Harmonic Models (2)

CS 275B/Music 254

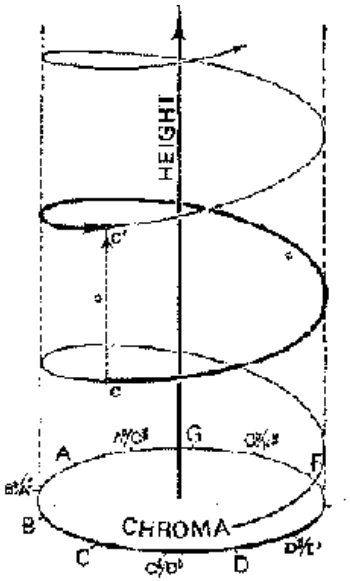
Harmonic Models: Overview

- Geometric models
  - 18th-century Germany
    - Henichen
    - Euler
  - 19th-century Germany
    - Riemann
  - Krumhansl (1990)
  - Purwins (2000-2006)
  - Chew (2000-2006)
- Acoustic models
- Metric and spectral models
- Harmony foundation as basis for composition

Geometric Models

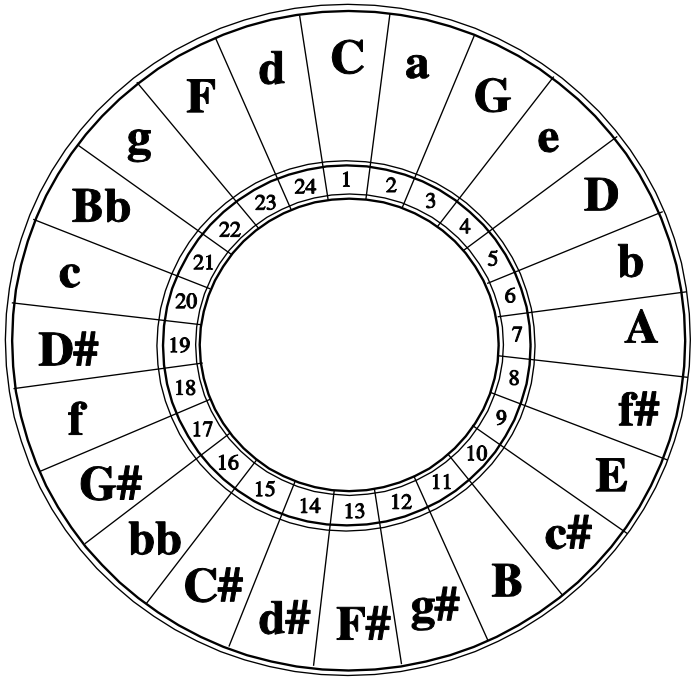
- Geometric models
  - 18th-century Germany
    - Henichen
    - Euler
  - 19th-century Germany
    - Riemann
  - Krumhansl (1990)
  - Purwins (2000-2006)
  - Chew (2000-2006)

Heinichen's Circle of Fifths (1728)

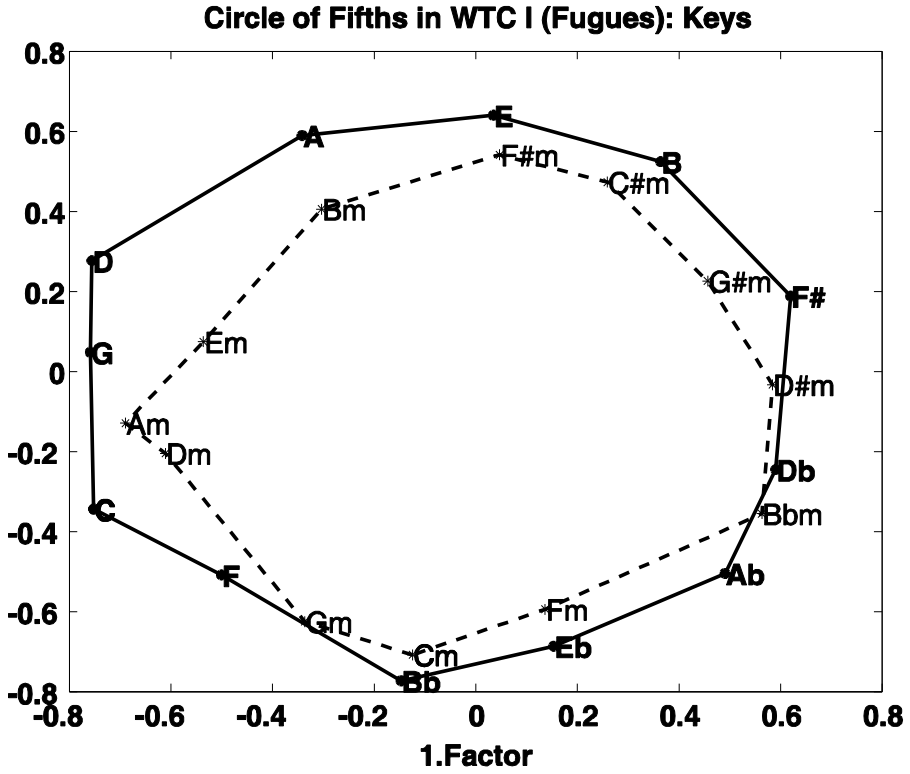


Chew's spiral array (2000)

Acoustical properties of the Circle of Fifths



Modern arrangement of Circle of Fifths



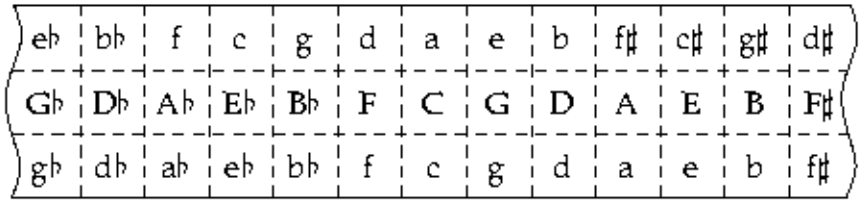
Ozgur Izmirli (CT), Computing in Musicology 15 (2008): differential utilization of key regions in WTC fugues

