

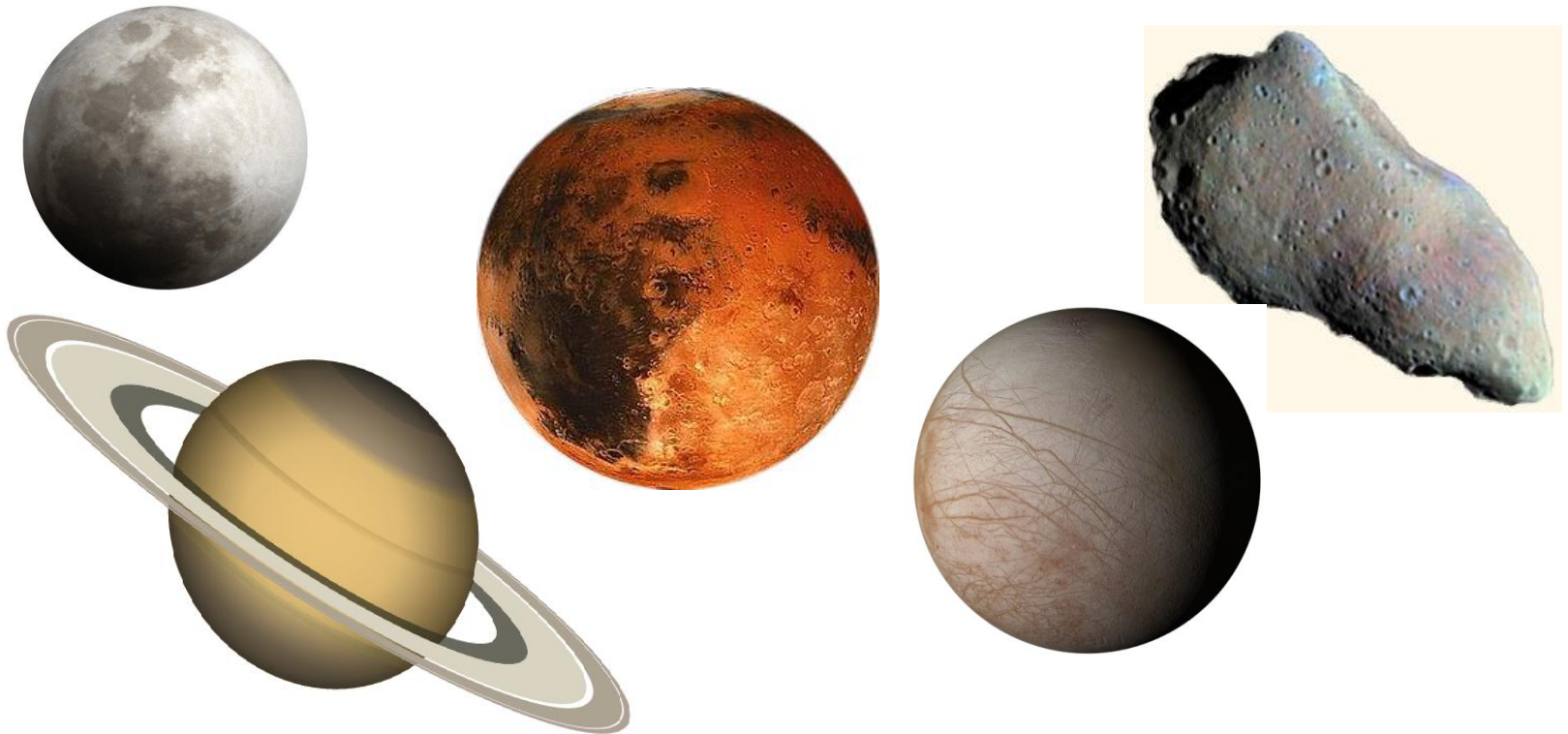


Jet Propulsion

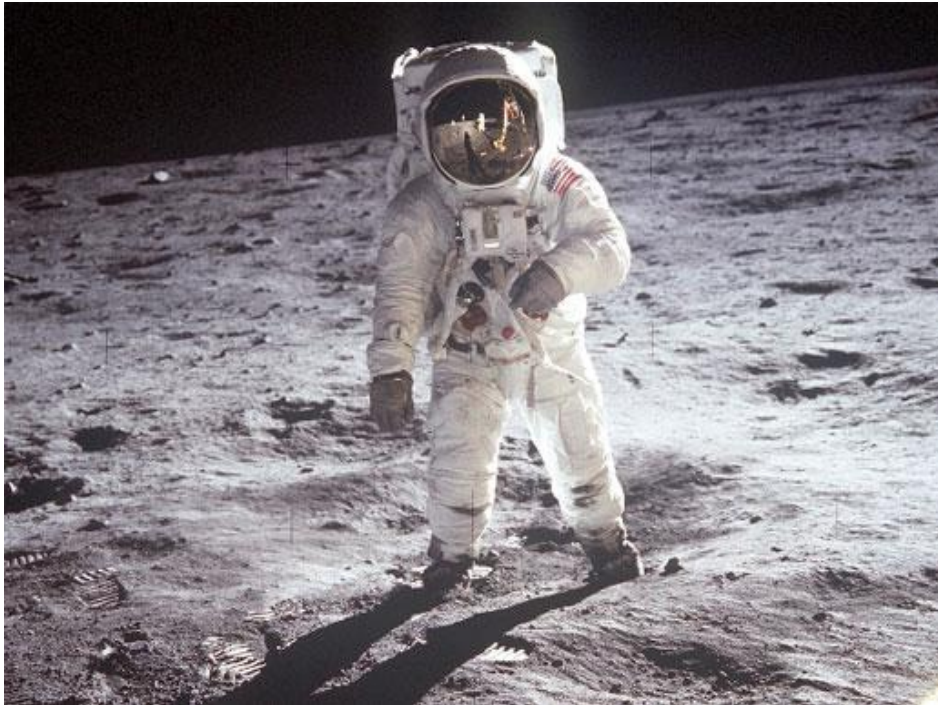
UCSD BioCircuits Institute
Elementary School Partnership

3rd grade, Objects in the Sky

There are lots of interesting
objects in the sky!



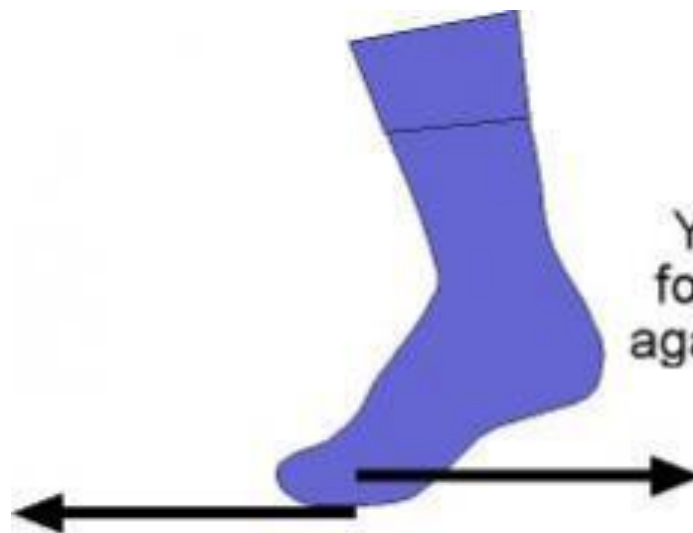
Sometimes, scientists (or their robots) need to get there in order to study them.



How would we get there?



Walk? Run?



You apply your
force backwards
against the ground

and the ground applies
a static frictional force
forwards against you.

