# Tipping Over & Swinging Down

# Lowering the Center of Gravity

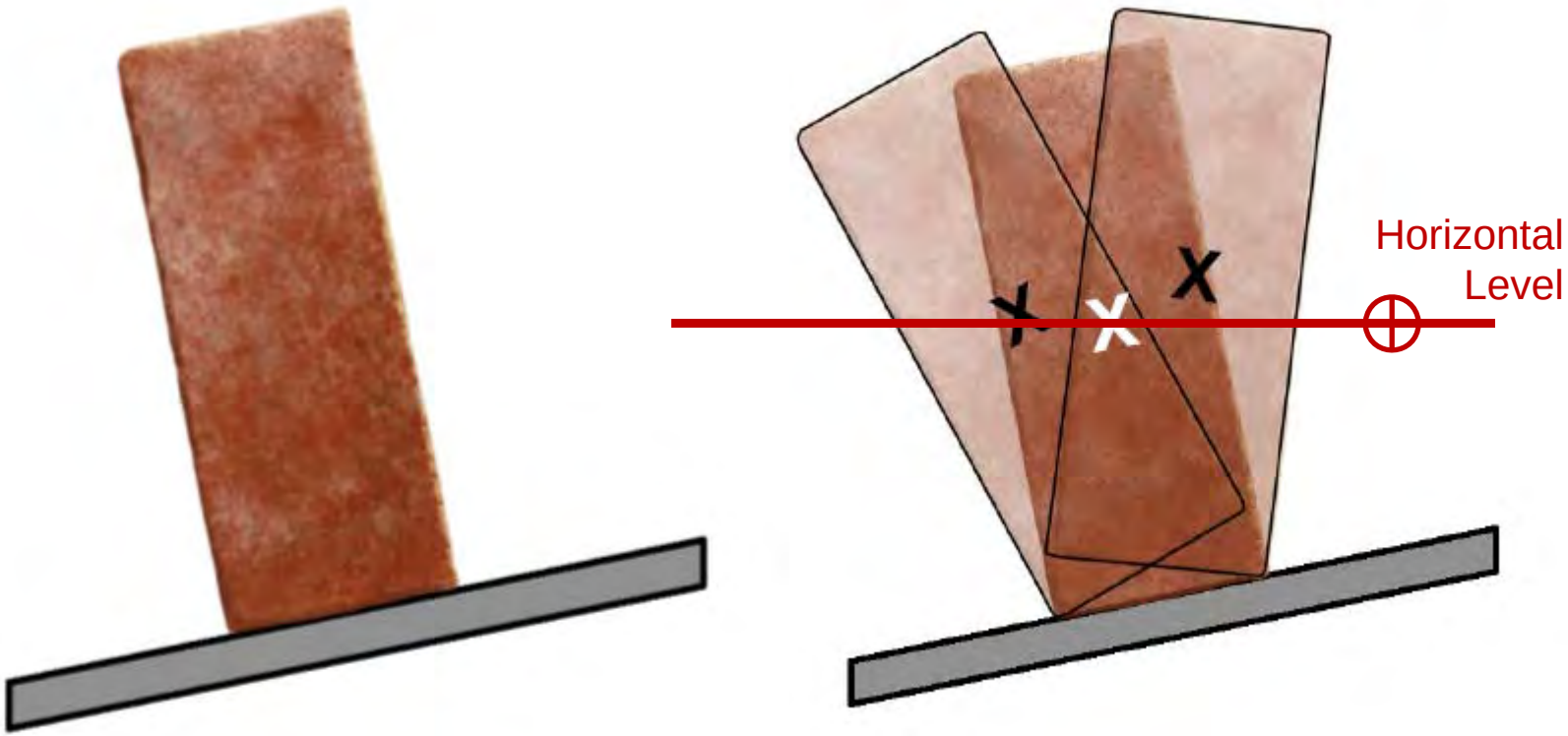
If nothing prevents a stationary object from lowering its center of gravity then it will do so.

Stepping off of a high tree branch, Tarzan swings downward on a vine.

The motion may continue past the lowest point, due to follow-through (inertia), but if he keeps swinging back and forth he'll eventually come to rest with the CG as low as possible (right under the point of suspension).

