

TEXAS A&M UNIVERSITY

PHYSICS LECTURE DEMONSTRATIONS

Colleagues,

The Physics Demonstration Program has been reorganized and updated for implementation in the new George P. and Cynthia Woods Mitchell Institute for Fundamental Physics and Astronomy and the George P. Mitchell '40 Physics Building. [Click here to view Oscillations and Waves Demonstrations.](#)

The labeling system of the demonstrations has also been changed. The new labeling will incorporate the Demonstration Classification System (DCS) suggested by PIRA, the Physics Instructional Resource Association. The goal of the PIRA Demonstration Classification Scheme is to create a logically organized and universally inclusive taxonomy giving a unique number to every lecture demonstration.

External website references have been added to the demonstration notes when possible. These references have information (historical and practical) to supplement the notes listed in the demo page.

If you are interested in using one of these demonstrations in your classroom, you may send me an email with your class information and the demonstration number and name. Please allow at least two class days notice for the demonstration requests.

Santos Ramirez

Coordinator

- - Physics Lecture Demonstration Program

- - 200 Level Physics Teaching Laboratory Program

Department of Physics and Astronomy

Texas A&M University

College Station, TX 77843-4242

U.S.A.

Phone: (979) 458-7918

Email: Ramirez@physics.tamu.edu

Oscillations and Waves

[Oscillations]

3A40.10 SIMPLE HARMONIC MOTION (BALL ON SPRING/MOTOR)

3A60.10 TACOMA NARROWS BRIDGE (DVD FORMAT)

3A70.10 WILBERFORCE PENDULUM (COUPLED OSCILLATIONS)

3A70.25 COUPLED PENDULUM

[Wave Motion]

3B10.30 WAVE MACHINE (TRANSVERSE PULSE AND WAVES)

3B22.10 STANDING WAVES ON A ROPE

3B30.30 BELL IN A VACUUM

3B55.10 TWO SPEAKER INTERFERENCE

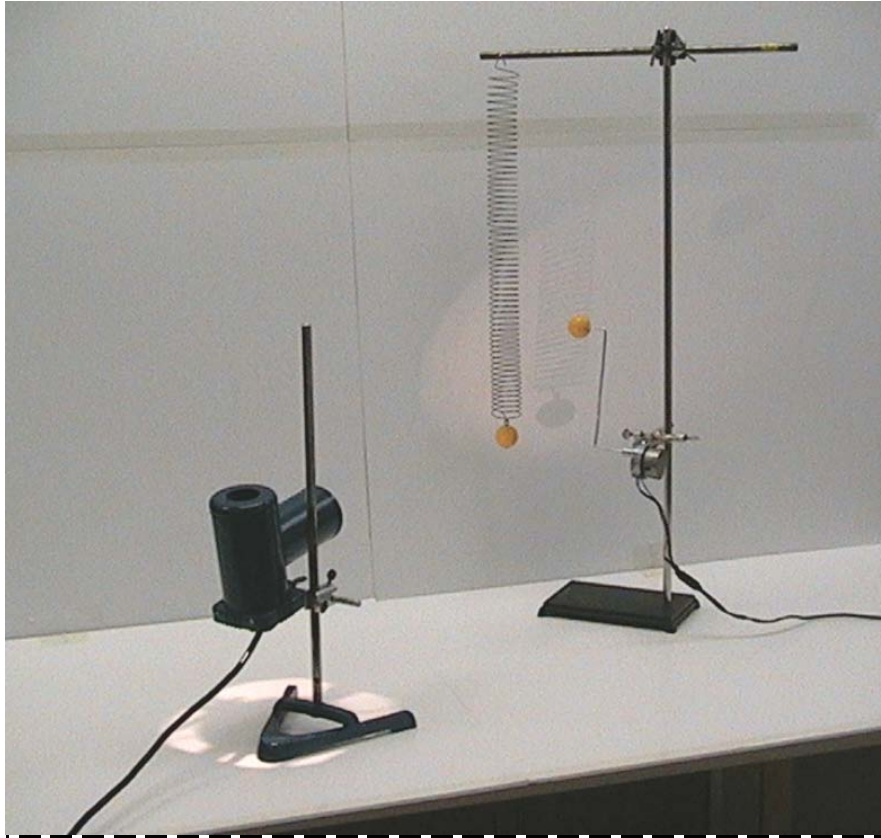
3B60.10 BEATS WITH TUNING FORKS

3B70.10 COUPLED TUNING FORKS (COUPLED RESONATORS)

[Instruments]

3D30.35 BLOOGLES (RESONANCE CAVITIES)

3A40.10 SIMPLE HARMONIC MOTION (BALL ON SPRING/MOTOR)



