

# SciGirls Activity 4

## Music and Sound



### Icebreaker

#### Make an oboe orchestra!

#### SciGirls Skill: Observing

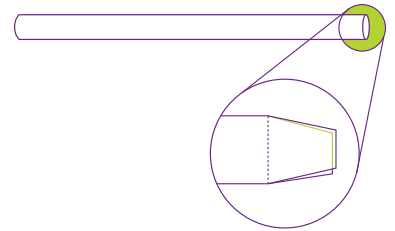


#### You'll need:

- plastic drinking straws
- scissors

#### Guide your girls as they

- 1) Ask an adult for permission to use scissors. Cut one end of a straw so it comes to a dull point.
- 2) Put the cut end of the straw in your mouth, so that your teeth gently press on the straw near where you made the cut. Close your lips around the straw, and blow hard through the straw . . . it makes a sound!
- 3) Cut additional straws the same way, but then cut them to make them shorter, or stick two straws together to make a long straw. Predict how the sound will be different using the long and short straws.



Close-up of how to cut the straw



**SciGirls Suggestion:** Have plenty of straws handy for this activity. When cutting the end, make sure to cut inward from both sides, so that the end of the straw has two loose flaps, like reeds on an oboe. Instruct your kids that they'll need to blow quite hard in order to get a note out. They'll need to pinch slightly with their teeth at the dotted line location, also.



For more information about this activity, visit [pbskidsgo.org/dragonflytv/superdoit/straw\\_oboe.html](http://pbskidsgo.org/dragonflytv/superdoit/straw_oboe.html)

## Investigation

### Music and Sound

Maxine and Hannah here! We caught the Omni theater movie "STOMP: Worldbeat" at the Science Museum of Minnesota. STOMP is a musical group that finds rhythm everywhere. They make music with anything and everything, from drumming barrels to sweeping brooms. STOMP not only had us tapping our feet, they inspired an important science question. We're curious: How can we make our own musical instruments from simple objects?

We went to the Experiment Gallery at the Science Museum of Minnesota. We plucked the strings of a cello, played with a tuning fork, and checked out the giant wave machine. Then we got busy creating a musical instrument of our own. We used some leftover plastic plumbing tubes, some cardboard wrapping paper tubes, and some copper tubing. We cut the tubes at different lengths and dropped them to see what kinds of sounds they made. The longer tubes made low pitch sounds and the shorter tubes made high pitched ones.



### You'll need:

- 8-10 cardboard tubes, especially long ones from gift wrap paper
- tape measure, yardstick, or meterstick
- scissors, to cut the tubes
- optional: electronic keyboard, to match notes from the found objects to the musical scale



**SciGirls Suggestion:** The Do-Re-Mi scale has eight notes from the first Do to the next. On a piano keyboard, however, there are twelve keys from Do to Do when you include black and white keys. Challenge your kids to get all the tube lengths required to make the full 12-note scale.



## SciGirls Want to Know

### How can we make our own music?

#### Guide your girls as they

- 1) Collect at least 8-10 cardboard tubes from gift wrap paper. Alternately, one could use PVC pipe (2 inch diameter), available from a home improvement store.
- 2) Pick one tube, measure its length, then drop it onto a hard surface (table top or uncarpeted floor), and listen for the "thud" sound it makes. Drop it as many times as necessary to distinguish the pitch. Try to hum the same note that the tube makes.
- 3) If one is available, use an electronic keyboard to find the same note on the musical scale. If you know the name of the note on the keyboard, write the note name onto the tube.
- 4) Take a second tube, and cut it so it is half the length of the first tube. Drop it onto a hard surface, and listen for its note. Compare it to the note of the first tube. Write down your observations, and try to match the new note to a key on the keyboard.
- 5) Continue with remaining tubes, carefully cutting them to lengths that are in between the lengths of the first two tubes. Try to find the right lengths to make the notes of the Do-Re-Mi scale.



#### SciGirls Secret

This investigation takes some time and patience, and requires kids to listen carefully. They don't think of tubes, cans, or boxes as musical instruments, but careful attention shows that these objects can produce notes. Point out to them that violin and guitar makers tap on the wood pieces they use to get just the right sounds out of the instrument they are about to build.

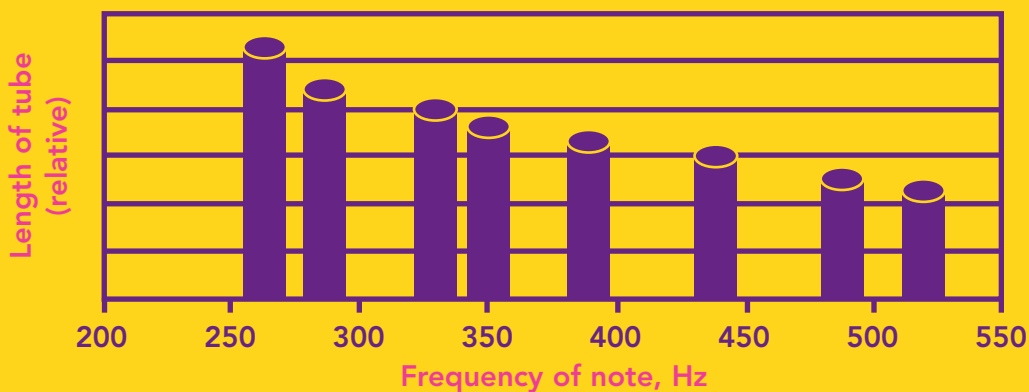


## SciGirls Synthesize Data and Analysis

- 1) Lay the tubes out on the table or floor in order, from low pitch to high pitch.
- 2) Line up the bottoms of the tubes, so they are resting on the same imaginary line.
- 3) As a first step, put the same amount of space between the tubes, say, 3 inches.
- 4) Notice the pattern made by the tops of the tubes. The tops do not lie along a straight line, but rather follow a gentle curve.
- 5) Here is a listing of the notes in a C major scale, with their approximate frequencies in Hertz (Hz). Use this listing to make a graph out of the cut tubes, as illustrated below.

C – 260 Hz	D – 294 Hz	E – 330 Hz	F – 349 Hz
G – 392 Hz	A – 440 Hz	B – 494 Hz	C – 520 Hz

Musical tubes laid onto a frequency graph



## Keep Exploring!

Have your kids collect a bunch of empty food cans, peel off the wrappers, wash them, and start picking out the ones they need to make a musical scale. They can tap the cans with a metal spoon, and then arrange them in order of the sound they make. They shouldn't use the cans that are "out of tune." Encourage them to make a kind of homemade xylophone and start practicing!