

L'incarnation du temps, le cas de ST/4-1(080262) de Iannis Xenakis

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métaphore du corps

Le son comme corps temporel:
Êtres sonores et incarnation sonore

la vie des sonorités,
l'incarnation ou Êtres sonores
l'individuation dans le temps
processus d'individuation à transformation continue.

280

- spins
+ spins

« bâtir des Etres d'abord abstraits, puis des incarnations sonores ou lumineuses de ces Etres. » (MP, 27)

Êtres sonores

- Short sonorities:
 - legno batuto*,
 - pizz.*,
 - staccato/spicatto*
- Large sonorités:
 - lunga (ord.)*,
 - glissandi (ord.)*,
 - col legno gliss.*,
 - trémulo (sul pont.)*,
 - table*

All sonorities (short or large) are chained according to continuous variation of intensity form (See FM, p.143)

Handwritten musical notation examples illustrating various techniques and intensity variations:

- Top staff: *legno* (batuto), *arco*, *legno* (gliss.), with dynamic markings *p*, *ff*, *p*, *pp*, *ff*, *p*. A bracket labeled '5' spans the first five notes.
- Middle staff: *arco sul pont.* with dynamic markings *f*, *p*, *f*.
- Bottom-left staff: *Table*, *arco sul pont.*, *Pizz.* with dynamic markings *ff*, *f*, *ppp*, *ff*, *p*. A bracket labeled '3' spans the first three notes.
- Bottom-right staff: *Pizz.* with dynamic markings *ff*, *ppp*, *f*. Brackets labeled '6' and '6' span the first six and last six notes respectively.

Table of the 44 Intensity Forms Derived from 4 Mean Intensity Values, ppp, p, f, ff

ppp ————— ppp	f ————— p
ppp ————— p	p ————— #
ppp ————— p ————— ppp	p ————— # ————— p
p ————— ppp	# ————— p
ppp ————— f	ppp ————— # ————— f
ppp ————— f ————— ppp	# ————— ppp ————— f
f ————— ppp	f ————— ppp ————— #
ppp ————— #	f ————— # ————— ppp
ppp ————— # ————— ppp	f ————— p ————— #
# ————— ppp	f ————— # ————— p
ppp ————— f ————— p	p ————— # ————— f
f ————— ppp ————— p	# ————— p ————— f
p ————— ppp ————— f	f ————— ppp ————— f
ppp ————— # ————— p	f ————— p ————— f
# ————— ppp ————— p	f ————— # ————— f
p ————— ppp ————— #	f ————— # ————— f
p ————— # ————— ppp	# ————— # ————— #
p ————— p ————— p	# ————— ppp ————— #
p ————— f ————— p	# ————— p ————— #
p ————— p ————— f	# ————— f ————— #
p ————— f ————— p	# ————— f ————— #

Implication of objects and configurations (êtres sonores) for elasticity in time emergency

Individuation
Damped-ramped
Pre-audibility

The Illusions of Time
Philosophical and Psychological
Essays on Timing and Time Perception
Edited by Valtteri Arstila · Adrian Bardon
Sean Enda Power · Argiro Vatakis

Distortions of Subjective Time Perception Within and Across Senses
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Background: The ability to estimate the passage of time is of fundamental importance for perceptual and cognitive processes. One experience of time is the perception of duration, which is not isomorphic to physical duration and can be distorted by a number of factors. Yet, the critical features generating these perceptual shifts in subjective duration are not understood. *Methodology/Findings:* We used prospective duration judgments within and across sensory modalities to examine the effect of stimulus predictability and feature change on the perception of duration. First, we found robust distortions of perceived duration in auditory, visual and auditory-visual presentations despite the predictability of the feature changes in the stimuli. For example, a looming disc embedded in a series of steady discs led to time dilation, whereas a steady disc embedded in a series of looming discs led to time compression. Second, we addressed whether visual (auditory) inputs could alter the perception of duration of auditory (visual) inputs. When participants were presented with incongruent audio-visual stimuli, the perceived duration of auditory events could be shortened or lengthened by the presence of conflicting visual information; however, the perceived duration of visual events was seldom distorted by the presence of auditory information and was never perceived shorter than their actual durations. *Conclusions/Significance:* These results support the existence of multisensory interactions in the perception of duration and, importantly, suggest that vision can modify auditory temporal perception in a pure timing task. Insofar as distortions in subjective duration can neither be accounted for by the unpredictability of an auditory, visual or auditory-visual event, we propose that it is the intrinsic features of the stimulus that critically affect subjective time distortions.
Citation: van Wassenhove V, Buonomano DV, Shimizu S, Shao L (2020) Distortions of Subjective Time Perception Within and Across Senses. *PLoS ONE* 15(1): e021437. doi:10.1371/journal.pone.0214377