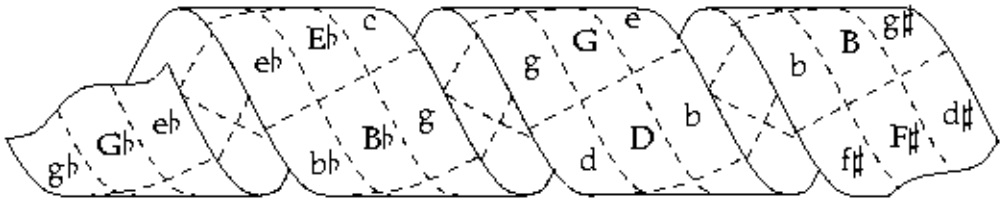
Toroidal model of tonality

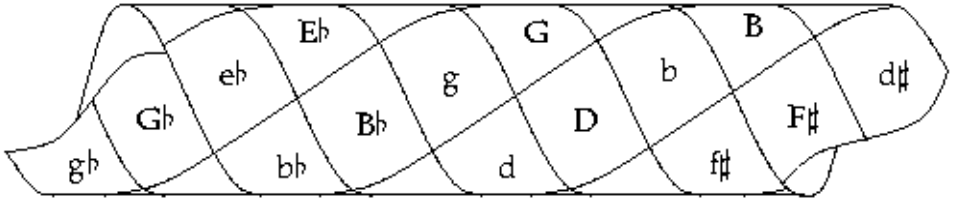
Hendrik Purwins, Technische Univ., Berlin, (*c.* 2000)

Weber (18th cent) key chart

d♯	F♯	f♯	A	a	C	c
g♯	B	b	D	d	F	f
c♯	E	e	G	g	B♭	b♭
f♯	A	a	C	c	E♭	e♭
b	D	d	F	f	A♭	a♭
e	G	g	B♭	b♭	D♭	d♭
a	C	c	E♭	e♭	G♭	g♭



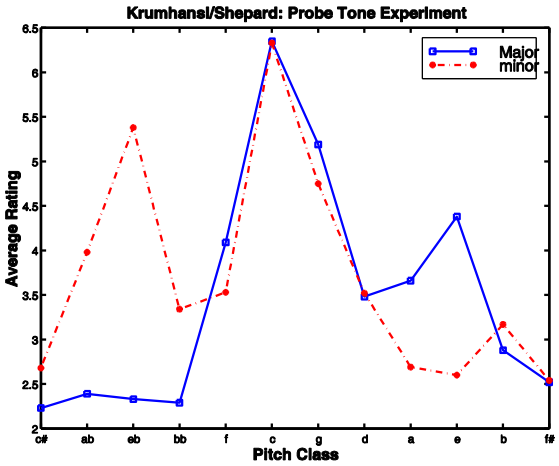


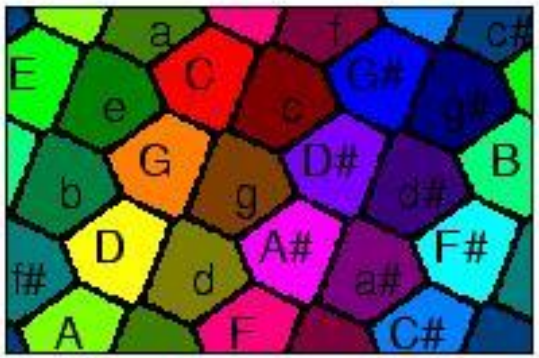


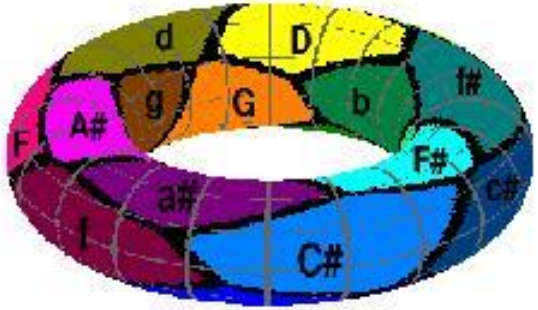
Derived from transformation of 18th-century German grids to three-dimensional mappings

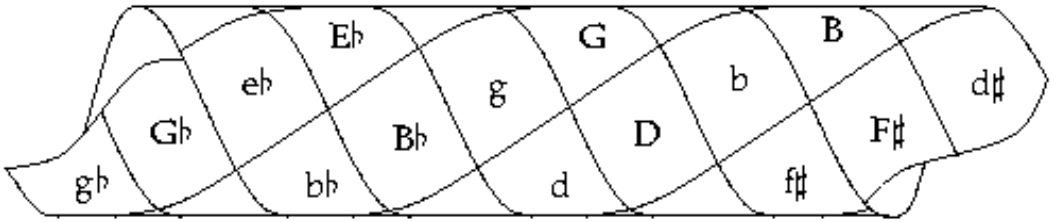
Krumhansl:
Cognitive Foundations of Musical Pitch (1990)

Probe-tone experiment results: How well to subjects judge how well a single tone
Relates to a musical passage? Intercultural studies show that judgments vary by mode (major/minor).



