Friends Of Galileo
ASTRONOMY CLUB

Greg Smith – editor

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Program: Observing Messier Objects – Ted Gruber – Via ZOOM

Meeting: June 17, 2020
Online at 7:00 p m

Online Learning.

I know that I sort of complained about watching astronomy related videos a couple of months ago, but... I have come across a good deal. The company that makes the learning series 'The Great Courses" that has 'lectures' on many various subjects from A to Z. Has a new online companion called "The Great Courses Plus" Right now you can get free trial periods that allow you to sample a full course or more depending on the length of your free trial and the inexpensive subscription for 3 months. You are not limited to one topic; I am watching astronomy while my wife is watching travel and cooking.

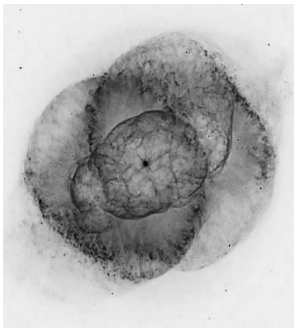
I found a course that is not general astronomy but is a specific subset of astronomy dealing with Exoplanets. This one is not just a light over-view; this has some depth to it. It explains in detail how exoplanets (planets outside of our solar system) are being detected. This includes a lot of detail on some of the math, the problems associated with the several methods used to detect these faint signals. I can only watch only two in a row before I am overwhelmed with the information. I do have to take a break between each one. To try to watch three starts to shut my mind off and I lose concentration. Theses 'lessons' are about 30 minutes each.

What else has been happening in the astronomical sciences? Have you heard about the black hole that has been sending a rhythmic signal now for several years? This is the longest lasting "heartbeat" signal that has been recorded. Others have been discovered but have lasted only a short time. This one has been listened to since 2007. It seems that type of signal occurs when the black hole is 'feeding' on the gaseous material is falling into it. Find out more on BBC.com

Did any of you watch the Space X launch of the NASA crew to the ISS and see the fully modern capsule and cool space suits? The automated docking was pretty cool too. The next thing is the automated return of the capsule with its crew.

A full landing on land with crew that lands like the Space X rockets that land standing up will be quite spectacular. As that is how they hope to land on Mars. I think they are supposed to do a trial of their 'Starship' launch system later this year which does exactly that.

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



What's in a Neutron Star?

There's Now Strong Evidence That an Exotic Type of Matter Exists Inside Neutron Stars

Neutron stars are rising to the top of the list of the most delicious objects in the Universe. First, it was dense "nuclear pasta" beneath their crusts. Now, we have fresh evidence that the cores of the most massive neutron stars are made up of an exotic 'soup' of subatomic particles called quarks.
Physicists have produced new calculations using data from gravitational waves first detected from a neutron star collision in August 2017, along with observations of surprisingly massive neutron stars. Their conclusion hints at an exciting result - the cores of the most massive neutron stars are so dense, atomic nuclei cease to exist, condensing into quark matter.
It is, the researchers say, an important milestone in understanding the strange innards of these extreme objects.
"Confirming the existence of quark cores inside neutron stars has been one of the most important goals of neutron star physics ever since this possibility was first entertained roughly 40 years ago," said theoretical physicist Aleksi Vuorinen of the University of Helsinki and the Helsinki Institute of Physics.
Neutron stars are pretty wild. They're actually dead - the collapsed remnants of massive stars that would have been between 8 and 30 solar masses (a measurement based on the mass of the Sun). When these stars go supernova, most of their mass is blasted off into space, the remaining core collapses down into an incredibly dense object.
The resulting neutron stars can range between about 1.1 and 2.3 solar masses, packed into a dense, small sphere only 10 to 20 kilometers (6.2 to 12.4 miles) across. Five large neutron stars, each containing more mass than our Sun, could comfortably fit along Hadrian's Wall, and with room to spare.
When the core-collapse supernova occurs, the protons and electrons in the atoms that make up the object are compressed into neutrons and neutrinos. The neutrinos escape, leaving the neutrons under such high-pressure conditions that they fuse together, making the neutron star essentially one big nucleus, with a density over 100 trillion times that of water at the base of the crust. (This produces the "nuclear pasta" structures.)
But density is expected to increase the deeper you go, and this is where the idea of quark matter cores comes in. Quarks are fundamental subatomic particles that combine to form composite particles such as protons and neutrons.
You can probably see where this is going. For a few decades, astronomers have hypothesized that, under high-enough heat and density, neutrons break down even further into their constituent quarks, creating a sort of quark soup.
It's really difficult to figure out what's inside a neutron star, though. So the August 2017 collision - GW170817 - was very exciting for astronomers, since the way the two stars changed as they became close enough to gravitationally deform each other could reveal information about their internal structure.

Vuorinen and his team have used that gravitational wave signal along with new theoretical and particle physics results to produce their tantalizing calculation. They found that neutron stars towards the upper mass limit of such objects - at least 2 solar masses - show characteristics that indicate the presence of a huge quark matter core, more than half the neutron star's entire diameter. It's not an absolute slam-dunk; but the calculations indicate that something really peculiar would have to be going on, if the cores of these stars are not quark matter.

