

Suggested Internet Resources

Periodically, Internet Resources are updated on our Web site at www.LibraryVideo.com

- physics.hallm.ac.kr/education/wave/music/teachgde.html
This "What Makes Music?" teacher's guide is part of an online exhibit at the Franklin Institute, with pages designed to teach students how sound is made, how it travels, and how it is heard.
- www.lhs.berkeley.edu/shockwave/jar.html
An interactive Web site from the Lawrence Hall of Science encourages the investigation of sound waves using virtual "instruments."
- eduscapes.com/42explore/musicmnts.htm
This site contains a number of great links to information about musical instruments and includes simple plans for building your own.

Suggested Print Resources

- Brain, Marshall. *How Stuff Works*. John Wiley & Sons, Hoboken, NJ; 2001.
- Levine, Robert. *Story of the Orchestra: Listen While You Learn About the Instruments, the Music and the Composers Who Wrote the Music!* Black Dog & Leventhal Publishing, New York, NY; 2003.
- Macaulay, David. *The New Way Things Work*. Houghton Mifflin, New York, NY; 1998.

TEACHER'S GUIDE

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The Way Things Work Video Series

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Teacher's Guides Included
and Available Online at:



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Musical Instruments

Grades 3-6

Journey to Mammoth Island, a whimsical place where investigating scientific principles is always an adventure. Olive, a young girl, assisted by the Island's mammoth population and a visiting inventor helps the locals discover why and how machines work. Science facts are clearly demonstrated, giving kids an opportunity to see how important everyday machines are linked together by the science that drives them. Students come to see that science is a way of organizing information about the world, explaining why things work the way they do and allowing us to predict what might happen in new situations.

This guide provides a brief synopsis of the program, background on the science concepts presented, discussion topics, additional activities, vocabulary and suggested print and Internet resources.



Program Summary

In *Musical Instruments*, inhabitants of Mammoth Island invite a visiting inventor to a concert of mammoth proportions! (Instead of playing instruments, the Islanders rely on musical mammoths for entertainment.) After the performance, which includes a rather dangerous stampede, the inventor shares what he knows about musical instruments with a younger Islander named Olive and her friends.

A sound wave with a high frequency vibrates more rapidly than a sound wave with low frequency. The faster the sound is vibrating, the higher the pitch. A whistle is a sound with high pitch. The slower the vibration — as in a low rumble — the lower the pitch of the sound. To make music, we purposely mix different instruments of different pitch.

Wind instruments depend on the vibration of a column of air to produce sound. The column of air vibrates when wind is blown into or across an instrument. There are two types of wind instruments: woodwind and brass.

Woodwind instruments use vibrating air to produce many different musical sounds. Despite their name, they are not all made of wood. The flute and piccolo create sounds when players blow across a hole in the instrument. The column of air vibrating through the instrument creates different tones based on the fingering of the player.

Woodwind instruments such as the saxophone need a reed to make the air columns vibrate. A player blows air through the reed, the vibrating reed sets the air inside the instrument in motion, and this creates the sound.

Brass instruments include the trumpet, the trombone, and the tuba. Brass instruments are really just long metal tubes that flare at the far end. Because they are so long, the tubes are bent and folded into compact shapes. Brass instruments are played by vibrating the lips and pressing them against the mouthpiece of the instrument. This causes the air column to vibrate and create sound. Higher or lower pitch can be produced in these instruments by changing the length of the air column.

Stringed instruments all use vibrating strings to make sound. The strings are made to vibrate by the musician, who either strums or plucks the strings with his or her fingers, as with the guitar, or alternatively by using a bow, as with the violin.

Percussion instruments include any instrument that produces sounds when it is struck, scraped or shaken. The xylophone, the cymbals, and all types of drums are percussion instruments. By teaching the Islanders how to make and play a number of these instruments, concerts became less dangerous and more melodious!

Glossary

The following words are included for teacher reference and for use with students to extend the subject matter in the show.

amplify — To make louder.

amplitude — A measurement of how big a sound wave is.

energy — The ability to do work.

frequency — A measurement of how many sound waves pass a certain point in a second. Waves with higher frequency have more energy than waves with lower frequency. As the frequency, or number of vibrations increases, the pitch of a sound becomes higher. A low frequency sound is like a rumble; and a high frequency sound is like a whistle.

pitch — The position of a sound within the complete range of sounds. As the frequency, or number of vibrations, increases, the pitch of a sound becomes higher.

resonator — A chamber that helps intensify a musical tone. Xylophones produce different notes using resonators of different sizes under metal or wooden bars.

sound — A form of energy caused by the movement or vibration of objects. Sound waves travel at different rates of speed and have different intensities and frequencies.

vibration — Movement up and down, or back and forth.

wave — A disturbance (vibration) that moves energy from one place to another.

wavelength — A measurement of how long a wave is.

work — To move or change something. Doing work takes energy.

Pre-viewing Discussion

- What is the difference between music and noise?
- What are some examples of musical instruments? How does each one make sounds?
- How does sound travel?

Follow-up Questions & Activities

- A vibrating string produces very little sound. Therefore, most string instruments have a sounding board. Your students can investigate how the sounding board increases the intensity of a sound by stretching a rubber band between your finger and thumb. Pluck the rubber band and describe the loudness of the sound. Then have the students place the same rubber band around a pie plate and pluck the rubber band. They will find that the sound of rubber band is much louder.
- Have students experiment with and record the results made by blowing across and tapping three glass drink bottles containing different amounts of water. Ask them to guess why different sounds result from different situations.
- Have students investigate sound waves using various musical instruments. Challenge them to arrange a few common instruments in order from those that make low-frequency sounds, like a tuba, to those with high frequency sounds, like a flute.
- Play soft classical music and loud rock music. Have students color or paint pictures to show how the different music makes them feel.

(Continued)