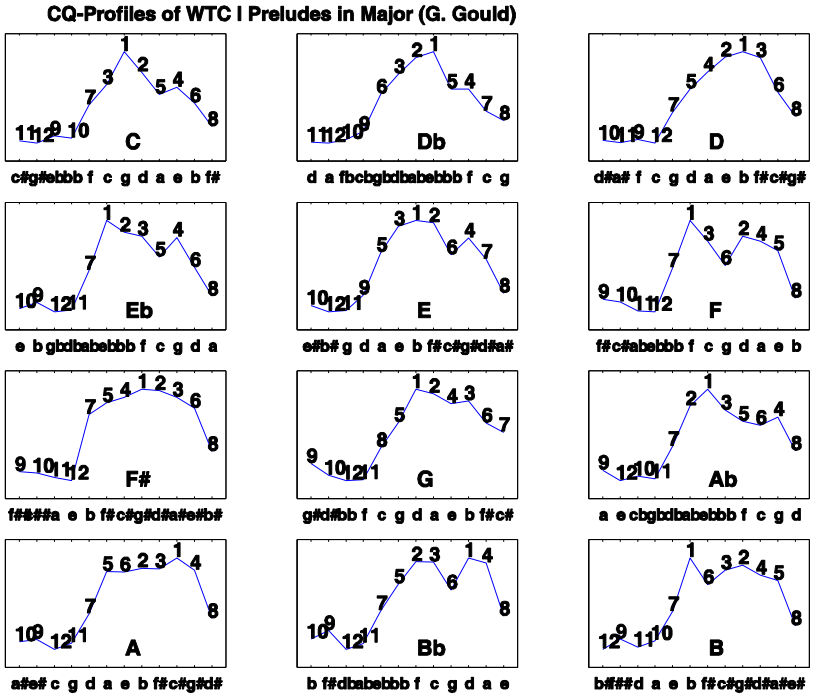


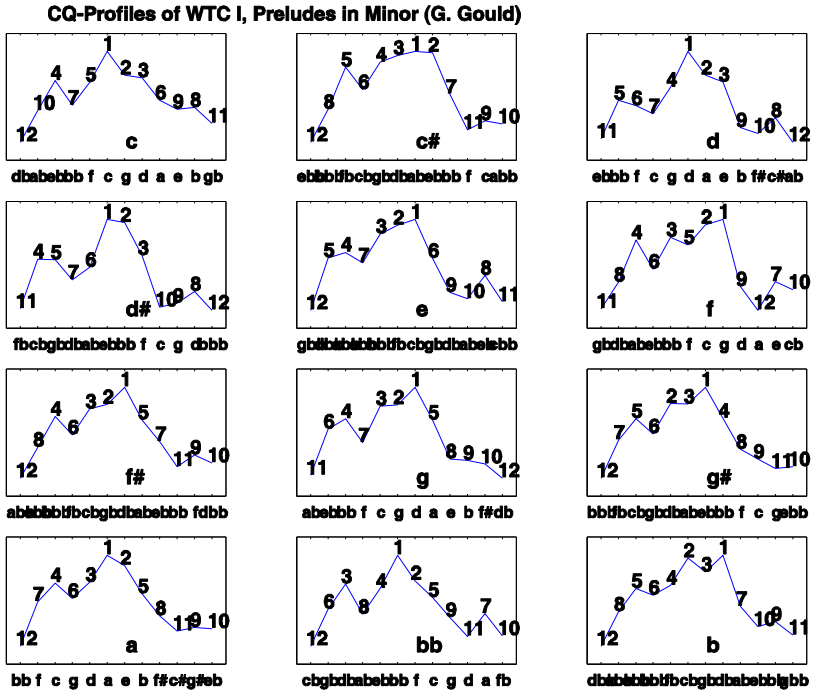




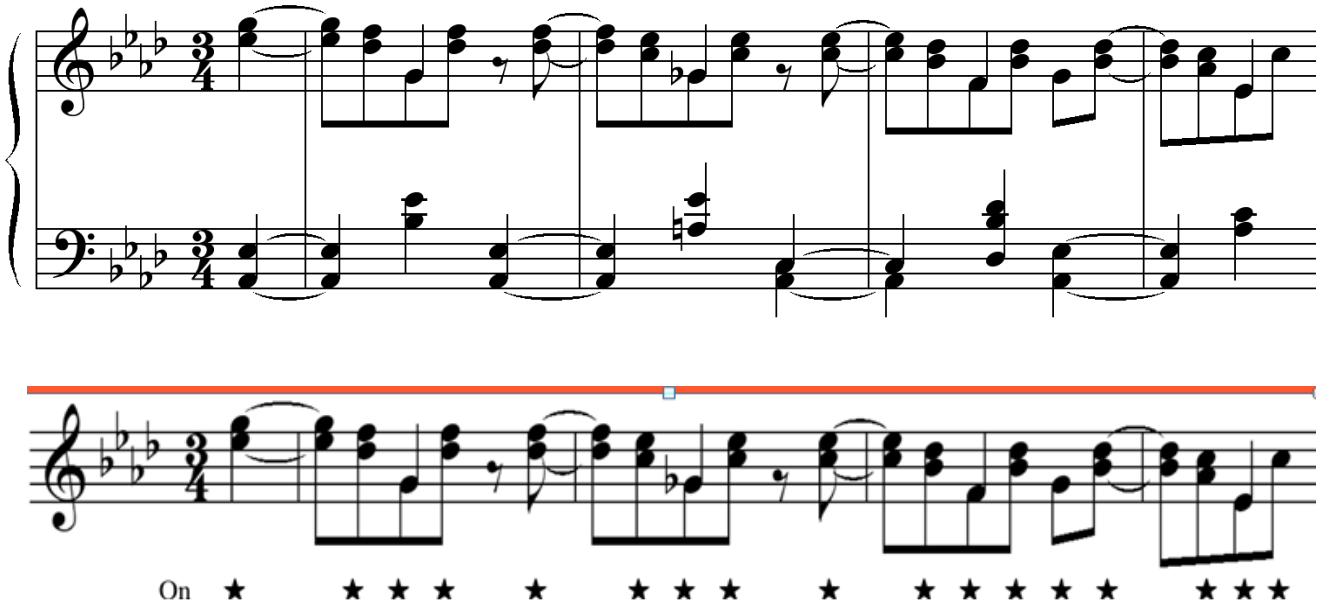
Well Tempered Clavier (Purwins)

