

CSU Physics Day Demonstrations for Students and Teachers

SI-117 9:00am 4/18/08

Presented by: Dr. Ted Wood

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Galileo's Free Fall Experiment—Which ball hits the ground first? Styrofoam or steel?

Pendulum—Conservation of Energy— If you start the bob at your nose and let go, how far will it come back when it returns? Is your nose safe to remain in the same place?? Is energy conserved? If not. Where does it go?

Newton's Cradle—Conserve Momentum and Energy—Steel ball but no putty. Also, put baseball on top of a basketball and drop together so basketball hits floor. *What is conserved?* Momentum? Energy?

Air Molecules—Computer simulation of air molecules in a box colliding with each other and with walls.

Thermal Expansion—Ball and Ring. *What prevents the ball from moving through the ring? What happens when you heat a strip of bi-metal!* Metals have different coefficients of expansion. Watch and see.

Air Pressure— Place ball on top of tube while closed at the bottom—then open the tube. Ball will drop down through the tube. *Why?* Opening the tube releases the air pressure.

Weight of Air—

Why can't we lift the rubber mat from the table top? Exactly how much pressure is being applied to the rubber mat from the air? 14.7lbs of air per square inch -- 30lbs per 2 square inch! Read the spring scale.

Blow Tube—

How powerful are your lungs? Watch how they blow a steel ball through a tube.

Precision of Gravity— Blow tube is aimed at metal pan. Pan is released automatically when ball exits the blow tube by an electromagnet. Ball will hit pan in mid-air every time.

Bernoulli's Principle—

Why does the ping-pong ball stay up in one place? Where is the air from the blow dryer moving the fastest? When the speed of air particles increases, pressure decreases.

Person Sits on Rotating Turntable—

What changes when you move your arms in and out? Inertia— Conservation of angular momentum.

Bike Wheel Precession—

With axle horizontal spin wheel and hang by string attached to axle off center.

Atoms— They consist of negatively charged electrons moving around a positively charged nucleus. Atoms normally have equal positive and negative charge and are therefore neutral. Metals have free electrons and are conductors. Other materials that do not have free electrons are insulators.

Charging by Rubbing— Rub Bakelite with silk—which has a greater affinity for electrons? Bakelite or silk? Both materials are insulators but electrons pulled off the Bakelite on to the silk remain on the silk. *What happens with wool? Plastic?* Check with electrometer.

Electrophorus— Electrons on the hard rubber repel the electrons to the top side of the copper plate. Touch top of plate to drain off these electrons leaving the copper plate positive.

Ping-Pong Electrometer—

Did the Electrophorus plate really get charged? Use Electrophorus plate to charge electrometer. *Can you pick up Styrofoam? Why?*

Wimshurst Machine—

Automatically works like the electrophorus but over and over at a high rate. Watch out—makes sparks 3 inches long!

Jacob's Ladder—

5000 Volts between wires inside glass tube. *What makes the arc rise?* Arc rises as air warms up in the tube.

Electrical Levitation—

Ping-pong ball painted with metallic paint to make it conductive is inserted between parallel aluminum plates which are in turn connected to the Wimshurst machine. *Why do they bounce?* The balls take on the charge of the plate they are in contact with and are therefore pushed up from the bottom plate and down from the top plate.