

# Hypermeter and Form as Temporal Structure, and Beethoven's Formal Innovations

Presentation to the McGill Music Research  
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Jason Yust, Boston University

<http://people.bu.edu/jyust>

[jason.yust@gmail.com](mailto:jason.yust@gmail.com)



# Organized Time: Temporal Structure in the Musical Domains of Rhythm, Tonality, and Form

ORGANIZED  
TIME

JASON  
YUST

*Rhythm,  
Tonality,  
& Form*

OXFORD STUDIES IN MUSIC THEORY



# Outline



- (1) Hypermeter and closure
  - (a) Meter as temporal hierarchy
  - (b) The rule of tonal-rhythmic closure
  - (c) Two methods of closure (simple, expanded)
- (2) Expositional closure
  - (a) Simple closure in expositions *Exx*: Haydn Op. 54/2, Beethoven Op. 9/2
  - (b) Delaying closure via elision *Ex*: Beethoven Op. 7
  - (c) The open exposition *Exx*: Beethoven Op. 47, Op. 59/2
- (3) Network model of musical form and the disjunctive coda
  - (a) Formal structure: Basic principles
  - (b) Integrated and disjunctive codas *Exx*: Haydn Symph. 101, Beeth. Op. 59/2
- (4) Innovative tonal-formal disjunction in Beethoven's middle period
  - (a) Off-tonic recapitulation *Ex*.: Op. 9/1 Scherzo
  - (b) Non-standard subordinate keys *Ex*.: Op. 29 Quintet
- (5) Relating structural shapes: The associahedron



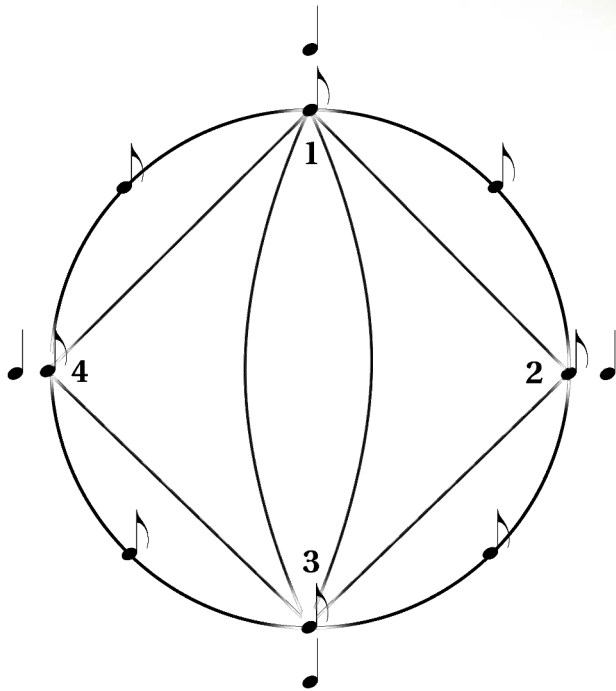
# **(1) Hypermeter and Closure**

- (a) Meter as temporal hierarchy
- (b) Rule of tonal-rhythmic closure
- (c) Two methods of closure  
(simple, expanded)

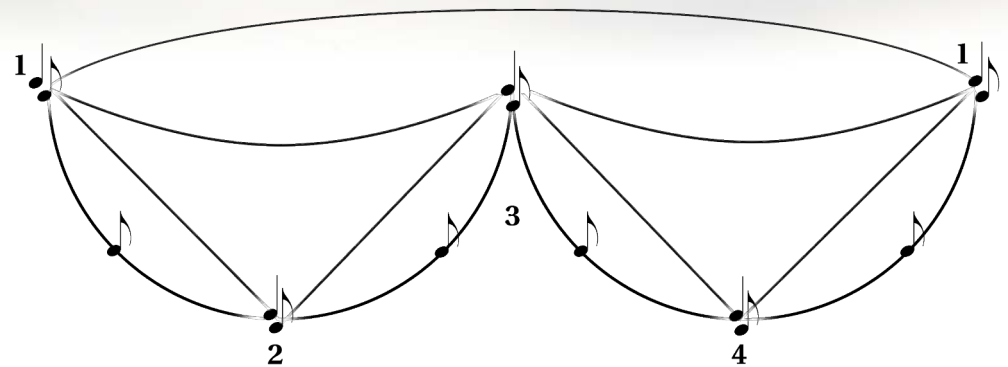


# Meter as temporal hierarchy

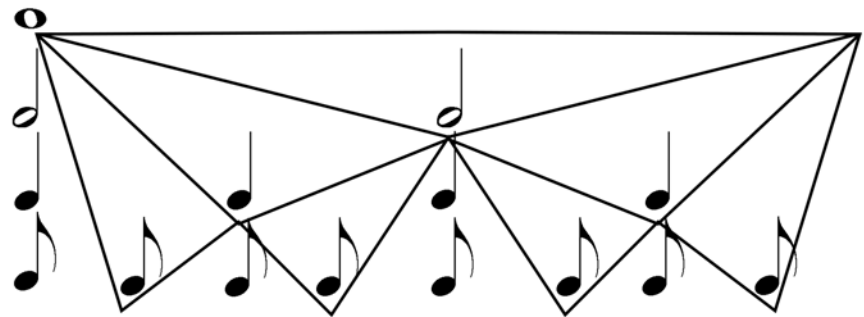
A measure of 4/4  
from Justin London,  
*Hearing in Time*:



Unfolded:



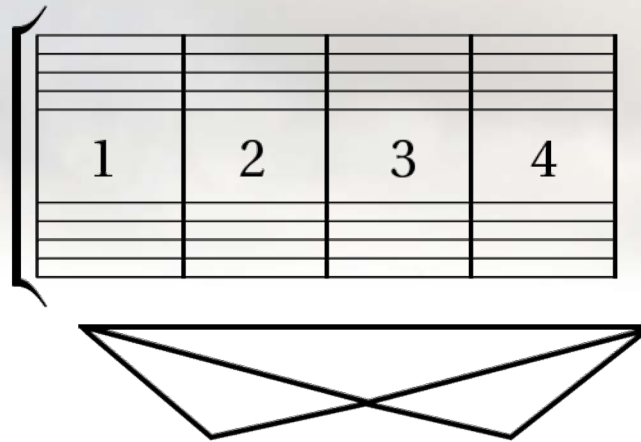
As a network on timepoints:





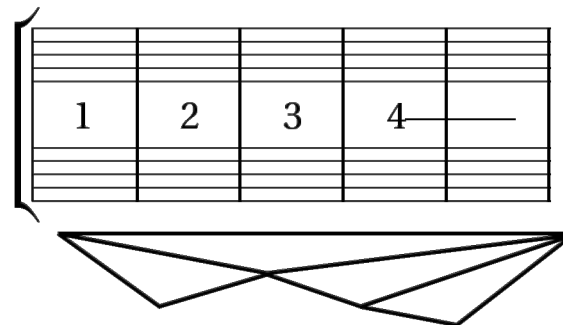
# Meter as temporal hierarchy

Normal hypermeter is a structural relationship between downbeats in four-measure groups:

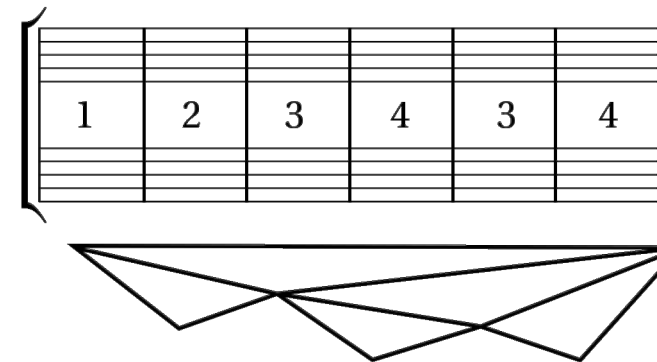


It also commonly allows for various types of irregularity:

One-measure extension:



Two-measure extension:



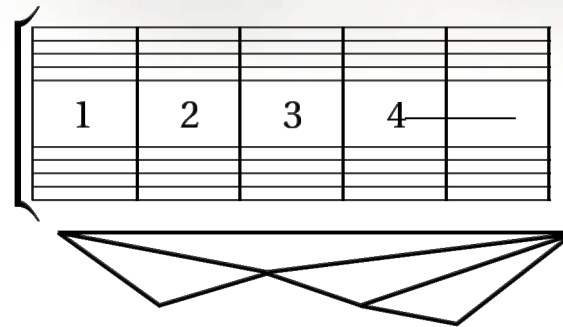


# Meter as temporal hierarchy

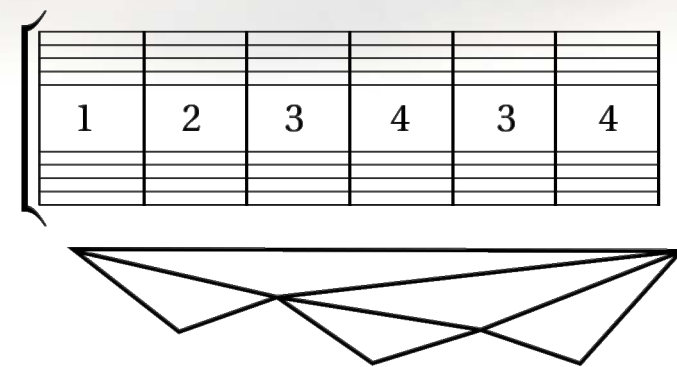
## Irregularities

Extensions:

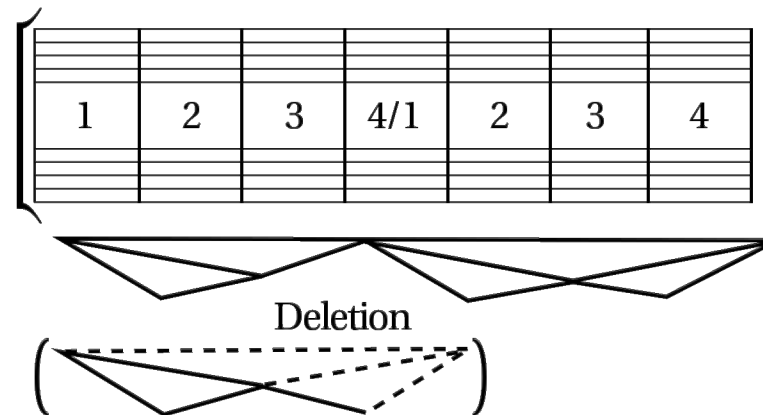
One-measure extension:



Two-measure extension:



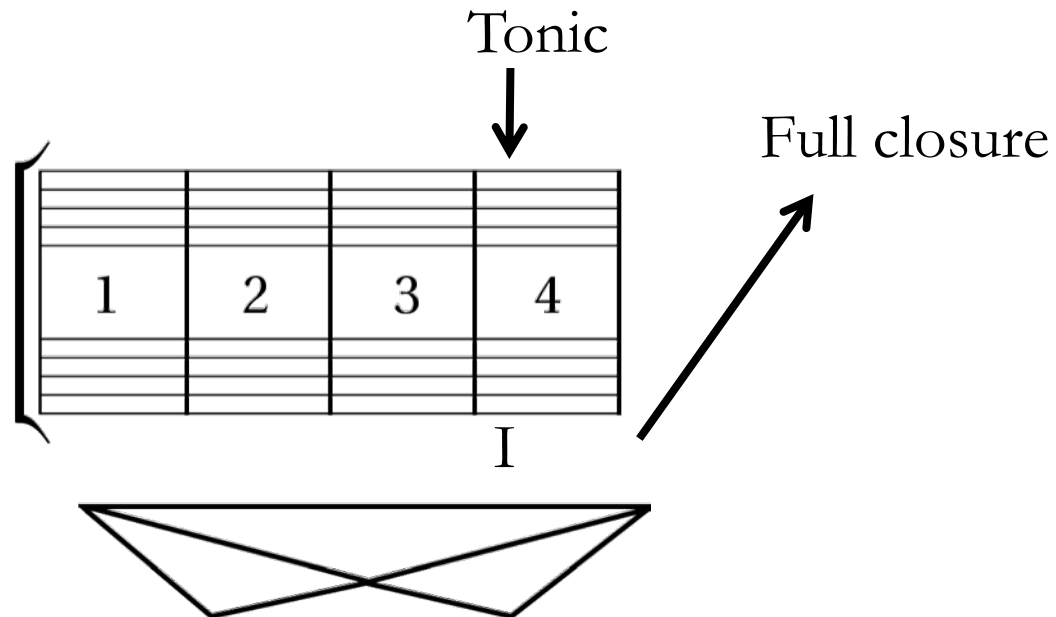
Deletion:





## Rule of tonal-rhythmic closure

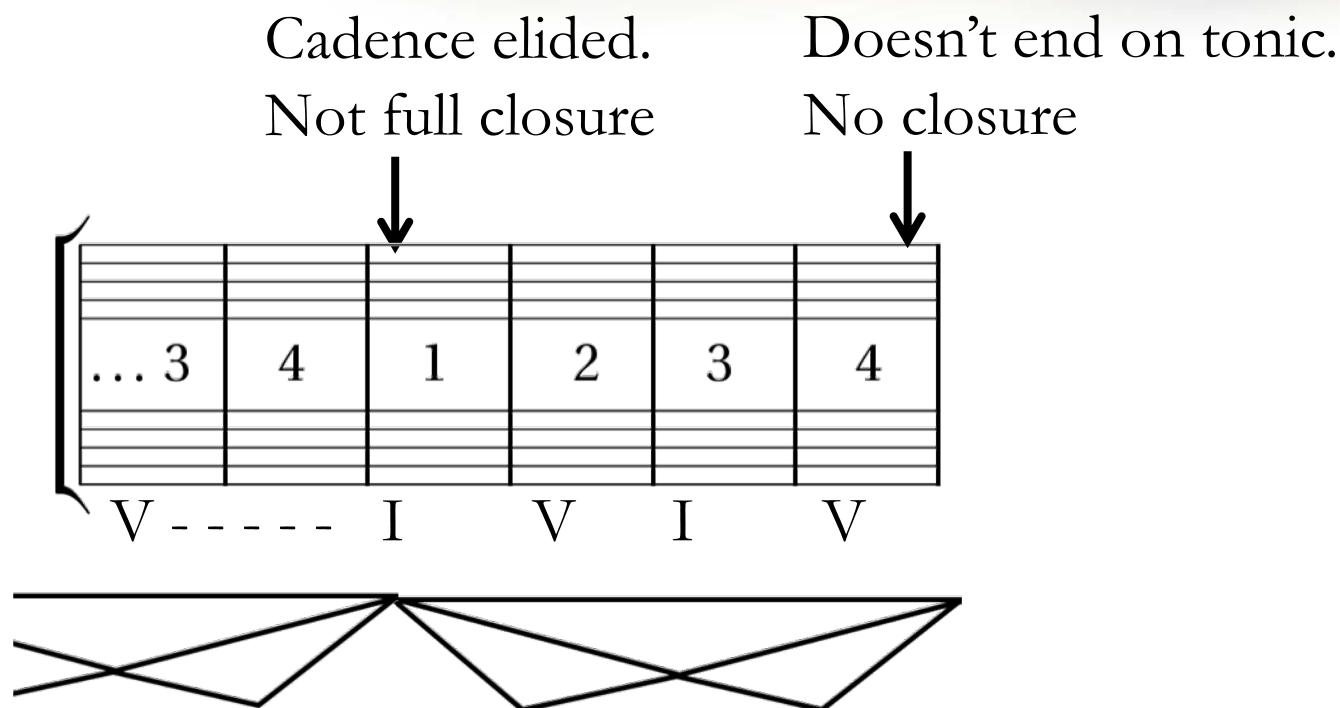
Tonal and rhythmic closure are *coordinated* when the cadential **final tonic** occupies the **final measure** of a group.





