

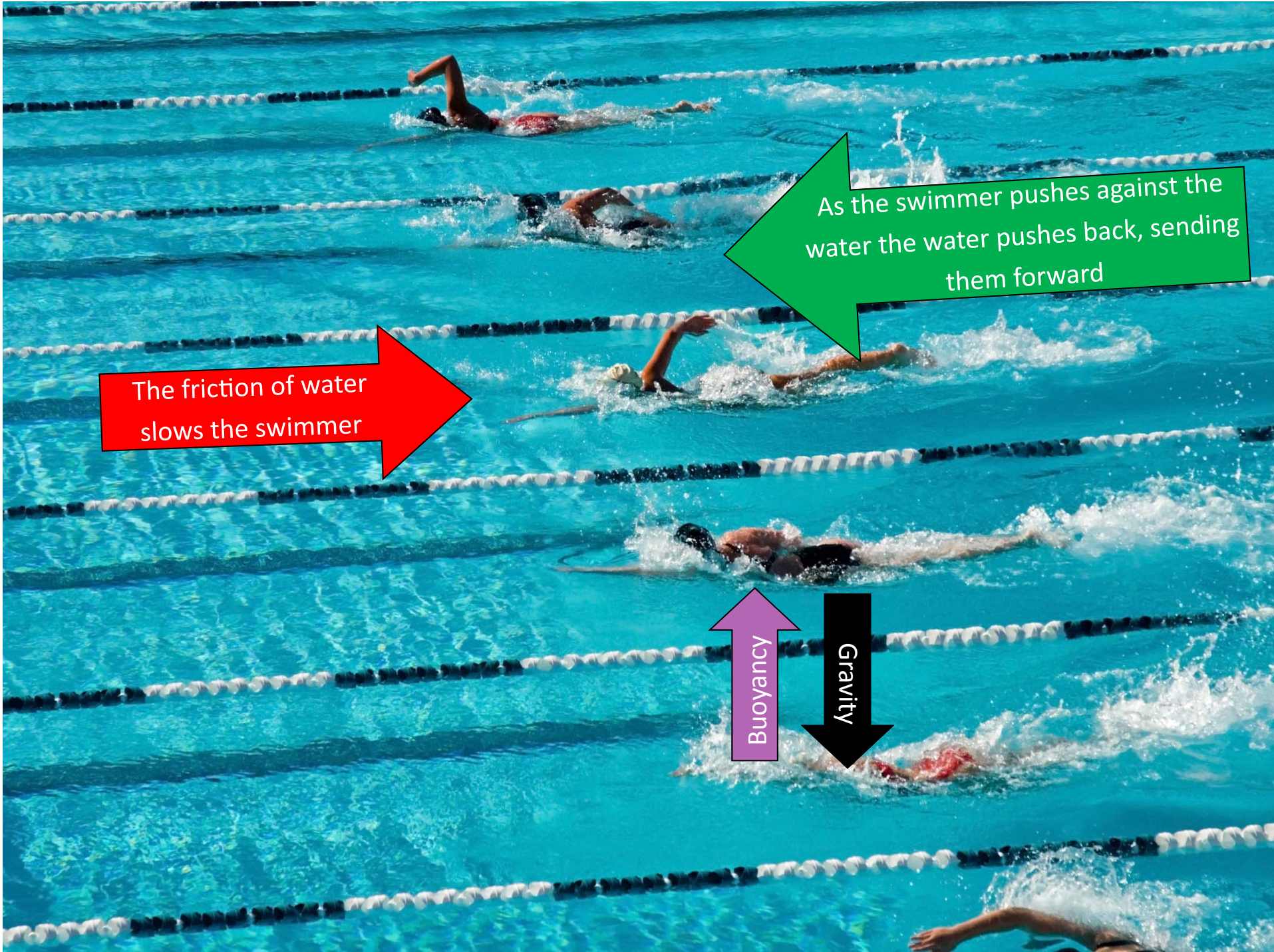
# OLYMPIC FORCES

The Science Behind the Summer Olympics



# What Forces Are Involved?



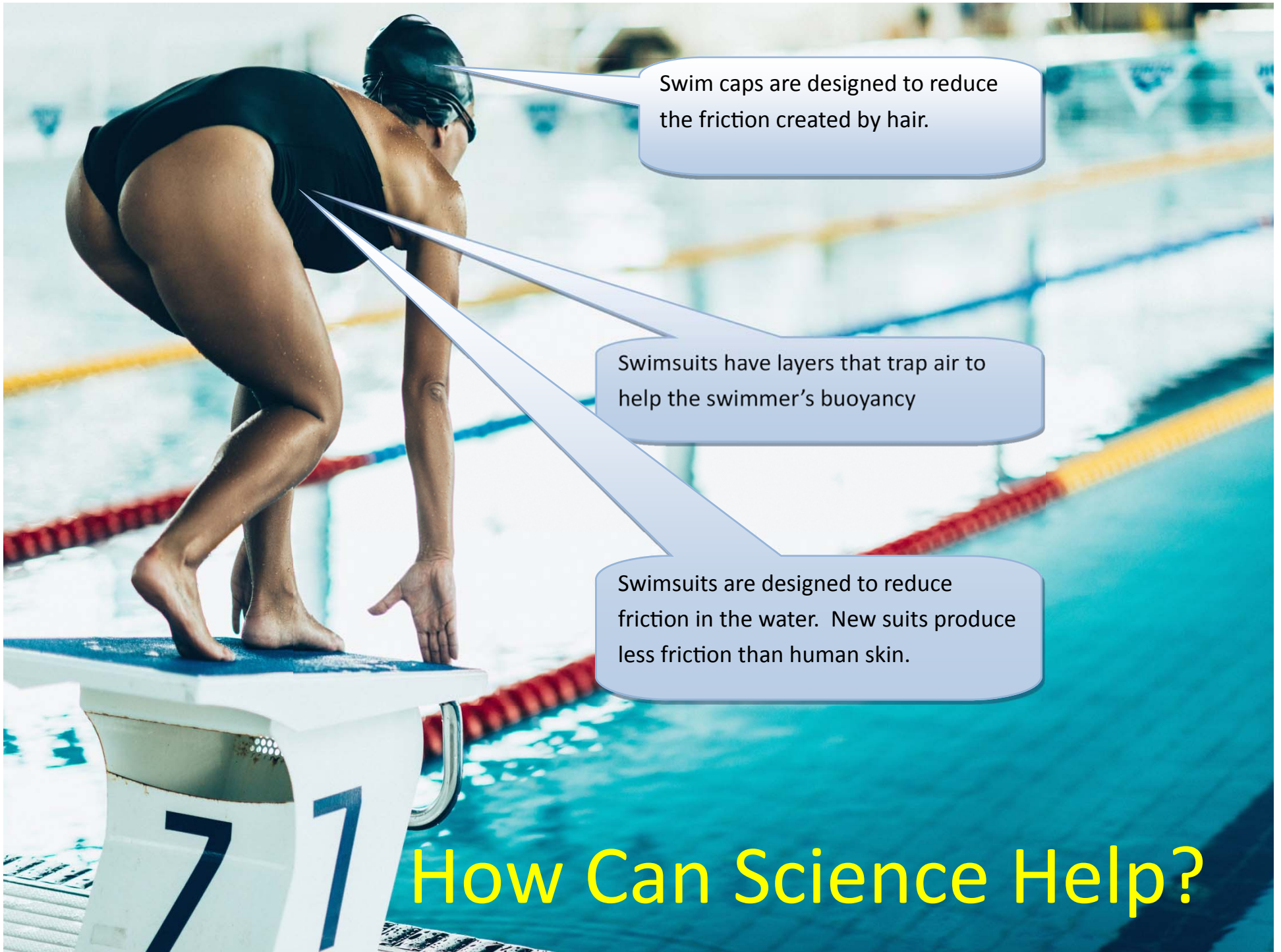


As the swimmer pushes against the water the water pushes back, sending them forward

The friction of water slows the swimmer