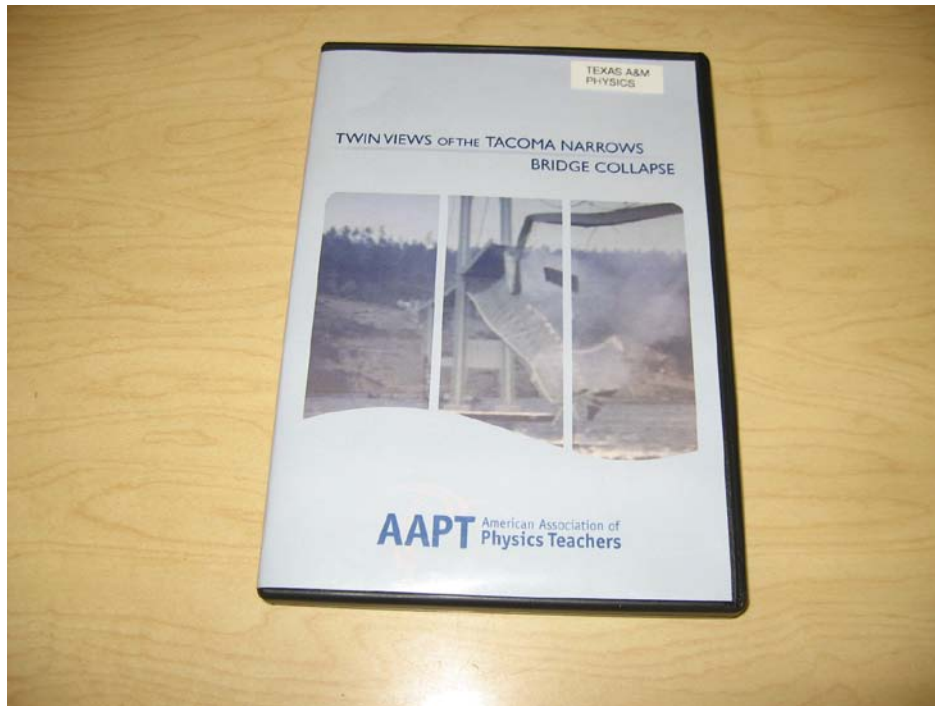
Apparatus: Projection light source
Long rod and base with motor attached
Two balls attached to apparatus (one on a spring and one on the end of the motor shaft)

Notes: Arrange the apparatus and the light source to project an image of the two balls on a wall. Turn on the motor and start the ball on the spring moving such that the two balls are in phase with each other.

(set up info – be careful with the ping pong balls, they are easily damaged. Make sure the motor screws are tight.)

[Top of the Document](#)

3A60.10 TACOMA NARROWS BRIDGE (DVD FORMAT)



Apparatus: Tacoma Narrows Bridge Collapse (on DVD)

Notes: The video has 2 segments. The first is a 3 minute segment taken from the original 8 mm silent film loop and has an audio narration. The second segment is 7 minutes long and has an audio track with people reading parts from the official report and newspaper accounts of the collapse.

(set up info - This DVD will be placed near the computer for the instructor to load into the computer. It will be picked up after the class.)

[Top of the Document](#)

3A70.10 WILBERFORCE PENDULUM (COUPLED OSCILLATIONS)



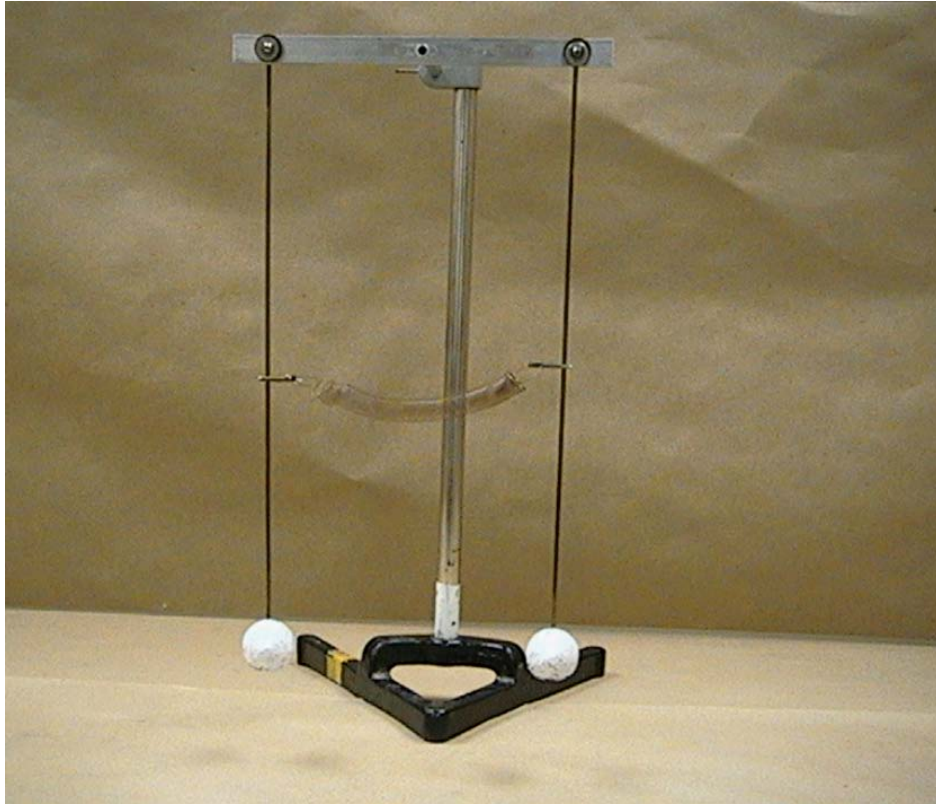
Apparatus: Bob with 4 adjustable masses on sides
Tall rod and two way clamp and short rod
Table clamp