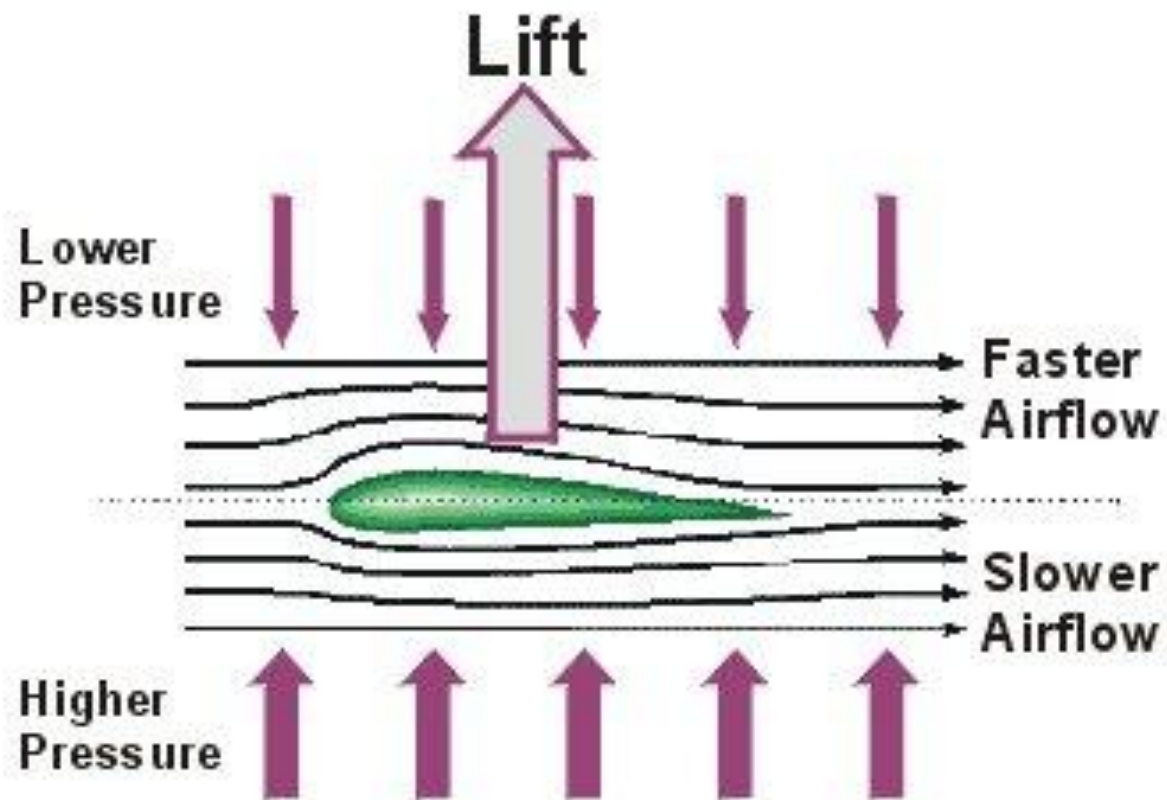


Hop? Jump? Jump really high?





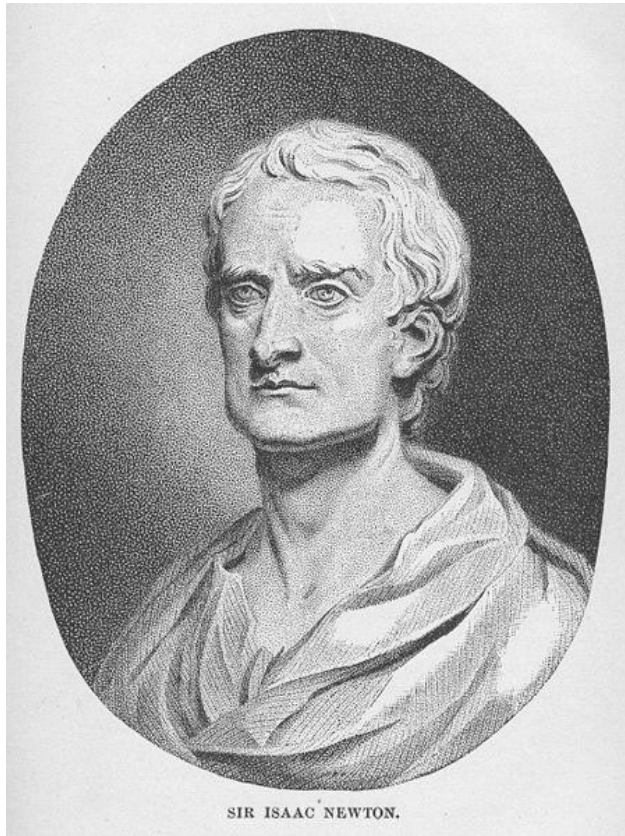
Fly? Like a bird? Like an airplane?