Buoyancy

Gravity



Swim caps are designed to reduce the friction created by hair.

Swimsuits have layers that trap air to help the swimmer's buoyancy

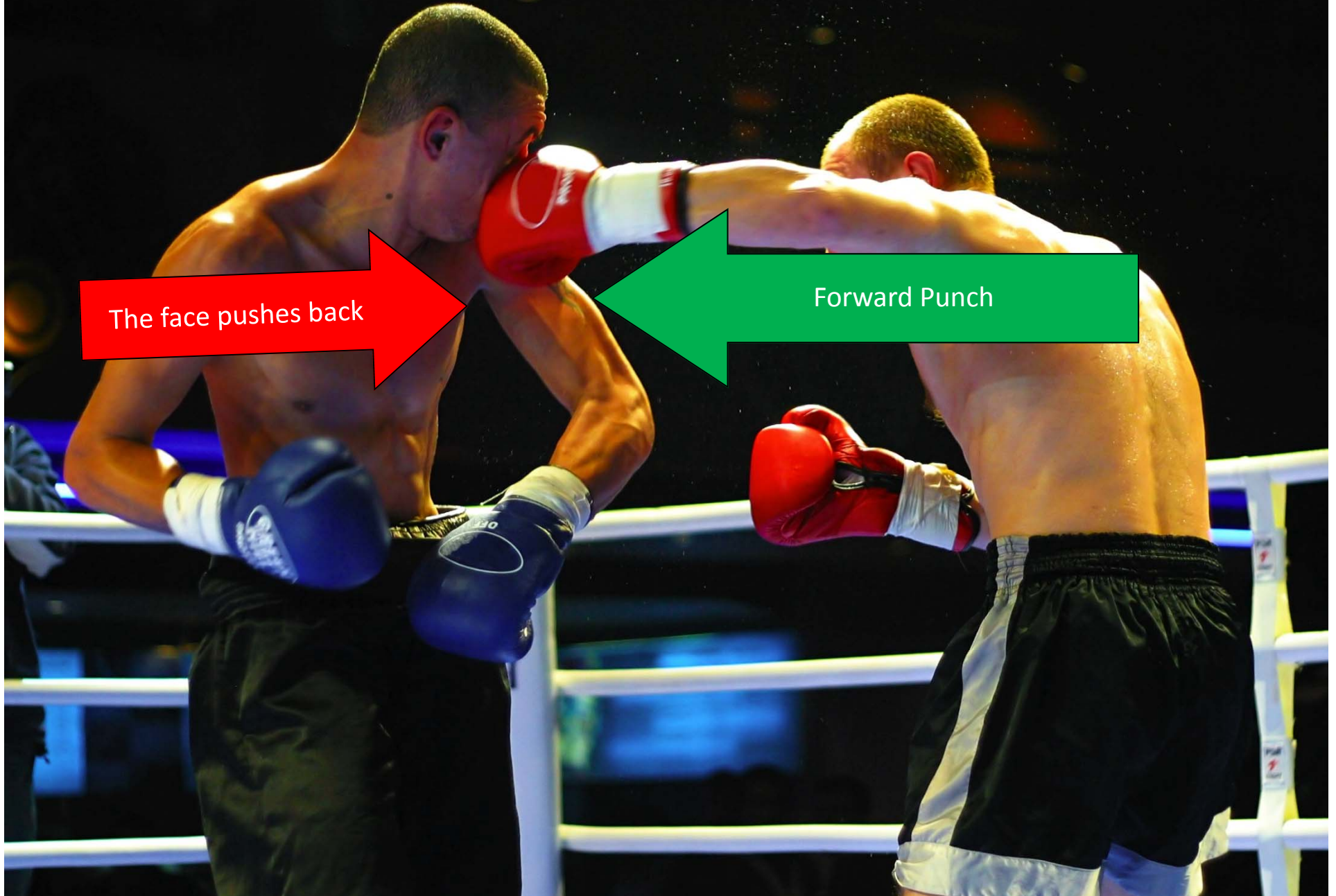
Swimsuits are designed to reduce friction in the water. New suits produce less friction than human skin.

