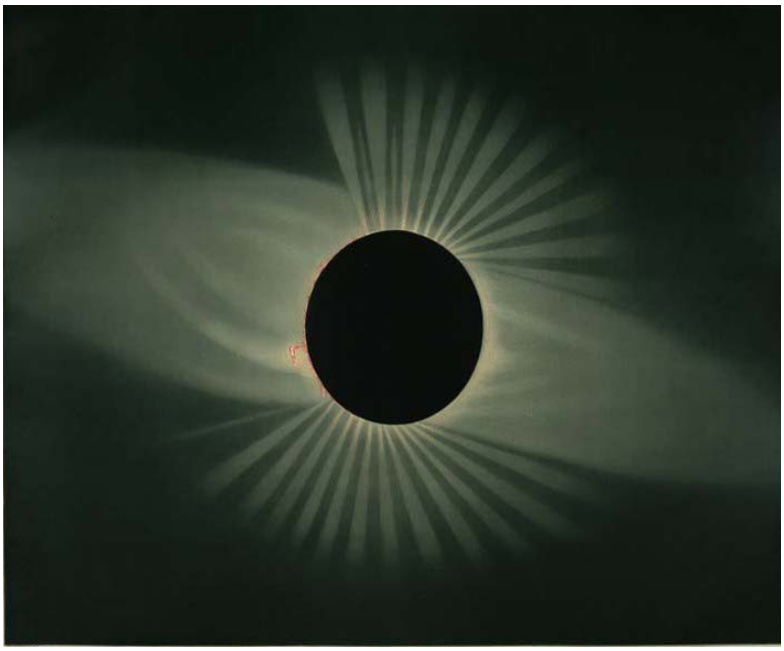
ECLIPSE NEWSLETTER



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

VOLUMN 2 NUMBER 3
MAY – JUNE 2018

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

Children's Programs Summer 2018

Date	Time	Host	Topic
Friday, May 4, 2018	8pm	Weaver	How to Choose Your Childs First Telescope
Friday, May 25, 2018	8pm	Provencal	The Solar System
Friday, June 8, 2018	8pm	Stratton	How the Earth was Made
Friday, June 29, 2018	8pm	Vincent	Constellations
Friday, July 13, 2018	8pm	King	Caroline Herschel, the Cinderella of Astronomy
Friday, July 27, 2018	8pm	Jackson	Fire and Ice in Our Solar System
Friday, August 3, 2018	8pm	Jackson	What is the Weather on Mars Today?
Friday, August 10, 2018	8pm	Hornberger	Astronomy in Other Cultures

Please contact us for reservations at 302-654-6407 between 9am and 1pm Monday through Friday. Or you can email me at KimGreenMCAO@gmail.com.

The admission fees are $3.00 for adults and $2.00 for children. A parent must attend with a child.

****Please dress appropriately for the weather conditions as the observations are outdoors**. ***Clear skies will result in chilly to cold conditions even during the warmer months.***

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

CONTENTS:

DEFINITION OF ASTRONOMICAL TERMS AND WORDS.

I offer this so those who are new to the subject matter offered will have a better chance of understand certain names as well as terms used in these articles. You will find them in red.

gravitational lensing - a distribution of matter (such as a cluster of galaxies) between a distant light source and an observer, that is capable of bending the light from the source as the light travels towards the observer.

red nova- stellar explosion thought to be caused by the merging of two stars. They are characterized by a distinct red color, and a light curve that lingers with resurgent brightness in the infrared. Luminous red novae are not to be confused with standard novae, explosions that occur on the surface of white dwarf stars.

binary star system - a star system consisting of two stars orbiting around their common barycenter.
Barycenter - The center of mass of two or more bodies, usually bodies orbiting around each other, such as the Earth and the Moon. The American Heritage® Science Dictionary.

pulsate - expand and contract with strong *regular* movements.

cosmic strings - a hypothetical one-dimensional subatomic particle having the dynamical properties of a flexible loop. (in cosmology) a hypothetical threadlike concentration of energy within the structure of space-time.

