



A JOURNAL OF THE SOCIETY FOR MUSIC THEORY

MTO 32.3 Examples: Kahrs, Unison Opening as Schema in Post-1945 Composition

(Note: audio, video, and other interactive examples are only available online)

<https://www.mtosmt.org/issues/mto.26.32.3/mto.26.32.3.kahrs.html>

Example 1. My annotations for the three exit strategies



wedge
(W)



addition of notes
(A)



glissando away
(G)

Example 2. James Tenney, *Critical Band*, full score.

CRITICAL BAND

for the Relâche Ensemble

James Tenney 10/88

The score is divided into 13 segments of varying duration. For each segment, the notation gives *available pitches*, with numbers above each note indicating its deviations from the tempered pitch in *cents*, its frequency *ratio* with respect to A=440, and its *frequency* in Hz. An electronic tuner may be necessary to achieve the intonation accuracy required, although *beat frequency* (at 5.44 beats per second) can be used in Segment 2 to determine the pitches of A+13¢ and A-14¢. In Segment 3, A+27¢ and A-27¢ will be given by the piano. In each segment, the players choose, in any order, one after another of the available pitches, playing them according to the rhythmic and dynamic indications given.

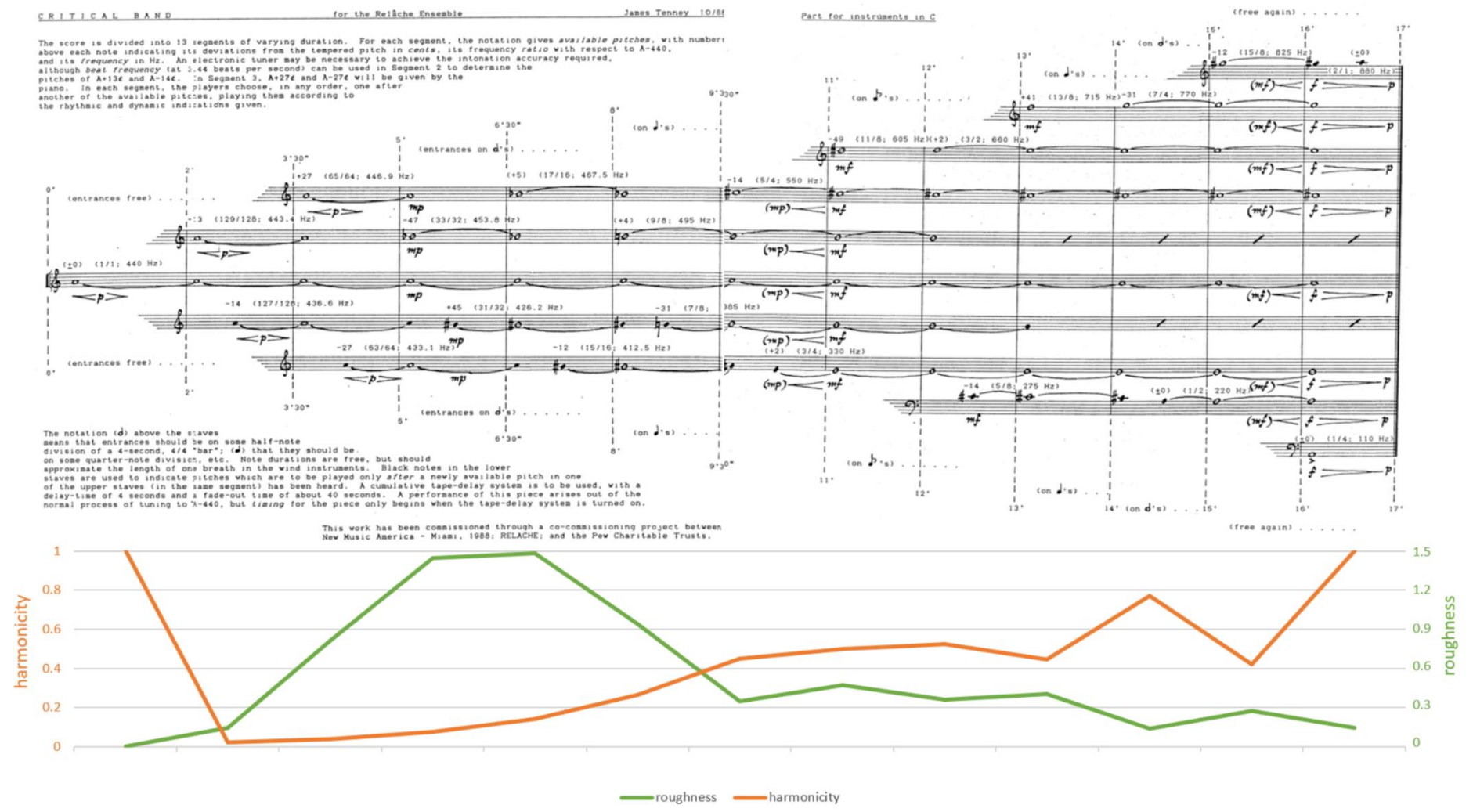
The notation (*d*) above the staves means that entrances should be on some half-note division of a 4-second, 4/4 "bar"; (*d*) that they should be on some quarter-note division, etc. Note durations are free, but should approximate the length of one breath in the wind instruments. Black notes in the lower staves are used to indicate pitches which are to be played only *after* a newly available pitch in one of the upper staves (in the same segment) has been heard. A cumulative tape-delay system is to be used, with a delay-time of 4 seconds and a fade-out time of about 40 seconds. A performance of this piece arises out of the normal process of tuning to A=440, but *timing* for the piece only begins when the tape-delay system is turned on.

This work has been commissioned through a co-commissioning project between New Music America - Miami, 1988; RELACHE; and the Pew Charitable Trusts.

Example 2, Continued.

[illegible]

Example 3. Theoretical values for roughness and harmonicity over the course of *Critical Band*



Example 4. List of pieces beginning on a unison and ending on a harmonic series

[See also Appendix 1]

Surname	First name	Title	Year	Pitch	Exit	Discussed in
Eastman	Julius	<i>Crazy [n-word]</i>	1979	Bb5	W	Gottschalk 2016, 47; Hanson-Dvoracek 2015; Hisama 2014, 276–79
Grisey	Gerard	<i>Periodes</i>	1974	D4	AG	Baillet 2000, 11–14, 113; Drott 2013, 25; Féron 2010; 2021, Jakubowski 2019, 68–69, 201–3
Hosokawa	Toshio	<i>Fragmente II</i>	1989	F#4	AG	
Lamb	Catherine	<i>diviso spiralis</i>	2019	Bb5	W	
Lamb	Catherine	<i>Prisma Interius IX</i>	2018	G4	WA	
Tenney	James	<i>Critical Band</i>	1988	A4	WA	Fakhratabatabaie and Jennings 2021; Wannamaker 2021a, 225–231

Example 5. Julius Eastman, *Crazy [n-word]*, opening (click on green boxes for audio examples)

CRAZY N R

Julius Eastman 78
N.Y.C.

