



# Artists on Tour

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Holly's Harps

*Assembly: The Science & Math of Harp Music*  
and  
*Hands-on Harp Workshop*



## STUDY GUIDE

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# BACKGROUND: WHY HARPS?

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- A small harp is easily managed by a child seated on the floor. (In the youngest grades, two children work with one harp.) No chairs or music stands are necessary.
- Beginning harp technique is simple. Learners produce pleasing sounds from the first try.
- The layout of notes on the harp makes it an ideal instrument for teaching basic musical concepts such as high and low notes, up and down, intervals, patterns, conjunct and disjunct motion, etc.
- The harpist/educator encourages children to learn using several senses to hear, feel, and see what we are doing. Simple tunes are easily learned, and even preschoolers can play a song using string colors as a guide. Children gain a sense of accomplishment in a short time.
- In assemblies, the harp is an item children rarely have seen. The large harp captures students' attention and the age-appropriate activities keep their interest. The children's fascination with the instrument itself allows the harpist to effectively introduce or reinforce concepts in music, science, history, language arts, and cultural studies.

## OVERVIEW

Depending on the activities your school has chosen, your students may be involved in:

- **ASSEMBLIES:** Students will learn about harps, hear music played (usually on more than one type of harp), learn some basic musical concepts which transfer to other musical instruments and even to vocal music, and explore scientific concepts, historical thinking, and language arts. For older groups, topics also include music-related careers, the secrets of practice for mastery (of anything, not just music!), and the role of the arts in students' own lives. Assemblies include a Q&A.
- **PRIMARY HARP WORKSHOPS (LEVELS PRE-K THROUGH 3<sup>RD</sup> GRADE):** Students use their "own" harps for firsthand learning about vibration, high and low notes, patterns, sequencing, starting and stopping sound, notes and rests, etc. Students learn one or two simple songs, play along with the big harp, get close-up to the big harp to see how it works, review vocabulary in music and science, identify and describe specific sounds, use several languages, and put together a sentence in American Sign Language. If time allows, a performance for peers, parents and community is optional.
- **INTERMEDIATE HARP WORKSHOPS (MIDDLE OR HIGH SCHOOL):** Each student has his or her "own" harp for the session. Students learn to play one or two songs; work on solo, small group and ensemble skills; try melody, harmony, and variation form. Learners use the harps to test the scientific concepts introduced in the assembly, exploring acoustical science and related mathematics at a level appropriate for the age group. In some classes, students consider the music they are learning in historical context, and relate music to visual art and dance. During multi-day residencies, students build skills in daily sessions, do more interdisciplinary work, take harps home to practice, and participate in a performance. (Performances for local senior centers are encouraged!)

# BASIC VOCABULARY, CONCEPTS, PRE-VISIT ACTIVITIES

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## CLASSROOM ACTIVITY AND DISCUSSION POINTS: WHERE DO WE FIND HARPS?

Have student ever seen a harp? Some may have seen a real harp in an orchestra, in a restaurant or at a wedding. Some may be familiar with images of harps in religious iconography. Make a list of places students have seen harps. Make a list of words students associate with a harp. It is likely that some ideas about harps will be prominent, e.g. harps will be associated with royalty or wealth, with a particular country or culture, with religious figures, or even with certain colors. These common notions are rooted in some historical fact, although, as with anything with a long history, the reality is even more complex.

Harps come in many sizes and styles. Many students probably will associate harps with Celtic cultures, but they may not know that harps are found in Africa, Asia, and Central/South America as well as Europe and North America. If you look at a globe, you can see that harps are found literally around the world. The earliest harp-like instruments that we know about were created over 5,000 years ago. Since harps are made of natural materials that eventually turn to dust, what types of evidence can students think of which would tell us about musical instruments played in ancient Egypt?

## CLASSROOM ACTIVITY AND DISCUSSION POINTS: FAMILIES AND INSTRUMENTS

Harps have strings. On the modern harp some strings may be made of metal, some of nylon or plastic, and some of other substances. Children will notice that harps strings are made of stiffer materials than, say, kite string. But just like the string of a kite being pulled by the wind, harp strings are tight because they are attached to something at both ends. The verb used to describe putting string on a harp is “to string.” The strings are strung from one part of the instrument (a resonator or sound box) to another part (a neck or crossbar).

The harp is a member of the **STRING FAMILY OF INSTRUMENTS**. Other musical instruments which are not harps also have strings and are members of the same family. If asked to name other instruments in the string family, students might think of violin or fiddle, viola, cello, bass, guitar, mandolin, dulcimer, autoharp, banjo, and more.

