Physics in Movies

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with Jamie Guillot (LPSB), Kermit Gauthreaux (IPSB),
and countless students (Bethany Richoux, Jenna Hall, Jackie Ponville, …)

- Why use movies in the classroom?
- What prevents it?

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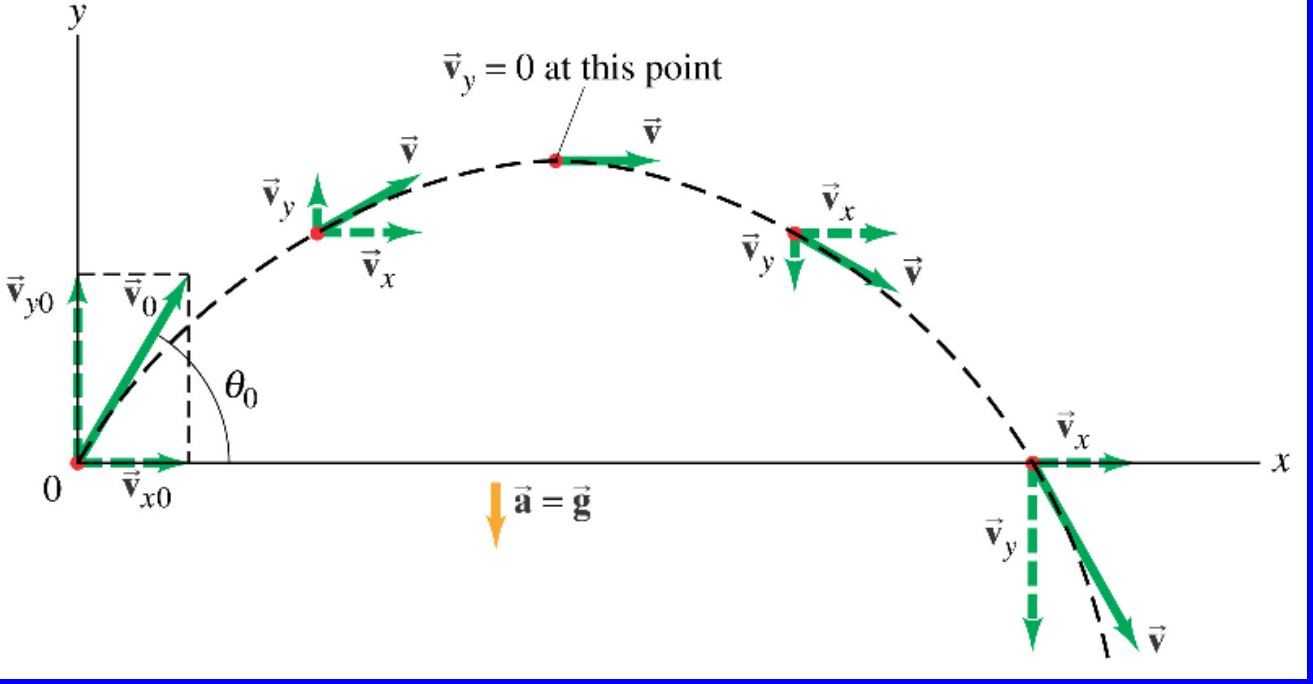
Projectile Motion in ***Gone in 60 Seconds***

Memphis Raines is fleeing the police and decides to jump a ramp in his stolen Mustang GT500.

All the necessary information for a typical projectile motion problem are contained in a short, 1 minute clip.



Gone in 60 Seconds

Assume 45° for maximum range

$$\theta = 45^\circ$$

$$v_o = 100 mi/hr = 45 m/s$$

Speed is given in clip just before jump

$$t_{1/2} = \frac{v_{y,top} - v_{y,0}}{g} = 3.2 s$$

Time for ½ of trajectory

$$x = v_x t = 200 m$$

Compare the range and time to the clip

How much did you like this clip?

