Astronomy 102 Lab: Monster of the Milky Way

If you own a laptop, please bring it to class. You will submit your answers into the dropbox on Cobra.

Pre-Lab Assignment: In this week's lab, you will learn about the ever elusive and exciting black hole. Specifically, you'll learn about the black hole that astronomers have detected at the center of the Milky Way, how it was detected, what it means for our galaxy, and whether there are other large black holes in the universe. Answer these questions before coming to lab.

A) What is a black hole?

B) How do black holes form?

C) Is the Sun going to become a black hole at the end of its life? Why or why not?

D) What might a trip into a black hole look like?

Introduction: Black holes are some of the strangest objects in the universe. Just their name alone sparks images of powerful cosmic forces at work, gobbling up everything in sight. But what is the science behind these monsters of the universe? This is what you'll learn in today's lab.

Procedure: Watch the NOVA special, "Monster of the Milky Way," and take notes on questions 1-9 below. Visit the specified websites listed below to answer the remaining questions. Your answers to video labs should be typed and in complete sentences. You may use the answer sheets at either URL below.

http://natsci.parkland.edu/ast/102/labs/monster.docx
http://natsci.parkland.edu/ast/102/labs/monster.rtf

1A. Why is it so hard to pinpoint the center of the Milky Way?

1B. How did astronomers overcome this problem?

2. Why is the neighborhood in the Galactic Center so much more exciting and dangerous than where the Sun is located?
3A. What was Einstein's crazy idea about space and time?

3B. How did that explain how gravity worked?

4. Why can physicists not explain what happens in the very center of a black hole?

5. Describe the conclusive experiment that showed that the Milky Way did indeed have a massive black hole in its center.

6A. Explain how the tidal force of a black hole would kill you as you approach the event horizon.

6B. How does this differ if you fall into a supermassive black hole?

7. What is the significance of the missing gas in the galaxy cluster images?

8A. What did the teams determine about the activity level of the black hole in the center of the Milky Way?

8B. When is the next feast scheduled in the Galactic Center?

9A. What will happen to the Earth when the Milky Way merges with Andromeda?

9B. What will happen to the black hole at the center of the Milky Way?

Internet questions: Begin by going to the following website:

10. How does "frame dragging" work in addition to general relativity?

Now go to the following website: http://imagine.gsfc.nasa.gov/ask_astro/black_holes.html
Go to the question about the first person to discover a black hole from 1997 November 24.

11A. What was the first black hole to be definitively detected?

11B. How was it detected?

12. In about 1/3 of a page, describe your reaction to the material you've read and seen. In your response, answer two or more of the following questions:

• Would you like to study a black hole up close? What would you look for?
• Now that you know more about the monster at the center of the Milky Way, are you worried about it becoming active again?
• Is Earth likely to find itself inside a black hole in the future?
• How has your view of black holes changed because of the material in the lab?