Music 5

Lecture 2

Thursday, April 16, 2020

Lecture Outline

1. Announcements
2. General Information
3. Module 3: Frequency
4. Writing Assignment

Announcements

- **The following items are DUE before Sunday, April 19 at 11:59 pm:**
  - Module 3 Quiz Listening Part 1
  - Module 3 Quiz Listening Part 2
  - Module 3 Quiz Rhythms
  - Module 3 Writing Assignment

General Information: Zoom recordings

- Please be aware that Zoom recordings are automatically deleted 30 days after they’re posted. If you’d like to view or download the videos, please do so within the 30-day period.

General Information: Audacity for macOS

- Unfortunately, macOS 10.15 (Catalina) doesn't officially support Audacity.
- The workaround linked below may fix the issue. If you're running Catalina and this workaround doesn't fix the problem, please let me know.

  https://www.audacityteam.org/macos-10-15-catalina-is-not-yet-supported-by-audacity/

General Information: Edits in Lecture 1 slides

- **I made the following edits in the Lecture 1 slides to clarify points and fix typos:**
  - (As a side note, UCSD doesn't exclusively focus on new music. Many other styles are showcased in our concerts and discussed in our courses, including **traditional** Western classical music.)
  - I changed the title of Module 1 to **"What is Music?"** and the title of Module 3 to **"Frequency"**.
  - In the slide "Module 1: Artistic indent", I added two bullet points that build on our discussion of what constitutes music
  - The role of music technology has three main aspects:
    - Creation: production tools (Ableton, digital effects, synthesizers)
    - Content: databases (iTunes, Google Play, Pandora, **YouTube, Spotify**)
    - Community: sharing tools (**SoundCloud, Bandcamp**)
  - **There is some overlap between content and community. For example, you can also share music using YouTube, and SoundCloud is also a database.**

General Information: Music genres

- The following names of music genres are **very closely related** and in some cases are used interchangeably:
  - Modernist music
  - Postmodernist music
  - New music
  - Experimental music
  - Experimental Western classical music
  - Electroacoustic music
  - Computer music
- All of the music genres listed above fall within **20th and 21st century music**

General Information: Music genres

- **However, we might make these distinctions:**
  - 20th and 21st century music includes music of the modernist movement (1890-1980) and the postmodernist movement (1930-present)
  - New music is art music of the postmodernist movement (some might also include music of the modernist movement). It includes experimental music, electronic music, and other genres.
  - Experimental Western classical music is a subgenre of experimental music.
  - Electroacoustic and computer music are two subgenres of electronic music
  - Electroacoustic music is art music that deals with the electronic processing of acoustic sounds
  - Computer music deals with the digital manipulation of acoustic sounds, the digital synthesis of artificial sounds, the creation of symbolic music compositions using computers, and more

General Information: Music genres

- Some claim that postmodernism is just modernism repackaged, since (among other things) both movements rejected the certainty of religious and Enlightenment thought (specifically, the idea of a “grand truth narrative”). **Perhaps** the main distinction is that whatever religiosity or rationality modernists held on to was rejected by postmodernists.
- Modernism (1890-1980) was a philosophical and artistic movement that occurred partly during the Modern era (1500-1930). Since the Modern era included the Enlightenment (1650-1800), it’s correct to say that Modernism rejected thought from the earlier part of the Modern era. Hence, there may be confusion about what constitutes a “modern thinker”, since the term “modern” is associated with **both** Modernism and the Enlightenment.

General Information: Music genres

- Although modernism and postmodernism rejected the certainty of Enlightenment thought (**including science**), the music of modernism and postmodernism has been very heavily influenced by science. **Case in point:** I'm pursuing a PhD in Music at a university that specializes in postmodernist music, and 99% of what I study and research would be classified as science or applied science. (Side note: if you were looking for more evidence that UCSD is a STEM-heavy school, this would be it).
- We will discuss some important scientific ideas that influenced modernist and postmodernist music, including the concept of frequency (covered today)
- **One last point:** In my mind, whether or not you actually accept the philosophical views of modernism or postmodernism, you can still make modernist and postmodernist music (i.e. "new music")

