PENNSTATE

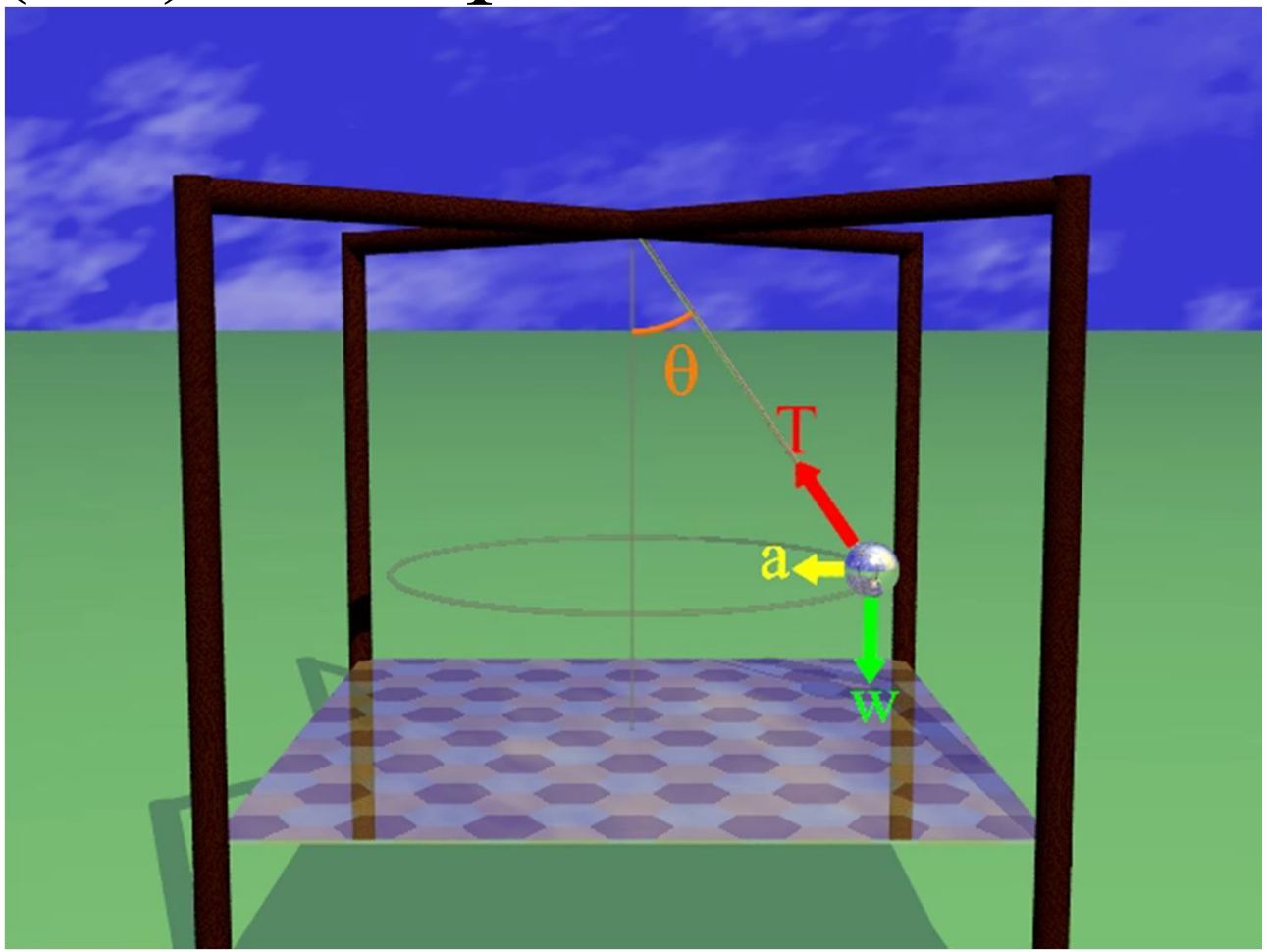
Penn State Schuylkill

A CAMPUS OF THE PENNSYLVANIA STATE UNIVERSITY

Animations for Introductory Physics and Astronomy

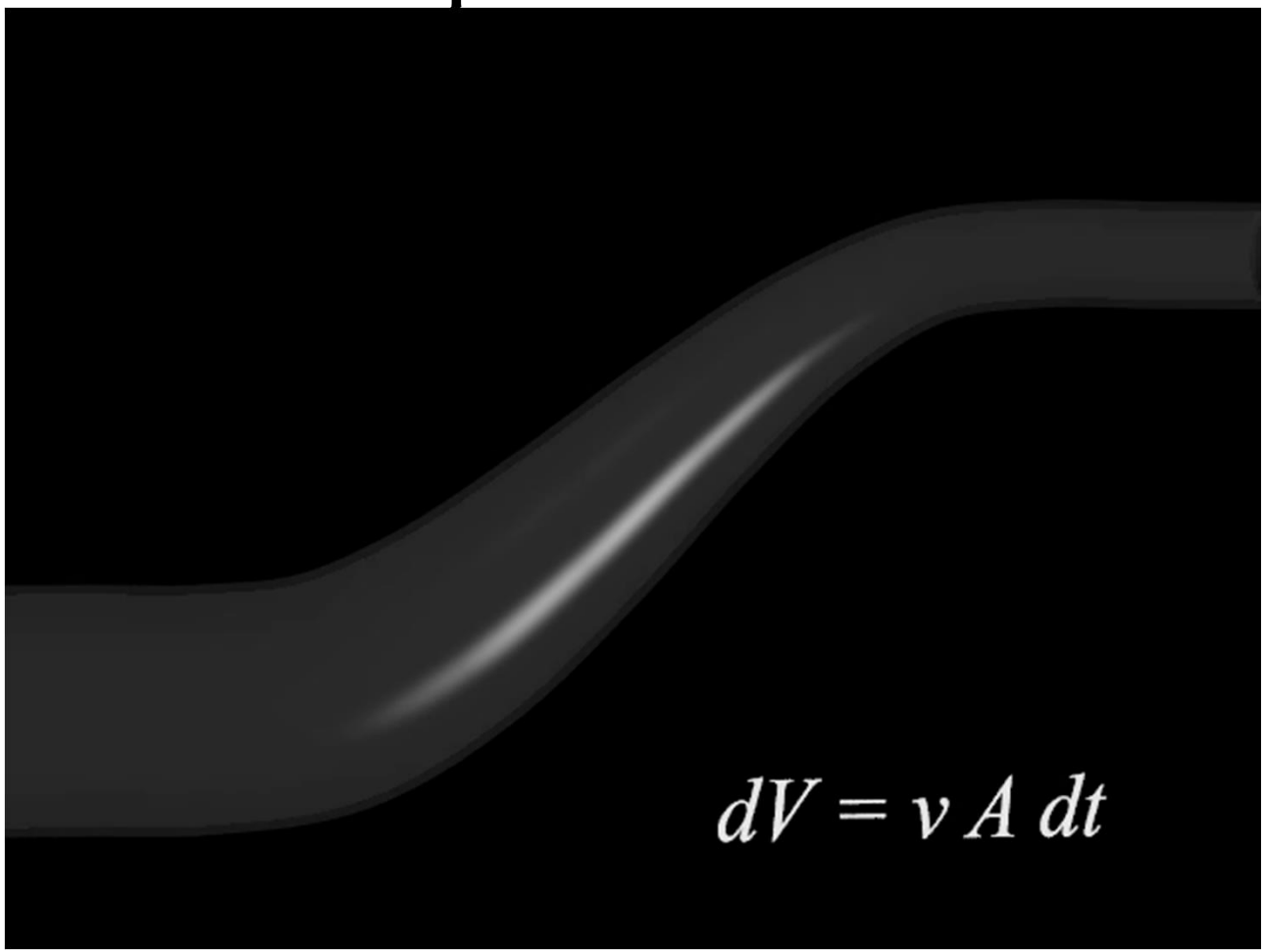
The Animations for Introductory Physics and Astronomy project at Penn State Schuylkill was initiated to help students visualize aspects of 3-dimensional situations where traditional static drawings were seen as inadequate. The animations have been used to portray a wide variety of dynamical systems and processes for physics and astronomy topics typically presented in the advanced high school through