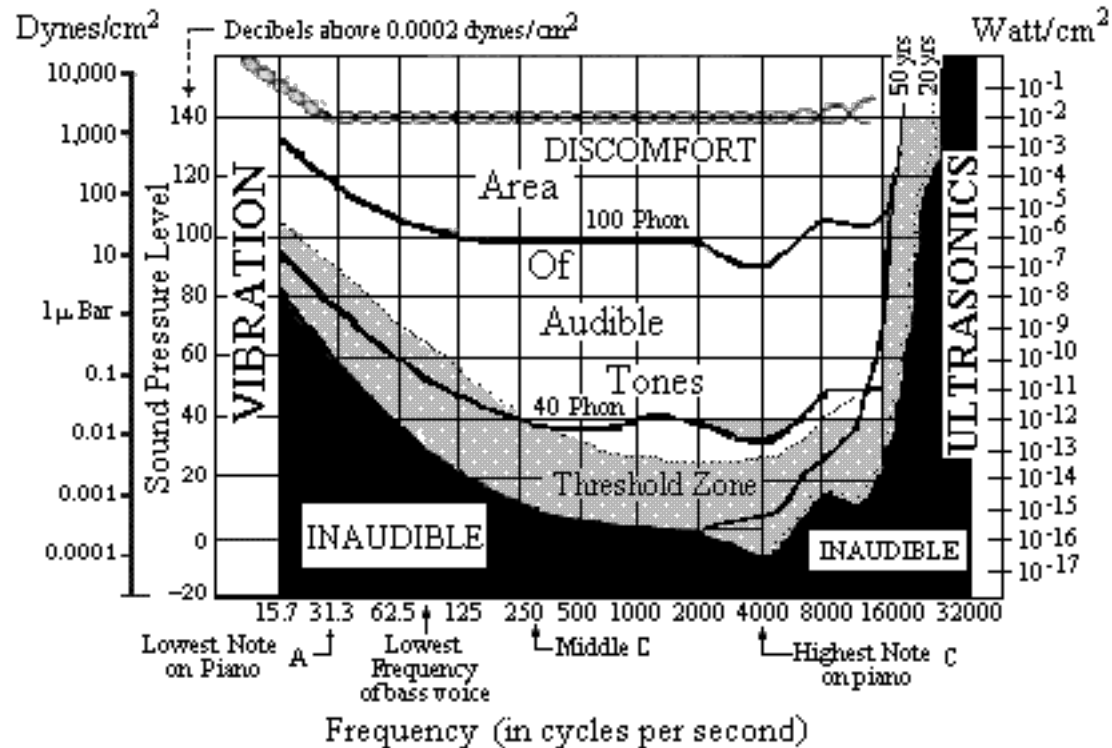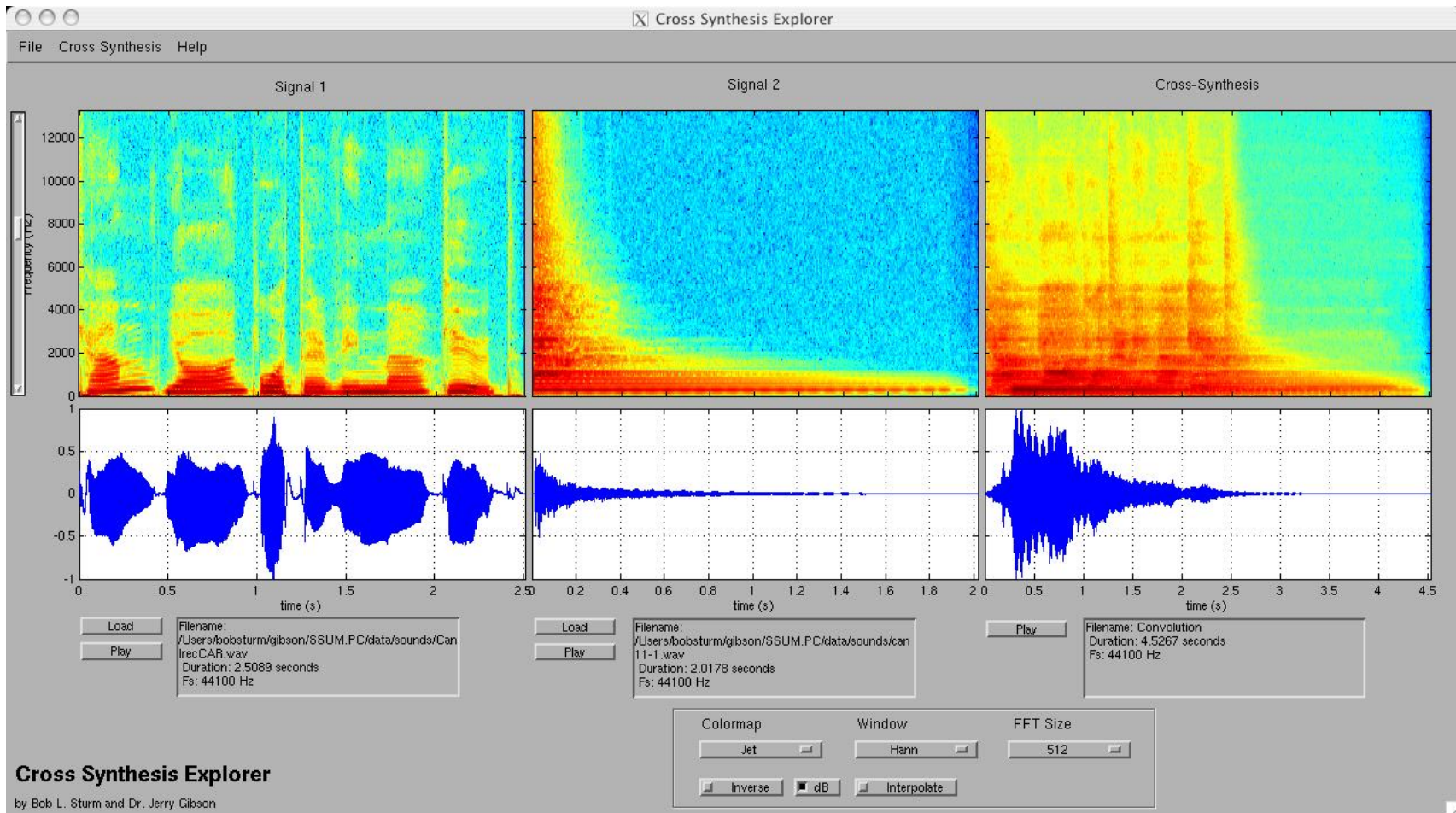# MUS434-571.3
Music of the Modern Era

