Alexander Graham Bell

Alexander Graham Bell was born in Scotland in 1847. Bell was curious from an early age – as a child, he invented a device that hulled wheat, which helped make chores more efficient for him and his brothers. However, he was most fascinated by sound. His mother was deaf, and as her deafness worsened, he began to invent ways to communicate more easily with her, first with a type of sign language and also by speaking in special tones that he knew she could feel the vibrations of. He began to wonder if there was a way to transmit sounds using electricity.

At the age of 16, he left Edinburgh to teach music and elocution before going to college. Afterwards, he took a job teaching the deaf to speak using a method his father, a speech researcher, had developed. Around this time he started thinking about using electricity to carry sound.

In 1870, the family moved to Canada. They bought a farm and Bell continued to teach the deaf all over North America. Eventually, he decided to live in Boston and moved there. He started a school for the deaf and became a professor at Boston University, working on ways to carry voices via electricity in his spare time. But after a few years, he quit his jobs and devoted himself to his experiments. He kept on a few students, whose families loaned him money to help him with his experiments, seeing how his work could improve the lives of their loved ones.

In 1874, he built a telegraph machine which sent several telegraphs at the same time over a single wire. Each message was sent as an electric pulse with its own frequency of AC. He was determined to find a way to make it transmit the human voice, but he didn't quite understand the science behind it. He hired an electrician named Thomas Watson to help him build his inventions. In 1875, he patented a device called the telephone. On the day it was patented, it actually wasn't ready! He hadn't succeeded in transmitting sound yet, but three days later, Bell was able to say "Mr. Watson, come here. I want to see you," over the phone. In the months after, he continued to make tweaks to his phone and was able to transmit speech over longer and longer distances. As he improved his device, more and more people wanted to have a telephone in their homes and businesses. The next year he founded the Bell Telephone Company, which became part of AT&T.

We tend to think of a sound wave as something that travels through the air. Sound is actually passed from molecule to molecule, and it travels through liquids better than gases, and through solids better than in liquids. This experiment is designed to test whether the human ear can hear sounds more easily through a gas, liquid or solid.

Materials:

- A swimming pool
- Two tin cans
- 20 meters of heavy-duty string
- A friend to help
- An adult with a drill
- (optional) A decibel reader

You can borrow a decibel reader from your school's science lab if they have one available. If not, you will need to do your best to keep your voice at a constant volume during each phase of the experiment.

Experimental Procedure:

1. Begin by testing how well you can hear sounds in the air. Stand ½ meter from your friend and speak one word at a normal volume.

2. Record the word you said. You will compare results with your friend at the end of the experiment. Use chart such as the one below.

3. Have your friend record the word that you said on their chart.

4. Move to a distance of 1 meter.

5. Say a different word at the same volume. If you have a decibel reader you can check to see if you are speaking at a constant volume.

6. Record the word you said.

7. Have your friend record what they heard you say and how loud they thought your voice was on a scale of 1 to 10.

8. Move to a distance of 5 meters, then 10 meters, then 15 meters, then 20 meters. Repeat steps 5-7 for each movement.

9. Continue the experiment by finding a swimming pool. You or your friend may have access to one at home or you may visit the community pool. It helps to visit the pool at a time when there are few other swimmers.

10. Hold your breath and go underwater with your friend.

11. Remain underwater at a distance of 1 meter from your friend.

12. Say a word. Try to speak at the same volume you did while you were on the land. Remember to enunciate clearly.

Experimental Procedure (continued):

13. Record the word you said.

14. Have your friend record what they heard you say and how loud they thought your voice was on a scale of 1 to 10.

15. Move to a distance of 5 meters, then 10 meters, then 15 meters, then 20 meters and repeat steps 10-14 for each movement.

16. Next, you will simulate being inside a solid by making a simple tin can telephone. Have an adult drill a hole in each of the tin cans just large enough to fit the string through. Insert one end of the string into one of the coffee cans. Tie a knot on the inside of the can on the end of the string so it doesn't slip out. Do the same for the other coffee can.

17. Stand 1 meter apart from your friend.

18. Pull the string until it is tight between the two cans. The string will come out the middle of one or both cans.

19. Speak one word into the coffee can.

20. Have your friend listen by placing the can against their ear. Record the word you said.

21. Have your friend record what they heard you say and how loud they thought your voice was on a scale of 1 to 10.

22. Move to a distance of 5 meters, then 10 meters, then 15 meters, then 20 meters and repeat steps 21-24 with each movement.

23. Compare the results you have recorded.