introductory college level. Additional applications of the animation technology will be presented, including using more extensive animations for semester mini-themes and "What's wrong" tasks using artificial video for video analysis. In addition, dissemination of the animations through the project web server at http://phys23p.sl.psu.edu/phys_anim/Phys_anim.htm and through the project YouTube channel at http://www.youtube.com/mrg3 will be discussed.

An (old) Example: Conical Pendulum

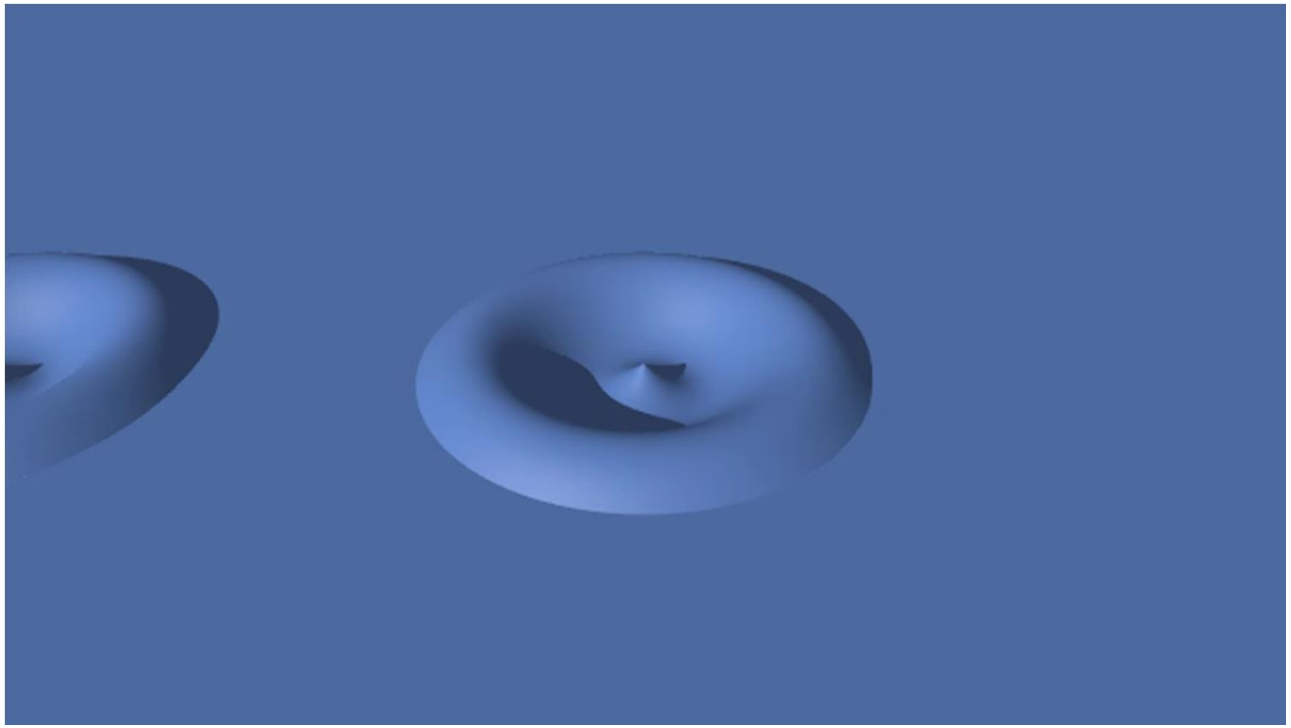


A 3-D dynamic situation sometimes mis-translated into 2-d static interpretation.