Radio Astronomy - a subfield of astronomy that studies celestial objects at radio frequencies.

dwarf galaxy - A small, dim galaxy, intermediate in size between a regular galaxy and a globular cluster. Like larger galaxies, dwarf galaxies are classified as elliptical, spiral, or irregular based on their shape. The closest known galaxy to the Milky Way is a dwarf galaxy in Canis Major that is believed to be losing stars to ours.

galactic Centre - the rotational center of the Milky Way.

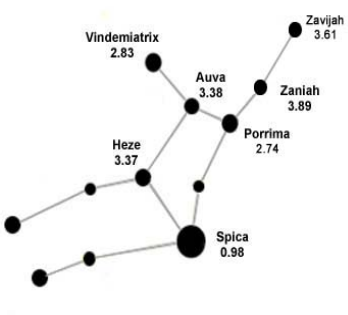
Exoplanets - or extrasolar planet is a planet outside our solar system that orbits a star.

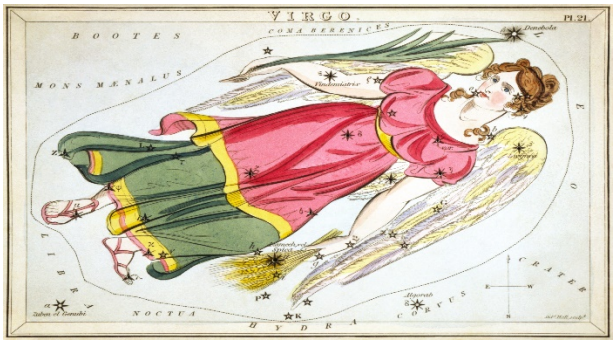
HOW TO FIND CONSTELLATIONS

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

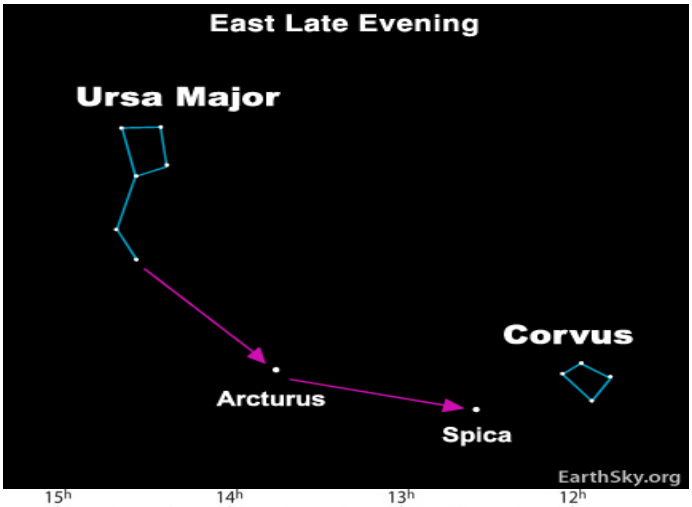
Step 2. Orient the Star Chart. You will notice there are two sides to the chart. One side is for viewing the sky to the North. The other side is for viewing to the South. Let's start with the side for the North. You will notice that the white part of the chart rotates. At the bottom, you will see months. Above the month is the date and above that the time. The month and date will rotate so now line them up with the time you are ready for viewing. Simply look at the chart to pick out the object then look up at the sky. Compare the stars on the star chart and the stars you see in the night sky**.** 3. To view South, turn the chart over and turn around to face South.

