# Gideon Freudmann
## *Sound Science*
## Educational Guide, Grades 2-12

### About the Performance

*Sound Science* is a S.T.E.A.M. program exploring both music and the scientific properties of sound. Demonstrating the tonal qualities of both the acoustic and electric cellos, Gideon explains the mathematical aspects of music such as how music is divided into beats, measures and phrases, and acoustic qualities including sound vibrations, pitch, and timbre. Using the electric cello and real-time digital effects, he shows how notes can be echoed, repeated, distorted, and augmented in many exciting and unexpected ways.

### About the Artist

Composer and acoustic/electric cellist **Gideon Freudmann** enjoys an international reputation for his innovative compositions and unique style of playing. He composes music for theater, film and dance, and also performs live soundtracks for classic silent films. His music is inspired by the best of classical, modern, jazz, and blues traditions, and is both immediately accessible and richly detailed in its nuance and complexity. Gideon has had his compositions featured on several NPR shows and has performed as a TED Talk speaker. He recently released his 19th CD, a duo album for cello and mandolin. *The Boston Globe* said Gideon "has brought the cello to a new realm."

### Program Learning Goals

1. To introduce the history, sound, physics, and construction of the cello.
2. To explore the breadth and flexibility of the cello through its infusion into various musical arenas.
3. To experience music as a means of creating, expressing, and understanding.

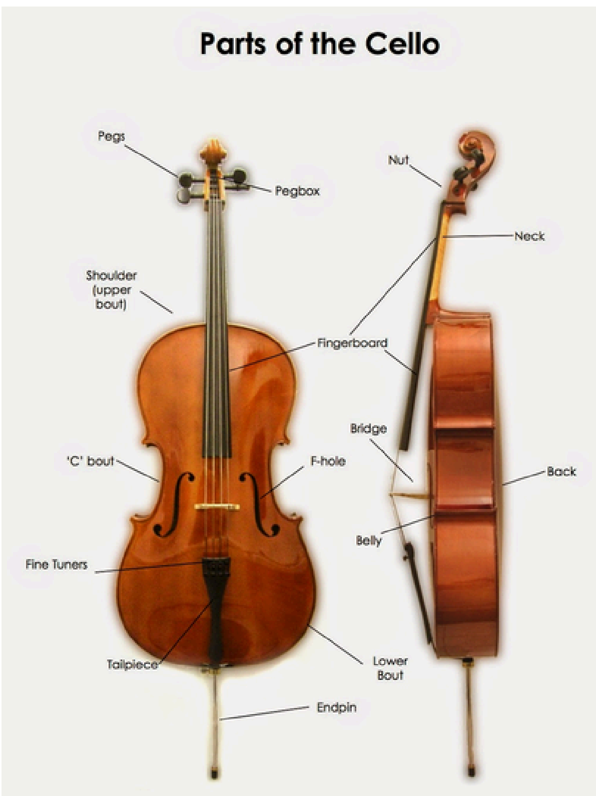
### Essential Questions

1. How can music help us to express ourselves?
2. How does music connect to your emotions?
3. How do musical styles develop and connect to each other?

## Key Facts and Context for Students

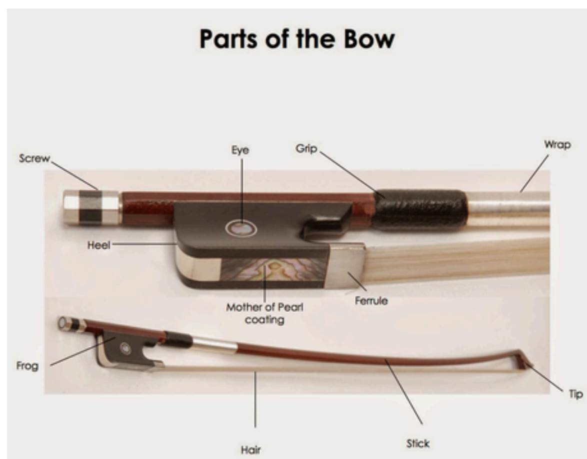
### What is classical music?