## Rule of tonal-rhythmic closure

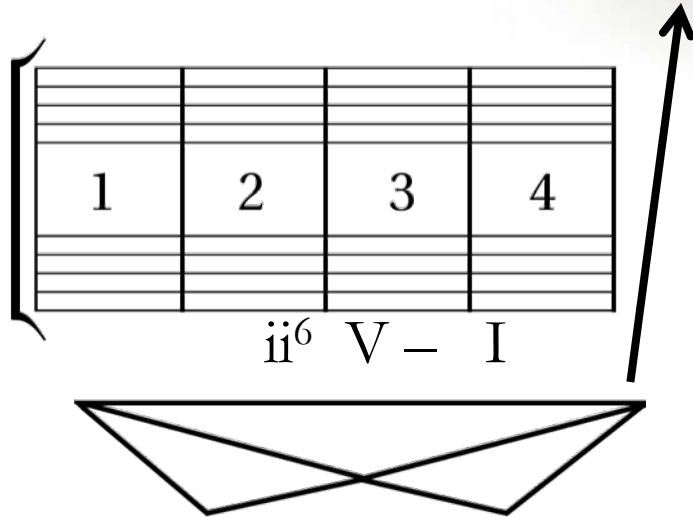
**Elided cadences** lack tonal-rhythmic coordination and therefore are a method of **avoiding full closure**



# Rule of tonal-rhythmic closure

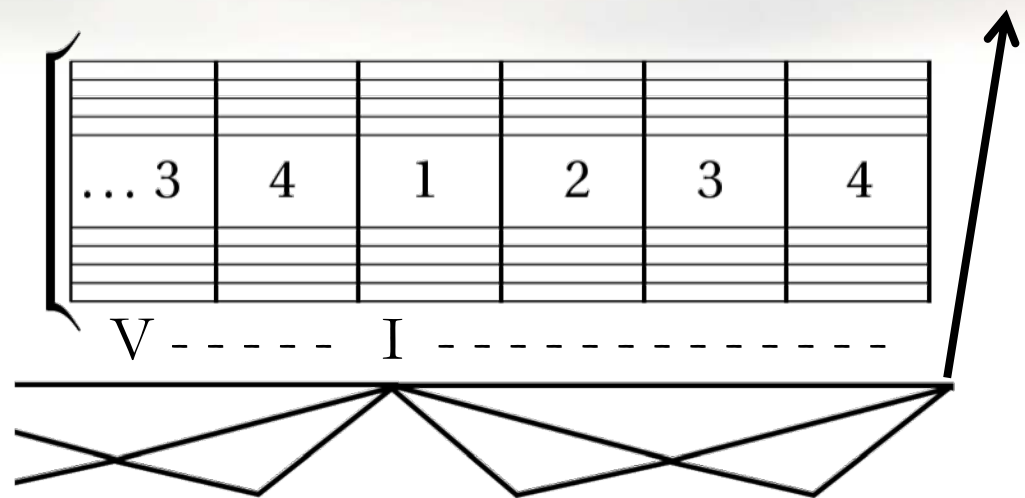
Two ways to satisfy the rule of closure:

Full closure



Simple method:  
Cadence in bar 4

Full closure



Expanded method:  
Cadence at the beginning of a group  
and hold tonic through entire group



# Rule of tonal-rhythmic closure

Example of simple closure,  
Haydn Op. 54/3, Trio

The image displays a musical score for a Trio in G major, Op. 54/3 by Joseph Haydn. The score is written for piano and features a 4-bar group. The first two bars are marked *f* (forte) and the last two bars are marked *p* (piano). The key signature is G major (one sharp). The score includes trills (*tr*) in the first two bars and a cadential figure in the last two bars. The cadential figure is labeled "Cadential" and "B: ii V I". Below the score, a diagram of a triangle is shown, with an arrow pointing from the final tonic chord (I) to the text "PAC, final tonic ends 4-bar group: full tonal-rhythmic closure".

PAC, final tonic ends  
4-bar group: full  
tonal-rhythmic closure

## **(2) Expositional Closure**

- (a) Simple closure
- (b) Elided closing material
- (c) Open exposition





## Methods of Expositional Closure: Simple Closure

Haydn usually gives full tonal-metrical closure through simple closure (PAC in the fourth bar of a group).

*Example:* String Quartet in C major, Op. 54/2

Many early works of Beethoven follow this precedent.

*Example:* String Trio in G major, Op. 9/1

# Haydn, Op. 54/2, End of ST group

48



HC

55



PAC

Simple closure

64



Repeat of cadential phrase

73



PAC

Simple closure

cresc.

8va

PAC

Simple closure



## ST part 2

[illegible]



## Elided Closing Material: Beethoven Op. 7

Persistent elision of cadences can push the moment of tonal-metrical closure to the end of the exposition.

This is common in Beethoven's Piano Sonatas and middle period works in many genres.



Beethoven, Op. 7 Piano Sonata, Exposition



Beginning of ST

PAC elided



Repeat



PAC elided



Beethoven, Op. 7 Piano Sonata, Exposition

The image displays three systems of musical notation for the Exposition of Beethoven's Piano Sonata, Op. 7. Each system consists of a grand staff with a treble and bass clef. The first system shows the initial key signature of two flats (B-flat and E-flat) and a common time signature. The second system features a *cresc.* marking and a *ff* (fortissimo) dynamic, followed by a *pp* (pianissimo) marking. The third system continues the melodic and harmonic development. A blue annotation "V ... Deceptive cadence!" is placed between the first and second systems, pointing to a specific harmonic progression. The notation includes various musical symbols such as notes, rests, accidentals, and dynamic markings.

V ... Deceptive cadence!

# PAC elided





Beethoven, Op. 7 Piano Sonata, Exposition

Closing  
PAC elided

The image displays three systems of musical notation for Beethoven's Op. 7 Piano Sonata, Exposition. Each system consists of a grand staff (treble and bass clefs) with a key signature of two flats (B-flat and E-flat). The first system shows a complex melodic line in the treble clef with many accidentals, and a bass line with chords and a forte (*ff*) dynamic marking. The second system continues the melodic line in the treble clef, with a bass line featuring a half note and a forte (*f*) dynamic marking. The third system shows the melodic line in the treble clef, with a bass line featuring a half note and a forte (*f*) dynamic marking. The notation is connected by a large brace on the right side, indicating a continuous melodic line. The text "Closing PAC elided" is written in blue and red above the first system.

Beethoven, Op. 7 Piano Sonata, Exposition

The image displays three systems of musical notation for the Exposition of Beethoven's Piano Sonata, Op. 7. Each system consists of a piano (treble) staff and a bass staff. The key signature is B-flat major (two flats). The first system shows a piano introduction with a strong *sf* (sforzando) dynamic. The second system continues the piano part with a *sf* marking. The third system features a more complex texture with a *ff* (fortissimo) marking in the piano part, indicating a powerful climax. The notation includes various rhythmic values, slurs, and articulation marks.

Closure: hypermetric unit ends on tonic



# Open Expositions



In Beethoven's middle period, the tendency to delay closure in expositions evolves into a **denial of closure**, resulting in **open expositions**, ones that lacks tonal or tonal-metrical closure altogether.

*Examples:*

- Op. 47 Violin Sonata (“Kreutzer,” “Bridgetower”):  
Tenacious hypermeter prevents full tonal-metrical closure despite multiple PACs through elision.
- Op. 59/2 String Quartet (E minor): Also has strong hypermeter, but also no completed PAC—all cadences are deceptive, evaded, or imperfect.



# Beethoven, Op. 47 Violin Sonata, end of exposition

156 Subord. Theme no. 2

163

Evaded PAC

Evaded PAC

Elided PAC Closing Section

170

ff

PAC

i

Beethoven, Op. 47 Violin Sonata, end of exposition

177

184

$V_5^6/iv!$



# Open Expositions



## Denial of tonal-metrical closure in Haydn:

Op. 20/3 String Quartet (G minor)

Op. 76/2 String Quartet (D minor)

## Early examples from Beethoven:

Op. 13 Piano Sonata (“Pathetique”)\*

Op. 24 Violin Sonata (“Spring”)\*

Op. 30/3 Violin Sonata (G major)\*

Op. 47 Violin Sonata (“Kreuzer,” “Bridgetower”)

Op. 53 Piano Sonata (“Waldstein”)

Op. 69 Cello Sonata (A major)

\* Weak examples: dissonance over tonic pedal





# Open Expositions



Beethoven's denial of *tonal-metrical* closure quickly evolves into a **complete denial of tonal closure** in more adventurous works:

Op. 30/2 Violin Sonata (C minor)

Op. 59/2 String Quartet (E minor)

Fifth Symphony (Op. 67) Finale

Op. 70/2 Piano Trio (E-flat major)

Op. 95 String Quartet (“Serioso”)

Beethoven, Op. 59/2 String Quartet, exposition

Allegro. Main theme

Violino I.

Violino II.

Viola.

Violoncello.

10

Dom. Arr. Trans.

17

$V_5^6$  i

The image displays a musical score for Beethoven's Op. 59/2 String Quartet, exposition. The score is for Violino I, Violino II, Viola, and Violoncello. It shows measures 10 and 17. The tempo is Allegro. The key signature is one sharp (F#). The time signature is 6/8. The score includes dynamic markings (f, pp, p, cresc.) and articulation (accents, slurs). The first system (measures 10-17) is labeled 'Main theme'. The second system (measures 17-24) is labeled 'Dom. Arr.' and 'Trans.'. The third system (measures 24-31) is labeled 'V5^6' and 'i'.

Beethoven, Op. 59/2 String Quartet, exposition

24

*cresc.* *ff* *f*

30

HC

Subord. theme

*f* *sempre f* *f* *p*

36

8

*p* *p*



Beethoven, Op. 59/2 String Quartet, exposition

41

*cresc.* *p dolce*

46

V – I

*cresc.* *f* *p dolce*

EC!

V – vii°<sub>2</sub> V –

53

*f* *p* *pp*

EC vii°<sub>2</sub> p

EC  
(repeated)

Beethoven, Op. 59/2 String Quartet, exposition

60

*cresc.* *piu cresc.* *f*

*cresc.* *piu cresc.* *f*

*cresc.* *piu cresc.* *f*

*cresc.* *piu cresc.* *f*

Elided IAC!

67

*f* *ff*

72

Development

*p* *pp* *ff* *ppp*



### **(3) Network Model of Musical Form and the Disjunctive Coda**

- (a) Formal structure
- (b) The integrated coda
- (c) Disjunctive coda, examples:  
Haydn Symphony 101 (“Clock”)  
Beethoven Op. 59/2

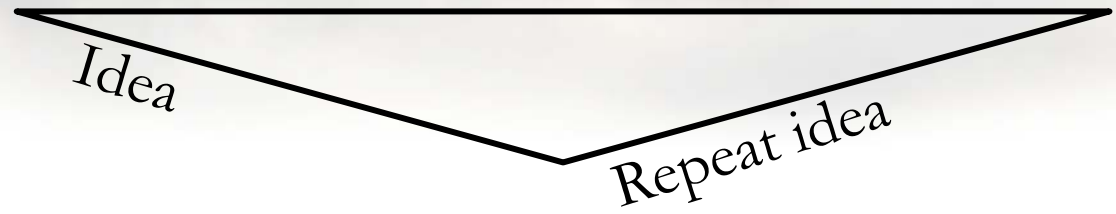


# Formal structure: Basic principles

Building blocks of formal structure:

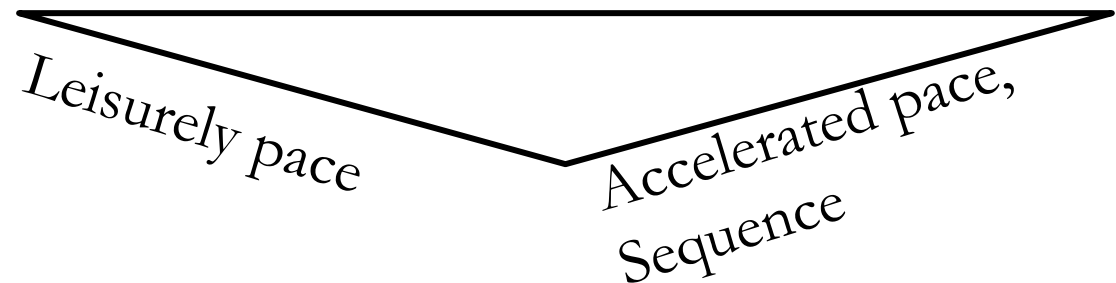
Repetition:

(Examples: Period  
“monothematic exposition”)



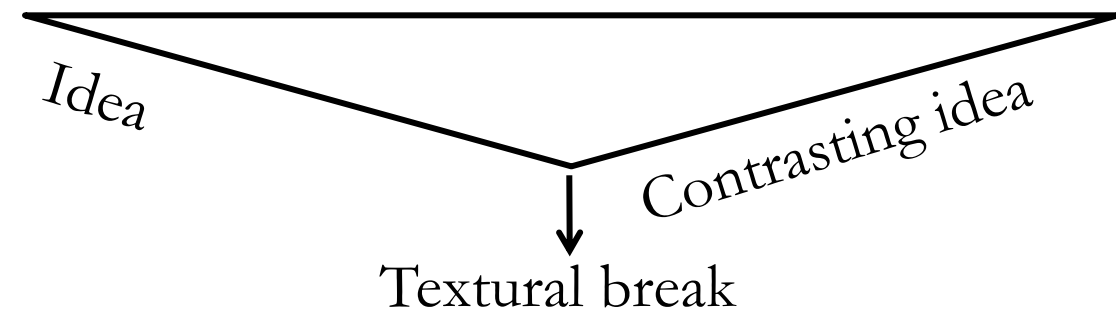
Fragmentation:

(Examples: Sentence  
continuous exposition)



Caesura/Contrast:

(Examples: Contrasting period,  
secondary theme)



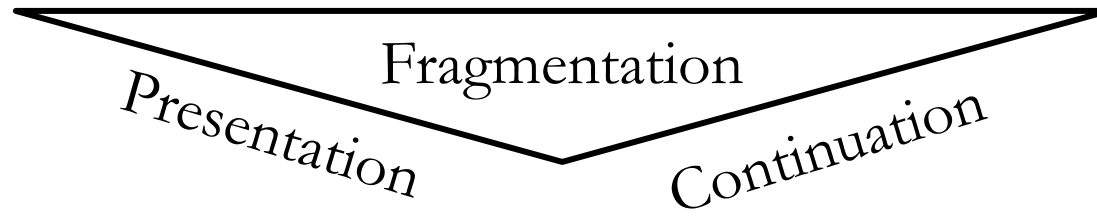
# Formal structure: Basic principles

Examples, basic theme types:

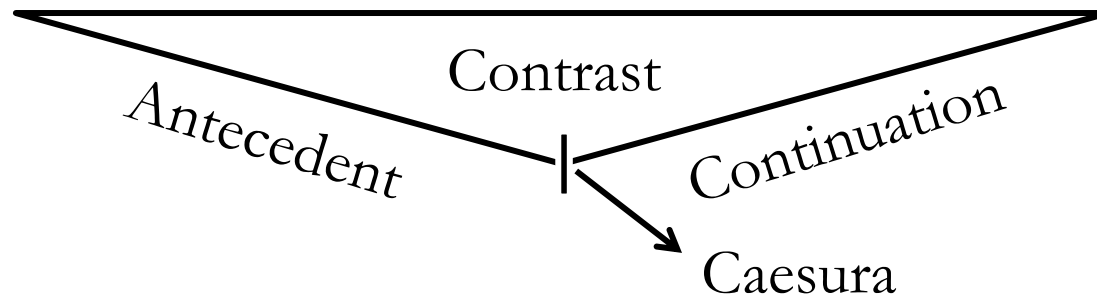
Period:



Sentence:



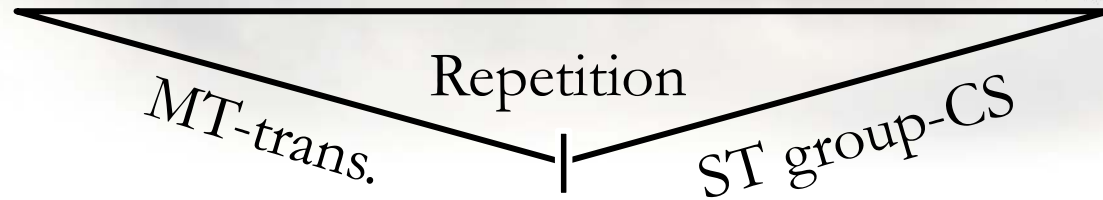
Contrasting  
period:



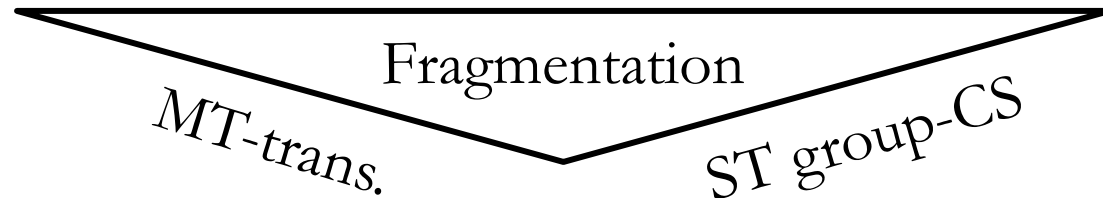
# Formal structure: Basic principles

Examples, expository strategies:

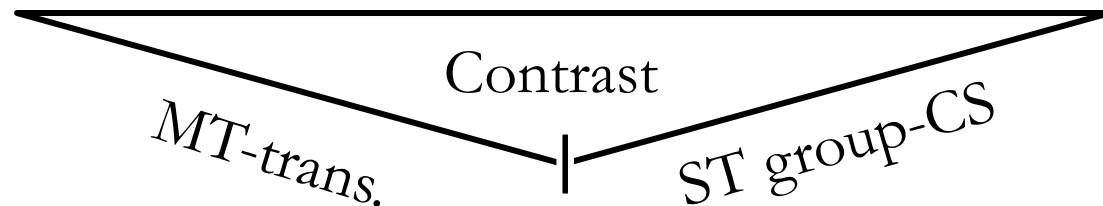
“Monothematic”:



“Continuous”:



Secondary  
theme:

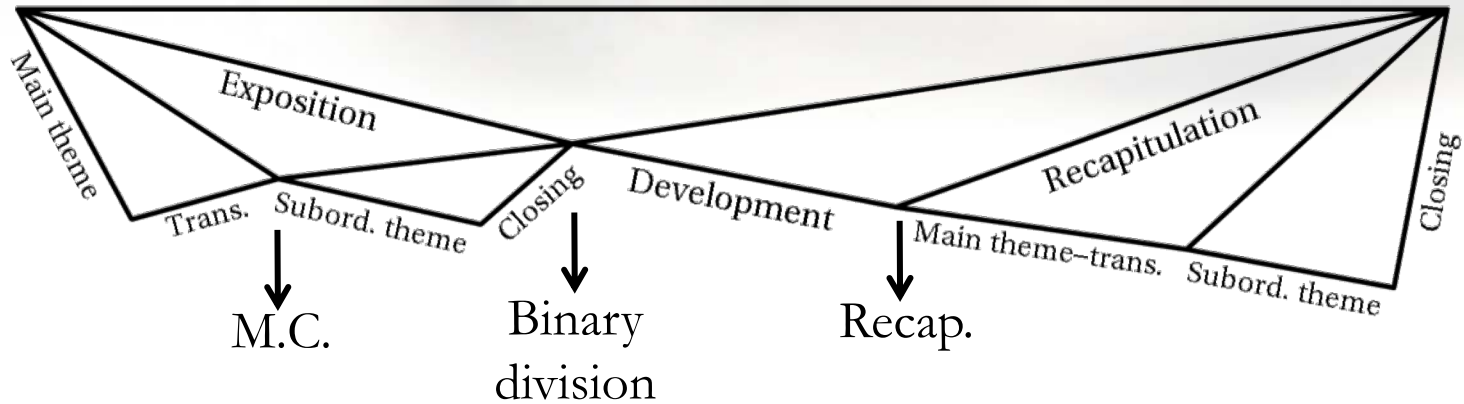




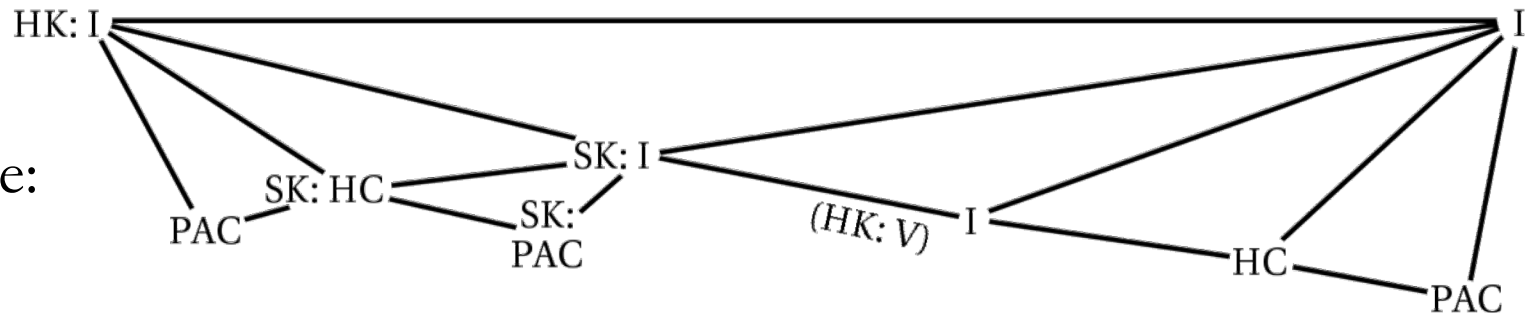
# Example: Sonata Form

Sonata form conventionally involves *coordinated* structures in two modalities, **formal** and **tonal**:

Form:

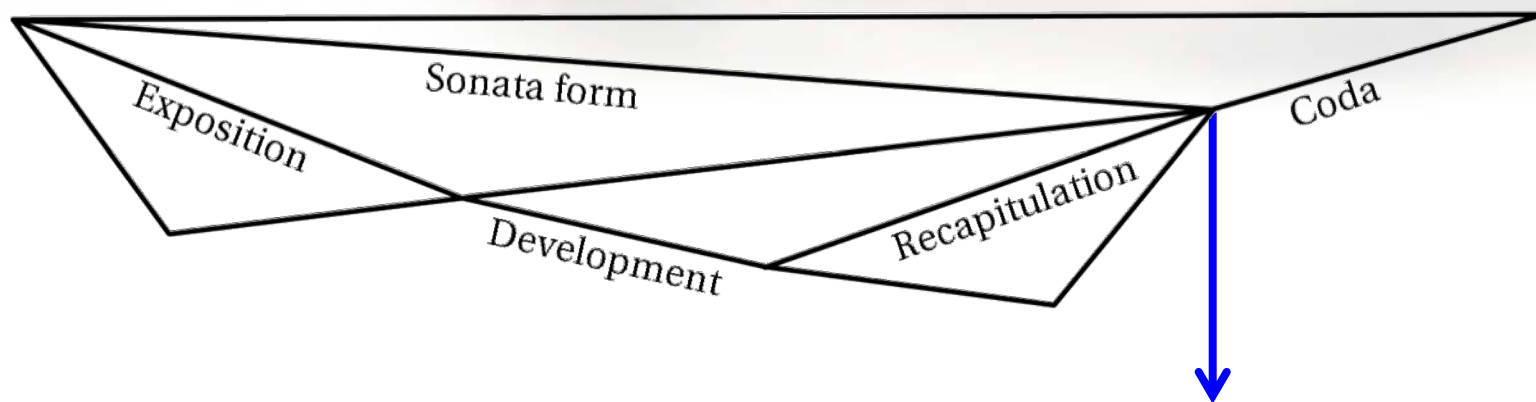


Tonal structure:



## The integrated coda (formal structure)

Most codas use some device to formally *integrate* the coda with the preceding sonata form, as a **third part**.



Repetition or fragmentation integrates coda

In an *integrated coda* the coda makes a larger structure with the sonata form using techniques of *repetition* —return of main theme—and/or *fragmentation*, e.g. development-like sequence (hence the notion of “second development.”)



# On Beethoven's Codas



Kerman (1982): “On Beethoven’s Codas”

Rosen (1988): *Sonata Forms* (Revised Edition)

Hopkins (1988): “When a Coda is More than a Coda”

Morgan (1993): “Coda as Culmination: The First Movement of the *Eroica* Symphony”

Analysis focuses on problems of individual works

(Why is there a coda in this piece?)

Observations are not generalizable

(E.g., coda solves outstanding problem)

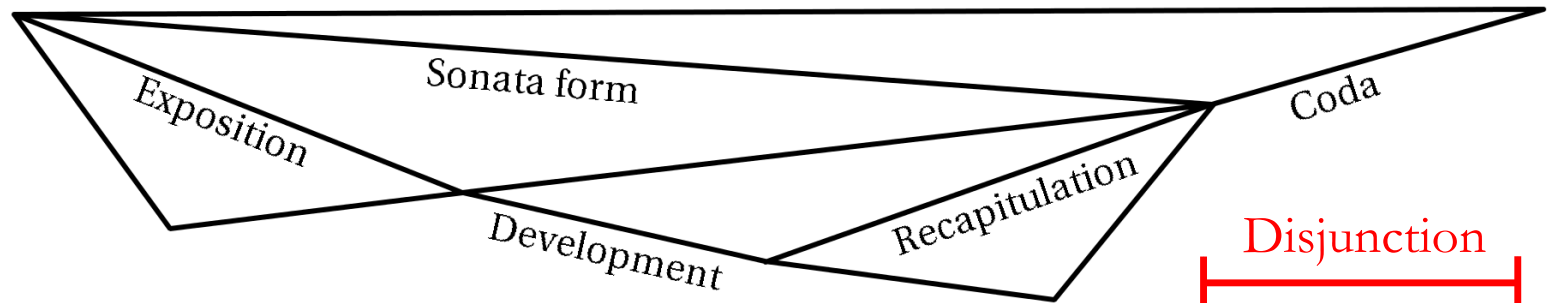
A different question: How do codas work (in general)?



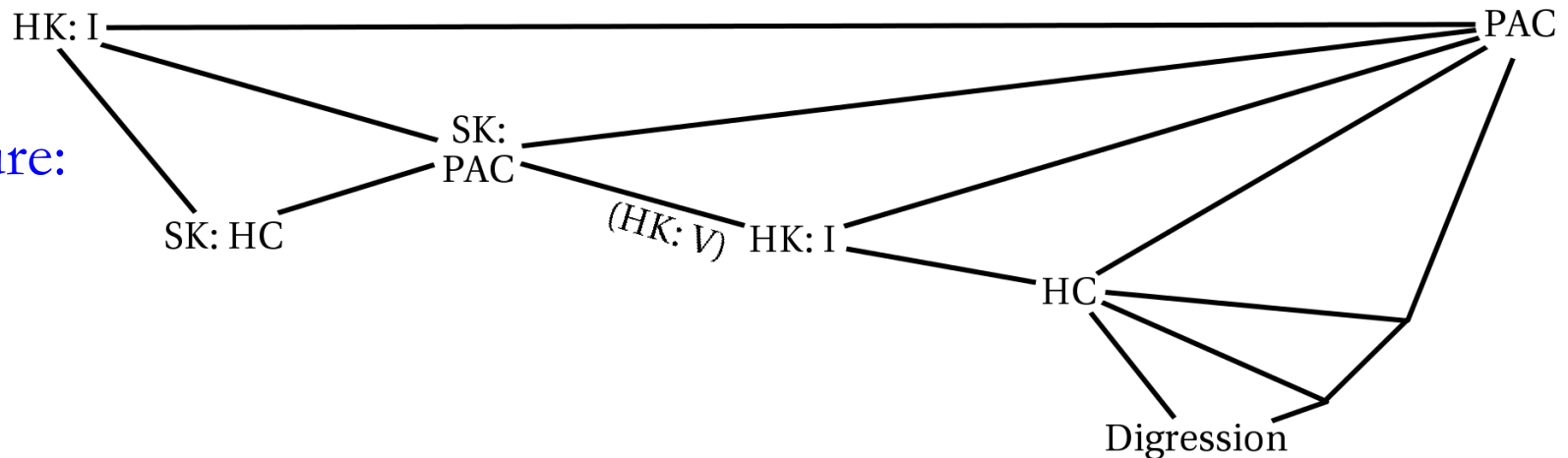
# Disjunctive coda, Examples: Haydn Symphony 101, Beethoven, Op. 59/2

In a *disjunctive coda* the denial of tonal closure perpetuates the *tonal* recapitulation, while the *formal* recapitulation is completed by the closing material.