Other families of instruments include the **WOODWIND FAMILY**, the **BRASS FAMILY**, and the **PERCUSSION FAMILY**. Some students may be able to name an instrument in each group or identify common characteristics of each family. All the different instruments in a family of instruments have something in common, just as all the people in a student’s family have something in common. If intermediate students are studying instrument families, ask if they think a piano is a stringed instrument or a percussion instrument. (A piano does have strings inside, but is considered a percussion instrument because the strings are struck by a hammer.)

Even if you have real musical instruments in your school, it is fun to invent (or make from instructions) and play instruments which can be classified in one of the families above. Numerous ideas for such instruments are found in some of the books listed, and on the web. An “orchestra” of these instruments can be made from all kinds of common items.

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## CLASSROOM ACTIVITY AND DISCUSSION POINTS: ABOUT SOUND

To play a harp, we pluck the strings. Some other instruments in the string family can be plucked, while some are played with a special stick called a bow. Other plucked strings instruments that may be familiar to students include guitar and banjo.

1. To see how plucking works, have one person stretch a rubber band, and another person pull the band sideways and release it. It will vibrate (move back and forth very fast) and make an audible sound. If you pull and release quickly, you have plucked the string.
2. Try other experiments with sound production. Around the classroom or house you can find items to blow into, blow across, strike or rub. Most objects will create a sound when they vibrate. If two objects are touching and you set one in motion, the other also will vibrate. Try holding an aluminum pie plate between two fingers and hitting it with a pencil so it swings loosely. Then have someone hold it firmly with two hands while you strike it. How does the sound differ? Can (intermediate) students explain why? How much does the pie plate vibrate in each case? How long does it continue to vibrate in each case?

### **A Pedagogical Note for Teachers of Primary and Intermediate Students**

I take two approaches to the science of sound, depending on the age of your students. The real key to sound production (other than electronic sound production) is that when an object vibrates, it creates tiny, repetitive changes in air pressure that travel outward from the object to your ears. Note that this is not quite the same as saying that the air moves (as in a breeze). However, air moving like a breeze is the concept more readily grasped by primary students. With primaries, we will explore how moving air can make something vibrate, and the vibration produces a sound. We will also note that an object in motion can make the air around it move. While both of these are true, the more sophisticated science of sound is more effectively introduced at intermediate levels. If you are an intermediate teacher, read on!

When science books picture sound in a wave pattern, the concept they are targeting is frequency, or how often something occurs over a given time. But—frequency of what??? The answer is, frequency of those tiny, repetitive changes (cycles) in air pressure that the vibrating object sets in motion. Frequency refers to the number of repetitions over a given time (e.g. per second) and different frequencies produce higher or lower sounds. Diagrams of sound waves reflect the fact there can be fewer or more repetitions over a period of one second. In an intermediate assembly we will demonstrate why sound is said to move in waves, what those textbook diagrams tell us about frequency and pitch, and how we use that information to produce the exact notes (pitches) we desire on a musical instrument. Frequency is also the key to understanding other forms of energy, e.g., light, radio waves, and microwaves. These also travel from place to place in waves. We will focus on sound.

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## CLASSROOM ACTIVITY AND DISCUSSION POINTS: HIGH AND LOW NOTES

The harp has strings of many different lengths: the shorter the string, the higher the **PITCH (NOTE)**; the longer the string, the lower the pitch. The vibrating length determines the pitch (the amount of tension also makes a difference).

1. Try the rubber band experiment with bands of different lengths. Does a smaller band make a higher or lower sound than a longer one? Does tightening or loosening the band make a difference in pitch? (When you get close to a harp, you will see that length, tension and even thickness of a string are different for different notes.)
2. Line up several glass bottles or jars of the same size, each containing a different amount of water. When each bottle is struck, it will make a different pitch. If the bottles are the same size, what makes the difference in sound? How much air is in a bottle that is one-quarter filled with water? How much air is in a bottle that is half full, or almost completely full? Which one makes the lowest note? The highest?
3. Experiment with really high or really low pitches using a set of bells, or other instruments in graduated sizes. Students will be able to sing some of the notes, but others will be too high or too low. Grown-ups can demonstrate that their own voices may go lower than the children's, but still not as low as the lowest note on a piano. (It is hard for students to visualize the relationship between size and pitch without looking at the length of strings inside a grand piano, because all the keys on the piano are the same size. However, the concept of moving from low to high is certainly piano-friendly, and the lowest notes on the piano are indeed beyond the reach of adult voices.)