4 Pulses = 92

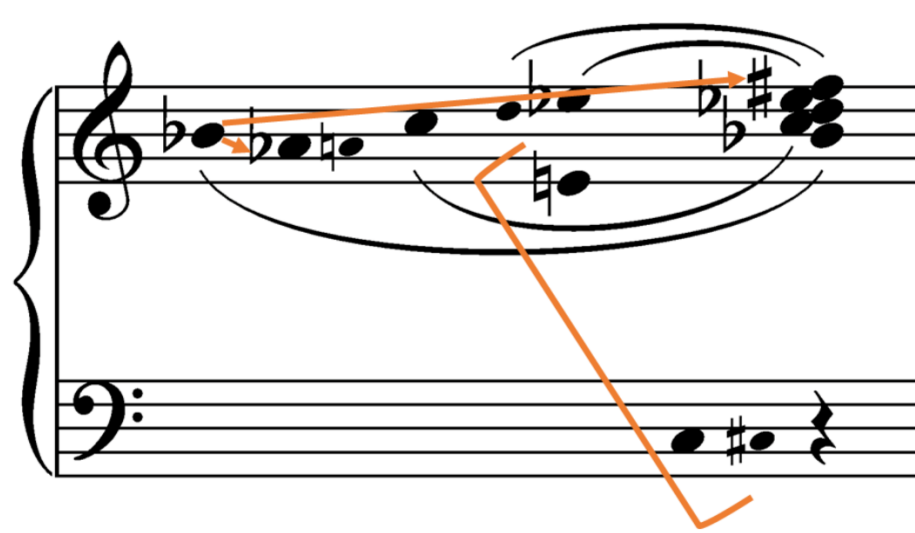
3:00 4:30 6:00 7:30 9:00

Take this as a guide & continue in the manner

[Silence]

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Example 6. Julius Eastman, *Crazy [n-word]*, reduction and analysis of opening



Example 7. Julius Eastman, *Crazy [n-word]*, conclusion

This image shows a handwritten musical score on ten staves, representing the conclusion of Julius Eastman's piece *Crazy [n-word]*. The notation is dense and includes various musical symbols, time signatures, and performance instructions.

Staff 1: Starts with a treble clef, a key signature of one sharp (F#), and a time signature of 4/10. Above the staff, time stamps are written: 46:00, 47:30, 47:57, 48:15, 48:25, 48:37, 49:44, and 49:48. The first measure contains a whole note with a sharp sign (#) and a circled 5.

Staff 2: Contains a treble clef, a key signature of one sharp (F#), and a time signature of 4/5. Above the staff, there is a handwritten "4.5" and a circled "5".

Staff 3: Contains a treble clef, a key signature of one sharp (F#), and a time signature of 8/5. Above the staff, there is a handwritten "8+5" and the word "Brad".

Staff 4: Contains a treble clef, a key signature of one sharp (F#), and a time signature of 8/2. Above the staff, there is a circled "5" and the word "Brad".

Staff 5: Contains a treble clef, a key signature of one sharp (F#), and a time signature of 6/5. Above the staff, there is a circled "5" and the word "Brad".

Staff 6: Contains a treble clef, a key signature of one sharp (F#), and a time signature of 5/6. Above the staff, there is a circled "5" and the word "Brad".

Staff 7: Contains a treble clef, a key signature of one sharp (F#), and a time signature of 4/4. Above the staff, there is a circled "5" and the word "Brad".

Staff 8: Contains a treble clef, a key signature of one sharp (F#), and a time signature of 3/4. Above the staff, there is a circled "5" and the word "Brad".

Staff 9: Contains a treble clef, a key signature of one sharp (F#), and a time signature of 3/2. Above the staff, there is a circled "5" and the word "Brad".

Staff 10: Contains a treble clef, a key signature of one sharp (F#), and a time signature of 2/3. Above the staff, there is a circled "5" and the word "Brad".

A large orange line is drawn across the page, starting from the first measure of the first staff and ending at the final measure of the tenth staff, indicating a continuous melodic or harmonic line.

Gérard Grisey
PERIODES (1974)
per sette strumenti

Vno
Vla
Cb.

* Accorder la 4^e corde un ton plus haut, de façon que l'harmonique soit exactement à l'unisson de la II^e corde.
Accordare la quarta corda un tono più alto, in modo che l'armonico sia esattamente all'unisono della seconda corda.
Tune the fourth string a whole tone higher so that the harmonic will be exactly in unison with the second string.
Die vierte Saite einen Ton höher stimmen, so daß das Flageolet unisono mit der zweiten Saite klingt.

Note 1. L'alto reste en dehors, les autres instruments l'enveloppent et le colorent mais restent très lointains, à peine discernables. Seul indication contraire, vn, vc, cb senza vibrato.
La viola resta in rilievo, gli altri strumenti la avvolgono e la coloriscono ma restano molto lontani, appena distinguibili. Salvo indicazione contraria: vl, vlc e cb senza vibrato e sul tasto.
The viola plays in relief throughout, the other instruments surround it and color it but remain distant, barely discernible. Without any other indication, the Vn, Vc and Cb play without vibrato and sul tasto.

Note 2. Dans le cas d'un enchaînement avec Prologue pour alto, le même altoist attaque le Ré à l'endroit indiqué dans le partition de Prologue par le signe ♯ et vient s'accrocher lentement au milieu du groupe.
Nel caso in cui questo brano venga eseguito concatenandolo a Prologue per viola, lo stesso violonista attacca il Re nel luogo che nella partitura di Prologue è indicato dal segno ♯ e viene a sedersi lentamente in mezzo al gruppo.
If performed together with Prologue for viola, the same violist attacks the D at the place indicated in the score of Prologue by the sign ♯ and then slowly goes and sits down in the middle of the group.
Falls dieses Stück an Prologue für Bratsche angeschlossen aufgeführt wird, setzt der gleiche Bratschist das D an der Stelle an, die in der Partitur von Prologue durch das Zeichen ♯ angegeben wird, und geht dann langsam, um sich mitten in der Gruppe hinzusetzen.

Example 9. Catherine Lamb, *Prisma Interius IX*, opening

The musical score is for the opening of Catherine Lamb's *Prisma Interius IX*. It consists of four staves: Violin (Vln.), Viola (Vla.), Violoncello (Vc.), and Violoncello/Double Bass (Viol.).

Violin (Vln.) Staff:

- Measure 1: Π 81 (405), Π^1 80 (400), 81 (405). An orange arrow points from the Π 81 to the Π^1 80.
- Measure 2: Π^1 81 (405), 80 (400), 81 (405).

Viola (Vla.) Staff:

- Measure 1: Π^2 80 (400).
- Measure 2: I^1 81 (405), 80 (400), 84 (420), 81 (405), 80 (400).

Violoncello (Vc.) Staff:

- Measure 1: Π^3 81 (405).
- Measure 2: Π^3 81 (405).
- Measure 3: Π^4 72 (360).
- Measure 4: 84 IV^7 72 Π^4 (420, 360).

Violoncello/Double Bass (Viol.) Staff:

- Measure 1: Π^1 64 (320 shadow).
- Measure 2: Π^1 81 (405 clear).

Performance Markings:

- Orange arrows indicate phrasing or bowing connections: from Vln. Π 81 to Vla. Π^2 80, and from Vc. Π^3 81 to Vla. I^1 81.
- Brackets and labels "shadow" and "clear" are used to denote specific performance techniques or articulation.