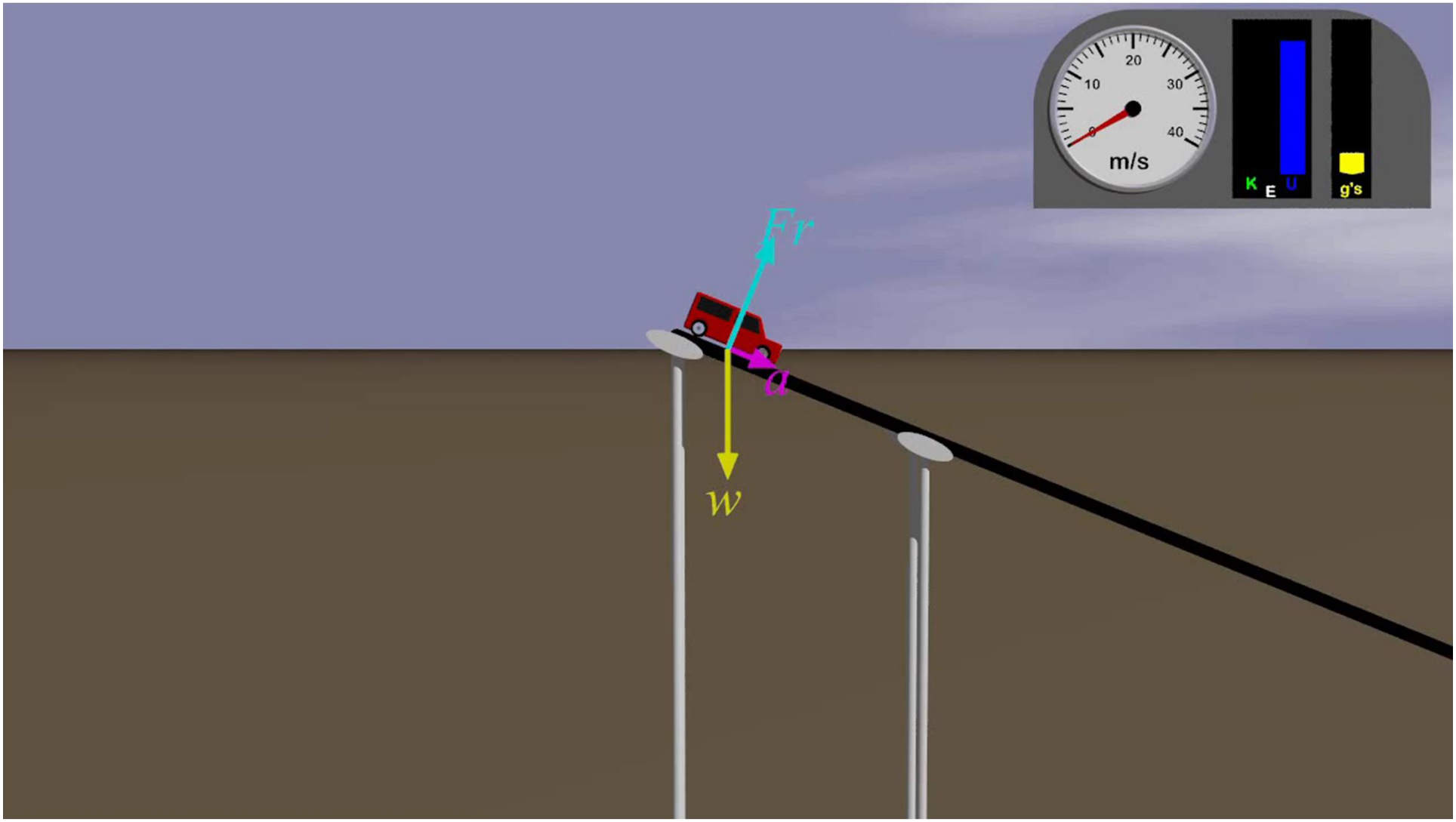
Incompressible Flow



Two Source Interference



Looping Physics

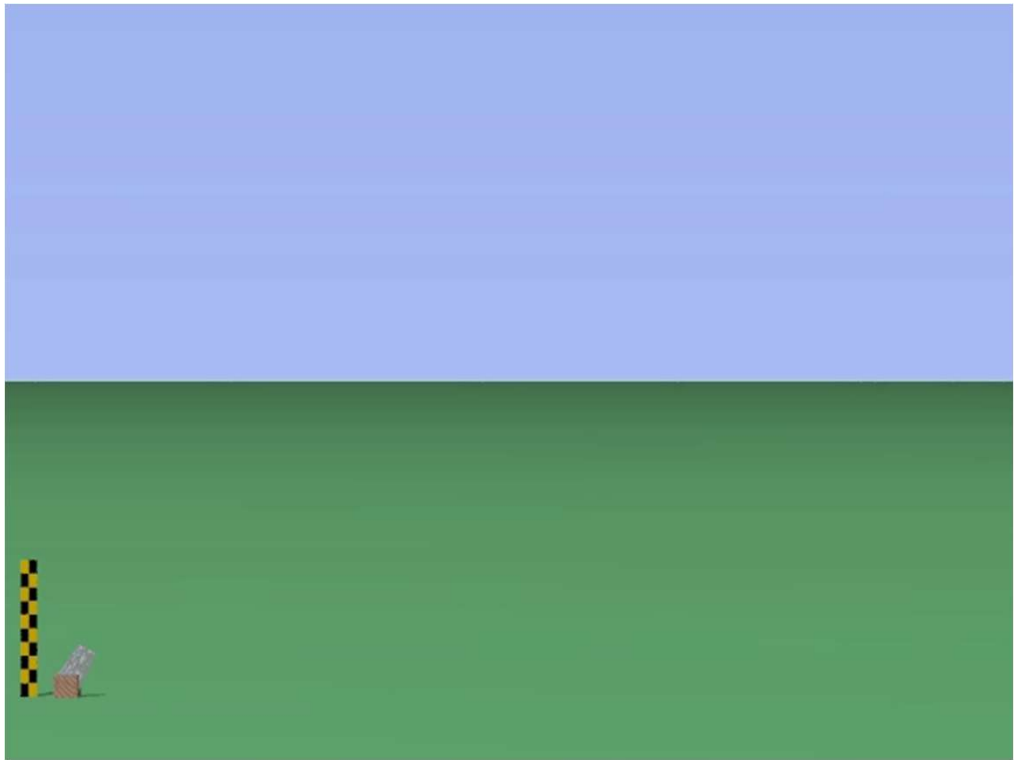


Using The Looping Physics Animation

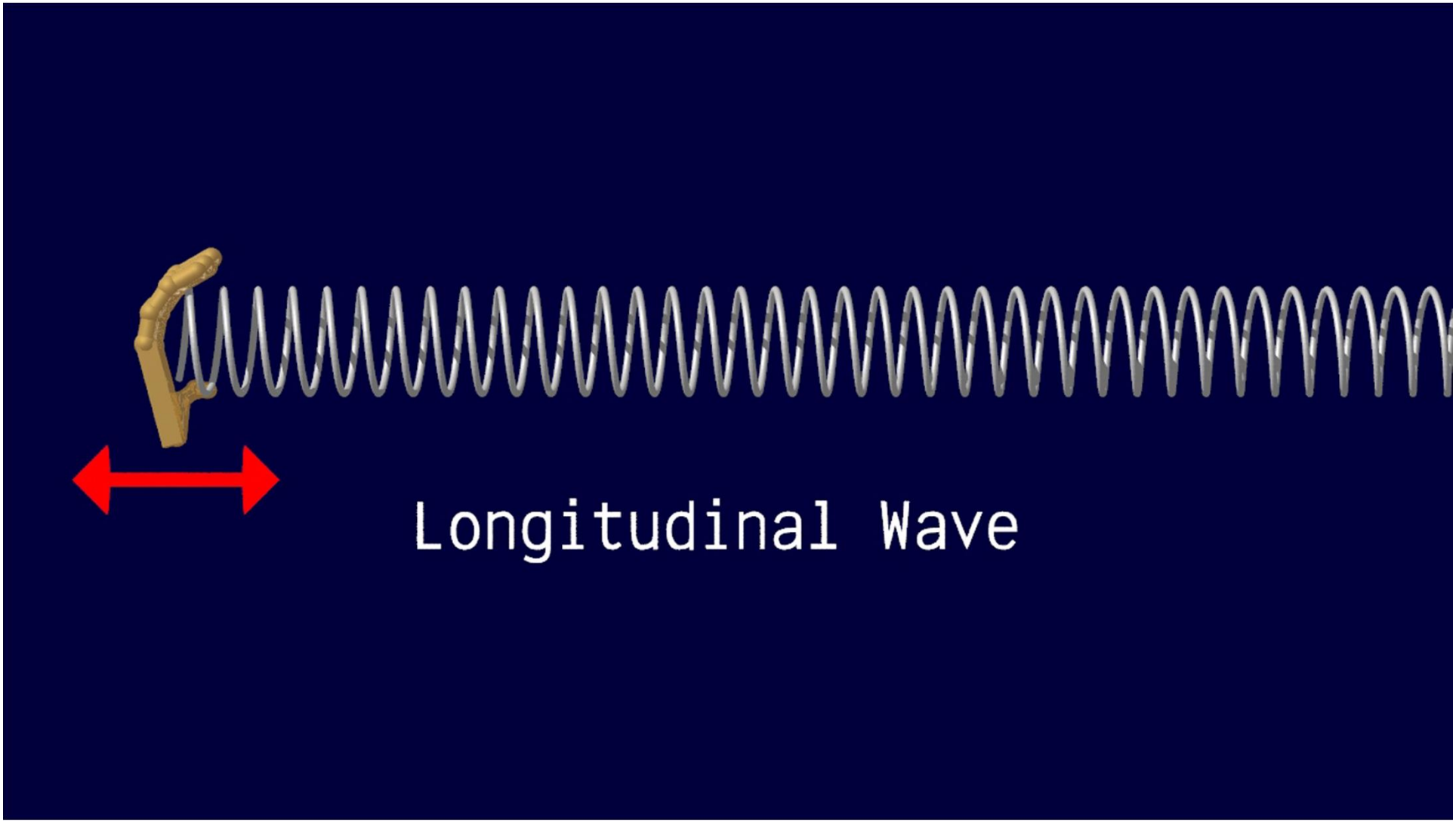
- Full Animation
  - 3 Minutes
  - Constant Speed, Failing at Constant Speed, Coasting, and Coasting Through Non-Circular
  - Some Physical Parameters Specified
  - Mini-Theme for Mechanics
    - Forces, Speed & Energy, Power Requirements, Impulse
      - "Can your car do this?"

