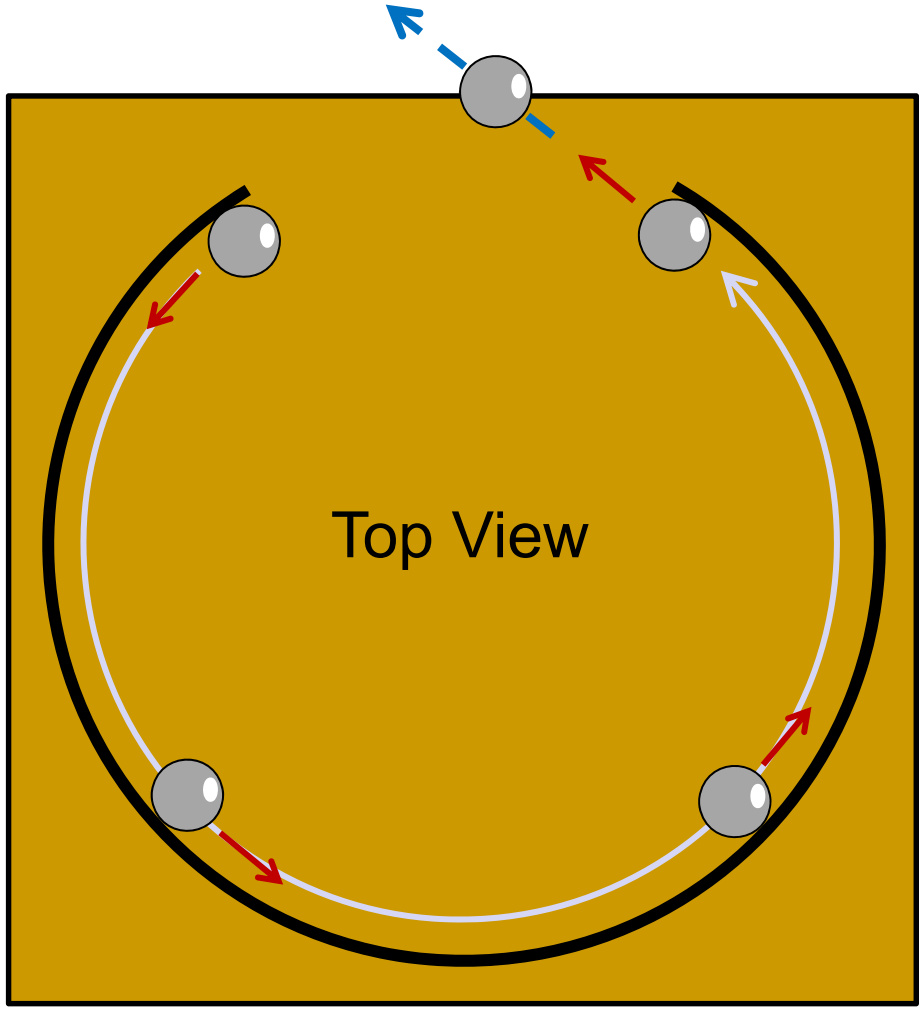
Centripetal Force & Centrifugal "Force"

Motion in a Circle

Ball spins around on a board with a circular wall.

Once the ball exits through the gap, it goes in a straight line.

