



NGSS: MS-ESS1 Space Systems

Integration of Science, Engineering and Technology

"Twittical" Reading

Using Twitter Article to Teach

Critical Reading (Guided Highlighted)

in the

Science classroom with CCSS and NGSS



CCSS: RST.6-8.7



**"Graveyard of Stars May Lie at
Milky Way's Center"**



MS-ESS1-3. Analyze and interpret data to determine scale properties of objects in the solar system

Emphasis is on the analysis of data from Earth-based instruments, space-based telescopes, and spacecraft to determine similarities and differences among solar system objects. Examples of scale properties include the sizes of an object's layers (such as crust and atmosphere), surface features (such as volcanoes), and orbital radius. Examples of data include statistical information, drawings and photographs, and models.] [Assessment Boundary: Assessment does not include recalling facts about properties of the planets and other solar system bodies.]

ESS1.A: The Universe and Its Stars

Earth and its solar system are part of the Milky Way galaxy, which is one of many galaxies in the universe. (MS-ESS1-2)

ESS1.B: Earth and the Solar System

The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them. (MS-ESS1-2),(MS-ESS1-3)

The solar system appears to have formed from a disk of dust and gas, drawn together by gravity. (MS-ESS1-2)

Emphasis for the model is on gravity as the force that holds together the solar system and Milky Way galaxy and controls orbital motions within them. Examples of models can be physical (such as the analogy of distance along a football field or computer visualizations of elliptical orbits) or conceptual (such as mathematical proportions relative to the size of familiar objects such as students' school or state). [Assessment Boundary: Assessment does not include Kepler's Laws of orbital motion or the apparent retrograde motion of the planets as viewed from Earth.]

Crosscutting Concepts

Scale, Proportion, and Quantity

Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. (MS-ESS1-3)

Connections to Engineering, Technology, and Applications of Science

Interdependence of Science, Engineering, and Technology

Engineering advances have led to important discoveries in virtually every field of science and scientific discoveries have led to the development of entire industries and engineered systems. (MS-ESS1-3)



RST.6-8.1 Key Ideas and Details

Cite specific textual evidence to support analysis of science and technical texts.

RST.6-8.4 Craft and Structure

Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.

RST.6-8.7 Integration of Knowledge and Ideas

Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-ESS3-2)

Teachers:

- Twitter is a wonderful source to find current, interesting and FREE articles that can be used with Critical Reading
- The most important step is to set up a twitter account for your classroom. Follow directions at <https://twitter.com>
- My suggestion is to make this a separate account from your personal account. Make your name something that is unique to you and your classroom (See MsHalseyScience)
- Follow reliable sources in the news and science world.
- Follow fellow scientist at the local, state and global levels
- To find a topic of interest, use the search tool at the top
- Skim Twitter periodically and retweet articles to use at later date
- Cut, copy, paste and edit the article to fit your classroom needs.



**The attached article has been edited
to fit a middle school classroom
Close and Critical reading lesson**

What Is Critical Reading?

To the **critical** reader, any single text provides but one portrayal of the facts, one individual's "take" on the subject matter. Critical readers thus recognize not only *what* a text says, but also *how* that text portrays the subject matter. They recognize the various ways in which each and every text is the unique creation of a unique author.

These three steps or modes of analysis are reflected in three types of reading and discussion:

What a text **says** – **restatement**

What a text **does** – **description**

What a text **means** – **interpretation**

Source: "Reading and Writing Ideas As Well As Words"

Dan Kurland's www.criticalreading.com

http://www.criticalreading.com/critical_reading.htm

Twitter Article



"National Geographic @NatGeo

Apr 29, 2015

Unidentified blast of X-rays suggests something violent is happening at core of the galaxy—but what is it?

<http://on.natgeo.com/1PZHnW6>

Cue/Opener

Where is an X Ray? What do you know about them?

