

# ANCIENT EGYPT & ANCIENT ANDES

## MUSICAL ARCHAEOLOGY

### Tool Kit II



*MIM's Egypt display*

## Objective

Students are introduced to research methodology related to **musical archaeology**. Students will analyze informational text, such as photos, videos, and published studies, related to ancient Egyptian and ancient Andean civilizations and gain an appreciation for the musical legacies they left behind.

## Background Information for Educators

We know from archaeological evidence that music has always been an important component of human life, from ancient civilizations until today. Archaeologists unearth evidence from tombs, temples, and other sites that give us clues about the daily lives, technology, and values held by ancient peoples. These artifacts often include depictions of musical instruments, references to music in ancient texts, and sometimes actual musical instruments. Sometimes, these instruments are even playable. When they are not playable or when they are too fragile to play, ethnomusicologists can also use the science of acoustics to predict the sounds these ancient instruments made. Combining what they learn from the ancient instruments with modern music from the same area or culture group (such as musical aesthetics, instrument construction, and playing techniques), ethnomusicologists can make educated guesses about music in ancient cultures. This type of research is called **musical archaeology**.



*Kawala in MIM's Egypt display*

## Ancient Egypt

Based on evidence from Egyptian archaeological sites, there is no doubt that ancient traditions have influenced modern practices. Ancient murals and carvings on the walls of tombs and temples show us that music was integral to people's daily lives during Egypt's pharaonic period. Included in these murals are familiar instruments such as harps, lyres, reed pipes, and plucked lutes. Musicians are shown performing during rituals, weddings, and other celebrations, and even while working—a clear indication that music was part of all aspects of Egyptian life.

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MIM's exhibit highlights two important periods and their lasting legacies: the pharaonic period (3200–332 BCE) some five thousand years ago and the era of folk music that is still played today. Many of the modern instruments played by folk musicians in Egypt (and throughout the Middle East and Africa) have changed very little in the last four millennia! For example, we know that **flutes** were in use during the pharaonic period, thanks to evidence from murals and other surviving records. A contemporary example of these flutes on display at MIM is the **kawala** (kah-VAHL-ah). The *kawala's* construction and playing position are almost identical to what is depicted in the murals.

But, archaeologists have also uncovered ancient examples of these flutes, which are now kept in museums or private collections. Ethnomusicologists can study and learn from these examples because they can still be played and make sound. Using recording technology and the **science of acoustics**, researchers can recreate the notes these flutes once made, which provides clues about how the music might have sounded.



Sikus (panpipes) in MIM's Peru display

### **Ancient Andes**

**Panpipes**, called *sikus* in Peru, have been played in the South American Andean region for a long time. The panpipe is an example of an instrument type that has endured the test of time, the rise and fall of different cultures in the Andean region, Spanish colonization, and modernization. It is still a cherished instrument performed today in Peru and throughout the South American Andes. Today, *sikus* are made of cane or bamboo and are played in pairs. Sometimes two rows of panpipes are tied together and sometimes they are separated and played individually.



MIM's Ancient Andes display

In MIM's Ancient Andes display, there are examples of panpipes made of bone, ceramic, and reed identified with the ancient culture of the **Nazca people**. The panpipes made of bone and ceramic are between 1,400 and 2,100 years old! Because materials such as bone and ceramic last a long time without deteriorating (unlike bamboo or other woods), those are the most common examples available for today's musical archaeologists to study. One of the instruments on display, panpipes called **antara**, is still playable and its pitches were studied by one of MIM's curators. Ancient instrument examples like these are playable, with each pipe producing the same pitch and roughly the quality of sound the Nazca people intended when they made them nearly two thousand years ago. In the case of panpipes, each pipe plays one note. The **science of acoustics** dictates that the longer the tube, the lower the note. Conversely, the shorter the tube, the higher the note. What we can never know, however, is how panpipe players in the ancient Andes put these pitches together into the melodies, rhythms, and forms of their music.