Why are damped sounds perceived as shorter than ramped sounds?
Massimo Grassi¹ · Giovanna Mioni¹
Published online: 3 June 2020
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Abstract
Hearing is the most accurate sense for perceiving duration. However, examples when it compares the subjective duration of tones that are increasing in intensity over time (i.e., ramped), and tones that are decreasing in intensity over time (i.e., damped). The latter tones are perceived as shorter than the former. The short duration of the damped tones is not due to the fact that they are less informative than the ramped tones. The short duration of the damped tones is interpreted as the result of the fact that the damped tones have a frequency that increases over time, and listeners are more likely to interpret the duration of the tones as being longer when they are constantly damped. This result is highly significant, demonstrating that the perception of duration is not only affected by the frequency of the tones, but also by the way the frequency changes over time.

POLYPHONIE
REVUE MUSICALE TRIMESTRIELLE
LE RYTHME MUSICAL

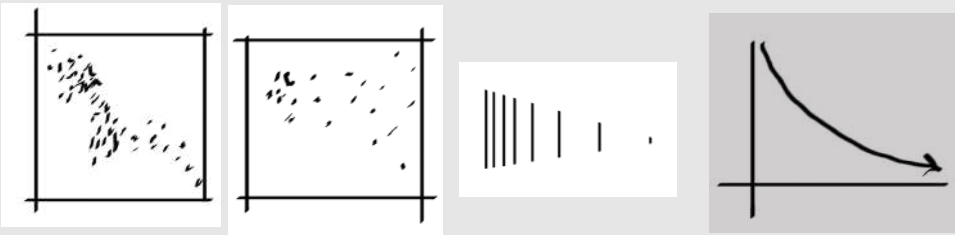
GÉRARD GRISEY
ÉCRITS
OU L'INVENTION DE LA MUSIQUE SPECIALE
MF
Catalina reproducciones
Edition établie par Guy Lelong
avec la collaboration d'Anne-Marie Réby

Ramped distributions



Ramped objects seem to be **faster** than damped objects.

Damped distributions



Ramped objects seem to be **longer** than damped objects.

Anisotropic

The sensation of sound duration is related to sound sequence configurations (distribution of onsets and frequencies in a sound field).

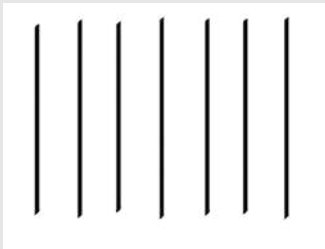
Listening paradoxe
longer but faster , shorter but slower



Anisotropic Configurations in *ST/4-1*

isotropic:

Stable rhythm, durations,
texture, timbre, amplitude

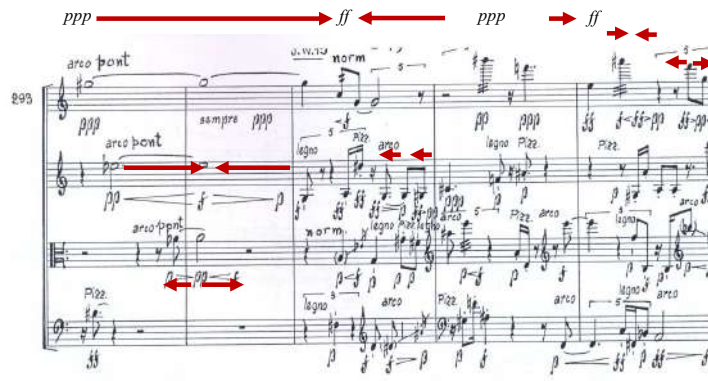


Time sensation related to
Configuration preaudibility: dragging time

ST/4
Local anisotropies inside
isotropic configuration



ST/4
Local anisotropies inside
Anisotropic configuration



ST(ochastic) Series *ST/X-n, dmmaa*
written in Fortran language
calculated by IBM7090, between january-october 1962