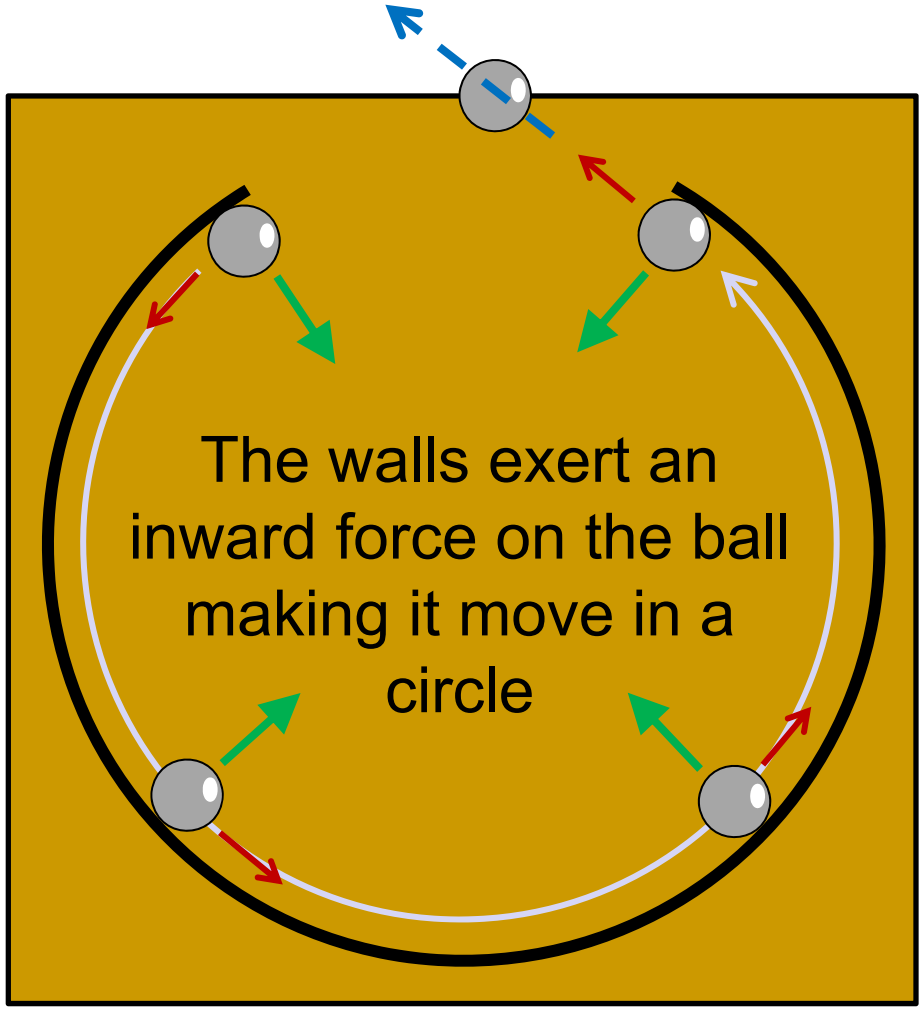


Centripetal Track

Centripetal Force

By the Law of Inertia, without an unbalanced force an object moves in a straight line.

Any unbalanced force that causes circular motion is called a *centripetal force*.

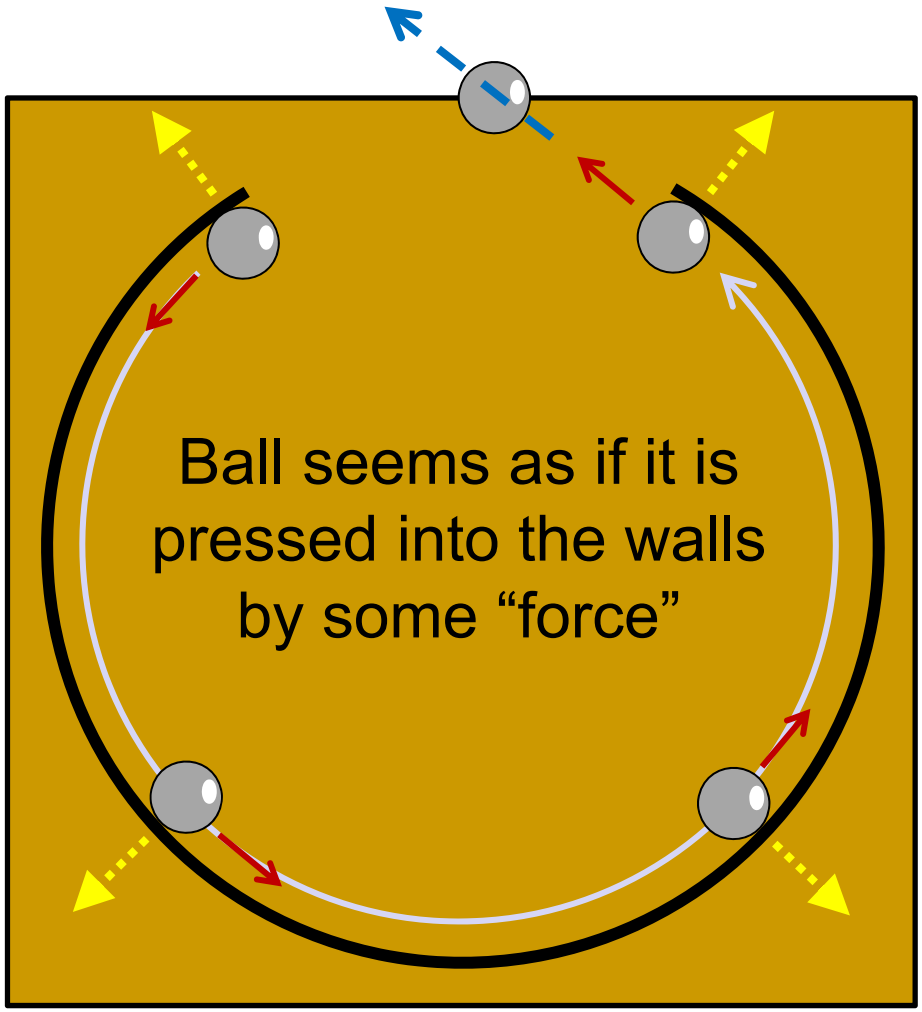


Centripetal: From Latin *centrum* "center" and *petere* "to seek"