# ADDITIONAL TOPICS

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Some of these topics are suitable for all ages; others are more approachable by intermediate or middle school students. These topics, related to history, social studies, physics and cultural studies, may be developed further according to your group's current related studies.

## HARP HISTORY

The first harps were probably fashioned after hunting bows. Harp strings make sound the same way a bow string does when the arrow is released. What part of the bow is vibrating the most?

Students can speculate on materials used to make the first harps. What might have been available a few thousand (or even a few hundred) years ago? Some harp strings today are made of nylon or plastic. Long ago, before the invention of plastic, what might have been available with which to make a string? What materials might have been hollowed out (or might have been naturally hollow) to use for the sound box?

Long ago, musicians were employed by powerful, wealthy people. Long before radios, televisions, or stereos, if people wanted to enjoy music, "live" musicians had to play instruments (or sing). People who could afford to show off how important they were might employ many musicians so there would always be music in their household. Sometimes people wanted to dance, and musicians played songs to dance to.

Musicians long ago also had a special job of telling stories with their songs. Before there were any newspapers or computers, people learned the "news" by hearing it from other people. Musicians could make up songs about events and sing the songs in many towns so everyone would hear the news. People who could not read also learned about their religion from songs. Some musicians traveled around singing songs that told everyone the news. In some places, these musicians were called troubadours. Some troubadours played the harp to accompany themselves when they sang. (If I accompany you someplace, I go with you. If I accompany you while you sing, I can play my harp to make your song even prettier. In a harp workshop, you can play a song and I will accompany you on the big harp.)

## MECHANICAL ASPECTS OF THE HARP

Changing the pitches of strings is done in two ways:

1. The harp is tuned. The strings are wound around a metal peg, and the harpist can turn the peg using a special tool called a tuning key. When the peg turns, the string becomes tighter or looser. What happens to the pitch when the string gets tighter or looser?
2. The harpist makes temporary changes with her or his feet. A modern harp (the large harp we see in the orchestra) has seven pedals near the bottom. Pressing on the pedals makes parts inside the harp move. In smaller assemblies and in workshops, we can get close to the big harp to see this somewhat complex mechanism. Not all harps have pedals. The harps the students will play do not have pedals.

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## MELODY, HARMONY AND SPECIAL SOUNDS

On a harp, you can play the melody of a song. **MELODY** is what you sing when someone asks you, “How does that song go?” You can also play **HARMONY**. While some students in a workshop are playing the melody, other students can play different notes at the same time. Those other notes are the harmony. The harmony is also called the accompaniment.

A professional harpist uses two hands at the same time to play both the melody and the harmony by herself or himself. Not all instruments can play two notes at exactly the same time. Guitars and pianos can, but a recorder or a trumpet can make only one note at a time. A person can sing only one note at a time. The sound of one person singing with no accompaniment is a **MONOPHONY**. Intermediate and middle school students can look up this word and related words like **POLYPHONY**. If I use two hands, does the harp make monophonic or polyphonic music?

A harp can be played **SOLO**. This is a word from the Italian language that means “alone.” A harp can also be played in an **ENSEMBLE** (a word from the French language), or group of instruments. I will play solo, and we will also play songs together in an ensemble.

Another Italian word is **GLISSANDO**, which means “glide.” It describes the sound you get when you slide a finger across many strings very fast. We will learn to identify this sound and produce it on our harps.

## PHYSICS

Harps are usually triangle shaped, for good reason. With older students we can discover why the harp does not explode or implode with the 4000+ pounds of pressure placed on it by tight strings.