Other Artificial Video Tasks

- Artificial Millikan Oil Drop for video analysis
  - Now, with fractional charges!
- "What's Wrong with This Picture"
  - Free fall
  - projectiles



Most Popular Video of Past Year (YouTube)



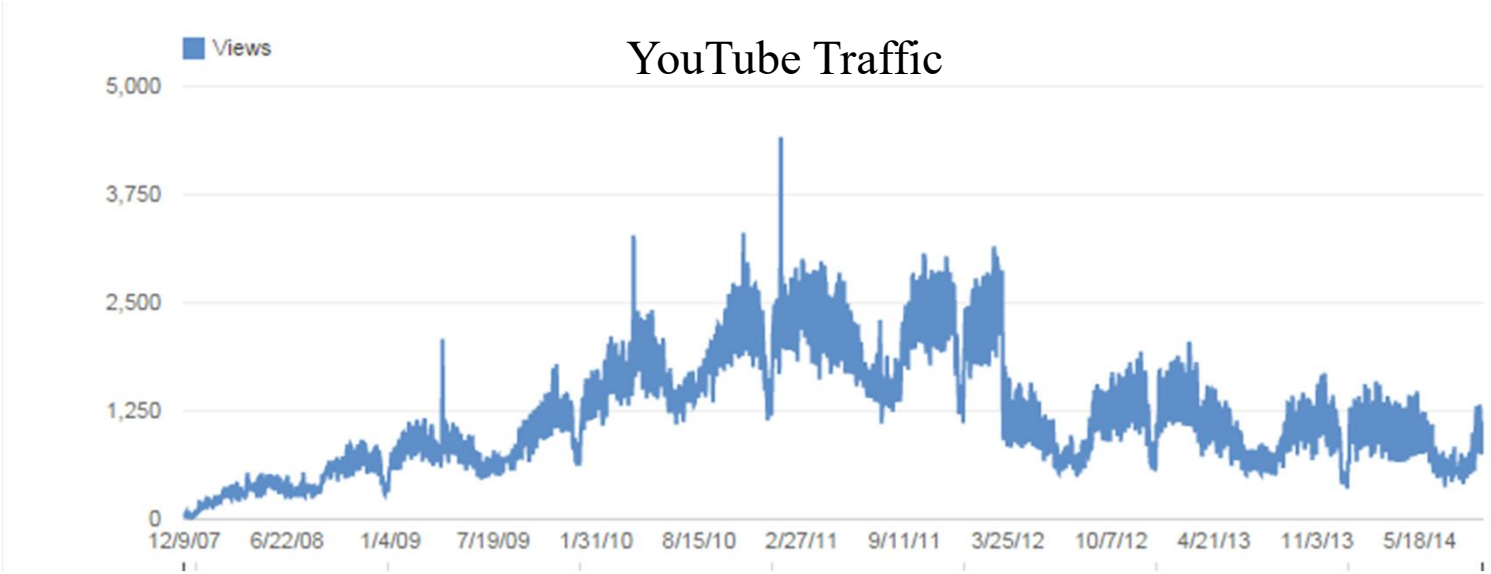
Some Reactions to Transvers/Longitudinal Wave Video

- OMG 25 SECONDS OF PURE GOODNESS I HAVE BEEN LOOKING FOR THIS FOREVER
- how on earth did this get dislikes?
- Finally! A video that simply explains how it works
- To the point~ most productive 25 secs of my life! (All these other online tutors need to start doing this!)
- Took me so long to find a video that was clear and made sense. Thanks!
- Very simple but helpful!

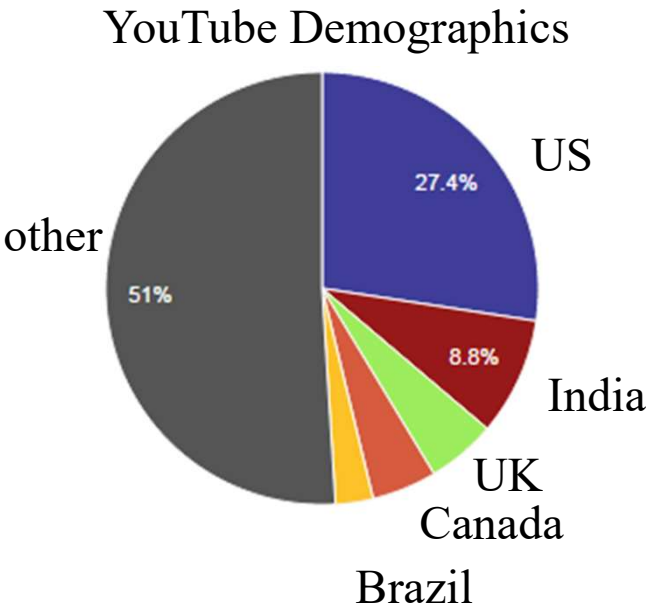
Related (older transverse/longitudinal wave videos):

- I added my own sound effects cause I found the silence awkward...
- I learned a 1-hour discussion in just 12 seconds. yey!
- who needs those useless 1 hour MIT lectures for waves when you got this, sriously!
- this 6 second video would have saved 3 physics classes..
- This 6 second video did a better job of explaining than my prof did in 2 hours...

Impact



- YouTube
  - Over 3 Million video views channel wide
- Project Server
  - Almost 2 Million views on project server since July 2006
  - Static Catalog & CWIS portal