# How Can Science Help?

# What Forces Are Involved?



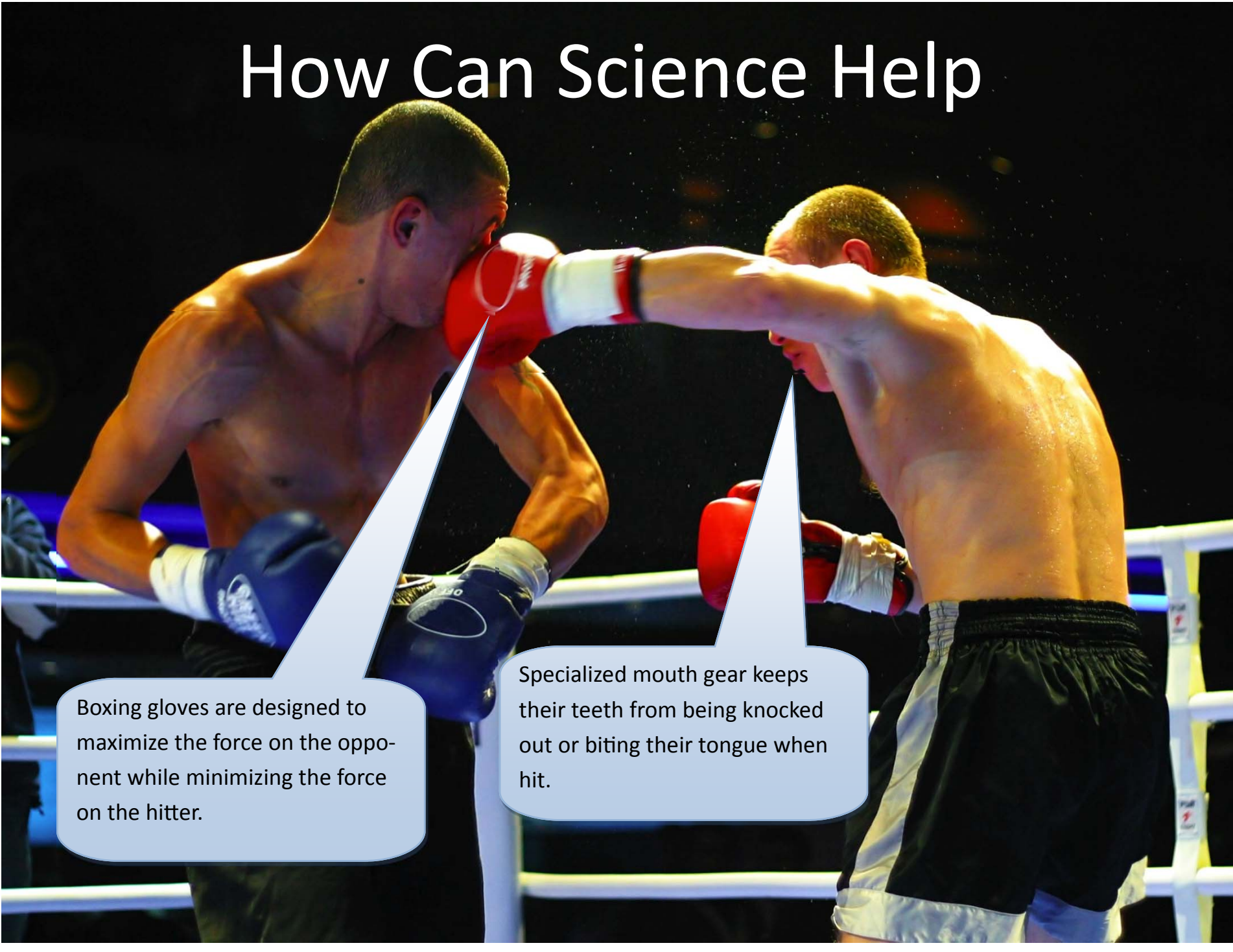
# What Forces Are Involved?



The face pushes back

Forward Punch

# How Can Science Help



Boxing gloves are designed to maximize the force on the opponent while minimizing the force on the hitter.

Specialized mouth gear keeps their teeth from being knocked out or biting their tongue when hit.

# What Forces Are Involved?





# What Forces Are Involved?

The ball is about to be hit forward by the arm, but will be slowed by air friction and begin to fall due to gravity.