(Cf. Gibson, 2022; *The Use of Stochastic Distributions in the Instrumental Works of Iannis Xenakis: Between Chance and Intuition.*

Xenakis. "Musique Stochastique libre, à l'ordinateur" In: *Musiques Formelles*)

ST/48-1,240162 (1956-1962)

ST/10-1,080262 (1956-1962)

ST/4-1,080262 (1956-1962)

Amorsima-Morsima (1956-1962)

Morsima-Amorsima - ST4/2, 030762 (1956-1962)

Atrees - ST/10-3,060962 (1956-1962)

Stratégies (1962)

Eonta (1964)

Séquence d'élaboration de *Achorripsis*, reprise à la programmation informatique pour la série ST/X

- a. La pièce est composée d'une succession de séquences indépendantes...
- b. Une densité moyenne est définie pour chaque séquence...
- c. Un orchestre est défini pour chaque séquence comprenant des classes d'instruments et des modes de jeu
- d. Définition d'un instrument spécifique dans chaque classe, en fonction des possibilités techniques.
- e. Définition de la hauteur en fonction de l'instrument et facteur de mémoire...
- f. Définition d'une vitesse et d'une portée pour les Êtres sonores en *glissando*.
- g. Définition des valeurs de durée des notes avec la restriction selon laquelle plus un instrument est présent, plus sa durée moyenne sera courte.

ST/4-1,080262

For string quartet

extended autonomization of the string quartet part of ST/10-1

JN=d

4+4
8 d = 40 ← 60 ← 80 MM

ST // 10-1, 080262
Dediee à Konstantin S. Mouraviev et à
son ensemble de chambre contemporaine de Paris

I. Xenakis

ST // 10-1, 080262

Dediee à Konstantin S. Mouraviev et à
son ensemble de chambre contemporaine de Paris

I. Xenakis

JN=d

$\frac{4+4}{8}$ $\delta = 40 \leftrightarrow 60 \leftrightarrow 80$ MM

1 - 5:4 2 3 4 5 6

Clab

Bfcl

Cor I

Cor II

Harpe

Cong

Tom

Wood-01

V1

V2

AB

V/C

$\text{♩} = 60 \text{ MM}$ en moyenne

IANNIS XENAKIS
(1922-)

J.W. 1

1^{er} Violon
2^d Violon
Alto
Vielle

wood. Bl
V1
V2
ARB
V/C

ST/10-1,080262
cps. 1-3



ST/4-1,080262
cps. 1-3

inserted and subtracted
elements in the string quartet
part between ST/10-1 and
ST/4-1

Musical score for ST/4-1, measures 14-19. The score is written for a grand staff (treble and bass clefs) and includes a piano part. It features complex rhythmic patterns with many sixteenth and thirty-second notes, and various articulations like slurs and accents.

ST/4-1

Keeping the almost similar
attack density

ST/10-1

And

ST/4-1

Musical score for ST/10-1, measures 14-19. This score is more complex, featuring multiple staves including grand staves and piano parts. It contains a variety of musical notations such as slurs, accents, and dynamic markings, illustrating a different approach to maintaining attack density compared to ST/4-1.

ST/10-1

ST/4-1,080262

For string quartet

Object and configuration entanglements

Êtres sonores: objects

All sonorities (short or large) are chained according to continuous variation of intensity form (See FM, p.143)