Example 10. Catherine Lamb, *Prisma Interius IX*, conclusion

The musical score is arranged in ten staves, each representing a different instrument or voice part. The staves are labeled on the left: Fl., Tpt., Tbn., E. Gtr., Vln., Vla., Voice (soprano), Vc., Voice (bass), and Viol. The score includes various musical notations such as notes, rests, and fingerings. Numerical data points are placed above or below the notes, often with a small asterisk. For example, the Fl. staff has data points like 112, 144, 200, 192, 168, 160, 168, 144, 120, and 144. The Tpt. staff has data points like 56, 64, 72, 80, 120, 128, 96, and 80. The Tbn. staff has data points like 32, 40, 24, 16, and 56. The E. Gtr. staff has data points like 6¹, 16, and 80. The Vln. staff has data points like 200, 160, 160, 160, 120, and 600. The Vla. staff has data points like 40, 24, 200, and 120. The Voice (soprano) staff has data points like 72, 360, 48, and 240. The Vc. staff has data points like 72, 360, 48, and 240. The Voice (bass) staff has data points like 24, 40, 120, 200, 32, and 160. The Viol. staff has data points like 24, 40, 120, 200, 32, and 160. The score also includes performance instructions such as "grad. to. spectrality" and "slowly lift finger to open string". The score ends with a double bar line and the number 25.

Fl. 112 144 200 192 168 160 168 144 120 144 25
grad. to. spectrality

Tpt. 56 64 72 80 120 128 96 80
grad. to. spectrality

Tbn. 32 40 24 16 56
grad. to. spectrality

E. Gtr. 6¹ 16 80
grad. to. spectrality

Vln. 200 160 160 160 120 600
grad. to. spectrality
slowly lift finger to open string

Vla. 40 24 200 120
grad. to. spectrality

Voice 72 360 48 240
grad. to. spectrality

Vc. 72 360 48 240
grad. to. spectrality
slowly lift finger to open string

Voice 24 40 120 200 32 160
grad. to. spectrality

Viol. 24 40 120 200 32 160
grad. to. spectrality

Example 12. Comparison of sonorities at start and end of *Fragmente II*, showing subset relationships

(0134) (013467)

1

lunga

con sordino
lunga

con sordino
lunga

con sordino
lunga

con sordino
lunga
lontano

ppp

mf

f

f

f

The image displays a musical score for 'Fragmente II' with five staves. The first system is marked with a boxed '1' and the tempo 'lunga'. The first four staves are marked 'con sordino' and the fifth 'con sordino lontano'. The key signature has one sharp (F#) and the time signature is 4/8. The first system ends with a double bar line. The second system begins with a double bar line and a key signature change to one flat (Bb). The first four staves of the second system are marked 'f' (forte). The score is annotated with two sonority sets: (0134) in orange at the top and (013467) in orange at the top right. Blue lines connect the notes of the first sonority (0134) in the first system to the notes of the second sonority (013467) in the second system. Green lines connect the notes of the second sonority (013467) in the first system to the notes of the second sonority (013467) in the second system. The notes are: Staff 1 (treble clef): C4 (half note), D4 (half note), E4 (half note), F#4 (half note). Staff 2 (treble clef): C4 (half note), D4 (half note), E4 (half note), F#4 (half note). Staff 3 (treble clef): C4 (half note), D4 (half note), E4 (half note), F#4 (half note). Staff 4 (bass clef): C3 (half note), D3 (half note), E3 (half note), F#3 (half note). Staff 5 (bass clef): C3 (half note), D3 (half note), E3 (half note), F#3 (half note). The second system notes are: Staff 1 (treble clef): G4 (half note), A4 (half note), B4 (half note), C5 (half note). Staff 2 (treble clef): G4 (half note), A4 (half note), B4 (half note), C5 (half note). Staff 3 (bass clef): G3 (half note), A3 (half note), B3 (half note), C4 (half note). Staff 4 (bass clef): G3 (half note), A3 (half note), B3 (half note), C4 (half note). Staff 5 (bass clef): G3 (half note), A3 (half note), B3 (half note), C4 (half note).

Example 13. Toshio Hosokawa, *Fragmente II*, conclusion

8 $\text{♩} = \text{ca. } 40$ molto e calmo

121 dolce

(013467)

ppp mp pp f ppp f

ppp *sempre ppp* (sul tasto) (sul pont.) (sul tasto) (pos. ord.)

dolce *ppp* mp pp f ppp f

pizz. arco (sul pont.) (sul pont.) (pos. ord.)

p dolce *ppp* mp pp f ppp f

con sord. (sul pont.) arco ord.

dolce *ppp* mp mf ppp f

poco rall.

125 in Piano

ppp (pos. ord.) *ppp* *morendo* *morendo* *morendo* *morendo*

ppp *ppp* *ppp* *morendo* *morendo* *morendo*

Example 14. List of compositions explicitly referencing acoustic phenomena without ending in a full harmonic series (orange indicates composers previously mentioned)

[See Appendix 2]

Example 15. Performance instructions for Scelsi, *L'âme ouverte*, indicating notation of beating speeds

INSTRUCTIONS

1. Beats produced by slight microtonal changes (represented by numbers in the score) are notated per second ($\text{♩} = 60$).
2. When beats are very fast, the symbol (V) is indicated.
3. When beats are too fast to count, no number is indicated.
4. The symbol O signifies a perfect unison; no beats are to sound.
5. Play throughout without vibrato

The following scordatura must be employed:



Example 16. Scelsi, *L'âme ouverte*, opening with specific beating speeds indicated

L'ÂME OUVERTE

(♩ = 60)

con sordina

pour violon solo

pppp quasi inaudibile

Giacinto SCELSSI

ppp *non vibrato*

ppp *pp*

pp *ppp*

mf *mp*

mf *f*

non troppo *(f)*

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Example 17. Per Nørgård, String Quartet No. 5 ("Inscape"), opening unison (manuscript from Nørgård's arkiv III, 01 mu 7909.1512)

1. *Presto, sul pont. al segno ♯*

PPP (rall.) (legato) (accel.) (rall.) (accel, rall.) [ca. 10"]

col legno meta coll'arco arco meta legno meta

presto (continuare)

rall. accel. ad lib. sul pont. al segno ♯

col legno meta coll'arco arco

PPP (legato)

presto (continuare)

rall. accel. ad lib. sul pont. al segno ♯

col legno meta coll'arco arco

PPP (legato)

presto (continuare)

rall. accel. ad lib. sul pont. al segno ♯

col legno meta coll'arco arco

PPP (legato)

1. a

Example 18. Scordatura for Per Nørgård, "Inscape" (Nørgårds arkiv III, 01 mu 7909.1512)

Handwritten musical notation for four staves, likely representing different string parts in a scordatura setting. The notation is written on four-line staves with various symbols and accidentals.

- Vl. I:** Starts with a treble clef and a colon. The first staff contains a double bar line, a sharp sign (#), and a dot (•) on the first line, followed by a double bar line, a sharp sign (#), and a dot (•) on the first line, and finally a double bar line, a sharp sign (#), and a dot (•) on the first line.
- Vl. II:** Starts with a treble clef and a colon. The first staff contains a double bar line, a sharp sign (#), and a dot (•) on the first line, followed by a double bar line, a sharp sign (#), and a dot (•) on the first line, and finally a double bar line, a sharp sign (#), and a dot (•) on the first line.
- Vla:** Starts with a treble clef and a brace. The first staff contains a double bar line, a sharp sign (#), and a dot (•) on the first line, followed by a double bar line, a sharp sign (#), and a dot (•) on the first line, and finally a double bar line, a sharp sign (#), and a dot (•) on the first line.
- Vcl:** Starts with a treble clef and a brace. The first staff contains a double bar line, a sharp sign (#), and a dot (•) on the first line, followed by a double bar line, a sharp sign (#), and a dot (•) on the first line, and finally a double bar line, a sharp sign (#), and a dot (•) on the first line.

