



The Dark Side of the Universe

Activity 1: Grades 9-12

Making Inferences

From what we can see, the universe doesn't add up. Estimates based on the amount of matter detected from Earth suggest that our universe should be rapidly expanding. But studies of the spectral fingerprints of stars don't show this expansion. That's why scientists believe there is a good deal of matter we can't see. Even though this dark matter is undetectable, its gravitational force produces the universe expansion pattern we detect.

This activity page will offer:

- An exploration in "black box" inquiry
- An arena for critical observation and analysis
- A chance to engage inference skills

Making Guesses

Much of what we theorize about the universe is based on inferences. Scientists make these inferences based on hard data collected from Earth-bound instruments. In this activity, you'll get to act like a scientist and make guesses.

Materials

- Cardboard pizza box
- Magnets
- Graph paper
- Tape
- Steel ball bearing

Procedure

1. Work in teams of two. Take a cardboard pizza box and an assortment of magnets.
2. Use scissors to carefully remove the lid of the box.
3. Cover the inside bottom with graph paper. Develop a coordinate

numbering system that will allow you to identify any location on the grid.

4. Turn the box over. Use tape to secure a variety of magnets to the underside of the box.
5. Turn the box right-side up. Exchange boxes with another team.
6. Place a steel bearing in the box.
7. Determine the location of the magnets by observing the behavior of the rolling ball.
8. Record the most likely location using the coordinate system labeled on the graph paper.
9. When you have identified the positions of the magnets, turn the box over. How close were you to identifying each position?

Questions

1. What sorts of clues did you use to uncover the placement of the hidden magnets?
2. How did the magnets affect the movement of the steel bearing?
3. Would a larger box make the task easier or more difficult? Explain.

Shakin' It Up

Obtain several plastic film canisters. Add a spoonful of a material such as dried beans, rice, gravel or salt to each container. Mark the containers and seal them with tape. Exchange sets with another student. Without opening the film canisters, can you infer the contents of each?

Science Fact and Fiction: The Hole Story

Black holes are subjects for great science and even greater science fiction. Astronomers believe that black holes are the super-dense remains of collapsed stars. Since they contain a stellar amount of matter concentrated in a very small area, they have a tremendous gravitational force. This force is so powerful that it can trap light, keeping in all visible evidence of its existence. Based on what scientists infer about black holes, create a science fiction story about someone falling into one of these collapsed stars. What would happen to them? What would they see? Where would they wind up?

Shaping Up

Create a basic geometric shape out of scrap cardboard. Secure the shape in the center of a pizza box with tape. Place a marble or small ball in the box. Close the box and tape the lid shut. Exchange the mystery box with another student. Without opening the box, try to figure out the identity of the hidden geometric shape.

Web Connection

Cosmos in a Computer

<http://archive.ncsa.uiuc.edu/Cyberia/Cosmos/CosmosCompHome.html>

This site, known as "cosmos in a computer," offers background on the universe, including animated clips of its evolution.

Dark Matter

<http://astron.berkeley.edu/~mwhite/darkmatter/dm.html>

This site presents a basic overview of dark matter.

HubbleSite- Universe

<http://hubblesite.org/discoveries/hstexhibit/universe/>

This site discusses the Hubble space telescope and its role in cosmology.

Academic Advisors for this Guide:

Suzanne Panico, Science Teacher Mentor, Cambridge Public Schools, Cambridge, MA

Anne E. Jones, Science Department, Wayland Middle School, Wayland, MA

Gary Pinkall, Middle School Science Teacher, Great Bend Public Schools, Great Bend, KS

Cam Bennet Physics/Math Instructor Dauphin Regional Comprehensive Secondary School

Dauphin, MB Canada



The Dark Side of the Universe

Activity 1: Grades 9-12

Making Inferences

Questions

1. What sorts of clues did you use to uncover the placement of the hidden magnets?
(Sounds made by rolling steel bearing, the feeling of the marble as it moved in box.)
2. How did the magnets affect the movement of the steel bearing?
(The magnets exerted a force that redirected the path of the steel bearing. If the magnet was strong enough, it stopped the bearing's motion completely.)
3. Would a larger box make the task easier or more difficult? Explain.
(More difficult. Since there would be a greater area for the bearing to move within, there would be less frequent interaction with the magnetic fields.)