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### Images, Videos (Click [here](#) for all images and videos)



*Antara (panpipes) attributed to the Nazca people in MIM's Ancient Andes display*



*Kawala in MIM's Egypt display*



*Sikus (panpipes) in MIM's Peru display*



*Image in MIM's Egypt display showing part of a mural from a tomb in Thebes*



*Video of a kawala being played*



*Video of an antara being played*



*Video of sikus being played*



*Tone generator*

**On The Discovery of the Ancient Egyptian Musical Scale**  
by

Prof. Mahmoud Effat    Prof. Fathi Salah    Prof. Robert Gibbis  
Institute of Arabic Music    Faculty of Engineering    California State  
Academy of Arts - Cairo    Cairo University    Univ. - Sacramento

**Introduction**

There is a lost link between the ancient Egyptian music and the music of other civilizations. This is due to the fact that there was no attempt to play the ancient Egyptian instruments and try to discover their features such as notes, scales, etc. The instruments that are preserved at the museums are of two categories: the string instruments and the wind instruments. The string instruments have, in general, an important difficulty which is, once they are mistuned, one can not rediscover their original tuning position. On the contrary, the wind instruments keep their original tuning by keeping their dimensions and the position of their holes. Investigating these instruments would reveal a lot about the nature of the ancient Egyptian music and its characteristics. An important problem in the wind instruments is the nature of the Egyptian flute which is normally played vertically. For this type of instruments the position of the mouth affects considerably the notes produced by the instrument. Fortunately, in the modern times, the Egyptian flute is played the same way. That is why an Egyptian flute player would be the most suitable person to test such instrument.

In order to carry this project a team was formed from specialists of oriental music, history of music, computer systems specialists and music scientists under the supervision of the staff of the Egyptian Antiquities organization of (EAO). The team had the following objectives:

- 1- Carrying precise measurement of all the wind instruments in the Egyptian museums with two purposes:
  - a. Checking the old measurements carried by Dr. Hans Hickmann
  - b. Completing the missing dimensions

### *“On the Discovery of the Ancient Egyptian Musical Scale” by Mahmoud Effat, et al.*

ROBERT STEVENSON

**Ancient Peruvian Instruments**

I

A variety of instrumental types and skilful fabrication sufficiently enrich their musical culture, then such early Peruvian peoples as the Nazca, Moche, and Chimu outstepped any of the aboriginal groups in Mexico or Central America. The Aztecs characteristically chose the heavy, well-sounded huastl and the two-pronged instrument for their favourite instruments. Melodic urges so little controlled their musical thinking that even their *tlapalcals*—the bone flutes with which Montezuma regaled himself when he fell—more often survive without than with fingerholes.<sup>1</sup> But as early as the Paracas horizon in Peru (beginning of the Christian era) bone flutes with unequally spaced holes and systems (*antara*) of six pipes in three pairs enter the bottle-shaped tombs of a people whose otherworld sounded with melody, and not just the beat of a log drum or the rhythmic tremolo of a two-key xylophone.

From Paracas Necropolis graves (c. 400 A.D.), located on one of the world's bleakest desert peninsulas, Jorge C. Muelle—director of the Peruvian Museo Nacional de Antropología y Arqueología—even took a 'mummy' bundled with some twenty-two pelican *albac* and llama *shaac*.<sup>2</sup> In three llamas and two pelicans, fingerholes have been drilled. The others have been prepared for drilling. The mummy itself may therefore well be the remains of an American musician who expected to continue pinning fingerholes in the next world.<sup>3</sup>

When the hole of a bone flute has been corrected by being partly refilled, or filled and another drilled in its place, as in specimens both at the National Museum and in the private collection of Arturo Jiménez Borja in Lima, the maker obviously sought a predetermined sound. But far more devious in proving pitch intention are the numerous systems which survive from the Peruvian archaeological past. Today in Lima, both the San Marcos University Museum (Samuelo 660)<sup>4</sup> and

### *“Ancient Peruvian Instruments” by Robert Stevenson*

MIM's Ancient Andes Display (November 8 2022 10:31)

Antara Pipe #	Note Frequency (Hz)	Approximate Pitch	Notes from MIM Collection
1	242	F4	
2	413.3	A4	
3	322	C5	
4	480	F#5	Quarter Note Antares EE
5	306.5	F5	
6	884	A5	
7	883.3	B5	
8	1038	C6	
9	1284	E6	
10	1312	F6	
11	1324	G#6	
12	1661	A6	
13	1812.5	B#6	Quarter Note Antares EE

### *Frequency Tables*

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#### Discussion Questions, Writing Prompts