Example 19. Notated "interference" at the end of the first phrase of "Inscape," a minute and a half in (Nørgårds arkiv III, 01 mu 7909.1512)

5 - 5 -

(♩ = c. 60)

(4/4)

(interferences: ||||| etc.)

accel. into unisono with VI. I!

(4/4)

(interferences: ||||| etc.)

accel. into unisono with VI. I!

(4/4)

(interferences: ||||| etc.)

(interferences: ||||| etc.)

Example 20. Performance instructions for Per Norgard's "Inscape," showing notation for beating (Nørgårds arkiv III, 01 mu 7909.1512)

' + interferences' (el. 'int.')

ang. svævning mlm. flere strege, de lodrette streger antyder svævnigernes tempo

Example 21. Murail's Figure 9 (1980) 2005, showing his summary of the opening in his own *Mémoire/Erosion*



Example 22. Saariaho, *Lichtbogen*, mm. 25–28

Example 23. Saariaho, *Lichtbogen*, mm. 42–44

Example 24. Compositions starting on a unison playable as an open string or natural harmonic (orange indicates composers previously mentioned)

[See Appendix 3]

Example 25. Scelsi, *Xnoybis*, opening

Example 25. Scelsi, *Xnoybis*, opening. The score is for three staves: I Corda (Rc#), II Corda (Si), and III Corda (Sol). The tempo is marked as 80. The score includes various dynamics like *ppp*, *pp*, *p*, and *mp*, and articulations like *PONT*, *TAST*, and *NAT.* An orange line connects the starting notes of the three staves, indicating a unison playable as an open string or natural harmonic.

Example 26. Berio, *Sequenza VIII* for violin solo, opening

Example 26. Berio, *Sequenza VIII* for violin solo, opening. The score is for a single staff. The tempo is marked as 54. The score includes various dynamics like *fff* and articulations like *V*. The score is written for a single staff with various fingerings and bowings indicated.

Example 27. Gubaidulina, String Quartet No. 2, opening

sofia gubaidulina
(*1931)

Violino I

Violino II

Viola

Violoncello

Example 28. Gubaidulina, String Quartet No. 2, around m. 4, showing how vibrato wedges further to chromaticism

Violino I

Violino II

Viola

Violoncello

Example 29. Gubaidulina, String Quartet No. 2, end of unison passage at m. 20, failed wedge leading to glissandi

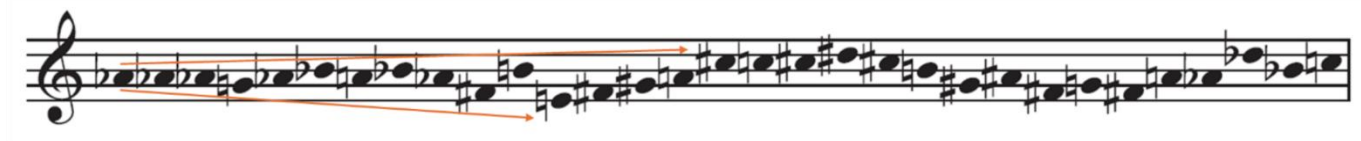
Example 29. Gubaidulina, String Quartet No. 2, end of unison passage at m. 20, failed wedge leading to glissandi

Example 30. Sørensen, *It is pain flowing down slowly on a white wall*, opening

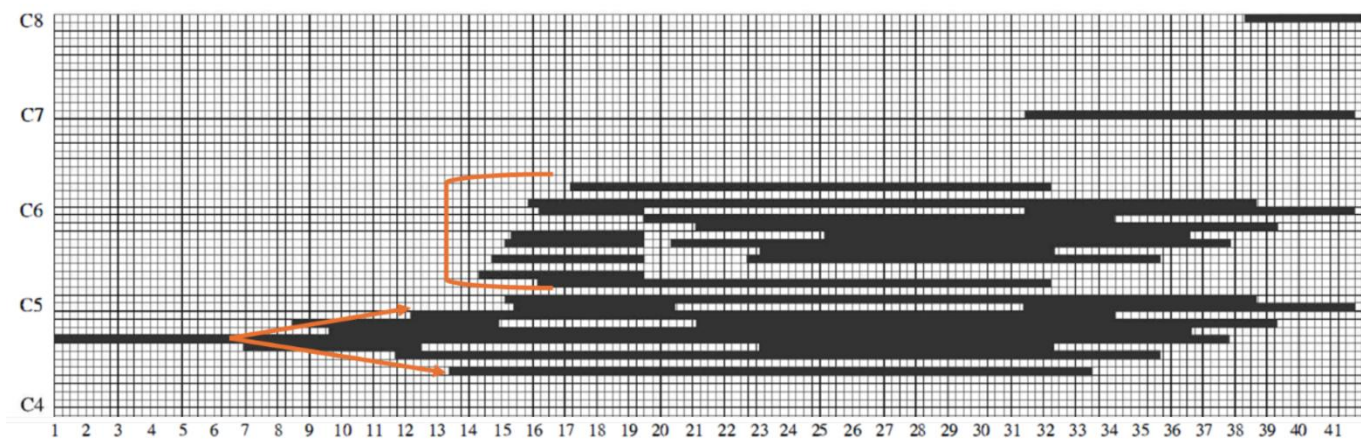
Example 30. Sørensen, *It is pain flowing down slowly on a white wall*, opening

[See Appendix 4]

Example 33. Levy's Example 5.18a (2017, 2021), showing first canonic theme in Ligeti, *Lontano*, with my analytical overlay



Example 34. Example 34: Bauer's (2004, 128) range graph for the opening of *Lontano*, with my annotations showing exit strategies



Example 35. Terrazas's "Tótem II (Miro hacia el cielo)," from *The Torres Cycle*, opening