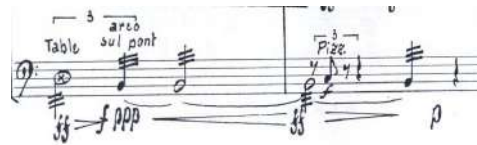


Table of the 44 Intensity Forms Derived from 4 Mean Intensity Values, ppp, p, f, ff

ppp ————— ppp	f ————— p
ppp ————— p	p ————— #
ppp — p — ppp	p — # — p
p ————— ppp	# ————— p
ppp ————— f	ppp — # — f
ppp — f — ppp	# — ppp — f
f ————— ppp	f — ppp — #
ppp ————— #	f — # — ppp
ppp — # — ppp	f — p — #
# ————— ppp	f — # — p
ppp — f — p	p — # — f
f — ppp — p	# — p — f
p — f — ppp	f ————— f
p — ppp — f	f — ppp — f
ppp — # — p	f — p — f
# — ppp — p	f — # — f
p — ppp — #	f ————— #
p — # — ppp	# ————— f
p — p — p	# — ppp — #
p — p — f	# — p — #
p — f — p	# — f — #

- Short sonorities: *legno batuto*, *pizz.*, *staccato/spiccato*
- Large sonorities: *lunga* (ord.), *glissandi* (ord.), *col legno gliss.*, *trémulo* (sul pont.), *table*

Êtres sonores: configurations

W. 2

A musical score for W. 2, consisting of three staves. The bottom staff contains a melodic line with various dynamics and articulations. A red arrow points from the beginning of the piece to the right, indicating a progression or a specific configuration.

A musical score with two staves. The top staff is marked with *legato* and *f*. The bottom staff is marked with *sempre ppp*. A red arrow points from the beginning of the piece to the right, indicating a progression or a specific configuration.

A musical score with three staves. The top staff is marked with *legato*. The bottom staff is marked with *sempre mp*. A red arrow points from the beginning of the piece to the right, indicating a progression or a specific configuration.

In Xenakis calculus short or large sonorities have the same status and, instead of being necessarily chained, it can be supersimposed according to sonorities individual duration (example from JW=11).

J.W. 11

The image shows a handwritten musical score for five staves, titled "J.W. 11". The notation is complex, featuring various dynamics such as *ff*, *p*, *ppb*, *pp*, and *mf*. Articulations include *arco*, *Pizz.*, and *sul pont.*. Rhythmic markings include a "5" with a bracket over the first staff, and "3" and "4" with brackets over other staves. The score is written in a style characteristic of Iannis Xenakis, with overlapping notes and dynamic markings that change rapidly. The staves are connected by vertical lines, and there are various slurs and accents throughout the piece.

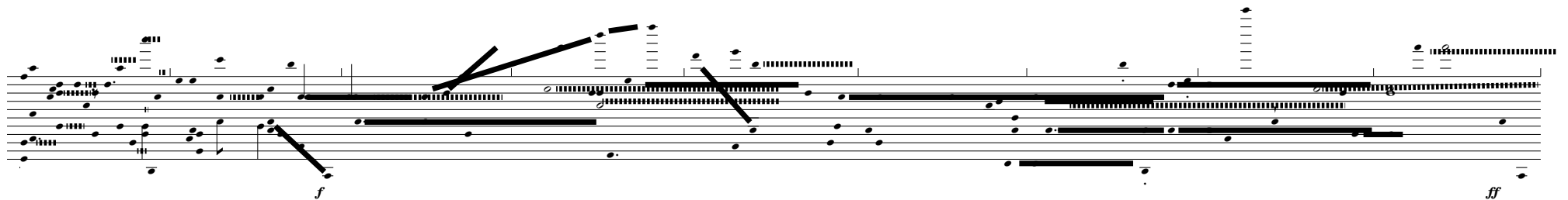
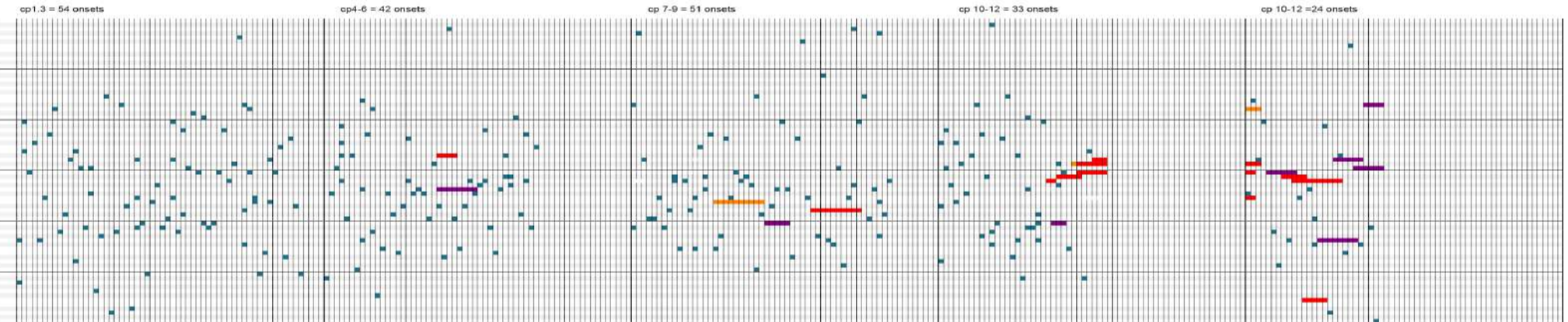
In Xenakis calculus short or large sonorities have the same status and, instead of being necessarily chained, it can be supersimposed according to sonorities individual duration (example from JW=11).