Air Friction

Air Friction

Gravity

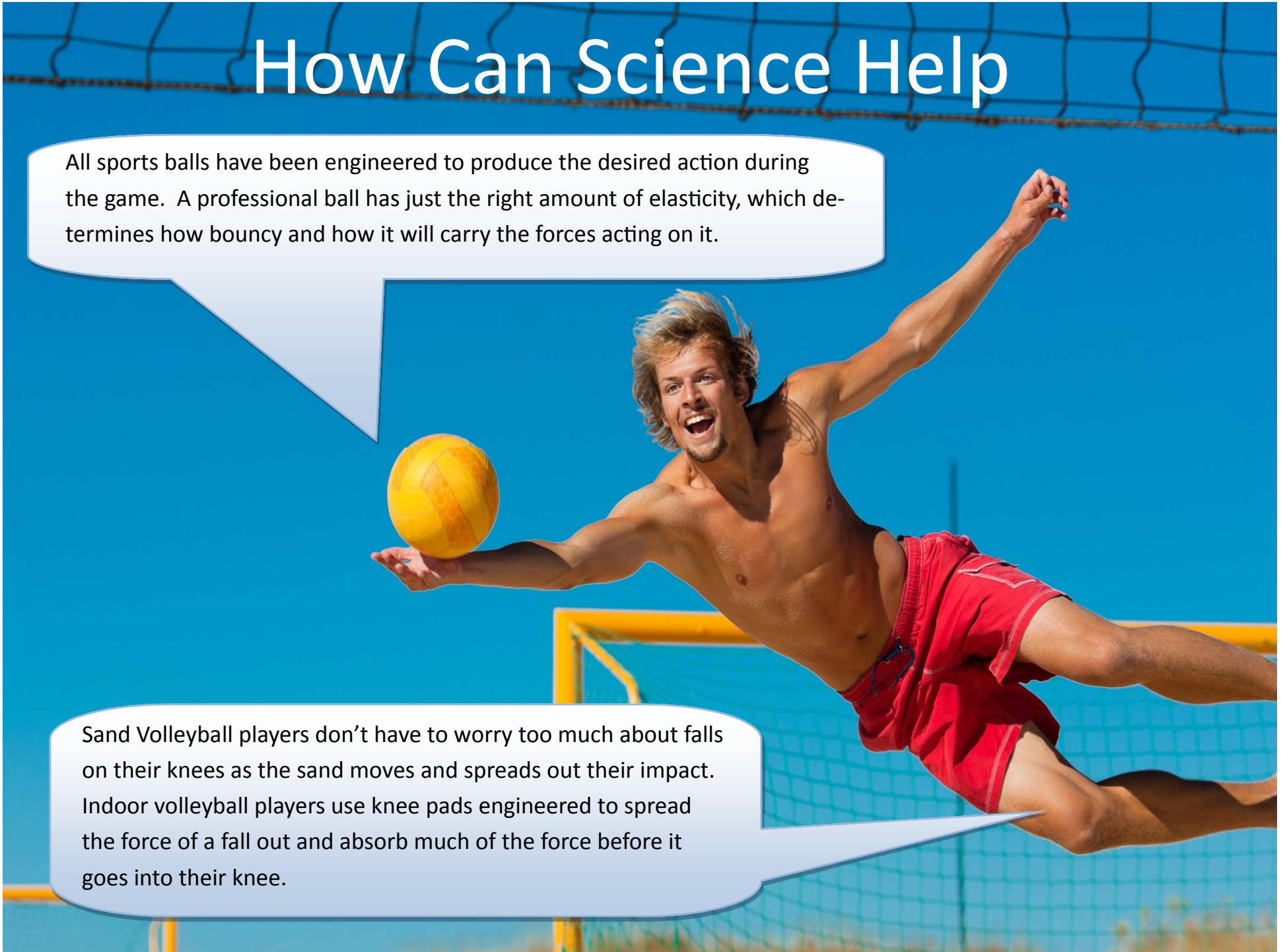
Forward Force from Push from legs



# How Can Science Help

All sports balls have been engineered to produce the desired action during the game. A professional ball has just the right amount of elasticity, which determines how bouncy and how it will carry the forces acting on it.

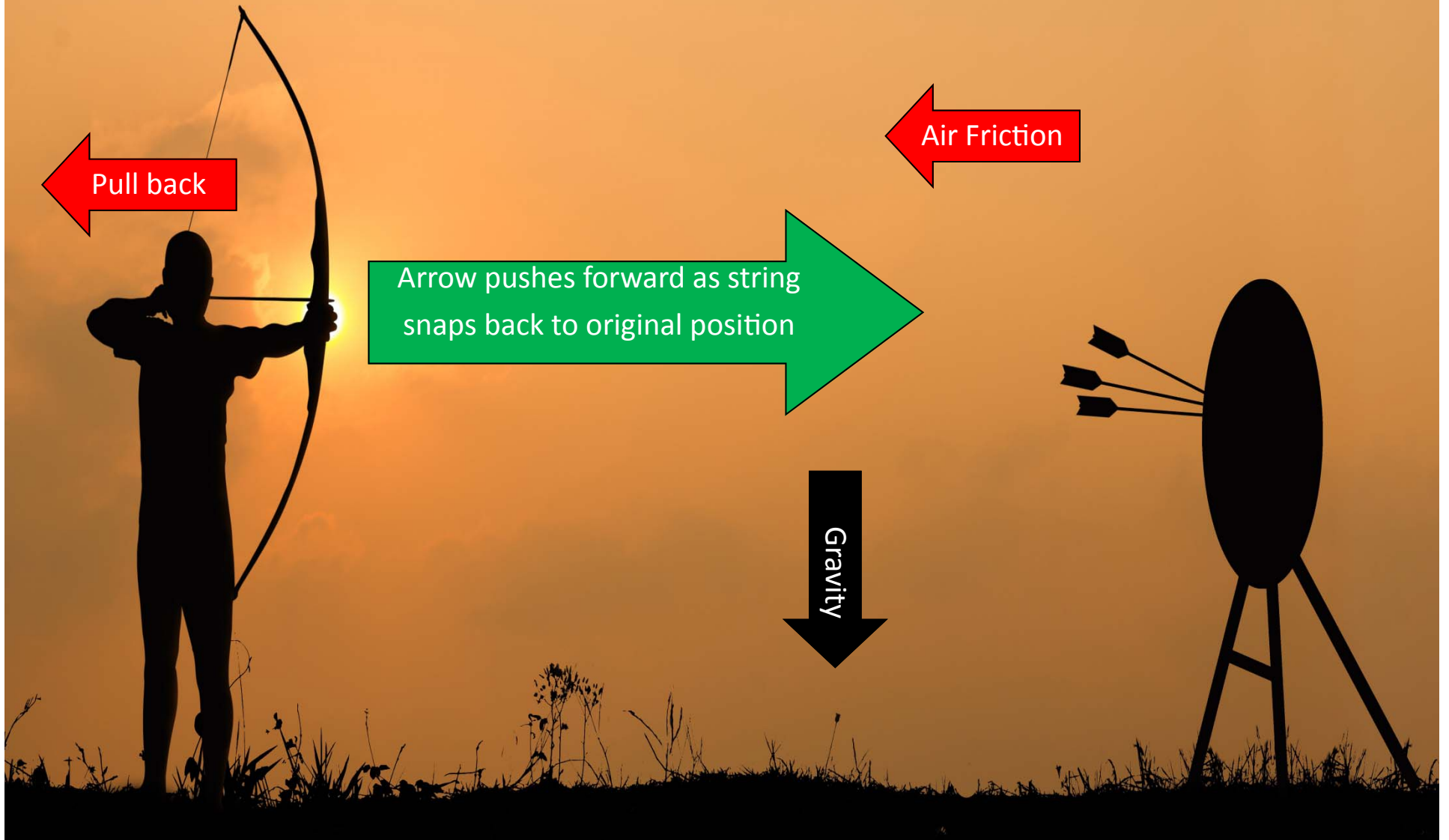
Sand Volleyball players don't have to worry too much about falls on their knees as the sand moves and spreads out their impact. Indoor volleyball players use knee pads engineered to spread the force of a fall out and absorb much of the force before it goes into their knee.




# What Forces Are Involved?




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# How Can Science Help?



Bows have been engineered so that maximum but stable force is exerted when the string is released. Materials for all parts of the bow must be able to hold lots potential energy without breaking.