Centrifugal “Force”

In circular motion there’s an apparent outward pull called centrifugal “force.”

This apparent outward force is just due to inertia; the real force is the centripetal force, which pushes inward.

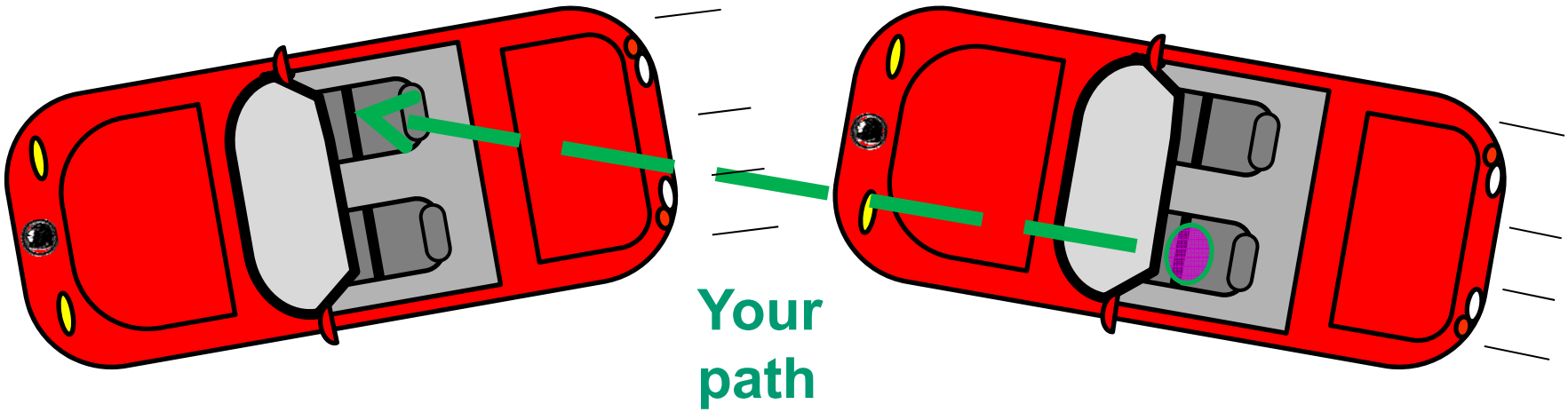


Centrifugal: From Latin *centrum* "center", and *fugere* "to flee"

Centrifugal Force & Inertia

The centrifugal force you experience on taking a sharp curve is nothing more than inertia keeping you moving forward in a straight line.

It feels as if you're pulled to the outside bank of the curve.