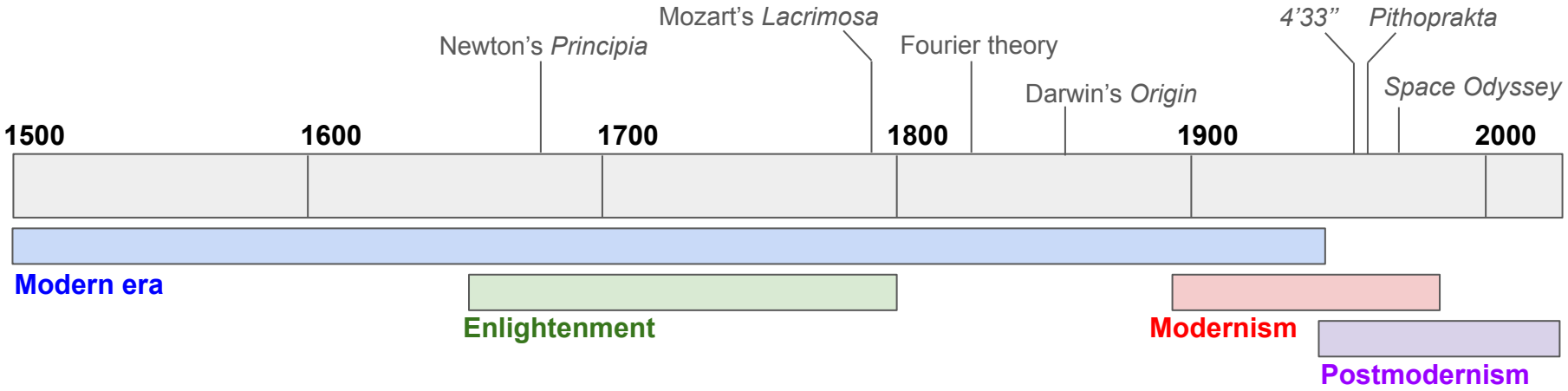
General Information: More new music

- **John Cage's 4'33" is quite unusual.** New music typically involves singing, musical instrument performances, and/or signal processing by computers.
- **2001: A Space Odyssey (*Atmospheres*):** https://www.youtube.com/watch?v=IP412YTxNGA
  - "**Heterophony**, which is a method for writing multiple voices without resorting to rules of western voice leading (polyphony or counterpoint), exists in many non-Western traditions, such as Arabic music, Japanese **Gagaku**, Gamelan music of Indonesia, and more. Heterophony is characterized by having multiple simultaneous voices play variations of same melodic line. A very dense version of such texture, sometimes called micropolyphony, has been used to create immensely impressive textures by Ligeti in his orchestral piece *Atmospheres* that Kubrick used in **2001: A Space Odyssey**." -Shlomo Dubnov
- **Gerard Grisey (*Partiels*):** https://www.youtube.com/watch?v=FS0hx9tqsPM
  - "**Spectral Music** is mostly a French school of composition that took inspiration in natural sounds and the ability to analyze them by computer, but instead of treating them electronically, translating them to orchestral scores. Imagine how [a] toothbrush sound ... would sound if it was performed by live musicians? Well, no matter how strange it sounds, the idea of immersing yourself in a world of sounds that is free from traditional musical conventions, but set in an artistic setting of a concert hall and allowing you to zoom in, elaborate or creatively develop something that originally was a fleeting sound moment, is a technique that created some very impressive musical results, if not masterpieces." -Shlomo Dubnov

General Information: More new music

- **Post-spectral music (focuses more on synthesis than on analysis)**
  - John Chowning (*Stria*): https://www.youtube.com/watch?v=988jPjs1gao
- **Experimental interpretation of traditional music**
  - Mozart (*Lacrimosa*): https://www.youtube.com/watch?v=6Rwu16GRseg
  - Jason Graves (*Lacrimosa*, “Dead Space 2”): https://www.youtube.com/watch?v=A_bGTRxpDBo
- **Other examples of new music**
  - Iannis Xenakis (*Pithoprakta*): https://www.youtube.com/watch?v=AE1M2iwjTsM
  - Iannis Xenakis (*Gendy 3*): https://www.youtube.com/watch?v=REjuK14IYDo
  - Da Pilk (*Lens7*): https://vimeo.com/125251099
  - Nathaniel Haering (*Spate II*): https://www.youtube.com/watch?v=7AfdSsclFjA