# Tipping & Center of Gravity

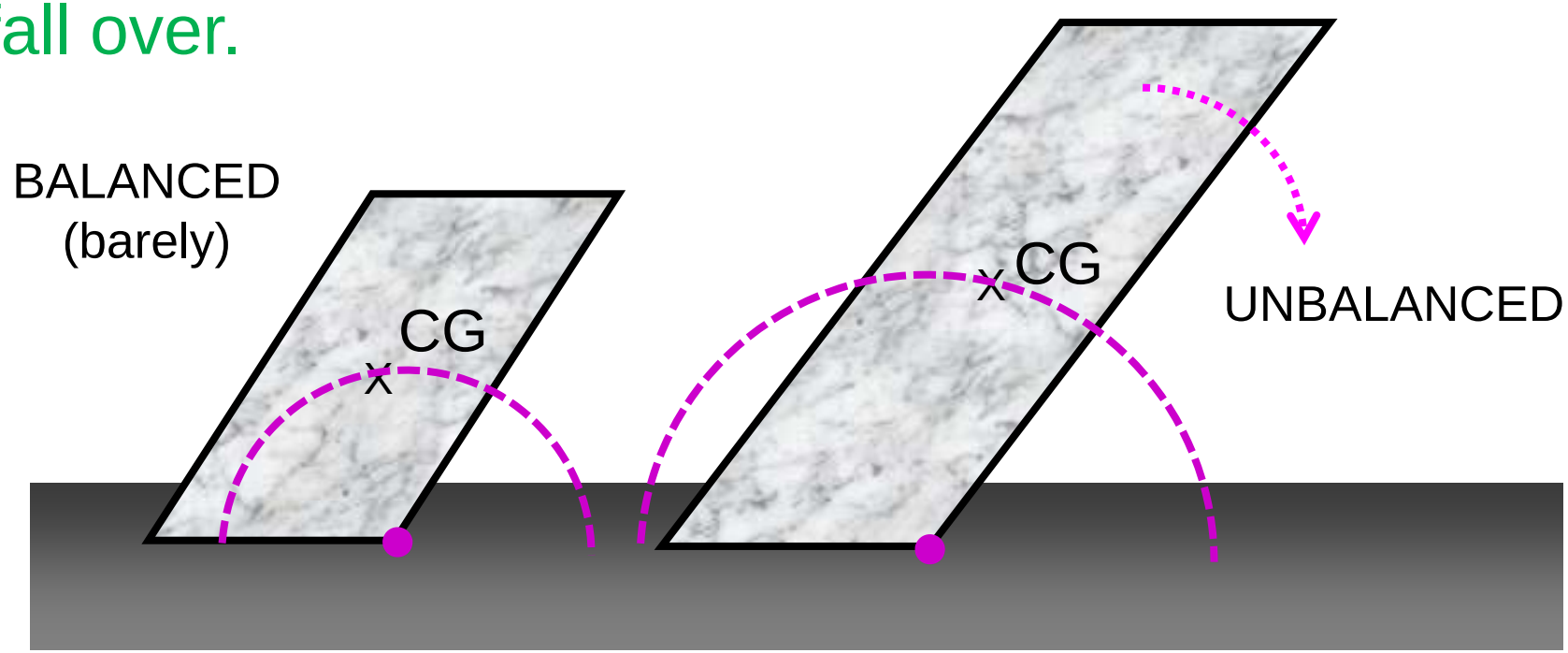
A brick sitting on a ramp does not tip over if the rotation would raise the center of gravity.



# Tipping & Center of Gravity

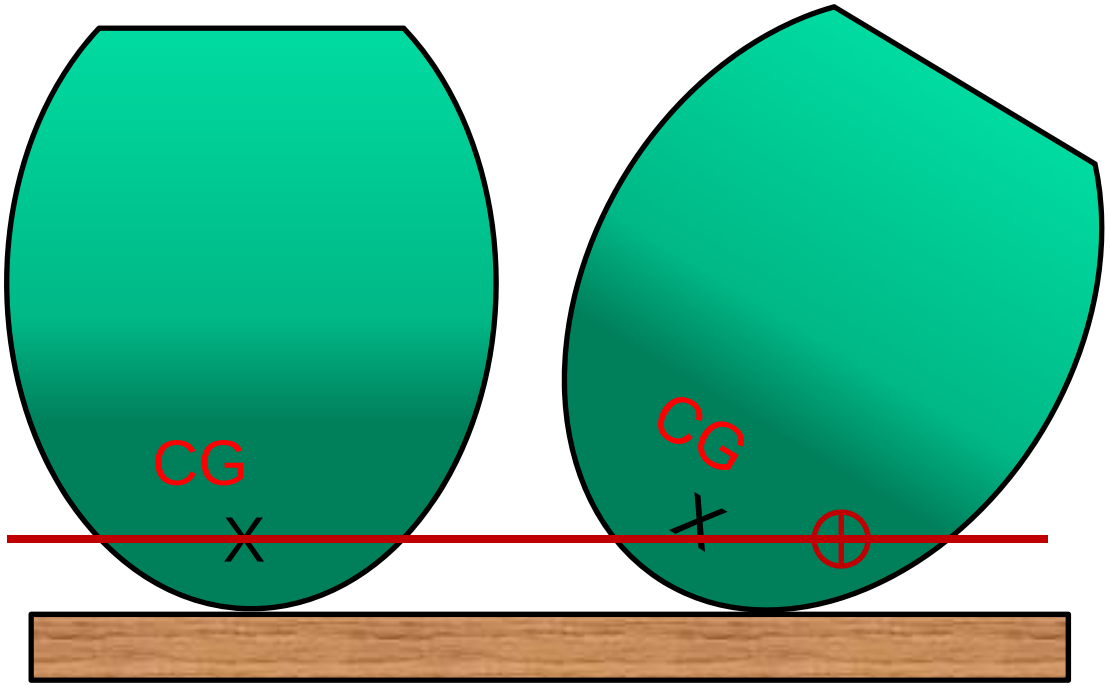
Tipping raises CG so this block doesn't fall over.

Tipping lowers CG so this block falls over.



