

WAVES AND SOUND

Introduction

The lecture demonstrations listed in this section also include a short description and outline of how the demonstration experiment works. This is for the benefit of the lecturer (who is going to use it in the classroom) and the student (who will see it demonstrated in class).

[To the lecturer:

All of the equipment used in these demonstrations is stored in Heldenfels Hall. Some of the equipment is rather delicate and not easily transported to other buildings (our only mode of transport is a cart pushed by hand).

When requesting a demonstration, be sure to mention the reference number and name listed in this section (example MEC-1 Friction). Requests for demonstrations to be set up in a different building from Heldenfels will require at least 3 class-days notice. The logistics of setting up demonstrations in different buildings gets difficult without advance notice.

Practice with the apparatus prior to use in the classroom is always encouraged.]

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WS-1 TORSION WAVE APPARATUS

Equipment: Wave demonstrator
Termination clamp

Comments: 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.



WS-2 BELL IN A VACUUM

Equipment: Vacuum pump
Bell in plastic tube
Battery pack

Comments: 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 volume of the bell.



WS-3 STANDING WAVES ON A STRING

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

Comments: 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.



WS-4 SLINKY

Equipment: Slinky

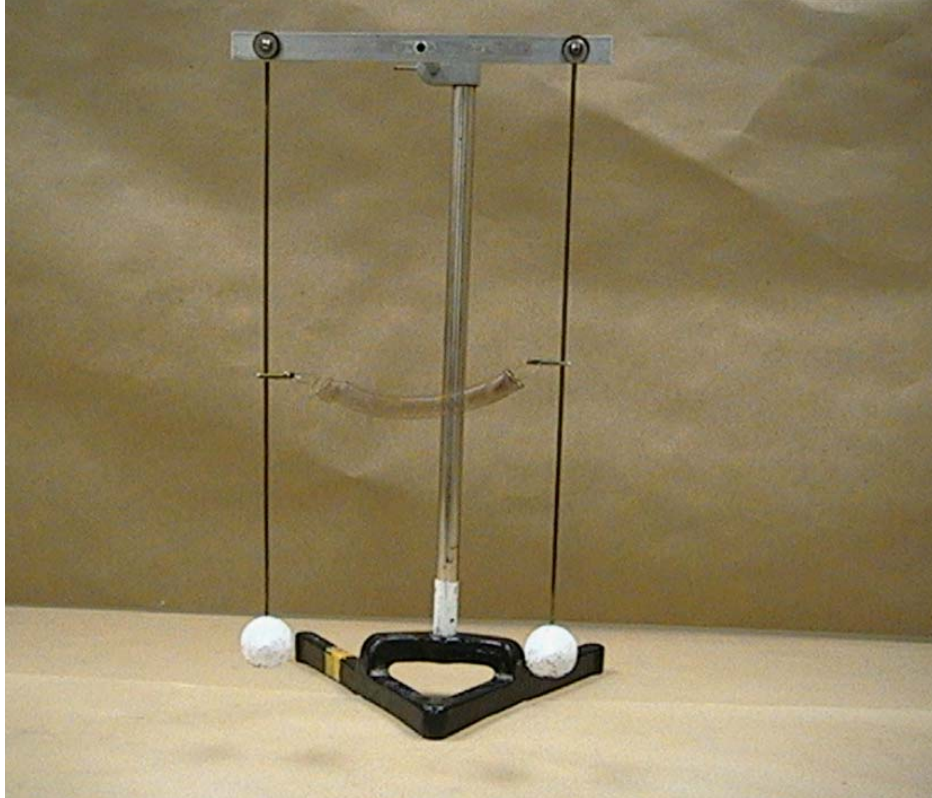
Comments: Stretch the slinky along the table top. Pull a few spirals toward one of the ends and release. A longitudinal wave motion will propagate to the other end and back.



WS-5 COUPLED OSCILLATOR

Equipment: Coupled oscillator apparatus

Comments: 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.



WS-6 BEATS USING TUNING FORKS

Equipment: Two tuning forks on wood bases
Rubber striker

Comments: 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.



WS-7 BEATS USING LOUD SPEAKERS

Equipment: Two speakers
Two audio generators

Comments: 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.



WS-8 TACOMA NARROWS BRIDGE VIDEO TAPE

Equipment: Video tape of Tacoma Narrow Bridge
VCR

Comments: This video tape shows the bridge collapse.

