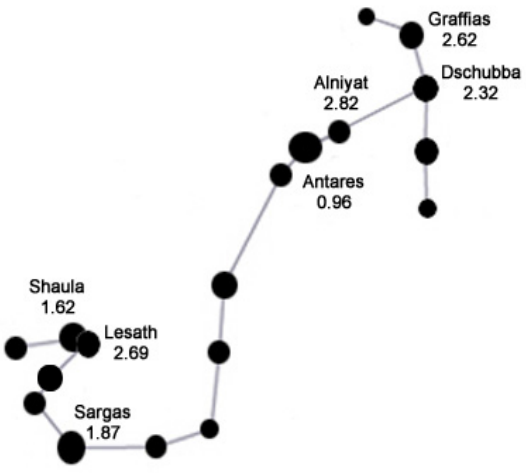
An object on the Moon would weigh less than it does on Earth because of the lower gravity, but it would still have the same mass. This is because weight is a force, while mass is the property that (along with gravity) determines the strength of this force.

super-Earth - A super-Earth is an extrasolar planet with a mass higher than Earth's, but substantially below the masses of the Solar System's ice giants, Uranus and Neptune, which contain 15 and 17 Earth masses respectively.[1] The term *super-Earth* refers only to the mass of the planet, and so does not imply anything about the surface conditions or habitability.

This issues constellation.

Scorpius Constellation: Facts About the Scorpion.

The Scorpius constellation has intrigued people for centuries, not only for its distinctive shape, but also because it is one of the brightest constellations in the sky. The name is Latin for scorpion, or literally translated as the "creature with the burning sting." However, Scorpius is not a scorpion to everyone. The Javanese people of Indonesia call this constellation Banyakangrem, meaning "the brooded swan" or Kalapa Doyong, meaning "leaning coconut tree." In Hawaii, it is known as the demigod Maui's Fishhook. In Chinese mythology, the constellation was part of the Azure Dragon. In the Northern Hemisphere, Scorpius lies close to the southern horizon; in the Southern Hemisphere, it lies high in the sky near the center of the Milky Way.



Home of exoplanets Scorpius happens to be the location for several interesting exoplanets, who have metrics ranging from extreme old age to potential habitability.

The planet PSR B1620-26 b is sometimes nicknamed "Methuselah" as it is estimated at roughly 12.7 billion years old. (By comparison, the universe is about 13.7 billion years old.) It's about twice Jupiter's mass and orbits around two stars, making it a circumbinary planet. (The two stars are called PSR B1620-26 A, and a white dwarf called WD B1620-26.)

Gliese 667Cc is a "super-Earth" that is roughly four times as massive as Earth. It orbits a red dwarf called Gliese 667C; the star is part of a three-star system that is only 22 light-years away from Earth. The planet is considered potentially habitable, according to the University of Puerto Rico at Arecibo's Planetary Habitability Laboratory.

Notably, the same system is also host to two other potentially habitable planets: Gliese 667Ce and Gliese 667Cf, both of which are about 2.7 times the mass of Earth. Among astronomers, "habitability "is often defined as a rocky world that is close enough to its parent star for liquid water to exist on the surface. However, there are likely other metrics

that come into play, such as the composition of a planet's atmosphere and the variability of the host star.

Other objects in Scorpius

Scorpius has many bright stars, including Antares (α Sco), Graffias (β1 Sco), Dschubba (δ Sco), Sargas (θ Sco),

Shaula (λ Sco), Jabbah (ν Sco), Girtab (ξ Sco), Iclil (π Sco), Alniyat (a name shared by two stars: σ Sco and τ Sco) and Lesath (υ Sco). Antares, also called alpha Scorpii, is a red supergiant and the 16th brightest star, with an apparent magnitude between 0.96 and 1.8. It is part of a binary system, having a faint companion. Shaula, also known as Lambda Scorpii, is the second-brightest star in the constellation and the 25th brightest star in the sky, with an apparent magnitude of about 1.63. Astronomers have confirmed it too is made up of two stars, and there could be a third one given that the star system is producing more X-rays than expected. Other binary stars in Scorpius include Beta, Nu, Xi and Sigma Scorpii.

