

Music 5

Lecture 3

Thursday, April 23, 2020

Lecture Outline

1. Announcements
2. General Information
3. Module 4: Music Intervals
4. Assignment and Quizzes

Announcements

- The following items are DUE before Sunday, [April 26](#) at 11:59 pm:
 - Module 4 Quiz Listening Part 3
 - Module 4 Quiz Listening Part 4
 - Module 4 Quiz Listening Part 5
 - Module 4 Studio Work Assignment

General Information: Grades

- I will post grades for Modules 1-3 soon
- A handful of students recently enrolled in the course. To maintain consistency in my evaluations, I prefer to grade all of the submissions at once.

General Information: Revisit Module 1

- **What is music?**
 - Music is an art form whose medium is **sound**
 - Can any sound be considered music? Does sound need to have a particular structure or set of structures to qualify as music? For example, would white noise qualify? Would silence?
- **From a traditional Western classical music perspective:**
 - Music consists of four key relationships between musical tones: melodies (tones played in succession), chords (multiple tones played simultaneously), rhythms (pulses or beats that organize the tones in time), and textures (tone qualities). These tone relationships are the basic components of musical environments.
 - A musical tone is a sound with four properties: duration, frequency, amplitude, and timbre.
 - Tones in melodies and chords are generally separated in pitch by certain **intervals that exhibit consonance** (fifth, fourth, etc) and a rhythm typically adheres to a **single, fixed time signature** at any one time

General Information: Revisit Module 1

- **From an experimental music perspective:**
 - Music is considered more broadly to be **any organization of sounds which creates an experience**. By “experience”, we mean some significant psychological or sociological event.
 - Do you agree with this definition of music? If not, why? Is this definition too broad? Can you justify your disagreement?

Module 4: Music Intervals

Module 4: Objectives

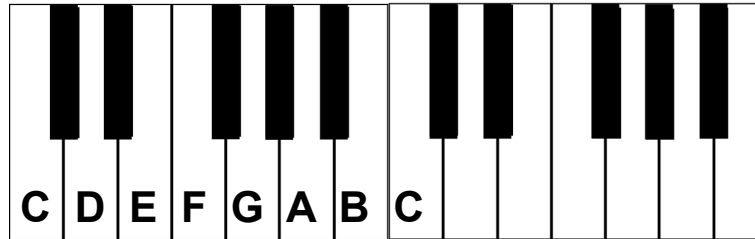
1. Demonstrate the concept of music intervals
2. Explain what is critical band in relation to beating and roughness
3. Demonstrate and explain the concept of consonance and dissonance in relation to roughness
4. Give an example of an alternative scale (Gamelan) and explain how it is related to a musical instrument
5. Explain the principle and reasons for Equal Temperament tuning

Module 4: Live session topics

- Demonstrate **music intervals** and **consonance vs. dissonance** by playing an instrument
- Use **Audacity Generate** to demonstrate beating and roughness
- Demonstrate a **scale** and relate it to music **notation** and the concept of musical tones
- Discuss tuning and **Equal Temperament** by playing the same piece in different keys
- Review music examples of **Gamelan** or other non western scales

