THE STAR

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MOUNT CUBA ASTRONOMICAL GROUP
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OUR PROGRAMS ARE HELD THE SECOND TUESDAY OF EACH MONTH AT 7:30 P.M. UNLESS INDICATED OTHERWISE
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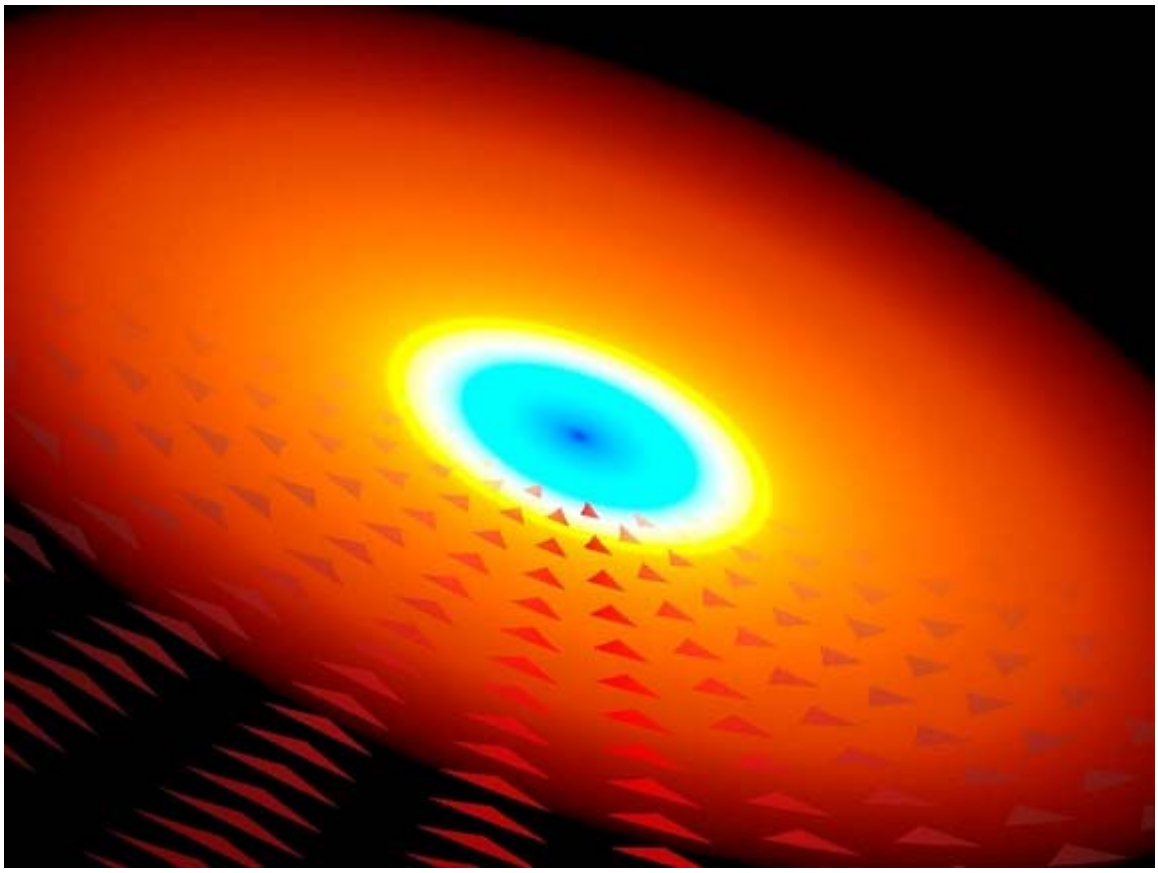
EDITOR'S NOTE:
The STAR will be back to our full format in September. I hope you have enjoyed the summer issues.

New Type of Quasar Found, Baffling Scientists



One theory of a newly discovered type of black-hole quasar suggests gas flows into a central black hole. More frequent particle collisions close to the black hole make the gas hot in regions that are closer to the center (shown in blue and white). Regions further away are cooler (yellow and orange).

The most luminous objects in the universe keep getting more mysterious.

Astronomers have discovered a new type of quasar — an incredibly bright galactic core powered by a super massive black hole — that current theory fails to predict.

Models predict that a quasar's light and heat should push nearby gas out from the center and toward the fringes of the host galaxy. The newly found quasars do

demonstrate this behavior, but, surprisingly, some of the gas also appears to be falling back to the center, researchers said.

"Matter falling into black holes may not sound surprising," study lead author Patrick Hall, an astronomer at York University in Toronto, Canada, said in a statement. "But what we found is, in fact, quite mysterious and was not predicted by current theories."

So far, astronomers have found 17 of these objects, which are thought to make up just 0.01 percent of all quasars.

Gas flow in and around quasars can be calculated by examining its Doppler shift, or the change in the wavelengths of light that are produced as the gas moves. On Earth, humans can hear the Doppler shift in action when a car toots its horn as it zooms by. As it comes towards you, the sound waves are compressed and the horn's pitch sounds higher. After it passes, the sound waves lengthen and the pitch drops.

Particles of gas in a distant galaxy emit light at expected wavelengths. These changes as the gas moves toward Earth or away from it. Gas receding from Earth is shifted to the red edge of the light spectrum (which has longer waves), while gas moving toward Earth appears more blue.

Quasar light is easy to track because it is astonishingly bright, producing "enough light to be seen across the observable universe," York University officials said in a statement. The appearance of these newfound quasars, however, generated a mystery.

"The gas in the disk must eventually fall into the black hole to power the quasar, but what is often seen instead is gas blown away from the black hole by the heat and light of the quasar, heading toward us at velocities up to 20 percent of the speed of light," Hall said.

