Music: Science and Culture

Explore the science behind the music you hear, and learn more about cultural aspects of music.

MUSEUM OF ARCHAEOLOGY AND ANTHROPOLOGY

IUMUSEUM

Welcome!

The IU Museum of Archaeology and Anthropology is currently under renovation, but we are pleased to participate in ScienceFest! Our museum is dedicated to understanding and caring for the objects that people make and use—this includes everything from musical instruments and clothes to tools like cooking pots or hammers. As part of understanding the objects and the people who made/make and use/used them we use scientific skills like observation and classification and we use academic fields like archaeology, anthropology, folklore, and history in addition to chemistry, biology, and design.

This activity book will help you explore these and other questions:

What is sound?
What makes sound?
What is music?
What is culture?

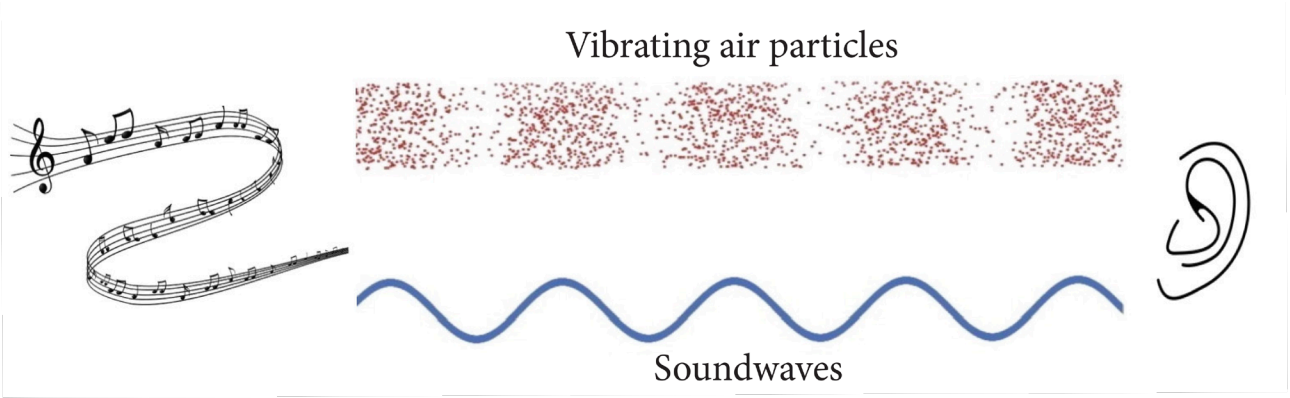
It also has instructions for a few instruments you can make at home using items that many people have in their recycling bins or kitchens.