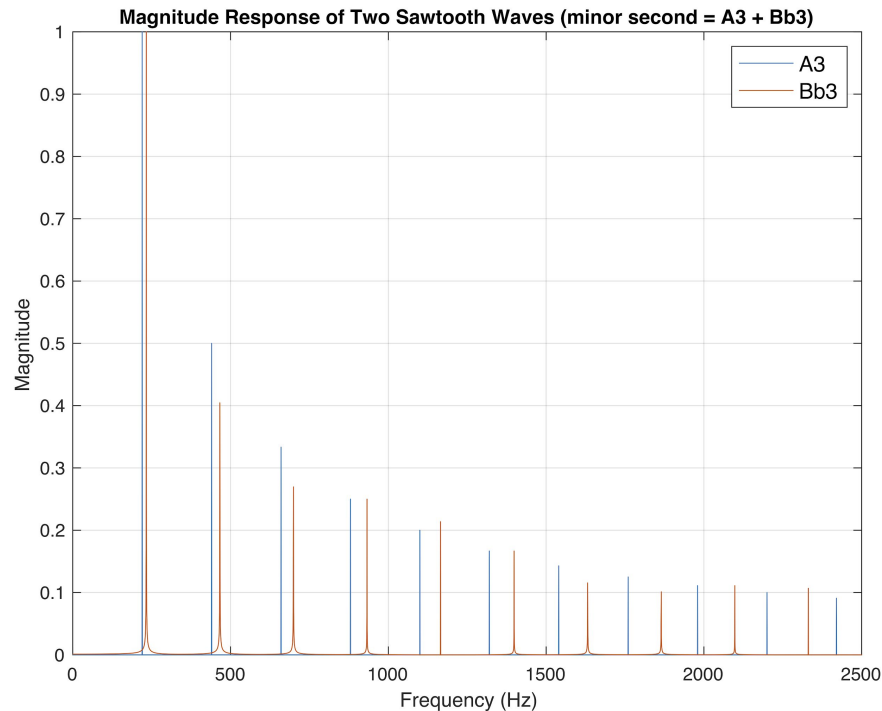
Module 4: Music intervals

- A music interval is **the difference in pitch between two musical tones**
- Pitch is a person's *subjective perception* of frequency (when someone hears a tone with a fundamental frequency of 440 Hz, they might perceive the pitch to be the note A above middle C)



Module 4: Music intervals

- **Audio Samples:**
<https://chadmckell.com/intervals>
- Some intervals sound more **rough** than others. Roughness is caused by our ear's inability to distinguish between multiple tones (**not** simply by whether a note is high or low)
- Several partials of the minor second interval played using two **sawtooth waves** lie very close to each other (see plot).



Module 4: Music intervals

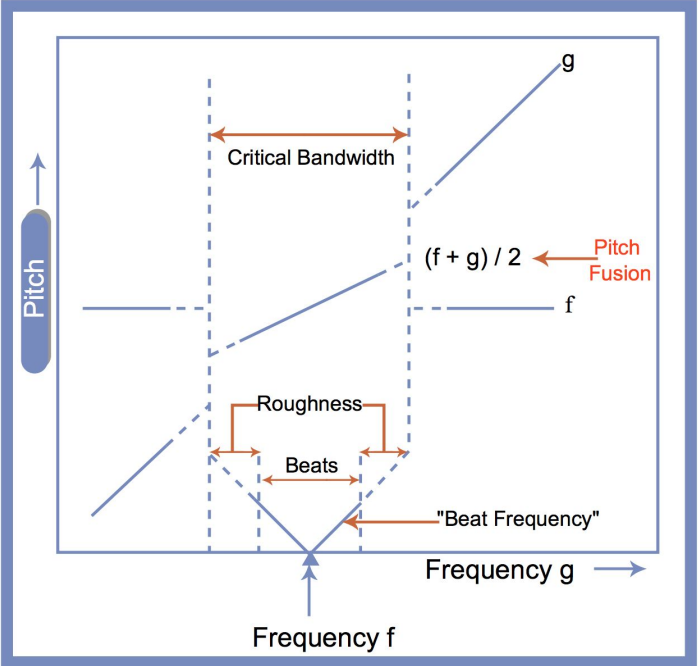


Figure by MIT OpenCourseWare.

