Grades 9-10

Science, Mathematics, and

Technical Information

Walker, Jearl. "Amusement Park Physics." ***Roundabout: Readings from the Amateur Scientist in Scientific American.*** **New York: Scientific American, 1985. (1985)**
From "Amusement Park Physics: Thinking About Physics While Scared to Death (on a Falling Roller Coaster)"

The rides in an amusement park not only are fun but also demonstrate principles of physics. Among them are rotational dynamics and energy conversion. I have been exploring the rides at Geauga Lake Amusement Park near Cleveland and have found that nearly every ride offers a memorable lesson.

To me the scariest rides at the park are the roller coasters. The Big Dipper is similar to many of the roller coasters that have thrilled passengers for most of this century. The cars are pulled by chain t the top of the highest hill along the track, Released from the chain as the front of the car begins its descent, the unpowered cars have almost no speed and only a small acceleration. As more cars get onto the downward slope the acceleration increases. It peaks when all the cars are headed downward. The peak value is the product of the acceleration generated by gravity and the sine of the slope of the track. A steeper descent generates a greater acceleration, but packing the coaster with heavier passengers does not.

When the coaster reaches the bottom of the valley and starts up the next hill, there is an instant when the cars are symmetrically distributed in the valley. The acceleration is zero. As more cars ascend the coaster begins to slow, reaching its lowest speed just as it is symmetrically positioned at the top of the hill.

A roller coaster functions by means of transfers of energy. When the chain hauls the cars to the top of the first hill, it does work on the cars, endowing them with gravitational potential energy, the energy of a body in a gravitational field with respect to the distance of the body from some reference level such as the ground. As the cars descend into the first valley, much of the stored energy is transferred into kinetic energy, the energy of motion.

- Students *determine how* Jearl Walker clarifies the *phenomenon* of acceleration in his essay "Amusement Park Physics," *accurately summarizing* his *conclusions* regarding the physics of roller coasters *and tracing* how *supporting details* regarding the *processes* of rotational dynamics and energy conversion are incorporated in his explanation. [RST.9–10.2]