Projectile Motion Experiment and Computational Model
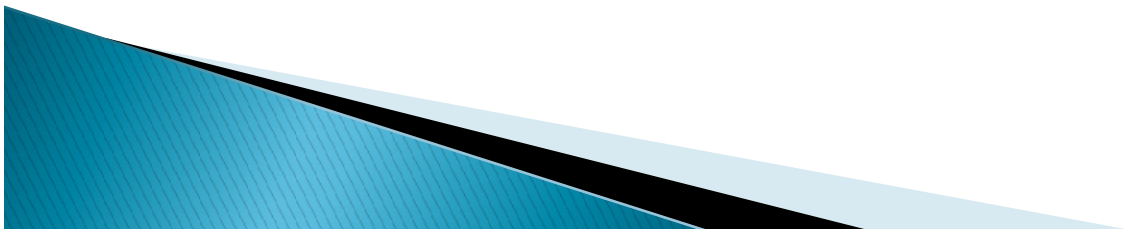
AAPT Winter Meeting
Jan 8, 2018

Todd Zimmerman
University of Wisconsin – Stout
Menomonie, Wisconsin

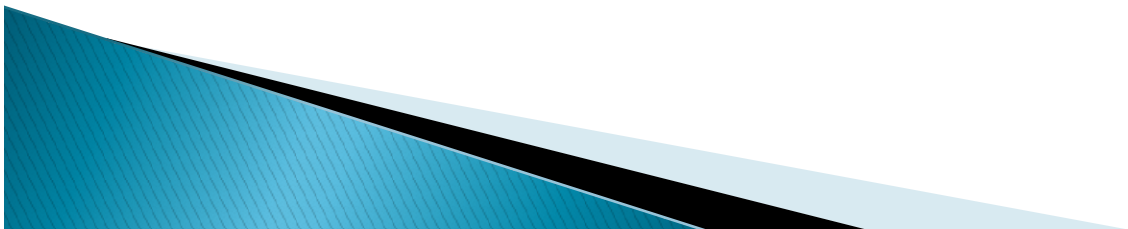# Computation and Experiment

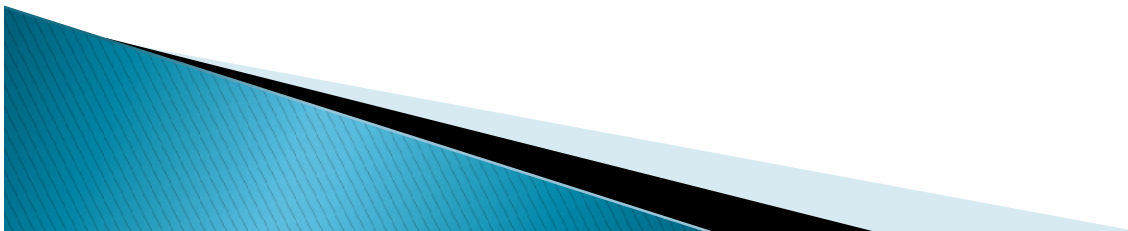- The 3-legged stool
  - Theory
  - Experiment
  - Computation

University Physics I

- 23 students per section
- All students have laptops
- 3 hours of lecture
- 2 hour labs
- 2 hour discussions

