Everyday Mysteries: Why don’t I fall out of an upside-down roller coaster?

By Library of Congress, adapted by Newsela staff

**Question:** Why don’t I fall out when a roller coaster turns upside down?

**Answer:** Inertia is what keeps you from falling out. Inertia is a resistance against a change in direction. It keeps you pressed against the bottom of the car with a force stronger than gravity.

Have you ever wondered how roller coasters stay on their tracks and why people can hang upside down in them? It is all a matter of different forces and different kinds of energy acting together. Energy is the ability to do work. It is a kind of power.

**A Cable Helps It Climb**

A roller coaster does not have an engine. A cable pulls it up the first hill it climbs. As the coaster goes higher and higher, it builds up stored energy. Stored energy is also called potential energy. This energy will be used to go down the hill as the train is pulled by gravity.

Then, at the bottom of the hill, all of that stored energy is converted into kinetic energy. Kinetic energy is the energy that builds up when a body or object is moving. It is what gets the train to go up the next hill. This type of energy pushes the coaster to the top of the next hill. Then the process repeats all over again. So, as the train travels up and down hills, its motion is constantly switching between potential and kinetic energy.

The taller the hill the coaster is coming down, the more kinetic energy there will be to push the cars up the next hill, and the faster the train will go. Over time, though, the train's wheels and the wind blowing in the opposite direction will gradually slow the coaster down. So toward the end of the ride, the coaster has less energy. For that reason, the coaster's final hills tend to be made lower than the first hills.

**Wood Versus Steel**

Most roller coasters are either wooden or steel. Wooden tracks are not as bendable as steel tracks. For that reason, they usually do not have complicated shapes, such as loops that flip passengers upside down. After steel tracks were introduced in 1959, more complicated and adventurous coasters became possible.

Roller coaster wheels are designed to prevent the cars from flipping off the track. They secure the train to the track while it travels through fancy loops and twists.

**Not A Perfect Circle**

When you go upside down on a roller coaster, inertia keeps you from falling out. This resistance to a change in motion is stronger than gravity. It is what presses your body to the outside of the loop as the train spins around.

Gravity keeps pulling you toward the Earth when you go upside down, but inertia pushes you against the floor of the roller coaster car. This pushing force is stronger than gravity.

The loop cannot be a perfect circle, though. If it was, the pushing force would be too strong for safety and comfort. For that reason, roller coaster loops are elliptical. They are shaped like stretched-out circles.
America's First Coaster

The earliest version of the roller coaster was a Russian sled ride from the 1400s. It was called Russian Mountains.

La Marcus Thompson built the first American roller coaster. Known as the Switchback Railway, it opened at Coney Island in Brooklyn, New York, in 1884.

One of the first high-speed coasters was the Drop-The-Dip. It opened at Coney Island in 1907, and it was the first roller coaster to use seat belts.

In 1975 Knott's Berry Farm in Buena Park, California, introduced the Corkscrew. It was the first coaster to turn passengers completely upside down.

The world's tallest and fastest steel roller coaster is the Kingda Ka. It is located at Six Flags Great Adventure in Jackson Township, New Jersey. Kingda Ka is 456 feet tall. It travels at a speed of 128 miles per hour.