CLIL Project – Physics in English

Anno scolastico 2013-2014

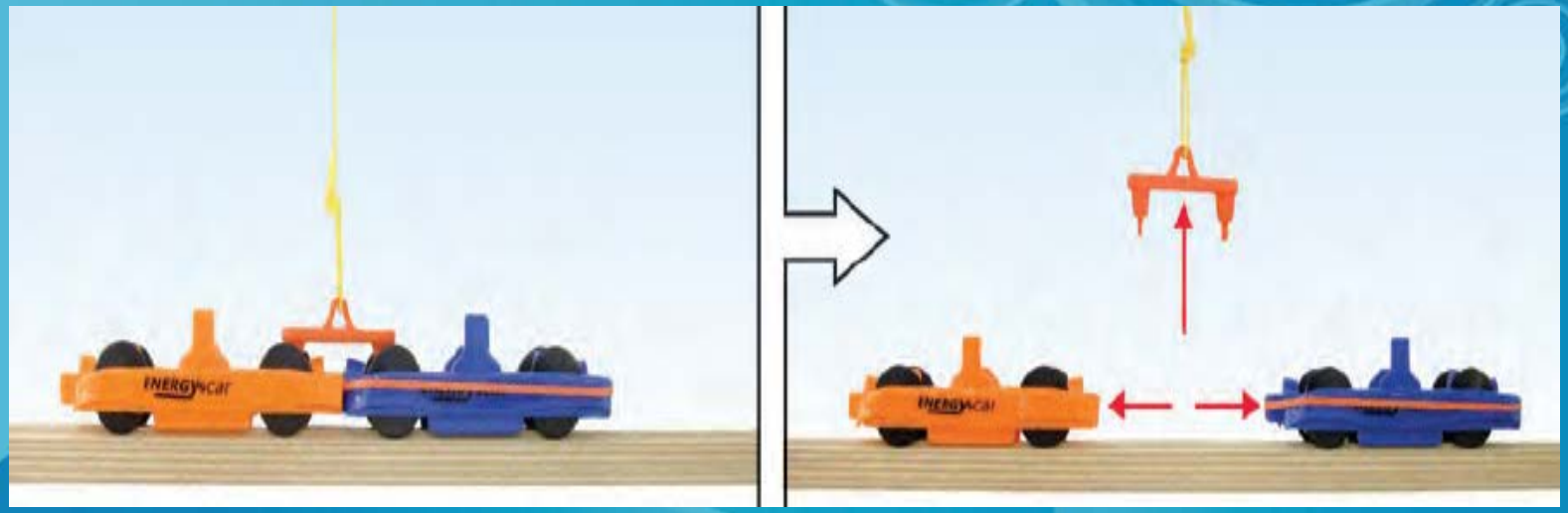
Newton's Laws
Force and Motion
Lecture 5