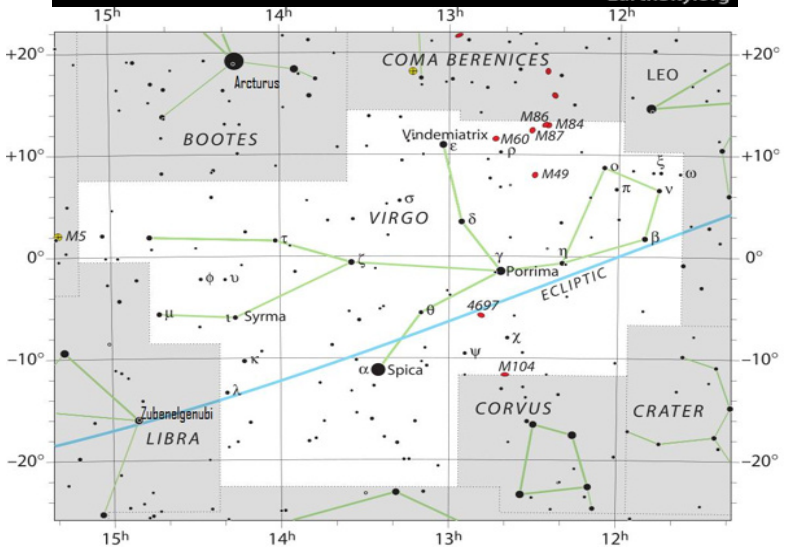
CONSTELLATION VIRGO





HOW TO FIND VERGO





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.

MESSIER OBJECT 45 PLEIADES

Messier 45 (M45), also known as the Pleiades or Seven Sisters, is a bright open star cluster located in the constellation Taurus, the Bull.

The Pleiades cluster has an apparent magnitude of 1.6 and lies at an average distance of 444 light years from Earth. The cluster is also known as Melotte 22. It does not have an NGC designation.

Messier 45 contains a number of hot, blue, extremely luminous B-type stars and is one of the nearest star clusters to Earth. It is the easiest object of its kind to see without binoculars. M45 has a core radius of 8 light years and its tidal radius extends to about 43 light years. The cluster is home to more than 1,000 confirmed members, but only a handful of these stars are visible to the naked eye. The total mass of M45 is estimated at about 800 solar masses.

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

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.

HUBBLE CATCHES GLIMPSE OF FARTHEST STAR EVER SEEN.

A team of researchers said in a published study that they discovered the farthest star ever seen in an image provided by the famed Hubble Space Telescope.

Astronomy magazine, citing Nature Astronomy, reported that the international team of researchers located the blue supergiant—nicknamed Icarus-- that emitted its light when the universe was one-third its current age.
The light was emitted 4.4 billion years after the Big Bang took 9 billion years to reach Earth.

"You can see individual galaxies out there, but this star is at least 100 times farther away than the next individual star we can study, except for supernova explosions," Patrick Kelly, an astrophysicist at the University of Minnesota and lead author of the study, said.

Scientists were able to see the star due to gravitational lensing, which occurs when light rays diverge and bend back inward when passing a massive object, the report said.

NASA described gravitational lensing as a "massive cluster of galaxies acts as a natural lens in space, bending and amplifying light. Sometimes light from a single background object appears as multiple images. The light can be highly magnified, making extremely faint and distant objects bright enough to see."
Astronomy reported that the discovery could shed light on dark matter.

LOOKING INTO SPACE, WHEN DO WE START LOOKING INTO THE PAST?

Jillian Scudder , CONTRIBUTOR

"While observing an astronomical event at a faraway distance from Earth, can we consider the events captured by our strongest telescope happening at an earlier time (past event) being captured by the devices (due to the large distance from Earth) or nearly real-time event (with time in reference to that on Earth)?

It depends very much on how far away you're looking! Most things out there could be considered "a far away distance", even when we're dealing with objects within our own solar system, but the times involved to travel between Mars and the Earth are much closer to nearly real-time than they are if you start venturing further afield.