The constellation encompasses U Scorpii, one of only 10 known recurring novas, which is the rapid increase in the brightness of a star. While it normally has a magnitude of 18, it reaches a magnitude of about 8 during outbursts, which have been observed in 1863, 1906, 1936, 1979, 1987, 1999 and 2010.

Scorpius is also home to four deep space object that were among the first to be catalogued by Charles Messier: M4 (NGC6121); M6 (NGC6405), also called the Butterfly Cluster; M7 (NGC6475); and M80 (NGC6093).

What are the Messier Objects?

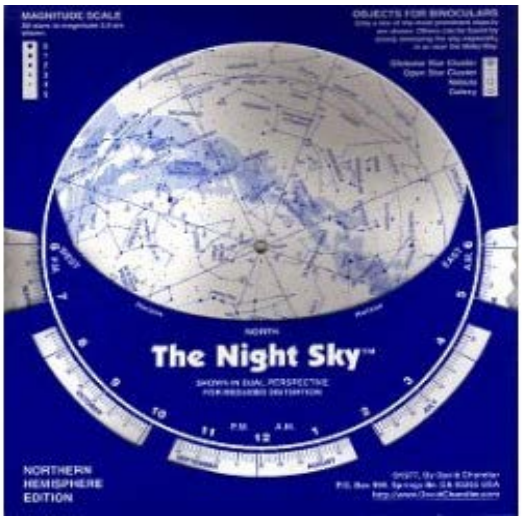
The Messier objects are a set of over 100 astronomical objects first listed by French astronomer Charles Messier in 1771.[1] Messier was a comet hunter, and was frustrated by objects which resembled but were not comets, so he compiled a list of them,[2] in collaboration with his assistant Pierre Méchain, to avoid wasting time on them. The number of objects in the lists he published reached 103, but a few more thought to have been observed by Messier have been added by other astronomers over the years.

For a list of Messier objects:

https://en.wikipedia.org/wiki/List of Messier objects

How to find Constellations.

Step 1. Purchase a Star Chart as shown below. Mt. Cuba Astronomical Observatory sells this one for $4.00.



Step 2. Orient the Star Chart. To use a star chart to identify stars and constellations, you must first find the one appropriate for the time of year you are observing. Face North to ...
Step 3. Compare. Compare the stars on the star chart and the stars you see in the night sky.

How Do We Calculate Distances of This Magnitude?

The methods astronomers use to measure distances to the stars are pieces of fundamental and active work in astronomy with important implications for how we understand the Universe around us.

One of the most accurate methods astronomers use to measure distances to stars is called parallax. If you hold your finger in front of your face and close one eye and look with the other, then switch eyes, you'll see your finger seem to "shift " with respect to more distant

objects behind it. This is because your eyes are separated from each other by a few inches - so each eye sees the finger in front of you from a slightly different angle. The amount your finger seems to shift is called its "parallax".

Astronomers can measure parallax by measuring the position of a nearby star very carefully with respect to more distant stars behind it, then measuring those positions again six months later when the Earth is on the opposite side of its orbit. If the star is close enough to us, a measurable parallax will be seen: the position of the star relative to the more distant background stars will have shifted. The shift is tiny - less than an arcsecond even for the nearest star. (An arcsecond is 1/60 of an arcminute, which is 1/60 of a degree.) (Imagine the Universe has more information on calculating parallax.)