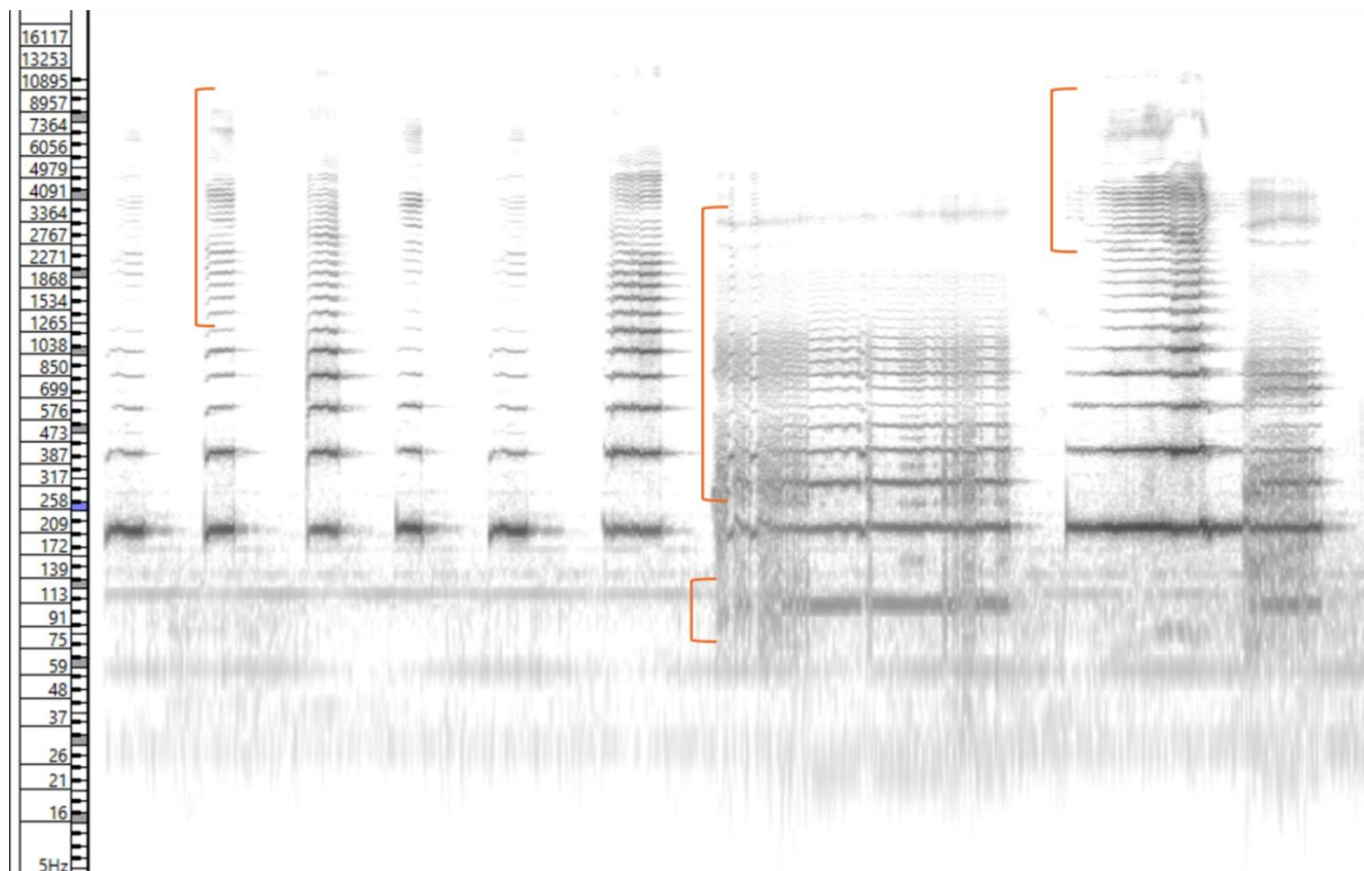
TÓTEM II
MIRO HACIA EL CIELO
 (2019) for piccolo(s)
 WILFRIDO TERRAZAS

A EXPANSIVE, "TIMELESS" Ensemble version: play in irregular canon
 mp ↔ f Change timbre each fermatta

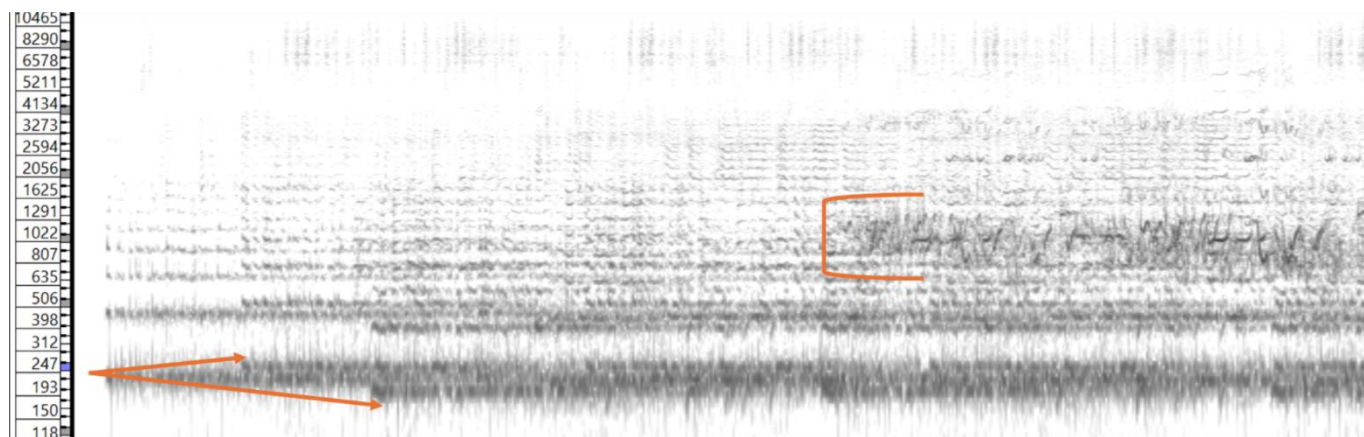
B SUDDENLY "MUSICAL" Ensemble version: play in irregular canon ("Gagaku-like")
 (free dynamics)

The image shows a handwritten musical score for a piccolo. It features two staves of music. The first staff is marked with a circled 'A' and includes the instruction 'EXPANSIVE, "TIMELESS" Ensemble version: play in irregular canon' and 'mp ↔ f Change timbre each fermatta'. The second staff is marked with a circled 'B' and includes the instruction 'SUDDENLY "MUSICAL" Ensemble version: play in irregular canon ("Gagaku-like")' and '(free dynamics)'. The title 'TÓTEM II' and subtitle 'MIRO HACIA EL CIELO' are written above the staves, along with the year '(2019)' and 'for piccolo(s)'. The composer's name 'WILFRIDO TERRAZAS' is written at the top right.