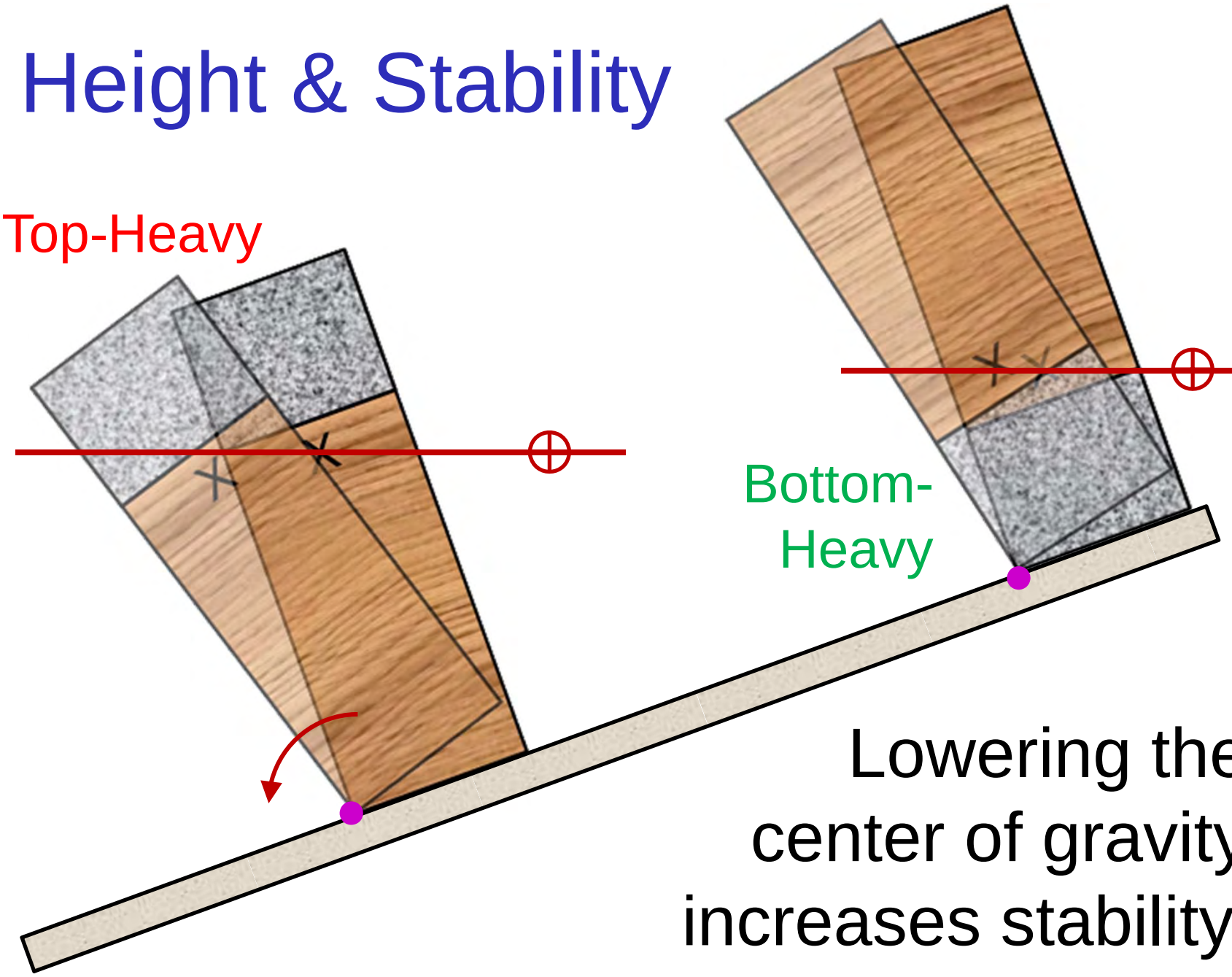
# Weebles

"Weebles wobble but they don't fall down" since their CG rises if they tip to the side.



