

SESSION 1

BACKGROUND RESEARCH

Name: _____

Class: _____

Directions:

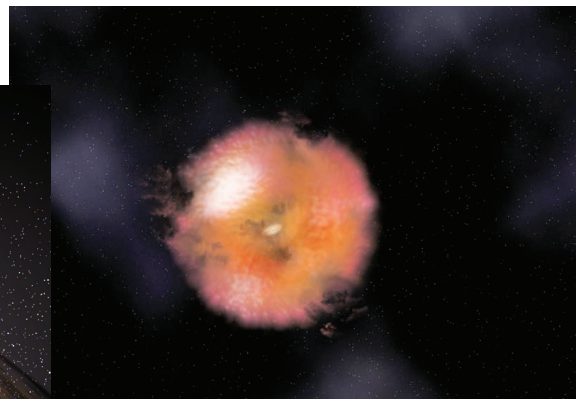
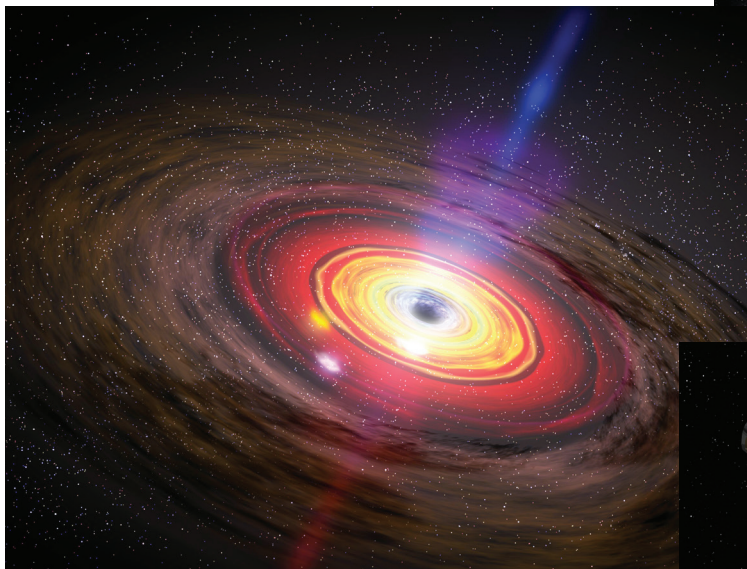
Your class will be researching information to help you understand a scientific discovery by the Swift and Suzaku satellites.

1. You will be placed in groups of three and each person will be assigned to research one of the following: black holes, active galactic nuclei (AGN), or the Swift and Suzaku satellites.
2. Your primary source of information will be the web pages provided on your research worksheet.
3. After your research is complete, your team will combine your information to prepare a presentation for your peers.

Black hole expert: _____

AGN expert: _____

Satellite expert: _____



SESSION 1

BLACK HOLE RESEARCH

Name: _____

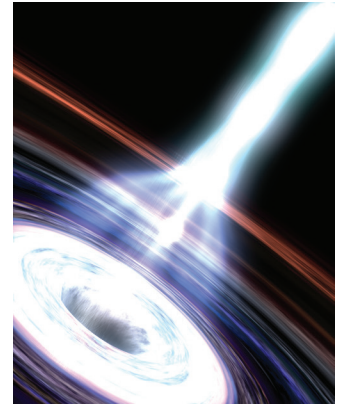
Class: _____

Directions:

Today you are going to learn all about black holes. Use the links below to answer the questions about black holes. Be sure to note which web site(s) you've used to answer each question, in case you need to go back for more information.