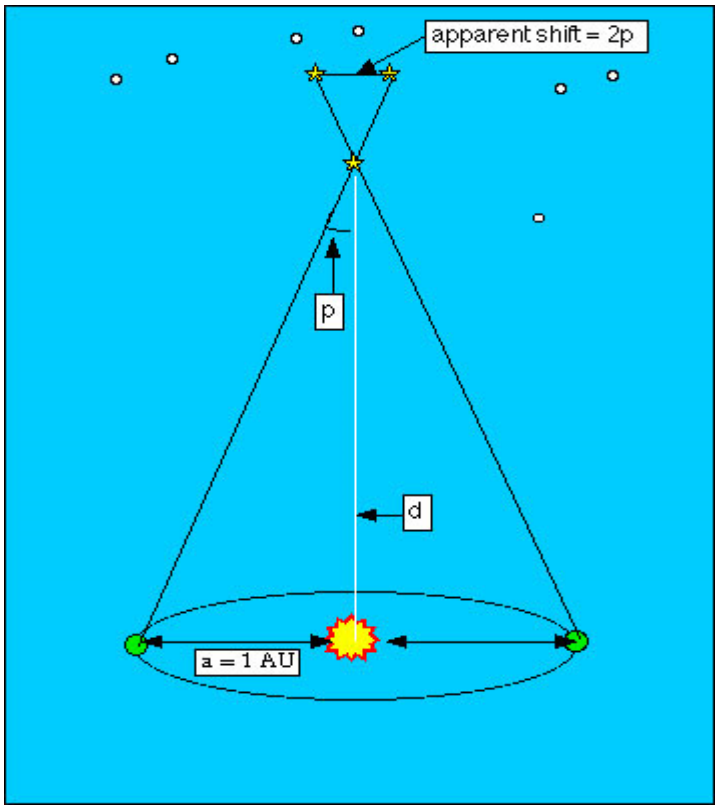


Image Credit: Imagine the Universe, NASA/GSFC

Why Are These Distances Important To Astronomers?

Stars are not actually stationary objects! The Galaxy is rotating, and the stars are in orbit around its center. Not every star moves at the same rate - how fast they orbit can depend on where the star is located within the Galaxy. Our Sun, being fairly far from the Galactic Center, takes over 200 million years to circle the Galaxy once. Some of the stars near us are moving faster than us, and some slower. As Phil Plaitt, from Bad Astronomy says, "...like

cars on a highway, stars continually pass each other as they orbit the Galaxy. They change positions, slowly, but measurably."

Image Credit: Frog Rock Observatory,
public domain and copyright-free.

This animation by Frog Rock Observatory shows the movement of Barnard's Star across the sky from 1985 to 2005. Barnard's Star is approaching the Sun so rapidly that around 11,700 AD, it will be 3.8 light years from the Sun - and thus the closest star to our own! (Garcia-Sanchez, et al, 2001)

Travel Time

The Voyager 1 spacecraft is on an interstellar mission. It is traveling away from the Sun at a rate of 17.3 km/s. If Voyager were to travel to Proxima Centauri, at this rate, it would take over 73,000 years to arrive. If we could travel at the speed of light, an impossibility due to Special Relativity, it would still take 4.22 years to arrive!

Why Can't We Travel Faster Than the Speed Of Light?

According to Special Relativity the mass of an object increases as its speed increases, and approaches infinity as the object's speed approaches the speed of light. This means that it would take an infinite amount of energy to accelerate an object to the speed of light.

There's no fundamental reason why we can't get as close to the speed of light as we like, provided we have enough energy. But this is probably far in the future.

Who's in charge of outer space?