# POST-VISIT ACTIVITIES

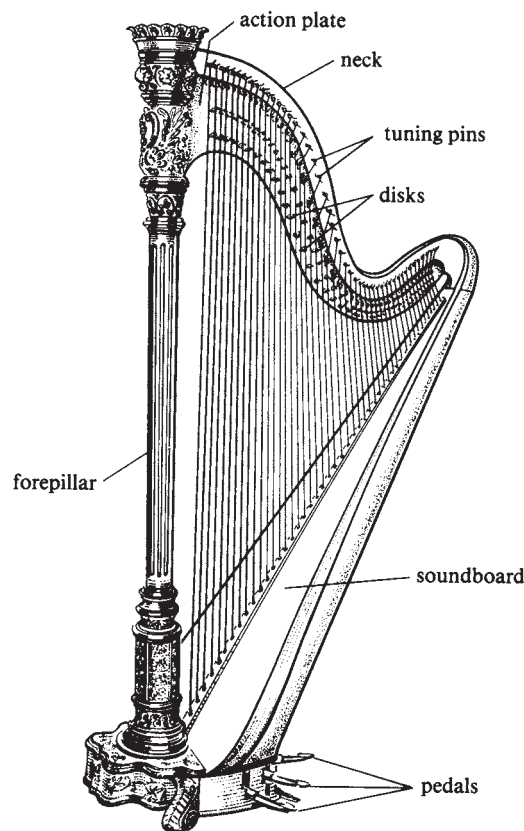
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Doing some of the pre-visit activities again may help solidify the concepts and vocabulary from the program. In addition, below are some activities for review.

## NAMING HARP PARTS

Parts of the harp have the same names as parts of our bodies. Children can find these parts on the harp picture. The back of the harp is the part where the sound box is (not really visible in the picture but by now students know where to find the sound box!) The neck is the curved, horizontal part across the top. At the very bottom on the floor are the feet. Kids are amused that on the harp, unlike on people, the neck is attached to a part called the knee! That part (the curved part, upper right of picture) looks like a bent knee.

Other parts students probably will be able to identify after the harp activities include the column or pillar, the sound box, and the pedals. Sometimes I bring a harp with a “crown” on it, as in the picture.



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## PATTERNS AND SEQUENCING OF HARP STRINGS AND NOTES

The picture of a harp has 47 strings. Some harps have a different number of strings. But all large harps with pedals (as well as the small harps you will play in workshops) have strings arranged in patterns of colors. The colors are red, blue, and white, although the “white” strings may be off-white, clear, yellowish, or silver metal. After you have seen a harp close up, you will know the pattern of colors. You can count how many strings are between the red and the blue, and how many are between the red and the next red. This pattern is always the same on every harp. You can color the strings in the same patterns of red, blue, and “white.”

- What color was the wood of the harp? What color was the crown?
- See if intermediate students remember a word for a group of 8 notes (1, 2, 3, 4, 5, 6, 7, 1). If a word begins with the prefix “oct-,” what number does it refer to?
- You can’t see all the pedals in the picture, but intermediate students may remember that there are 7 pedals on the large harp, corresponding to the notes they have learned (1, 2, 3, 4, 5, 6, 7, 1). Remember that after 7 we find another 1, and that’s why we don’t say “8.” The pattern repeats all the way to the top.

## USING OTHER INSTRUMENTS

Intermediate students often enjoy reproducing our harp songs on other instruments. Pitched bells or Orff instruments work especially well. Students who play any other instrument may be able to play any of the songs we learned. This is a good opportunity to review the elements of music we worked with: melody and harmony parts, some variations, note names or numbers, counting patterns, and relative lengths of notes. Students should be able to identify what part of another instrument is vibrating when they play. (Note: in a wind instrument the thing that is vibrating is a column of air inside the instrument.)

# A FEW REFERENCE WORKS

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***The explosion of information technology has rendered any attempt at “suggested bibliography” obsolete. There are thousands of books, videos, CDs and websites out there on topics related to items in this study guide. Still, I can’t help offering a couple of quirky recommendations.***

For a fun, clear lesson in sound waves, try this website: [www.acoustics.salford.ac.uk/schools/](http://www.acoustics.salford.ac.uk/schools/)

For some useful books, try:

Ammons, Mark. *Music A.D. 450-1995*. Carson-Dellosa, 1996.

Part of a series introducing arts to intermediate students and middle schoolers. Relates music to history, geography, math, science. Timelines, puzzles, summary questions.

Ardley, Neil. *Music*. New York: Knopf, 1989.

Part of the EYEWITNESS BOOKS series, a beautifully photographed volume packed with historical, cultural, scientific and musical notes on instruments from around the world. Easily followed but with a serendipitous feel.

Drew, Helen. *My First Music Book*. London: Dorling Kindersley, 1993.

Attractive presentation of ideas for experimenting with sound production and making instruments from common materials. Early primary.

Lutrell, Guy L. *The Instruments of Music*. Nashville: Nelson, 1977.

All the basics of sound production on many instruments. Technical explanations including a clear explanation of the technical side of the harp’s pedal mechanism.

Anything in the MILLBROOK ARTS LIBRARY SERIES.

*If you need more references to work with, feel free to contact me.*