"There is still a small but nonzero chance that all neutron stars are composed of nuclear matter alone," Vuorinen explained.

"What we have been able to do however, is quantify what this scenario would require. In short, the behavior of dense nuclear matter would then need to be truly peculiar. For instance, the speed of sound would need to reach almost that of light."

The discovery of quark matter inside neutron stars wouldn't just be amazing for its own sake - it could help us learn more about the very earliest moments of our Universe.

Cosmologists believe that, for a few microseconds just after the Big Bang known as the quark epoch, the Universe was filled with a hot soup of quark-gluon plasma that rapidly coalesced into hadrons.

These days, we can only find quark matter very briefly in particle collider experiments; but some massive neutron stars could be harboring it, too. If we can characterize the neutron star conditions under which quark matter forms, that could help us better understand the quark epoch.

Since GW170817, the LIGO-Virgo Collaboration has detected a second neutron star merger, and it's only a matter of time before more start pouring in. Analysis of more mergers could help the team validate their calculations further and iron out the uncertainties.

"There is reason to believe that the golden age of gravitational wave astrophysics is just beginning, and that we will shortly witness many more leaps like this in our understanding of nature," Vuorinen said.

The research has been published in Nature Physics.

Minutes of the May Meeting

Our first ever Zoom Meeting was a success with up to 15 members being present. Our program was presented by Bernie Taylor, Naturalist, Archaeo-astronomer and Author of Before Orion: Finding the Face of the Hero and Biological Time. His program was called "The First Astronomer". His website is www.beforeorion.com where you can find more videos.

Ted gave the monthly Sky Report. This is the last chance to see Venus in the evening sky. It will return to the morning sky in June. Mercury is also in the evening sky right now. In mid June both Jupiter and Saturn will return to the late evening sky. Mars is in the morning sky. The Messier of the Month is M10, a 6.4 magnitude globular cluster in Ophiuchus. It has approximately 100,000 stars. In binoculars it looks like a fuzzy ball. Using a 6" scope, you can start to see individual stars.

This is our 1st meeting since February because of COVID 19. Considering the circumstances, we have had a pretty good turnout. The meeting link was only sent to people who receive our newsletter.

Usually May is the month we vote on new officers. All the officers have agreed to stay in their respective position until September. We will vote in September on new officers. Hopefully next May we will get back on track.

Dues are due. You can mail send a check for $24 to Steve Powell. An email will go out to members with Steve's address to send checks to. You can also pay cash in September. If you want to pay by credit card, we can do it through Square and will cost $25 due to the fees incurred for using Square. As a reminder, our dues help pay for our membership to the Astronomical League.

Mark and Ted have been discussing the possibility of having social distant star parties at Mike Fiest's home this summer. They will talk with Mike and make a schedule if he agrees. We might be able to have a private star party at Elk Rock or the Castle Lake overlook near Mt. St. Helen's also this summer. More information to come.

We never have meetings at Mark Morris High School in June, July or August due to summer break. Depending on COVID 19 regulations, Ted would like to have a summer meeting at his house this summer in either July or August. It will be a socially distant meeting.

It was proposed to cancel all Sidewalk Astronomy for this summer. We will try again next year. That will also give us more time to find another location now that Starbucks closes earlier.

Both the Oregon Star Party and the Mt. St. Helen's Institute Star Parties have been cancelled this year. Mt. St. Helen's is already asking for dates for the 2021 Star Party.

We will meet again on June 17th at 7:00 pm, via Zoom for our next meeting. Ted volunteered to do a Messier Object program if Mark would like. Watch your email for more information.

Meeting adjourned.

2020 Friends of Galileo Astronomy Viewing Schedule*

June Moon: Full=5, New=21

17 Virtual Club Meeting (Zoom)

26/27 Club Star Party (Mike's)

July Moon: Full=5, New=20

18/19 Club Star Party (Mike's)

25 Club Picnic/Meeting (Ted's)

August Moon: Full=3, New=18

14/15 Club Star Party (Mike's)

19 Virtual Club Meeting (Zoom) ?

21/22 Club Star Party – Backup Dates (Mike's)

September Moon: Full=2, New=17

16 Club Meeting TBA (Zoom vs. MMHS)

18/19 Club Star Party (Mike's)

* Cancellations:
· All public "Sidewalk Astronomy"
· Oregon Star Party
· Mount St. Helens Sky & Star Party

☞ June 2020 Meeting ☜

DATE: **Wednesday June 17**
TIME 7:00pm
PLACE: Your Laptop / Tablet / or Smartphone.

A **Zoom** enabled meeting
PROGRAM: Observing Messier Objects
By Ted Gruber

Drinks : Your Choice
Snacks : Whatever is in your Cupboards

Friends of Galileo Club Officers

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

Next Month's Newsletter Deadline

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

Wednesday: seven days before next meeting.

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

Submit your material by E-mail to: grlyth@msn.com

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