Key frequency in Gould performances of Bach's WTC





Spectral Weights (in association with metric weights)

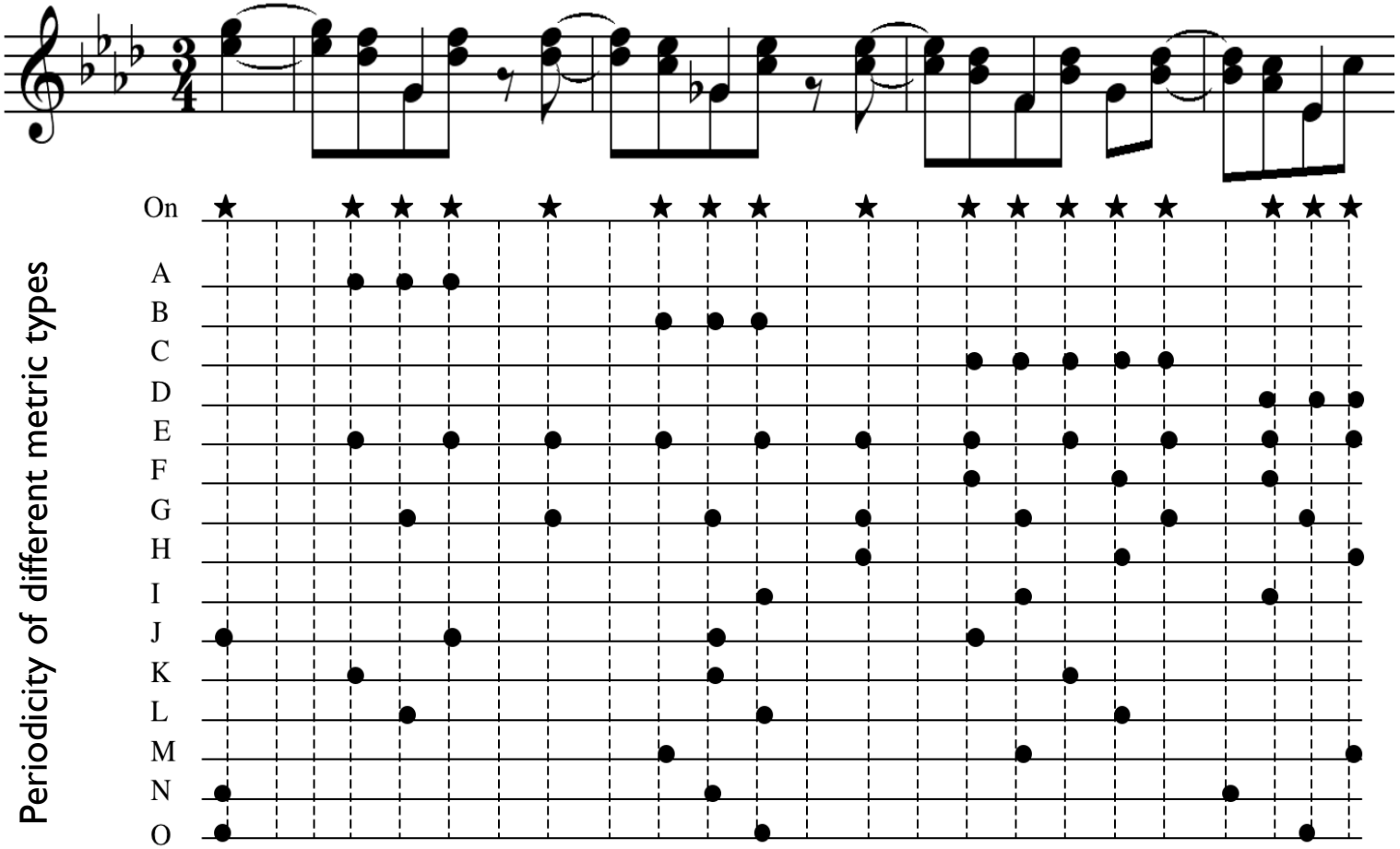


Schumann Waltz Op. 124, N. 15, mm. 1-4

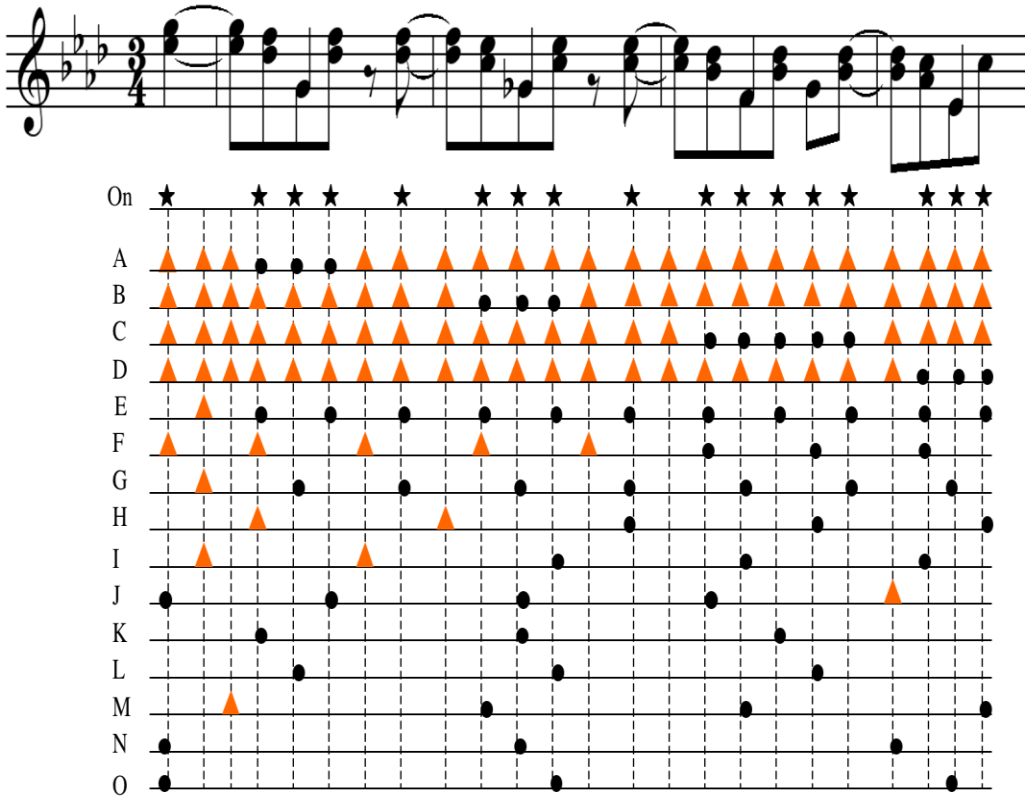
Work of Anja Volk (Utrecht Univ.)

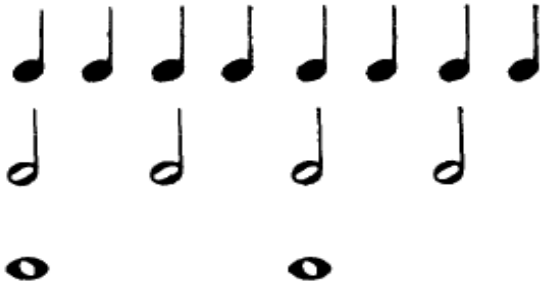
- **inner metric structure** [outer metric structure = meter]

