



## Minor Challenge Set #1

**STEM Field:** Biology / Biomedical Engineering

**Level:** Intermediate

**Challenge Name:** Make An Ear Trumpet

**Project Cost:** 0-20 USD

### Materials Required:

- Cardboard tubes (e.g. paper towel rolls)
- Plastic funnel
- Plastic bottles
  - Ask an adult to cut the bottoms off each bottle
- Disposable cups
  - One variety is enough, but you can compare the effects of material if you wish (paper, plastic, styrofoam)
- Segments of clear plastic tubing
  - ~1.5 cm diameter, and ~10-15 cm in length
- Scissors
- Tape
- Blu-tack or modelling clay

### Safety:

- Complete this activity with an adult
- Do not put small objects near or in your ear

### Duration:

- The challenge take approximately 1-2 hours to finish, however, the time guideline is an estimation only, and students and mentors can complete the tasks around their schedules

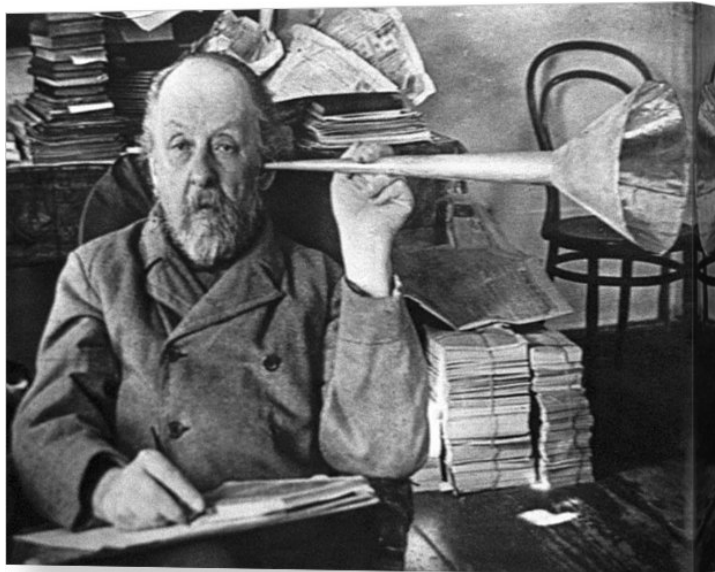
# Introduction:

The human ear can hear a large range of sounds, however hearing can deteriorate with age or illness. While many people with hearing difficulties have a hearing aid to help them, in the past **ear trumpets** were used to amplify sounds and make them more easily heard.

Ear trumpets had a large, funnel-shaped end that would focus sound waves down the main pipe and into a smaller end that would fit near your ear.

The **amplitude** of a sound refers to its loudness, whereas the **pitch** can describe how “low” or “high” the noise sounds. For example, the roar of an aeroplane could be described as high amplitude (loud) and of low pitch. The buzz of a fly could be described as low amplitude (soft) and of high pitch.

In this experiment, we will make and test the quality of an ear trumpet.



# Instructions:

- 1) Take note of at least 5 noises in your current environment, and describe them in terms of low/high amplitude, and low/high pitch.

These can include background noises, as well as sounds you can make by using objects around you.

- 2) Using the material provided, make your first attempt at an ear trumpet. The key is to have one large end to focus sound waves, and a smaller end to place next to your ear.

For inspiration, see some examples below. What features do you notice?



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- 3) Test your ear trumpet against some of the noises you noted earlier. Does your ear trumpet work well for all noises, or are there certain sounds that are better amplified by your device?

Were these sounds low/high amplitude, and were they low/high pitch? Record your results.

## Extension: Ear Trumpet Modifications

Think about what could be changed about the ear trumpet, e.g. the size of your funnel, or the length of the tubing.

Modify your ear trumpet and see how this affects the sounds that are

amplified. Record your results. Compare from the original ear trumpet design and possibly other versions as well. Which design maximises the amplitude? How about the pitch?

## Reflection Questions:

- Are there any improvements you would make to this challenge?
- What real world application can you apply the challenge to?
- What are the key concepts of science and engineering that relate to this challenge?
- What changes did you need to make to your ear trumpet to alter the amplitude of the sounds you heard?
- Does your ear trumpet work better for low pitch or high pitch noises? Did you make any changes so that you could hear one pitch better than the other?

## Submission Guidelines:

- Submit photos of your experiment setup. Include a short summary that addresses the reflection questions.

Note: Remember, if you want to upload pictures of your Minor Challenge that also include you, please check if it is OK with your parent or guardian first.

- The submission form is on the Minor Challenges page:  
<https://sciencechallenge.org.au/index.php/minor-challenges/>  
Fill out the details and make sure you upload your submission.

## Learn More! Resources:

- How do birds make do without external ears?  
[https://www.huffpost.com/entry/birds-ears-hear-external\\_n\\_6314760](https://www.huffpost.com/entry/birds-ears-hear-external_n_6314760)
- Learn more about how hearing work -  
<https://health.howstuffworks.com/mental-health/human-nature/perception/hearing.htm>

## Bibliography:

- *What was that?* (no date) *Neuroscience for Kids - Hearing Experiments*.  
Available at: <https://faculty.washington.edu/chudler/chhearing.html>  
(Accessed: March 13, 2023).