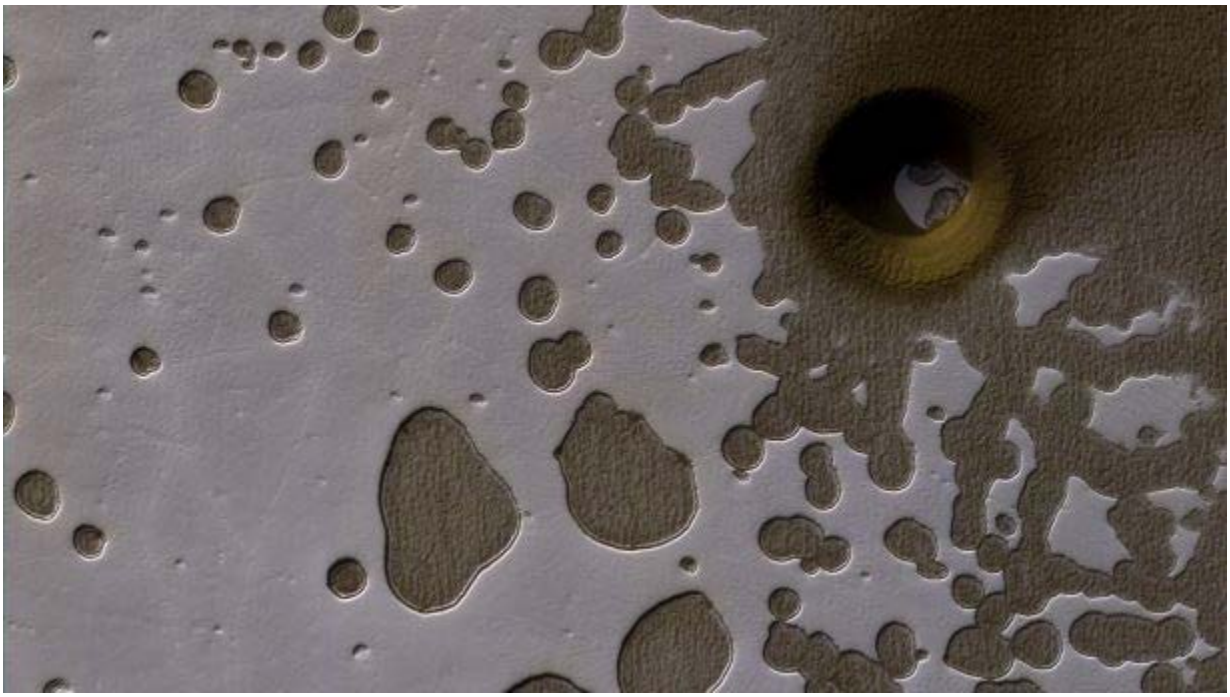
In space, no one can hear you scheme. But here on Earth, plans to go where few have gone before are getting louder by the minute.

In February, Virgin Galactic's SpaceShipTwo passed its third glide-flight test, putting it on pace to offer suborbital space tourism by the end of 2018. In March, Goldman Sachs announced to investors that a single asteroid containing $25 billion to $50 billion of platinum could be mined by a spacecraft costing only $2.6 billion—less than a third of what has been invested in Uber.

"While the psychological barrier to mining asteroids is high," the Goldman report concludes, "the actual financial and technological barriers are far lower." In April, NASA selected Trans Astronautica Corp., an aerospace company based in Lake View Terrace, Calif., for $3.25 million in technology study grants. Among TransAstra's NASA-approved projects: an asteroid-hunting telescope whose stated mission is "to start a gold rush in space."

The final frontier is starting to look a lot like the Wild West. As more companies announce ambitious plans to do business beyond Earth, serious questions are emerging about the legality of off-planet activity.

Huge, deep hole on Mars leaves scientists baffled.



A depression huge and deep on Mars has left astronomers baffled.

It was discovered by NASA's Mars Reconnaissance Orbiter (NRO), which has been studying the Martian surface for 11 years. The vast pit, estimated to be hundreds of feet across and surrounded by frozen carbon dioxide, is located on the south pole of Mars— sticking out among the Swiss cheese terrain of Earth's closest neighbor.

According to NASA, "the depressions are thought to be caused by sublimation, which is when a material goes directly from a solid to a gas phase."

According to Science Alert, there are many ways such holes are formed on Mars, which is colder than Earth— meteorites leave craters; lava tubes collapse and produce deep pits; floods from long ago hollow out grand canyons; and volcanos melts ice fashioning funnels.

