Midway Magic: It's All Science

Written by Tim Lougheed for Science Alberta Foundation

As you've been spinning around your favourite fairgrounds this year, have you thought about how the rides move? There's a lot on display at an amusement park, and science is at the centre.

Gravity works harder than you think

As a roller coaster rockets along its track, it is easy to imagine that it has some kind of engine or power source that keeps it moving. But if you look closely at the cars, you will find no such equipment. Apart from the system that pulls the cars to the top of a ramp, the rest of the work is being done by gravity, which supplies enough momentum to keep the cars moving throughout the rest of the course.

Hence the name "coaster," since your ride amounts to nothing more than an extended slide. The result is essentially the same as you would experience taking a toboggan or a sled down a snowy hill. The first roller coaster, introduced at New York's Coney Island park in 1884, was little more than that. Today, thanks to ambitious design methods and the creative use of materials, roller coasters can reach heights that were once fit for skyscrapers, and travel upside down through repeated loops at speeds reaching 190 km/hour.

Carousel horses really are racing

One of the earliest depictions of a merry-go-round dates from some 1500 years ago. The image shows people riding in baskets that were spinning around a pole. Similar devices were used in the Middle Ages for training cavalry riders to fight from the backs of their horses.

The carousel may not qualify as a thrill ride in the same way that the roller coaster does, but it can offer an intriguing physical observation. If you and a friend are riding on horses that are side by side, you will look to one another as though you are going exactly the same speed. But the one that is further away from the centre must actually travel in a larger circle, and cover a longer distance, than the one that is nearer. Since they both go around in exactly the same time, the outside horse must be travelling faster, even though the two of you can hold hands during the entire trip.

A weighty wheel

Another wheel that has long charmed fair-goers is the big one named after an American bridge-builder, George Ferris, who devised the first version for the Chicago World's Fair in 1893. Like a carousel, this ride demonstrates some of the effects of rotation. In this case, though, those effects are combined with the same force of gravity that gives roller coasters their kick.

When you ride a Ferris wheel, you and all the other passengers are attached to the outside of the structure, and so are moving at the same rate. However, the direction of your movement is constantly changing in order to keep you at the same place on that structure. In effect, you are being pulled inward, toward the centre of the wheel, though your motion will feel as though you could fly off the edge at any given moment.

In fact, that feeling will be different depending on where you are at any given time. When you are at the bottom of the wheel as it is turning, you will feel heavier than normal as your downward acceleration combines with gravity. In contrast, you should feel lighter than normal at the top, where your upward acceleration counteracts gravity.

And so, while you might stay in the same place, these rides will show you the fair through new eyes, with gravity and a few circles to guide you.

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