Spectral Music – Apr. 18, 2013

Frequency Spectrum

- Hearing range 20 Hz to 20,000 Hz (20 kHz)

Spectral Analysis (FFT)

Spectral Music

- Timbre is created by each sound's unique spectral content
- FFT (Fast Fourier Transform) is the process by which one analyzes a sound's spectrum over time
- More scientific and perceptive approach to composition
  - Acoustics / Physics of Sound
  - Focus on timbre through exploration of the overtone series
  - Electronic music principles and techniques with acoustic instruments

Overtone Series

EXAMPLE 1: THE FIRST THIRTY-TWO PARTIALS OF AN OVERTONE SERIES
BASED ON A LOW E

Spectral Music

- Sonority = any group of pitches
- Harmonicity – using overtones in a sonority
- Inharmonicity – using tones that are not overtones in sonority
- Formant – strongest frequencies ("vowel sound")
- Microphony – "zoomed in" perception of sound (sustain/decay)
- Macrophony – sound events perceived over time
- Subharmonicity – Invert intervallic relationships of overtones (large intervals on top, small microtonal relationships on bottom)

Gérard Grisey – *Partiels* (1975)

- One of six pieces from *Espaces Acoustiques*
- Based on overtone series of low trombone E
- Stable sonority gradually altered, noise added
  - Inhalation (increased activity / instability)
  - Exhalation (restoring order)
  - Rest (on E fundamental)
- Temporal processes applied
  - Spectral polyphony – counterpoint between timbres (sonorities)
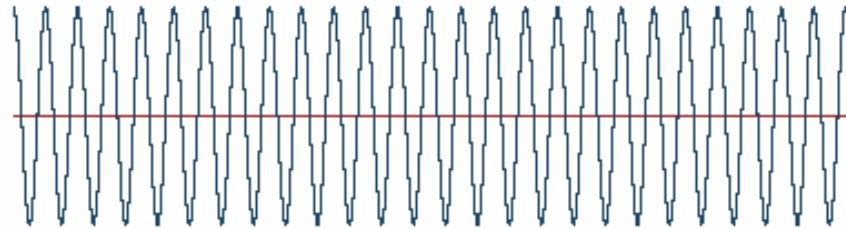
Tristan Murail – *Gondwana* (1980)

Ex.1 Opening spectral of Murail's *Gondwana* (1980)
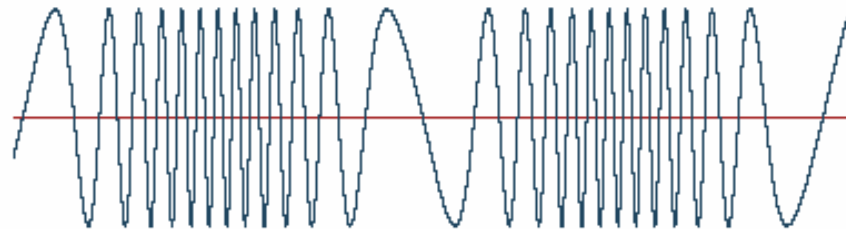
Frequency Modulation
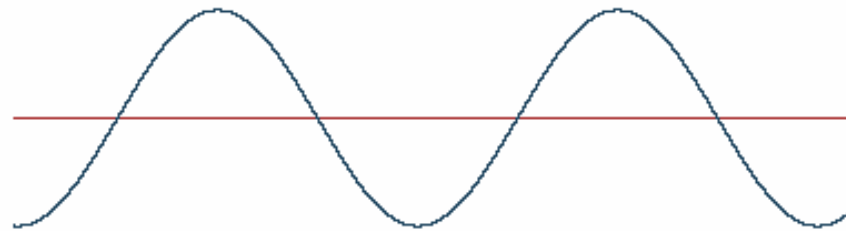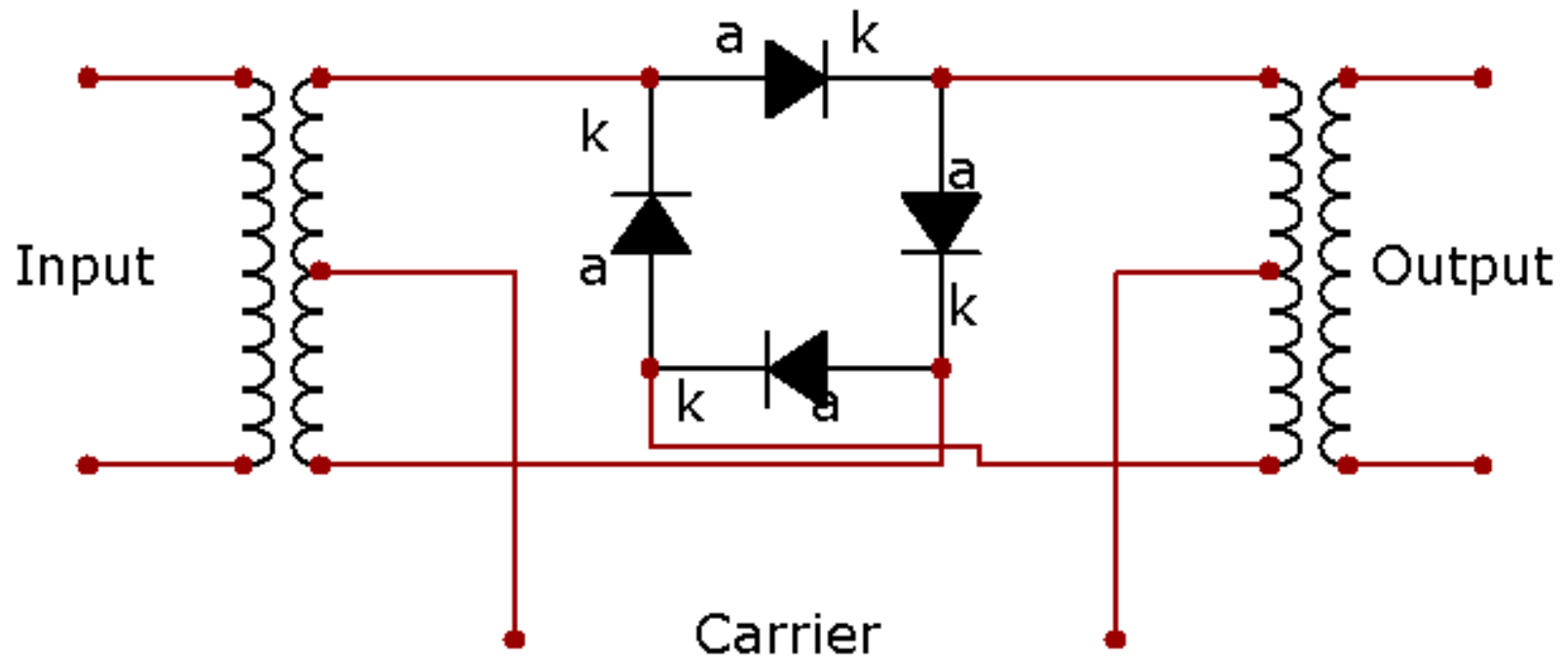
Ring Modulation