J.W. 11

The image shows a handwritten musical score for J.W. 11. The score is written on a grand staff with multiple staves. The notation includes various musical symbols such as notes, rests, and dynamic markings like *ff*, *ppp*, *f*, *p*, and *ppm*. Performance instructions such as *arco*, *legno*, *Pizz.*, and *sul pont.* are also present. Overlaid on the score are 24 numbered red bars, each representing a sonority. The bars are numbered 1 through 24, with some numbers followed by 'e' (e.g., 1e, 2e, 3, 4, 5e, 6, 7e, 8e, 9, 10, 10, 11, 12, 12e, 13, 14, 15e, 16, 17, 18, 19e, 20e, 21, 22, 23, 24). The bars vary in length and are positioned across different staves, illustrating how they are supersimposed based on their individual durations.

Decreasing of onsets at first JW1 24 bars and JW2->3 9 bars
Transition between points and large lines (*glissandi* and long *tremolos*).

legenda: cada grupo corresponde a 3 compassos de ST4/1
em azul escuro as notas puntuais, em laranja glissandos, em vermelho notas longas
em roxo trêmulos longos.



$\text{♩} = 60\text{MM}$ en moyenne

table
pizz.
legno
ord.
pont. trem.

• - 1st violin
x - 2nd violin
o - alto
* - cello

table
pizz.
legno
legno trem.
ord.
pont. trem.

• - 1st violin
x - 2nd violin
o - alto
* - cello

The quartet begins and ends with very dense, fast alternating actions, which can be difficult to co-ordinate both internally and between each player. Arditti.

JW=1 JW=3

$f \rightarrow ff$

$pp \rightarrow ff$

$p \rightarrow f$

♩ = 60MM en moyenne

IANNIS XENAKIS

1. JW.1

JW=1. ms.1-3

JW=15 ms.293-300

JW=16 ms 365_368

JW.16

Pizz. = apres la pizz. la corde doit battre sur l'angle qui fait leure

JW=15 ms 293-300

A musical score for JW=15 ms 293-300, consisting of two systems of music. The first system is divided into two measures, with a red rectangular box highlighting the right-hand measure. The notation includes vocal lines with lyrics such as "aria pont", "aria", "surre", "amo", and "piza". The second system continues the musical notation with various dynamics and articulations. The score is written in a standard musical notation style with treble and bass clefs.

JW=15

Musical score excerpt starting at measure 310, showing complex rhythmic patterns with various dynamics and articulation marks.

Musical score excerpt starting at measure 330. Includes French performance instructions:
 Châtements ordinaires batt. aller à 10 battements aller à 10 battements les maintenir (battements entre fort et sol ; le fort le corde se rapprochant ou s'alignant du sol.)

Musical score excerpt starting at measure 299. Features the marking 'arco pont' and 'norm'.

