TEACHER RESOURCE

STARDOME OBSERVATORY & PLANETARIUM
FACTS, RESOURCES AND ACTIVITIES ON...

UP VS. DOWN (PART 2)

Gravity is what gives us a sense of what is up and down. No matter where you stand on Earth – gravity will tell you that down is towards the centre of the Earth and up is towards the sky. The idea that up is north and down is south is entirely a matter of perspective. The first cartographers were from the northern hemisphere, so it is with their perspective that many of todays maps are made.

Gravity is the attractive force between two objects, with the larger object exerting a stronger gravitational pull on the smaller object. This is why the Sun (99.9% of the mass of our Solar System) pulls all the planets into an orbit around itself, and why the Earth pulls the Moon (0.01% of Earth's mass) into an orbit around itself. Gravity also explains why the Moon pulls objects (like astronauts) to its surface with less force than when objects are on the Earth's surface. Check out the link below to watch astronauts 'bounce' on the Moon; it's just the weaker gravitational force that causes this. The direction of 'down' on the Moon is towards the centre of the Moon, just like 'down' on Earth is towards the centre of the Earth. But what about up and down on smaller objects, like a space station?

Astronauts living on a space station appear to float through the air. They have no concept of which way is up or down because the space station doesn't have enough gravitational pull to give them that orientation. Instead, they are suspended in a constant freefall to Earth.

Gravity is also what creates an orbit. In order for an orbit to hold, the force of gravity pulling the satellites towards the larger body has to be balanced with the force of inertia. For example, the speed at which a satellite is trying to move in a straight line is equal to the speed at which the gravity of Earth is pulling it inwards, resulting in a continual curve.

This image of the Earth taken by Apollo 17 astronauts had to be flipped upside down to look like the Earth as we are accustomed to seeing it.

check out these other resources...

- www.nasa.gov/education/microgravity/
- Follow the Space Station as it orbits! spaceflight.nasa.gov/realdata/tracking/index.html
- Watch astronauts 'bounce' on the Moon: www.nasa.gov/multimedia/hd/apollo11_hdpage.html#.VD7SgMnyB8H

SCIENCE CONTENT / CURRICULUM LINK

PHYSICAL WORLD – PHYSICAL INQUIRY AND PHYSICS CONCEPTS. EXPLORE EVERYDAY EXAMPLES OF PHYSICAL PHENOMENA. SEEK AND DESCRIBE SIMPLE PATTERNS IN PHYSICAL PHENOMENA.

DISCUSSION POINTS

Watch astronaut Chris Hadfield brushing his teeth on the ISS and see how gravity works differently from on Earth. http://youtu.be/TU9kffoAQ8U

What would change in your day if the gravity of Earth wasn't as strong?

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ACTIVITY

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WHAT GOES UP, MUST COME DOWN

Objective...

Explore gravity with this easy classroom experiment.
What force causes all objects to fall to the ground?
Where does this force come from?

You'll need...

- Balls of the same size but different mass. For example, you could use a metal ball and a rubber or wooden ball that is about the same size. Or you could use two different sport balls that are roughly the same size but have different weights.
- A ladder or a step stool.
- Optional: A video camera or iPad and a helper to video tape the experiment.

Instructions...

If you are recording your experiment, set the camera up now and have your helper get ready to record.

Climb the ladder or step stool with the two balls.

Drop the balls from the same height at the same time. Ask the kids to keep an eye on the ground.

Did one ball hit the ground before the other? Did they hit at the same time?

Every object in the Universe that has mass uses a gravitation pull or force on every other mass. The amount of pull depends on how large the mass of the object is. People have a gravitational pull on other objects but that force isn't very strong, because people aren't very massive. But the Earth is huge and has a very large mass so it's gravitational pull is noticeable. Everything on Earth is being pulled by gravity towards the centre of Earth the same amount. That's why we don't float off into space and why objects of different mass hit the ground at the same time.

{ Take a photo of your experiment and send it to us. We'd love to see it! education@stardome.org.nz }

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