Science Fun #2 – Fun with Physics!

The world around us is a FASCINATING place! There are so many weird and wonderful things around us and as scientists, we want to figure out how the world works! For instance, how is that birds and planes can fly but dogs and people can't? Why is the sky blue? Why are clouds white? What makes a rainbow?

These are REALLY interesting questions, and to be able to answer them, we first have to know something called physics. Now, you may be saying to yourself – physics? What's physics? Physics is probably the oldest science and really tries to help us understand how the universe behaves.

There's a lot to know in physics, but today I want to talk to you about what we call "Newton's Three Laws of Motion". These are from Sir Isaac Newton, one of the smartest people ever. You may have heard of Sir Isaac Newton sitting under an apple tree and getting hit with an apple? Well, ole Sir Isaac got to wondering why the apple fell down and not up.

After a lot of thinking, he figured out that there are really only three rules for how things move in the whole wide universe! These three rules, or laws are:

Science Fun #2 – Fun with Physics!

The First Law: An object at **rest** tends to stay at rest, and an object in **motion** tends to stay in motion, with the same direction and speed. That is, if you place a ball still on the floor it doesn't move (it rests). If you roll the ball on the floor it keeps going in one direction.

BUT if you throw the ball up in the air, it first goes up, and then goes down. What is happening here? GRAVITY is pulling the ball down! Gravity is a force that causes objects to fall to the ground, not up! This then leads to the Second Law.

The Second Law: When a force (like gravity) acts on an object, it makes that object change its speed and/or direction. The change is called "acceleration". Gravity makes the ball slow down as it is moving up and then eventually fall down. Bigger things take more force to change speed or direction than smaller things. That is, it's harder to throw a bowling ball than a tennis ball! Now, force has a definition, it is simply the following:

Force = mass of an object x its acceleration

So the bigger an object is or the faster it accelerates, the more force!

And this leads to the third law:

The Third Law: For every action, there is an equal and opposite reaction. Now what does that mean? It means that for every force, there is another force in the opposite direction! Let's take a tennis ball and drop it. What happens? The tennis ball bounced because it hit the floor with some force or **acted** on the floor. The floor pushed back, or **reacted** with a force in the opposite direction! If the floor hadn't reacted, the ball would not have bounced back! Get it?

Science Fun #2 – Fun with Physics!

Now, let's try and show Newton's Laws using a balloon hovercraft. For this, we need the following:

- CD/DVD disk with pop-top cap glued in the middle
- Pop-top cap from a water bottle
- Balloon

Here's how you make the balloon hovercraft:

1. Push the pop-top cap closed. Blow up the balloon, then hold it so that no air escapes, but don't tie it off. Stretch the mouth of the balloon over the bottle cap. If you need help just let someone know! Now adjust the balloon so that it stands up straight and centered.
2. Set the hovercraft on a hard, smooth table and open the pop-top; then nudge the device along and see what happens!

What Happened:

1. Before you opened the pop top, the disk was not moving (it was "at rest"). It started moving when you opened it, showing Newton's First Law!
2. The air moving out of the balloon was a force, and it caused the disk to accelerate up a little bit. This is Newton's Second Law!
3. The disk hovercraft works by forcing air out beneath it, creating a cushion of air to float on. That is, the air from the balloon pushed down and this caused the table surface to push back up with equal force. This is Newton's Third Law!

Other Things to consider

- Tape two disks together and see what happens. Does it "float"as easily?
- Hovercrafts work best on smooth surfaces so the air can spread evenly, but experiment with yours on several different surfaces to see how it behaves. For instance, does it work on a carpet? Or grass? Be creative!