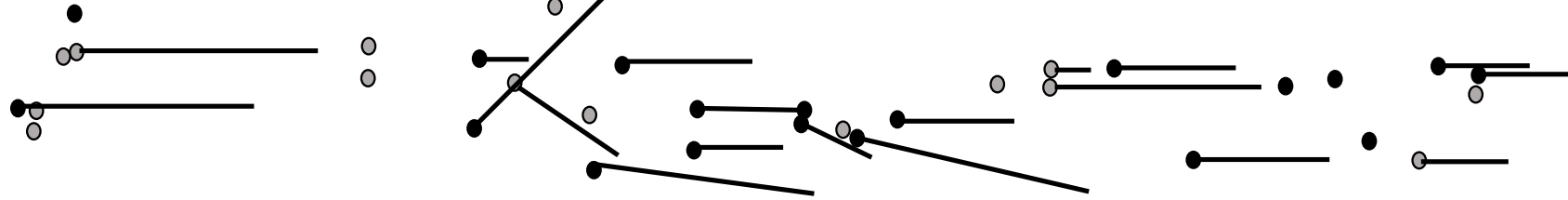
Musical score excerpt starting at measure 501. Includes markings for 'table', 'arco', and 'pizz'.

Musical score excerpt starting at measure 365. Includes the instruction 'Pizz D = apres le pizz la corde doit battre sur l'ongle qui s'effleure'.

JW=16

Handwritten musical score for J.W. 16, measures 365-372. The score is written for a string instrument and includes various performance instructions such as Pizz., arco, legno, sul pont., and table. It also features dynamic markings like p, mf, and pp. A handwritten note at the bottom explains the 'Pizz.D' marking: 'Pizz.D = apres le pizz. la corde doit battre sur l'ongle qui l'effleure'.

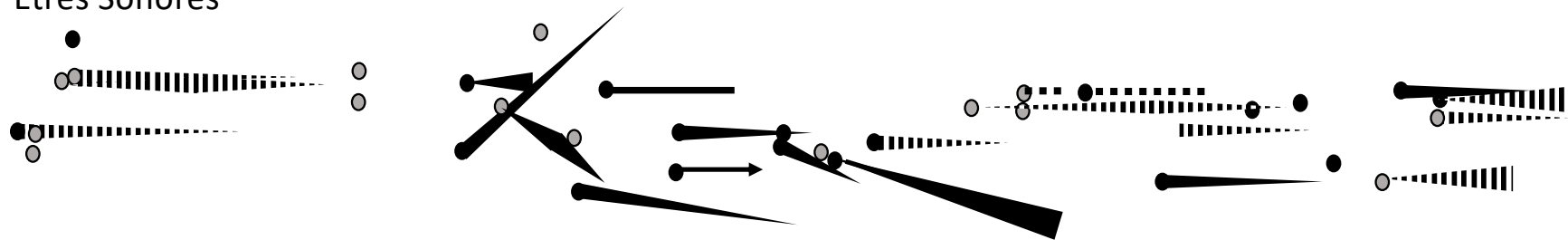
Points and vectors



from abstracts points and vectors
to
concrete êtres sonores



Êtres Sonores



*Visions of the piece being calculated, not composed ran through my head.
However, the work seemed very much composed to me and I later found out
that Xenakis used stochastic methods to provide him with possibilities before
making his compositional decisions.*