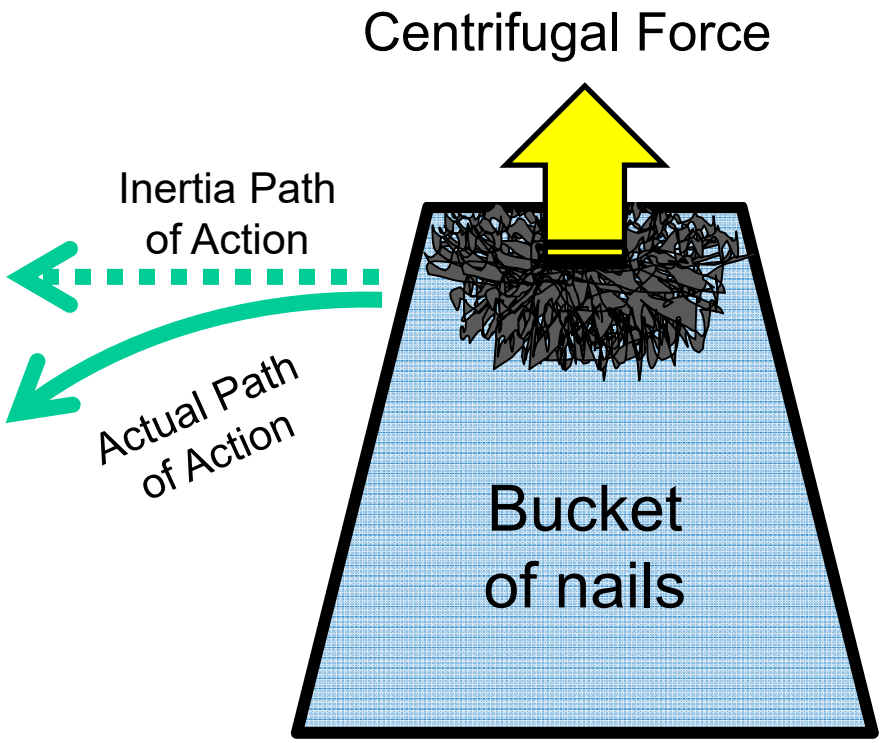
Bucket Overhead

Bucket of rusty nails is upside-down over my head.

Bucket Overhead, Analyzed

The nails stay in the bucket as if a force is pushing them upward.

In reality, they stay in the bucket due to inertia but it's useful to use the concept of a centrifugal force pushing them upward.



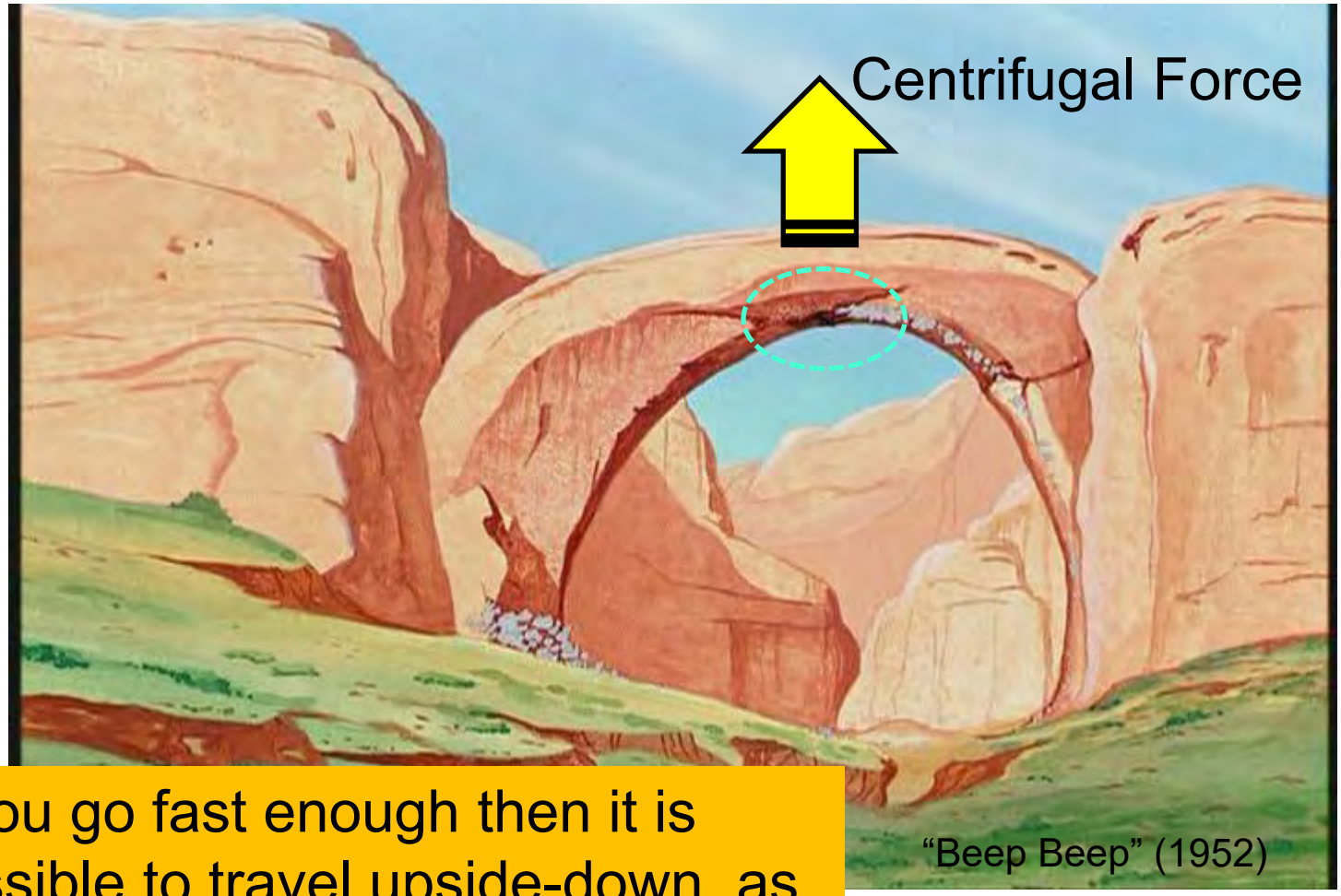
Wile E. Coyote & Loop-the-Loop

Watch carefully as Wile E. Coyote travels in a circle around a natural arch bridge.

