Astronaut Experiment: Crash Course Kids #32.2

Physical Science
https://youtube.com/watch?v=RrJ1-YofCaA
https://nerdfighteria.info/v/RrJ1-YofCaA

Seeing is believing, right? That's what people say, and that's why some things can be kind of hard to understand. Things can look a certain way, but sometimes there's a lot more going on than what your eyes can show you.

Like last time we learned that all objects, no matter how massive or heavy they are, fall at the same speed on Earth, but objects can seem to fall at different speeds because of a little something called air resistance, the friction between a moving object and air. So if I drop the hammer and a feather from the same height at the same time, the Hammer's going to hit the ground before the feather.

Now that's great and all, but do we know that air resistance is what affects how fast things fall here on Earth?

(text: Big Question)

To figure this out, let's start by going back to our old friend Commander Dave Scott. He is the astronaut who dropped the feather and the hammer on the moon back in 1971, and when he dropped them both at the same time, they reach the ground (or at least the surface of the Moon) at the same time, even though the hammer obviously had a lot more mass than the feather.

So why did Commander Scott get different results from his experiment, whereas if I did the hammer would hit the ground first? I mentioned last time that the Earth has an atmosphere, while the moon has almost none, so as the feather falls through the air on Earth. It's flat, fluffy shape makes it run into a lot more air resistance than a hammer does. In other words, on both Earth and the moon, it's not a difference in gravity that causes the hammer to hit the ground before the feather, it's a difference in air resistance.

But in order to prove it we have to do an experiment like Commander Scott's, but do it on Earth. This looks like a job for cartoon Sabrina!

(text: Investigation)

For this experiment, she's going to need a ball, a little parachute and a spacesuit. First let's watch as mini-me climbs up the ladder and dropped the ball, we'll see how long it takes the ball to hit the ground and write down the data. Now let's take the same ball and attach a little parachute to. We'll drop it again from the ladder and we see if it takes longer for the ball with the parachute to hit the ground. Why?

Because there's more friction between the ball parachute combo and the air than just the ball alone. More friction means more air resistance and more air resistance means a longer time to reach the ground. OK, that adds up right? But if we're going to do something like Commander Scott did on the moon, we have to ask what would happen if there were no atmosphere.

For this part of the experiment we'll need to create a vacuum: an area where there is no air. So we'll repeat the experiment in a large, airtight room and pump out all of the air. And in you go cartoon Sabrina.

What do you think will happen when cartoon me drops the same two things, the ball with the parachute and just the ball, in a room with no air? It makes sense, and no air means no air resistance, right? Let's see. First, cartoon me drops the ball from the ladder again, and we record the time and then see what happens when we attach the ball to the parachute.

Well now the parachute doesn't make much of a difference in how long it takes for the ball to hit the ground. In fact, the parachute doesn't even open. That's because in a vacuum, there is no air. No air means no air resistance, and when we take away a air resistance, we take away the force that slows down the object that's falling, and that means objects dropped at the same height will hit the ground at the same time. So we get the same basic result that Commanders Scott did on the moon. Thanks little me!

(text: Conclusion)

So air resistance, or the friction between a moving object and the air, have a huge effect on how fast things fall on Earth. We can support this argument with the evidence we got from our investigation. When it comes to objects falling on Earth, it's the resistance that makes the difference. I may not have made it to the moon myself yet, but at least cartoon me has managed to recreate a famous astronaut experiment.