

SciGirls Activity 14

Microgravity



Icebreaker

Explode the myth of falling peanut butter sandwiches with this weighty experiment!



You'll need:

- slices of bread
- peanut butter
- a ladder, a table, a chair
- a meter stick or tape measure
- a mop!
- optional: paperback books instead of sandwiches

SciGirls Skill: Experimenting

Guide your girls as they

- 1) Make a bunch of open-face peanut butter sandwiches.
- 2) Slide one, face up, slowly toward the edge of a kitchen counter or table ledge, and let it fall to the floor.
- 3) Which side lands down? Try sliding a sandwich from a lower level, like from the seat of a chair, or higher, like off a step ladder.
- 4) Does the sandwich always land face down? Is there a height from which it lands face up? What if you use a different size bread slice, or a cracker? Hey, don't forget to clean up your mess!



SciGirls Suggestion: This activity is a light-hearted look at the relationship between an object's rate of fall with respect to its rate of rotation. You don't need to use complex terminology such as "rotational inertia" in order for the girls to arrive at some sound conclusions about why a sandwich does or does not always land peanut butter side down.



Find descriptions of other simple science activities at pbskidsgo.org/dragonflytv/superdoit/index.html

Investigation

Microgravity

We're Sammy and Thianna, and we love roller coasters. Who doesn't? Your stomach jumps into your throat and you feel like you're floating. That feeling is weightlessness, which is kind of like what astronauts feel in space. Astronauts call it microgravity, because during the fall you feel only a tiny amount of gravity's pull. We wondered: How do ordinary things behave in microgravity?



For each group of four girls, you'll need:

- a large plastic storage box with lid (approx. 20 gallon or more)
- a wireless video camera and transmitter, computer and software (see www1.jsc.nasa.gov/er/seh/microgravity_drops.pdf for assembly instructions)
- 4" sheets of foam padding or other cushion material
- a candle
- a small postage scale (spring-type)
- other gravity-dependent objects or phenomena, small enough to be contained in the storage box
- a ledge or balcony from which the drop box can be dropped, with a 16 foot minimum drop, ideally.
- a stopwatch
- a notebook



Find out more about Sammy and Thianna's investigation at pbskidsgo.org/dragonflytv/show/microgravity.html

Check out this investigation on the SciGirls DVD. Select "Microgravity" from the main menu.



SciGirls Want to Know

How do ordinary things behave in microgravity?

Guide your girls as they

- 1) Select an everyday phenomenon to study in microgravity. Good candidates are those that somehow rely on Earth's gravity. Examples include: a burning candle, a fizzing seltzer tablet, a swinging pendulum, a spring pendulum.
- 2) Observe the object or phenomenon in ordinary gravity. For example, observe how many bounces a spring pendulum completes in a minute, or the size and shape of a candle flame. Record all observations in a notebook.
- 3) Place the object into the drop box, in view of the wireless camera installed in the box. Activate the camera, and test to see that the image appears on the computer screen.
- 4) Bring the drop box to the ledge or balcony, and prepare to drop it. Again, activate the camera, set it to record, then drop the box off the ledge into the cushioning material.
- 5) Inspect the video recording to make sure the quality of the video is acceptable. If necessary, repeat the exercise.
- 6) Capture images during free fall (i.e., microgravity) of all the phenomena or objects from all the groups.



SciGirls Secret

It's often surprising which everyday phenomena rely on gravity, and which do not. Once your girls discover a phenomenon that behaves differently under microgravity conditions, be sure to discuss fully how it is that gravity plays a part in the phenomenon.



SciGirls Synthesize Data and Analysis

- 1) Play back the video for the specific phenomenon in question. Observe changes in the behavior of the object or phenomenon, if any, during the free fall. For example, observe changes in the size or appearance of a candle flame, or in the way a spring pendulum bounces.
- 2) Categorize the phenomena as either "Behaves differently in microgravity" or "Does not behave differently in microgravity."
- 3) For each phenomenon that does behave differently, identify how gravity plays a part in the phenomenon, and why the near absence of gravity (i.e., microgravity) during free fall alters the behavior.
- 4) For each phenomenon that does not behave differently, identify why the change from full gravity to microgravity has no effect on the phenomenon.

Keep Exploring!

After this initial exploration of microgravity, select some new phenomena to study. This time, do an analysis BEFORE making the observations in the drop box. That is, attempt to identify how gravity plays a part in the phenomenon, and what effect there might be once the phenomenon goes into free fall. After dropping the box, compare the actual behavior to your predictions.