Volk's Inner metric structure



Inner vs outer metric sturcture





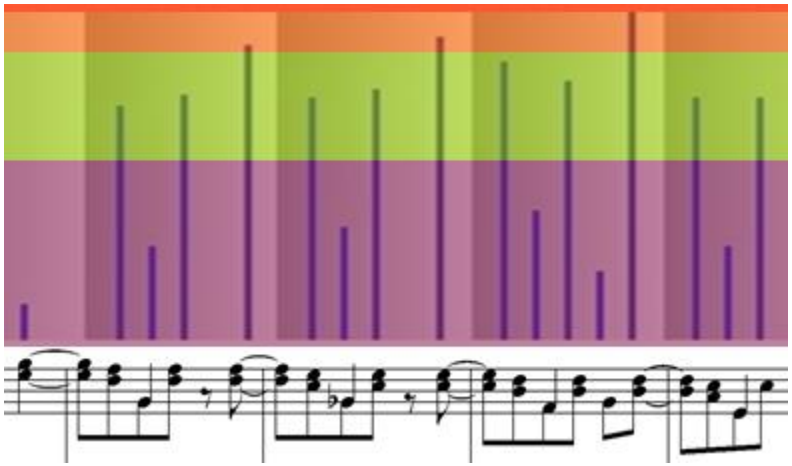
Spectral weights

$$m_{s,d,k} = \{s + id, i = 0, \ldots, k\}$$

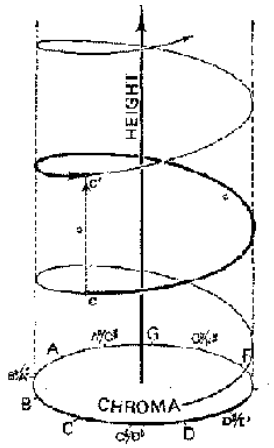
start

period

length

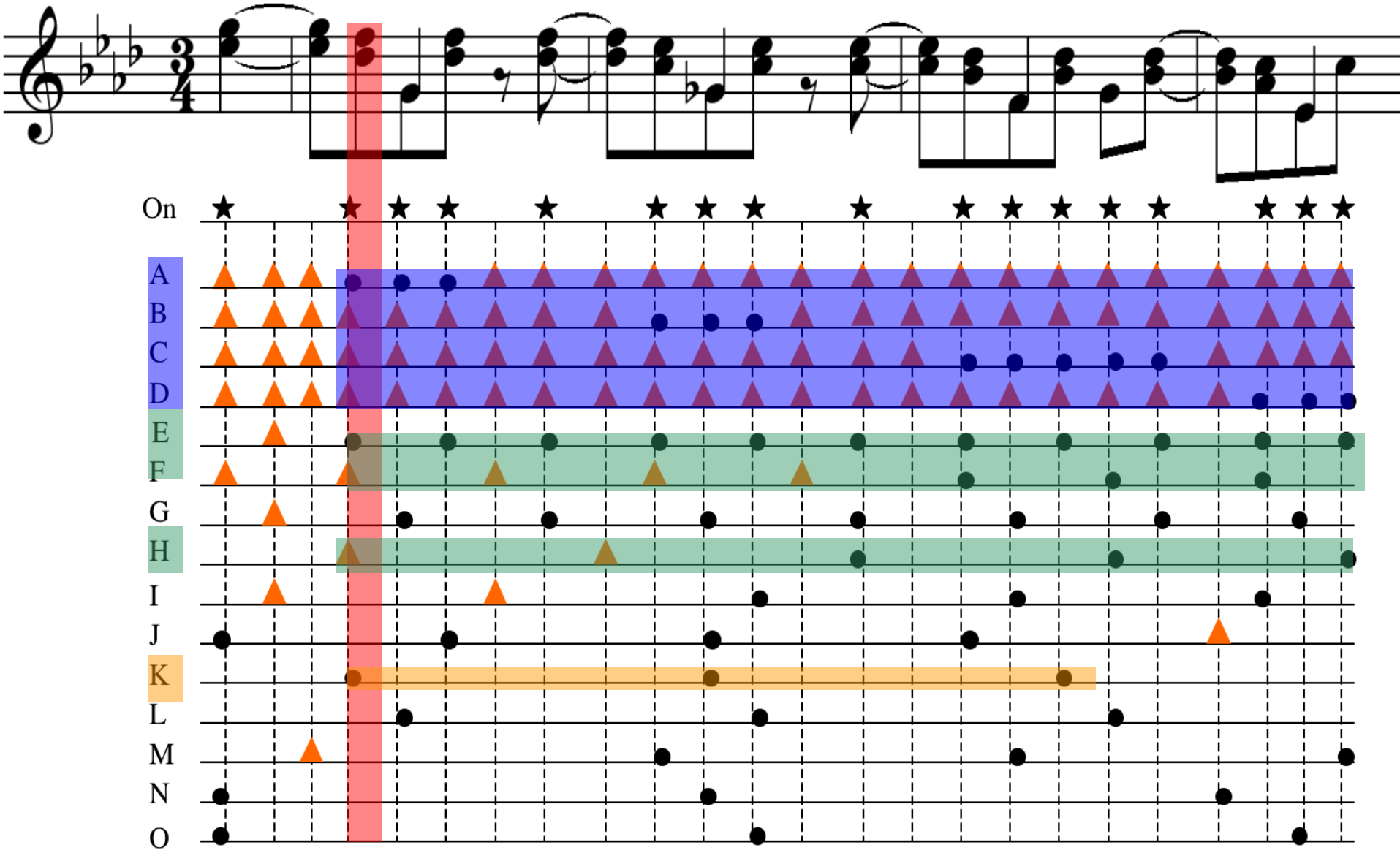


$$W_{l,p}(o) = \sum_{\forall m_k : k \geq l, o \in m_k} k^p$$

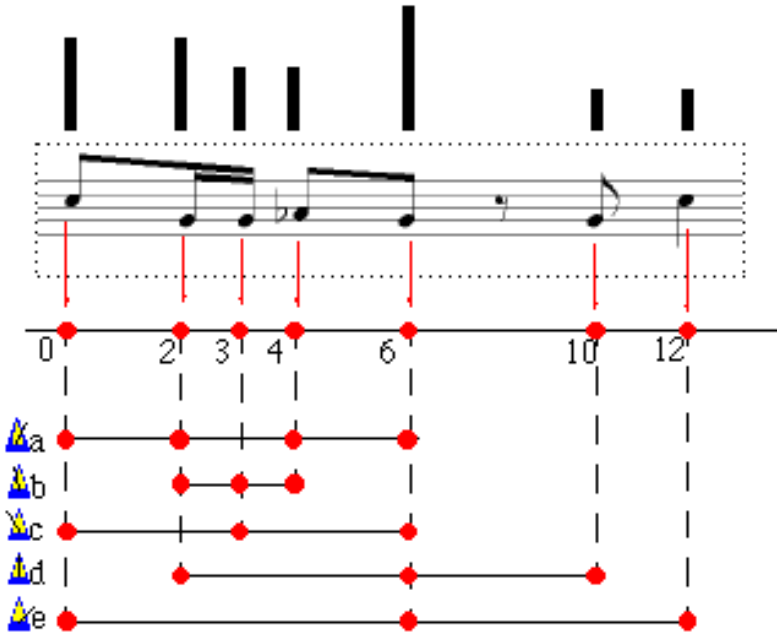


Work of Anja Volk (Utrecht Univ.)

- inner metric structure [outer metric structure = meter]
- **Spectral weights** (additive from inner metric weight grid)


On
A
B
C
D
E
F
G
H
I
J
K
L
M
N
O

Inner metric structure (summary)



Author's summary of process

Prozess

-Ausgangspunkt ist midi-Repräsentation d.Stückes, am Ende erhält man für jede Note ein metrisches Gewicht, dass die metr. Bedeutung dieses Tones kodieren soll

-metr. Analyse berücksichtigt nun lediglich die Einsatzzeiten der Töne, vergißt Tonhöhe und Dauern

-sucht nach Regularitäten in den EZ, indem nach wiederholenden Einsatzzeitenabständen gesucht wird

-d.h. ermittelt werden die sog. Lokalen Metren, dies sind Raster oder Kämme von Tönen im gleichen Einsatzzeitenabstand

-metr. Gewicht einer EZ berechnet sich als gewichtete Summe aus allen lokalen Metren, an denen sie beteiligt ist (man „mißt" die Regularitäten)

-höchstes metr. Gewicht auf G entspricht nicht unserer Erwartung;

-**Frage**: was kann man denn erwarten von diesem Ansatz?