Fundamentally, information can only travel through the Universe at the speed of light, and the larger your distances get, the longer it takes light to cross those distances. For anything happening on the Earth, this is not usually much of an impediment, because the distances involved in circling the Earth are not so great. To get from the surface of the Earth to the ISS (a distance of 408,000 meters), light, which travels at 299,792,458 meters every second, is only going to spend about a thousandth of a second (0.0013 seconds) in transit. Events on the ISS can therefore be considered pretty much real time, even though there is a measurable communications lag.

If you go further afield, but still within our solar system, light takes about 1.25 seconds to get to the Moon (so a two and a half second round trip), eight minutes to get from the Sun to the Earth, or about twelve and a half minutes to get to Mars. This all starts to build up to a more considerable time delay, but these are manageable delays - if I got an email response from someone I was writing to in less than 24 minutes I'd think that was pretty rapid.

Once you try talking to the outer solar system, the time delays get a little more significant. The light travel delay to New Horizons when it was swinging past Pluto was about four and a half hours, so to ping New Horizons and hear back instantaneously from the craft, you'd be waiting about nine hours. Somewhere around this kind of time delay, we might start to classify things as happening "in the past", but this is still a time delay on functional human timescales. Nine-hour delays are sending an email to someone and hearing back in the morning. Not so convenient, especially if something complicated is happening in that time, but also not the worst.

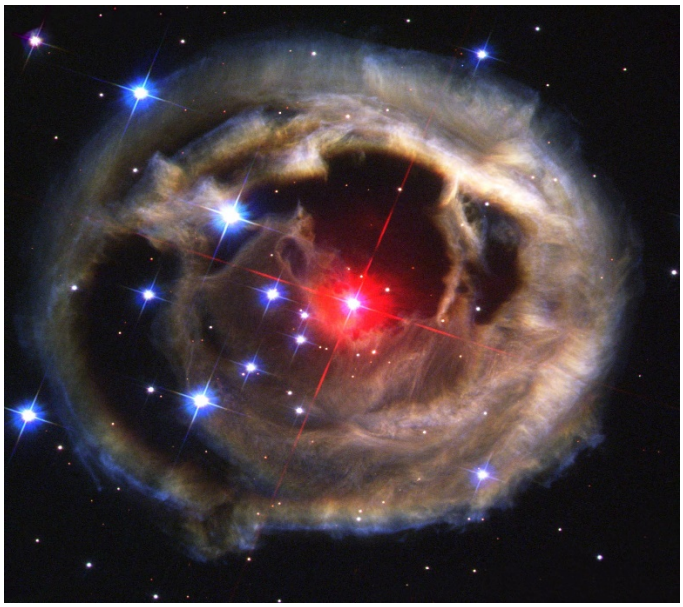
It's when we start looking beyond our solar system and into the Milky Way as a whole, or towards other galaxies that the time delay, which has just been scaling up with the distances involved, gets a little more outrageous. To get information from the center of our own galaxy out to Earth, you have to wait over 26 thousand years. That is no longer a length of time I can wait for an email reply. Information that reaches the Earth from the center of our galaxy is as up to date as it can be, but it's reporting on changes that happened 26,000 years prior. The changes we

see, therefore, are happening at whatever speed we see them happening, but with a time-lag. If we teleported there, it'd be old news.

You can imagine that the further out we go, the bigger this problem gets. So, scrolling outwards, the next big thing is Andromeda, which is so far from us that light has been stretching towards us from those stars for 2.5 million years. I think by most standards, this would be considered observing the past, and yet it's the closest (and therefore informationally least out of date) galaxy we can look at! Most of the rest of the galaxies in the Universe are much further away, and therefore any changes that happen within them are going to be reported to us by our cosmic messenger in light many millions or billions of years later. The one above is 100 times further away than Andromeda, so news from that galaxy will take 100 times longer to reach us.

Where exactly you feel you should put the boundary between "pretty close to real-time" and "definitely looking at the past" is a bit of an arbitrary, fuzzy boundary. If you want to use "how long would you wait for an email reply" as your metric (as I have here), then your boundary is somewhere within the confines of the solar system. But no matter what you want to put down, there comes a point where we are definitely looking into the past, and certainly by the time we're looking at other galaxies, we've reached it.