Example 36. La Barbara, *Voice Piece*, 0:00–0:50



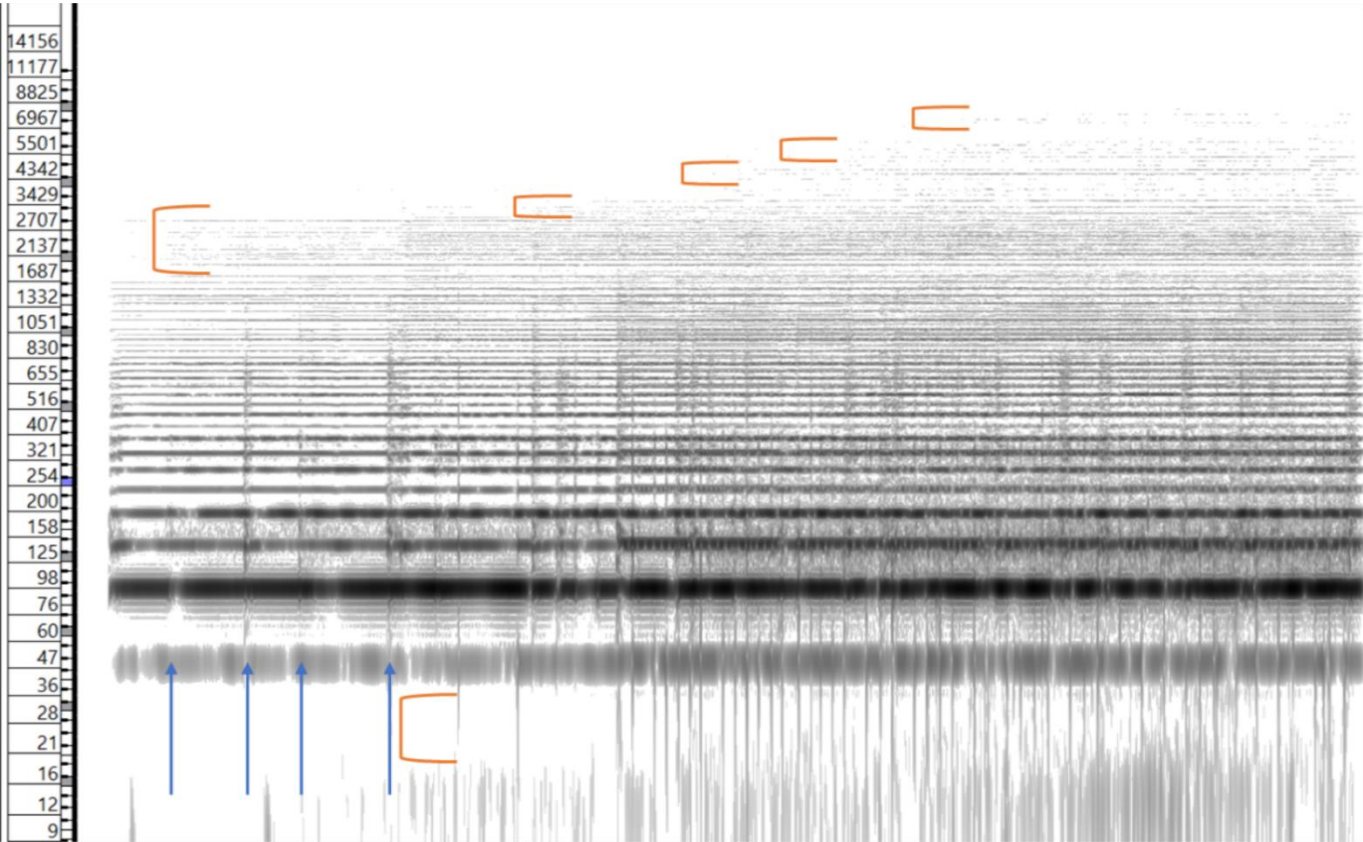
Example 37. Z, "Quatre Couches / Flare Stains" from *A Secret Code*, 0:00–0:30



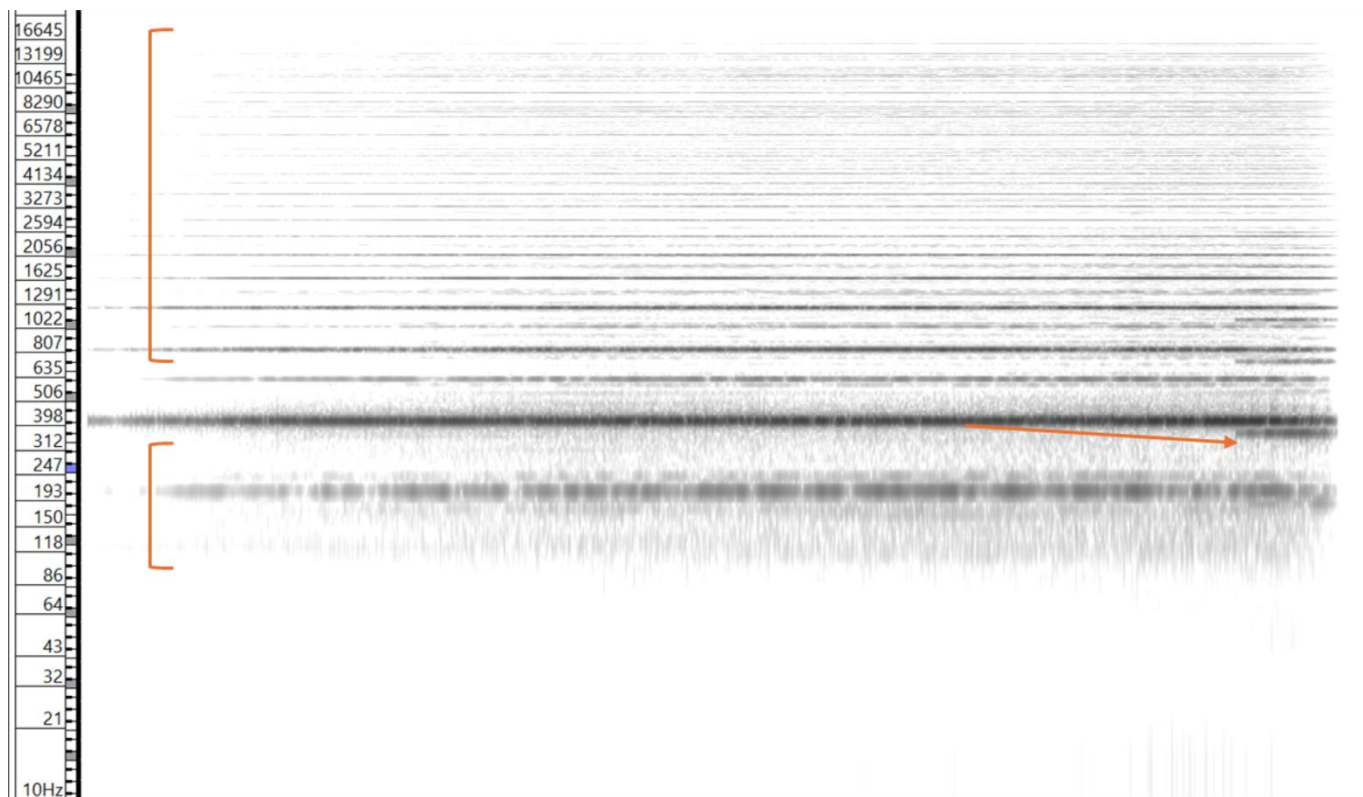
Example 39. List of unisons involving electronics (orange indicates composers previously mentioned)

[See Appendix 5]

Example 40. Niblock, *Harm*, 0:00–0:56



Example 41. KMRU, *Imperceptible Perceptible*, 0:00–0:35



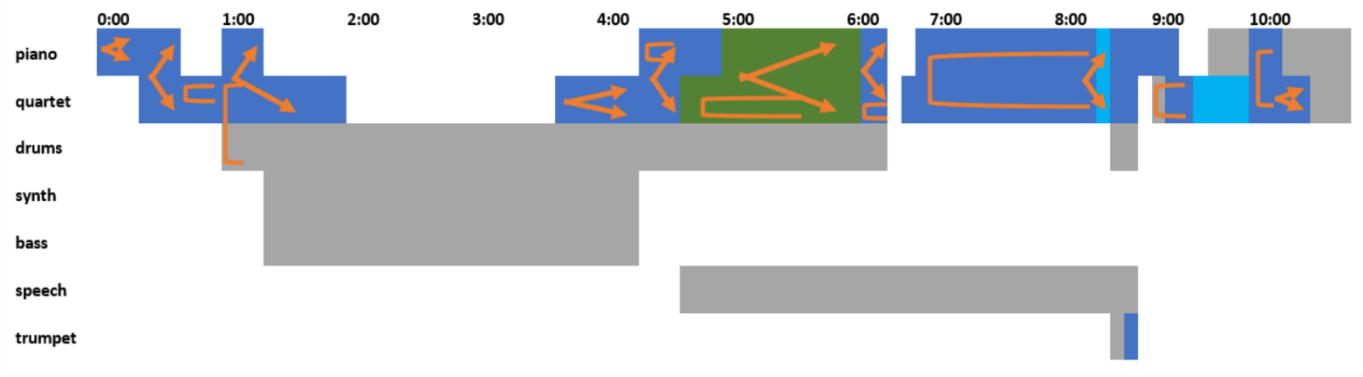
Example 42. Transcription of Akinmusire, "Americana," 6:04–6:54