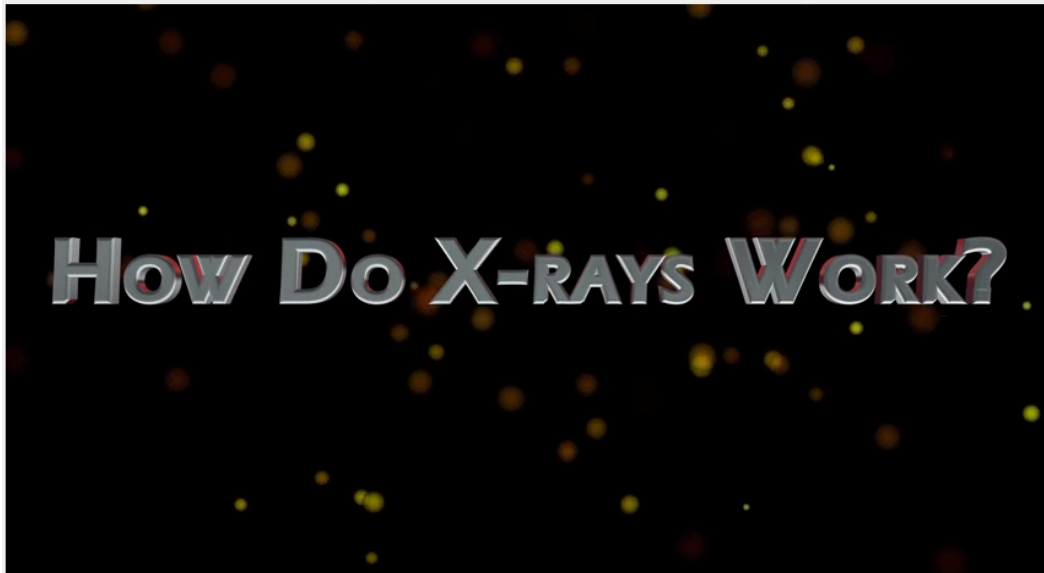
Have you had an X Ray? What do you remember about it?

Are X Rays in the galaxy similar to the ones in a doctors office?

Share with your partner

Video: How do X Rays Work? NIBIB's 60 Seconds of Science


 https://youtu.be/hTz_rGP4v9Y



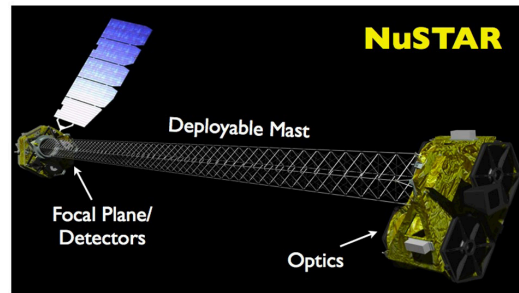
What do we know about the Milky Way?



- Our solar system is in the Milky Way
- Contains over 200 billion stars (including our sun)
- It's a spiral galaxy
- Over 100,000 light years in diameter
- There is a black hole in the center
- It's almost as old as the universe

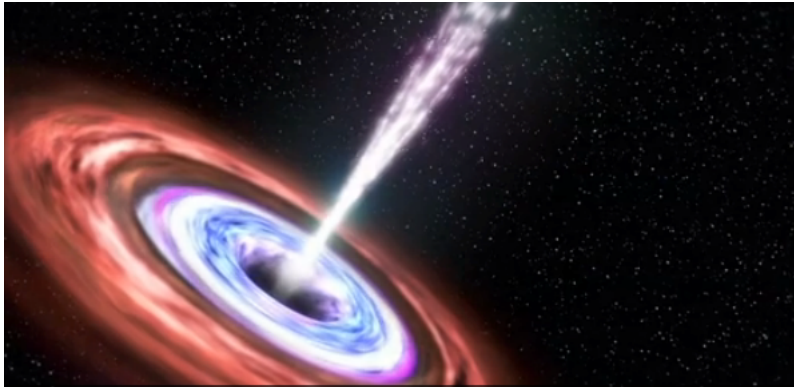
 [facts-about-the-milky-way.webloc](#)

Key Vocabulary *(Before Reading)*



NuSTAR telescope (Nuclear Spectroscopic Telescope Array): is a space-based X-ray telescope that uses a cone shape to focus on high energy X-rays from objects in the universe.

Black Hole: a region of space having a gravitational field so intense that no matter or radiation can escape.



Neutron Star: a celestial object of very small radius (30 km) and very high density, composed of closely packed neutrons. Formed by the gravitational collapse of a supernova explosion, and produces a black hole.



What does the text say?

In paragraph 1, highlight the words used to describe the Milky Way

In paragraph 1, highlight "starry mass graveyard" and the attributes of this graveyard

In paragraph 2, how does the credible source Kristen Perez answer the question, "Where does the haze come from?"