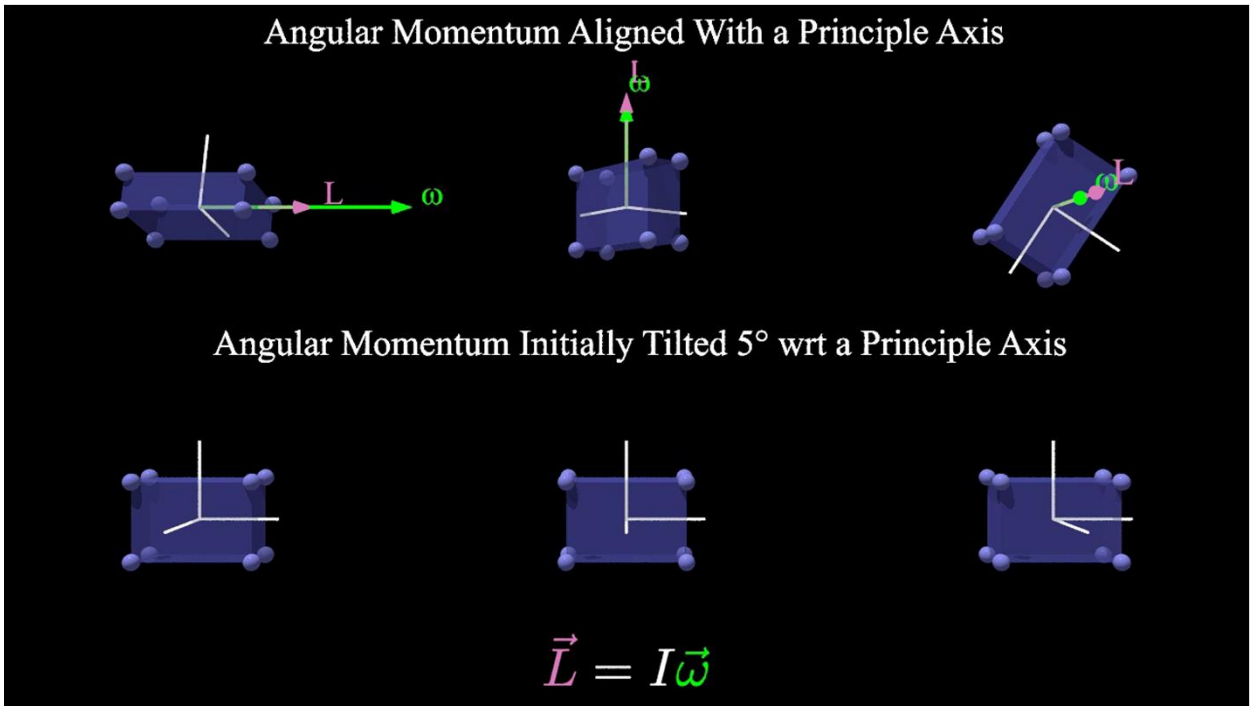


Most Popular Videos (YouTube)

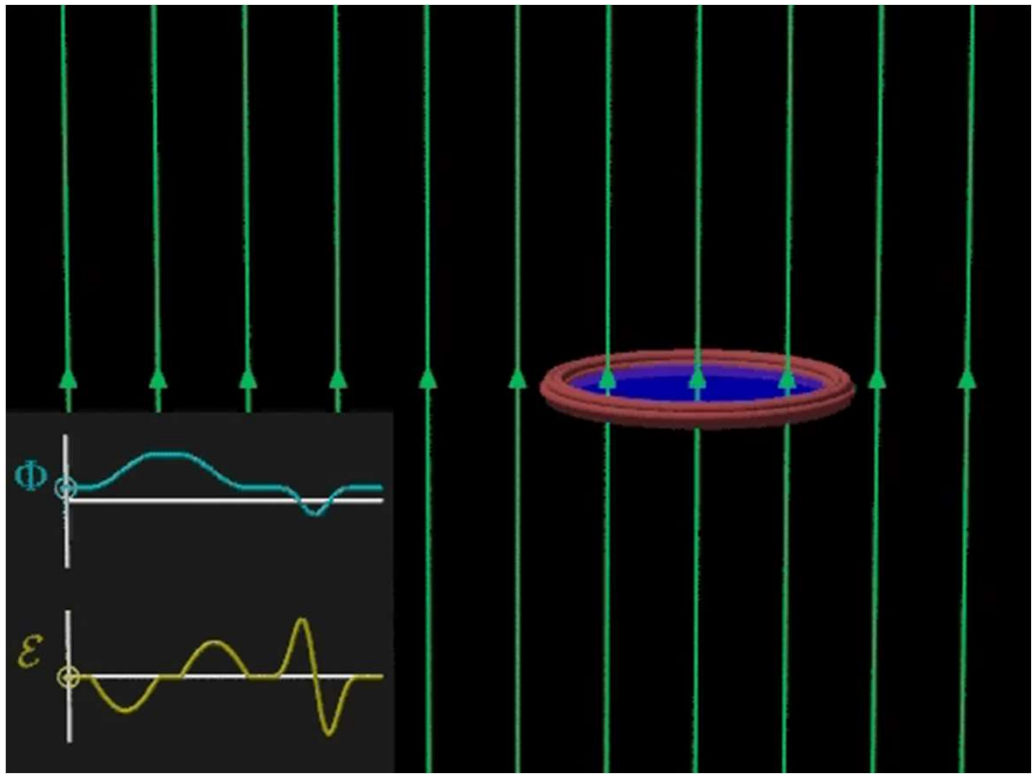
Video views (lifetime)	Views
Transverse and Longitudinal Waves	226,117 (7.4%)
Lenz's Law	195,333 (6.4%)
3 phase rectifying circuit	175,632 (5.7%)
Direct Current versus Alternating Current	170,852 (5.6%)
Wave Interference	166,597 (5.4%)
Full Wave Rectification with a Diode Bridge	155,258 (5.1%)
Creating a Longitudinal Wave	113,104 (3.7%)
Creating a Transverse Wave	96,626 (3.1%)
Creating Standing Waves	80,918 (2.6%)
The Right Hand Rule and the Magnetic Fie with a Current Loop	75,882 (2.5%)

Video views (last 365 days)	Views
Longitudinal and Transverse Waves	33,377 (9.4%)
Creating a Longitudinal Wave	28,434 (8.0%)
Transverse and Longitudinal Waves	26,853 (7.5%)
Creating a Transverse Wave	21,493 (6.0%)
Lenz's Law	15,228 (4.3%)
Direct Current versus Alternating Current	14,004 (3.9%)
Creating Standing Waves	13,630 (3.8%)
x ray interactions	12,167 (3.4%)
Cavendish Experiment	10,283 (2.9%)
3 Phase Rectifying Circuit (HD)	8,923 (2.5%)
Wave Interference	8,202 (2.3%)
Full Wave Rectification with a Diode Bridge	7,711 (2.2%)