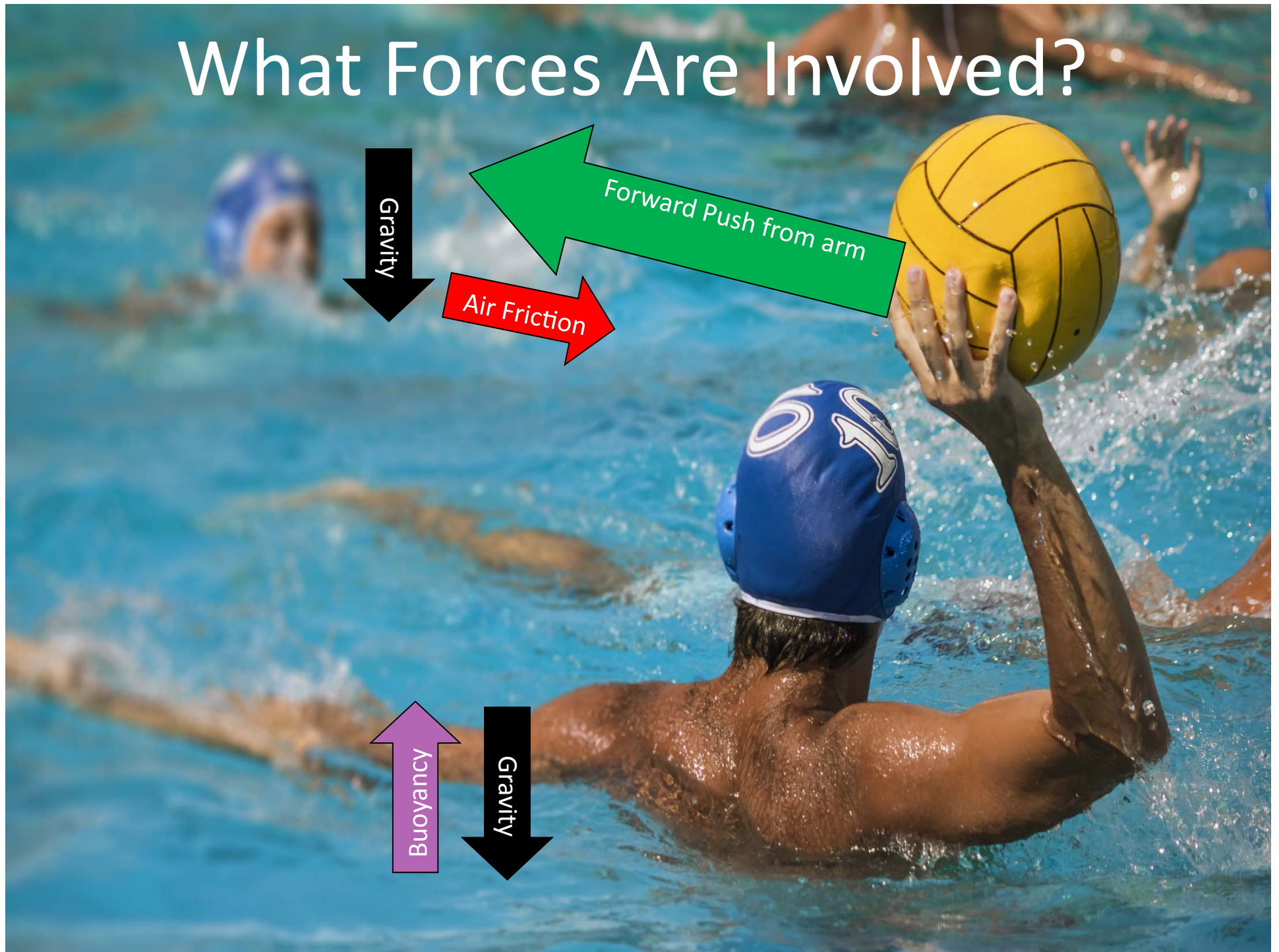


Arrows have a lot of engineering in them that allows them to fly as straight as possible. Vibration is also controlled in the best arrows. Any wiggle or vibration will take the arrow off course.

# What Forces Are Involved?



# What Forces Are Involved?



# How Does Science Help?

A photograph of a water polo player in a blue cap and shirt, holding a yellow water polo ball with both hands above the water. The player is in a pool of blue water, and other players are visible in the background. A white speech bubble is overlaid on the left side of the image, containing text about the science of sports balls.

Water polo players are pretty natural. However, all professional sports balls are engineered so they behave in the desired way. You don't want too much elasticity (which will cause too much bounce) but you need enough so that it transfers the force of the throw.



# What Forces Are Involved?



# What Forces Are Involved?



# How Can Science Help?



Uniforms are engineered to reduce air friction

Shoes are engineered to be as light as possible while providing maximum transfer of energy back forward when the athlete pushes against them.

Starting blocks are engineered to provide proper grip on the bottom so that they do not slide back when force is applied to them. You want all the force applied to push the athlete forward.

What Forces Are Involved?