~~SageMathCloud~~ CoCalc

- VPython
- Jupyter Notebooks running at CoCalc.com

- Also used Glowscript.org
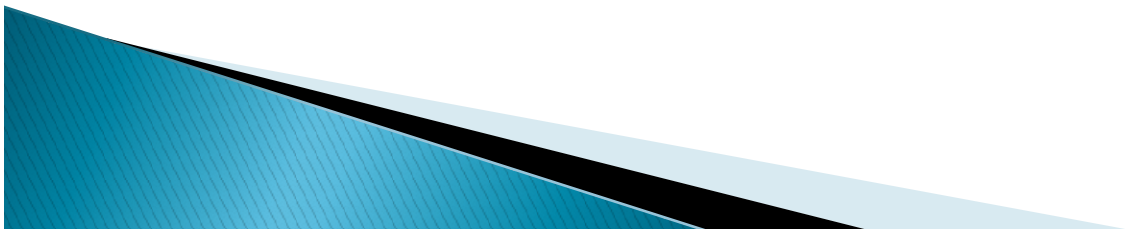
Activity

- **Projectile Motion**
  - Computer Model
    - Look at horizontal distance traveled and total time in the air
      - Horizontal launch
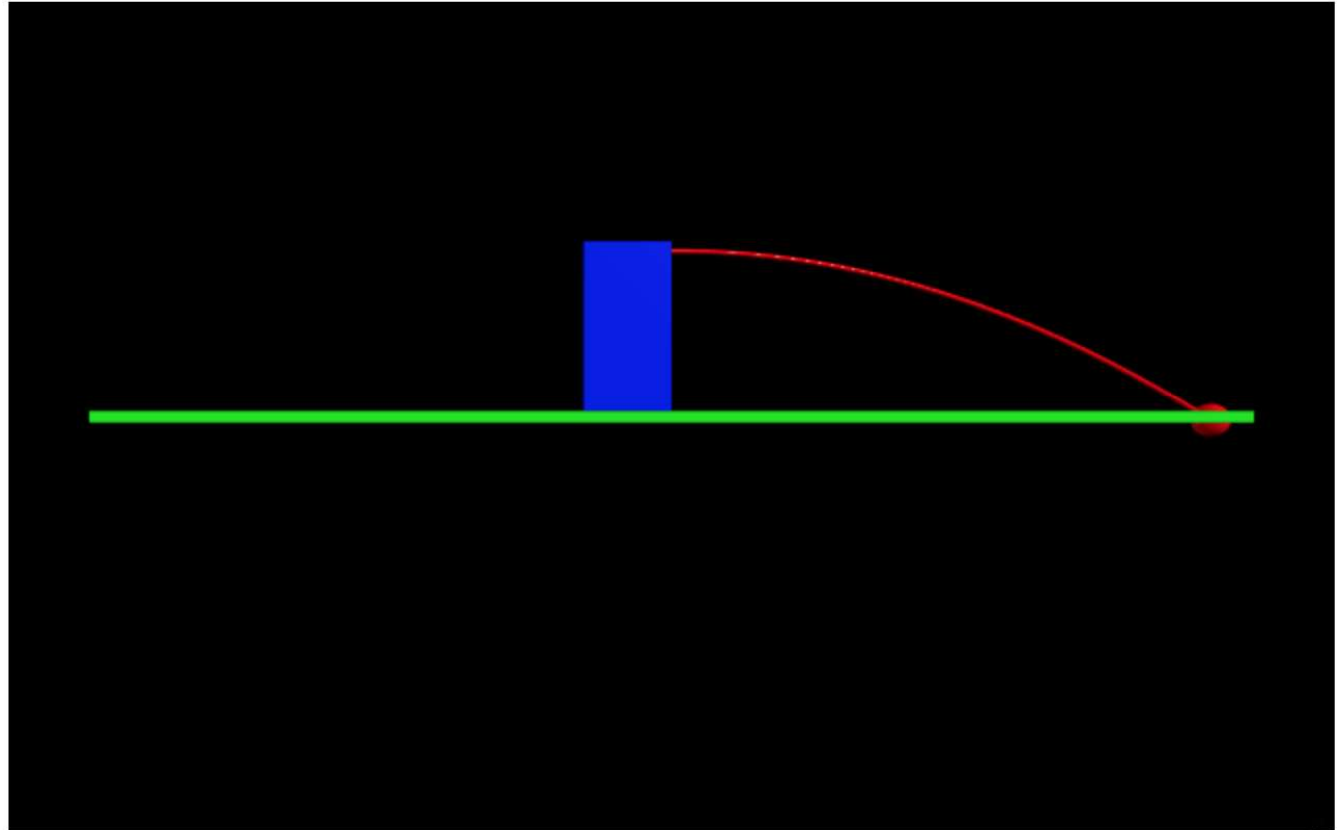   - Vertical launch
  - Experiment
    - Determine launch velocity
    - Model launch for arbitrary angle and do experiment
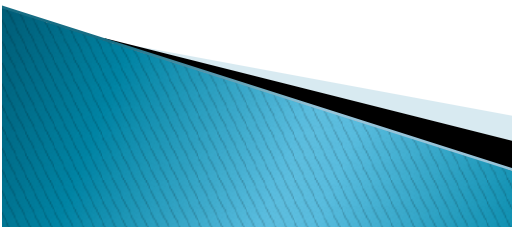
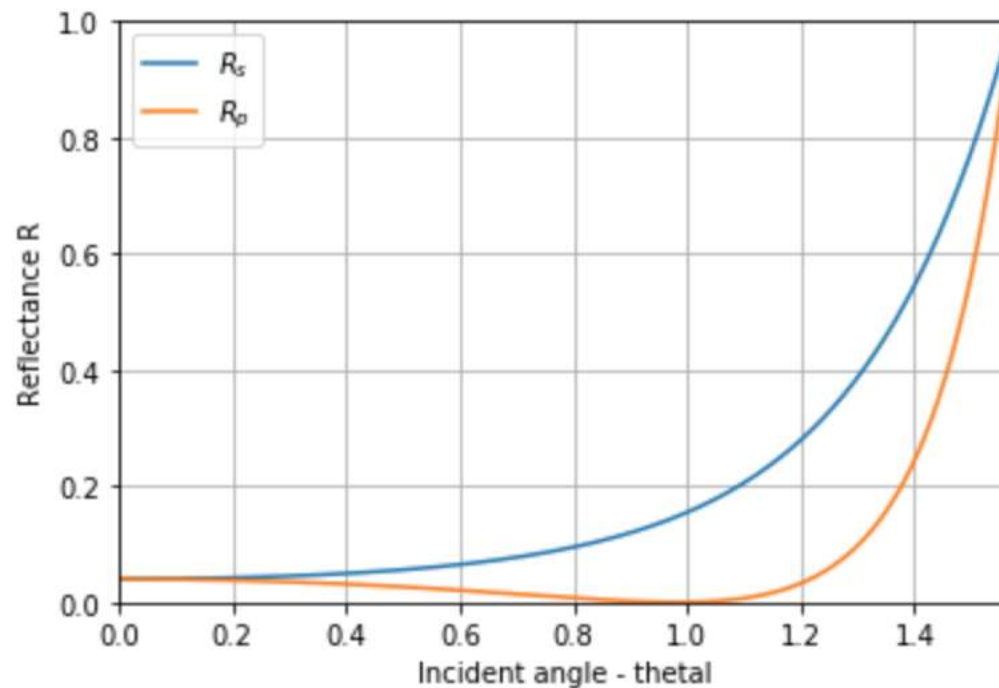# Jupyter Notebook