Form:



Tonal  
structure:



# Haydn, Symphony 101: Main theme

## Main theme

25

Presto

Measures 25-29 of the Main theme. The music is in G major (one sharp) and 3/4 time. The tempo is Presto. The key signature is one sharp (F#). The melody is in the treble clef, and the bass line is in the bass clef. The melody starts with a quarter note G4, followed by eighth notes A4, B4, C5, D5, E5, F#5, and G5. The bass line starts with a quarter rest, followed by eighth notes G3, F#3, E3, D3, C3, B2, A2, and G2. The melody continues with a half note G5, followed by a quarter note F#5, and then a half note E5. The bass line continues with a half note G2, followed by a quarter note F#2, and then a half note E2. The melody ends with a quarter note D5, followed by a quarter note C5, and then a quarter note B4. The bass line ends with a quarter note G2, followed by a quarter note F#2, and then a quarter note E2. The dynamic marking *p* (piano) is present at the beginning of measure 28.

30

Measures 30-34 of the Main theme. The music continues in G major and 3/4 time. The melody is in the treble clef, and the bass line is in the bass clef. The melody starts with a quarter note G4, followed by eighth notes A4, B4, C5, D5, E5, F#5, and G5. The bass line starts with a quarter rest, followed by eighth notes G3, F#3, E3, D3, C3, B2, A2, and G2. The melody continues with a half note G5, followed by a quarter note F#5, and then a half note E5. The bass line continues with a half note G2, followed by a quarter note F#2, and then a half note E2. The melody ends with a quarter note D5, followed by a quarter note C5, and then a quarter note B4. The bass line ends with a quarter note G2, followed by a quarter note F#2, and then a quarter note E2. The dynamic marking *p* (piano) is present at the beginning of measure 31.

# Haydn, Symphony 101: Subord. th. group

73 Subord. theme I

Presentation

*sf*

Continuation

79 PAC

Subord. theme II

Early PAC

*p*

Presentation

85 \*(see recap.)

Continuation

91 Cadential

*p*

pizz.



# Haydn, Symphony 101: Expo. ST group

99 EC

105 Cadential

111 PAC Closing section

119 *p*

The musical score is for the String Trio section of the Exposition of Haydn's Symphony 101. It is written in G major (one sharp) and 3/4 time. The score is divided into four systems of staves. The first system (measures 99-104) features a treble staff with eighth-note patterns and a bass staff with dotted half notes. A red box labeled 'EC' is above measure 100. The second system (measures 105-110) continues the treble staff pattern, with a blue label 'Cadential' above measure 107. The third system (measures 111-118) features a treble staff with chords and a bass staff with dotted half notes, with a red box labeled 'PAC' above measure 113 and a blue label 'Closing section' above measure 114. The fourth system (measures 119-124) features a treble staff with chords and a bass staff with eighth-note patterns, with a 'p' dynamic marking above measure 120.

(No ST I  
material  
in recap.)

# Haydn, Symphony 101: Recap. ST group

256 Recap.: Subord. theme (from ST II)

Presentation *p* Added repeat

262 New continuation

268 New cadential material

275 *p* *cresc.* *f*

281 IAC!

# Haydn, Symphony 101 : Recap. ST group

Parallel to exposition (\*)

287

Continuation

293

*p* Cadential

*pizz.* *p*

301

New extension

307

313

Cadential (from exposition)

# Haydn, Symphony 101 : Recap. ST group

320 **EC!**

326 MT-based coda

332

340

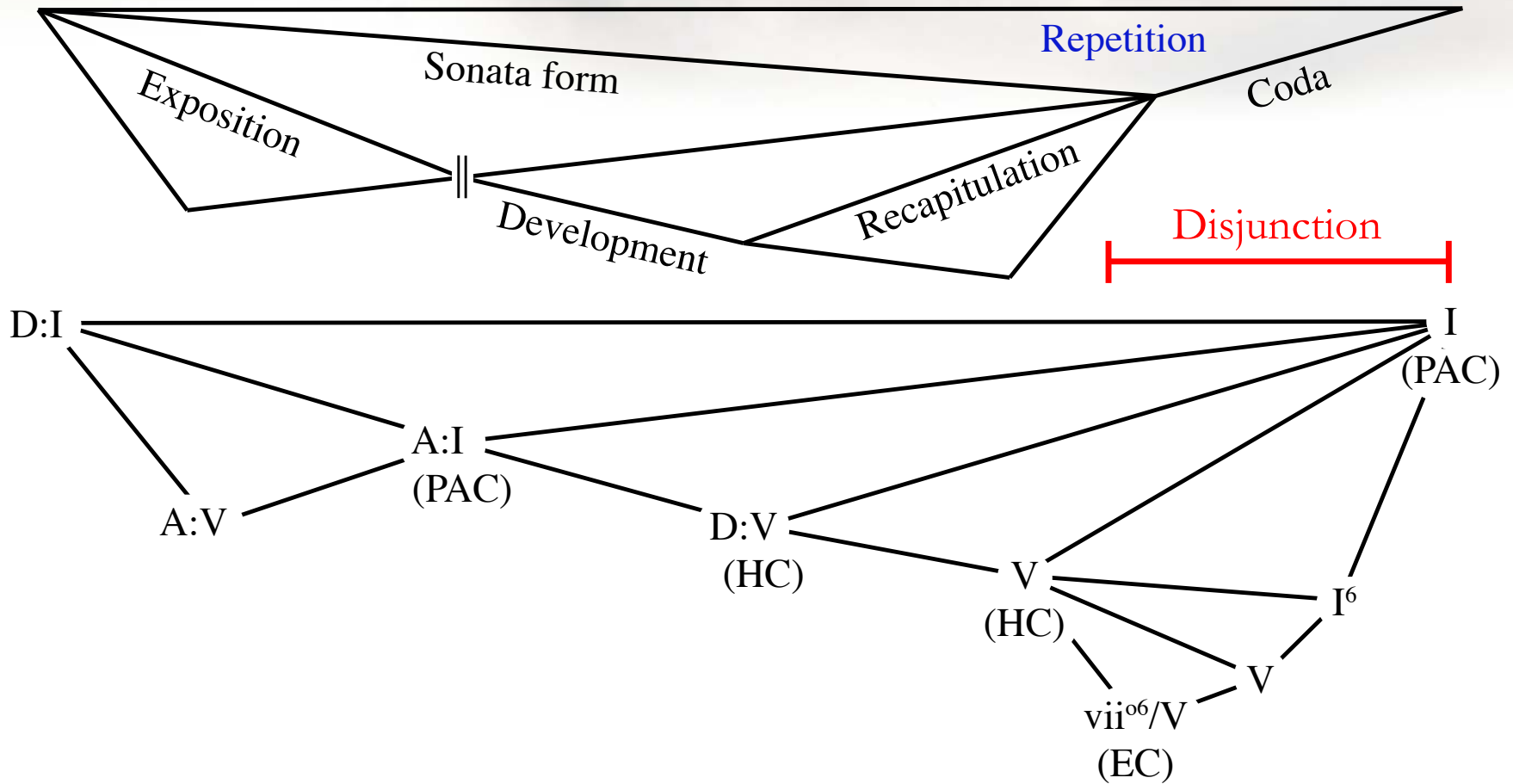
347

*p* *f* *fl.* *f*

Detailed description: This image shows a page of musical notation for the first string group (ST group) of Haydn's Symphony 101, specifically the recapitulation section. The score is written for two staves (treble and bass clef) in G major (one sharp). It covers measures 320 to 347. Measure 320 is marked with a red 'EC!' above the staff. Measure 326 is marked with a blue 'MT-based coda' above the staff. The notation includes various musical symbols such as notes, rests, slurs, and dynamic markings. Dynamics include piano (*p*) and forte (*f*). A 'fl.' marking appears above a note in measure 332. The first string group is indicated by the 'ST group' in the section header.



# Disjunctive coda: Haydn Symphony 101





# Open expositions and codas



Beethoven's use of **open expositions** is related to his use of **codas**

If the end of recapitulation parallels an open exposition, a coda is *required*.

If the exposition and recapitulation **lack tonal closure** then there must be a **disjunctive coda**.

*Example:* Op. 59/2

# Beethoven, Op. 59/2: Coda

Elided IAC

198

Measures 198-205. The score is in G major (one sharp). Measures 198-201 show a gradual crescendo from *pp* to *f*. Measures 202-205 show a decrescendo from *f* to *pp*. The texture is dense with many sixteenth and thirty-second notes.

206

Measures 206-208. Measure 206 begins with a *f* dynamic. Measures 207-208 show a decrescendo to *piano* (*p*). The texture remains dense with many sixteenth and thirty-second notes.

209

Measures 209-216. Measure 209 begins with a *ff* dynamic. Measures 210-216 show a decrescendo from *ff* to *pp*. The texture is dense with many sixteenth and thirty-second notes.

Coda: Fragmentation of main theme

Tonal digression VI

(Enharmonic cycle)



Beethoven, Op. 59/2: Coda

220

Cadential

Musical score for measures 220-230, labeled "Cadential". The score is in G major (one sharp) and 3/4 time. It features four staves: Treble 1, Treble 2, Bass 1, and Bass 2. The music consists of a series of half notes and quarter notes, with a crescendo leading to a fortissimo (ff) section. The dynamics are marked *pp* (pianissimo) at the beginning and end of the section, and *ff* (fortissimo) in the middle. The key signature is one sharp (F#).

230

Expanded Dominant

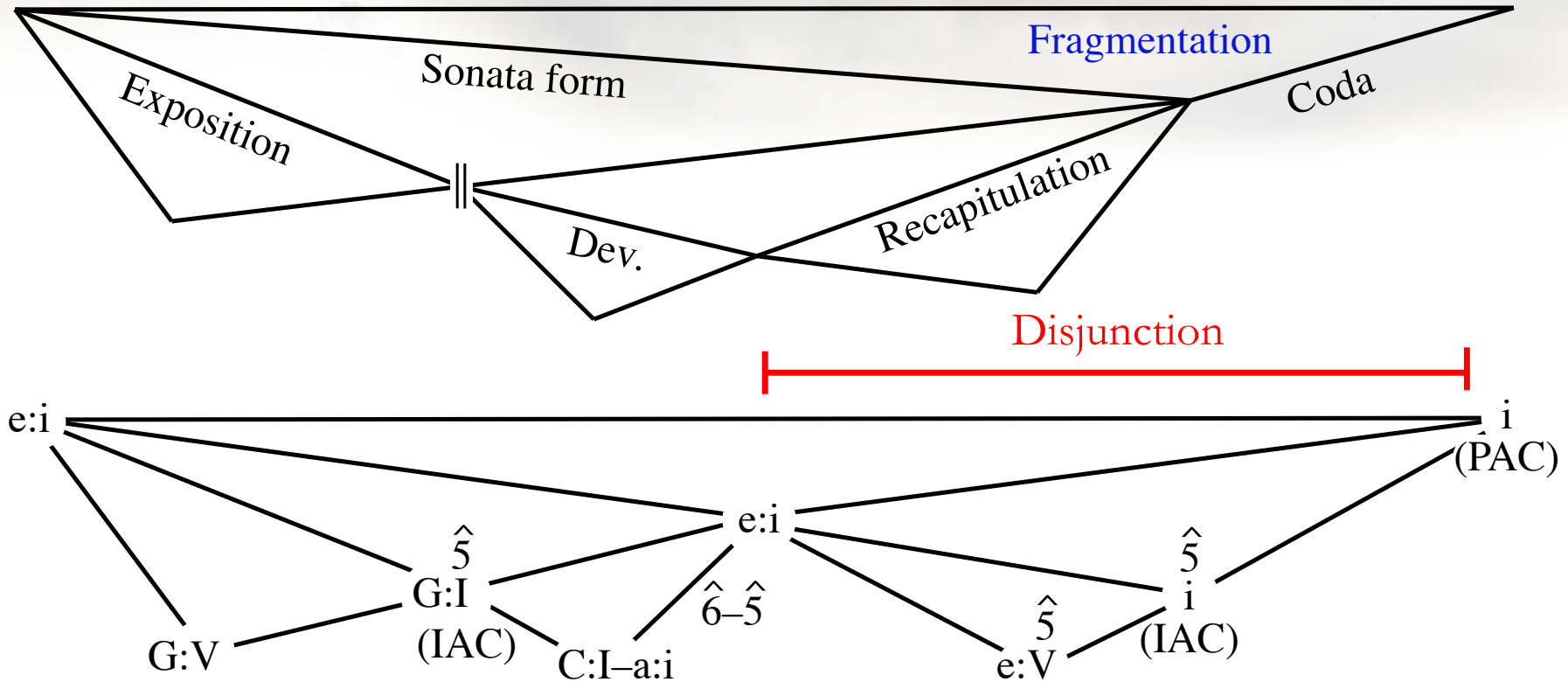
Musical score for measures 230-241, labeled "Expanded Dominant". The score is in G major (one sharp) and 3/4 time. It features four staves: Treble 1, Treble 2, Bass 1, and Bass 2. The music consists of a series of half notes and quarter notes, with a crescendo leading to a fortissimo (ff) section. The dynamics are marked *cresc.* (crescendo) at the beginning, *ff* (fortissimo) in the middle, and *p* (piano) at the end. The key signature is one sharp (F#).

241

Musical score for measures 241-245. The score is in G major (one sharp) and 3/4 time. It features four staves: Treble 1, Treble 2, Bass 1, and Bass 2. The music consists of a series of half notes and quarter notes, with a crescendo leading to a fortissimo (ff) section. The dynamics are marked *pp* (pianissimo) at the beginning and end, and *ff* (fortissimo) in the middle. The key signature is one sharp (F#).