Cover image: Kora, Mandigo people, Mali 1978-35-0001

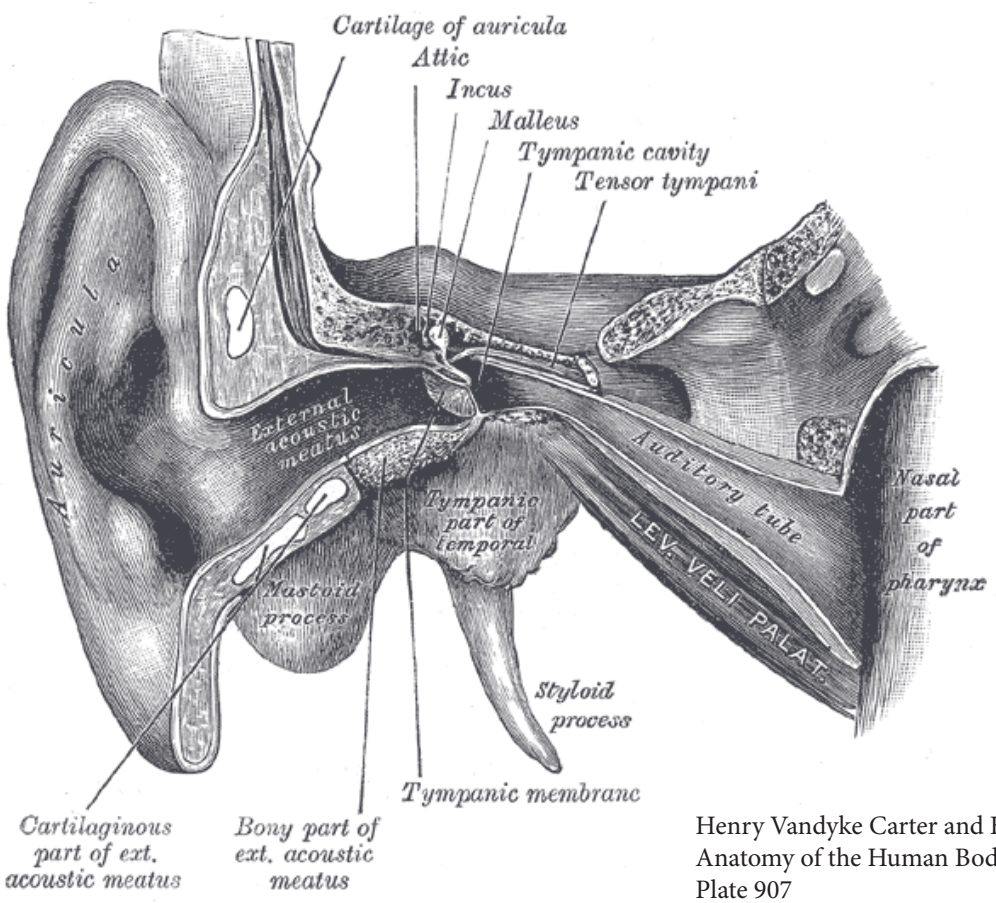
The Science of Sound

What is sound?
Sound is what you hear every day. It happens when dogs bark, cars honk, people speak, and when music plays.

What makes sound?
Sound is a type of energy caused by vibrations. These vibrations cause the air, water, or other medium around it to vibrate. Air vibrations that we can hear are referred to as soundwaves.



These soundwaves travel through the air and into your ear. Inside your ear are a membrane (your eardrum), small bones, and a special snail-shaped structure called the cochlea. These parts work together to transform physical soundwaves into electrical impulses that your brain recognizes as sound.



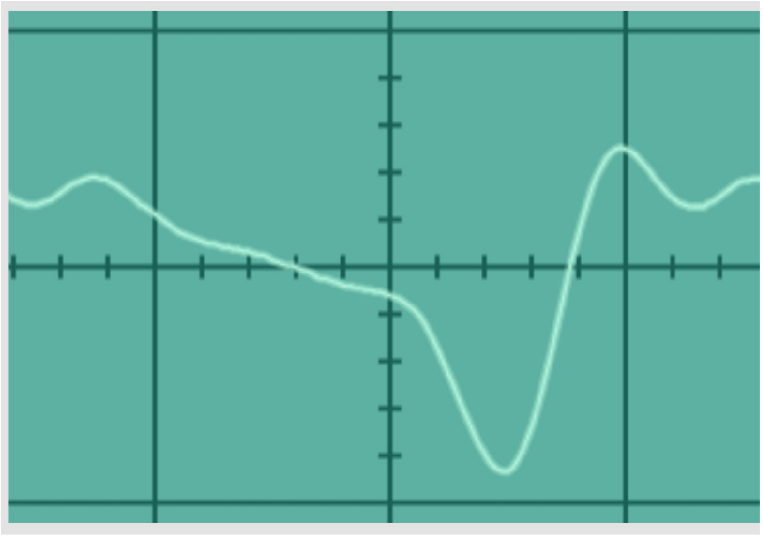
Henry Vandyke Carter and Henry Gray (1918) Anatomy of the Human Body, Gray's Anatomy, Plate 907