From “Beep Beep” (1952)

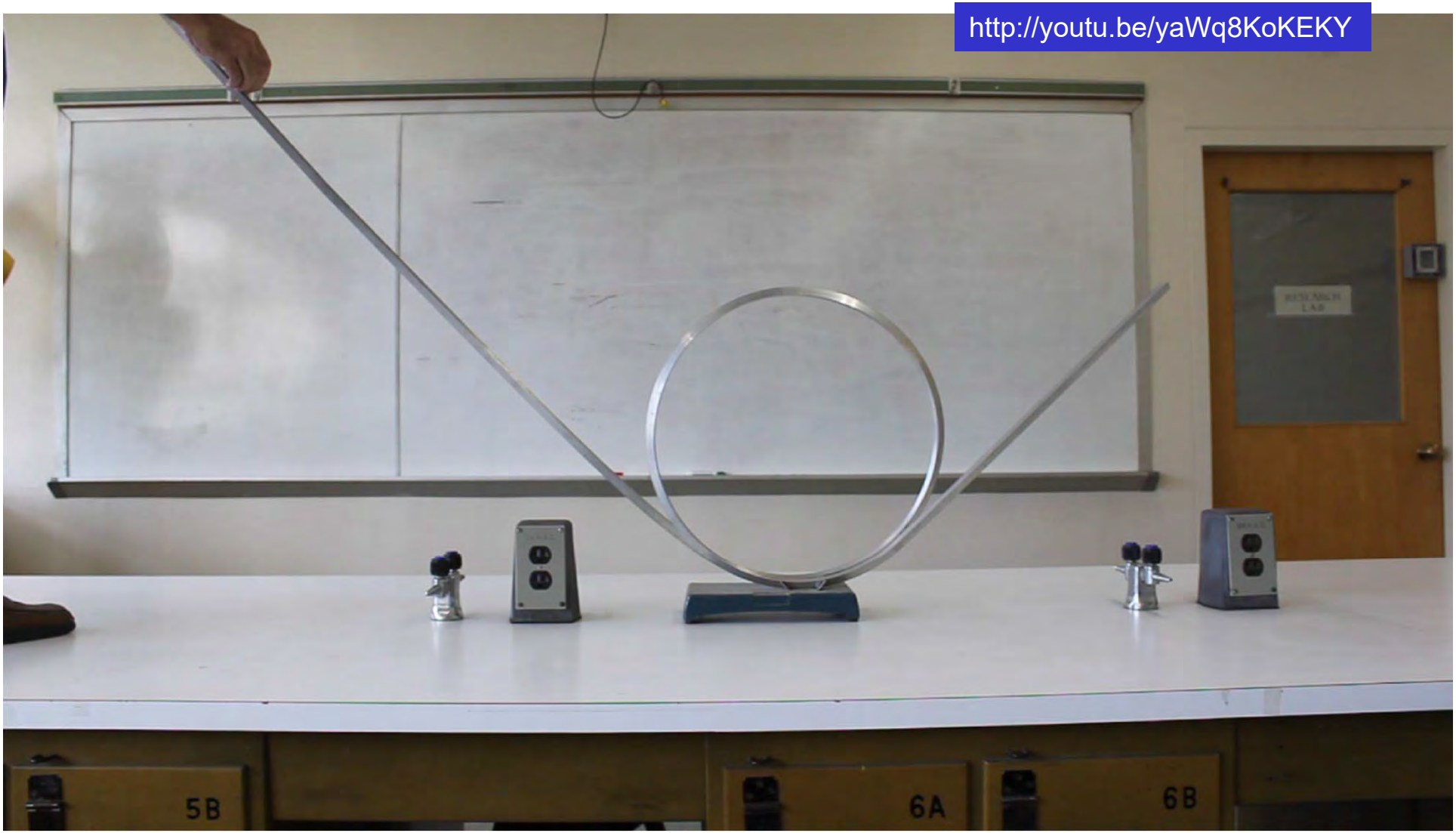
http://www.youtube.com/watch?v=p4YxdXw9evc