The depression was discovered by the MRO's High Resolution Imaging Science Experiment, or HiRISE camera, which allows NASA to see Martian objects larger than 3 feet from about 125 to 250 miles above.

The camera takes repeated images throughout Mars' seasons to monitor the terrain's changes.

New potentially habitable 'super-Earth' orbiting star 21 light years away has just been spotted.

Astronomers have found a new "super-Earth" circling an M-dwarf star, and it could be habitable. The dwarf star, designated as GJ 625, is around 21 light years away from our solar system and is around 1/3rd the size and mass of the Sun.

Super-Earths are a kind of exoplanet with a greater mass than the Earth, but not exceeding the mass of ice giants such as Neptune or Uranus. Although the term "super-Earth" is generally used to refer to the mass of the planetary body, scientists also use the term to describe planets that are visually larger than Earth.

The discovery was made by a team of astronomers led by Alejandro Suarez Mascareño of the Canary Islands Institute of Astrophysics. The scientists studied the dwarf star for over 3 years.

The astronomers said that the super-Earth was found orbiting "at the inner edge of the habitable zone of the star."

"As GJ 625 is a relatively cool star the planet is situated at the edge of its habitability zone, in which liquid water can exist on its surface," Mascareño said in a statement. "In fact, depending on the cloud cover of its atmosphere and on its rotation, it could potentially be habitable."

Stars like the one the newly discovered super-Earth was found circling, are often prime areas for researchers searching for alien Earth-like planets. This is because low mass rocky planets are more likely to be found around dwarf stars. However, discovering such planetary bodies can be challenging as the signals emitted by such stars can often mimic those of a planetary body.

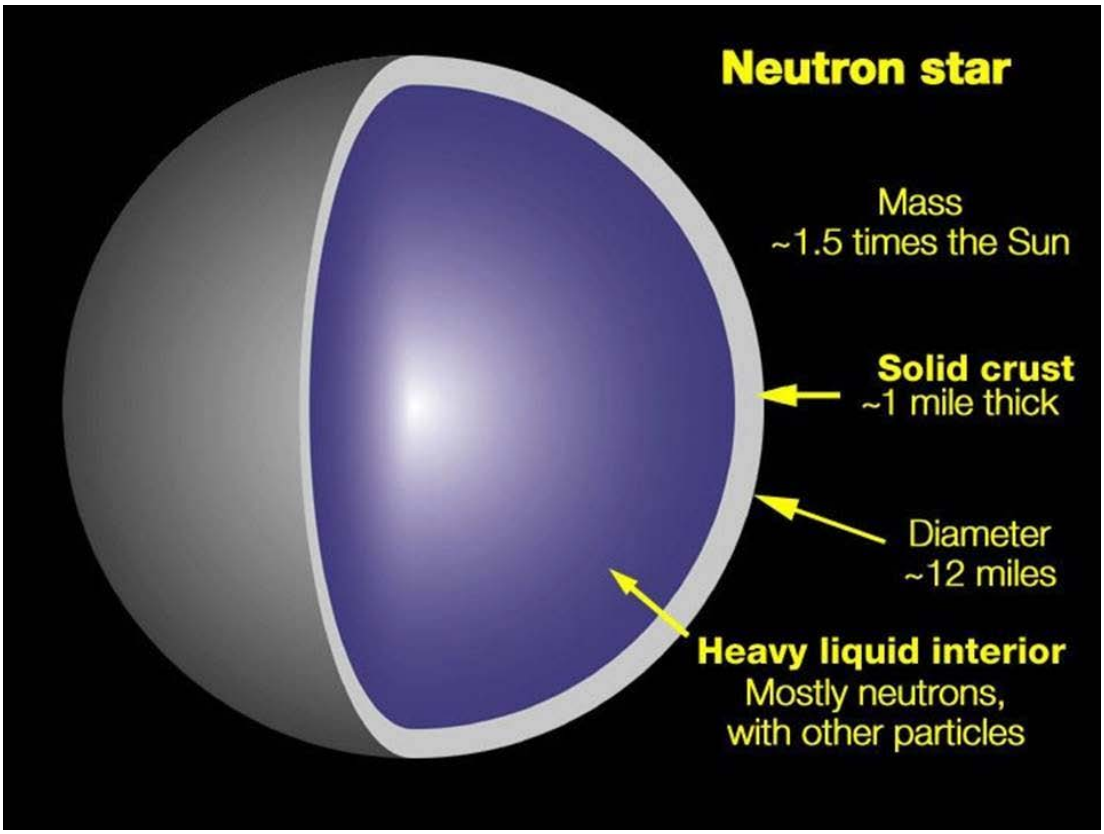
The super-Earth was designated as GJ 625 b. The exoplanet has a minimum mass of 2.8 Earth masses and is the lightest ever exoplanet found orbiting an M-dwarf star, which is the star's spectral designation. The exoplanet orbits the star every 14.6 days at a relatively close distance.