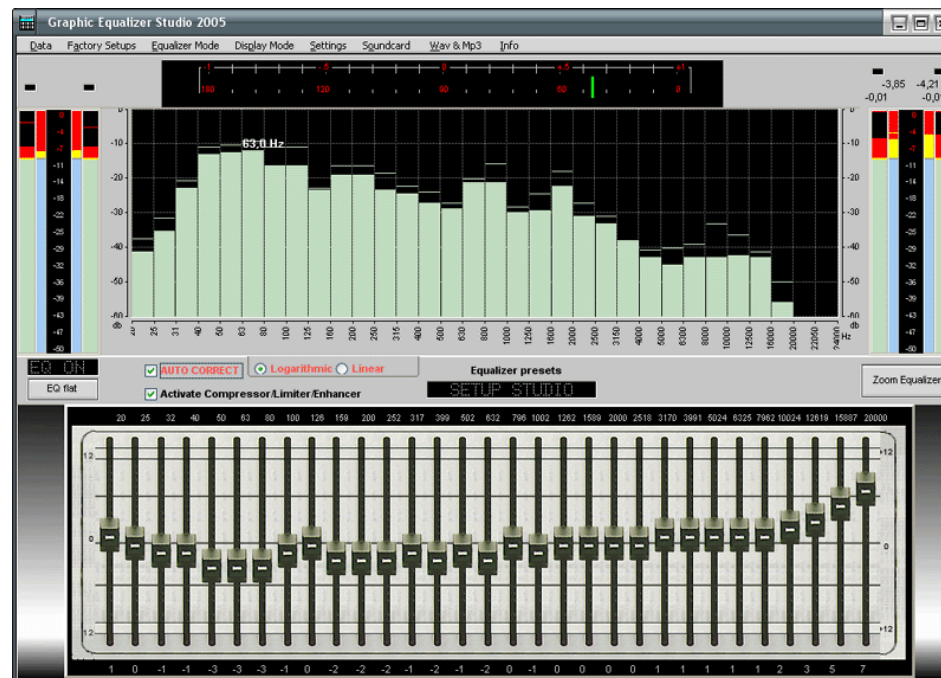# Ring Modulation

- Additive synthesis yields summation and difference tones
- 500 Hz wave modulated by 700 Hz wave
    - 1200 Hz (500 + 700)
    - 200 Hz (500 − 700 = -200 / take absolute value)