Wile E. Coyote & Loop-the-Loop



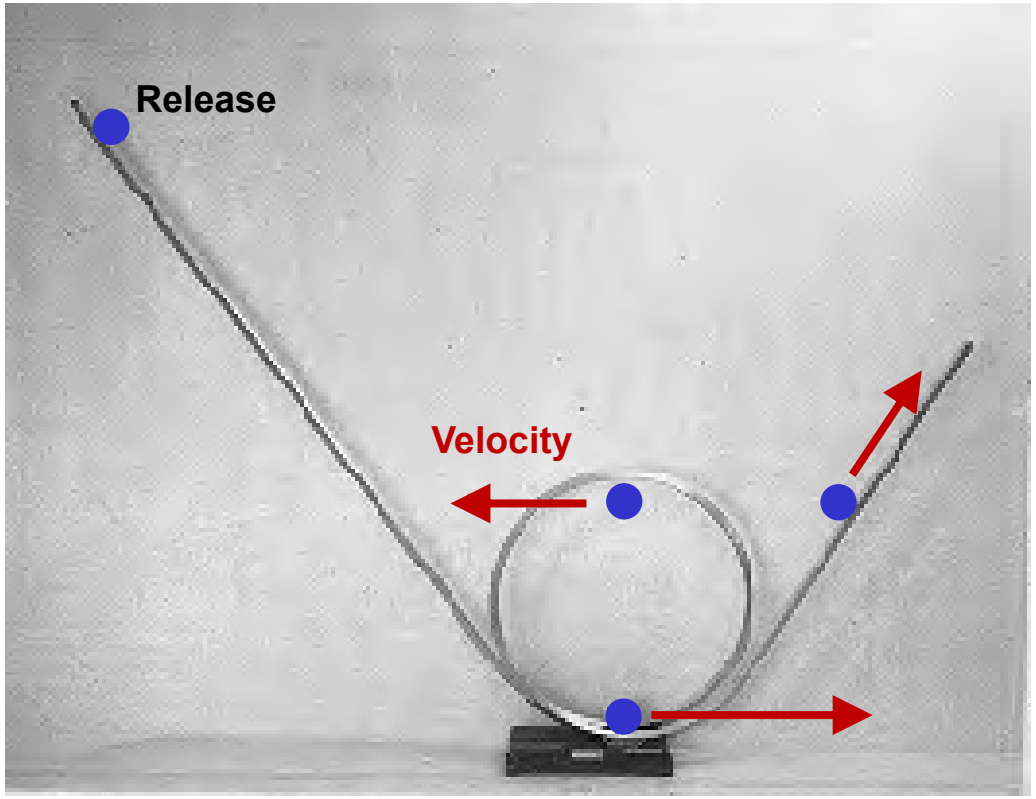
If you go fast enough then it is possible to travel upside-down, as Wile E. Coyote does in this scene.