# Disjunctive coda: Beethoven Op. 59/2



## **(4) Innovative Formal Disjunction in Beethoven's Middle Period**

(a) Off-Tonic Recapitulation  
Ex.: Op. 9/1 Scherzo

(b) Non-standard subordinate keys  
Ex.: Beethoven Op. 29 Quintet





# Disjunctive Techniques



Beethoven evidently adopted the disjunctive coda from Haydn. But it may have inspired the use of other forms of disjunction that were distinctively Beethovenian innovations:

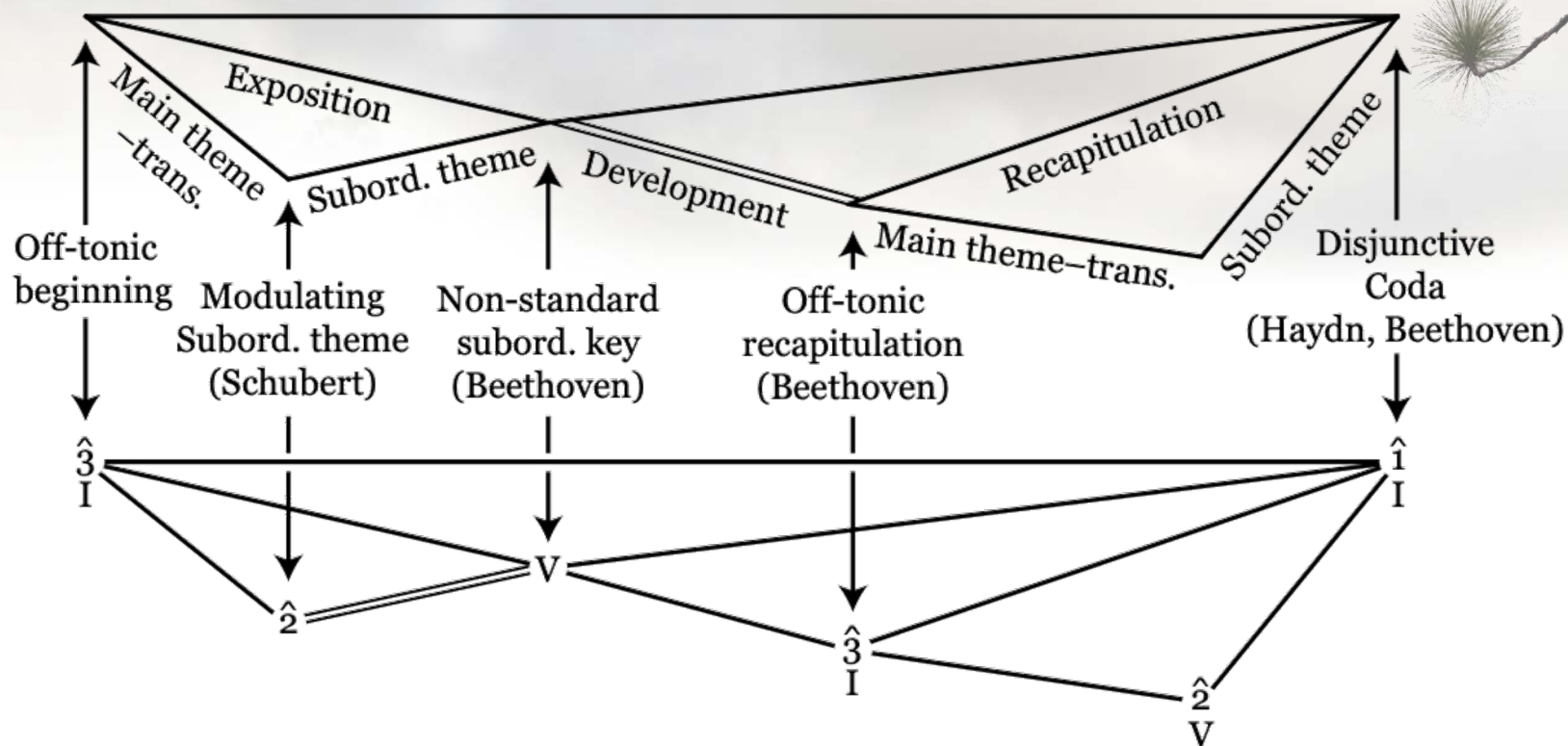
- Off-tonic recapitulation (Op. 9/1 first mvt. and scherzo, Op. 18/3, Op. 26 scherzo, Op. 27/2 allegretto, Op. 31/3, Op. 47, Op. 59/1 scherzando, etc.):

(Not unique to Beethoven, but cultivated as a disjunction by him to novel aesthetic ends)

—See Burstein “The Off-Tonic Return in Beethoven’s Piano Concerto No. 4 in G major, Op. 58, and Other Works.” *Music Analysis* 24/3 (2005)

- Non-standard subordinate keys (Opp. 28, 31/1, 53, 56, Lenore)  
= disjunction at the binary division (exposition/development)

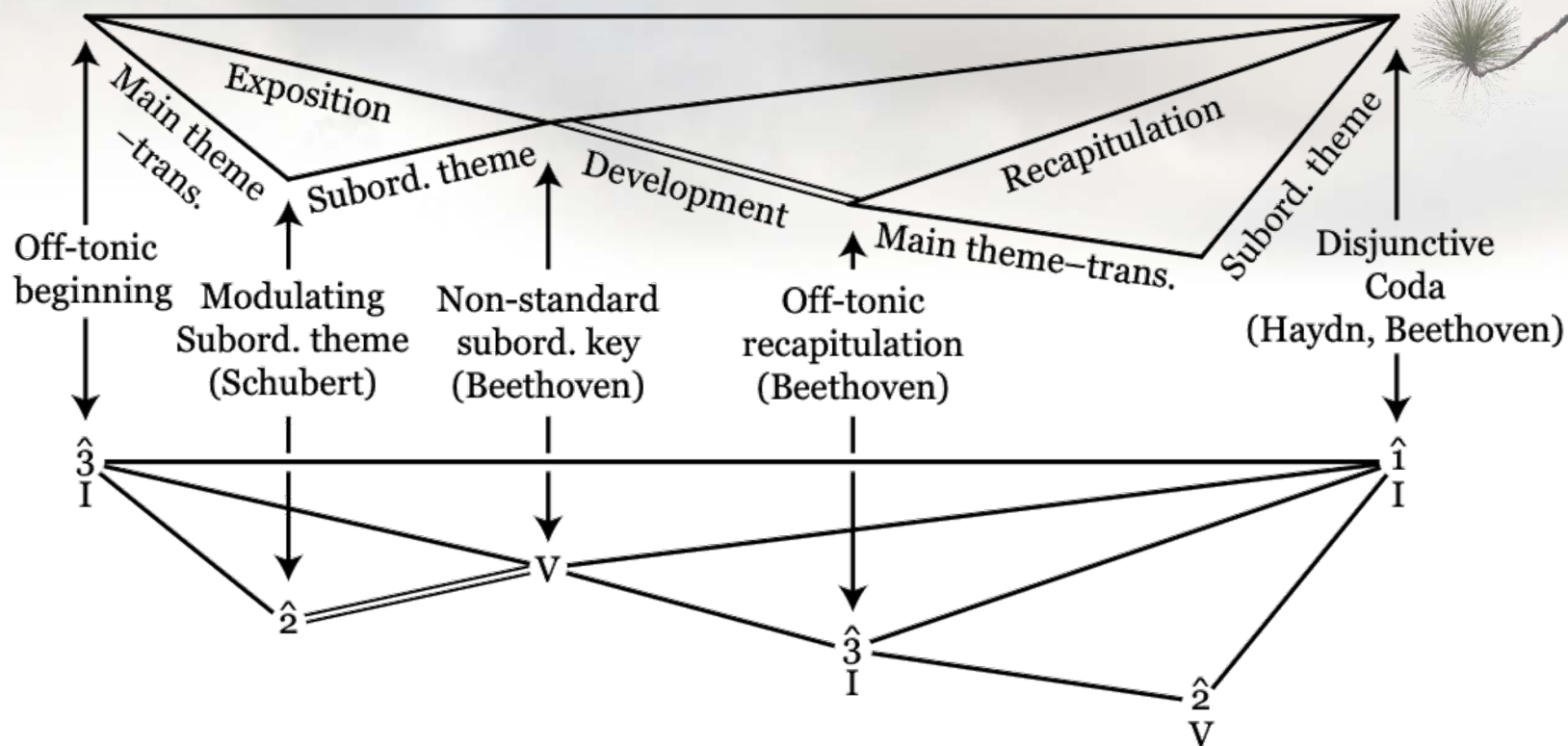
# Large-Scale Disjunctive Techniques



The possible types of large-scale tonal-formal disjunction can be classified by the point in the sonata form where the disjunction occurs.



# Large-Scale Disjunctive Techniques



These common types of disjunction are all **structural appoggiaturas** (except the disjunctive coda), meaning the corresponding point in the tonal structure is delayed to a later, lower-level, formal event.

# Beethoven Op. 9/1 Scherzo

The image displays a musical score for Beethoven's Scherzo Op. 9/1, organized into five systems. The notation is in G major (one sharp) and 3/4 time. The score includes various musical notations such as notes, rests, dynamics, and articulation marks.

**System 1 (Measures 1-6):** Labeled "Main theme" in blue. It begins with a piano (*p*) dynamic. The first measure is marked "Presentation" in blue. The second measure contains a green annotation  $ii^7$ . The third measure contains a green annotation  $V$ . The fourth measure contains a green annotation  $I^6$ . The system concludes with a "Continuation" in blue.

**System 2 (Measures 7-12):** Labeled "Contrasting middle" in blue. It begins with a measure marked with a blue *tr* (trill). The system includes a "Presentation" in blue and ends with a triplet of eighth notes.

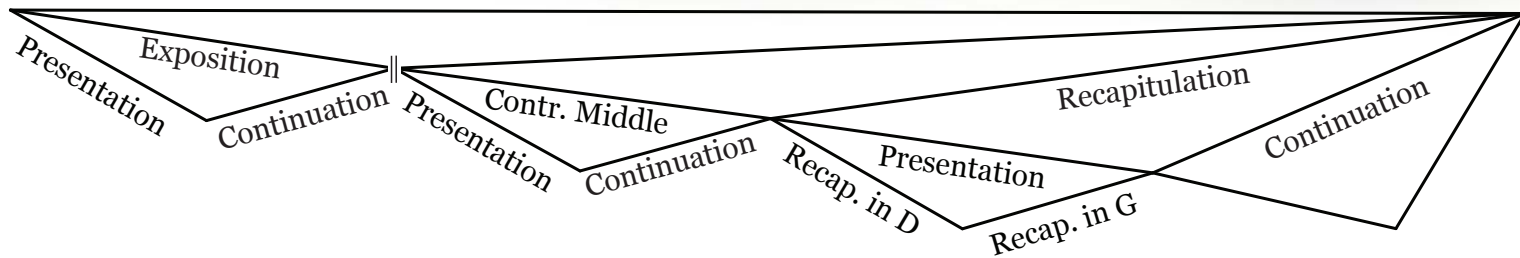
**System 3 (Measures 13-19):** Labeled "PAC" in red and "Recap. in D" in blue. It begins with a piano (*pp*) dynamic and a "Continuation" in blue. A crescendo (*cresc.*) is indicated over measures 14-16. A forte (*f*) dynamic appears in measure 17. The system ends with a piano (*pp*) dynamic and a "Presentation" in blue.

**System 4 (Measures 20-26):** Labeled "Recap. in G" in blue. It begins with a piano (*pp*) dynamic. The system concludes with a piano (*p*) dynamic and a "Continuation" in blue.

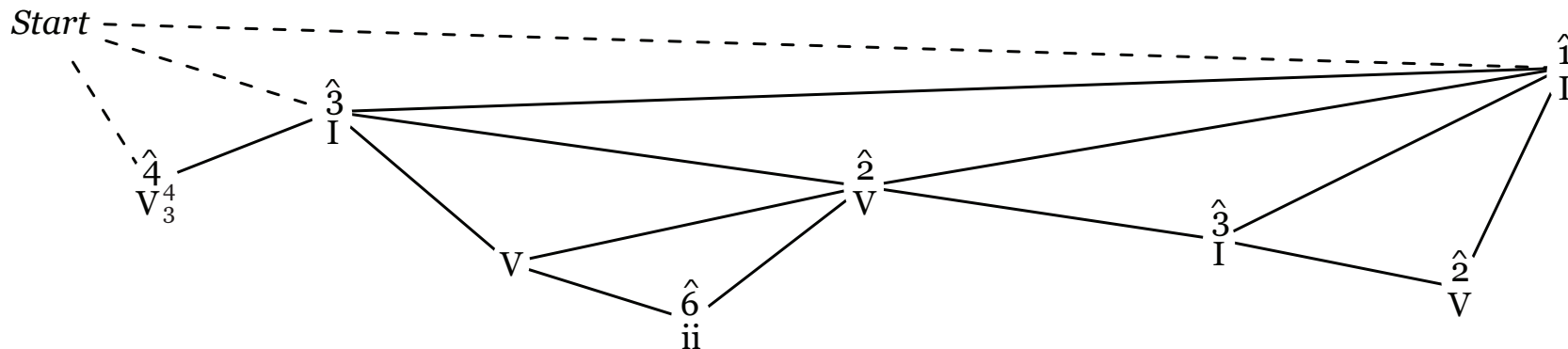
**System 5 (Measures 27-32):** Labeled "PAC" in red. It begins with a measure marked with a blue *tr* (trill). The system includes green annotations  $V_5^6$  and  $\frac{4}{2}$  in the third measure, and  $I^6$  in the fourth measure. The system concludes with a piano (*p*) dynamic and a "Presentation" in blue.

