Perception of Direction with Sounds  
(Speed of Sound)

Physics Concept
We are able to determine where sounds come from because we have two ears, a smart brain, and because sound travels at 330 m/s (about 1000 feet/second). Most people can determine a time span of less than 1/1000 second with their hearing.

Materials
A 1/4 inch diameter rubber tube about 4 feet long. A pencil.

Method
Have a student hold one end of the tube to each ear with the tube passing behind her back. Another person stands behind her and taps on the tube with the pencil. This produces a sound that goes independently from the point where the tube was tapped to each ear. If the tap is closer to the right ear, the listener hears the sound as coming from the right side. If the tap is closer to the left ear, the listener hears the sound as coming from the left side. If the tap is made near the center of the tube the listener cannot tell the direction of the sound.

For most people there is a section of the tube about four inches long where the listener cannot tell the direction. This is because the listener’s brain cannot separate sounds that are closer together than the time it takes for sound to travel about four inches or about 3/10,000 of a second.

Question
What happens to your hearing sense of direction when you are underwater? Sound travels through water at 1480 m/s. You might want to try this at a swimming pool, using a metal pan or a bell to make sounds underwater.