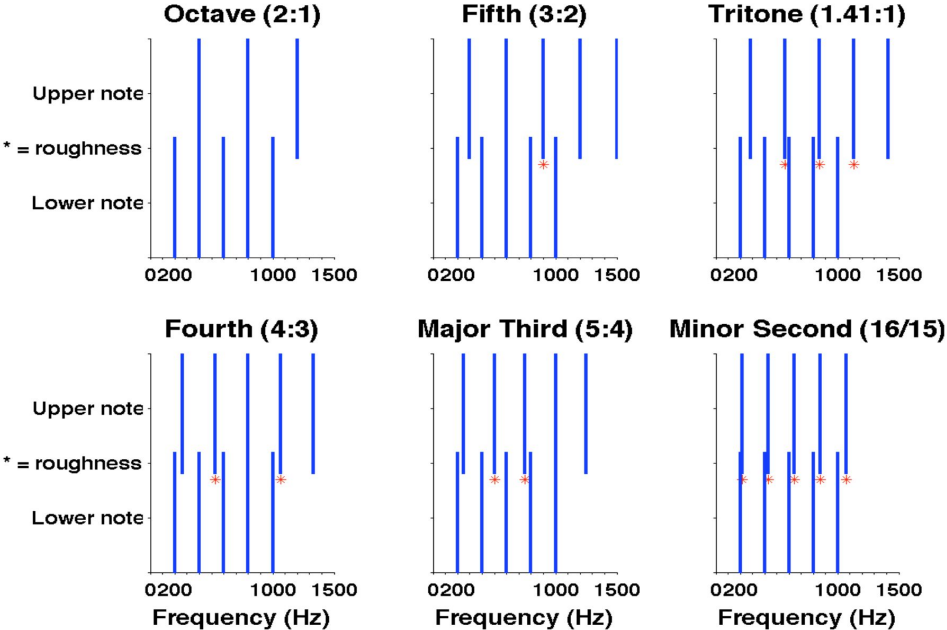


Figure by MIT OpenCourseWare.

Module 4: Consonance vs. dissonance

- **Consonant** intervals sound **less rough** while **dissonant** intervals sound **more rough**. The table below shows some consonant intervals associated with “harmonic” instruments.

Name of Interval	Octave	Fifth	Fourth	Major third	Minor third	Major sixth	Minor sixth
Notes (in Key of C Major)	C-C	C-G	C-F	C-E	E-G	C-A	E-C
Ideal Frequency Ratio	2	3/2	4/3	5/4	6/5	5/3	8/5
Number of Semitones	12	7	5	4	3	9	8

Figure by MIT OpenCourseWare.