TWO STARS WILL MERGE IN 2022 AND EXPLODED INTO RED FURY.



Every once in awhile, the stars actually do align — then merge, catastrophically explode, and spray their guts all over space.

Or at least that's the suspected trigger of rare "red nova's," so-named for their characteristic red color.

One of the best-studied red nova's happened in 2008. The object, called V1309 Scorpii, was a double-star system (also called a binary) measured for over 6 years before it merged and erupted.

But astronomers are desperate to find more such binary systems before they detonate, since watching the cosmic collisions would not only reveal a lot about the evolution of stars and nebulas, but also how space gets seeded with elements necessary for life.

Part of that effort has been a thorough search for binary star systems that look ready to blow.

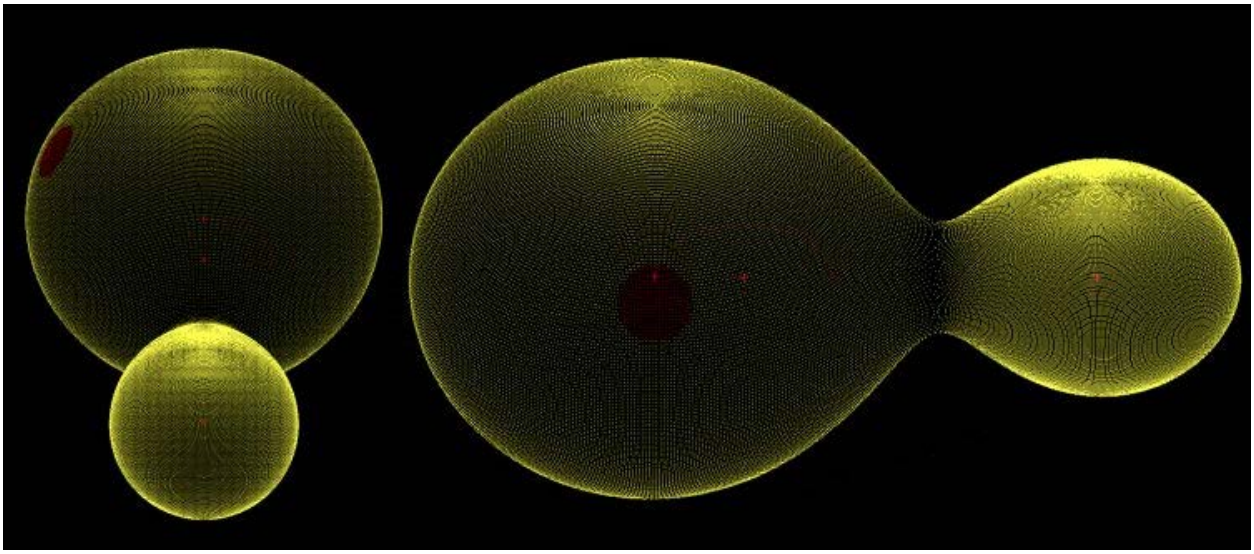
However, Larry Molnar, an astronomer at Calvin College in Grand Rapids, Michigan, has gone a big step further with a few colleagues: Over the past 2 years, he's claimed not only to have found such a system, but also predicted when it will blow up as a red nova.

"No one has ever seen a star go into this kind of explosion. No other situation has come up where any astronomer has ever been able to say, 'this is a star about to blow up,'" Molnar said in a preview for an upcoming documentary, called "Luminous."

His prognostication is specific enough to make any astrophysicist squirm: Molnar now says the whole thing will go down just 5 years from now.

In fact, according to Molnar's prediction, the stellar outburst should be visible in the night sky without any help from binoculars or a telescope.

"[I]n the lack of viable alternatives we must take seriously the unlikely hypothesis at hand," Molnar told Business Insider in an email.