# Off-tonic beginning: Beethoven Op. 9/1 Scherzo

Form:



Tonal structure:

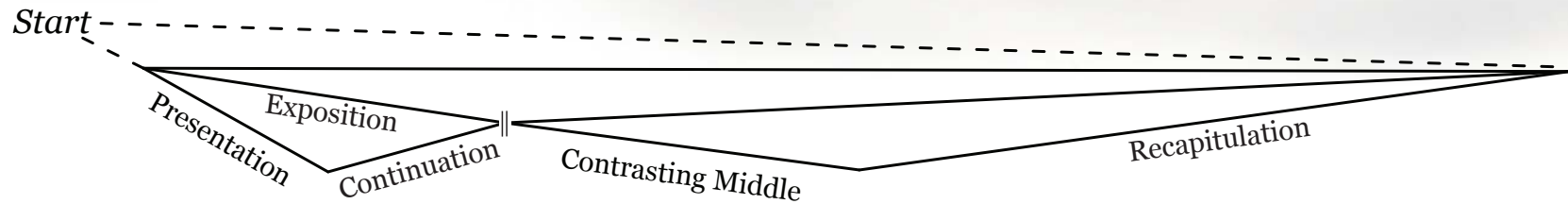




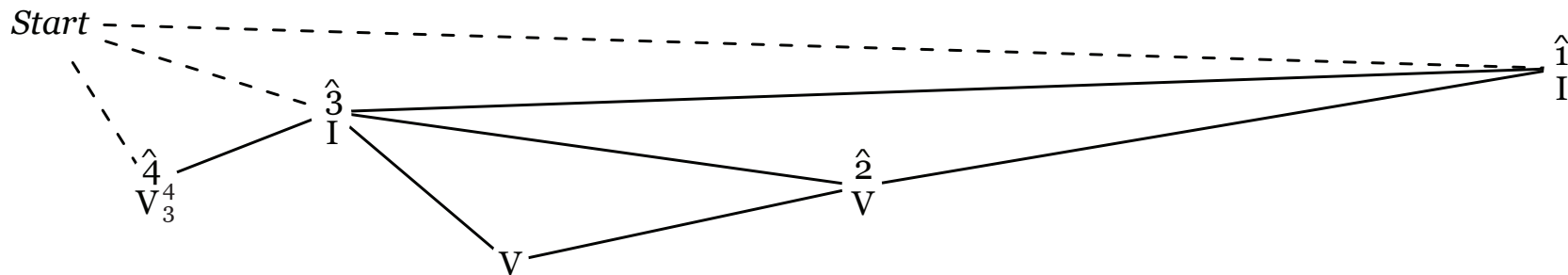
# Off-tonic beginning: Beethoven Op. 9/1 Scherzo

## Disjunction isolated

Form:



Tonal structure:



# Beethoven's Non-Standard Subordinate Keys

Work	Mvt.	Date	Key	SK	Rel.	ST Recap.
String Quintet, Op. 29	i	1801	C maj.	A min.	LM*	HK
Piano Sonata, Op. 31/1	i	1802	G maj.	B min.	UM*	LSM–LM–HK
Triple Concerto, Op. 56	i	1803	C maj.	A min.	LM*	HK
Piano Sonata, Op. 53	i	1803–4	C maj.	E maj.	USM	LSM–LM–HK
Lenore Overture No.2		1804–5	C maj.	E maj.	USM	—**
Lenore Overture No.3		1805–6	C maj.	E maj.	USM	HK
Piano Trio, Op. 70/2	iv	1808	E♭ maj.	G maj.	USM	LSM–HK
String Quartet, Op. 95	i	1810–11	F min.	D♭ maj.	LM	MajHK
Piano Trio, Op. 97	i	1810–15	B♭ maj.	G maj.	LSM	HK
Piano Sonata, Op. 106	i	1816–18	B♭ maj.	G maj.	LSM	HK
Piano Sonata, Op. 111	i	1821–22	C min.	A♭ maj.	LM	HK
Symphony no. 9	i	1817–24	D min.	B♭ maj.	LM	MajHK–HK
String Quartet, Op. 127	i	1823–4	E♭ maj.	G maj.	UM	HK
String Quartet, Op. 132	i	1825	A min.	F maj.	LM	UM–MajHK–HM***
String Quartet, Op. 130	i	1825–6	B♭ maj.	G♭ maj.	LFM	UFM–HK
String Quartet, Op. 135	iv	1826	F maj.	A maj.	USM	LSM–HK

\* Begins in the parallel major (LSM or USM). \*\* Does not have a full recapitulation.

\*\*\* Has two full recapitulations in different keys.

# Beethoven Op. 29 Quintet, Main theme

The image displays the first five measures of the Main theme from Beethoven's Op. 29 Quintet. The score is written for a piano quintet, featuring a treble and bass staff for each of the five instruments. The key signature is one sharp (F#), and the time signature is 3/4. The first system (measures 1-4) begins with a piano (*p*) dynamic. The melody in the treble staff consists of a dotted half note followed by a quarter note, with a slur over the next two measures. The bass staff features a continuous eighth-note accompaniment. The second system (measures 5-8) continues the melody and accompaniment. Measure 5 is marked with a '5' above the treble staff. The third system (measures 9-12) introduces a crescendo (*cresc.*) in the treble staff, indicated by a dashed line. The bass staff continues with the eighth-note accompaniment.

# Beethoven Op. 29 Quintet, End of transition

(... end of transition)

Standing on dom.

HC

Subord. theme

*dolce*

*p*

*pp*

*f*

The musical score is for the end of the transition in Beethoven's Op. 29 Quintet. It is written in G major and 3/4 time. The score is divided into three systems. The first system shows the end of a transition, with a 'Standing on dom.' (dominant) section. The second system continues the transition, featuring a 'Subord. theme' (subordinate theme) marked 'dolce'. The third system shows the end of the subordinate theme, marked 'f' (forte). The score includes various musical notations such as notes, rests, and dynamic markings.



# Beethoven Op. 29 Quintet, Development

95 Development (pt. 1)

*fp* *fp* *fp* *p*

F: V<sup>7</sup> I

104 *f* *p*

109 *p* *cresc.* *sf* *sf*

115 *cresc.* *ff* *p*

V<sub>3</sub><sup>4</sup>

This image displays a musical score for the Development section of Beethoven's Op. 29 Quintet, specifically measures 95 through 115. The score is written for a string quintet, with staves for Violin I, Violin II, Viola, Cello, and Double Bass. The key signature is one flat (B-flat major or D minor), and the time signature is 3/4. The score is divided into four systems. The first system (measures 95-103) features a forte-piano (fp) dynamic, with a crescendo leading to a piano (p) dynamic. The second system (measures 104-108) begins with a forte (f) dynamic, followed by a piano (p) dynamic. The third system (measures 109-114) starts with a piano (p) dynamic, followed by a crescendo (cresc.) leading to a fortissimo (sf) dynamic. The fourth system (measures 115-119) begins with a crescendo (cresc.) leading to a fortissimo (ff) dynamic, followed by a piano (p) dynamic. The score includes various musical notations such as slurs, ties, and dynamic markings. The text 'Development (pt. 1)' is written above the first system. The text 'F: V<sup>7</sup> I' is written below the first system. The text 'V<sub>3</sub><sup>4</sup>' is written below the fourth system.

# Beethoven Op. 29 Quintet, end of development

(... standing on dominant)

169

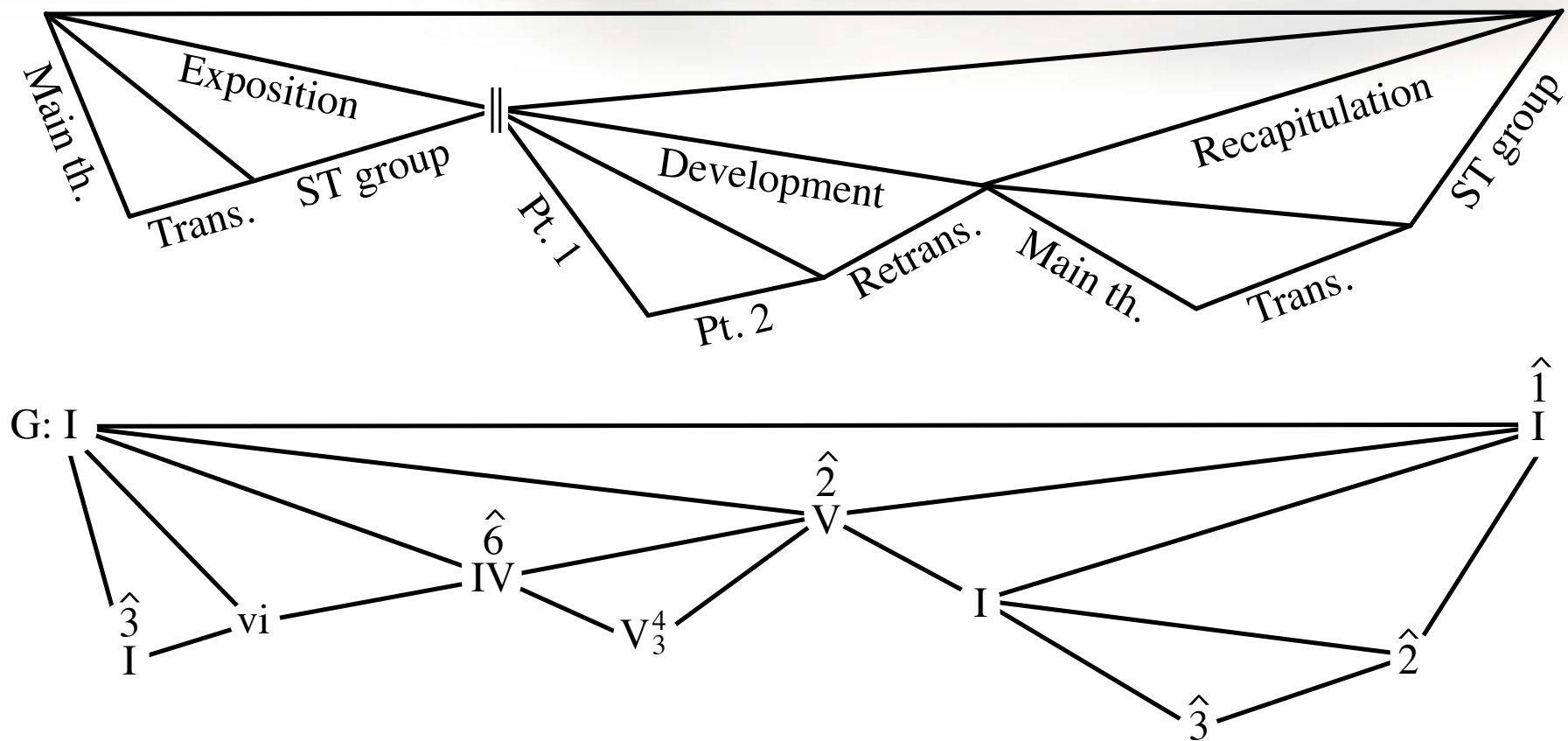
This musical system covers measures 169 to 172. It features a treble and bass staff. The treble staff has a melodic line with eighth and sixteenth notes, and a series of chords marked with a cross symbol. The bass staff has a melodic line with eighth and sixteenth notes, and a series of chords marked with a cross symbol. A 'cresc.' marking is present in the third measure, with a dashed line indicating a crescendo. The key signature has one sharp (F#).

Recapitulation

173

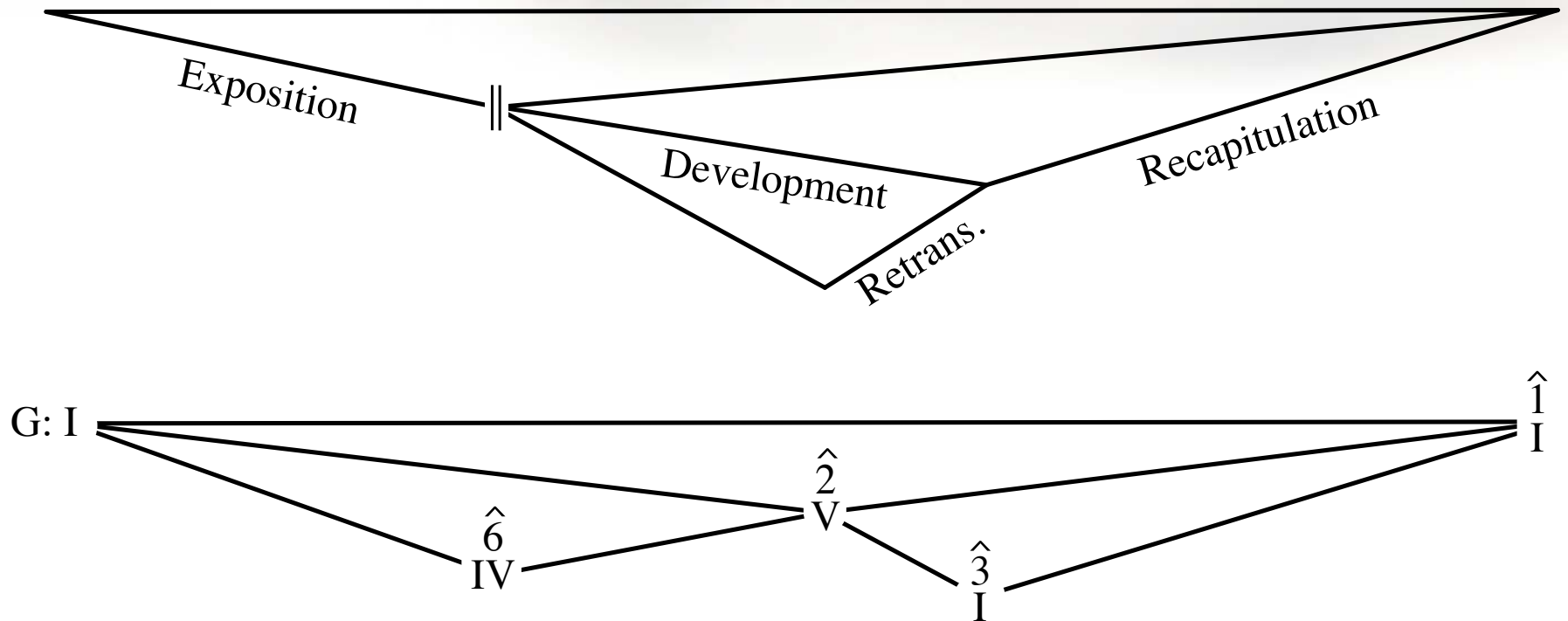
This musical system covers measures 173 to 176. It features a treble and bass staff. The treble staff has a melodic line with eighth and sixteenth notes, and a series of chords marked with a cross symbol. The bass staff has a melodic line with eighth and sixteenth notes, and a series of chords marked with a cross symbol. A 'ff' marking is present in the first measure, and a 'p' marking is present in the second measure. A 'p' marking is also present in the fourth measure. The key signature has one sharp (F#).