Module 4: Consonance of harmonic complexes

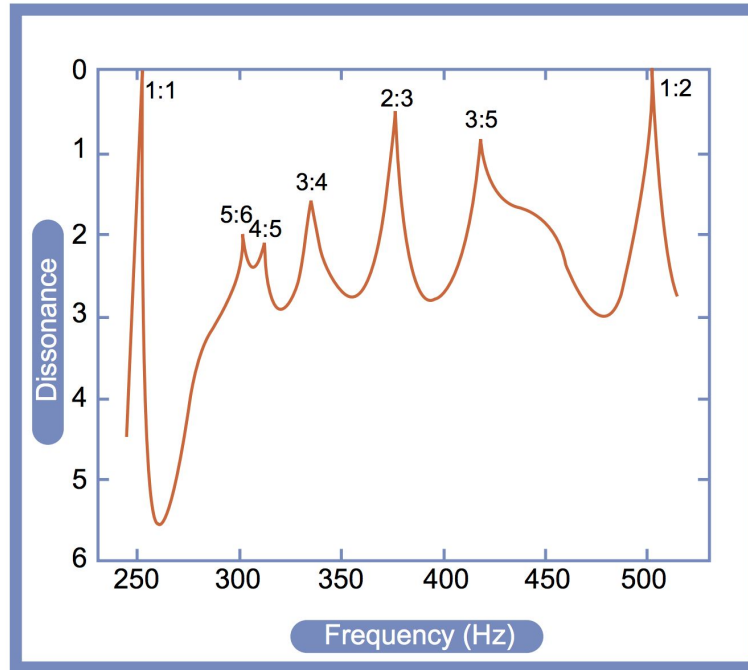
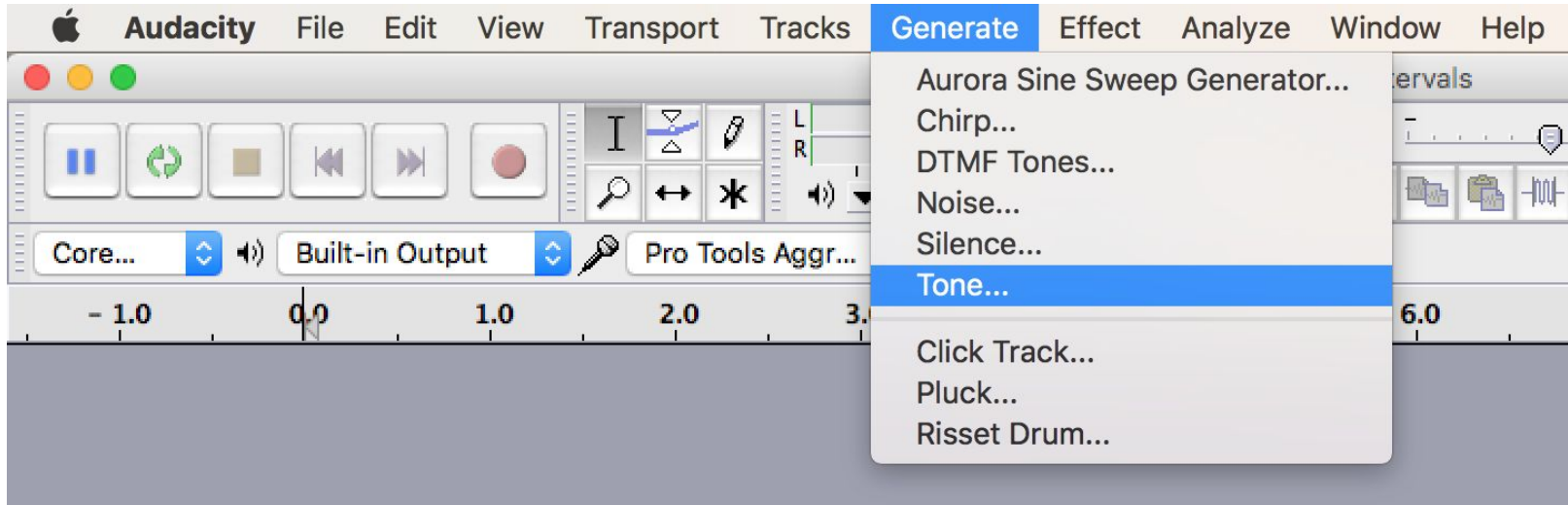


Figure by MIT OpenCourseWare.

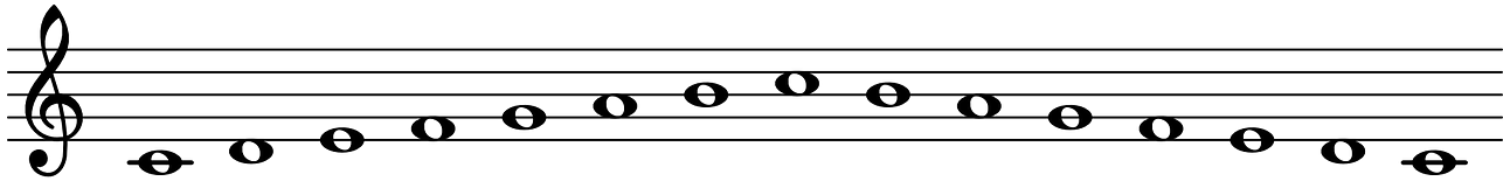
Module 4: Beating and roughness in Audacity

- We'll now use **Audacity Generate** to demonstrate beating and roughness. Note: we'll use a sawtooth wave, which is a “harmonic” instrument.