General Information: Timeline



Module 3: Frequency

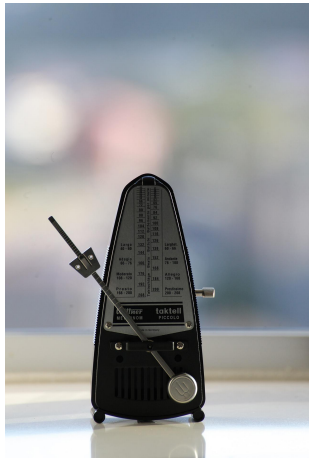
Module 3: Objectives

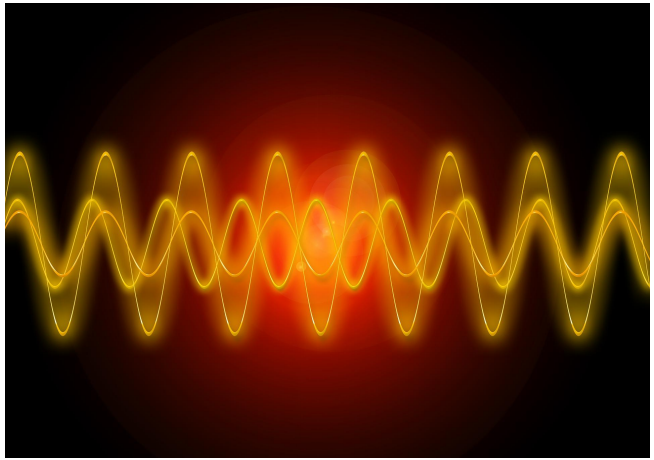
1. Demonstrate musical concepts of rhythm
2. Be able to define the concept of frequency
3. Identify which frequency ranges are identified as rhythm versus pitch
4. Define basic chords in terms of frequency ratios
5. Explain and demonstrate the difference between rhythm and pitch in terms of perception
6. Explain the concept of pure tone, complex tone, and noise
7. Schematically show how the cochlea responds to frequencies and how it changes in time

Module 3: Live session topics

- Explain the units of **rhythm** (BPM) and **pitched sound** (Hz)
- Give **frequency ranges** of rhythm and pitch
- Discuss the **speeding pulses** examples from class
- Explain **frequency ratios** of notes in basic chords
- Relate concepts of **timbre and overtone structure** in complex tones
- Demonstrate complex tones by doing **frequency analysis in Audacity**
- Discuss how the location of the excitation in the **Cochlea** relates to the frequency of tones

What concept do we use to describe repeated motion?





Frequency!

Module 3: What is frequency?

- **Frequency = the rate of repeated motion**
- **Rhythm** and **pitched sound** are examples of repeated motion in music
- Rhythm is movement that has successive strong and weak elements. Sound is vibration that travels through a medium such as air, water, or a physical object.
- We use **beats per minute (BPM)** for low frequency motion like **rhythm** and **cycles per second (Hz)** for high frequency motion like **pitched sound**
    - Range of rhythm: 1-1000 BPM
    - Range of pitched (audible) sound: 10-20,000 Hz
- The examples of speeding pulses from Professor Dubnov's video lecture demonstrate the difference between rhythm and pitched sound

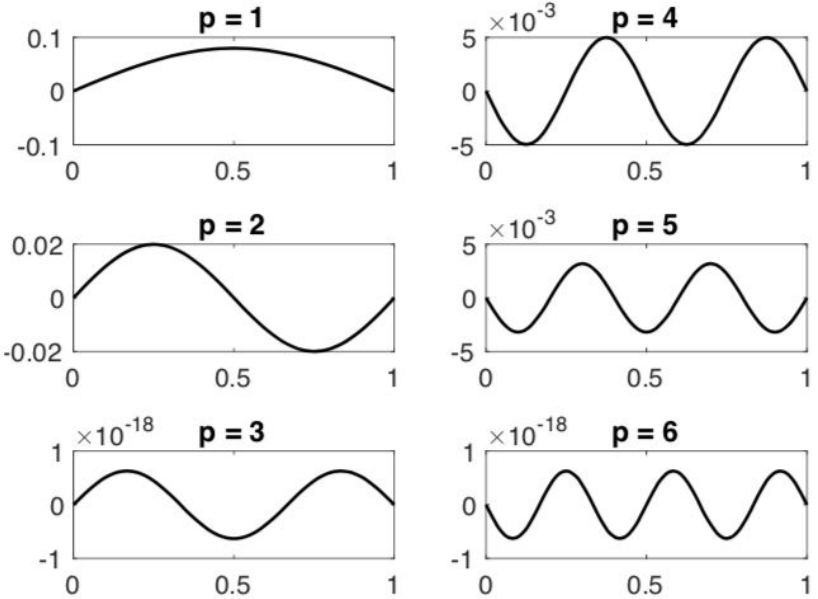
Module 3: What is frequency?