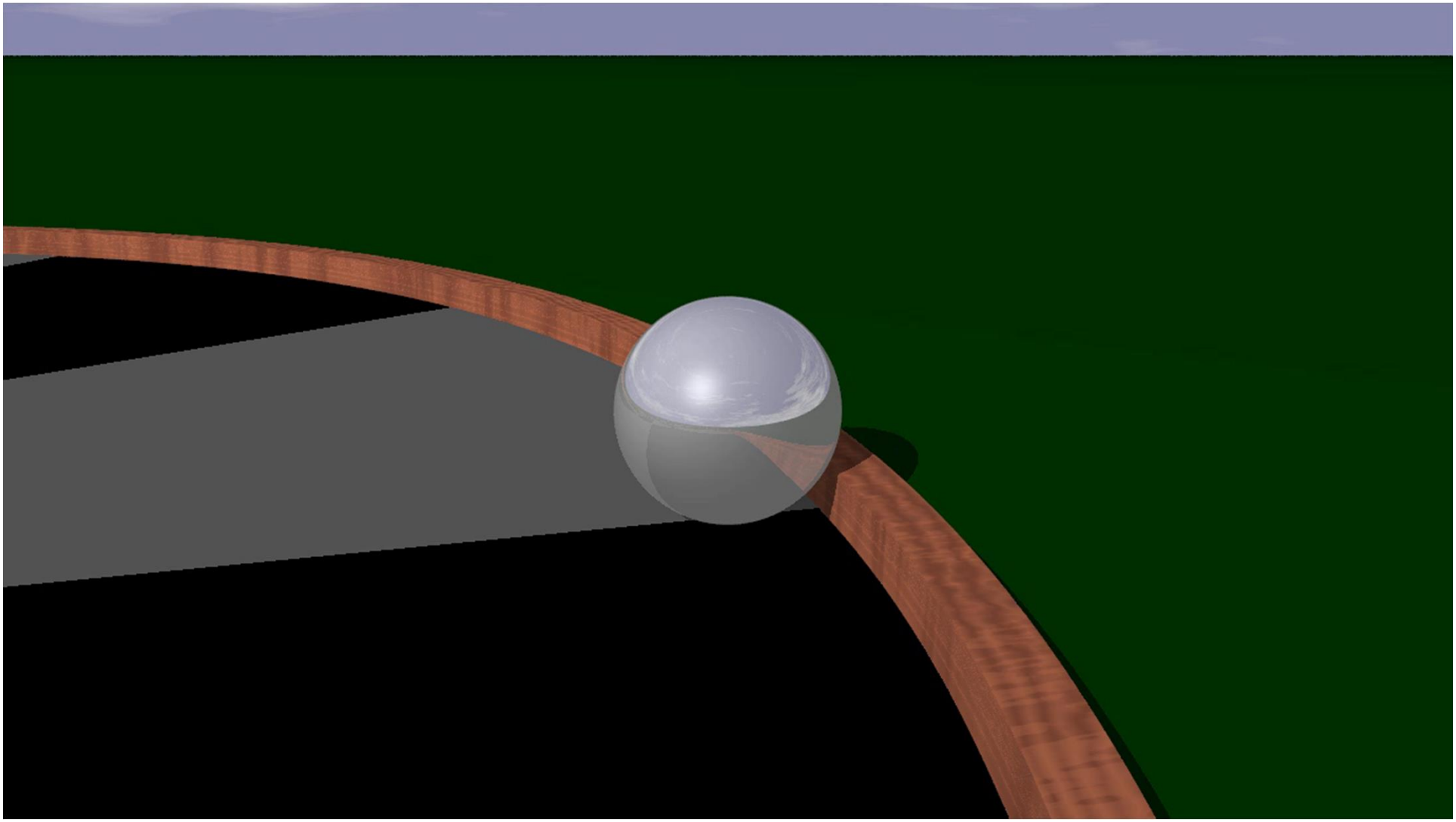
- Creative Commons License
  - BY-NC 3.0
- Created with free software
  - POV-Ray
  - VirtualDub
  - Audacity