Classe 3ª A Linguistico

Istituto Superiore "Marini-Gioia" - AMALFI

The Third Law: Action and Reaction

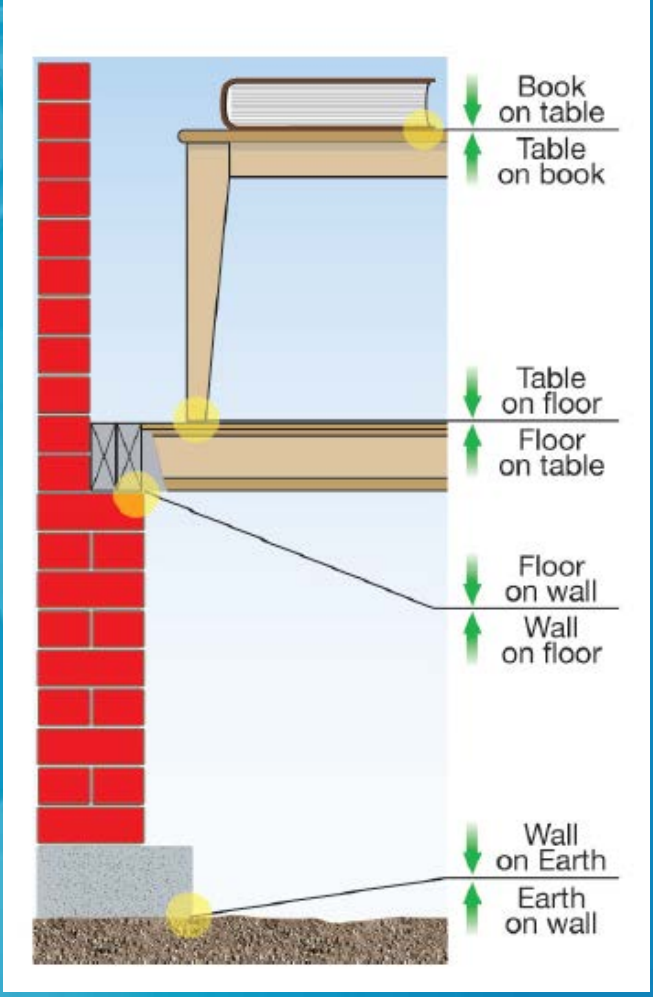
Investigation Key Question:
Can you identify action-reaction forces?



For every force acting on an object, there is an equal force acting in the opposite direction.

The Third Law: Action and Reaction

- *"For every action there is an equal and opposite reaction."*
- *This statement is known as Newton's third law of motion.*
- *Newton's third law discusses pairs of objects and the interactions between them.*

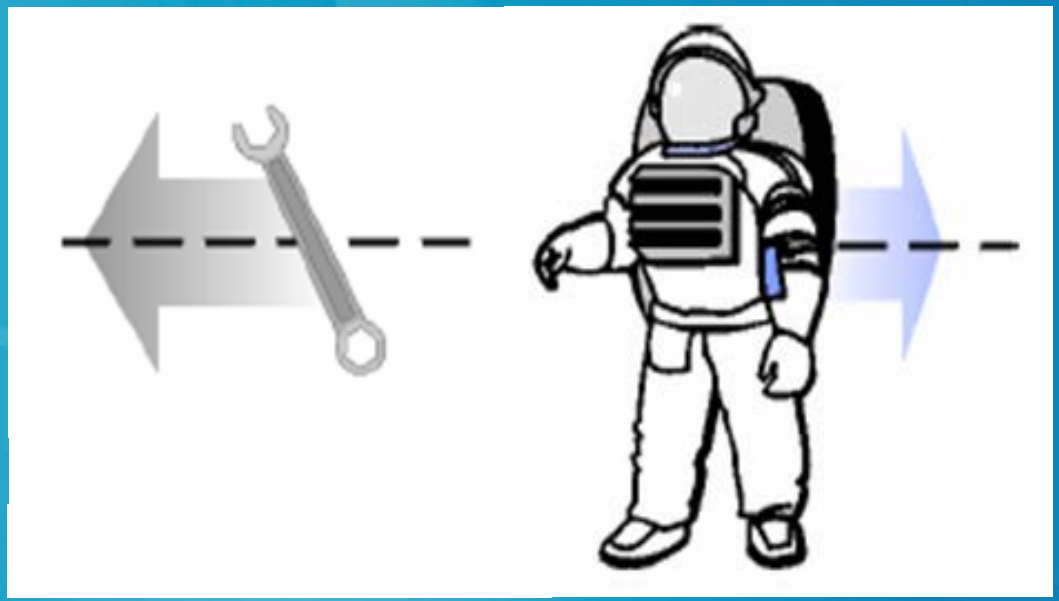


The Third Law: Action and Reaction

Forces occur in pairs

The astronauts working on the space station have a serious problem when they need to move around in space: There is nothing to push on.