Classical music is a very broad term. It includes music originally written, or **composed**, in **Europe** over many hundreds of years, but is now played all over the world. Classical music is performed with instruments, voices, or both! Usually musicians read music written on pages of **sheet music** which tells them what to play and how to play it. Some of the most famous **composers** of classical music include Johann Sebastian Bach, Ludwig van Beethoven, and Wolfgang Amadeus Mozart.




### What is a cello?

A cello (“chel-oh“, rhymes with “hello”) is a member of the **string instrument family**. It has four strings and is usually played with a **bow** (rhymes with “go”). It has a deep, low sound and can be played alone, in small groups, or with large orchestras. A person who plays the cello is called a **cellist**.




*Cello and bow images from the Suzuki Cello School of Austin*

### What other kinds of music can the cello play?

While Gideon first started playing classical music on the cello, over time he has learned, performed, and written music inspired by many musical genres from **jazz** to **folk** to **blues** to **rock**. He also uses special devices and technology to create **electronic music** where his cello playing can be combined in different loops and layers of sound. He will demonstrate all of this in his performance!

## General Music Vocabulary

- **Beat:** the steady pulse of a song or piece of music
- **Rhythm:** a strong pattern of notes or beats in music
- **Tempo:** the speed of a song or piece of music
- **Melody:** a series of notes that creates the main part of a song or piece of music
- **Harmony:** individual notes or groupings of notes that accompany and support the melody
- **Measure:** a set group of beats, also known as a “bar”
- **Meter:** the number of beats per measure, also known as a “time signature”
- **Pitch:** how low or high a note sounds
- **Timbre:** the character of a sound that differentiates it from other musical tones
- **Dynamics:** how loud or soft a note sounds, musical volume

## Musical Instrument Families

- **String instruments:** musical instruments sounded by plucking, striking, or moving a bow across a string
- **Woodwind instruments:** musical instruments sounded by blowing air into or across a mouthpiece
- **Brass instruments:** musical instruments made of curved, brass tubes and sounded by buzzing lips into a mouthpiece
- **Percussion instruments:** musical instruments sounded by striking, shaking or scraping

## Musical Ensemble Vocabulary

- **Orchestra:** a large musical ensemble comprised of all four instrument families playing together
- **Band:** a general term for a small or large musical ensemble that could have any instrumentation and perform any style of music
- **Chorus:** a musical ensemble comprised of vocalists who sing together
- **Conductor:** the leader of an orchestra, band, or chorus who ensures that everyone is performing the right music, in the right way, at the right time
- **Composer:** a person who writes music

## Pre-Performance Discussion Questions

- Do you like listening to music? If so, what kinds? How does music make you feel?
- What do you know about classical music? What would you like to know? How could you find out more?
- Have you ever seen an orchestra perform? What are the instruments in the orchestra? How are they played? Where to orchestras perform?
- What other styles of music do you know about? What instruments are common in those genres?

## Pre-Performance Activity: Sections of the Orchestra

**Learning Goals:**

- To familiarize students with the instruments and sections of an orchestra.
- To introduce the history and construction of the different orchestral instruments.

**Materials:**

Musical Groupings Worksheet (*see page 6*),
Musical Groupings Worksheet Answer Key (*see page 7*),
YouTube video: **"The Young Person's Guide to the Orchestra - Animation"**

**Directions:**

1. Discuss different instruments and styles of music with the class *(see discussion questions above)*. If any students play an instrument, ask them to talk about it or even demonstrate it to the class.
2. Explain that musical instruments are grouped into different families depending on the materials they are made from and/or how they are played: strings, woodwinds, brass, and percussion.
3. In four small groups, fill out the Musical Groupings Worksheet. Look up any unfamiliar instruments to figure out which instrument family they belong to.
4. Review the answers for the Musical Groupings Worksheet with the class. Which instruments did students know? Which instruments were unfamiliar?
5. Watch the YouTube video "The Young Person's Guide to the Orchestra - Animation" which sets music by Benjamin Britten to animation by Louise Wilson to highlight each instrument family in the orchestra.