6:08

"born in the belly of the beast"



Example 43. Orchestration chart for Akinmusire, "Americana," with schematic analytical overlay. Dark blue indicates D# = Eb4, light blue Eb5, and green C# / Db4.



Example 44. Transcription of Akinmusire, "Americana," 5:53–6:14

5:53
"sandcastle architecture"
piano and strings

5:57
"fan these fires"

6:04
"sand ho out to Yonkers"

The transcription shows three systems of music. The first system, from 5:53 to 5:57, is for piano and strings, featuring a melody in the treble clef and a bass line in the bass clef. The second system, from 5:57 to 6:04, is for piano and strings, featuring a melody in the treble clef and a bass line in the bass clef. The third system, from 6:04 to 6:14, is for piano and strings, featuring a melody in the treble clef and a bass line in the bass clef. The key signature is D major (F# and C#). The time signature is 4/4. The transcription includes various musical notations such as notes, rests, and accidentals.

Example 45. Transcription of Akinmusire, "Americana," 0:02–0:46

0:02, 0:19

1. piano only

2. piano and quartet

0:10, 0:27

This musical score is for Example 45, transcribing Akinmusire's "Americana" from 0:02 to 0:46. It consists of three staves of music in 4/4 time, with a key signature of three sharps (F#, C#, G#). The first staff, labeled "1. piano only", contains measures 1 through 10. The second staff, labeled "2. piano and quartet", contains measures 11 through 27. The third staff contains measures 28 through 46. The notation includes various rhythmic patterns, including eighth and sixteenth notes, and rests. There are orange markings on the first and third staves, highlighting specific musical phrases. The time markers 0:02, 0:19, 0:10, 0:27, 0:36, and 0:43 are placed above the corresponding measures.

Example 46. Transcription of Akinmusire, "Americana," 6:36–7:09

"render and
twisting souls"

6:40

solo violin only

piano and violin

This musical score is for Example 46, transcribing Akinmusire's "Americana" from 6:36 to 7:09. It consists of three staves of music in 5/4 time, with a key signature of two flats (Bb, Eb). The first staff, labeled "solo violin only", contains measures 1 through 10. The second staff, labeled "piano and strings", contains measures 11 through 20. The third staff, labeled "piano and violin", contains measures 21 through 30. The notation includes various rhythmic patterns, including eighth and sixteenth notes, and rests. There are orange markings on the first and second staves, highlighting specific musical phrases. The time markers 6:40, 7:01, and "Americana" are placed above the corresponding measures.

Example 47. Transcription of Akinmusire, "Americana," 9:24–9:29

9:24
strings only

A musical score for strings in 3/4 time, key of B-flat major. The score consists of two staves. The upper staff (treble clef) features a melodic line with eighth and sixteenth notes, including a red slur over a sequence of notes. The lower staff (bass clef) provides a harmonic accompaniment with eighth notes and a long, sustained note in the final measure.

Example 48. Partial transcription of Akinmusire, "Americana," 8:25–8:50

8:25
strings:

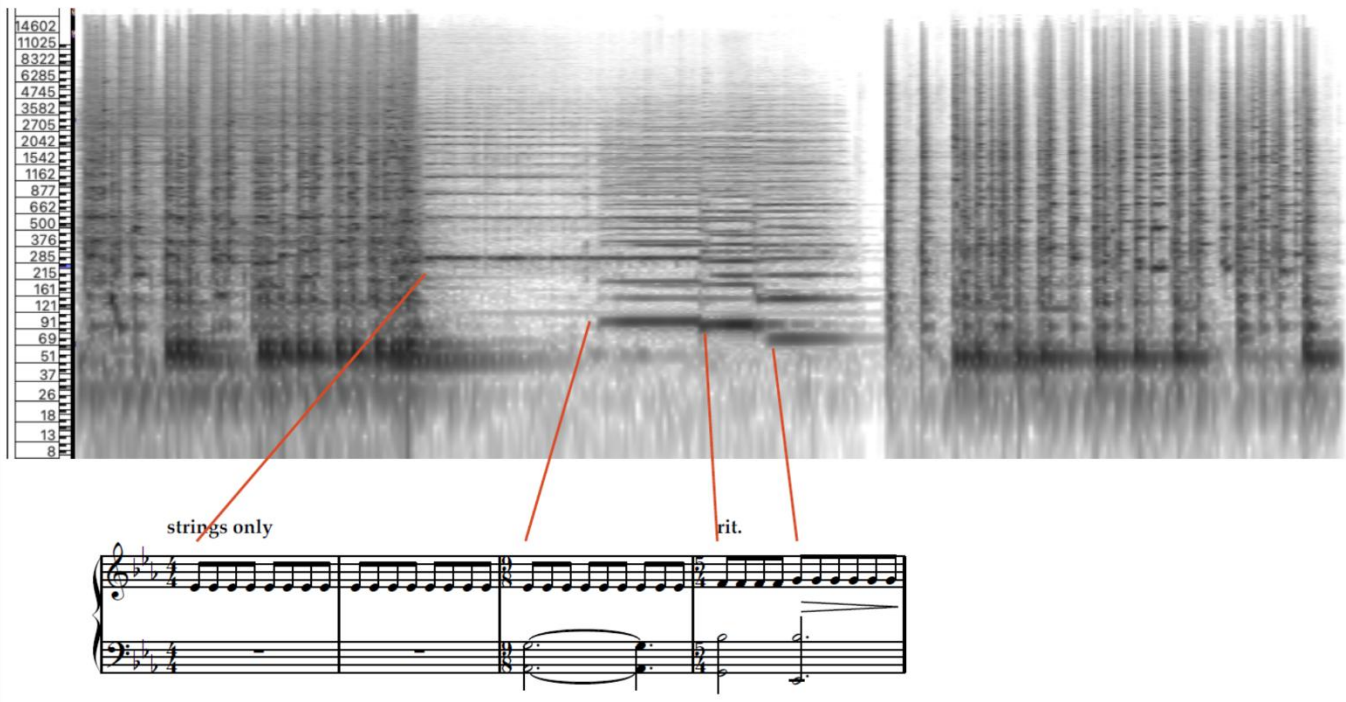
A musical score for strings in 4/4 time, key of B-flat major. The score is on a single staff with a treble clef, showing a melodic line with eighth and sixteenth notes.

trumpet(!):

A musical score for trumpet in 4/4 time, key of B-flat major. The score is on a single staff with a treble clef, featuring a melodic line with eighth and sixteenth notes, including a red slur over a sequence of notes.