ISS To Get Instrument To Study Neutron Stars.

Of all the strange and mysterious things in space that us humans and our machines can observe, few come close to neutron stars when it comes to flummoxing scientists. But a new scientific instrument being sent to the International Space Station (ISS) may provide information that will help us solve some of the neutron star's riddles.

When SpaceX launches its eleventh cargo mission to ISS for NASA — using a Falcon 9 rocket June 1 — it will include an instrument called Neutron Star Interior Composition Explorer (NICER), the first NASA mission dedicated to the study of neutron stars. It will be installed aboard the space station, from where it will observe both regular neutron stars as well as pulsars.

NICER team members Takashi Okajima, Yang Soong, and Steven Kenyon apply epoxy to the X-ray concentrator mounts after alignment. The epoxy holds the optics assemblies fixed in position through the vibrations experienced during launch to the International Space Station. Photo: NASA Goddard Space Flight Center



Neutron stars are similar, in some ways, to black holes. Both are incredibly dense and form when stars collapse. However, stars that turn into black holes are over 20 times the mass of the sun, or thereabouts, compared to neutron stars, which start out as stars with between seven and 20 solar masses. And while neutron stars are not as dense as black holes, they are

still the second-densest objects known to us. A teaspoon of neutron star matter, if brought to Earth, would weigh about one billion tons.

“If you took Mount Everest and squeezed it into something like a sugar cube, that’s the kind of density we’re talking about,” Keith Gendreau, the principal investigator for NICER at NASA’s Goddard Space Flight Center in Greenbelt, Maryland, said in a statement Friday.

Since we can’t observe what happens beyond the event horizon of a black hole, understanding how matter works inside neutron stars will provide scientists with knowledge of how matter behaves in conditions of extreme pressure and density that exists within black holes as well. And these are not conditions that can be artificially created in a laboratory on Earth.

Pulsars are rapidly rotating neutron stars, spinning up to hundreds of times per minute. They are also surrounded in extremely strong magnetic fields which are trillions of times stronger than that on Earth. These two properties — fast rotation and extreme magnetism — accelerates particles to speeds approaching almost that of light. When some of those particles fall on the pulsar’s magnetic poles, a large amount of heat is generated, visible in X-ray as brightly glowing hot-spots.

The gravity of neutron stars, akin to that of black holes, is very intense and warps space-time. This warping distorts the view of the star’s surface and the hot spots on it. By measuring the changes in the brightness related to the distortion, caused by the spinning of the neutron star, NICER will be able to determine the pulsar’s radius.

Goddard’s Zaven Arzoumanian, NICER deputy principal investigator and science lead, said in the statement: “Neutron stars represent a natural density limit for stable matter that you can’t exceed without becoming a black hole. We don’t know what happens to matter near this maximum density. … NICER is designed to see the X-ray emission from those hot spots. As the spots sweep toward us, we see more intensity as they move into our sightline and less as they move out, brightening and dimming hundreds of times each second. … Once we have a measure of the mass and radius, we can tie those results directly into the nuclear physics of what goes on when you compress so much mass into such a small volume.”