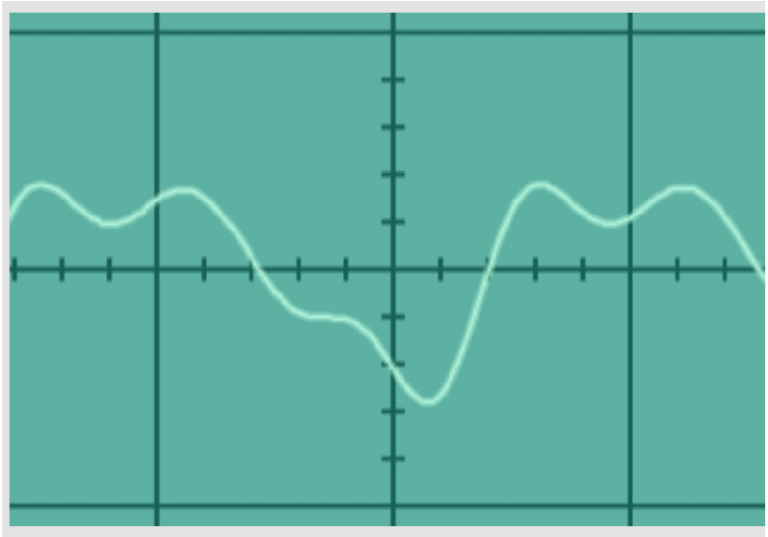
Seeing Sound

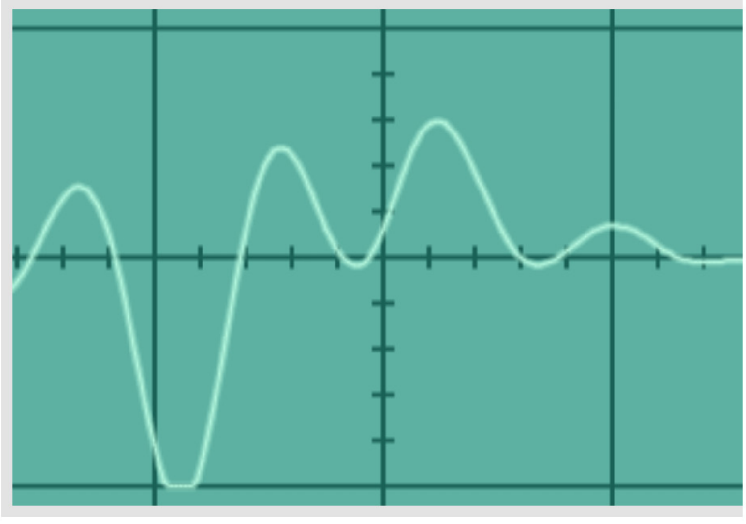
To see sound you need a special instrument called an oscilloscope. With your adult's permission you can download an app to a cell phone or tablet that does the same work as an oscilloscope. The oscilloscope makes the sound waves visible--now you can see how a dog's bark looks or what middle C on a piano looks like! Looking at oscilloscope images can be a little mysterious until you learn the different parts of the soundwave. Spend a little time learning the lingo and then try your hand at decoding the images. If you have downloaded an oscilloscope try investigating some different sounds. What does the soundwave from a kazoo sound like? What about a zither? (Instructions for making these are found later in this booklet!)

Useful vocabulary:
Wavelength: the space between the top of each wave.
Pitch: the degree of highness or lowness of a sound.
Frequency: the number of times per second a soundwave repeats itself. The greater the frequency the higher the pitch. The lower the frequency, the lower the pitch. Frequency can also be thought of as the speed of the vibrations.
Amplitude: the height of the soundwaves. Larger amplitudes mean louder sounds, smaller amplitudes mean quieter sounds

Look at these oscilloscope images. Can you describe the sounds being pictured? Low? High? Loud? Soft?







Musical Instruments: what's making that sound?

Music is created with sound, and that sound is created by vibration. So this leads to an interesting question. Have you ever stopped to think about what part of an instrument is making the sound? Different instruments create vibrations in different ways. At times the musician blows into an instrument, at other times they might strike it or pluck it or strum it or shake it. There are many ways to create vibrations.

Our museum uses the different ways instruments create vibrations to help us categorize the many instruments in our collection. This to a special system called the Hornbostle-Sachs Taxonomy. This system puts instruments into groups according to what vibrates to create the sound you hear.

Nagaphani, Aerophone, Nepal 1974-02-04

Aerophones use air to make the air vibrate, typically by blowing or twirling. Examples are flutes, trumpets, bullroarers etc.

This aerophone is called a *nagaphani* and is from Nepal where it is used in Buddhist ceremonies. It was collected in the 1970s by a scholar working in Nepal.

Charango, Membranophone, Argentina, 1967-35-0005

Chordophones cause air to vibrate by setting a string or cord into motion through plucking or bowing. Examples are violins, guitars, cellos, etc.

This chordophone is called a *charango* and is from Argentina. They were historically made with armadillo exoskeletons but are often made from wood today.

Musical Instruments: what's making that sound?

Xeti-xie, Idiophone, Brazil, 1980-13-0012

Idiophones make sound when they are struck and the object starts to vibrate. Examples are bells, cymballs, xylophones, etc.