- Sounds we perceive to be unpleasant are often referred to as **noise.** White noise is actually composed of all frequencies in equal amounts.
- The professor's video lecture slides on Canvas imply that audible waves are only transmitted through air. We will regard this as correct for the quiz. However, please note that audible waves are **also** transmitted through other media, including water, pipes, and strings. **If you missed this question, please let me know.**

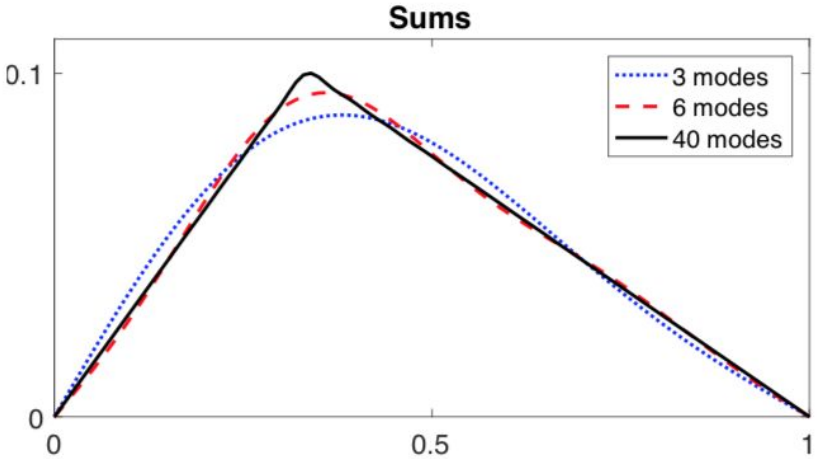
Module 3: Fourier theory

- In the early 1800s, Joseph Fourier and others developed certain mathematical concepts that we use today to analyze sound, such as Fourier series and the Fourier transform.
- A **Fourier series** is a periodic function (such as a sound signal) that can be written as a weighted sum of integer multiples of a fundamental frequency. This tells us that a sound can be broken down into constituent frequencies.
- The **Fourier transform** is a mathematical operation that breaks down a sound into its constituent frequencies. The frequency spectrum describes the distribution of those frequencies.

Module 3: Fourier theory (spatial frequency)