Another problem NICER could help solve concerns the critical mass at which a star can turn into a black hole. In cases of binary systems, when a neutron star orbits another star, the former often pulls material off the latter and gains mass. Understanding the critical threshold when the mass is enough for the star to turn into a black hole will allow us to prict the number of black holes and neutron stars in the universe.

Skyglow: The night sky you can't see.

When was the last time you looked up at the night sky and glimpsed the Milky Way? Last night? A year ago? Never? Some 80% of North Americans can no longer see the galaxy due to light pollution, or skyglow.

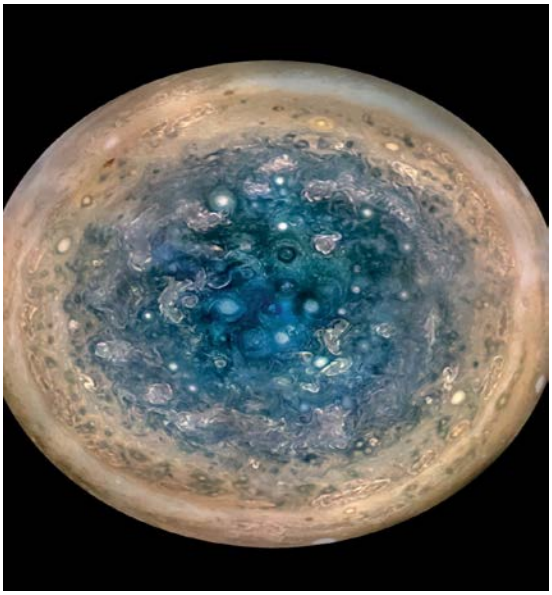
Light pollution causes a profound ecological disruption that affects human health, alters animal migratory patterns and obstructs astronomical research. Recent findings even suggest higher breast cancer rates may result from artificial day conditions created by over-lighted cities and the consequent suppression of nocturnal melatonin production. It's estimated that one third of the world's population lives under light-polluted skies, a situation worsening dramatically with aggressive urban expansion.

To bring attention to the problem, we traveled across the continent using long exposure DSLR photography to capture the cosmos from North America's endangered "dark sky" locations. Despite its immense population, we still found some of the best shots in our own backyard of Southern California. Each photo was exposed for 25 seconds, allowing galactic details to flood in — far more than can be seen with the naked eye. The psychedelic "star trails" effect in many of the pictures was created by tracking the rotation of the Earth's axis over several hours as our cameras fired continuously, operated by remote controls known as intervalometers.

Night isn't just a darker version of day, it's our chance to see the universe — or it was once, and could be again if we understood light pollution as the environmental tragedy it really is.

Editors note. The above picture is a very good example of skyglow. I live just to the south east of the I95-R273 interchange as well as the service center just below that interchange. When I moved here in 1971, I had a wonderful view of the North Star, Big and Little Dipper as well as several other sky objects. Today, I have no view at all due to the state installation at both the intersection and service area of several very tall (300 feet?) light stands with multiple spot lights on top of each pole.

You've Never Seen a Photo of Jupiter - and Its Cyclones - Like This One!



Even if you're not a fan of science, you've gotta admit this epic photo of Jupiter's south pole is insanely cool. The close-up photo was taken during NASA's six year Juno mission to Jupiter, and what the space agency discovered is just as fascinating as the colorful image

itself. For one, those oval features you see on top of the Gas Giant planet are actually humongous cyclones that are about the same size as planet Earth.

The extensive Juno trip also included a measurement of the magnetic field of Jupiter, which turned out to be "twice as strong" as previously predicted by scientists and "10 times greater than the field that surrounds Earth," according to The Guardian.

UPCOMING STAR PARTIES

For more information on DAS STAR PARTIES, visit the mountcuba.org web site. Select Delaware Astronomical Society DAS.

Select Events at top and then STAR PARTIES.