Irvine Arditti

ST/4-1,080262

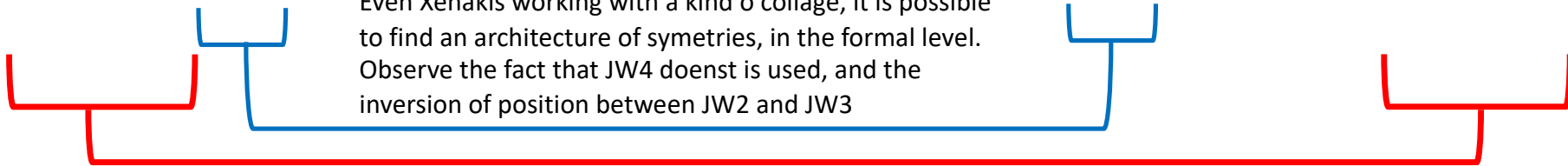
For string quartet

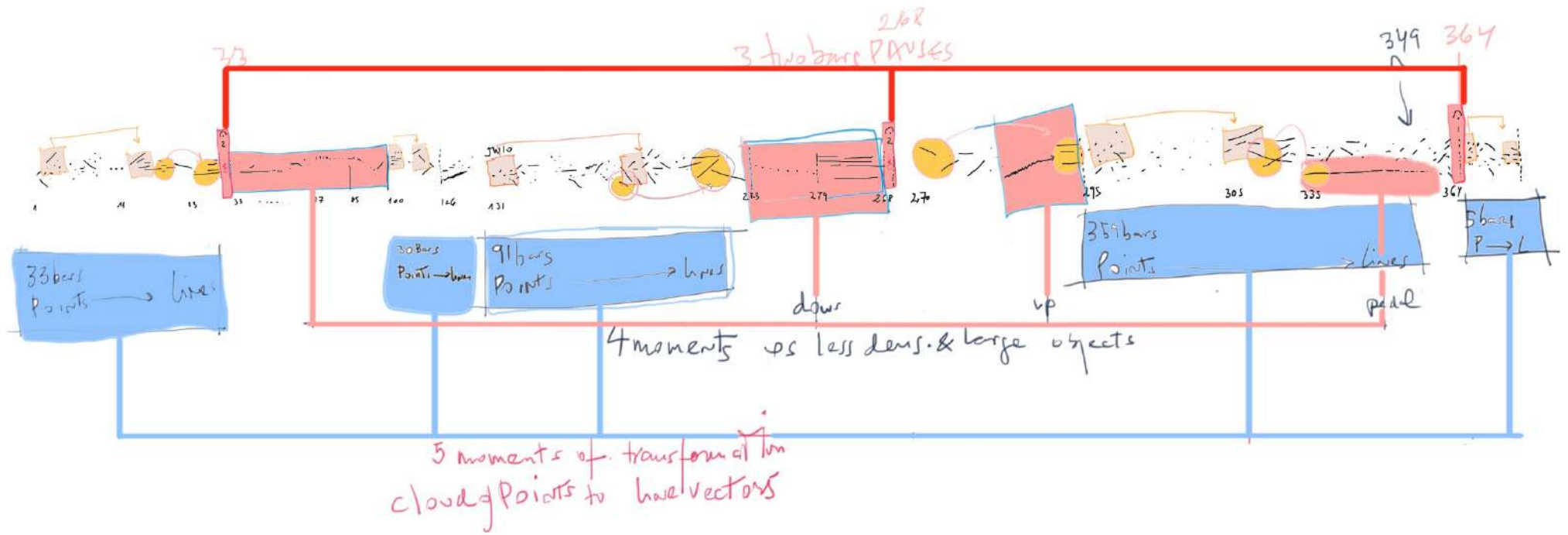
Considerations on formal srtructure

Table of JW moments, number of bars per moment, stabilitie, iso/anisotropic, classes of *êtres sonores*

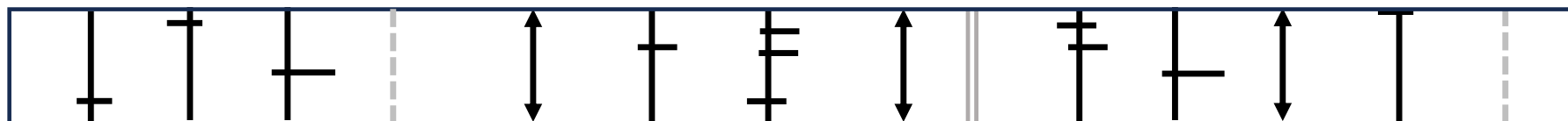
JW1	JW3	JW2	JW5	JW6	JW7	JW8	JW9	JW10	JW11	JW12	JW13	JW14	JW15	JW16
10	9	56	15	6	25	5	3	59	33	55	6	10	69	4
iso	aniso	iso	aniso	iso	aniso	aniso	aniso	iso	iso	aniso	aniso	aniso	aniso	iso
stable	transition	stable	transition	stable	transition	transition	transition	stable	double transition	stable moved descent	transition	Stable Mov. ascend	transition	stable
Points + gliss + trem.	Ord. > Trem.	Large	Repeated point > Trem.	Justaposition 2 moments Repeat And gliss	Repeated > trem.	Gliss>trem.	Repeated > large	Polif	Pollif > gliss trem. > gliss ord.	large	Pont +gliss > Trem.	Gliss.trem. +points > Trem. > Large	Points > Gliss > Jété	Points Gliss Jété Trem.
		silences								silences				

Even Xenakis working with a kind o collage, it is possible to find an architecture of symetries, in the formal level. Observe the fact that JW4 doenst is used, and the inversion of position between JW2 and JW3





Passages between JW moments (interlaced, continuous, cut-off, silence)



JW=1 | JW=3

This block shows the musical score for the first passage. It includes piano (pp), mezzo-forte (f), and fortissimo (ff) dynamics. A diagonal line indicates a transition from a lower dynamic to a higher one.