Jet propulsion!



But what is jet propulsion?
Why does it work? How does it work?



Isaac Newton's Laws of Motion

Law #1

Something that's not moving will not move until you apply a force.
Something that's moving will not stop moving until you apply a force.

Newton's First Law of Motion



An object at rest will remain at rest...

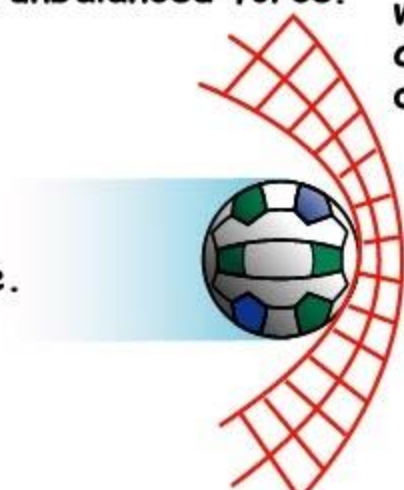


Unless acted on by an unbalanced force.



An object in motion will continue with constant speed and direction,...

... Unless acted on by an unbalanced force.



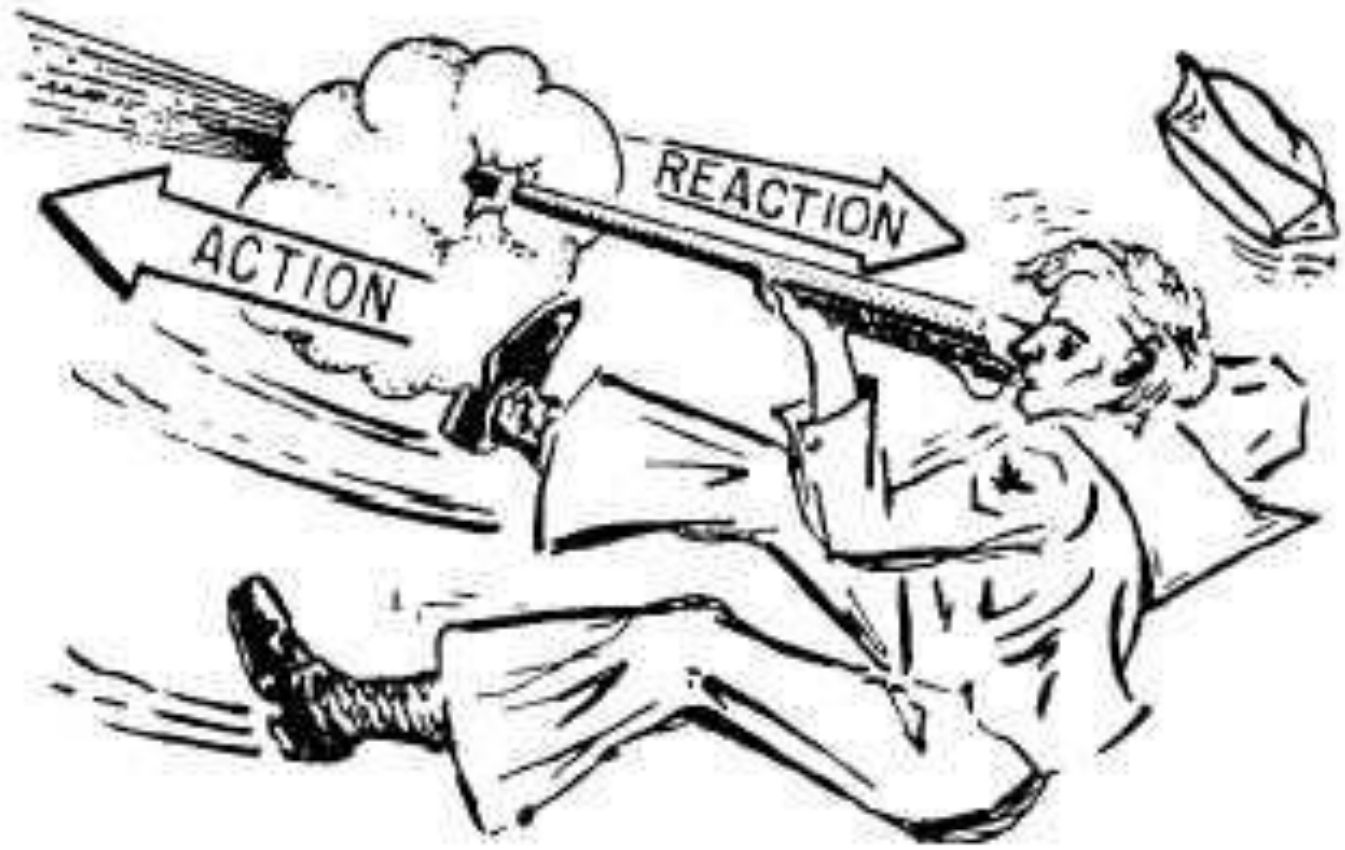
Law #2

Heavier things need a stronger force to get them to move (or stop moving).



Law #3

If you push (or pull) something with a force, it will push (or pull) you back with a force with the same strength, but in the opposite direction.



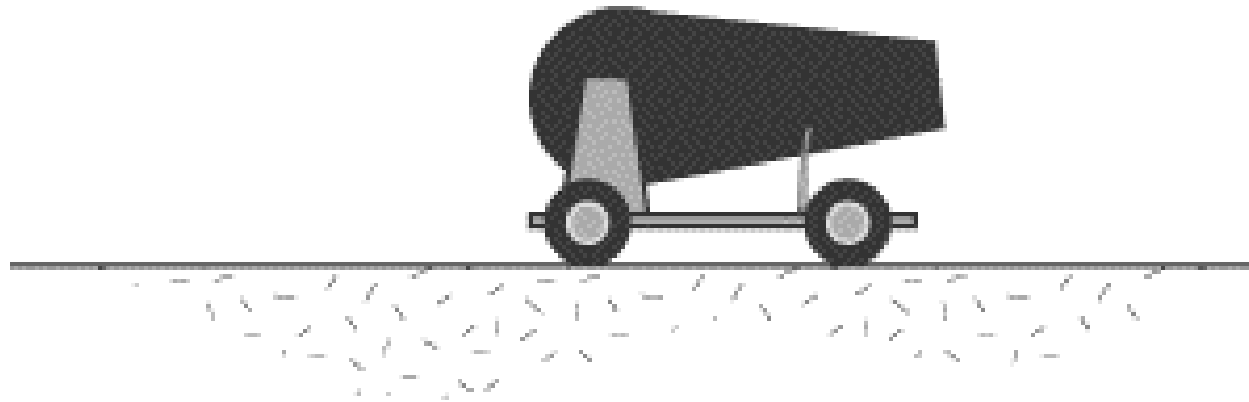
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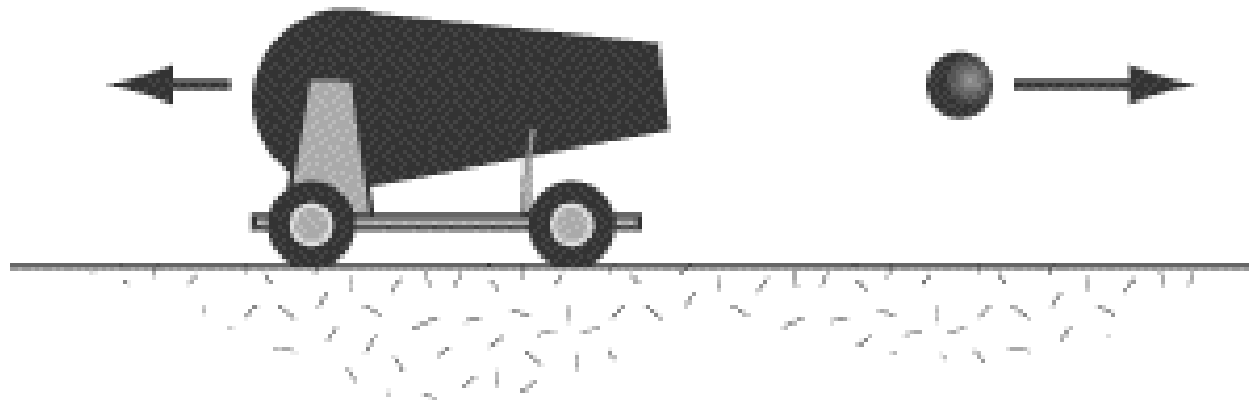
For every *action*, there is an equal and opposite *reaction*.