A computer model of the binary star system.
The stars in question are a system called KIC 9832227, and they're locked in a dance of death.

In fact, they're so close together that they share each other's million-degree-plasma atmospheres: an object called a "contact" binary.

If you could magically teleport to the system, which is located about 1,700 light years from us amid the constellation Cygnus, it might appear as a brilliantly glowing bowling pin.

But no one was certain that KIC 9832227 was actually a double-star system; all astronomers knew was that its brightness varied over the years. Many types of stars and star systems "pulsate" their brightness in this way, so Molnar and a Calvin College student had to first rule out any doubt that it was two stars.

What they found in 2015 is that it behaved much like V1309 Scorpii — one of the best-known binary systems to unpredictably merge — and that the stars' mutual orbits were closing in.

"Over the past ten years, the period of KIC 9832227 has been getting shorter at a faster and faster rate," Molnar and his team wrote in a research poster about their discovery. "This implies that the stars are orbiting faster and getting closer together."

The team has recently ruled out more "mundane" explanations for what they see, according to a January 7 press release by Calvin College.

https://youtu.be/OVUqEoqAsRE

ASTRONOMERS MAY BE CLOSING IN ON SOURCE OF MYSTERIOUS FAST RADIO BURTS.

Pulses may be from a neutron star cocooned by a strong magnetic field – though experts are not ruling out more unorthodox explanations such as alien ships.

Astronomers appear to be closing in on the source of enigmatic radio pulses emanating from space that have become the subject of intense scientific speculation.

Previous candidates for the origin of the fleeting blasts of radiation – known as fast radio bursts, or FRBs – have included exploding stars, the reverberations of weird objects called cosmic strings or even distant beacons from interstellar alien spaceships.

Now, new observations provide backing for a scenario involving a rapidly rotating neutron star cocooned by an ultra-powerful magnetic field. The explanation is more orthodox than some of the alternatives offered, but could point astronomers towards some of the most extreme magnetic environments in the known universe.

Fast radio bursts: stirrings from a galaxy far, far away

“Our preferred model is that they are coming from a neutron star ... that could be just 10 or 20 years old in an extreme magnetic environment,” said Jason Hessels, a co-author of the new paper

and astronomer at the Netherlands Institute for Radio Astronomy in the Dutch town of Dwingeloo.

Fast radio bursts have perplexed astronomers ever since the signals were discovered in 2007 in earlier observation data from the Parkes radio telescope in Australia.

Initially dismissed by many as data glitches, 30 similar sources have since been identified, but only one of these, known as FRB 121102, has been seen to flare repeatedly. All the rest have been one-off blasts, making them hard to study and almost impossible to locate. Yet the growing intrigue around FRBs has led to at least as many theories to explain them as there are actual observations.

When the repeating FRB 121102 was pinpointed last year to an unremarkable-looking dwarf galaxy three billion light years from Earth, the puzzle of what could be unleashing the blasts only deepened. Astronomers calculated that the source must be emanating as much energy as 500m suns in the space of a millisecond, in order to explain how it was still detectable three billion years after the event.

"If we had one of these on the other side of our own galaxy it would disrupt radio here on Earth, and we'd notice, as it would saturate the signal levels on our smartphones," said Prof James Cordes, an astronomer at Cornell University and co-author of the study. "Whatever is happening there is scary. We would not want to be there."

The latest findings arise from observations of FRB 121102 made simultaneously on 26 August by the alien-hunting Breakthrough Listen project using the Green Bank Telescope in West Virginia and a Dutch team using the William E Gordon Telescope at the Arecibo Observatory in Puerto Rico.

The astronomers identified 16 new bursts during a 10-hour period, and for the first time were able to identify distortions in the signals that revealed the radio waves had passed through an ultra-powerful magnetic field after being emitted.