Standards Addressed	Prompt
<p>English Language Arts, Middle School Reading Standards for Informational Text <i>Integration of Knowledge and Ideas</i></p> <p>Visual Arts, K–High School Creating <i>Generate and conceptualize artistic ideas and work</i></p> <p>Visual Arts, Middle School Responding <i>Cultural associations suggested by visual imagery</i></p>	<p>The <b>image</b> in MIM’s Egypt display shows part of a mural inside a tomb in Thebes. What instruments do you see? (<i>Harp, plucked lute, double single-reed pipes</i>)</p>
<p>English Language Arts, 3<sup>rd</sup>–5<sup>th</sup> Grade Writing Standards <i>Text Types and Purposes</i></p>	<p>Use either of the Egyptian murals (<b><i>Tomb of Niankhkhnum, Theban Tomb no.38</i></b>) included in the <i>Additional Resources</i> section and create a short story. If the mural were a “freeze frame” of a moment in time, what do you think happened right before it was “frozen”? Who are each of the characters represented in the mural? What are they thinking and doing?</p>
<p>English Language Arts, Middle School Reading Standards for Informational Text <i>Key Ideas and Details</i> <i>Integration of Knowledge and Ideas</i></p> <p>Music, 3<sup>rd</sup>–8<sup>th</sup> Grade Responding <i>Apply teacher-provided criteria to evaluate music</i> Connecting <i>Relationships between musics and other content areas</i> <i>Context for performances</i></p> <p>Music, High School Connect – Reflect on Understanding <i>Connections between music and other content areas</i> <i>Personal reactions to musical experiences</i></p>	<p>Using the <b>photo</b> and <b>video</b> of the <i>antara</i> and the <b>photo</b> and <b>video</b> of the <i>sikus</i>, answer the following questions:</p> <ol style="list-style-type: none"><li>1. How are the <i>antaras</i> and <i>sikus</i> similar?</li><li>2. How are they different?</li></ol>

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Standards Addressed	Prompt
<p>Social Studies, 3<sup>rd</sup>–6<sup>th</sup> Grade, Middle School, High School Strand 2: World History <i>Concept 1: Research Skills for History</i></p> <p>English Language Arts, Middle School, High School Reading Standards for Literacy in Science and Technical Subjects <i>Key Ideas and Details</i> <i>Craft and Structure</i> <i>Integration of Knowledge and Ideas</i></p>	<p>Answer the following comprehension questions: <b><u>“On the Discovery of the Ancient Egyptian Musical Scale”</u></b></p> <ol style="list-style-type: none"><li>1. Why is it difficult to rediscover stringed instruments’ original tuning?</li><li>2. In contrast, what is it about wind instruments that allow researchers to rediscover their original tuning?</li><li>3. Why did the researchers choose to compare the ancient Egyptians’ music to the diatonic (aka Western) scale?</li></ol> <p><b><u>“Ancient Peruvian Instruments”</u></b></p> <ol style="list-style-type: none"><li>1. Why do you think <i>antaras</i> (panpipes) and flutes made of stone and bone are studied most often?</li><li>2. What materials are contemporary panpipes made out of?</li><li>3. What are some examples of the <b>provenance</b>, or original place, in which <i>antaras</i> and bone flutes have been found?</li></ol>
<p>English Language Arts, Middle School Reading Standards for Informational Text <i>Integration of Knowledge and Ideas</i></p> <p>Mathematics, 4<sup>th</sup>–5<sup>th</sup> Grade <i>Measurement and Data</i> <i>Operations and Algebraic Thinking</i></p> <p>Science, 4<sup>th</sup>–6<sup>th</sup> Grade <i>Strand 1: Inquiry Process</i> <i>Strand 5: Physical Science</i></p>	<p>Use the <b>table of frequencies</b> created from <b><u>“On the Discovery of the Ancient Egyptian Musical Scale”</u></b> to answer the following questions:</p> <ol style="list-style-type: none"><li>1. Which flute plays the lowest pitch? Which flute plays the highest pitch?</li><li>2. Determine what note each frequency refers to. Use the <b>tone generator</b>. Why do you think there isn’t always a perfect match between the frequency and a note?</li></ol>
<p>English Language Arts, Middle School Reading Standards for Informational Text <i>Integration of Knowledge and Ideas</i></p> <p>Mathematics, 4<sup>th</sup>–5<sup>th</sup> Grade <i>Measurement and Data</i> <i>Operations and Algebraic Thinking</i></p> <p>Science, 4<sup>th</sup>–6<sup>th</sup> Grade <i>Strand 1: Inquiry Process</i> <i>Strand 5: Physical Science</i></p>	<p>Use the <b>table of frequencies</b> created by one of MIM’s curators for the ceramic <i>antara</i> in MIM’s Ancient Andes display and the photo of the <b><i>antara</i></b> to answer the following questions:</p> <ol style="list-style-type: none"><li>1. Determine how many tubes the <i>antara</i> has and check your answer by examining the <b>photo</b></li><li>2. Using the <b>tone generator</b>, determine what note each frequency refers to. Why do you think there isn’t always a perfect match between the frequency and a note? <i>Use the Additional Resources about Flute Acoustics to learn more about how playing techniques can affect sound and pitch</i></li></ol>