Loop-the-Loop Demo



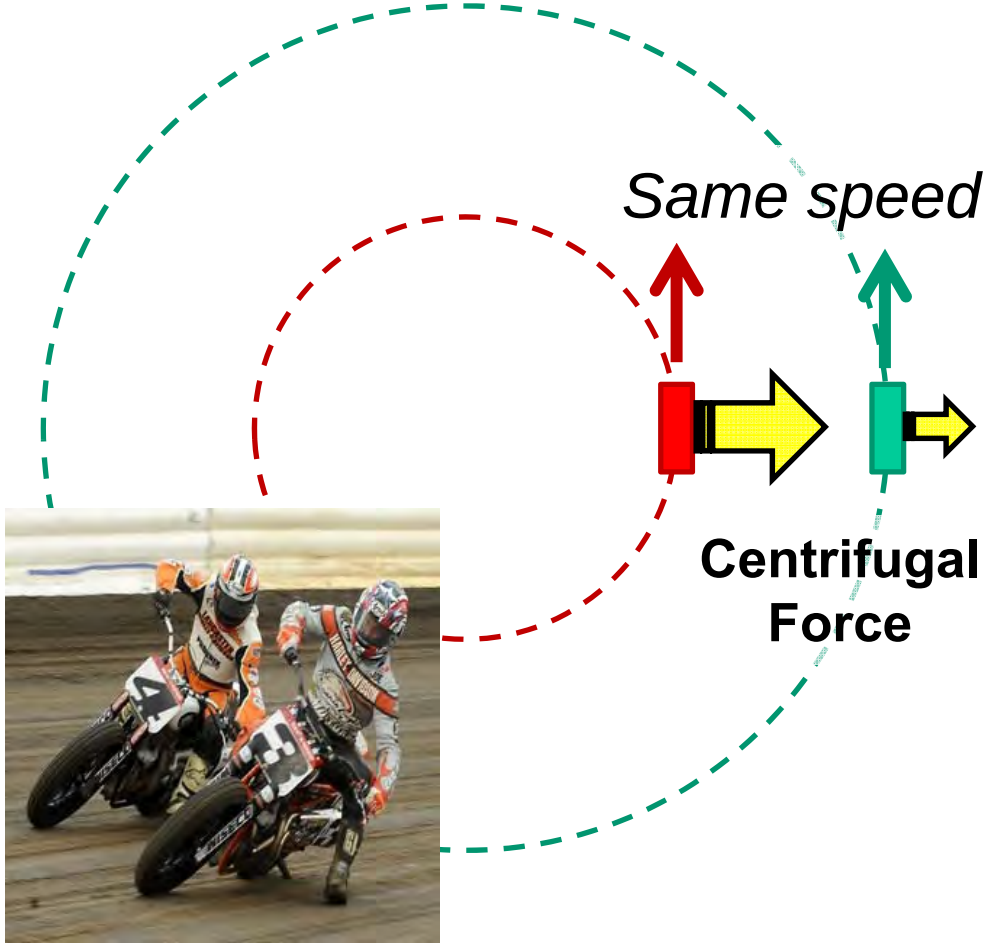
Loop-the-Loop Demo

If the speed of the ball is large then not only does it stay on the track, the ball even pushes outward and against the rail.



Radius of the Turn

Going the same speed, the tighter the turn radius the greater the centrifugal force.

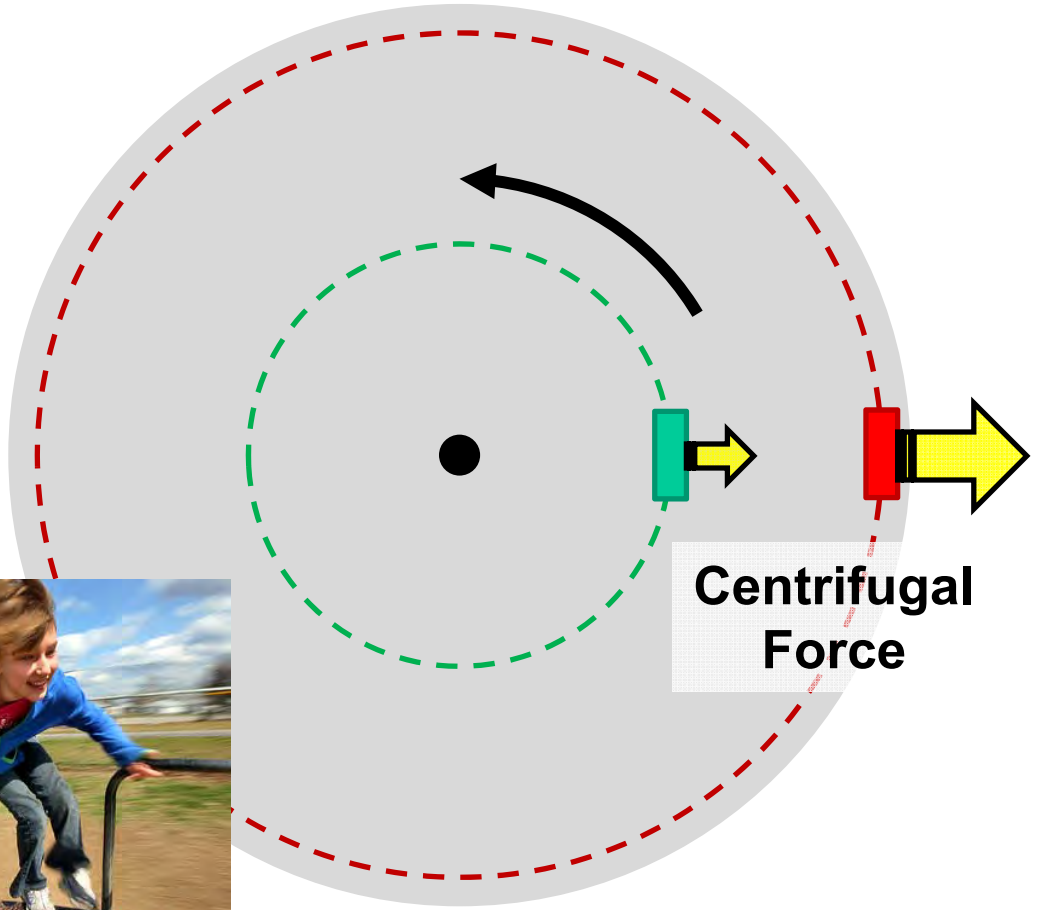


Jackass 2 (2006)