Notes: Pull the bob down a couple inches and release. The bob will oscillate up and down for a while and then its energy will be transferred into rotational motion. After a while, the bob goes back to oscillating vertically.

References: <http://www.compadre.org/OSP/items/detail.cfm?ID=7569>
<http://mac.softpedia.com/get/Math-Scientific/Wilberforce-Pendulum.shtml>

[Top of the Document](#)

3A70.25 COUPLED PENDULUM



Apparatus: Coupled oscillator apparatus

Notes: Two pendulums (with the same length and mass) are connected by a spring. When one pendulum is set in motion, the spring “couples” the energy to the other pendulum and soon sets it in motion.

[Top of the Document](#)

3B10.20 SLINKY ON TABLE (TRANSVERSE PULSE AND WAVES)



Apparatus: Slinky

Notes: Stretch the slinky along the table top. Pull a few spirals toward one of the ends and release. A longitudinal wave motion will propagate to the other end and back.

[Top of the Document](#)

3B10.30 WAVE MACHINE (TRANSVERSE PULSE AND WAVES)



Apparatus: Wave demonstrator
Termination clamp

Notes: The short steel rods (fragile) are attached perpendicular to a long torsion wire mounted on a wood frame. By moving the steel rods vertically (at one end), one may see the wave motion propagate from end to the other. A clamping device may also be used to show a “closed” end of a wave.

[Top of the Document](#)

3B22.10 STANDING WAVES ON A ROPE



Apparatus: Drill with offset rod and rope attached
Variac
Strobe light
Table clamp and rod set-up
Fan

Notes: Attach the aluminum block (that has the rope tied in the bearing) to the rod/table clamp assembly. Adjust the rod such that the height of the rope (on the alum block) is about 5 feet off the floor. Note that the drill is attached to the other end of this rope. Plug the drill power cord into the variac. Set the variac to zero (max ccw) and squeeze the trigger on the drill. Vary the control knob of the variac and/or vary the tension on the rope to produce standing waves with the rope. A strobe may be used to “stop” the motion of the rope. The fan may be used to show how a strobe works. CAUTION – do not aim the strobe light towards the students’ faces.

[Top of the Document](#)

3B30.30 BELL IN A VACUUM



Apparatus: Vacuum pump
Bell in plastic tube
Battery pack

Notes: Connect the battery pack to ring the bell in the tube (without a vacuum). Turn on the vacuum pump for a while (then turn it off). Note the difference in the volume of the bell.

[Top of the Document](#)

3B55.10 TWO SPEAKER INTERFERENCE



Apparatus: Two speakers
Two audio generators

Notes: Set the output of the generators to about 600 Hz and adjust the volume. Varying the frequency of one of the generators will cause a change in the beat frequency. (set up info – set the generator to sine wave, connect the leads to the HI output, and leave the generator ON and at the correct frequency but turn down the volume.)

[Top of the Document](#)

3B60.10 BEATS WITH TUNING FORKS



Apparatus: Two tuning forks on wood bases
Rubber striker

Notes: The 2 forks have about the same frequency (tunable with a sliding bar on one fork). Use the striker to cause the forks to vibrate. Aim the open ends of the bases toward each other. Beats may be heard. Changing the sliding bar will increase the difference in the beat frequency.

[Top of the Document](#)

3B70.10 COUPLED TUNING FORKS (COUPLED RESONATORS)



Apparatus: Two tuning forks on wood bases
Rubber striker

Notes: The 2 forks have the same frequency. Aim the open ends of the bases toward each other. Use the striker to cause one the forks to vibrate. Wait a short while and put your hand on the tines of that tuning fork. You should now hear the vibrating sound from the other tuning fork.
(set up info – the fork should be struck near the top of the flat side.)

[Top of the Document](#)

3D30.35 BLOOGLES (RESONANCE CAVITIES)



Apparatus: Plastic corrugated tube that is open at both ends

Notes: Whirl the tube at different speeds to produce different sound tones.

[Top of the Document](#)