Links:

- What is a black hole?
<http://cosmology.berkeley.edu/Education/BHfaq.html#q1>
- Black Holes
http://iimage.gsfc.nasa.gov/docs/science/know_l2/black_holes.html
- How many types of black holes are there?
http://hubblesite.org/reference_desk/faq/answer.php.id=62&cat=exotic
- If nothing can escape a black hole, why do they still emit X-rays?
<http://www.astronomycafe.net/qadir/q385.html>
- Black Hole Bipolar Jets
http://iimage.gsfc.nasa.gov/docs/ask_astro/answers/990923a.html
- Jets from neutron star rival those made by black holes
<http://www.news.wisc.edu/13894>
- Black Holes
<http://nasascience.nasa.gov/astrophysics/Black%20Holes>
- X-rays and Black Holes
http://www.astro.umd.edu/~chris/Research/X-rays_and_Black_holes/x-rays_and_black_holes.html



Artist's conception of matter swirling around a black hole.

Image Credit: NASA

Questions to answer:

1. What is a black hole?
2. How do we "see" black holes?
3. There are two kinds of black holes: stellar-mass (or galactic) and supermassive. What's the difference between the two?
4. How do stellar-mass black holes form?
5. Do all stars become stellar-mass black holes? Why or why not?
6. How do supermassive black holes form?
7. Why do black holes create streaming jets of matter?
8. How does X-ray radiation help scientists better understand black holes?

SESSION 1

AGN RESEARCH

Name: _____

Class: _____

Directions:

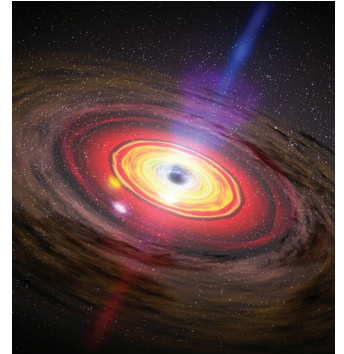
Just like a nucleus is the center of a cell, a galactic nucleus is the center of a galaxy. Use the links below to answer the questions about active galactic nuclei (AGN). Be sure to note which web site(s) you've used to answer each question, in case you need to go back for more information.

Links:

- Active Galactic Nuclei
<http://heasarc.gsfc.nasa.gov/docs/objects/agn/agn.txt.html>
- AGN Introduction
<http://aether.lbl.gov/www/projects/neutrino/agn/disk.html>
- Accretion Disks
http://iimage.gsfc.nasa.gov/docs/ask_astro/answers/001106a.html
- Galaxies
<http://herschel.jpl.nasa.gov/galaxies.shtml>
- Active Galaxies
http://iimage.gsfc.nasa.gov/docs/science/know_l2/active_galaxies.html
- Active Galaxies (Lecture Notes)
http://www.astronomy.ohio-state.edu/~ryden/ast162_9/notes37.html
- NASA's Spitzer Finds Hidden, Hungry Black Holes
<http://www.nasa.gov/vision/universe/starsgalaxies/spitzer-080305.html>

Questions to answer:

1. What are active galactic nuclei (AGN)?
2. What is an accretion disk?
3. Accretion disks in AGN are hard to image because they are very small and far away. How, then, do astronomers study accretion disks in AGN?
4. What does the "doughnut shaped ring" refer to?
5. Draw and label a sketch of an AGN complete with accretion disk, black hole, torus and jets.
6. What is the difference between a quasar, blazar, and a Seyfert galaxy?
7. What is a "shrouded" AGN or quasar? Why can't we observe the shrouded AGN in the infrared?



Artist's conception of the central engine of an active galactic nucleus.

*Image Credit: NASA/
Dana Berry/SkyWorks
Digital*

SESSION 1

SWIFT & SUZAKU RESEARCH

Name: _____

Class: _____

Directions:

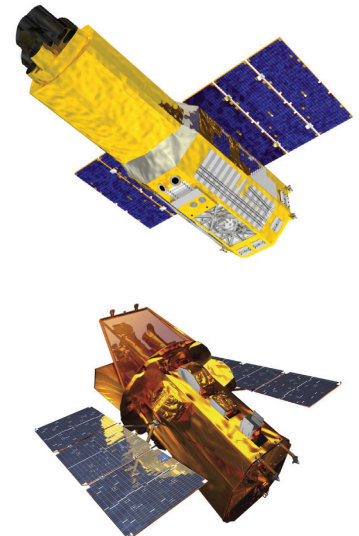
Astronomers use data from many satellites. Today you will learn about two of them: Swift and Suzaku. Use the links below to answer questions about these two satellites. Be sure to note which web site(s) you've used to answer each question, in case you need to go back for more information.