# What Forces Are Involved?



# What Forces Are Involved?



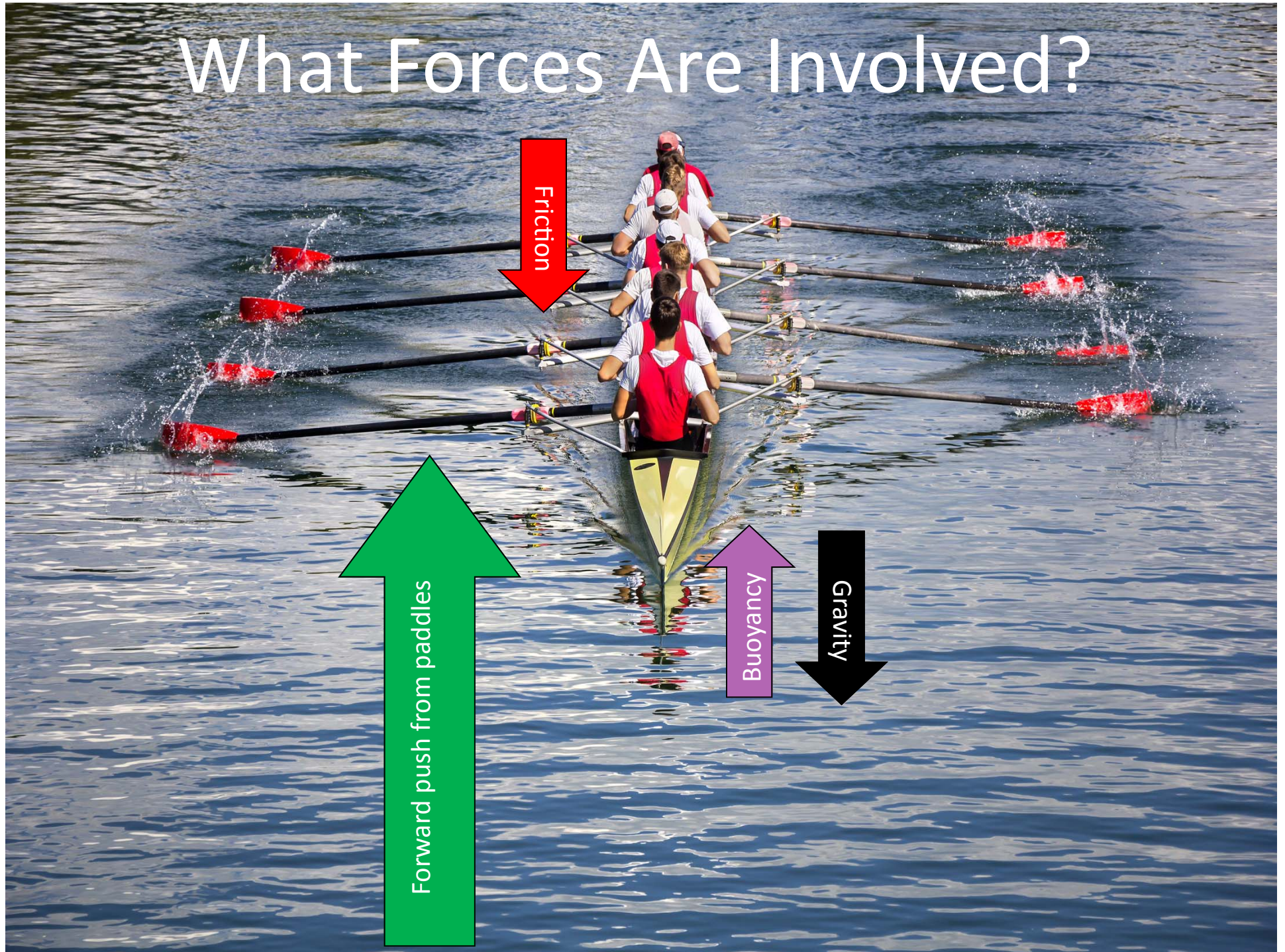
Sports shoes are designed to provide the desired effect for the given sport. In soccer, you want a shoe that will transfer most of the energy from the kick into the ball—not absorb it. You also want a shoe that grips the ground to provide proper traction and push.

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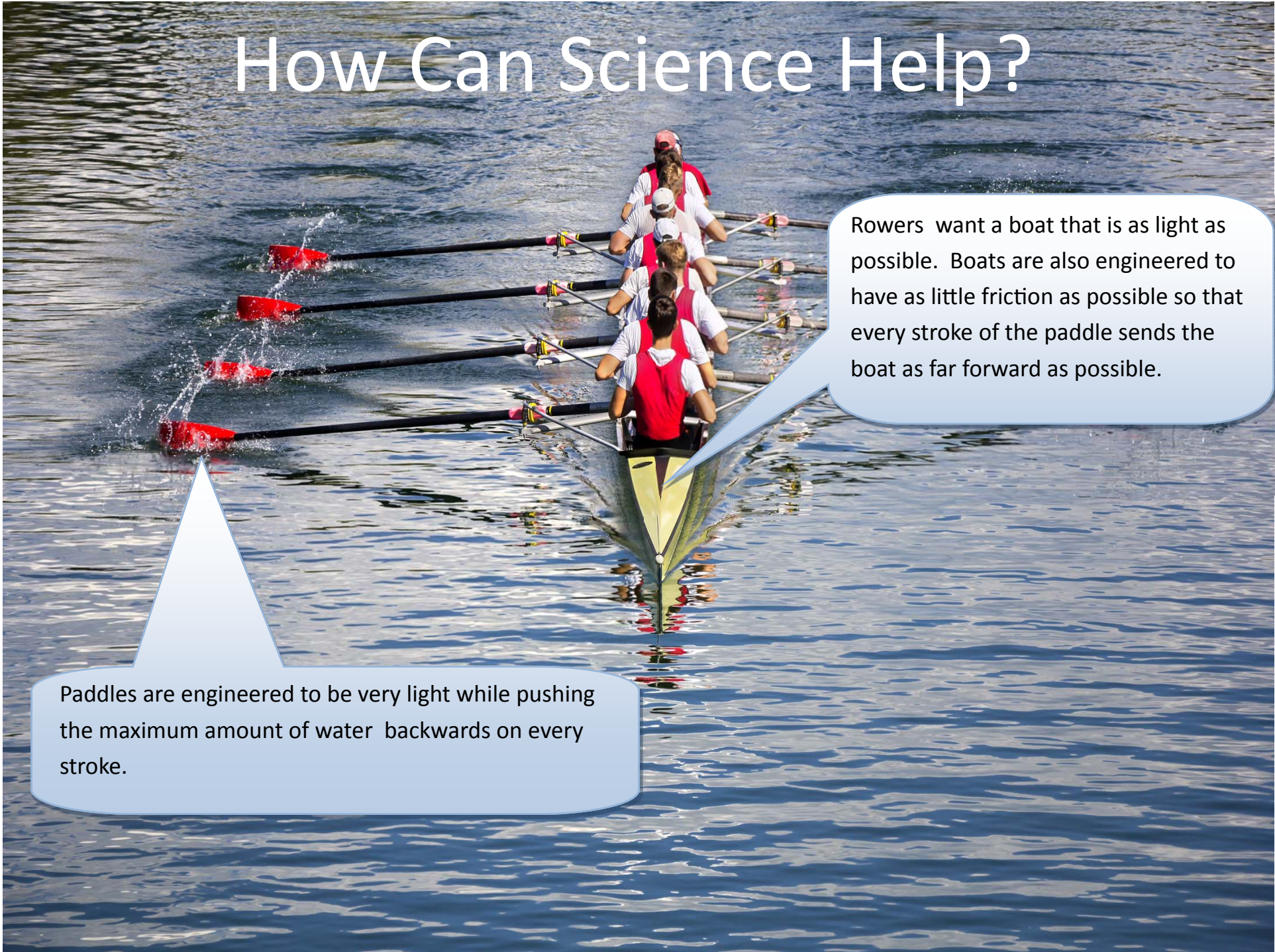




# How Can Science Help?

Rowers want a boat that is as light as possible. Boats are also engineered to have as little friction as possible so that every stroke of the paddle sends the boat as far forward as possible.