A musical score for strings in 4/4 time, key of B-flat major. The score is on a single staff with a treble clef, showing a melodic line with eighth and sixteenth notes.

Example 49. Spectrogram and partial transcription of Akinmusire, “the lingering velocity of the dead’s ambitions,” 8:50–9:20



Example 50. Prominent unisons in Wubbels, *the children of fire come looking for fire*, with boxes showing links between them and colors highlighting shared pitches or pitch-classes. Click directly on a passage to play corresponding audio.

p. 24, II-11:28

Vln. *mf*

Vcl. *mf*

II. $\text{♩} = 30-40$, "tuning rubato"

(a)

p. 1, I-0:00

Violin (amplified) $\text{♩} = 132$

Piano (amplified) $\text{♩} \approx 48$

pizz. *sfz*

arco s.p., metallic, filtered, complex;

(b)

p. 4, I-3:27

Vln. $\text{♩} = 266$ Glitching

Pno. $\text{♩} = 266$

p

(ii)

p. 13, I-9:15

Vln. $\text{♩} = 50$

Pno. $\text{♩} = 112$

pizz. *l.v.* *p*

pochiss. gliss. *rhythm of beating* *pp*

(c)

Example 51. Wubbels' instructions on production of beating

Beating Glyphs



– just tuning: completely pure and rich, no beats



– “resonant”/chorus tuning: slow, rolling beats (~3-6 Hz / beats per second)



– beating tuning: dissonant + rough, with fast beats (8-12 bps)

④:③ – ⑫:⑤ – ⑦:③ Ratios in just intonation. The numbers show the intervallic relationship to a fundamental (either virtual or played) when tuned precisely. E.g., “4:3” signifies the fourth and third partials sounding together, an interval of a just-tuned perfect fourth.

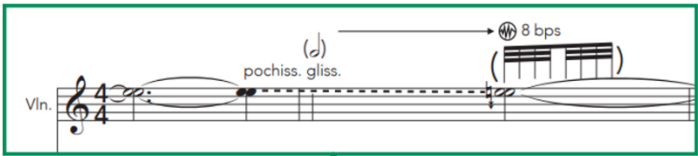
When tuned exactly, the fundamental is audible to the player, as a faint (or not so faint) psychoacoustic difference tone. Therefore all of these intervals can be tuned reliably by ear with a small amount of practice.

♭♭ / ♭♯ – lowered by a septimal comma (i.e. 31 cents). Used for 7th and 14th partials; tuned by ear.

•All microtonal accidentals that appear in the absence of tuning ratios are not tempered, but used to produce beating.

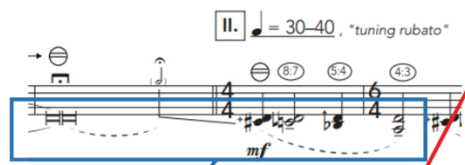
Example 52. Associations connecting Wubbels p. 14 (opening of second part) to other moments in the piece, with colors as in Example 50. Click directly on a passage to play corresponding audio.

p. 14, I-10:24



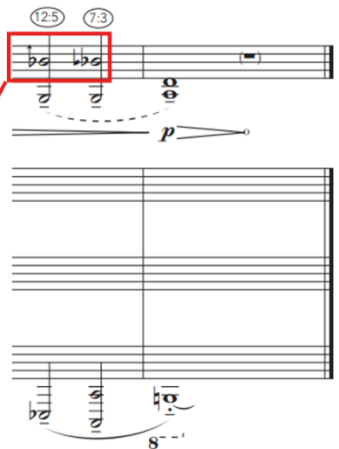
Vln. 4/4 pochiss. gliss. 8 bpm

p. 24, II-12:20



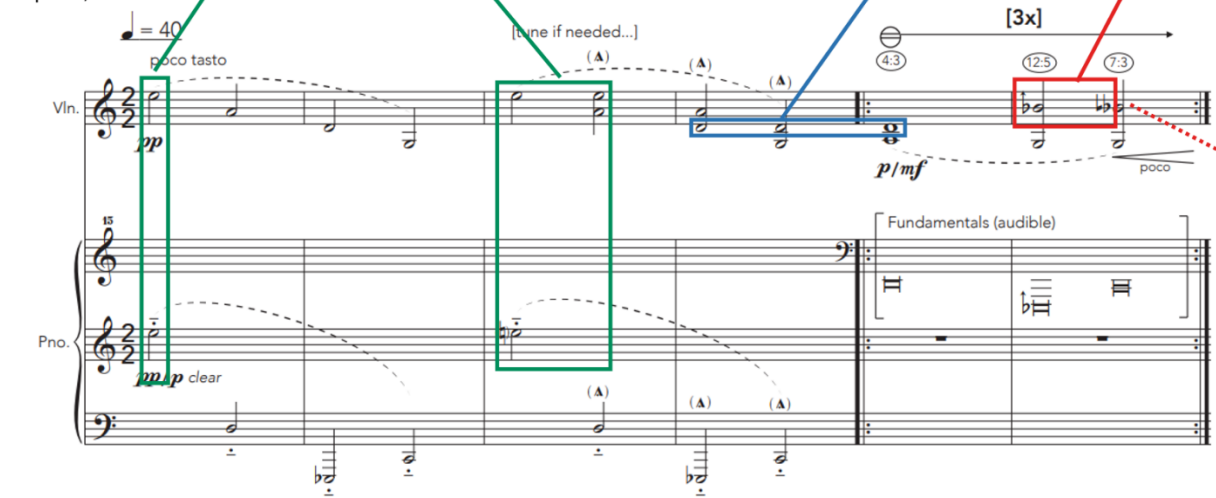
II. ♩ = 30-40, "tuning rubato" mf

p. 24, II-13:13



(12:5) (7:3) p

p. 14, II-0:00



Vln. 3/4 ♩ = 40 poco tasto pp

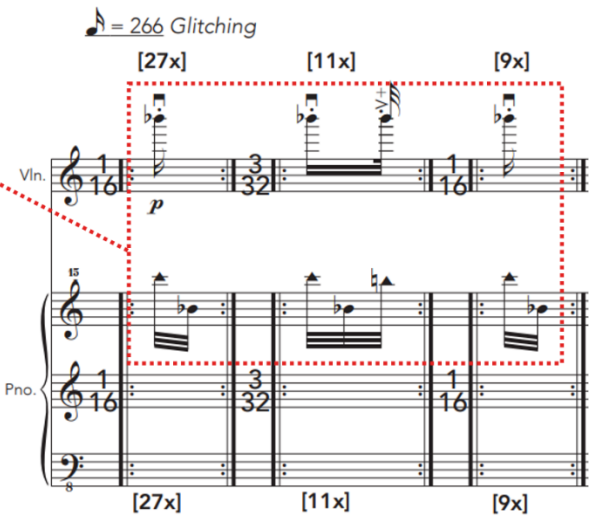
Pno. 2/2 mp clear

[tune if needed...]

[4:3] [12:5] [7:3] p/mf poco

Fundamentals (audible)

p. 4, I-3:27



Vln. 16/16 ♩ = 266 Glitching p

Pno. 16/16 [27x] [11x] [9x]