Links:

- Images - Introduction
http://imagine.gsfc.nasa.gov/docs/science/how_l1/images.html
- X-ray Astronomy Introduction
http://imagine.gsfc.nasa.gov/docs/science/know_l1/history1_xray.html
- Official NASA Swift Homepage
<http://swift.gsfc.nasa.gov/docs/swift/swiftsc.html>
- Swift Frequently Asked Questions
http://swift.sonoma.edu/about_swift/general_faq.html
- Suzaku Collaboration
http://globalastro.gsfc.nasa.gov/?page_id=72
- Suzaku Overview
http://globalastro.gsfc.nasa.gov/?page_id=101
- Suzaku Guest Observer Facility
<http://heasarc.gsfc.nasa.gov/docs/suzaku/astroegof.html>
- Cosmology/Deep Fields/X-ray Background
http://chandra.harvard.edu/xray_sources/background.html
- Chandra Resolves the Hard X-Ray Background
<http://apod.nasa.gov/apod/ap000114.html>

Questions to answer:

1. How do we “see” X-rays?
2. What is the Swift satellite and what information can it provide?
3. What kinds of objects does Swift study?
4. What band of X-rays can Swift detect?
5. What is Suzaku and what information can it provide?
6. What kinds of objects does Suzaku study?
7. What band of X-rays can Suzaku detect?
8. What is the X-ray background?



Artist's conception of the Suzaku (top) and Swift (bottom) satellites.

Credit: JAXA and NASA E/PO, Sonoma State University, Aurore Simonnet

SESSION 1

PRESENTATION TIPS

Name: _____

Class: _____

When preparing your group presentation, keep the following tips in mind.

Colors

- Use colors that are pleasing and easy on the eyes.
- Use contrasting colors: for a dark background, use light fonts; for a light background, use dark fonts.

Fonts

- Use common fonts – especially if you will show the presentation on a different computer.

Font Size

- Make sure your font is large enough to read from all areas of the room.
- Keep text to a minimum – keep it short and sweet.

Slides

- Keep slides attractive and professional. Distracting slides could take away from your content. Avoid too many transitions, animations, and clutter.
- When making a professional presentation, do not animate a long sentence “by letter.”

Animation

- Less is more.
- Use visual effects in small doses – if you emphasize everything with animation, you emphasize nothing.
- Consistency is crucial for formal presentations. Stick with a familiar pattern so you don't jar your audience.
- Consider your audience and the tone you want to convey. Save the wackier animation and sound effects for less formal presentations.
- Experiment with the various effects until you understand what each one does, then use them selectively.

Remember

- ➔ Make presentations pleasing and interesting without over-using transitions, sound, and animations
- ➔ Preview your presentation on the presentation equipment you plan to use.
- ➔ Think of your audience – is this a presentation you'd like to sit through?

SESSION 1

PRESENTATION GRADING RUBRIC

Name: _____

Class: _____

Directions: Here are some guidelines on how your presentation will be graded. Include all elements to get a good grade. Also, be sure to follow your teacher's instructions.

Presentation Group: _____

Scoring Criteria	5 Excellent	4 Good	3 Needs Improvement	2 Needs Much Improvement	1 No Information
Clearly and effectively communicates an introduction of the theme/objective of the project					
Clearly and effectively communicates the content throughout the presentation					
Integrated a variety of multimedia resources to create a professional presentation (transition, graphics, and animations)					
Presentation holds audience attention and relates a clear message					
Timing between slides is sufficient for the viewer to read or observe content					
Each image and font size is legible to the entire audience					

Scale:

- 26 - 30 **A** Master Astronomer
- 21 - 25 **B** Astronomer
- 16 - 20 **C** Rookie Astronomer
- 11 - 15 **D** Stargazer
- 6 - 10 **F** Terrestrial Walker

Total =

Title: _____