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## Pre-Performance Activity, continued

**Directions, continued:**

6. Assign each student an instrument from the orchestra to research. What is this instrument's origin? How is it constructed? How is it played? What kind of sound does it make? Encourage students to find at least one photo and one video of the instrument to share with the class.
7. Have each student present their research to the class by instrument family. Compare and contrast instruments within each musical family, as well as to the other instrument families.

## Pre-Performance Activity Extensions

- Talk about what is involved in playing an instrument. For example: breathing, fingering, posture, mouthpiece, bowing, reeds, practicing, etc.
- Discuss different styles of music (i.e. classical, popular, jazz, etc.). Which instruments are used in these different styles of music? Are some of the same instruments used in classical as in popular or rock music?
- Play audio/video clips of musical instruments and/or students' favorite songs. Ask students to try to identify the instrument(s) used.
- Research an orchestral instrument in terms of its use outside of western classical music. How has the instrument evolved in various countries or cultures? Present findings in an oral or written report.

**Name:** ______________________________________________

## Musical Groupings Worksheet

**Directions:** Place the instruments listed below into their musical instrument families.

**Instruments:**

| | | | |
|---|---|---|---|
| Violin | Clarinet | Timpani | Bassoon |
| Drums | Trombone | Cello | Xylophone |
| Oboe | Cymbals | French Horn | Double Bass |
| Tuba | Viola | Flute | Trumpet |

| String Family | Woodwind Family |
|---|---|
| | |

| Brass Family | Percussion Family |
|---|---|
| | |

## ANSWER KEY

**Name:** ______________________________

## Musical Groupings Worksheet

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### String Family

**Violin**
**Viola**
**Cello**
**Double Bass**

### Woodwind Family

**Flute**
**Clarinet**
**Oboe**
**Bassoon**

### Brass Family

**Trumpet**
**Trombone**
**French Horn**
**Tuba**

### Percussion Family

**Drums**
**Cymbals**
**Timpani**
**Xylophone**

## Post-Performance Discussion Questions

- What was your favorite part of the performance? What surprised you? What did you see and hear?
- What did you learn about different musical genres and the cello?
- How might electronic music be introduced into traditional orchestral music?

## Post-Performance Activity: Visualizing Music

**Learning Goals:**

- To encourage students to experience music through listening and visualization.
- To demonstrate the emotional breadth and flexibility of various musical arenas

**Materials:**

Recordings of classical music, such as:

- "Eine Kleine Nachtmusik" by Wolfgang Amadeus Mozart
- "Für Elise" by Ludwig van Beethoven
- "Toccata and Fugue in D minor" by Johann Sebastian Bach

Recordings of students' favorite songs, speakers/equipment to play recordings

**Directions:**

1. Discuss Gideon Freudmann's performance. Which musical selections were familiar? Unfamiliar? What did the music make them think about?
2. Make a list of students' favorite songs and select a few to play for the class. Try to select songs across several genres. Ask students to write down words that they think of while listening to the music.
3. Repeat this activity using classical music.
4. Discuss the words that students wrote down. Did students write down the same words when listening to their favorite songs versus when listening to the classical music?
5. Listen to same recordings again. This time, have students draw pictures or sketches of images they visualize while listening to the music. Discuss the different images.
6. Have each student write a short paragraph to accompany one of their sketches. What were they inspired to draw? Why? How did it change or enhance their listening experience?
7. Share each student's paragraph. Discuss how listening to music can be enhanced if people allow themselves not only to listen, but also to visualize.