In paragraph 2, the author describes the area around a black hole as "not a friendly neighborhood." Highlight why he uses this analogy.

Highlight the first plausible idea in paragraph 3, and why this is likely NOT the source of the X-ray blast from the core of the galaxy.

Highlight the next plausible idea in paragraph 4, and why this is likely NOT the source of the X-ray blast from the core of the galaxy.

Highlight the last plausible idea in paragraph 5, and why this is likely NOT the source of the X-ray blast from the core of the galaxy.

In paragraph 6, highlight Avi Loeb's plausible explanation.

Paragraph 6, gives an excellent conclusion as to what is happening in the core of the galaxy. Highlight this conclusion.

How does the text say it?

Highlight the title of the article AND the date it was written

Highlight the name of the news source this article was taken from

Highlight around the picture, the caption and the source of the image

In paragraph 1, highlight the word that means "a powerful whirlpool."

In paragraph 2, highlight the credible sources and the universities she is affiliated with

Onomatopoeia is word that mimics the sound of the object or action it refers to. In paragraph 2, 5 and 6, highlight the examples of onomatopoeia

What does the text mean?

Using what you know about science, engineering and technology, do you think we will have an answer to this phenomenon in your lifetime? Why or why not?

After watching the following video, summarize the science and engineering design of the NuSTAR telescope. What obstacle did they have to overcome?



High Energy Vision

<https://youtu.be/rwh9XCnaThI>

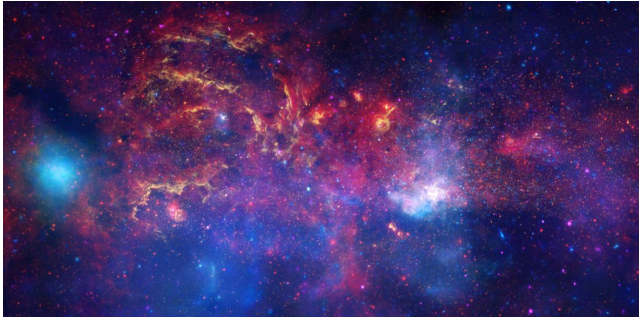


Graveyard of Stars May Lie at Milky Way's Center

By **Michael D. Lemonick**, National Geographic

PUBLISHED April 29, 2015

An unidentified blast of powerful X-rays suggests something violent is happening at the core of the galaxy—but astronomers aren't sure what it is.



The Milky Way's center, seen as a white area right of center, is a chaotic and mysterious place holding a massive black hole. Powerful bursts of X-rays emanating from the region might be coming from a cluster of dead stars, new research suggests.

Image by NASA, ESA, SSC, SXC, AND STScI

- 1 The center of the Milky Way is a crowded, violent place, where stars and gas clouds whirl at high speed around a gigantic black hole. Now astronomers have spotted a haze of high-energy X-rays in this maelstrom that might be coming from dead stars—enough of them to make up a starry mass graveyard. They X-rays are bunched tightly around the Milky Way's central black hole and come from a region about 13 light-years across and 26 light-years thick.
- 2 “The mystery,” says Kerstin Perez of Haverford College and Columbia University, “is where does that haze come from?” The answer, says Perez, lead author of a report published Wednesday in *Nature* on the X-ray haze: “We don't know.” When stars venture too close to a black hole, it shreds them, gulps them down and releases a violent blast of electromagnetic energy to mark the occasion. It's not a friendly neighborhood. And even when the black hole is between meals, the Milky Way's core crackles with energy—notably, a constant sizzle of X-rays. Perez and her co-authors aren't at a loss for explanations of where the X-rays could come from. “We have several plausible ideas,” she says. “We can't rule any of them out, but each has its own complications.”
- 3 The first three ideas fall into a single category: dead stars that are pulling in matter from an orbiting companion star. The dead stars could be white dwarfs—the glowing embers left behind when a sun-like star collapses into a small, dense mass. If gas from an adjacent star falls onto a white dwarf, it vaporizes in a burst of energy that includes X-rays. But the original sun-like stars that produced the white dwarfs would have had to be relatively massive to create the type of high-energy X-rays Perez and her colleagues see with the NuSTAR telescope. And there aren't enough of these white dwarfs in the galaxy to explain the strength of the signal.
- 4 Or the dead stars could be neutron stars or star-sized black holes, which would also emit X-rays when sucking in matter from a companion. The complication here, says Perez: “These objects generally give off bright flares every now and again,” she says. “We've been looking at the galactic center for ten years, and don't see enough of these flares to explain the population you'd need.”
- 5 The other possibility is that the X-rays don't come from stars at all, but rather from gas clouds whirling around the galaxy's giant central black hole. The black hole emits small burps of energy about once a day, but truly noteworthy blasts happen far less often. This idea has its own complication, she says. “The shape of the X-ray-emitting region doesn't match up with our maps of where the gas clouds are.”
- 6 Neither Perez nor her colleagues venture to guess which explanation might be right, although Avi Loeb, who heads Harvard's astrophysics department and was not involved with this research, has a favorite. Most likely, he says, is a huge graveyard of white dwarfs that is gobbling up matter. Whatever the explanation, however, it almost certainly has to do with how ultra-dense objects, whether they're white dwarfs or neutron stars or black holes, rip apart and destroy matter. It's happening all the time at our galaxy's core, as the resulting X-rays make clear. “It's really a fun place to look with NuSTAR,” Perez says.