# Weebles

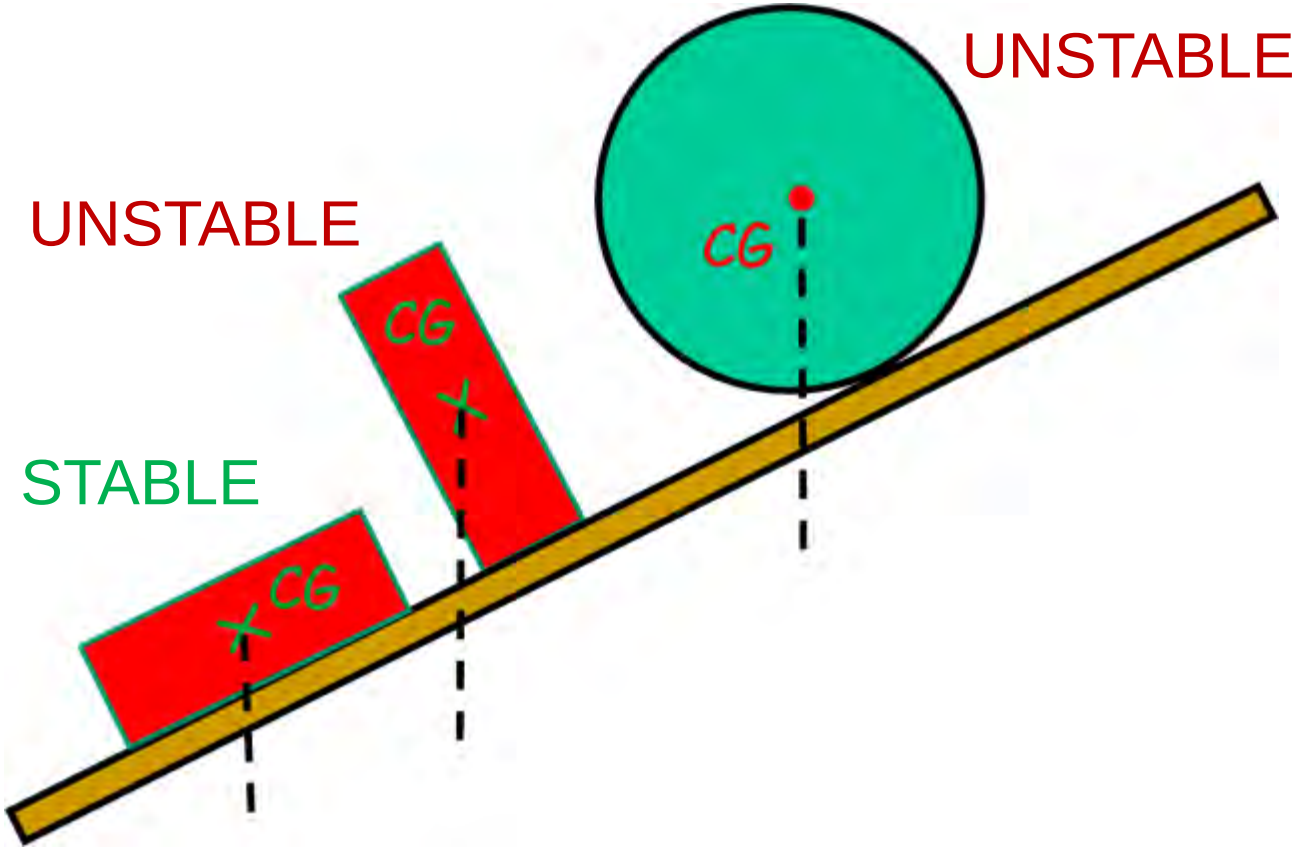
# Height & Stability




Lowering the center of gravity increases stability.

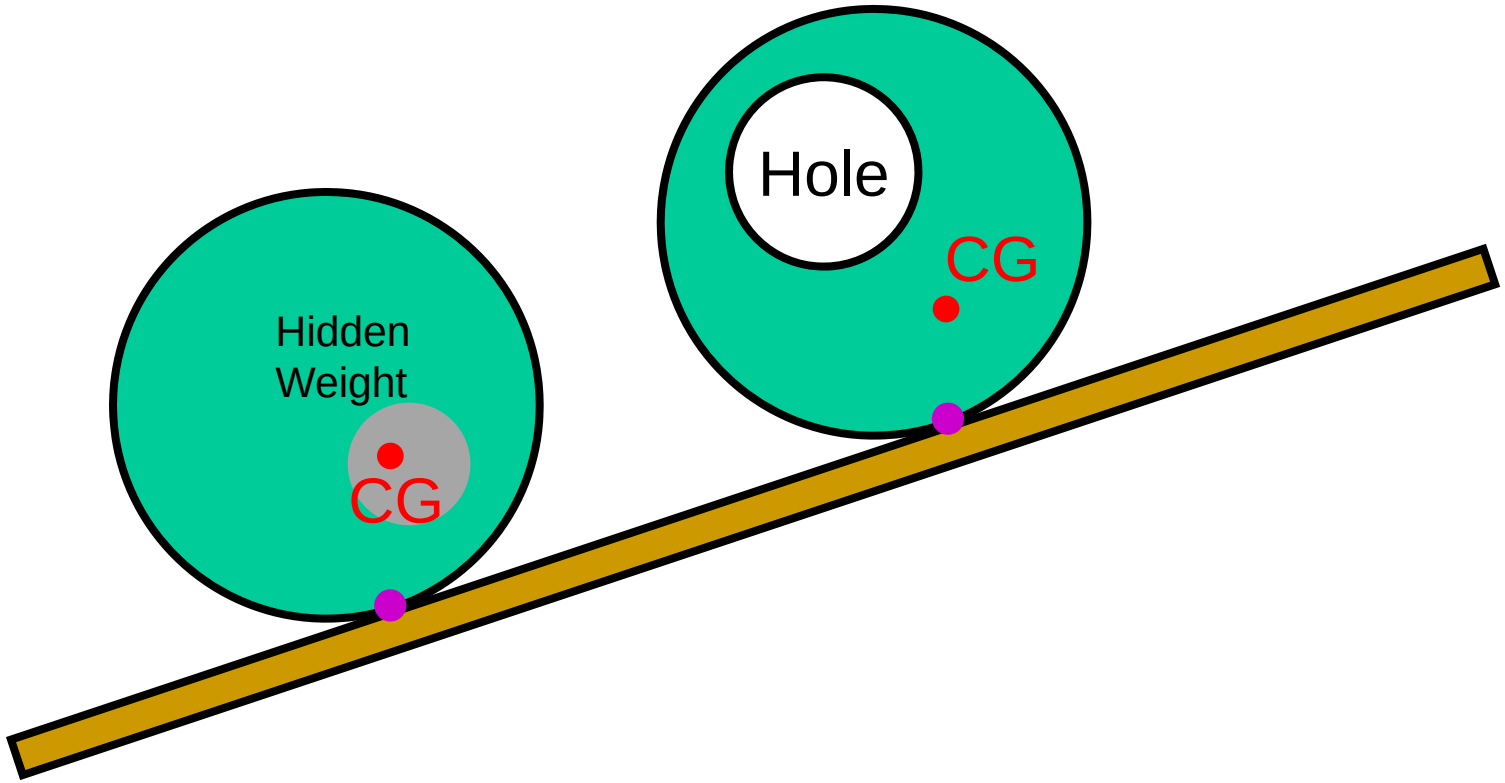
# Rolling Wheels

Wheels roll on a slope because they can always lower their center of gravity.



