

the harmonic series and physics

- The harmonic series
 - A series of whole-integer multiples of a given frequency
 - Measured in cycles per second
 - $N, 2n, 3n$, etc. potentially infinite
- Physics of a vibrating string
 - A node is a point of no displacement. String oscillates back-and-forth at a frequency between these points
 - The antinode is the point of highest vibration
 - By touching the string at the antinode it doubles the frequency. This is called the second harmonic
 - Each time we divide the string, we multiply the frequency
 - Double the frequency and get a harmonic octave
 - Major triad has the strongest possible mathematical grouping of notes, thus its dominance in Western music
- Perspectives of the major scale
 - Linear (most common): 1, 2, 3, 4, 5, 6, 7, 8ve
 - Harmonic: 1, 5, 3, flat 7, 2 (9), sharp 4. Tonic and dominant are the most important, predominantly in Western terms but is so incidentally in several other systems
- Tuning the guitar
 - Beat frequency is the wavering between notes (the third frequency is the difference between two played notes)
 - E.g. 600Hz and 500Hz creates a beat frequency of 100Hz
- Frequency ratio
 - Consonance 'harmony' and dissonance
 - The simpler the mathematical ratio, the more likely we are to hear consonance
 - The opposite applies to dissonance
 - HOWEVER what an individual interprets as consonant is culturally coded
- Brass instruments and overblowing
 - Overblowing allows the instrument to work through the harmonic series
 - The buttons on a trumpet allows players to lengthen or shorten the column of air, and choose overtones for that fundamental
 - Most musical cultures alter it in some way

temperament

- Just and equal temperament
 - Just is tuned to be harmonically true
 - Each note is tuned to a 'true' harmonic
 - Bach was one of the primary contributors to the push from just to equal temperament, as just temperament compromises modulation

- Western 'dominant culture' tuning system compromises the true tuning as dictated by physics for the ability to modulate
- Some ensembles do perform in just temperament, because the nature of the instruments requires the performers to tune by ear (e.g. string quartet)
- Harmonic chants
 - 'Sigit' voices from the centre of asia
 - Original bagpipes are from Bulgaria

scales and modes

- Scales and modes
 - Music used to be in seven modes
 - Now predominantly Ionian (major) and aeolian (natural minor)
 - Scales are usually classified by the number of notes. Each mode may be understood as the same group of notes but starting or finishing at a different point
 - Western major scale has seven notes and seven modes within it. Often referred to as 'church' music.
- Classical music of central Asia
 - Modal forms do not work in harmonic progression, but in linear-melodic progressions that move outward from and inward to a fixed tonal centre
- Microtones
 - Intervals between the tones on a piano
 - Meaning depends on an assumption of the meaning of the term 'tone', and the assumption that a tonic is a harmonic benchmark
 - We need to remember that tone in the equal temperament is not harmonically true
- Balinese gamelan
 - Tunes slightly apart
 - Sustained notes have distinctly audible beat difference
 - 'Out of tune' in Western context, deliberate and desirable in Balinese context
 - Thus, evidence that tuning is a culturally coded concept