Partimenti: Harmonic foundation as basis of composition

- 18th Neapolitan practice of composition
- Sanguinetti (2012): *The Part of Partimento*
- Robert Gjerdingen (2010): http://faculty-web.at.northwestern.edu/music/gjerdingen/partimenti/collections/Durante/diminuiti/index.htm

Gjerdingen: Partimenti website

Northwestern University

Sanguinetti: Partimento book

- The Rule of the Octave
- Suspensions
- Elaborations of the Rule of the Octave
- Relationships to compositional genres
- How to create your own partimenti

The Art of Partimento (OUP, 2012)

Sanguinetti, 2

- **The Rule of the Octave**
  - How to harmonize an octave
    - Ascending/descending
    - Major/minor
- Suspensions
- Elaborations of the Rule of the Octave
- Relationships to compositional genres
- How to create your own partimenti

Sanguinetti, 3

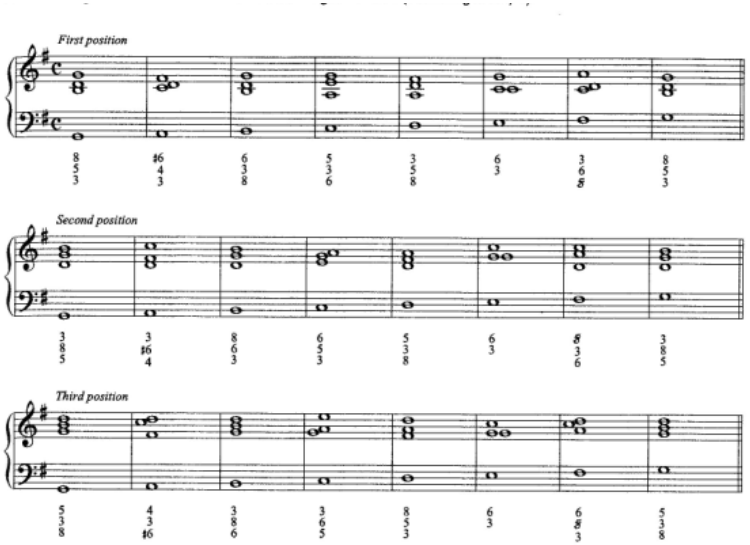
- **The Rule of the Octave**
  - How to harmonize an octave
    - Ascending/descending
    - Major/minor
- **Suspensions**
  - In the soprano: by the 4^{th}, by the 7^{th}, by the 9^{th}
  - In the bass: by the 2nd
- Elaborations of the Rule of the Octave
- Relationships to compositional genres
- How to create your own *partimenti*

Sanguinetti, 4

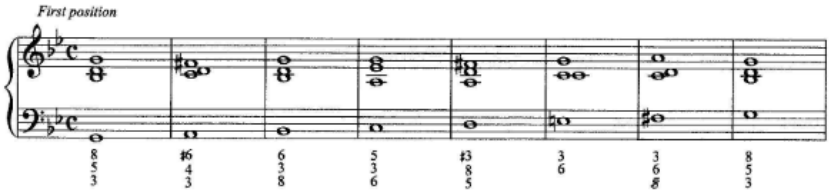
- **The Rule of the Octave**
  - How to harmonize an octave
    - Ascending/descending
    - Major/minor
- **Suspensions**
  - In the soprano: by the 4^{th}, by the 7^{th}, by the 9^{th}
  - In the bass: by the 2nd
- **Elaborations of the Rule of the Octave**
  - Interpolations in the bass line
  - Variations, diminutions in any part
  - Motives, subjects et al.
- Relationships to compositional genres
- How to create your own *partimenti*

Examples: Ascending, descending scales

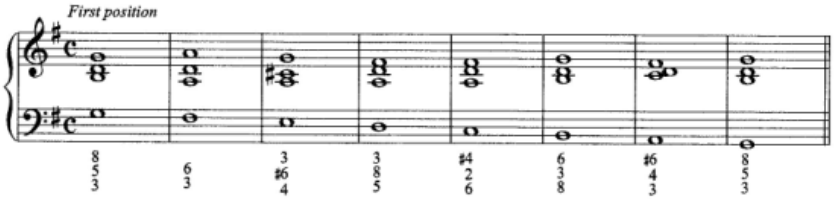
- Octave, ascending, 3 positions



- Ascending, minor, 1st position



- Descending, major, 1st position

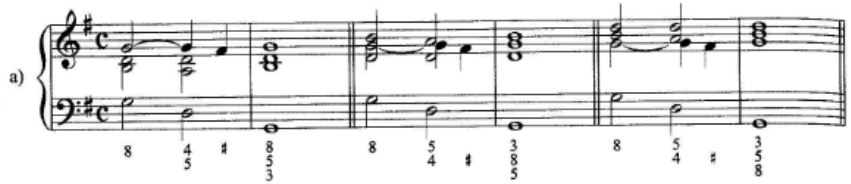


Positions:

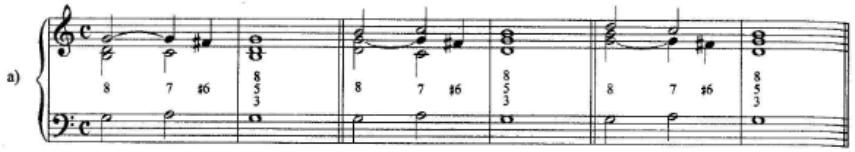
Treble starting on the first, 3rd, 5th

Examples: Suspensions

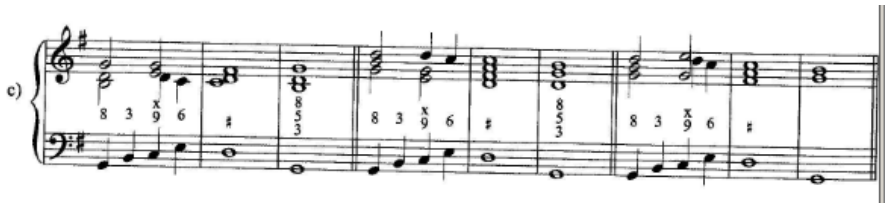
- Fourth suspensions



- Seventh suspensions



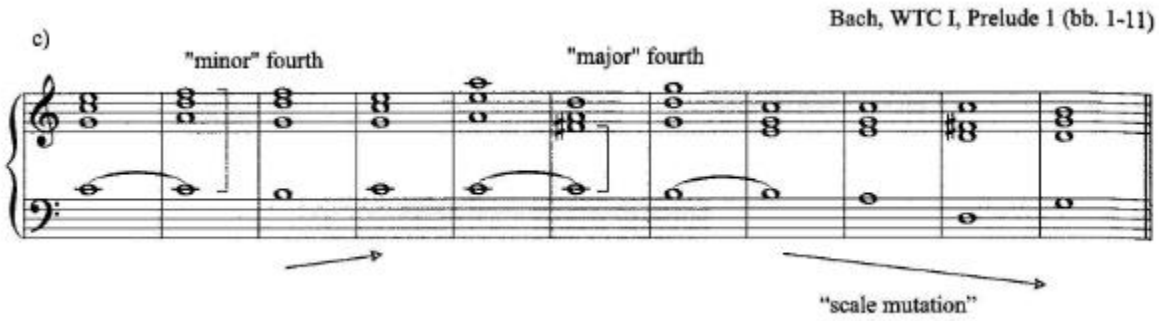
- Ninth suspensions



As in exachordal theory, a "mutated" bass thrusts the harmonic action into a new key.

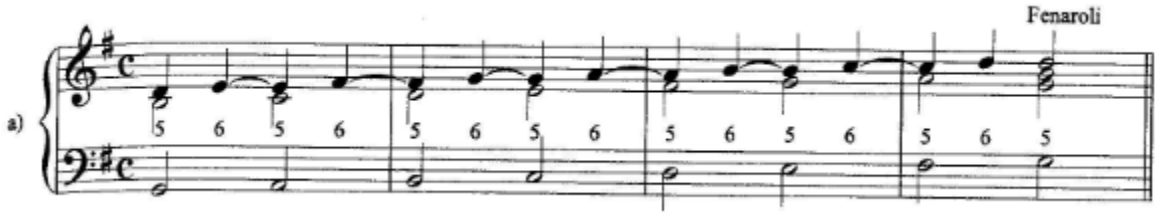
- Mutated bass
- "Major," "minor" fourths

4th, 7th, 9th suspensions pertain to treble

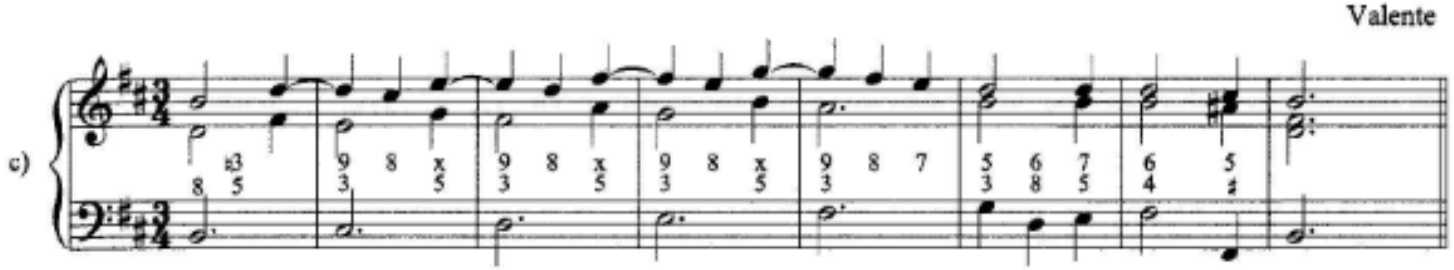


Examples: Rhythmic variation

- Limping suspensions

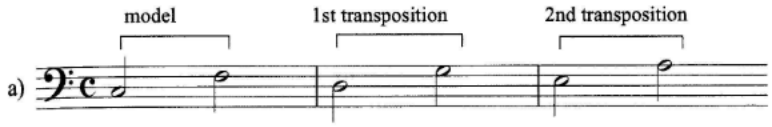
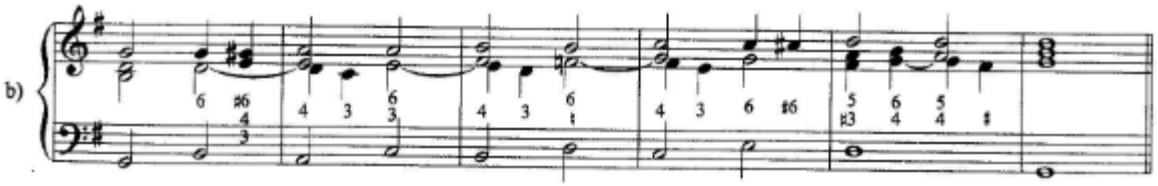
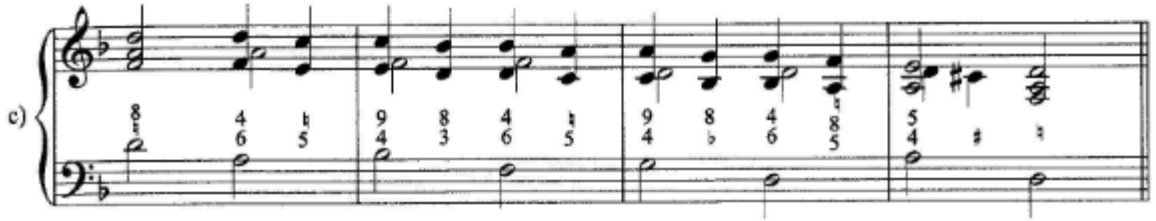


- Rhythmic enrichment



Examples: Patterned basses

- Sequential bass



- Patterns based elaboration
  - Rising by 3rds, falling by step
  - Falling by 4ths, rising by step