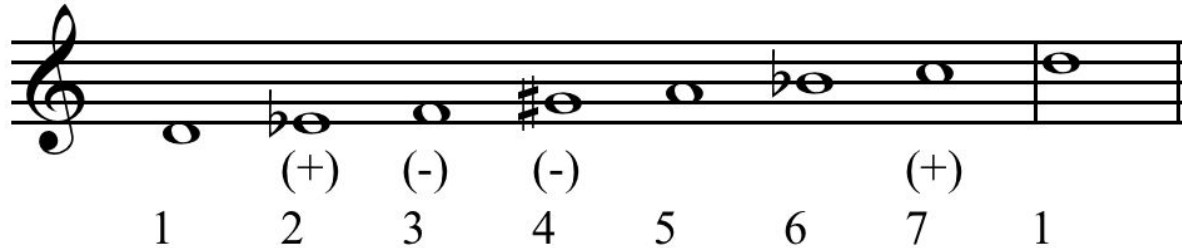
Module 4: Western Scales and notation

- Western scales were built using **consonant intervals of harmonic complexes** found in Western musical instruments (“harmonic” instruments)
- The C major scale can be built by adding intervals *up a fifth* and *down a fifth* from various notes. Question: what two notes are located up a fifth and down a fifth from the C note?
- The C major scale is notated below



Module 4: Non-Western scales

- Non-Western scales like the Gamelan scales have different consonant intervals associated with **non-harmonic complexes found in non-Western musical instruments** (e.g. bell-like instruments)
- The Gamelan scale *Pelog* is approximated below using Western notation



Module 4: Non-Western scales

- Below is a link to a composition written using a Gamelan scale:
<https://www.youtube.com/watch?v=HfrOSJRCsfM>



Module 4: Well-tempered tuning

- Well-tempered tuning is a tuning system that assigns frequencies to each of the 12 notes of the “octave range” such that **moving between scales** doesn’t cause a composition to sound out of tune.
- It was invented by J.S. Bach in the early 1700s
- One drawback with well-tempered tuning is that we must **approximate the ideal frequency ratios** (i.e. the “just intervals”). See the “Consonant Intervals” table for examples of ideal frequency ratios.

Module 4: Equal temperament tuning

- Equal-temperament tuning is one type of well-tempered tuning system. It divides the 12 notes into **equal steps on a logarithmic scale**.
- Specifically, the steps are given by
 - $2^{(1/12)} = 1.06$
 - $2^{(2/12)} = 1.12$
 - $2^{(3/12)} = 1.19$
 -
 - $2^{(12/12)} = 2.00$
- *According to Professor Dubnov*, J.S. Bach championed equal temperament
- To hear the same piece played in different keys, please ask Prof. Dubnov

Assignment and Quizzes

Module 4: Studio work assignment (guidelines)

- Follow the basic guidelines outlined on Canvas
- You must submit **at least 5 recorded sounds and/or music selections**. (You'll use these sound segments to create your “soundscape” composition in a future assignment). You may submit a combination of recorded sounds and music selections (e.g. 3 recorded sounds + 2 music selections) or sound segments from just one category (e.g. 5 recorded sounds).
- Regarding the music selections, you may choose music from popular compositions or songs. The only stipulation is that the music selections you choose must be linked to a place and time along your sound walk or to a particular activity you experience during the day that you can describe.

Module 4: Studio work assignment (guidelines)

- For ideas on what to do, have a look at the example sound walks from past years posted on Canvas. However, unlike the examples posted on Canvas, **please paste your SoundCloud links in your PDF document with an appropriate description for each link.**
- Don't worry about the sampling rate, bit rate, and so forth. If you record sounds with your phone, the audio quality will be acceptable.
- Please note that you don't have to go outside if you don't feel comfortable doing so. **You may gather sounds from your home.**

Module 4: Quizzes

- To ensure you don't miss any important concepts, please review **both** these slides and Professor Dubnov's slides posted on Canvas before answering the quiz questions
- If you still can't find an answer, either email me for help or have a look at the Zoom recording of today's section lecture

Questions