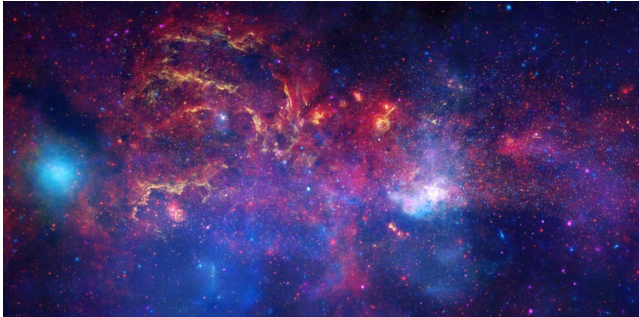


Graveyard of Stars May Lie at Milky Way's Center

By Michael D. Lemonick, National Geographic

PUBLISHED April 29, 2015

An unidentified blast of powerful X-rays suggests something violent is happening at the core of the galaxy—but astronomers aren't sure what it is.



The Milky Way's center, seen as a white area right of center, is a chaotic and mysterious place holding a massive black hole. Powerful bursts of X-rays emanating from the region might be coming from a cluster of dead stars, new research suggests.

Image by NASA, ESA, SSC, SXC, AND STScI

1 The center of the Milky Way is a crowded, violent place, where stars and gas clouds whirl at high speed around a gigantic black hole. Now astronomers have spotted a haze of high-energy X-rays in this maelstrom that might be coming from dead stars—enough of them to make up a starry mass graveyard. They X-rays are bunched tightly around the Milky Way's central black hole and come from a region about 13 light-years across and 26 light-years thick.

2 “The mystery,” says Kerstin Perez of Haverford College and Columbia University, “is where does that haze come from?” The answer, says Perez, lead author of a report published Wednesday in *Nature* on the X-ray haze: “We don't know.” When stars venture too close to a black hole, it shreds them, gulps them down and releases a violent blast of electromagnetic energy to mark the occasion. It's not a friendly neighborhood. And even when the black hole is between meals, the Milky Way's core crackles with energy—notably, a constant sizzle of X-rays. Perez and her co-authors aren't at a loss for explanations of where the X-rays could come from. “We have several plausible ideas,” she says. “We can't rule any of them out, but each has its own complications.”

3 The first three ideas fall into a single category: dead stars that are pulling in matter from an orbiting companion star. The dead stars could be white dwarfs—the glowing embers left behind when a sun-like star collapses into a small, dense mass. If gas from an adjacent star falls onto a white dwarf, it vaporizes in a burst of energy that includes X-rays. But the original sun-like stars that produced the white dwarfs would have had to be relatively massive to create the type of high-energy X-rays Perez and her colleagues see with the NuSTAR telescope. And there aren't enough of these white dwarfs in the galaxy to explain the strength of the signal.

4 The dead stars could be neutron stars or star-sized black holes, which would also emit X-rays when sucking in matter from a companion. The complication here, says Perez: “These objects generally give off bright flares every now and again,” she says. “We've been looking at the galactic center for ten years, and don't see enough of these flares to explain the population you'd need.”

