

PTRA: Bringing Physics to Life Through Literature

Tommi Holsenbeck
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AMERICAN ASSOCIATION OF PHYSICS TEACHERS
PHYSICS TEACHING RESOURCE AGENTS



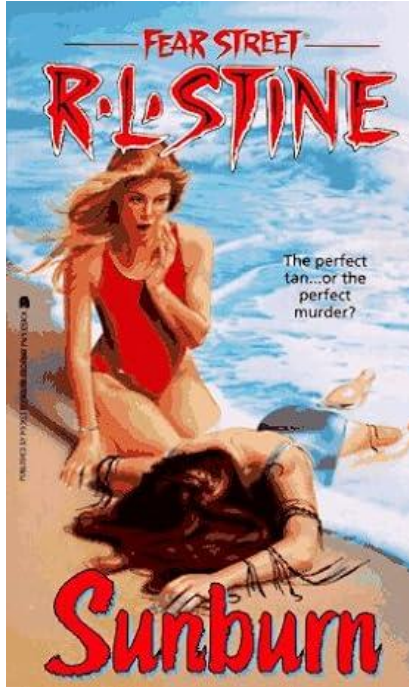
PTRA: Elementary and MS Physics Books

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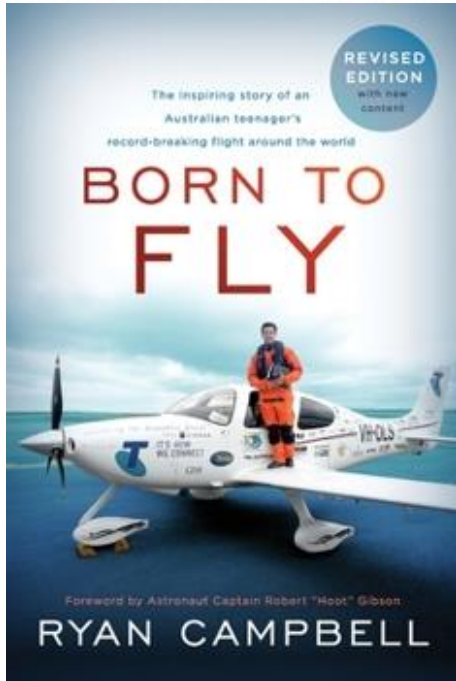
Sunburn by R L Stine



UV Beads from Educational Innovations.
Lesson Plan for HS

chrome-
extension://efaidnbmnnnibpcajpcglclefindmkaj/https://cdn.
commercev3.net/cdn.teachersource.com/downloads/lesso
n_pdf/SunBurns9-12.pdf

Born To Fly by Ryan Campbell



Video with Straw and Ping Pong Ball-
https://www.youtube.com/watch?v=724noDp_cz8



Bernoulli Ball

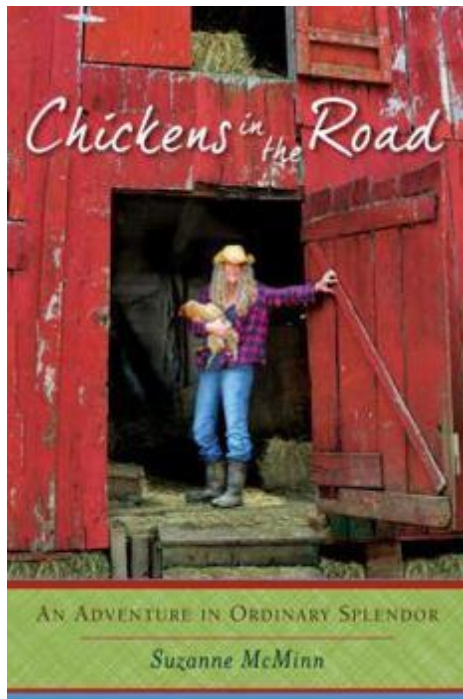
Literature:

Princess Hyacinth (The Surprising Tale of a Girl who Floated)

Materials:

Flex Straws Styrofoam ball
 or crumpled up piece of paper

Chickens in the Road by Suzanne McMinn



CLUCKING CHICKEN

BACKGROUND: When something with a small surface like a string vibrates, it pushes a very small mass of air, resulting in a sound that is not very loud. But if the string is attached to a larger surface, forcing it to vibrate at the same frequencies as the string, the larger surface will push a larger mass of air, resulting in a louder sound. Physicists very sensibly refer to this phenomenon as forced vibration.