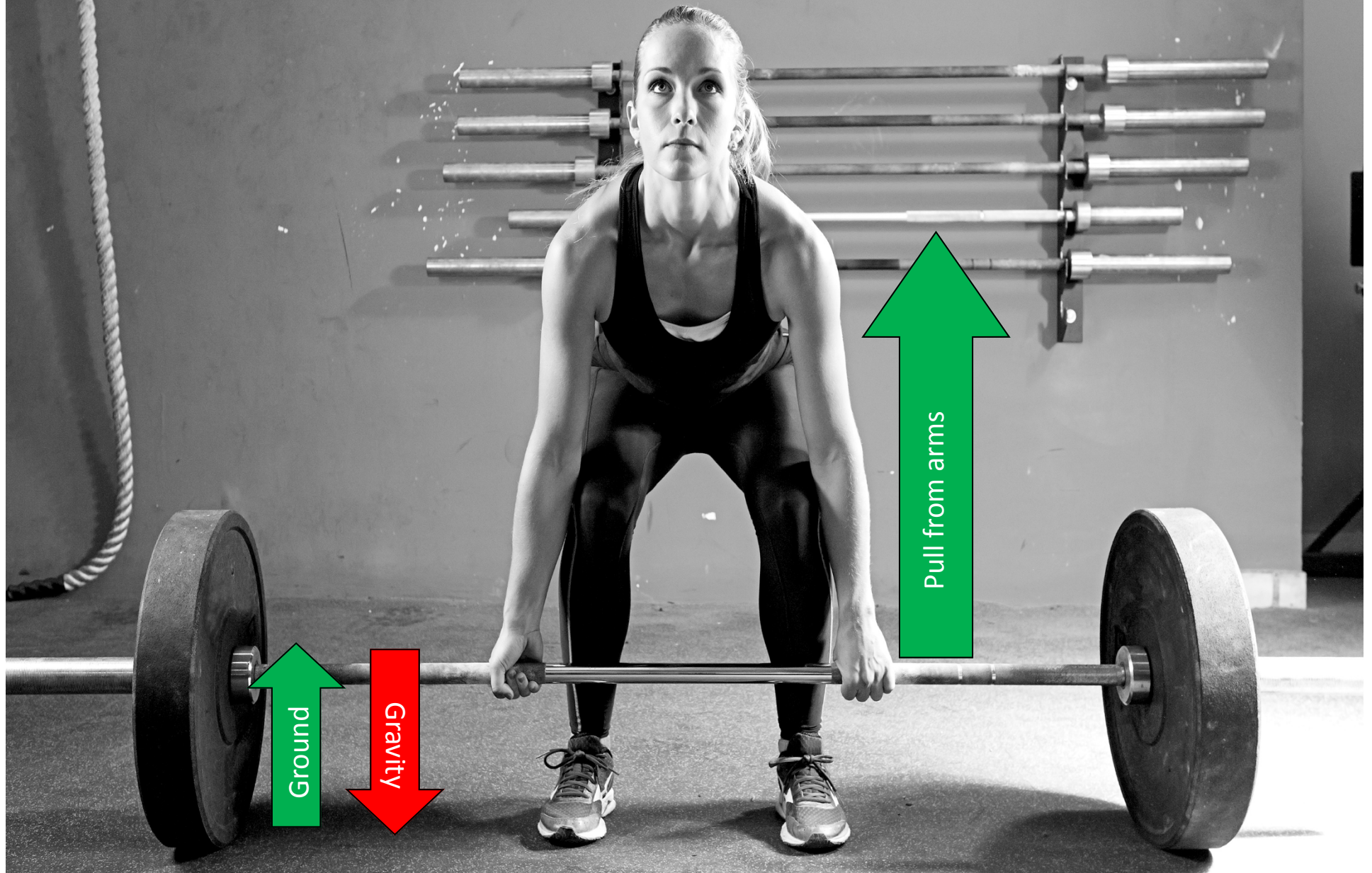
Paddles are engineered to be very light while pushing the maximum amount of water backwards on every stroke.



# What Forces Are Involved?



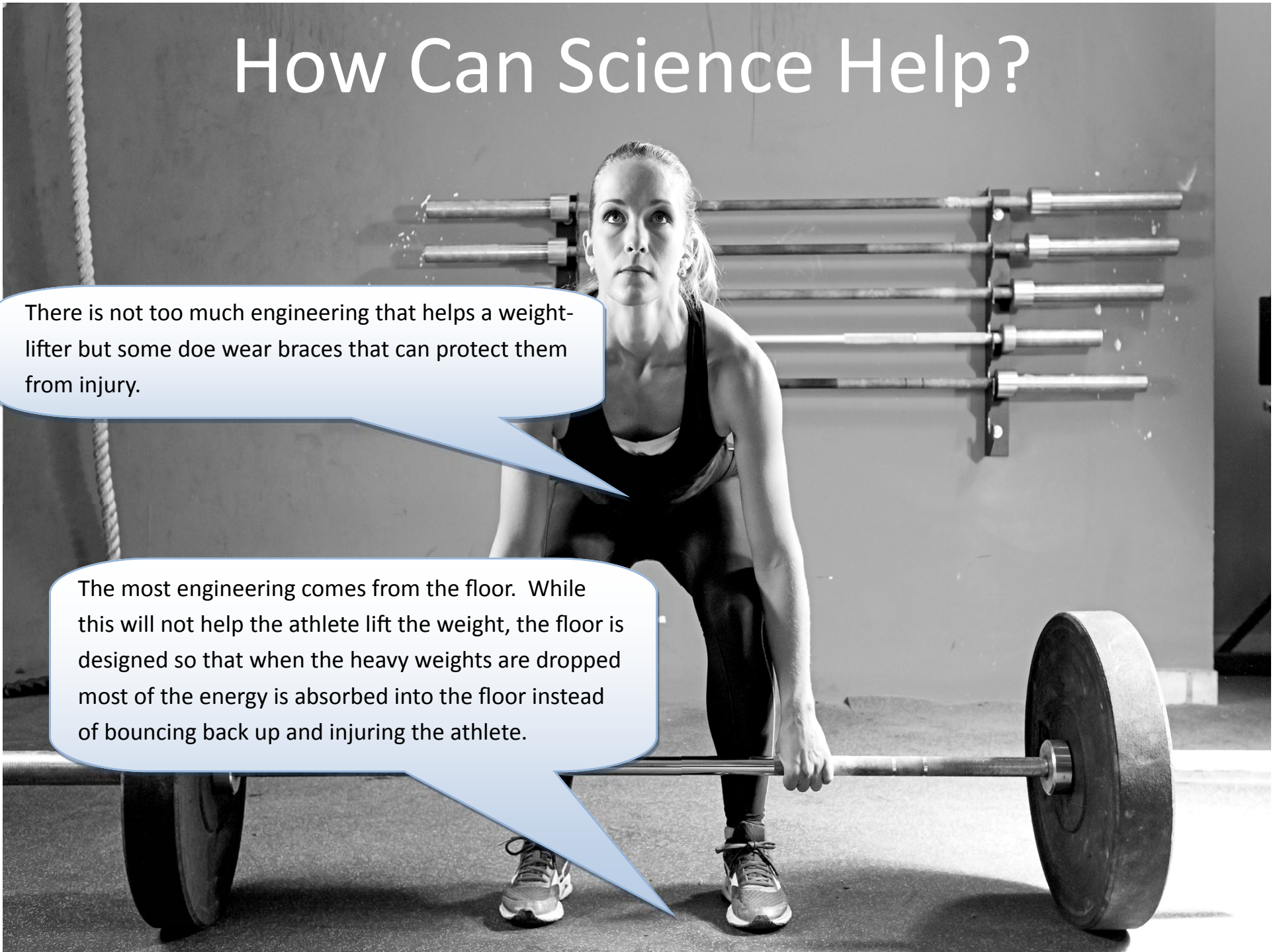
# What Forces Are Involved?