5 The other possibility is that the X-rays don't come from stars at all, but rather from gas clouds whirling around the galaxy's giant central black hole. The black hole emits small burps of energy about once a day, but truly noteworthy blasts happen far less often. This idea has its own complication, she says. “The shape of the X-ray-emitting region doesn't match up with our maps of where the gas clouds are.”

6 Neither Perez nor her colleagues venture to guess which explanation might be right, although Avi Loeb, who heads Harvard's astrophysics department and was not involved with this research, has a favorite. Most likely, he says, is a huge graveyard of white dwarfs that is gobbling up matter. Whatever the explanation, however, it almost certainly has to do with how ultra-dense objects, whether they're white dwarfs or neutron stars or black holes, rip apart and destroy matter. It's happening all the time at our galaxy's core, as the resulting X-rays make clear. “It's really a fun place to look with NuSTAR,” Perez says.



Graveyard of Stars May Lie at Milky Way's Center

By Michael D. Lemonick, National Geographic

PUBLISHED April 29, 2015

An unidentified blast of powerful X-rays suggests something violent is happening at the core of the galaxy—but astronomers aren't sure what it is.



The Milky Way's center, seen as a white area right of center, is a chaotic and mysterious place holding a massive black hole. Powerful bursts of X-rays emanating from the region might be coming from a cluster of dead stars, new research suggests.

Image by NASA, ESA, SSC, SXC, AND STScI

- 1 The center of the Milky Way is a crowded, violent place, where stars and gas clouds whirl at high speed around a gigantic black hole. Now astronomers have spotted a haze of high-energy X-rays in this **maelstrom** that might be coming from dead stars—enough of them to make up a starry mass graveyard. They X-rays are bunched tightly around the Milky Way's central black hole and come from a region about 13 light-years across and 26 light-years thick.
- 2 “The mystery,” says **Kerstin Perez of Haverford College and Columbia University**, “is where does that haze come from?” The answer, says Perez, lead author of a report published Wednesday in *Nature* on the X-ray haze: “We don't know.” When stars venture too close to a black hole, it shreds them, **gulps** them down and releases a violent blast of electromagnetic energy to mark the occasion. It's not a friendly neighborhood. And even when the black hole is between meals, the Milky Way's core **crackles** with energy—notably, a constant **sizzle** of X-rays. Perez and her co-authors aren't at a loss for explanations of where the X-rays could come from. “We have several plausible ideas,” she says. “We can't rule any of them out, but each has its own complications.”
- 3 The first three ideas fall into a single category: dead stars that are pulling in matter from an orbiting companion star. The dead stars could be white dwarfs—the glowing embers left behind when a sun-like star collapses into a small, dense mass. If gas from an adjacent star falls onto a white dwarf, it vaporizes in a burst of energy that includes X-rays. But the original sun-like stars that produced the white dwarfs would have had to be relatively massive to create the type of high-energy X-rays Perez and her colleagues see with the NuSTAR telescope. And there aren't enough of these white dwarfs in the galaxy to explain the strength of the signal.
- 4 Or the dead stars could be neutron stars or star-sized black holes, which would also emit X-rays when sucking in matter from a companion. The complication here, says Perez: “These objects generally give off bright flares every now and again,” she says. “We've been looking at the galactic center for ten years, and don't see enough of these flares to explain the population you'd need.”
- 5 The other possibility is that the X-rays don't come from stars at all, but rather from gas clouds whirling around the galaxy's giant central black hole. The black hole emits small **burps** of energy about once a day, but truly noteworthy blasts happen far less often. This idea has its own complication, she says. “The shape of the X-ray-emitting region doesn't match up with our maps of where the gas clouds are.”
- 6 Neither Perez nor her colleagues venture to guess which explanation might be right, although Avi Loeb, who heads Harvard's astrophysics department and was not involved with this research, has a favorite. Most likely, he says, is a huge graveyard of white dwarfs that is **gobbling** up matter. Whatever the explanation, however, it almost certainly has to do with how ultra-dense objects, whether they're white dwarfs or neutron stars or black holes, rip apart and destroy matter. It's happening all the time at our galaxy's core, as the resulting X-rays make clear. “It's really a fun place to look with NuSTAR,” Perez says.

Look for more Critical Reading
Ms. Halsey's Science & SIP



www.nasa.gov

NIBIB's 60 Seconds of Science

thenextweb.com

*My*CuteGraphics