http://www.youtube.com/watch?v=36fD7KSUjkw

Radius of the Rotation

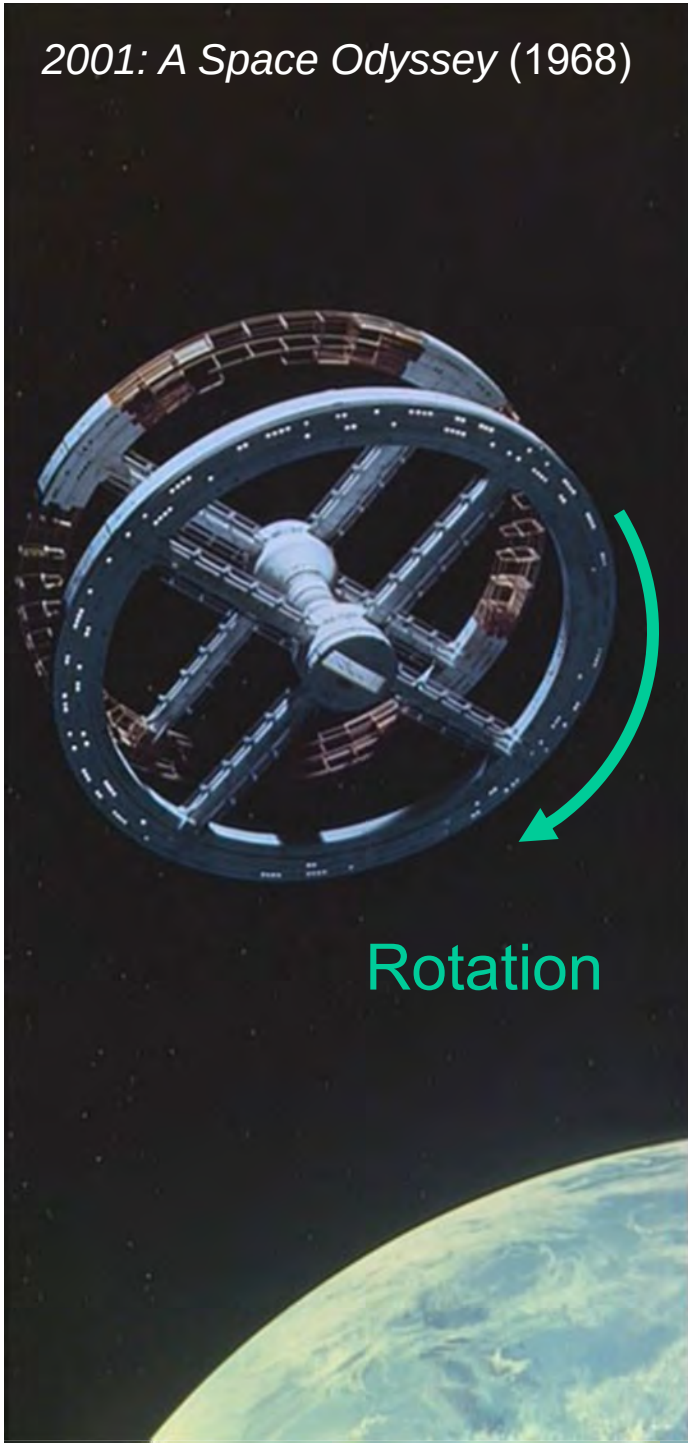
With constant rotation (rpms), the farther from the center the greater the centrifugal force.



Simulated Gravity

Centrifugal force could simulate gravity in a rotating space station with a large radius.

With the right rotation rate a person on the outer rim would feel as if they stood on the surface of Earth.



Summary

- Centripetal force pushes inward, deflecting the path of action into circular motion.
- Objects moving in a circle feel an apparent outward centrifugal force due to inertia.
- Going the same speed, the smaller the turn radius, the greater the centrifugal force.
- With constant rotation (rpm), the farther from the center of the circle, the greater the centrifugal force.