# Non-standard subordinate key: Beethoven Op. 29, mvt. 1



# Non-standard subordinate key: Beethoven Op. 29, mvt. 1

Disjunction isolated





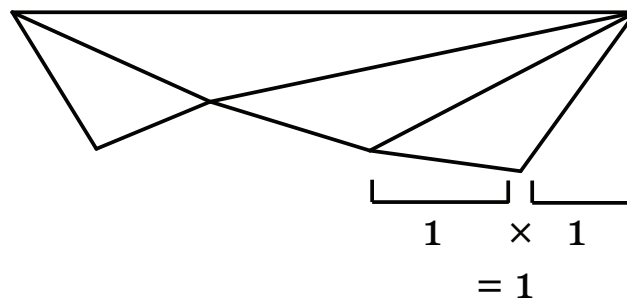
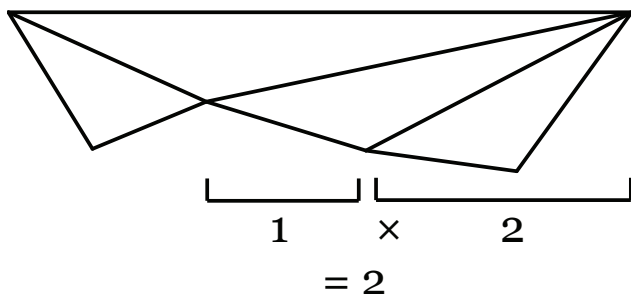
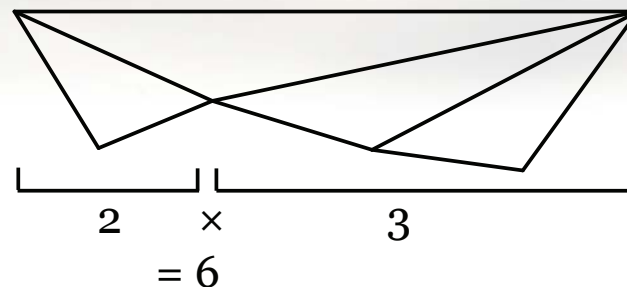
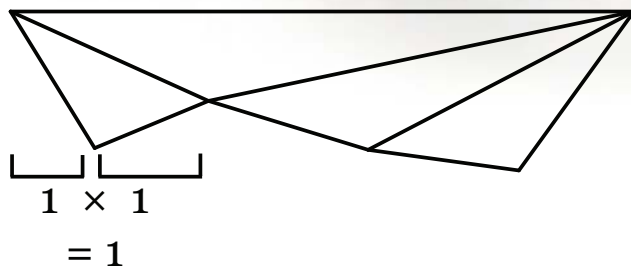
The background of the slide is a piece of marbled paper with a complex, organic pattern of swirling, vein-like shapes in various shades of beige, tan, and light brown. The pattern resembles natural stone or aged parchment.

## **(5) The associahedron**

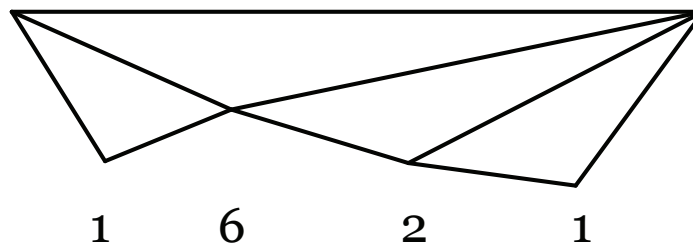
# Calculating the coordinates for a structure

Each vertex gets a value by multiplying the number of edges to its left and right

Example:



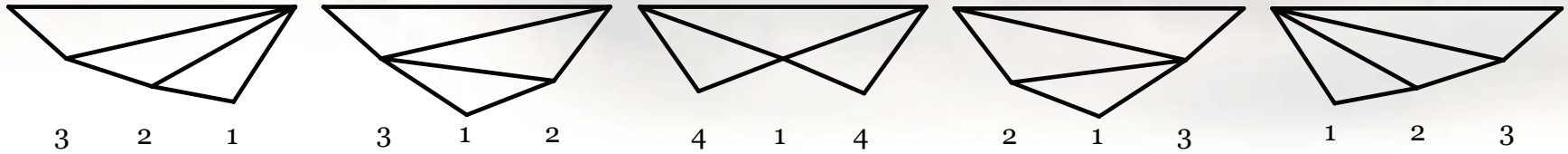
Result:



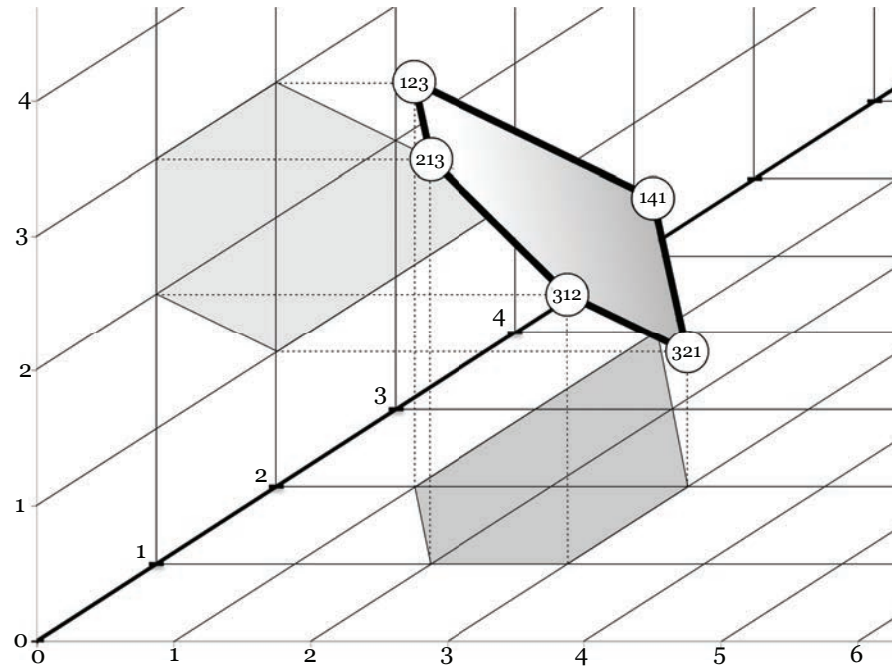


# The 3-associahedron

Coordinates for all structures with 3 internal nodes:

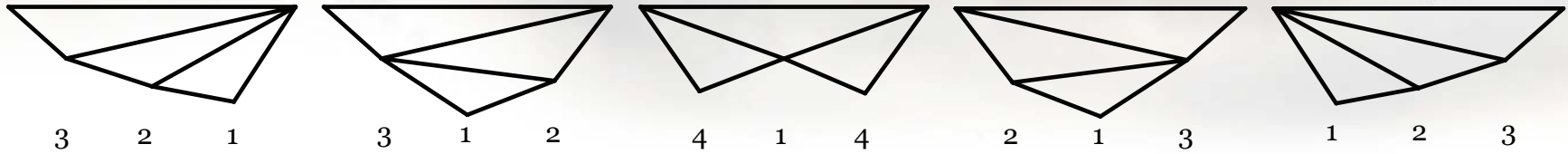


These lie on a plane  
( $a + b + c = 6$ )



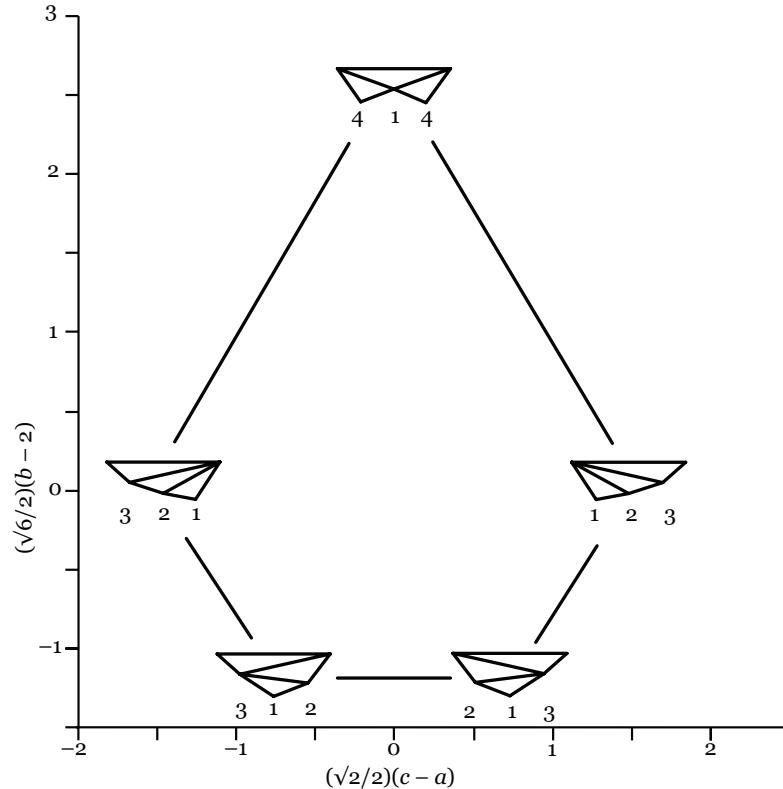
# The 3-associahedron

Coordinates for all structures with 3 internal nodes:



The points make a convex 2-d polygon (an irregular pentagon)


Connected vertices are related by a “flip”



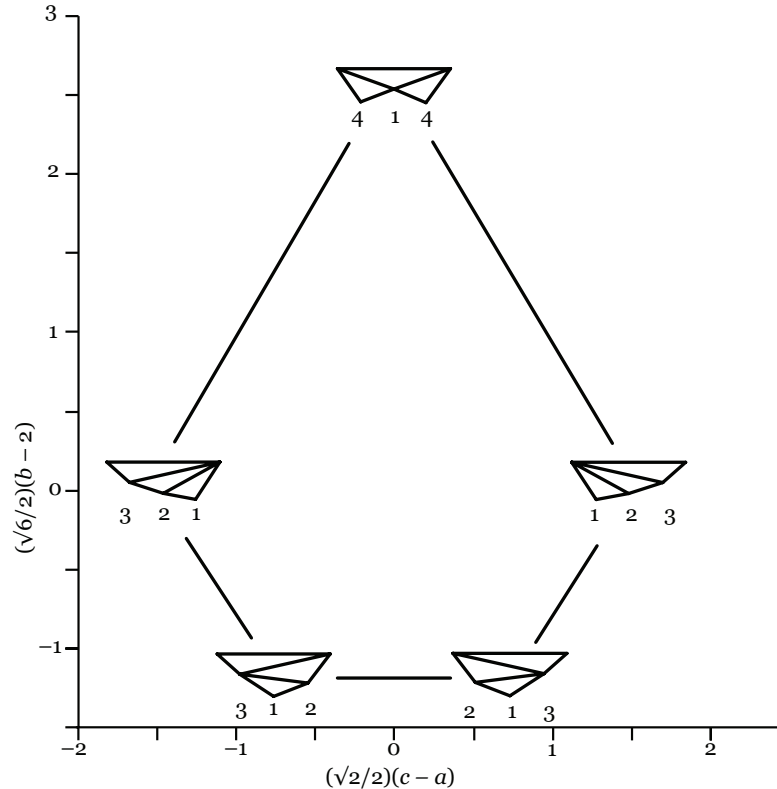


# The 3-associahedron

“Flip” (left  $\rightarrow$  right):

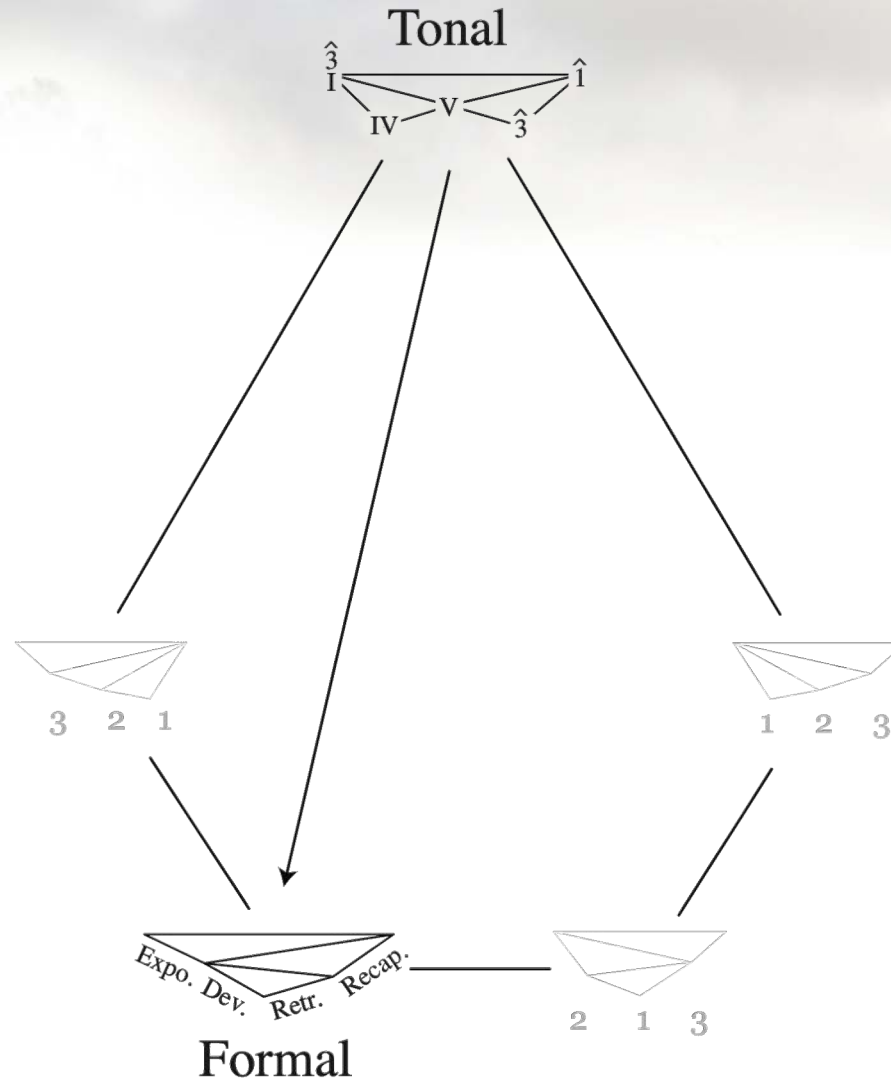


Connected vertices are related by a “flip”