Ball Spring Launcher

```
Time in air =  0.6500000000000004
Horizontal distance traveled =  6.499999999999993
```
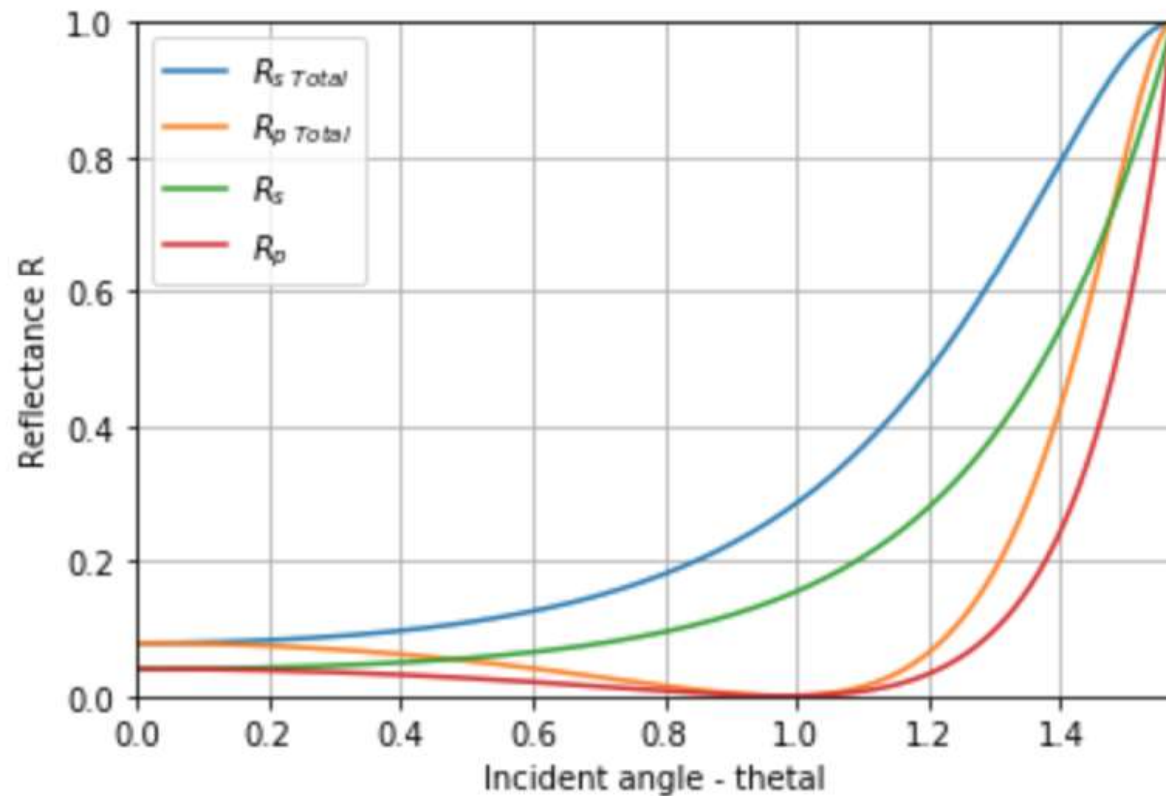
Fresnel's Equations

- Use Snell's law to plot angles
- Plot reflectance at air-to-glass surface
  - Use graph to predict results
- View reflected light w/ polarizer and glass slide
  - Observe Brewster's angle

Additional Activity

▸ Account for reflection from back surface

Thank You

- Thanks to the UW-Stout Office of Research and Sponsored Programs and to the Nakatani Teaching and Learning Center for financial support

- Slides are available at:

https://github.com/zimmermant/talks/