In the Milky Way, the only known example of such an extreme magnetic environment is in the vicinity of the massive black hole at the galactic Centre. It is possible that a neutron star sitting in such a position could produce such blasts. Another possibility, Hessels said, is that the material thrown out in a supernova as a massive star collapses could leave the remnant neutron star surrounded by a swirling nebula that could create an extremely strong magnetic field.

"You would naturally expect a very young neutron star to be in some sort of cocoon of material," said Hessels. "The only problem is that to explain [the field], the nebula would have to be ridiculously great – bigger than anything we've seen in our own galaxy."

Duncan Lorimer, an astronomer based at West Virginia University, who co-discovered the first FRBs, said the latest observations were very exciting. "They demonstrate that this FRB is in a highly magnetized environment," he said. Lorimer added that the neutron star theory was plausible, but that alternative possibilities could not yet be excluded. "Right now, I would say nothing is ruled out!" he said.

Lorimer said the mystery of why most FRBs have not been observed to repeat raised the question of how they differed, or whether they resulted from an altogether separate phenomenon.

Prof Avi Loeb, an astrophysicist at Harvard University, agreed. “Perhaps some of the FRBs are associated with artificial radio beams produced by alien civilization,” he said. “Given that we do not understand the origin of FRBs, we should keep an open mind and examine future data without a prejudice.”

Astronomers do not yet understand the circumstances under which neutron stars would unleash such powerful blasts of radiation. But there are lots unanswered questions about the basic physics governing neutron stars, which are some of the most exotic objects in the universe. They are only about 12 miles (19kms) wide, but a teaspoon of neutron star material has a mass of about a billion tons. The core is a soup of pure neutrons, while the crust is smooth, solid and 10bn times stronger than steel.

Hessels said that astronomers may have overestimated the amount of energy being thrown out, as it is possible that the magnetic field acts as a form of cosmic magnifying glass, making the source appear ten or 100 times brighter than it really is.

The findings were presented at the American Astronomical Society’s winter meeting in Washington DC and published in the journal Nature.

NASA’s NEXT PLANET HUNTER IS READY TO FIND UNDISCOVERED WORLDS.