# How Can Science Help?

There is not too much engineering that helps a weightlifter but some do wear braces that can protect them from injury.

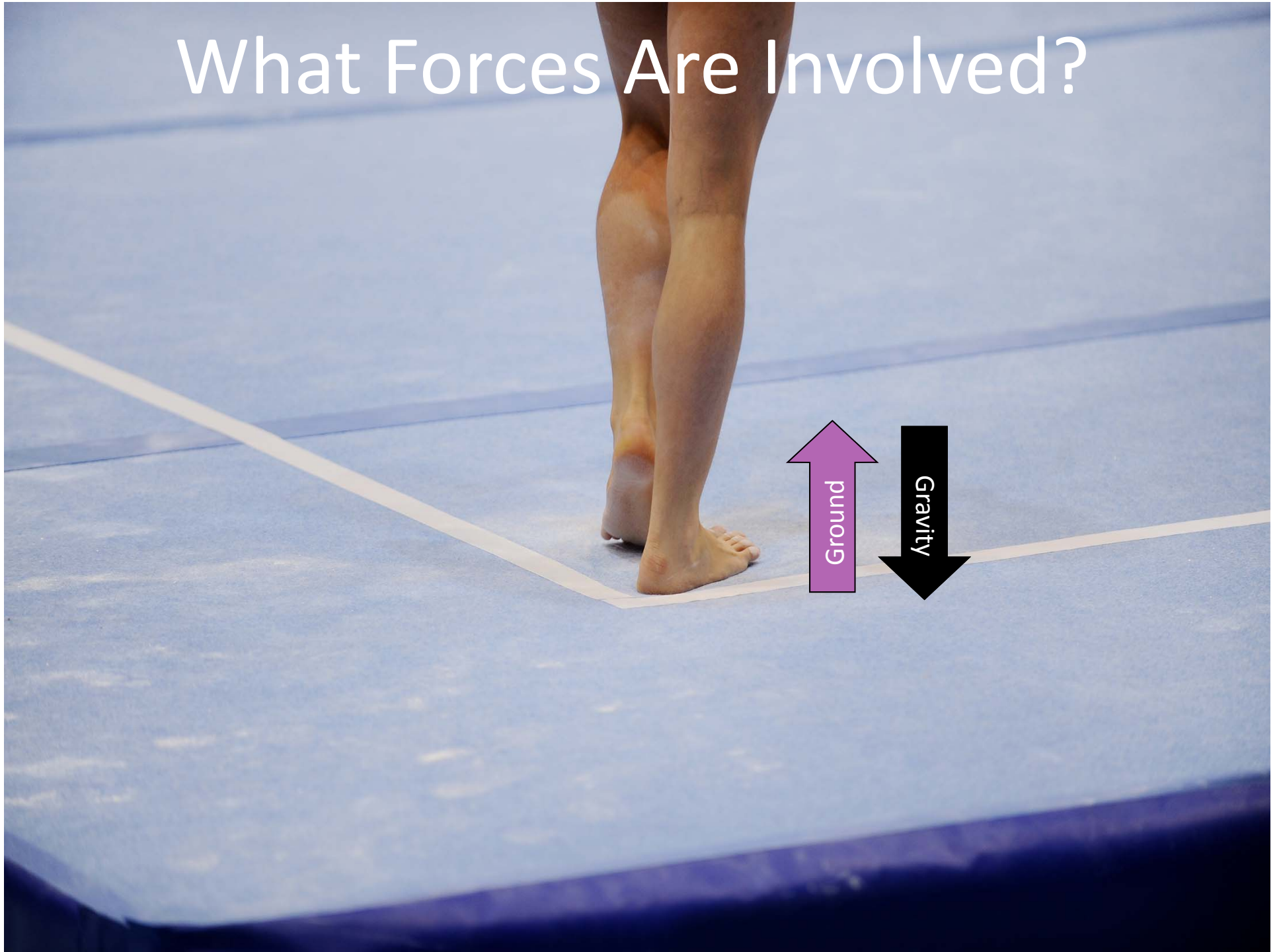
The most engineering comes from the floor. While this will not help the athlete lift the weight, the floor is designed so that when the heavy weights are dropped most of the energy is absorbed into the floor instead of bouncing back up and injuring the athlete.



What Forces Are Involved?



# What Forces Are Involved?



# How Can Science Help?



An engineered floor is an incredible benefit to gymnasts. The floor is built with many springs underneath it. This does two things. First, when a gymnast lands, a lot of the energy goes into compressing the springs instead of stressing their bones and joints. Second, once the springs are compressed, they spring back with an opposite force. This allows a gymnast to jump much higher. A floor routine without these specially engineered floors would not be near as exciting or safe as they are now.

# What Forces Are Involved?





# What Forces Are Involved?



# How Can Science Help?

A shot put ball is designed to be heavy with very little elastic qualities to it. This allows the ball to mostly stay in place when it lands.

Shoes are designed to give the athlete maximum friction so that when they are pushing the ball forward all of the force is going forward and not into sliding their shoe backwards.