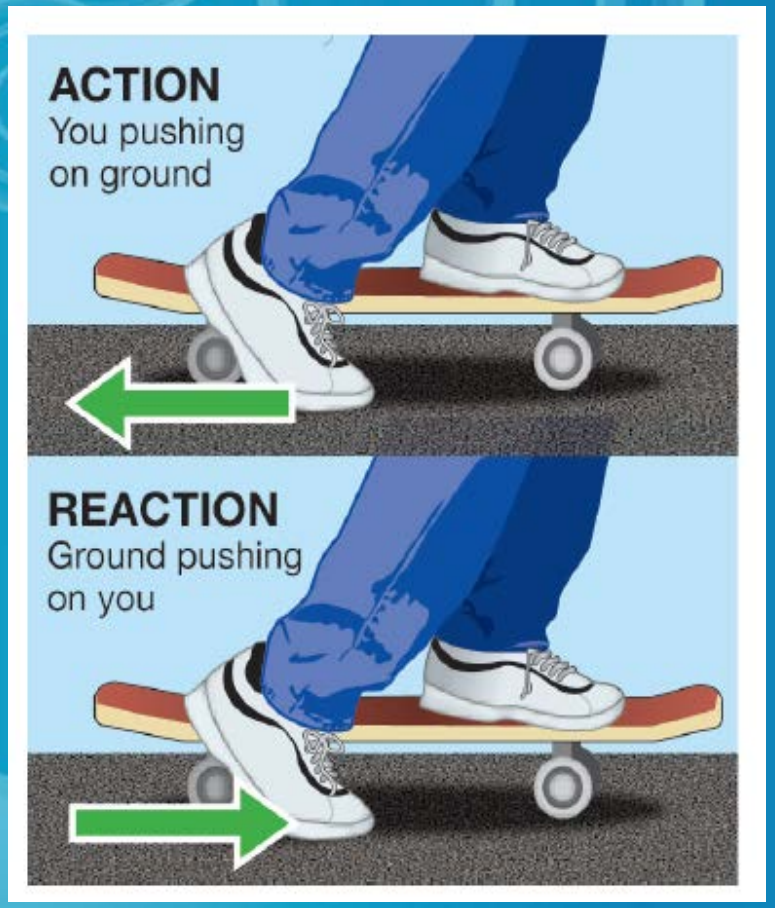
One solution is to throw something opposite the direction you want to move.



The Third Law: Action and Reaction

Forces occur in pairs

- The two forces in a pair are called **action** and **reaction**.
- Anytime you have one, you also have the other.
- If you know the strength of one you also know the strength of the other since both forces are always equal.

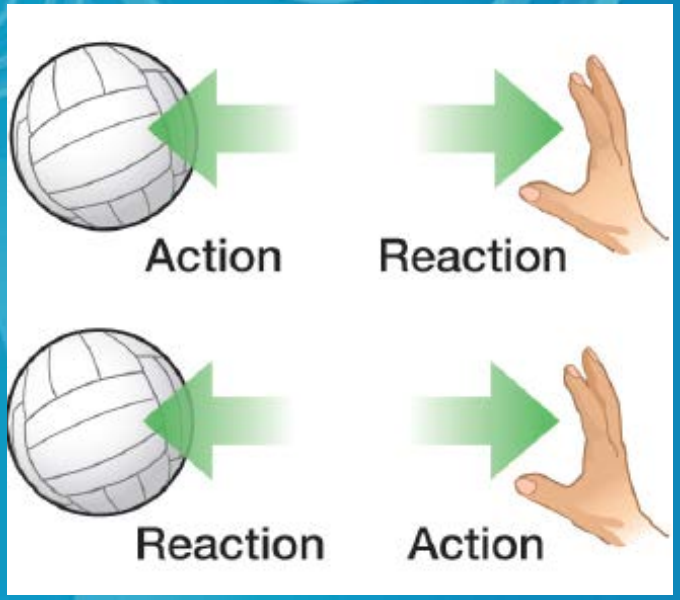


The Third Law: Action and Reaction

Statement:

- *Newton's third law states that for every action force there has to be a reaction force that is equal in strength and opposite in direction.*

- *Action and reaction forces act on different objects, not on the same object.*



The Third Law: Action and Reaction

Think about it…

Right now, gravity is pulling you down in your seat, but Newton's Third Law says your seat is pushing up against you with equal force. This is why you are not moving. There is a balanced force acting on you – gravity pulling down, your seat pushing up.