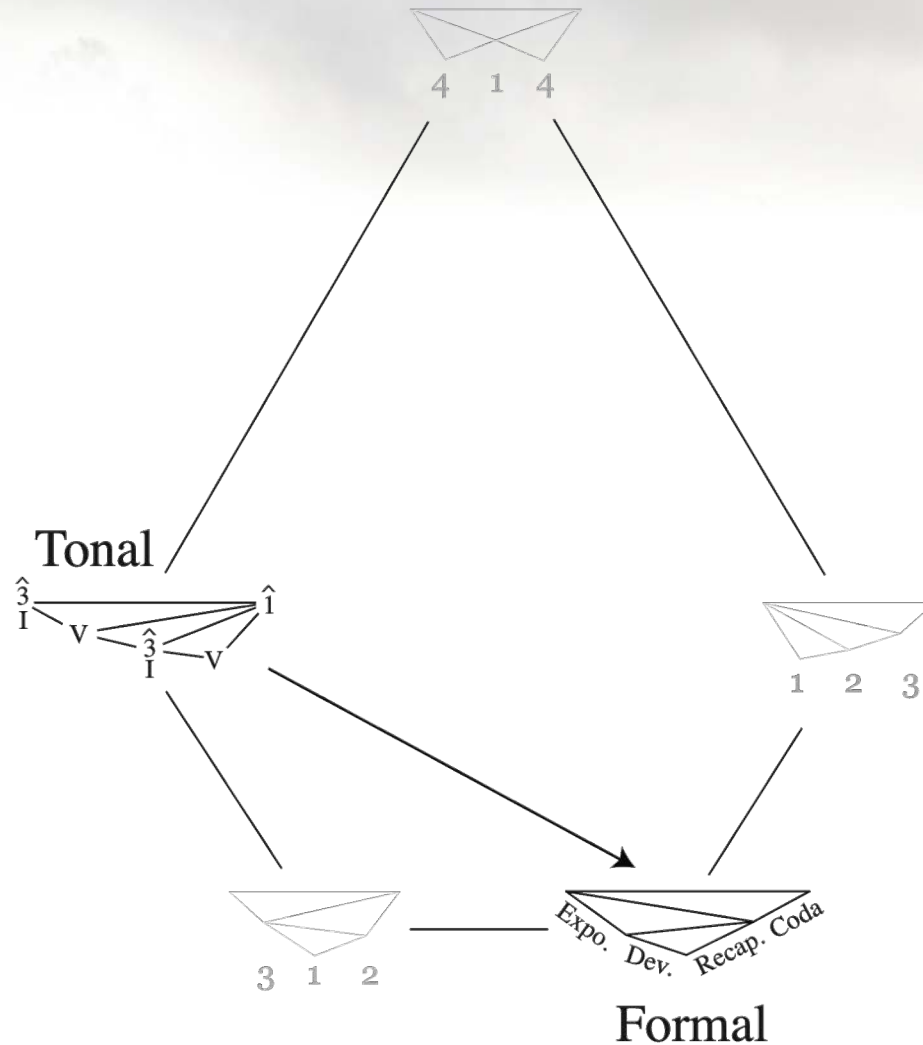
# Tonal-formal disjunction on the 3-associahedron

Beethoven Op. 29, mvt. 1



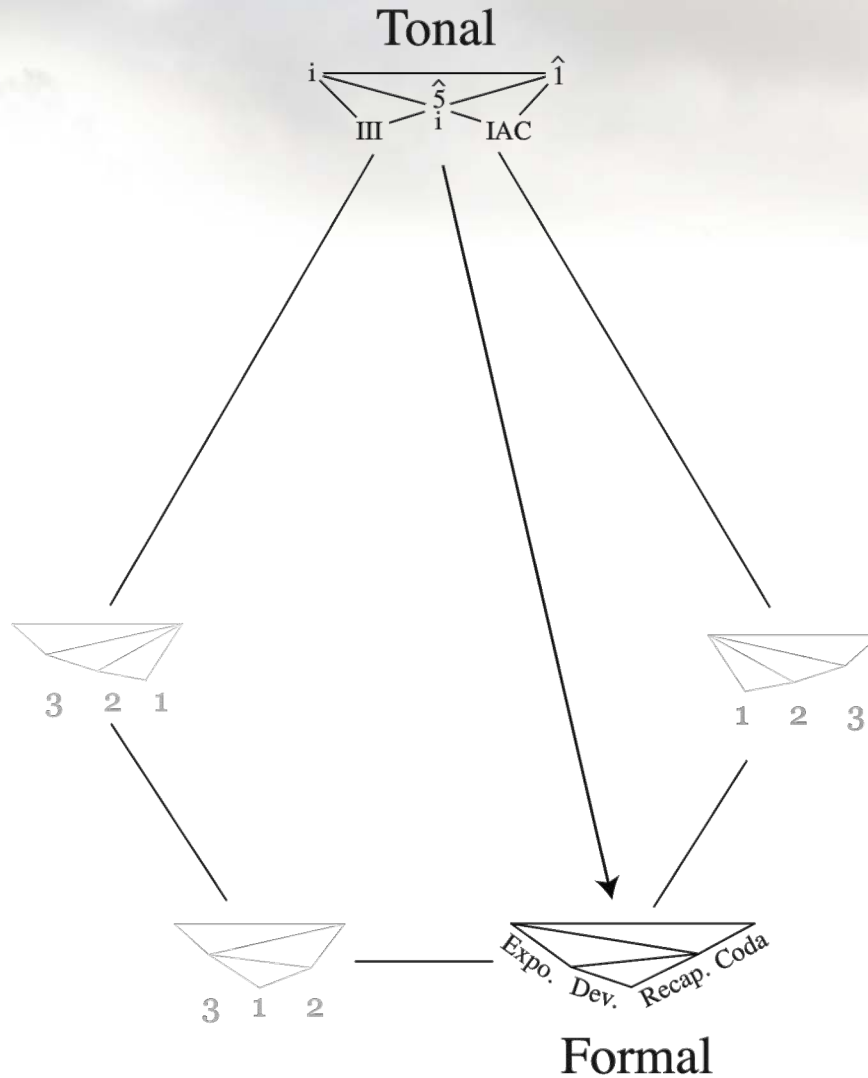
# Tonal-formal disjunction on the 3-associahedron

Haydn Symphony 101, mvt. 1



# Tonal-formal disjunction on the 3-associahedron

Beethoven Op. 59/2, mvt. 1

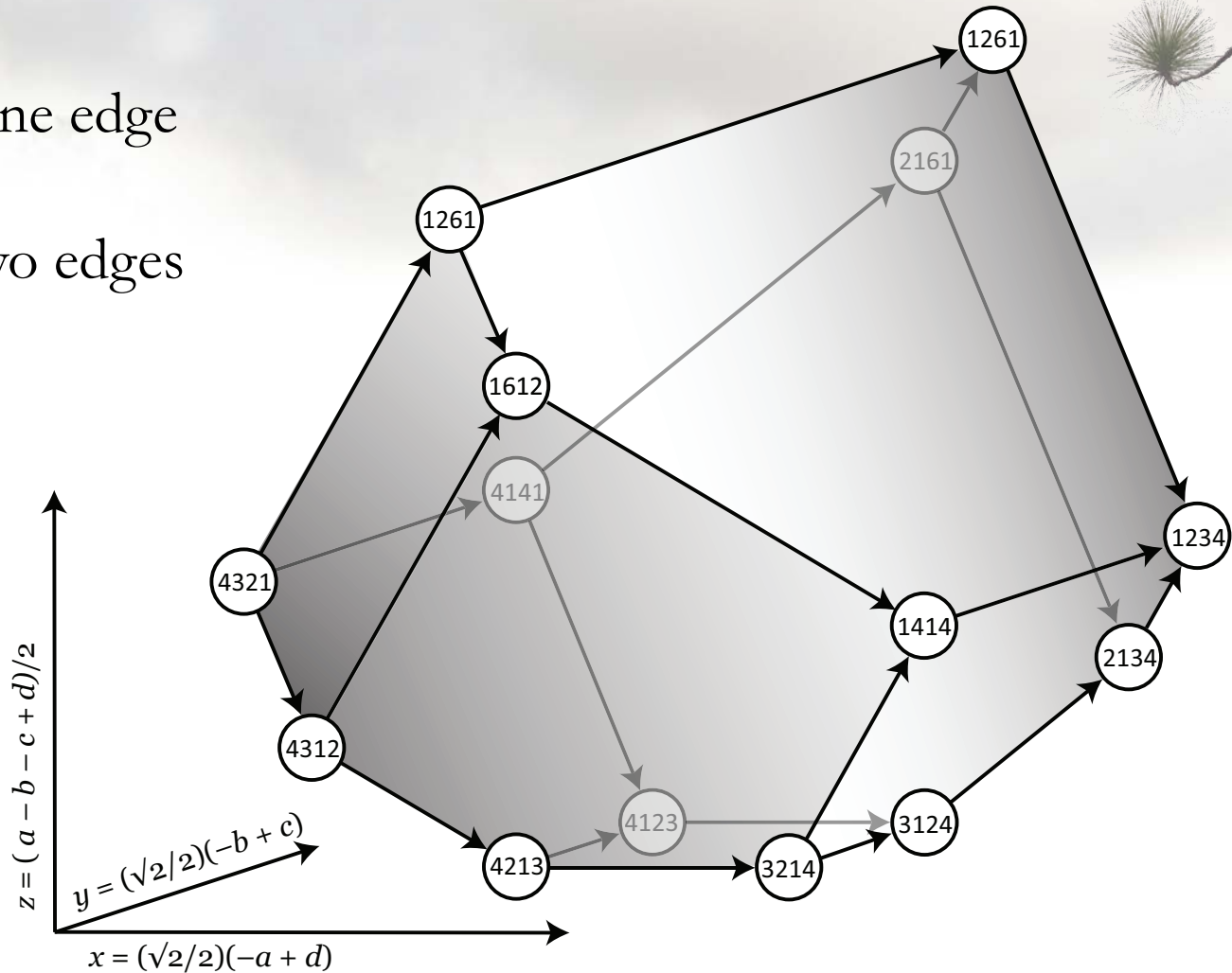




# The 4-associahedron

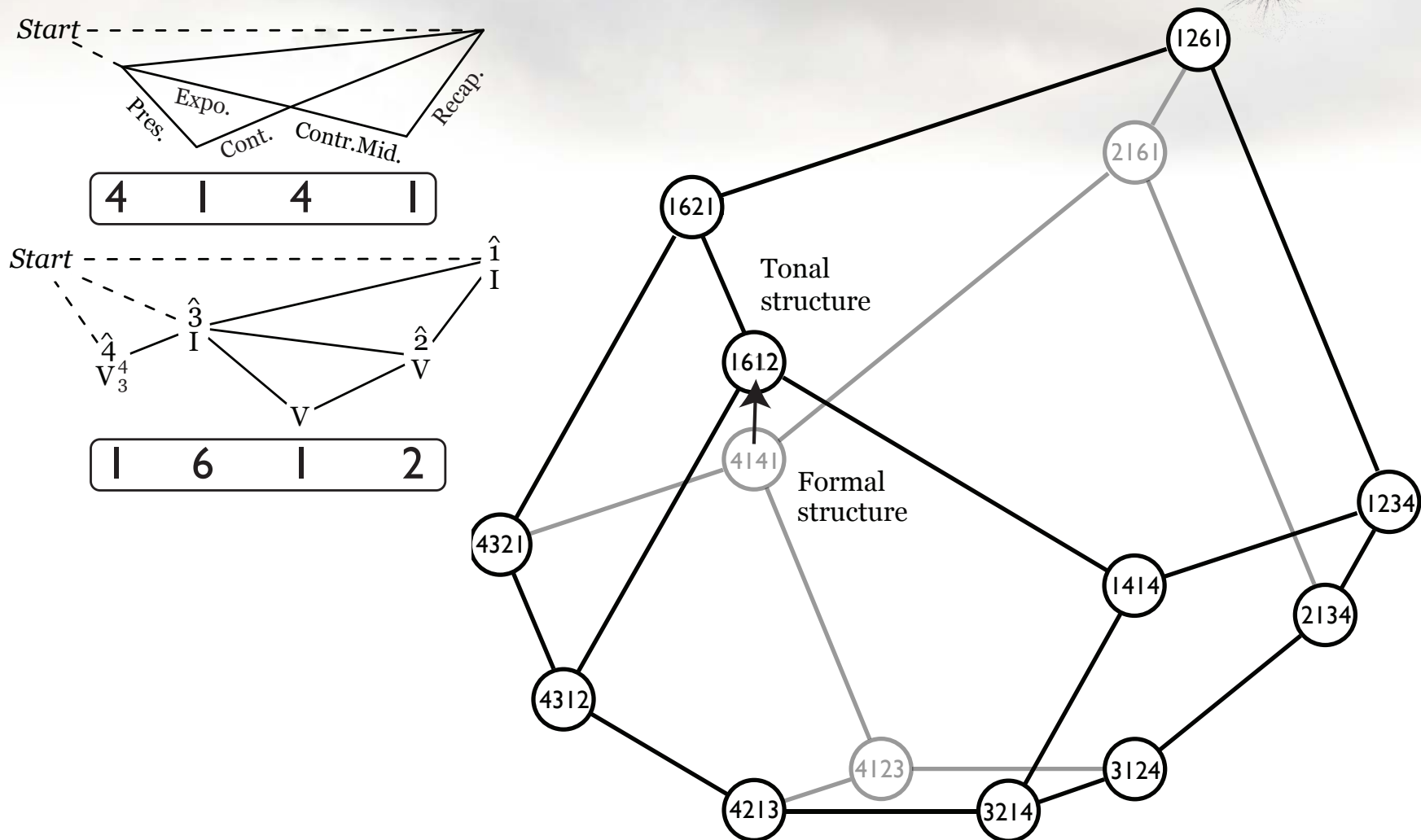
Edges: Flip one edge

Faces: Flip two edges



# Tonal-formal disjunction on the 4-associahedron

Beethoven Op. 9/1 scherzo





## Summary



- A common model of **temporal structure** applies independently to rhythm, form, and tonality, allowing analysts to observe how structure is coordinated between modalities.
- Hypermetric elision, a method of *delaying* expositional closure in Haydn, becomes a method of **denying expositional closure** altogether in Beethoven, leading to more radical denial of closure in the middle-period works.
- The denial of closure in recapitulations leads to an early large-scale disjunctive technique, the **disjunctive coda**.
- Beethoven developed additional methods of large-scale tonal-formal disjunction in his middle period: **off-tonic recapitulations** and **non-standard subordinate keys**.
- Disjunctions can be understood as paths in the associahedron.



# Hypermeter and Form as Temporal Structure, and Beethoven's Formal Innovations


Presentation to the McGill Music Research  
Doctoral Colloquium Series

Jason Yust, Boston University

<http://people.bu.edu/jyust>

[jason.yust@gmail.com](mailto:jason.yust@gmail.com)





# Organized Time: Temporal Structure in the Musical Domains of Rhythm, Tonality, and Form

- Independence of three domains (rhythm, tonality, and form)
- Common model of temporal structure across domains
- Coordination and disjunction