"If the gas is falling into the black hole, then we don't understand why it's so rare to see infalling gas," he added. "There's nothing else unusual about these quasars. If gas can be seen falling into them, why not in other quasars?"

One theory suggests the gas is not descending into the black hole but instead is circling it after the quasar pushes it away. This means that some particles of gas in the galaxy would be moving toward Earth, while others are moving away.

"To make an analogy: Imagine an ant on a spinning merry-go-round, crawling from the center to the edge," Hall said. "You will see the ant moving toward you about half the time and away from you about half the time. The same idea could apply to the gas in these quasars. In either case, the gas in these quasars is moving in an unusual fashion."

Astronomers found the quasars using data from the Sloan Digital Sky Survey (SDSS-III), which examines large swaths of the sky. Scientists expect quasar models will have to be revisited, so the researchers plan follow-up surveys using the Gemini Observatory.

The research was published Sept. 1 in the Monthly Notices of the Royal Astronomical Society.

Credit Elizabeth Howell,

SPACE.com Contributor

What is Dark Matter?

This Hubble Space Telescope composite image shows a ghostly "ring" of dark matter in the galaxy cluster Cl 0024+17.

Roughly 80 percent of the mass of the universe is made up of material that scientists cannot directly observe. Known as dark matter, this bizarre ingredient does not emit light or energy. So why do scientists think it dominates?

Studies of other galaxies in the 1950s first indicated that the universe contained more matter than seen by the naked eye. Support for dark matter has grown, and although no solid direct evidence of dark matter has been detected, there have been strong possibilities in recent years.

The familiar material of the universe, known as baryonic matter, is composed of protons, neutrons and electrons. Dark matter may be made of baryonic or non-baryonic matter. To hold the elements of the universe together, dark matter must make up approximately 80 percent of its matter. [Image Gallery: Dark Matter Across the Universe]

The missing matter could simply be more challenging to detect, made up of regular, baryonic matter. Potential candidates include dim brown dwarfs, white dwarfs and neutrino stars. Super massive black holes could also be part of the difference. But these hard-to-spot objects would have to play a more dominant role than scientists have observed to make up the missing mass, while other elements suggest that dark matter is more exotic.

Most scientists think that dark matter is composed of non-baryonic matter. The lead candidate, WIMPS (weakly interacting massive particles), have ten to a hundred times the mass of a proton, but their weak interactions with "normal" matter make them difficult to detect. Neutralinos, massive hypothetical particles heavier and slower than neutrinos, are the foremost candidate, though they have yet to be spotted. The smaller neutral axion and the uncharched photinos are also potential placeholders for dark matter.

A third possibility exists — that the laws of gravity that have thus far successfully described the motion of objects within the solar system require revision.

Credit Nola Taylor Redd,
SPACE.com Contributor

This Mysterious Signal 'Could Not Be Explained By Known Physics,' Astronomers Say.

When astronomers detected a strange signal in a massive galaxy cluster millions of light years from Earth, they knew they had stumbled upon something big.

"I couldn't believe my eyes," Esra Bulbul, of the Harvard Center for Astrophysics, said in a written statement. "What we found, at first glance, could not be explained by known physics."

Just check out the video above, released this week by Science@NASA, to learn more.

In 2012, Bulbul and her colleagues examined data collected by NASA's Chandra X-Ray Observatory on the Perseus Cluster, an array of thousands of galaxies in the constellation Perseus. The Perseus Cluster is surrounded by a cloud of superheated gas, which contains ions that each emit their own "line" in the x-ray spectrum.

When the astronomers analyzed the cluster's "spectral signature," they found a mysterious spike that they couldn't explain.

"A line appeared at 3.56 keV (kilo-electron volts) which does not correspond to any known atomic transition," Bulbul said in the statement. "I have re-analyzed the data; split the data set into different sub groups; and checked the data from four other detectors on board two different observatories. None of these efforts made the line disappear."

The astronomers believe the emission may result from the decay of so-called sterile neutrinos, hypothetical particles that may make up dark matter, a mysterious substance that constitutes 80 percent of the mass of universe.

"We know that the dark matter explanation is a long shot, but the pay-off would be huge if we're right," Bulbul said in an earlier statement released by NASA last month. "So we're going to keep testing this interpretation and see where it takes us."

Credit The Huffington Post and NASA

<u>OTHER MCAG ACTIVITIES:</u>
MCAG will once be at the Creamery on August 2, and Sept 6. Both are Saturdays with the 1st Quarter Moon well placed in the sky. We will start around 7:30pm and go until Woodside closes at 9:00pm.

What more proof is needed to assure you it is all worth the time and effort? Good job MCAG.

<u>PUBLIC NIGHTS AT MCAO:</u>

11-Aug-14	**Hank Bouchelle**	**The Perseids and other meteor shows.**
25-Aug-14	**Rob Lancaster**	**Nebulaes-the birthplaces of stars.**
08-Sept-14	**Judi Provencal**	**Space based astronomy-Hubble and beyond.**

If you know of anyone who is interested in Astronomy or someone who would like to learn more, please do not hesitate to extend and invitation to them to attend our meetings. If they have an interest in joining, our application is below.

Mount Cuba Astronomical Group
Membership Form

The Mission of the Mt. Cuba Astronomy Group is to increase knowledge and expand awareness of the science of astronomy and related technologies. Benefits include:

Monthly newsletter that includes details about the groups activities and articles on astronomy as well as other related subjects.

Monthly programs on subjects and topics of astronomical interest.

Free or discounted subscriptions to astronomy related publications.

Free registration to MCAG workshops and classes.

Mention Mount Cuba Astronomical Group and receive a 5% discount at Manor Books in New Castle (http://www.yelp.com/biz/manor-used-books-New Castle)

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