☺☺ a) A whole lot

☺ b) A little bit

😐 c) Ehh, I didn't *not* like it

☹ d) Not really that much

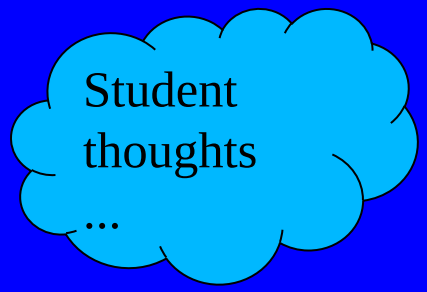
☹☹ e) I really hated it

Is this really useful?

Improves class engagement/attention:

They were effective, makes class more interesting.

They are the bomb.



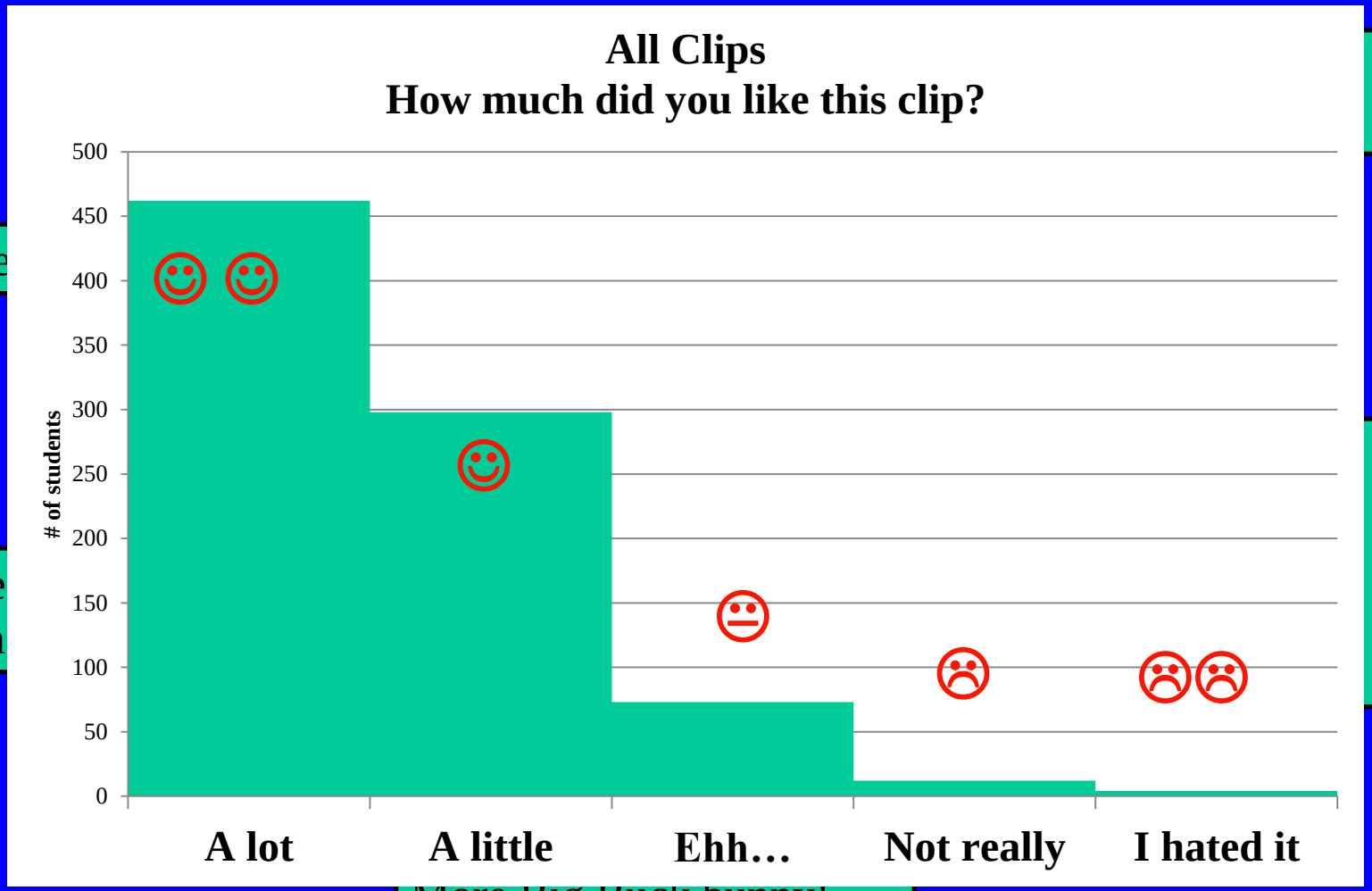
The movie clips were not only effective, but also gave a reprieve from monotonous math problems.