Filtering

- Phase relationships between sound waves change the strength of various frequencies

- Equalization

Tristan Murail – *Gondwana* (1980)

- Opening: slowly shifting sonorities
  - Incorporate elements from one chord into the next
- More active textures / rhythms
- Gestural phrases
- Evocative reference to prehistory
- Frequency Modulation to create extra tones

Chaya Czernowin – *MAIM (2006)*

- Three, continuous movements
  - "Strange Water Stolen Water"
  - "The Memory of Water"
  - "Water of Dissent"
- Instrumentation
  - Large orchestra
  - 5 soloists (saxophone/tubax; oboe/musette/English horn; piano/harpsichord; electric/steel guitars and viola)
 - Live electronics
- "Scaling" – microphony and macrophony

TUBAX!

Toru Takemitsu

- Influenced by Debussy and Messiaen
- 1951: Jikken Kōbō (Experimental Workshop)
  – Textural fragmentation (pointillism)
  – Electronic music
- 1960's: Include traditional Japanese instruments
  – *November Steps* (concerto for biwa and shakuhachi)
- 1970's: Less sound mass, more harmonic and timbral differentiation
- 1980's: Shifting toward more tonal focus
- Film music, arranging Beatles, Gershwin songs

Biwa
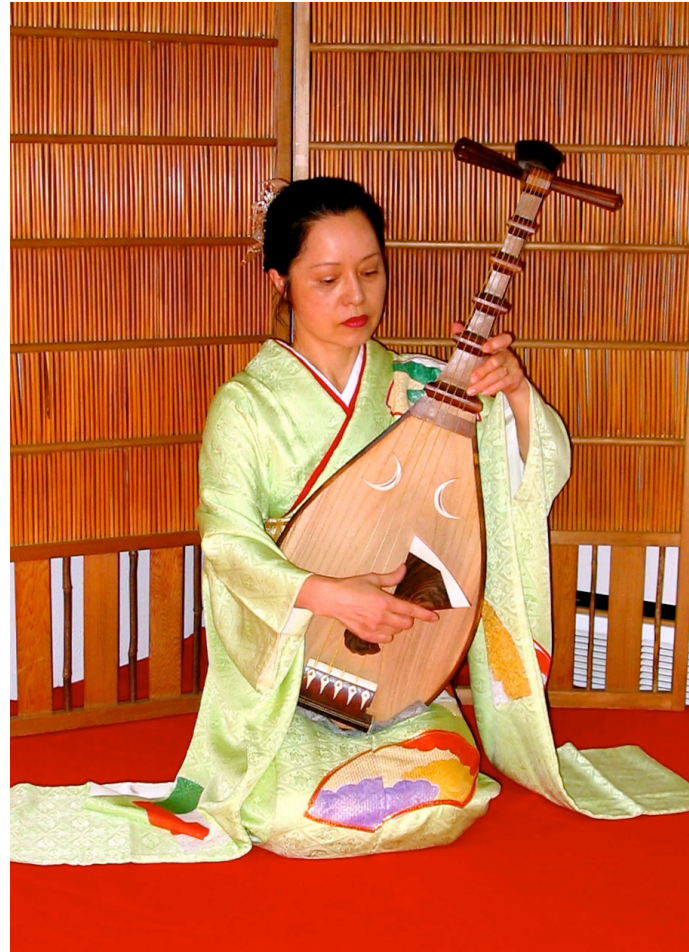
Shakuhachi

Toru Takemitsu – *Rain Spell* (1982)

- Flute, clarinet, harp, vibraphone, piano
- Multiphonics, fingering trills, microtonal harp, inside the piano techniques
- More traditional approach to phrasing and form while maintaining interest in timbre and interaction of sounds

Summary

- Composing with "sound" and "perception," often microtonal
- Timbre is paramount!
  - Interactions between complex sounds create new ones
- Redefinition of musical time
  - Repetition / process
  - Microphony (sound within the sound)
  - Evolving sound masses, inclusion of noise
- Grew out of research in electronic music
- Principles may be applied to all styles / forms