This example was came to the museum in the 1980s from Brazil. It is called a *xeti-xie* and it is important in dances.

Membranophones make air particles move when a stretched, flexible membrane/head is struck and starts vibrating. Examples are snare drums, djembe, etc.

The *assotor* in the photograph to the right is a very special drum for people who practice Voudun, a religion common in Haiti. This drum is 67 inches tall and was collected in 1938.

Assotor, Membranophone, Haiti, 1986-12-0281

Music and Culture: Sound

The music we think of as normal is due in part to something called enculturation. This word refers to the process by which we learn about our surrounding culture and what is considered appropriate, preferrable, desirable, etc. It applies to manners, how we learn, how we worship, and so much more.

But wait, what is culture anyway? Culture is a set of shared understandings about the world and how to do things in it. It is shared among a group of people, sometimes these people share a geographic space, and other times they do not. For example, there are English people who live in the United States but still observe English customs and are culturally English.

Take a few minutes and think about the music you like. Why do you think you like it? Is it something your parents listen to? Is it something you hear at school or in the grocery store?

Listening exercise:

Go to YouTube and search for Angklung. Pick one or two videos to watch. How is the sound different than what you are used to? How is it the same?

Try the same thing with a Mbira/lamellophone.

Spend some time exploring other instruments you might not be familiar with. To find some, search for a country's name and the words "musical instrument". What did you find? Which one is your favorite?

Music and Culture: Uses*

Have you ever sung "Happy Birthday"? Why? It was someone's birthday, right? But what is the deeper reason? It is because in American culture it is considered appropriate to sing that song on someone's birthday. Music serves cultural purposes: it marks special occasions, it creates social bonds, it helps us have group identities, and it can be used to help engage in protest. It can also be very important to celebrations like birthdays, weddings, coming of age ceremonies like graduation, or even funerals.

Music helps us create social bonds, and can be a way we announce our identity. Have you ever heard the bagpipes? What place or culture do you associate with that instrument? Did you say Scottish or Scotland? You'd be right! That instrument has come to signal a particular place and culture. Cultures aren't just associated with countries though, they can apply to other groups like scouts or schools. At Indiana University many students know the school's song. Knowing it, and when it is appropriate to sing it, signals that you are part of IU. (If you sing it while you are washing your hands you'll know you've washed your hands for long enough!)

Music plays other important cultural roles as well. It can be a form of shared memory that unites cultures that might be spread out around the world, and music helps create a space for us to participate in culture, often our own, but other times not. What examples can you think of?

Music can also be used to engage in protest or politics, both of which are part of culture. What songs can you think of that are associated with protest? One of the most famous in the United States is "We Shall Overcome." This song served as the unofficial anthem of the Civil Rights Movement of the 1960s and continues to be a well-known song today.

Historically another important function of music has been to tell stories and remember histories. In some European cultures the person responsible for doing this was called a bard. In parts of West Africa the French word *griot* has been used for these very important people. You can listen to a griot performance at this link: https://www.youtube.com/watch?v=xaBvnG13qlo&feature=youtu.be

If you were writing a song about this year and important moments in it, what would it sound like?What would the words be?

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If you are interested in more on this topic please consult
Lidskog, R. (2016), The role of music in ethnic identity formation in diaspora: a research review. International Social Science Journal, 66: 23-38. doi:10.1111/issj.12091

Instrument Building

On the following pages are instructions for making your own instruments.

The materials being used can be found in many homes' recycling bins, junk drawers, or craft supplies.

Zither:
Egg carton
rubber bands of varying thicknesses

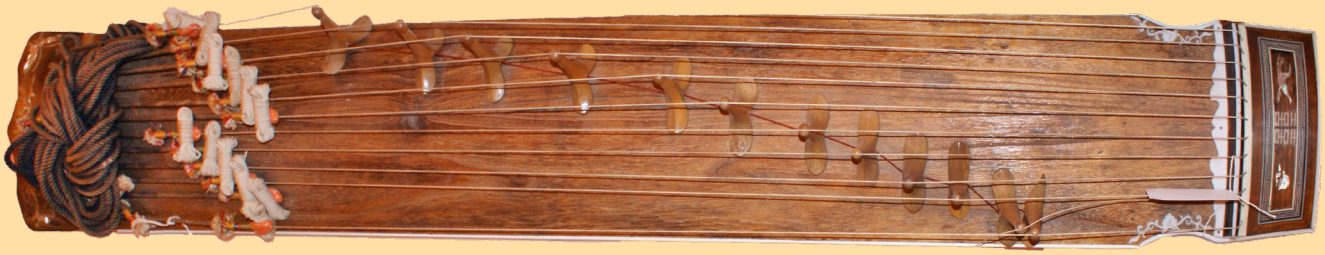
Panpipes:
2-3 drinking straws
scissors
tape (Scotch tape, masking tape, or painters tape are good choices)
Stickers or markers (optional)