Please understand that this is not resonance. Resonance is a special case of forced vibration in which a body is induced to vibrate at its natural frequency. Every object has one or more frequencies at which it will naturally vibrate. In this activity we will force the bottom of a plastic cup to vibrate at frequencies which are natural to a string but not to the cup bottom.

CONSTRUCTION: Make a small hole in the bottom of a metal can or plastic cup. Tie a small paper clip on one end of a sturdy cotton string about 70 cm long, and run the other end through the hole in the bottom of the cup (see diagram). Tie a small piece of cellulose sponge at the other end of the string. (The rectangular sponges commonly sold at supermarkets are made of cellulose.)

PROCEDURE: Dip the sponge in water and squeeze it so that it is damp, not soggy. Hold the cup securely in one hand. With the other hand fold the sponge in half, and use it to grasp the upper part of the string tightly. While maintaining a tight grip, slide the sponge down the string with short jerking motions. The sound produced will resemble a loud, raucous chicken. By varying the manner in which the sponge is slid down the string, the sound can be made to resemble a frog or what might politely be called "rude noise." Some students enjoy decorating their creations with felt scraps and doll eyes to resemble chicken or frog heads.

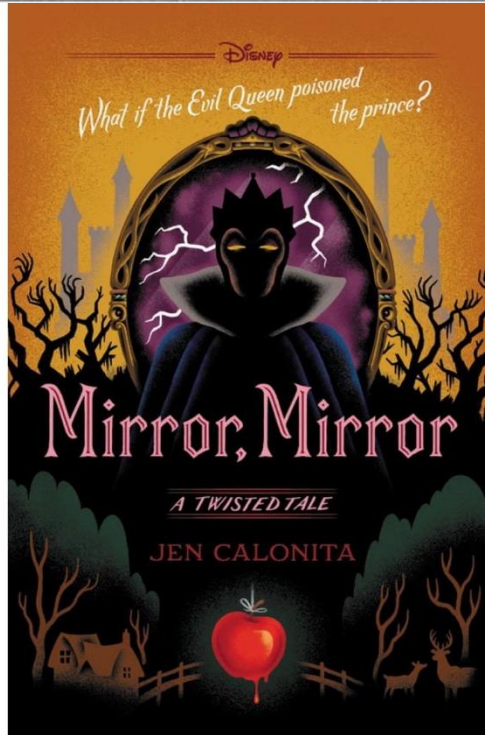
EXPLANATION: Wetting the sponge adjusts the friction between it and the string to a level where it sticks and slips in rapid succession. This sets up an irregular mixture of vibrations in the string. Irregular vibrations result in what is commonly called noise; what most people consider music results from regular vibrations. The string forces the cup bottom to vibrate at the same frequencies, thus amplifying the sound.

FURTHER INVESTIGATION: Instead of attaching a cotton string to the cup, try various cords, wires and ribbons, or strings from violins or guitars. Instead of a damp sponge, try leather or cloth coated with beeswax or rosin. What if the string is attached to the inside of the cup instead of to the outside? Attach a spring, elastic or chain of rubber bands to the cup and pluck it. Attach a stretched wire coat hanger and bang it with a hard object. What happens if you use larger containers such as a restaurant size food can or a garbage can?

Demonstrate the amplifying properties of a block of rigid foam plastic. Simply straighten the hook of a wire hanger and stick it into the block. Strike the hanger with a plastic pen to produce a loud sound.

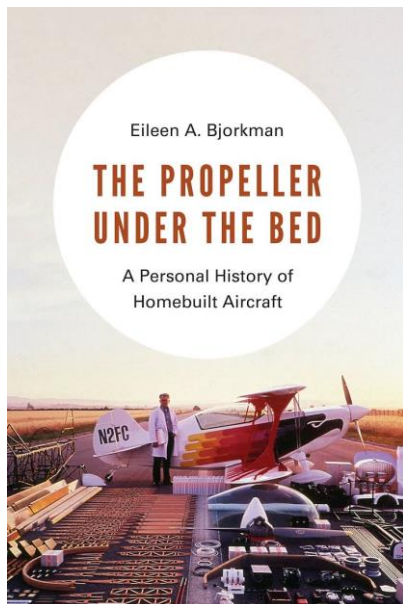


Mirror, Mirror by Jen Calonita



Mylar Sheets to investigate Curved Mirrors and Fun House Views. Plus find a way to raise your right hand in near your face and see your right hand raise in the mirror.