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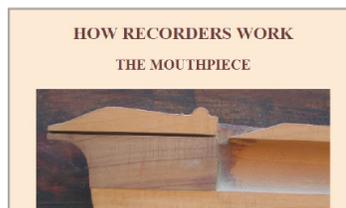
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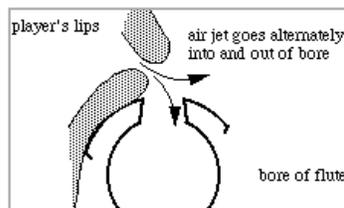
Standards Addressed	Prompt
<p><b>Mathematics, 4<sup>th</sup> Grade</b> <i>Operations and Algebraic Thinking</i></p> <p><b>Science, 4<sup>th</sup>–6<sup>th</sup> Grade</b> <i>Strand 1: Inquiry Process</i> <i>Strand 5: Physical Science</i></p>	<p>Create mathematical phrases that represent the following statements:</p> <ol style="list-style-type: none"><li>1. If two notes have an interval of one octave between them, then the frequency of the higher pitch is twice that of the lower pitch.</li><li>2. The frequency at which a medium (such as a wooden flute, or a ceramic panpipe) vibrates is the same as the frequency of the sound (i.e., the source of the vibration).</li><li>3. The frequency of a low-sounding note is less than the frequency of a high-sounding note.</li><li>4. The <b>theory of resonance</b> states that given a tube open from both sides, it will resonate at a frequency corresponding to a wavelength that is equal to twice the length of the tube. (summarized from <b>“On the Discovery of the Ancient Egyptian Musical Scale”</b>). <i>Use the Additional Resources about Flute Acoustics to learn more.</i></li></ol>

## Additional Resources

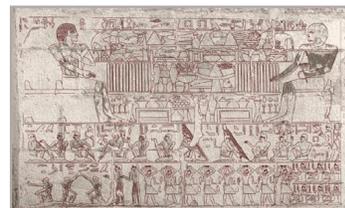
click on the thumbnail to see each resource



Flute Acoustics | “How Recorders Work.”



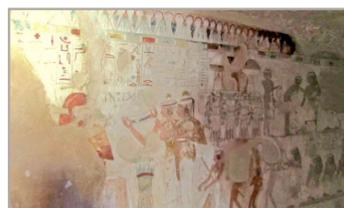
Flute Acoustics | University of New South Wales. “Flute Acoustics: An Introduction.”



Egyptian Mural | Tomb of Niankhkhnum and Khnumhotep at Saqqara in the Fifth Dynasty



Egyptian Mural | Theban Tomb no.38 of Zeserkaresonb



Egyptian Mural | Theban Tomb no.38 of Zeserkaresonb

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#### Table of Frequencies

Generated by one of MIM's Curators for the Ceramic *Antaras* in MIM's Ancient Andes Display (Accession # 2012.188.8)

Antara Pipe #	Note Frequency (Hz)	Approximate Pitch	Notes from MIM Curator
1	342	F4	
2	418.5	A4	
3	522	C5	
4	680	F $\flat$ 5	Quarter tone between E5 & F5
5	700.5	F5	
6	884	A5	
7	980.5	B5	
8	1038	C6	
9	1304	E6	
10	1373	F6	
11	1524	G $\flat$ 6	
12	1661	A $\flat$ 6	
13	1812.5	B $\flat\flat$ 6	Quarter tone between A6 & B $\flat$ 6

#### Table of Frequencies

Generated from a Bamboo Egyptian Flute from the Cairo Museum ("Flute #4," also denoted as "69817")

*On the Discovery of the Ancient Egyptian Musical Scale* (Effat, Mahmoud)

Flute Note #	Note Frequency (Hz)	Approximate Pitch	Notes from Authors
1	419.9	A4	
2	168.4	B4	
3	198	C5	
4	540.5	D5	
5	625.2	E5	
6	687.3	F#5	
7	732.2	G5	
8	839.5	A5	