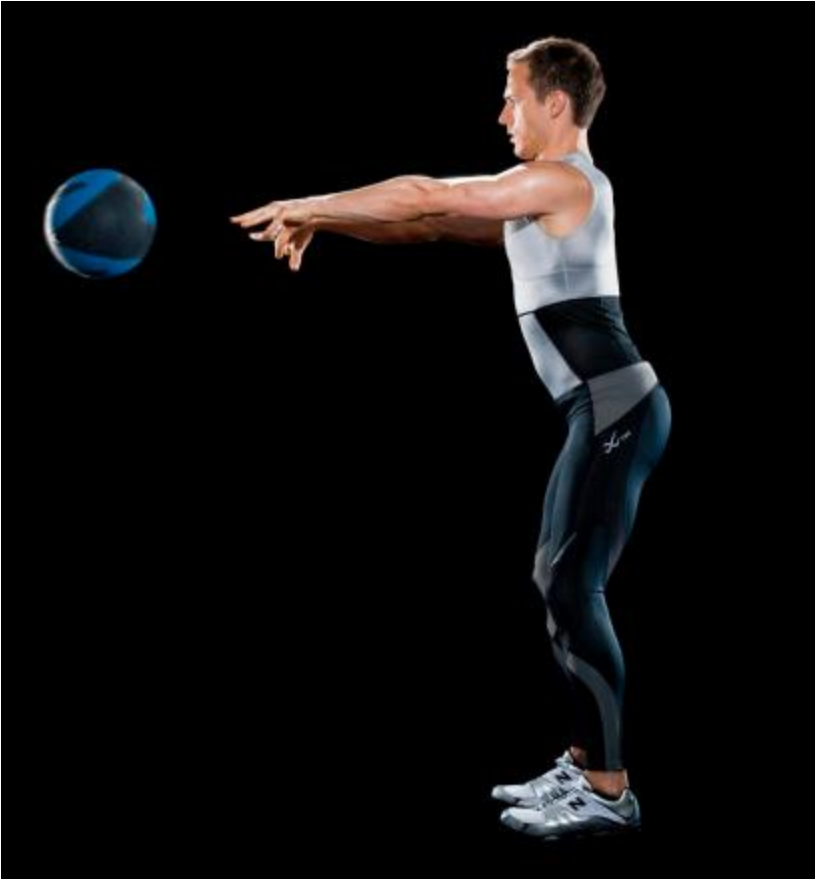


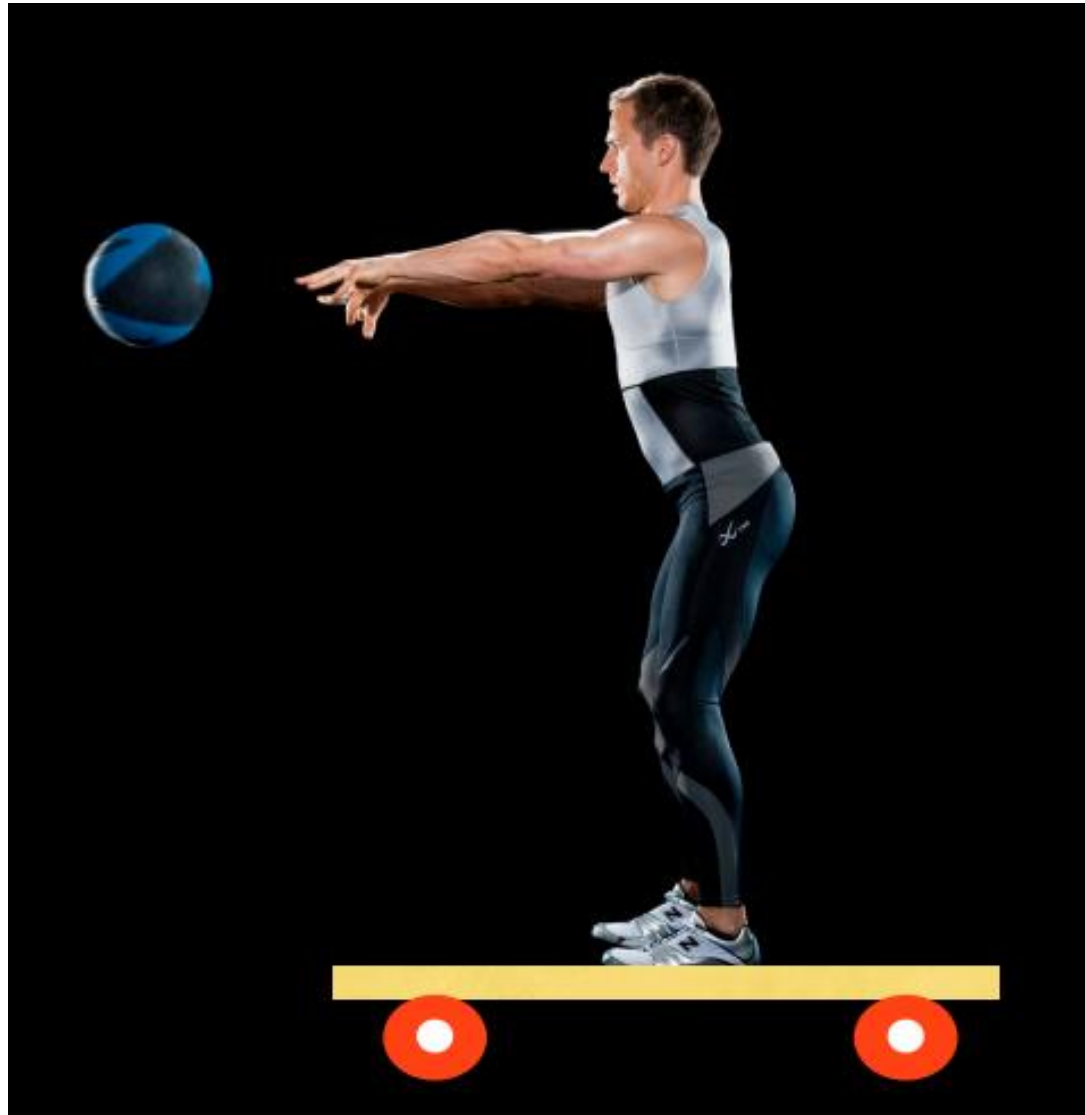
before



after













air moves



balloon moves