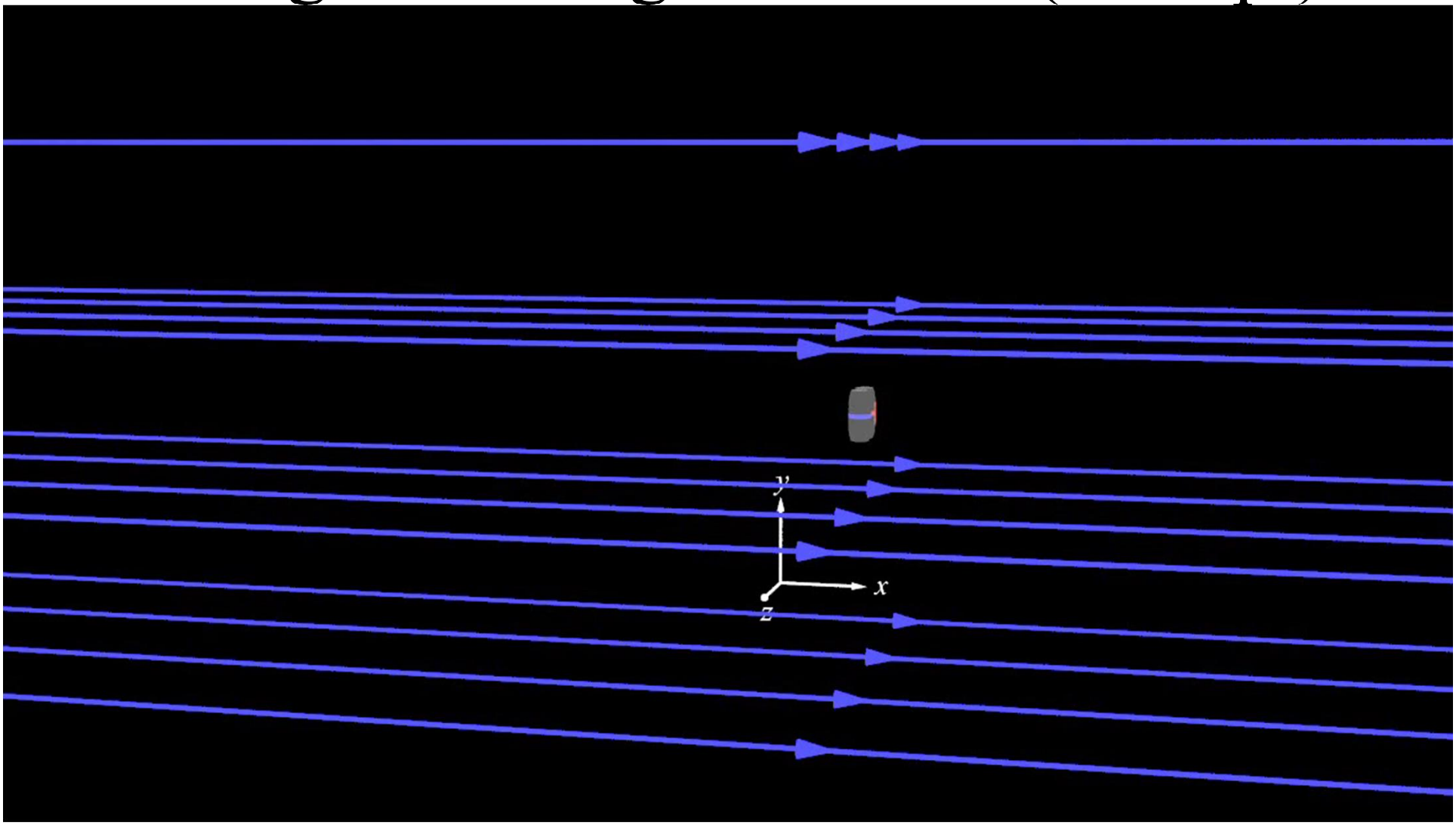
Lenz's Law



Circular Motion (excerpt)

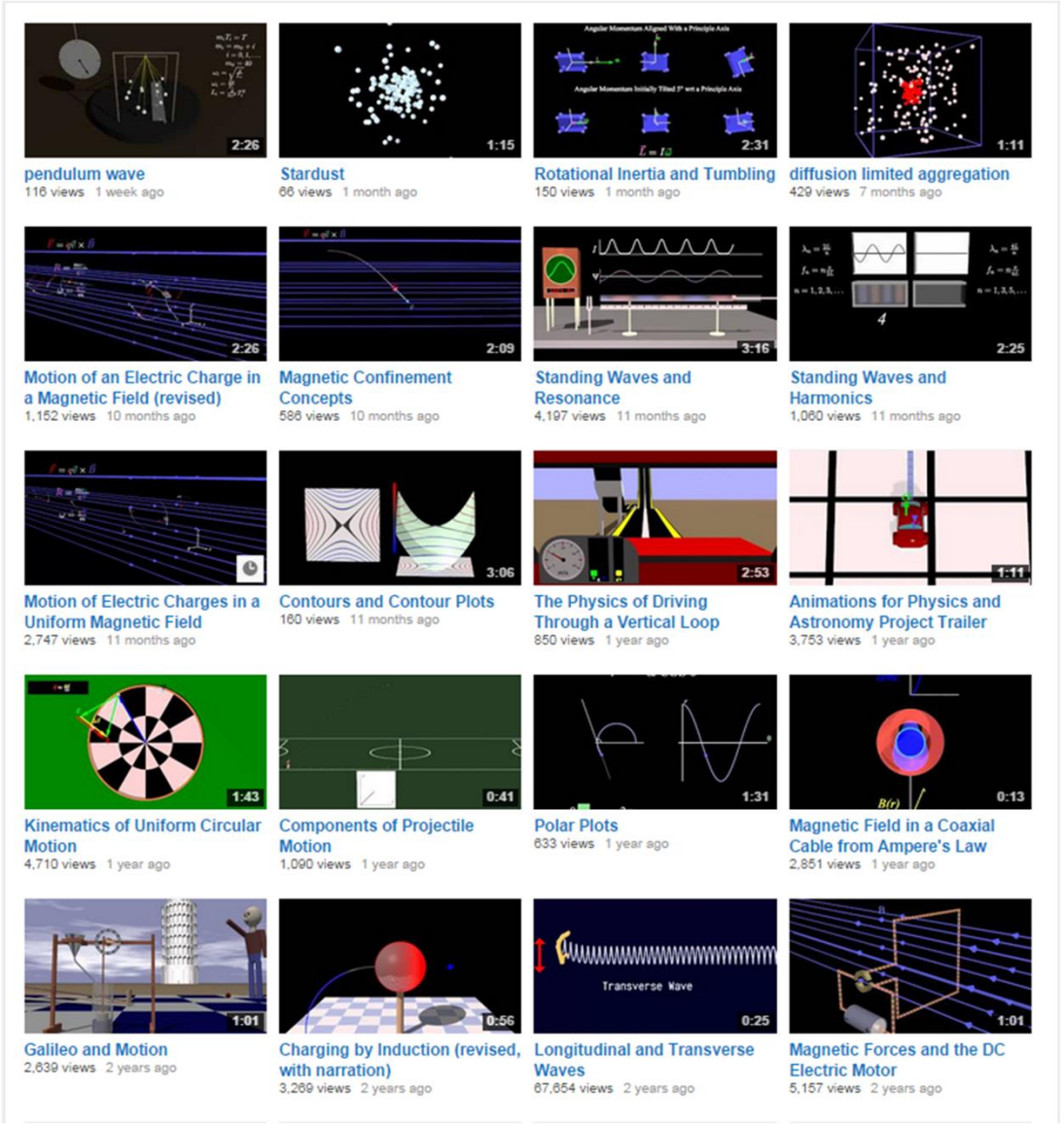


Charge in a Magnetic Field (excerpt)



… also check out the magnetic confinement video

And Much More



- 272 animations on the Project Web Site
- 182 animations on the Project YouTube Channel