Effective, keeps me from daydreaming.

More Big Buck bunny!

Is this really useful?

Improves class engagement/attention:



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More Big Buck bunny!

Freefall in
Big Buck Bunny

Big Buck Bunny is one of a new class of open source movies created by the Peach Open Movie project.

In this clip, there are 2 different freefall problems.

Freefall in *Big Buck Bunny*

Here, the peach falls in slow motion. Estimate the height. If y=20 m…

$$y = y_o + v_o t + \tfrac{1}{2} a t^2$$

$$t = \sqrt{\frac{-20m}{\frac{1}{2}(-9.8\frac{m}{s^2})}} = 2\ s$$

Then, the peach's speed at impact is…

$$v = v_o + at$$

$$v = 0\frac{m}{s} + (-9.8\frac{m}{s^2})(2s)$$

$$v = -20\frac{m}{s}$$

Here, the movie appears to not be in slow motion, so we can measure the freefall time (~ 4s).

$$y = y_o + v_o t + \tfrac{1}{2} a t^2$$

$$y = 0m + 0\frac{m}{s}(4s) + \tfrac{1}{2}(-9.8\frac{m}{s^2})(4s)^2$$

$$y = -80\ m$$

Then, the squirrel's speed at impact is…

$$v = v_o + at$$

$$v = 0\frac{m}{s} + (-9.8\frac{m}{s^2})(4s)$$

$$v = -40\frac{m}{s}$$

How much did this clip increase your understanding of the topic?

☺☺ a) A whole lot
☺ b) A little bit
😐 c) Ehh, it didn't make me stupid
☹ d) Not really that much
☹☹ e) Iknow less now than before

Is this really useful?

Does it increase the student's understanding?

They did help to visually see examples of the material we were learning.

Helps relate what we learn on paper to real life. Very effective!

Student thoughts

The movie clips help to understand the different concepts we are learning. I enjoy them.

I really enjoyed them-they gave examples of real app. of physics not just numbers on paper

The movie clips were entertaining and effective. They helped me to remember concepts.

Is this really useful?

Does it increase the student's understanding?