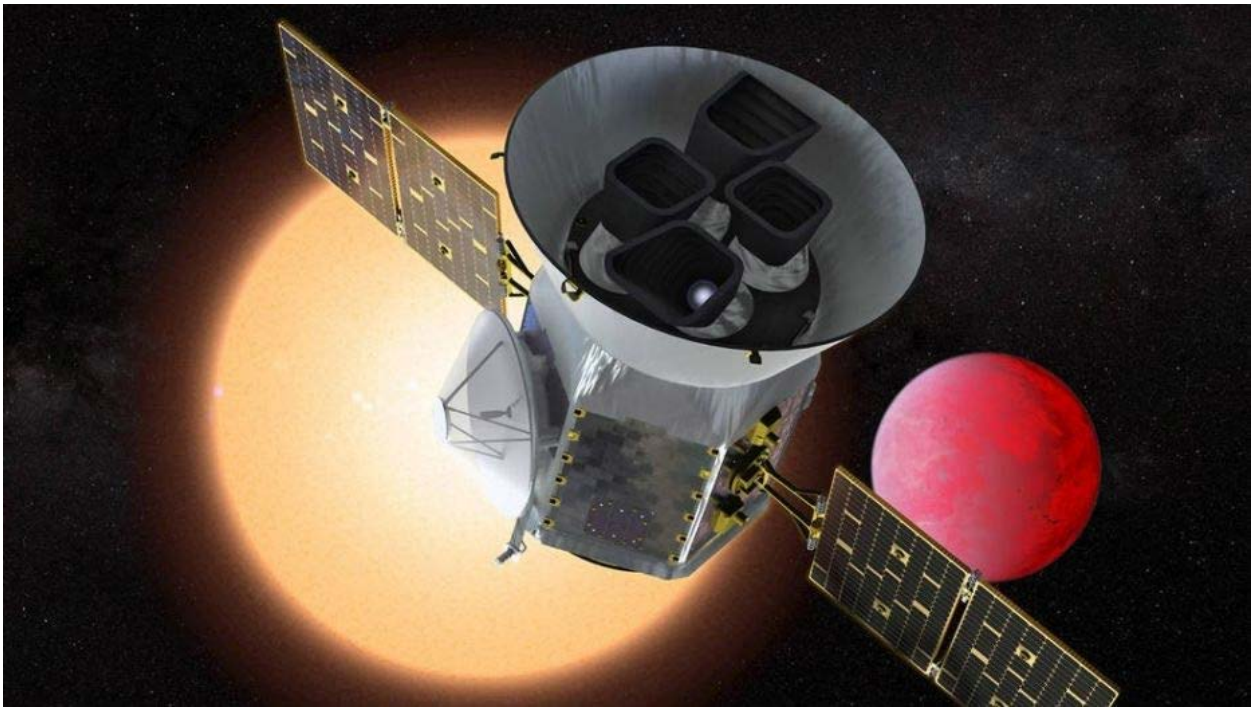


Illustration of the Transiting Exoplanet Survey Satellite (TESS) in front of a lava planet orbiting its host star. TESS will identify thousands of potential new planets for further study and observation. (Credits: NASA/GSFC)

The search for extraterrestrial life is about to get serious, as the U.S. space agency announced in a statement this week. NASA's Transiting Exoplanet Survey Satellite (TESS) has completed all certifications and is currently undergoing final preparations for an April 16 launch aboard a SpaceX Falcon 9 rocket from Cape Canaveral, Florida.

Initially slated for a two-year mission, TESS will ascend to an elliptical 13.7-day orbit around the Earth. It's a unique and extreme orbit that's never been used before, varying as close as 67,000 miles and as far away as 232,000 miles from its home planet. According to Space.com, the stable orbit will allow TESS to stay in space for decades without any need for course corrections.

Outfitted with four wide-angle cameras, TESS will be able to observe 85 percent of the surrounding sky as it looks for exoplanets. The instruments on the spacecraft will map 26 different "sectors" of the sky over a two-year period.

Specifically, TESS will be looking for a phenomenon called a "transit," which is when a planet passes in front of its star. The resulting decrease in brightness can be observed and measured with spectroscopy, giving astronomers a better idea of the size and composition of the planet.

"TESS is opening a door for a whole new kind of study," said Stephen Rinehart at Goddard Space Flight Center. "We're going to be able study individual planets and start talking about the differences between planets. The targets TESS finds are going to be fantastic subjects for research for decades to come."

TESS is replacing the aging Kepler telescope, which is running on fumes and will soon be unable to maneuver. Unlike TESS, Kepler is in a solar orbit and can only make observations in one direction. "TESS will cast a wider net than ever before for enigmatic worlds whose properties can be probed by NASA's upcoming James Webb Space Telescope and other missions," said Paul Hertz of NASA.

Kepler used the same methods to discover more than 2,600 exoplanets, but it was always observing the same area of space and most of the planets were more than a thousand light-years away. TESS will set its sights on more nearby stars that are within 300 light-years of Earth.

The discoveries made by TESS may invite further study with the upcoming $8.8 billion James Webb Telescope planned for launch in 2020. “With those larger telescopes, we’ll be able to look for telltale signs in the atmospheres of those planets that might tell us what the planets are made of, and perhaps even whether they have the kinds of gases in their atmospheres that, on Earth, are an indication of life,” Hertz said at a news conference.

TESS may even moonlight at times to investigate other cosmic phenomenon it encounters besides exoplanets. Researchers will be invited to use the spacecraft as part of a “guest investigator” program, NASA said.

“I don’t think we know everything TESS is going to accomplish,” Rinehart added. “To me, the most exciting part of any mission is the unexpected result, the one that nobody saw coming.”