The Third Law: Action and Reaction

Think about it…

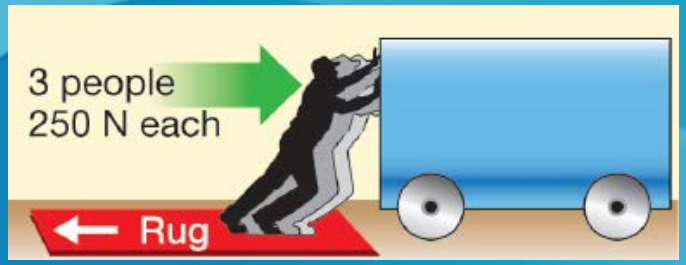
What happens if you are standing on a skateboard or a slippery floor and push against a wall? You slide in the opposite direction (away from the wall), because you pushed on the wall but the wall pushed back on you with equal and opposite force.

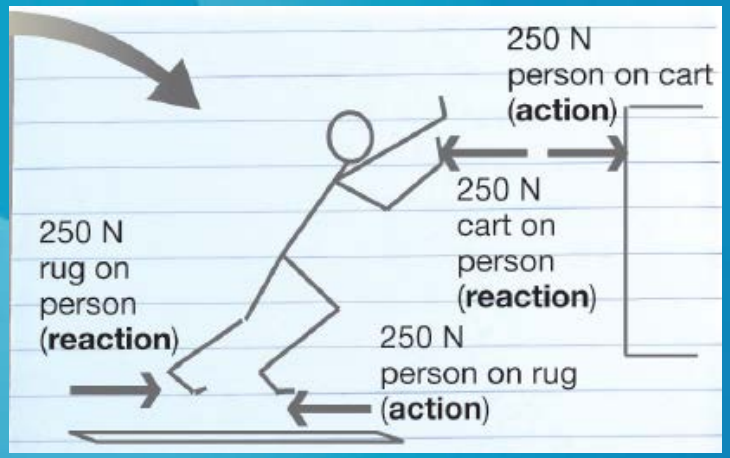
Why does it hurt so much when you stub your toe? When your toe exerts a force on a rock, the rock exerts an equal force back on your toe. The harder you hit your toe against it, the more force the rock exerts back on your toe (and the more your toe hurts).

The Third Law: Action and Reaction

Calculating force

Three people are each applying 250 Newtons of force to try to move a heavy cart. The people are standing on a rug. Someone nearby notices that the rug is slipping. How much force must be applied to the rug to keep it from slipping? Sketch the action and reaction forces acting between the people and the cart and between the people and the rug.