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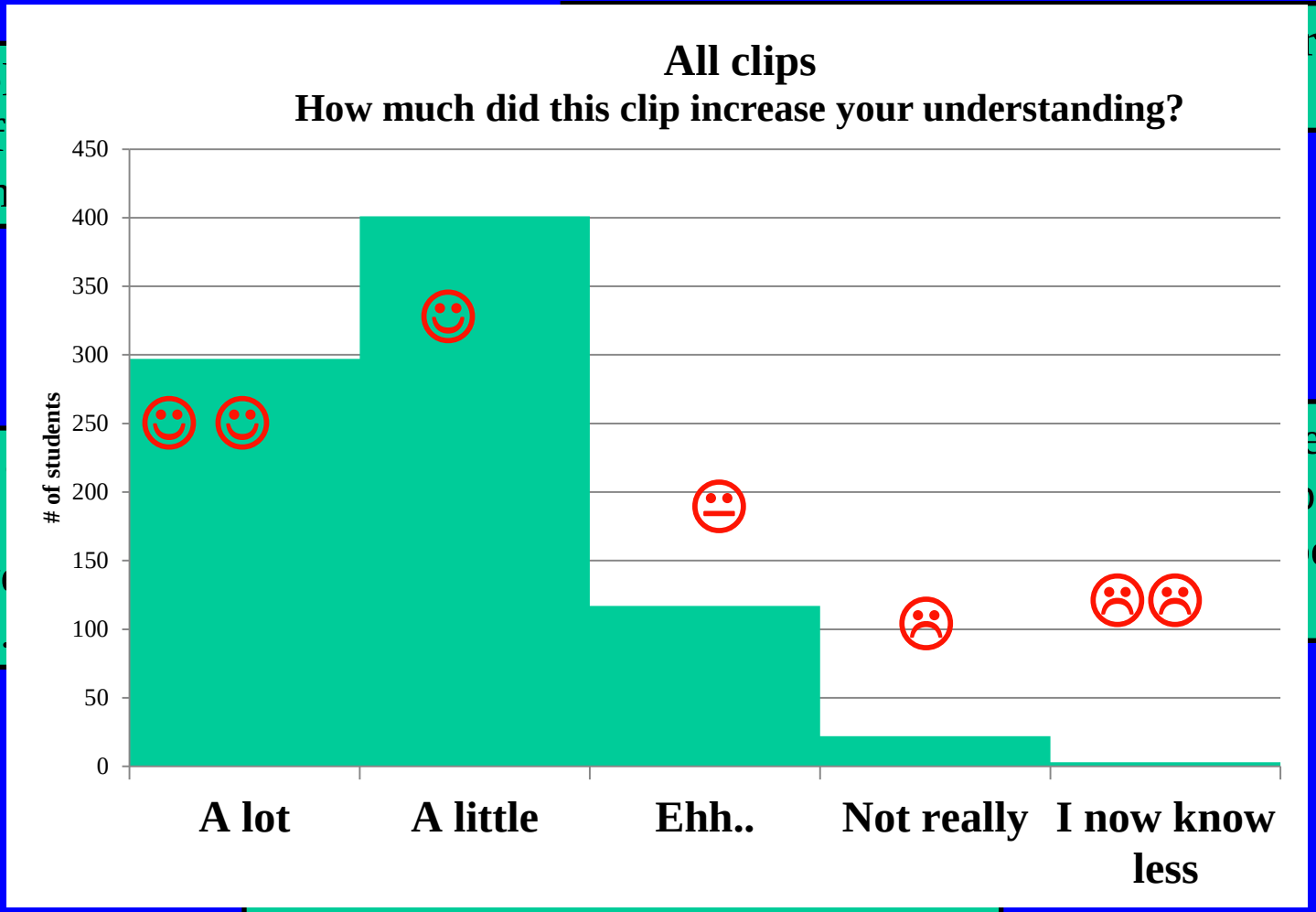
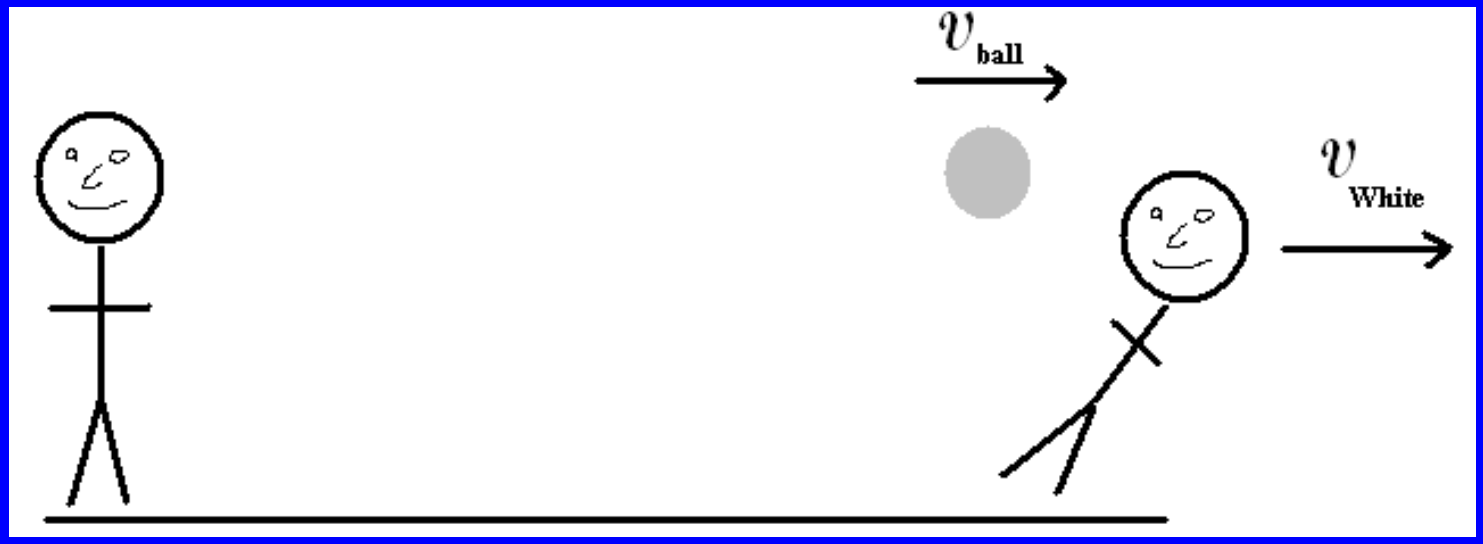