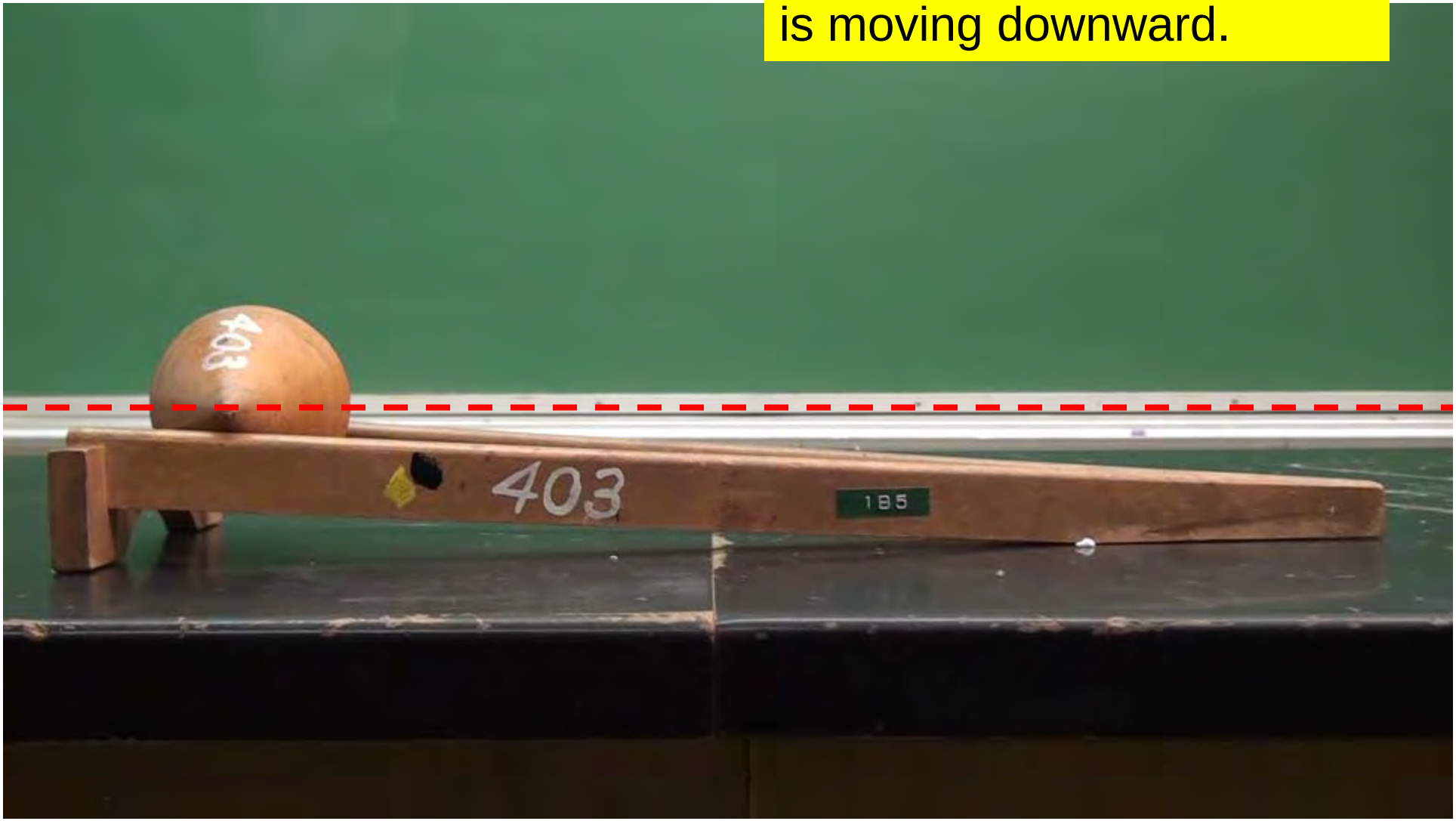
# Mystery Wheel

Wheel doesn't roll down hill. How is that possible?



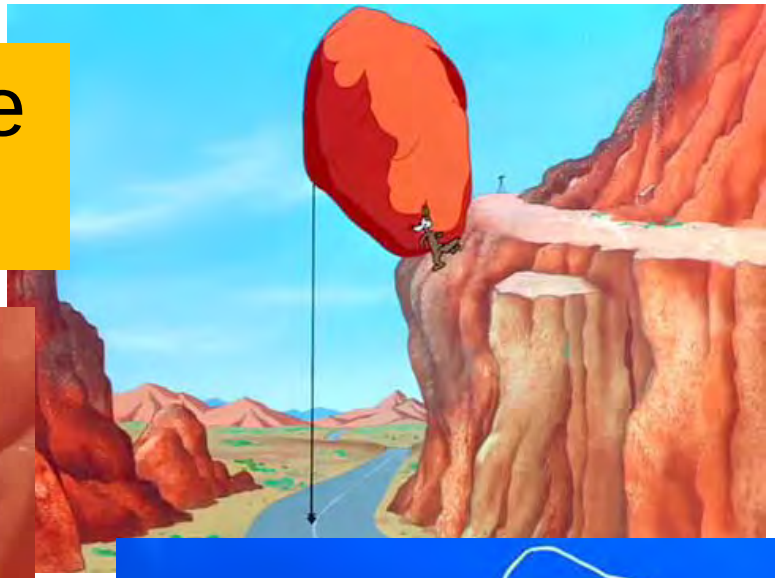
# Rolling Uphill?

