

# SCIENCE IS FUN!

## DEMONSTRATIONS CONNECTING VIBRATIONS AND SOUND

Name: \_\_\_\_\_ Period: \_\_\_\_\_ Date: \_\_\_\_\_

The source of a mechanical wave is a vibrating object. Sound is a mechanical wave. In this activity, we'll turn vibrations into sound.

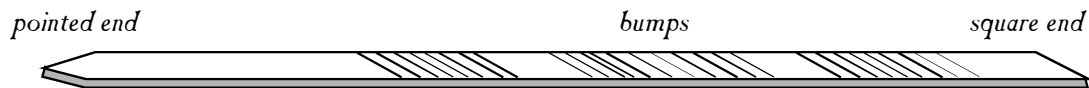
### PRELAB AMUSEMENT (OPTIONAL)

Visit [www.jeffmilner.com/backmasking](http://www.jeffmilner.com/backmasking) and try "Paparazzi" and "Stairway to Heaven" to get a sense of audio pareidolia: the mind's ability to construct a pattern where a pattern does not actually exist. The power of suggestion is strong, indeed! [Try some "Electronic Voice Phenomenon" (EVP) videos, too.]

### APPARATUS

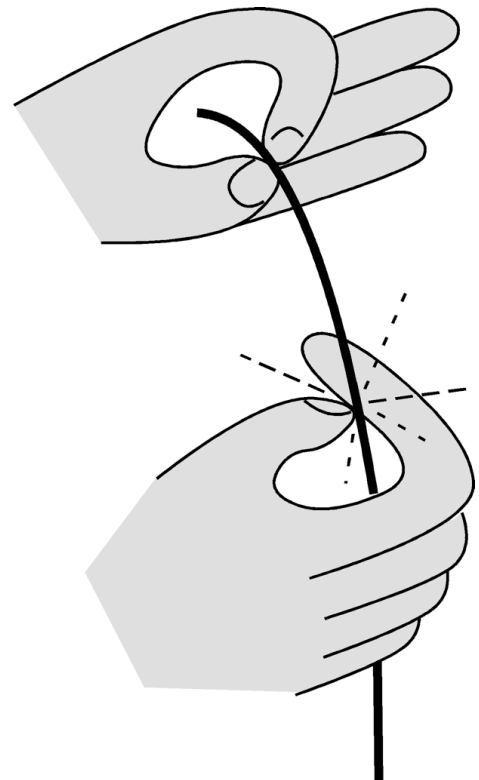
\_\_\_ Talkie Tape    \_\_\_ cup (Dixie or salsa)    \_\_\_ your body: primarily ears, teeth, and a thumbnail

Examine the Talkie Tape. Pay particular attention to its bumpy side and its pointed end.



### 1. ON THE AIR

- Hold the Talkie Tape in your non-writing hand. Pinch the tape near its pointed end.
- Maintain that secure pinch with your non-writing hand and grasp the tape with your writing hand such that your thumbnail presses against the bumpy side of the tape and the smooth side of the tape rests on your forefinger.
- Pull the tape through your thumbnail-forefinger "gauntlet" so that your thumbnail passes across the bumps. A good speed is about 0.5 m/s. Experiment with thumbnail pressure and pull speed to hear the secret message encoded in the bumps of the tape. If the sound is too faint, try holding/pulling so that your thumbnail is close to your ear.



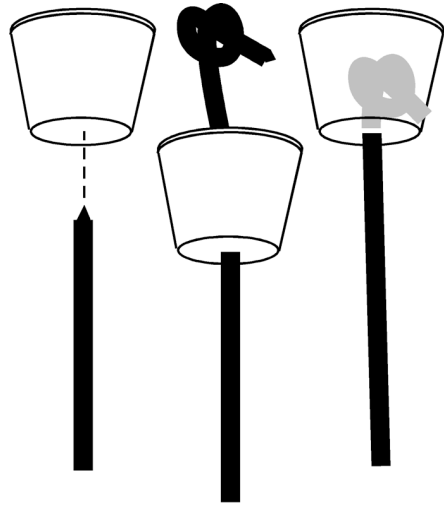
### 2. IT'S ALL IN YOUR HEAD

- Place the pointed end of the tape in your mouth and bite hard enough with your front teeth to secure it.
- Run your thumbnail/forefinger down the tape (away from you) to hear the secret message by "bone conduction."

*The vibrations from the thumbnail/tape interaction vibrate your teeth, which vibrate your skull. These skull vibrations are detected as sound and interpreted in the same way external sounds are. But these sounds are "all in your head."*

### 3. MAKE A JOYFUL NOISE

- a. Use the pointed end (or a ball point pen or something else) to poke a small hole in the center of the bottom of the Dixie cup. The hole should only be big enough to let the tape pass through it.
- b. Pull enough tape into the cup so that you can tie a simple knot near the pointed end.
- c. Pull the tape back until the knot rests against the hole. The tape can't get back out since the knot is too big to fit through the hole.
- d. Use your non-writing hand to hold the cup, and once again run your thumbnail/forefinger across the bumps.
- e. Recalling the lesson of the initial activity, how was the tape's message suggested (other than my listening to it)?



### 4. THE MUSICAL BOX (OPTIONAL)

Allow a musical box mechanism to play while holding it in your hands. Then allow the mechanism to play while pressed against a solid object such as a table, door, or shelf. What is the difference and why does it occur?

### 5. HONDA MUSICAL ROAD

- a. Watch the YouTube video, "2009 Honda Civic Musical Road" ([v=YR5Cejq2uyc](https://www.youtube.com/watch?v=YR5Cejq2uyc)) or equivalent.
- b. Describe the connection between the Musical Road and this activity.
  - i. What plays the role of the plastic tape?
  - ii. What plays the role of the thumbnail?
  - iii. For both, how are high notes/tones different from low ones?
  - iv. For both, how are loud notes/tones different from quiet ones?
- c. The speed limit on the Musical Road is about 24 m/s and a common musical note on the road is 240 Hz. How far are the grooves from each other on that section of road?