

I. Newton's 3rd law and gravity

A thoughtful student puts forth the following argument about when Newton's 3rd law applies.

I understand why Newton's 3rd law applies to contact forces, the forces objects exert on each other while touching, like when a truck hits a car. But I don't think Newton's 3rd law applies to gravity. When you drop a ball, the Earth exerts a gravitational force upon it, which makes the ball rush down to the Earth. But according to Newton's 3rd law, the ball exerts just as big a force on the Earth as the Earth exerts on the ball. That can't be right! The Earth doesn't "rush up" to meet the ball. This goes to show that the Earth exerts a bigger force on the ball than the ball exerts on the Earth. So, Newton's 3rd law isn't true for gravity.

How would you respond to the student?

II. Thinking about Timmy:

Bert was trying to learn about Newton's laws and having done the two tutorials on Newton's Laws Bert has an epiphany about the case of Timmy from the previous tutorial (Reconciling common sense and Newton's Laws; recall that Timmy needed to be pulled up using a rope):

Bert: In tutorial#3 last week our group decided when Timmy is going up at a constant speed, the rope force is 250N upwards while the gravitational force on Timmy (his weight) was 250N downward. It all makes sense now! The rope force is equal to and opposite the gravitational force, by Newton's third law.

There is something about Bert's reasoning that is not quite right. Respond specifically to Bert's reasoning –in other words, tell us specifically what part of Bert's reasoning is wrong, and why?