## Pre-Performance Activity Extensions

- Write a review of Gideon Freudmann's performance. What did you like? Were there any surprises? What are your favorite instruments?
- Have students choose one of the classical music examples from the Post-Performance Activity (*see page 8*) and create a story to go along with the music. Include characters, setting, and plot.
- Pick a famous classical music composer to research. What was their life like? What is their music like? Were they famous in their lifetime? Why is their music popular today?

## Further Resources

- **Gideon Freudmann Artist Website**
- **The Kennedy Center's Digital Classical Music Collection**
- **Classics for Kids**
- **Math + Science + Music, by the Herbie Hancock Institute of Jazz**
- Ho, Joanna: *Playing at the Border: A Story of Yo-Yo Ma,* HarperCollins (2021)
- Hood, Susan: *Ada's Violin: The Story of the Recycled Orchestra of Paraguay,* Simon & Schuster Books For Young Readers (2016)
- Levine, Robert: *A Child's Introduction to the Orchestra,* Black Dog & Leventhal (2019)
- Marsalis, Wynton: *Squeak, Rumble, Whomp! Whomp! Whomp!*: A Sonic Adventure, Candlewick Press (2021)
- Morland, Charlie: *Music and How it Works: The Complete Guide for Kids*, DK Children (2020)
- Oliver, Carmen: *Building an Orchestra of Hope: How Favio Chavez Taught Children to Make Music from Trash*, Eerdmans Books for Young Readers (2022)
- Prelutsky, Jack: *The Carnival of the Animals*, Knopf Books for Young Readers (2010)
- Woo, Eddie: *It's a Numberful World: How Math Is Hiding Everywhere - from the Crown of a Tree to the Sound of a Sine Wave*, The Experiment; Illustrated edition (2019)

## Curricular Connections

**Arts Standards: Music**

**Creating**

- Generate and conceptualize artistic ideas and work. (M.Cr.01)
- Organize and develop artistic ideas and work. (M.Cr.02)

**Performing**

- Convey meaning through the presentation of artistic work. (M.P.06)

**Responding**

- Perceive and analyze artistic work. (M.R.07)
- Interpret intent and meaning in artistic work. (M.R.08)
- Apply criteria to evaluate artistic work. (M.R.09)

**Connecting**

- Synthesize and relate knowledge and personal experiences to make art. (M.Co.10)
- Relate artistic ideas and works to societal, cultural and historical contexts to deepen understanding. (M.Co.11)

**English Language Arts and Literacy Anchor Standards**

**Writing**

- Write narratives to develop experiences or events using effective literary techniques, well-chosen details, and well-structured sequences. (W.PK-12.3)

**Speaking and Listening**

- Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally. (SL.PK-12.2)
- Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric. (SL.PK-12.3)

**History and Social Science**

**Grade 2**

- Topic 3: History: migrations and cultures (HSS.2.T3)

**Grade 6**

- Topic 1: Studying complex societies, past and present (HSS.6.T1)

**Grades 9-12**

- US History II Topic 2: Modernity in the United States: ideologies and economies (HSS.USII.T2)
- US History II Topic 5: United States and globalization (HSS.USII.T5)

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## Curricular Connections, continued

**Science and Technology/Engineering**
**Physical Science**

- Matter and Its Interactions (2.PS.1, 5.PS.1)
- Motion and Stability: Forces and Interactions (3.PS.2, 4.PS.3, 5.PS.2)
- Energy (2.PS.3, 5.PS.3, 7.PS.3)
- Waves and Their Applications in Technologies for Information Transfer (4.PS.4, 6.PS.4)

**Technology/Engineering**

- Technological Systems (7.ETS.3, HS.ETS.3)
- Materials, Tools, and Manufacturing (8.ETS.2)

**Physics**

- Energy (HS.PHY.3)
- Waves and Their Applications in Technologies for Information Transfer (HS.PHY.4)