Kazoo:
paper towel or toilet paper tubes (1 per instrument)
rubber band (1 per instrument)
wax paper (1 square big enough to cover the end of the tube plus a two inch border)
markers/crayons

Please remember to be safe, and to be respectful of the materials and the people you are working with.

Instrument Building Challenge

Now that you know how instruments make sound, can you invent your own instrument? You might want to build the zither, panpipes, or kazoo first to give you some ideas. Be sure to ask an adult before using materials. We'd love to see what you built! Tag us on social media with a photo of your creation or send it to museumed@indiana.edu.



Zither

A zither is a musical instrument whose strings go all the way across its body. Zithers come in many shapes and sizes and can be found all over the world!

In Korea, one of the most popular traditional instruments is a zither called a ***kayagum***. It typically has 12 strings, though some have 18! This type of zither is called a trough zither because its soundboard is shaped like a trough, or a long, shallow bowl.

Look online to see tube zithers, trough zithers, and others. What could you use to make your own?

We'll be using egg cartons to make our own trough zithers!

1. Decorate an egg carton lid with markers.

2. Choose 3 or 4 rubber bands to be the strings on your zither. Wide rubber bands will make lower sounds, and skinny rubber bands will make higher sounds.

3. Stretch the rubber bands lengthwise around the egg carton lid.

4. Pluck the strings to play your zither!

Panpipes

Panpipes date back to at least ancient Greek times, where they were played at feasts and rituals. Today, they are found around the world, from Australia to Peru and are used by different cultures. In some places, they are a shepherd's instrument, while in others they are played by professional musicians.

Panpipes are made from different lengths of tubes. The most common material is bamboo, a type of grass. Grasses called reeds are used because they produce naturally hollow tubes when cut. The tubes are arranged from smallest to largest in size. There are usually between four and eighteen tubes, and they are held together using cane, flax, or wax.

Panpipes are played by blowing across the top of the pipes. They are usually played with other instruments, such as drums, in order to make a musical ensemble or band.

Instructions:

1. Select five straws and cut them so they are different lengths. They will be taped together, so make sure none are too small!

2. Arrange the straws from smallest to largest.

3. Use tape to keep the straws in place. Go around the straws a few times so you don't lose any.

4. Decorate your panpipes with markers, stickers, string, or other things.

5. Blow gently across the top of your panpipe to see what sound it makes!

6. What other materials might work? How does switching the material change the sound?

Kazoos

The kazoos we know and love are a type of *mirliton*, an instrument you play by singing, speaking, or humming into it. A membrane changes the sound of the voice. The simplest form of *mirliton* are combs covered with paper.

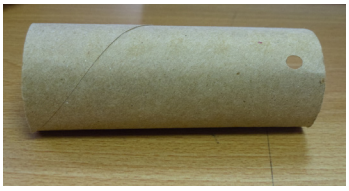
The instrument we call the kazoo originated in the United States in the 1850s and was important in Black American music. It was common in vaudeville music, early jazz bands, and country string bands.

Over time the kazoo was less often used in everyday music, though there are still musicians who use them! And there are even composers who write about them: *The Danse des Mirlitons* in Tchaikovsky's *The Nutcracker* is one example.

Make your own kazoo at home!

1. Select a toilet paper roll for the body of your kazoo.

2. Punch a hole half an inch from the end of the tube.



3. Decorate the roll with paint, crayons, or markers.

4. Put a square of wax paper over the end of the tube closest to the hole you punched.

5. Secure the wax paper with a rubber band.

6. Hum into your new kazoo! This is tricky, but you can't blow, you have to hum loudly.

7. Can you figure out what is vibrating to make the sounds you hear?