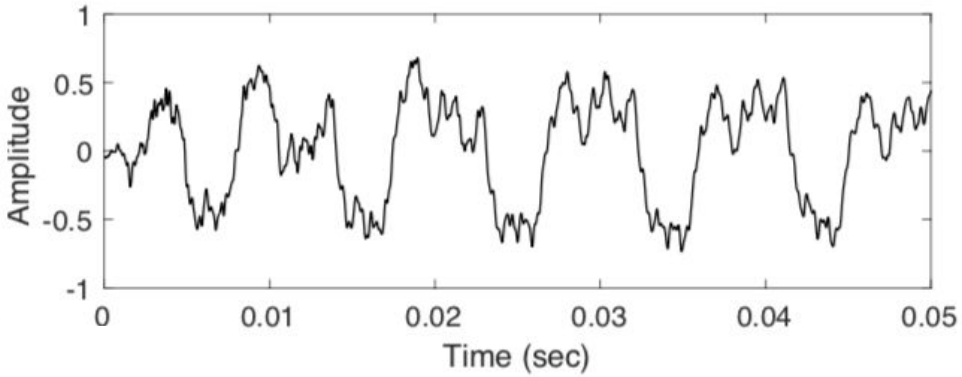
(a) Weighted mode shapes



(b) Sums of mode shapes

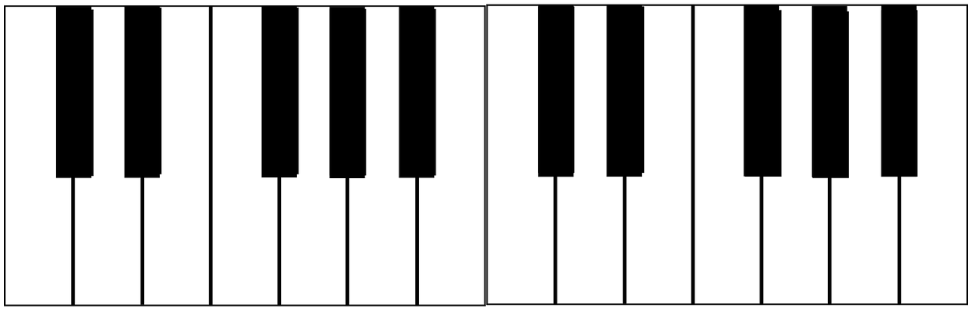
Module 3: Fourier theory

- Two components for the frequency composition of sounds are **amplitude** and **time**. In other words, a frequency component in the spectrum is defined by the strength of the component and how many cycles per second the component completes.



Module 3: Frequency ratios in chords

- Below is a link to a description of frequency ratios in common chords. Note that a half step is the distance between successive keys on a piano.
  https://pages.mtu.edu/~suits/chords.html

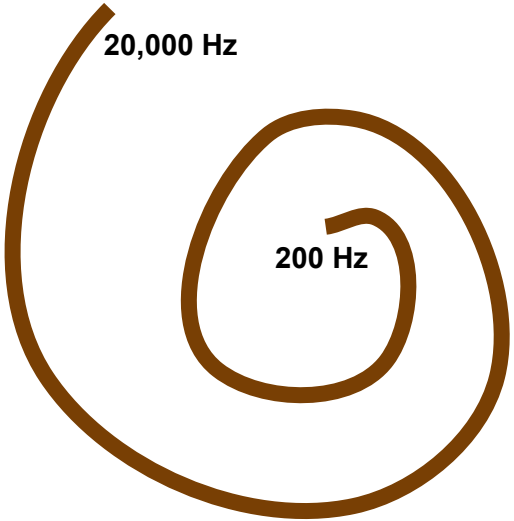


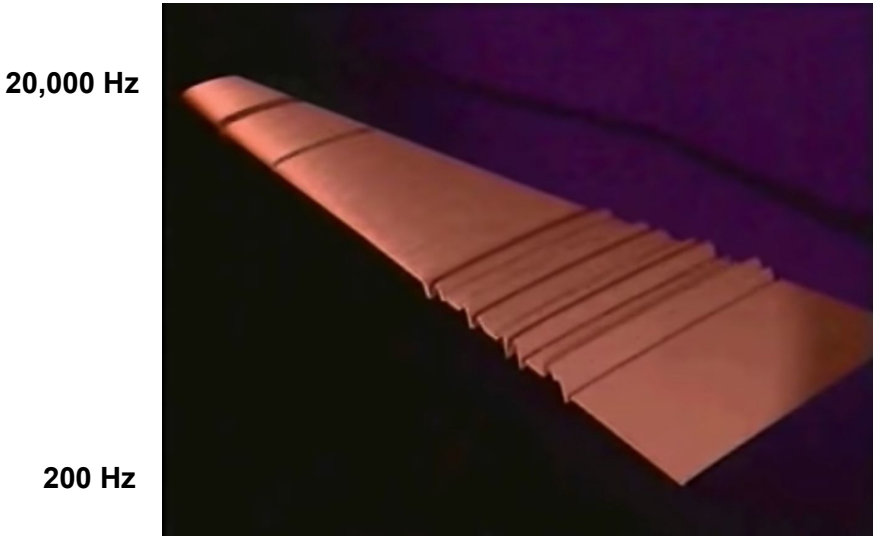
Module 3: Timbre and overtone structure

- An **overtone** is any sound frequency greater than the fundamental frequency. It could be harmonically-related to the fundamental frequency or not. Note that partials are the fundamental frequency and its overtones (fundamental=1st partial, first overtone=2nd partial, second overtone=3rd partial, and so on).
- **Timbre** describes the quality of a sound. It's what distinguishes, for example, the sonic difference between a clarinet and a piano. Timbre is quantified by the frequency spectrum (i.e. the fundamental frequency + the overtone structure) and the envelope of the sound.