The Third Law: Action and Reaction

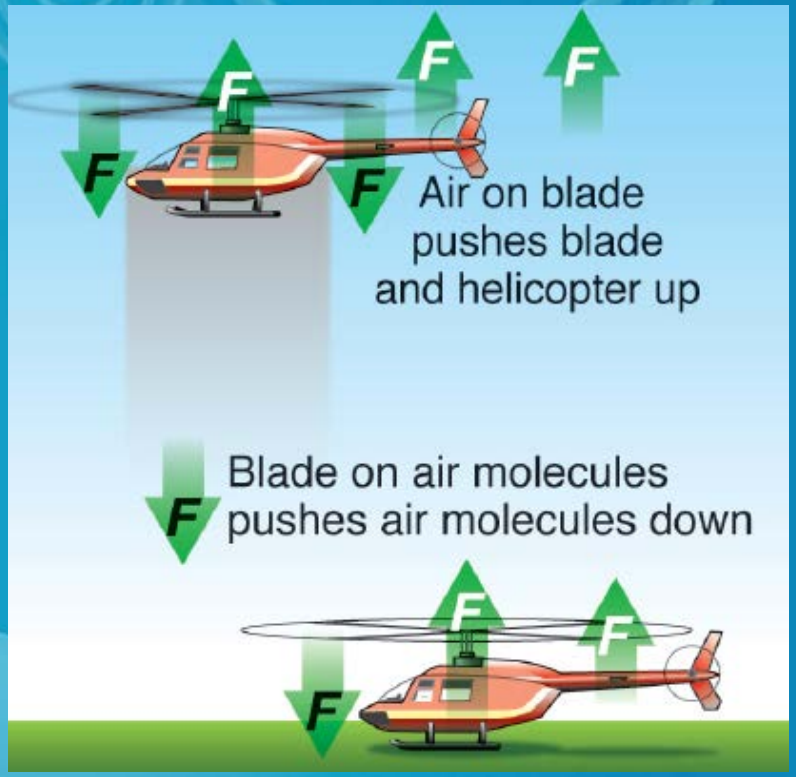
Locomotion

- The act of moving or the ability to move from one place to another is called ***locomotion***.
- Any animal or machine that moves depends on Newton's third law to get around.
- When we walk, we push off the ground and move forward because of the ground pushing back on us in the opposite direction.

The Third Law: Action and Reaction

Locomotion

- *Jets, planes, and helicopters push air.*
- *In a helicopter, the blades of the propeller are angled such that when they spin, they push the air molecules down.*

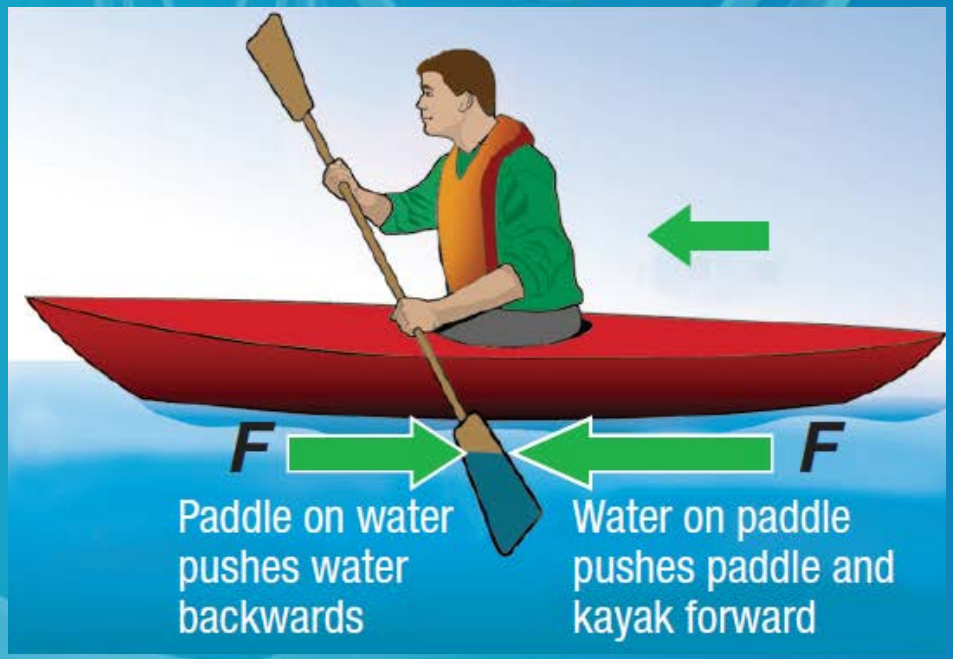


The Third Law: Action and Reaction

Locomotion

Did you realize that, except for the wind, all the energy used to move your canoe through the water is transmitted through your paddle?

All canoe strokes work on the same principle - for every action, there is an equal and opposite reaction.



The Third Law: Action and Reaction

Video on the third law…

REVIEW

Newton's First Law:

Objects in motion tend to stay in motion and objects at rest tend to stay at rest unless acted upon by an unbalanced force.

Newton's Second Law:

Force equals mass times acceleration (F = ma).

Newton's Third Law:

For every action there is an equal and opposite reaction.