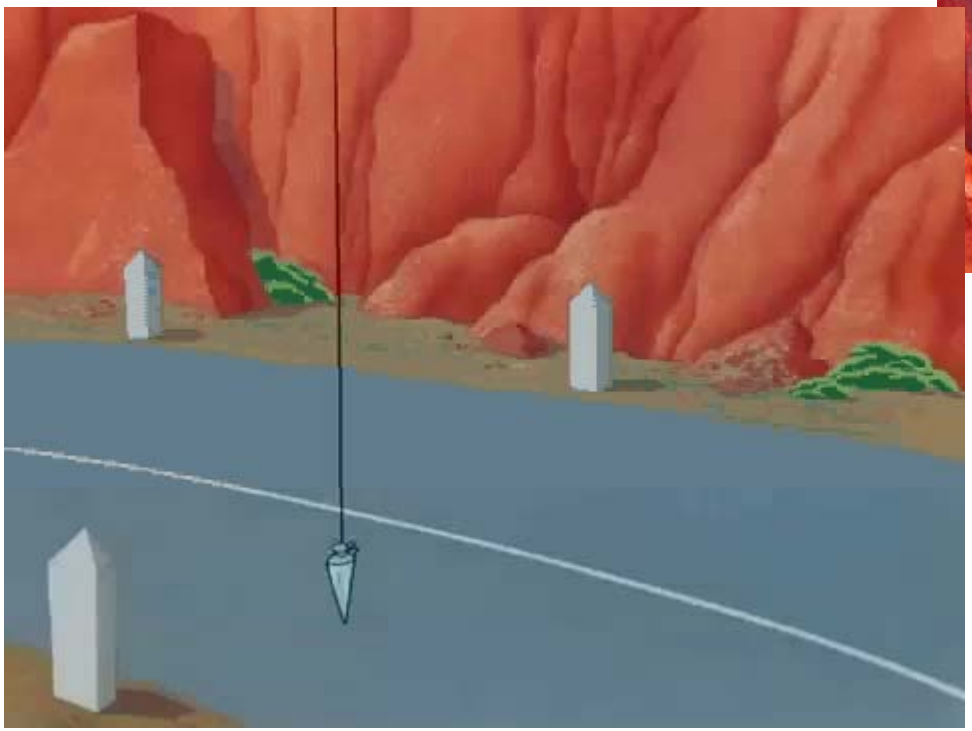
The double cone seems to be rolling uphill but in reality the center of gravity is moving downward.