Module 3: Cochlear frequency analysis

- The cochlea decomposes sounds we hear into their constituent frequencies: https://www.youtube.com/watch?v=dyenMluFaUw&feature=emb_title





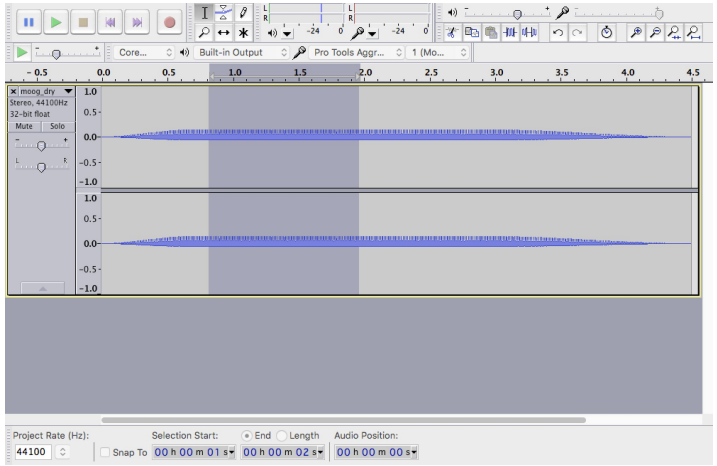
Module 3: Steve Reich's *Clapping Music*

- Unfortunately, the audio latency of Zoom makes it very difficult (if not impossible) to accurately perform this piece together
- The instructor and TAs will meet soon to discuss alternatives for completing the music performances
- Here's what Steve Reich's *Clapping Music* should sound like:
  https://www.youtube.com/watch?v=lzkOFJMI5i8

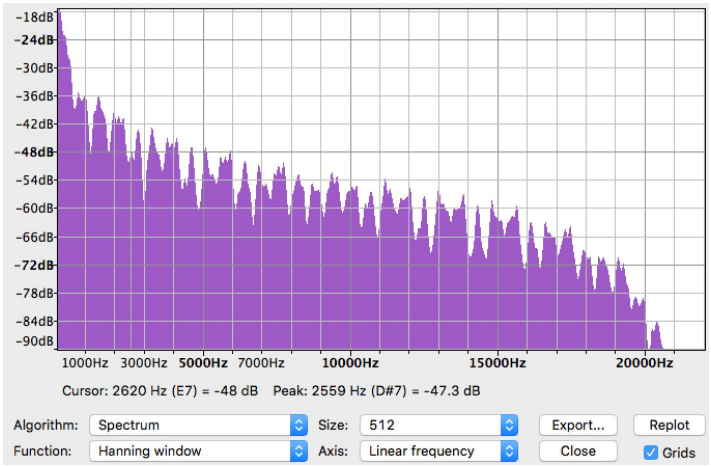
Module 3: Frequency analysis

- Let’s analyze the frequency content of sounds using Audacity. We will use this analysis to discuss timbre and overtones.

Time signal



Frequency spectrum



Module 3: Other points

- The **modes of listening** to music are a product of human intention and perception (note that intention and perception are also basic processes of human cognition). In other words, as humans, we want to treat sounds we perceive as musical.
- Polyrhythms are common in traditional African and Indian music
- Even more complicated rhythms can be performed with the aid of mechanical machines or computers

Writing Assignment

Module 3: Writing assignment (Attali)

1. Describe briefly each **code** (Sacrifice, Representation, Repetition, and Composition) and use it to discuss how music and noise, according to Attali, are related to **politics and economy**.
2. What can we learn from music and noise about **past and future societies**? Note that the book was written in 1977, so the future for Attali has already passed. Did his prediction of **Composition society** realize in any way? Tell us what you think.
3. What are the "**prophetic**" aspects of music, and how can music be used to forecast **social or political change**?
4. Provide examples for a process of turning sounds into "**commodity**": from the symbol of power to music use as public exchange.
5. Provide examples of how music is being used for **social control & expression of power**.

Module 3: Writing assignment (Schafer)

1. Analyze comparatively the approach to non-musical sounds in **Russolo's Manifesto versus Schafer's soundscape approach**. What are the sonic/musical and ideological/conceptual differences?
2. Explain why according to Schafer our thrive to **Hi-Fi** creates more **Lo-Fi** sonic environment.
3. Discuss the role of soundscape in view of the **two Greek myths** on the origin of music.
4. Explain the **schizophonia** concept and how it related to music in general and evolution of sound experience over time.

Module 3: Writing assignment (guidelines)

- Follow the basic guidelines outlined on Canvas
- **Minimum length**: **30 words per prompt** (since there are 9 prompts, the total word count for this assignment should be at least **270** words)
- If you have any questions, please email me early so that I can respond before the deadline on April 19

Questions