Conservation of Momentum in ***Dodgeball***

Peter La Fleur and White Goodman are facing off in this dodgeball match.

What was the velocity of Peter's dodge ball?



$$P_o = P_f$$

$$m_{ball} v_{o,ball} = m_{White} v_{f,White}$$

$$m_{ball} \approx 0.5kg$$

$$m_{White} \approx 80kg$$

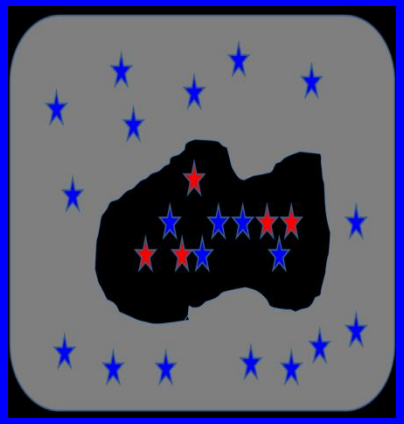
$$v_{f,White} \approx 2m/s$$

Assume masses and estimate White's final speed

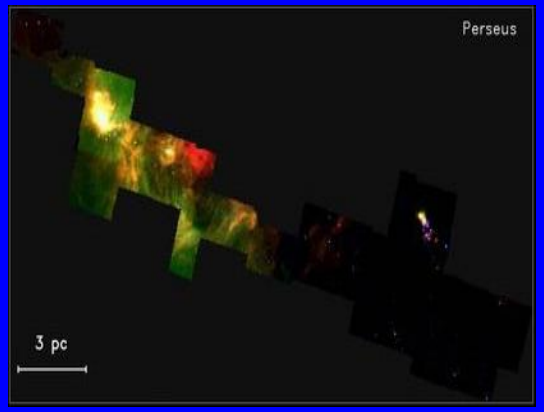
Muzzle velocity of a typical handgun

$$v_{ball} = 320m/s$$

Future Plans



- Distances to star-forming cores.
- Perseus with Kaisa
- Education



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Future Plans (& Dreams)

- Distances to star-forming cores.
- Perseus with Kaisa
- Education
- Attending seminary…bivocational pastor?
- Ride cross-country
- RV roadtrip

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