

The Speed of Sound

[CHIMES] The speed of sound is dependent on the medium it travels through. But if there is no medium, there can be no sound.

There is no sound in space.

There are no molecules to act as a medium, to move the energy of the sound vibrations. And so space is soundless.

[SINGING]

So then how do astronauts hear? Their space capsules and spacesuits hold air so they can breathe and hear. Sound always needs a medium to travel, and the speed varies somewhat depending on the temperature.

At room temperature, the speed through the air is 343 meters per second, or 1,125 feet per second. At freezing point, sound travels at 332 meters per second, or 1,089 feet per second.

[WHALE CALL]

But sound travels much faster in both liquids and solids. In the ocean, it travels at 1,525 meters per second, or 5,000 feet per second. And in solids, much faster still. In Earth, sound travels at 3,350 meters per second, or 11,000 feet per second. The question is, why are there these differences in the speed of sound?

The molecules in water are much closer together than in air, and in solid material they are packed even closer. In a dense medium, the sound vibrations do not have as far to travel. This is called the elasticity of the medium. The more elastic the medium, the faster the sound waves will travel.

Seismic waves from explosions--

[CRASH]

--and earthquakes send a very intense longitudinal waves with huge amplitude, the same as sound waves. But they also transfer energy through transverse waves. These disturbances of energy can travel up to seven times faster than the speed of sound in air. The waves can be of such magnitude that hillsides blow up and buildings collapse.

[RUMBLING]
