



Try This at Home Science: Mattress Gravity Well

Activity Overview:

Observe how gravity fields affect different objects.

Materials:

- Mattress
- Small balls (golf balls or bouncy balls)
- Basketball, soccer ball, or something of a similar size
- Heavy book or other heavy object
- You!

Try this!

1. Make your way to your mattress and pull back the covers.
2. Take the small balls and gently roll a couple across the bed. Observe how they move.
3. Remove the small balls. Take the larger ball and place it on the center of the mattress.
4. Roll the small balls gently across the bed. Observe. Did the balls move the same way or differently than in step 2?
5. Remove all the balls.
6. Take the heavy book and place it on the bed. Repeat Step 4. Do the smaller balls seem to interact with the book in any way?
7. Take the larger ball and gently roll it across the bed. Observe.
8. Remove all the balls.
9. Stand on the center of the mattress. Have someone help you roll the small and large balls across the bed. What do you notice?
10. Clean up by putting everything away and remaking the bed.

What's happening?

You've created a gravity well in your own bedroom! A gravity well represents the gravitational field of an object. Massive objects (such as stars and planets) bend space-time, causing space to curve around the object. Each object used in this experiment, including you, has mass. The more massive the object, the greater the gravitational field. You should have noticed that the mattress was bent less by the large ball than by the book, and less by the book than by you.



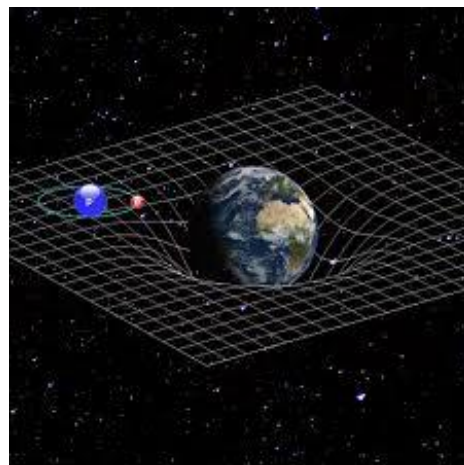
In this case we have taken everyday objects and observed their gravitational field. The smallest and lightest balls simply rolled across the bed in step 2 because there was not a more massive object on the mattress for them to interact with. Once you added a heavier object and repeated

the experiment, the small balls rolled towards the heavier object as they entered that object's gravitational field. When you stood on the bed, you created the largest well yet and every other object rolls right to our feet because we have the greatest mass in a single space creating the greatest pull on the space surrounding us.

How does this relate to our Solar System?

Orbits of space objects are formed because of gravity wells. Think about the Moon and the Earth. The Moon has a smaller mass than the Earth, therefore the Moon is trapped in the Earth's gravity well and formed an orbit. The most massive object in our Solar System is the Sun, so all the other planets and their moons have formed an orbit within the Sun's gravity well too. But why don't the planets get pulled into the Sun?

In our experiment, all the objects rolled right into the most massive object on the mattress. As the balls in our experiment rolled across the fabric, they lost their initial speed and eventually collided with the heavy object. However, the planets are orbiting the Sun at extremely fast speeds and in outer space, there is no air resistance or friction slowing them down. They will maintain their orbit unless another object, like an asteroid, collides with them, sending them off course.



Now try...

- Try to have the small balls form an orbit around your massive object. What direction do you need to roll the balls to achieve this?
- Repeat the experiment, but use irregularly shaped objects. What do you notice about the gravity fields?
- Try stretching a sheet or other elastic material over a hula hoop to make a gravity well. Repeat the experiment while holding the hula hoop and use marbles, tennis balls, a baseball, golf balls, and a basketball. What do you notice? **For safety, DO NOT stand in the middle of the hula hoop gravity well.**

Additional Information

See MiSci's giant gravity well on [this segment](#) of Live in the D!