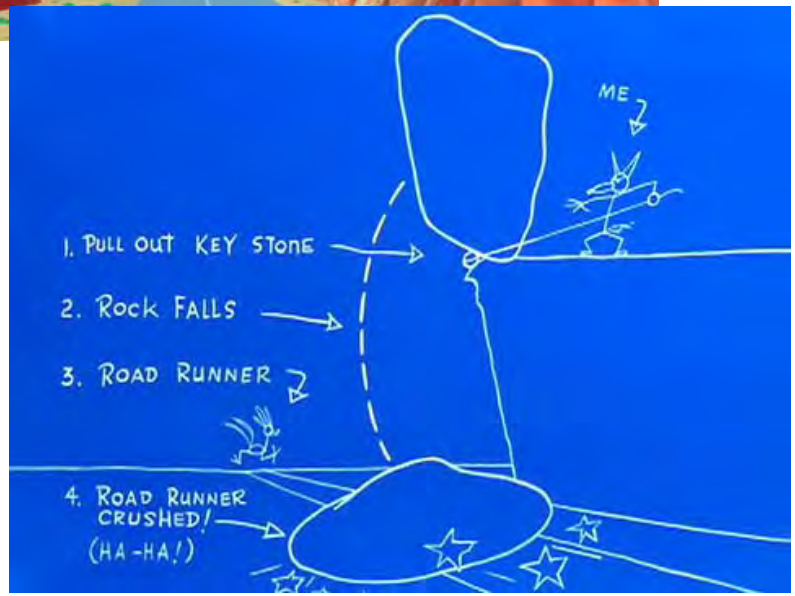


# Wile E. Coyote & Tipping

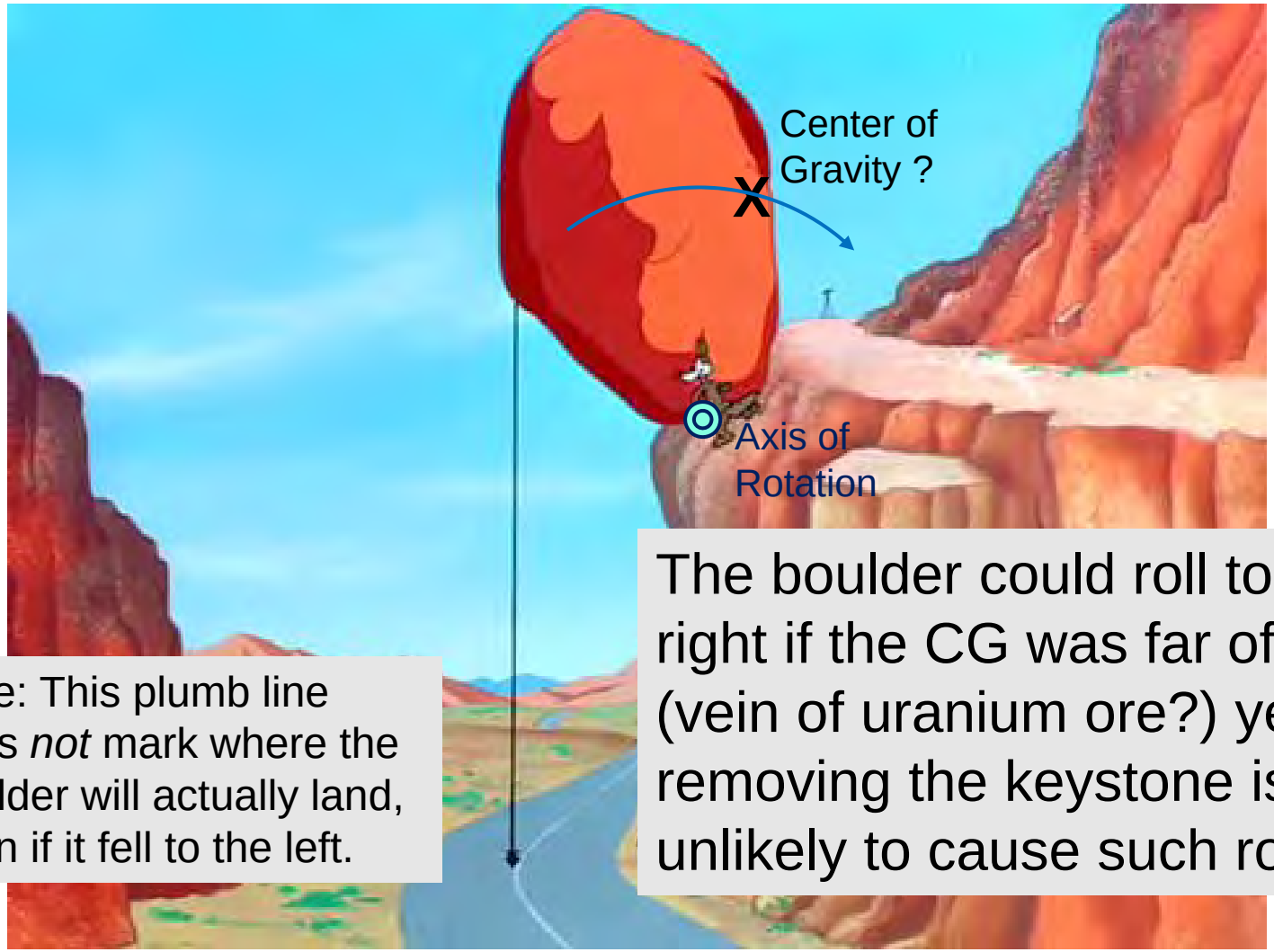
Another brilliant scheme by Wile E. Coyote…