Propeller Under the Bed by Bjorkman





Resonance Fan

Literature:
Karlson on the Rook *Dizzy the Mutt with the Propeller Butt*

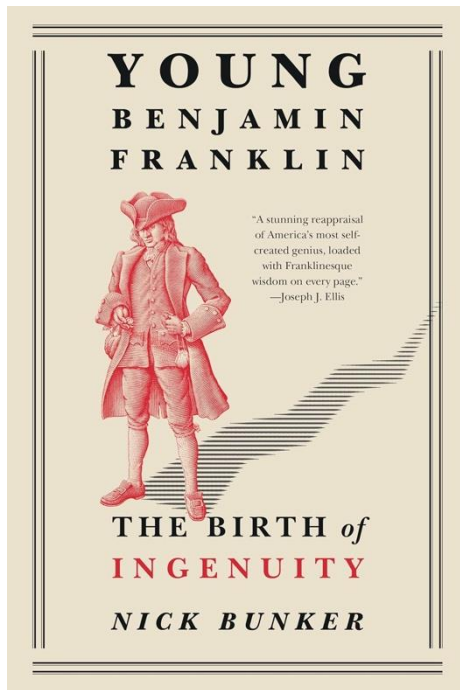
Materials:
 Straws bamboo skewer scissors

Construction Details at
<http://www.arvindguptatoys.com/toys/strawfan.html>


by K V Potdar
 via Arvind Gupta




Young Benjamin Franklin: The Birth of Ingenuity by Nick Bunker



Electrostatic Fliers



Literature:




Frank Einstein and the Electro-Finger

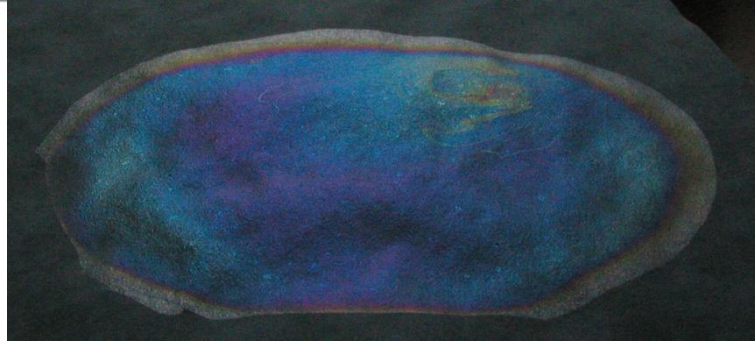
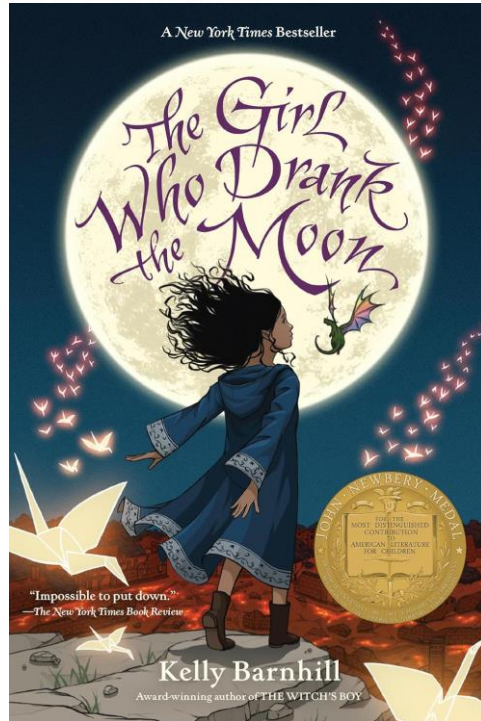
Materials:

- Plastic bag
- Balloon
- Scissors
- fur or cotton cloth

Construction Details at
<https://www.youtube.com/watch?v=IOHVB1mRUho>
 by Nyle Steiner



The Girl Who Drank the Moon by Kelly Barnhill



Permanent Rainbow

<https://tinyurl.com/bdxc85x5>