# Wile E. Coyote & Tipping

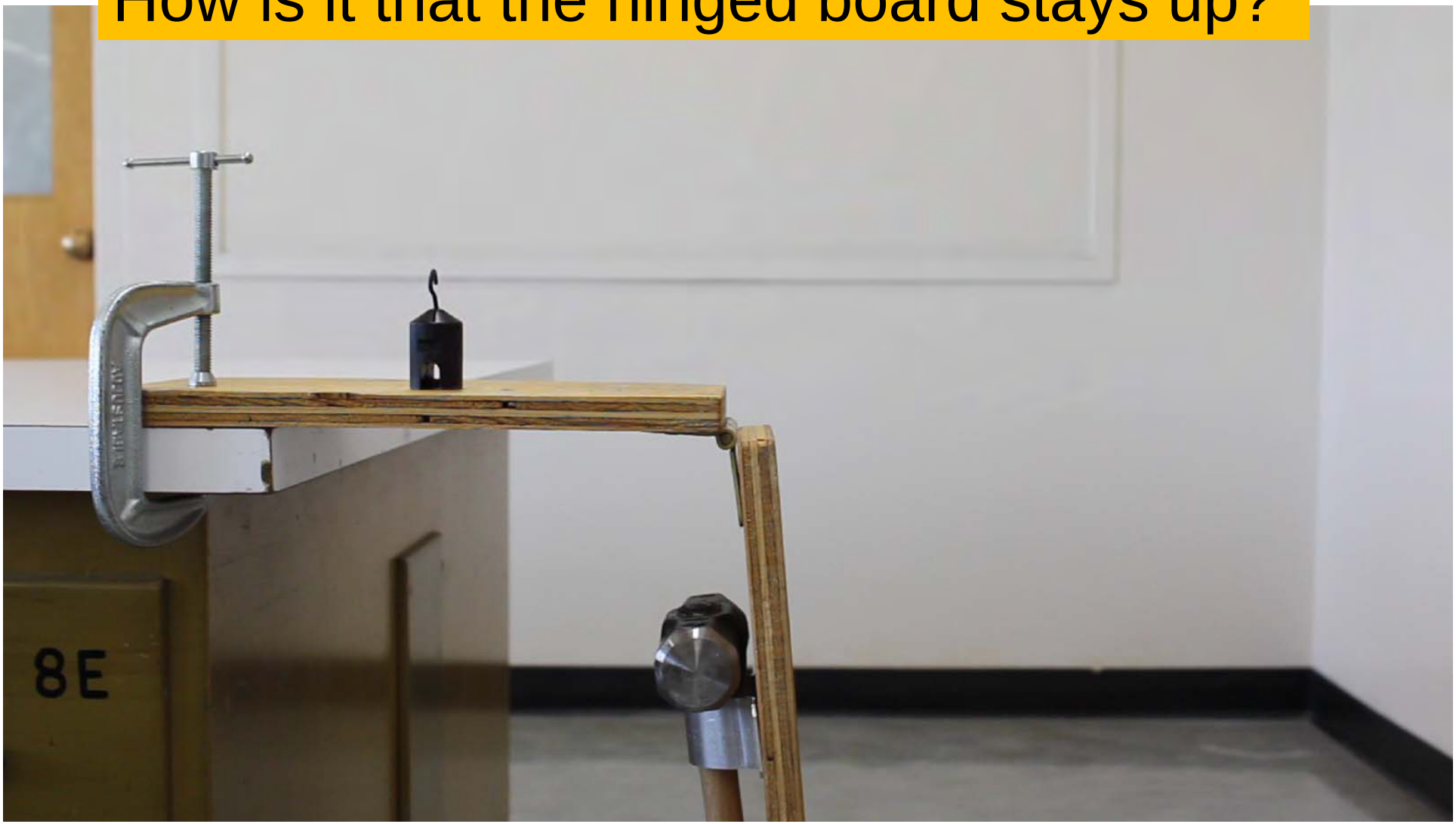



Note: This plumb line does *not* mark where the boulder will actually land, even if it fell to the left.

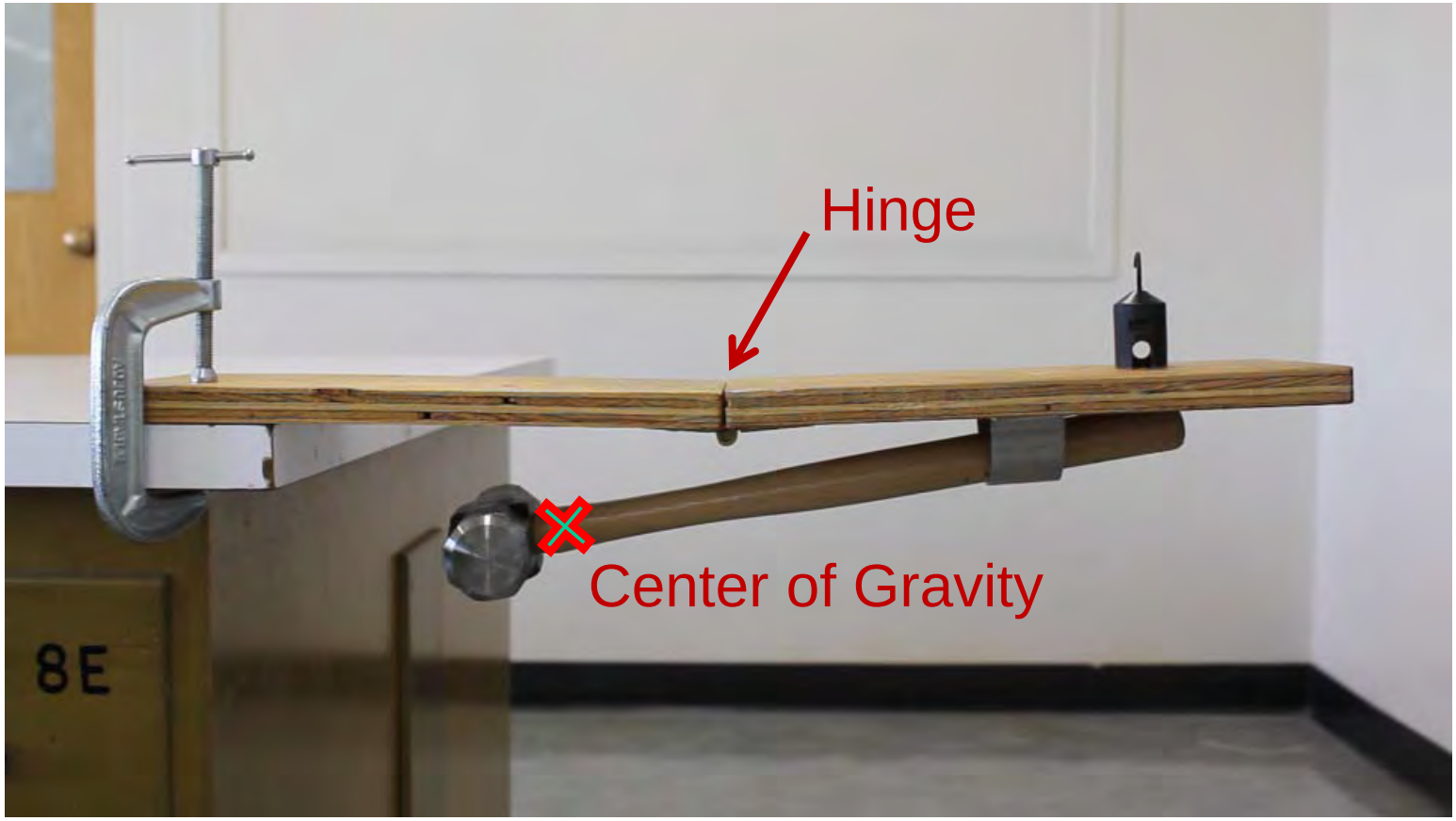
The boulder could roll to screen right if the CG was far off center (vein of uranium ore?) yet removing the keystone is unlikely to cause such rotation.

# Hammer & Hinge

How is it that the hinged board stays up?



# Hammer & Hinge




The center of gravity is located near the head of the hammer so the CG is lowest when the board is up.

# Summary

- If there's nothing to prevent an object (or a character) from lowering its center of gravity then it will fall downward.
- An object is in balance if tipping over would cause its center of gravity to go up.
- A lower center of gravity tends to increase an object's stability for balance.