JW=2 | JW=5

This block shows the musical score for the second passage. It includes fortissimo (ff), piano (p), and fortissimo (ff) dynamics. A horizontal line indicates a sustained dynamic level.

JW=8 | JW=9

This block shows the musical score for the third passage. It includes mezzo-forte (f), piano (p), mezzo-forte (f), and fortissimo (ff) dynamics. A diagonal line indicates a transition from a lower dynamic to a higher one.

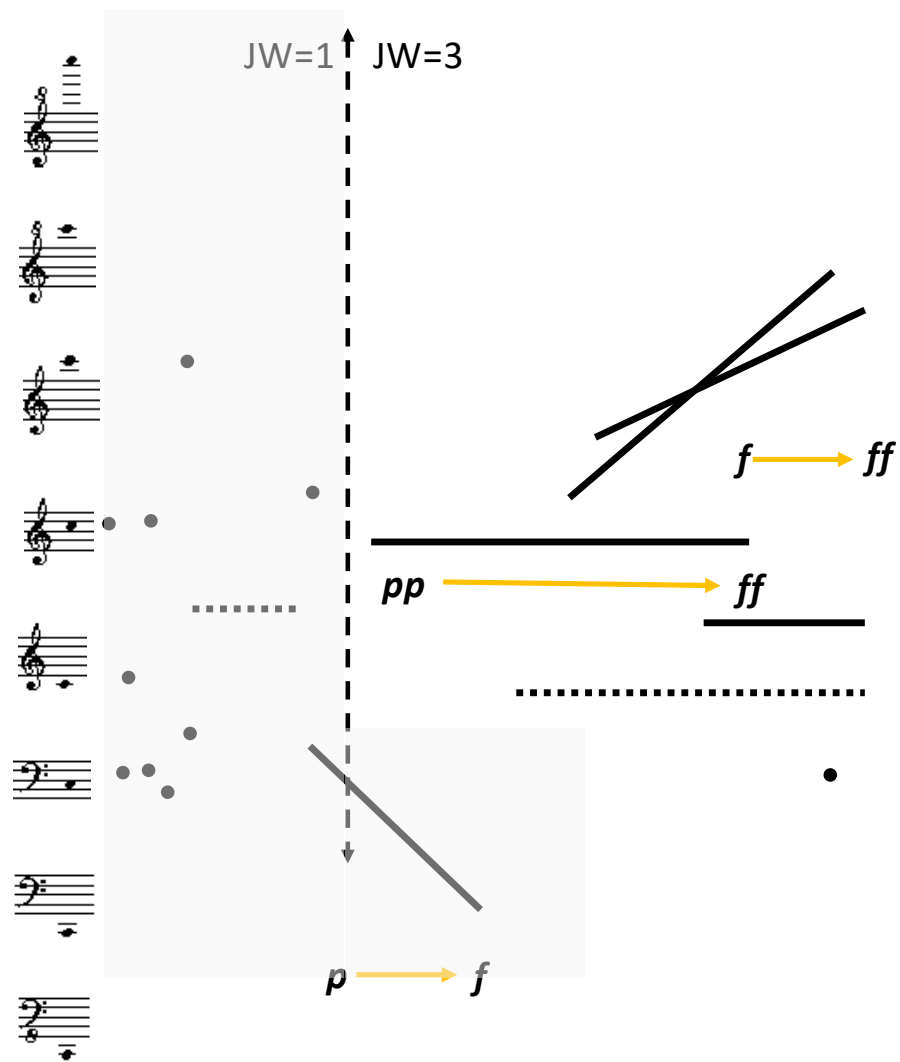
JW=10 | JW=11

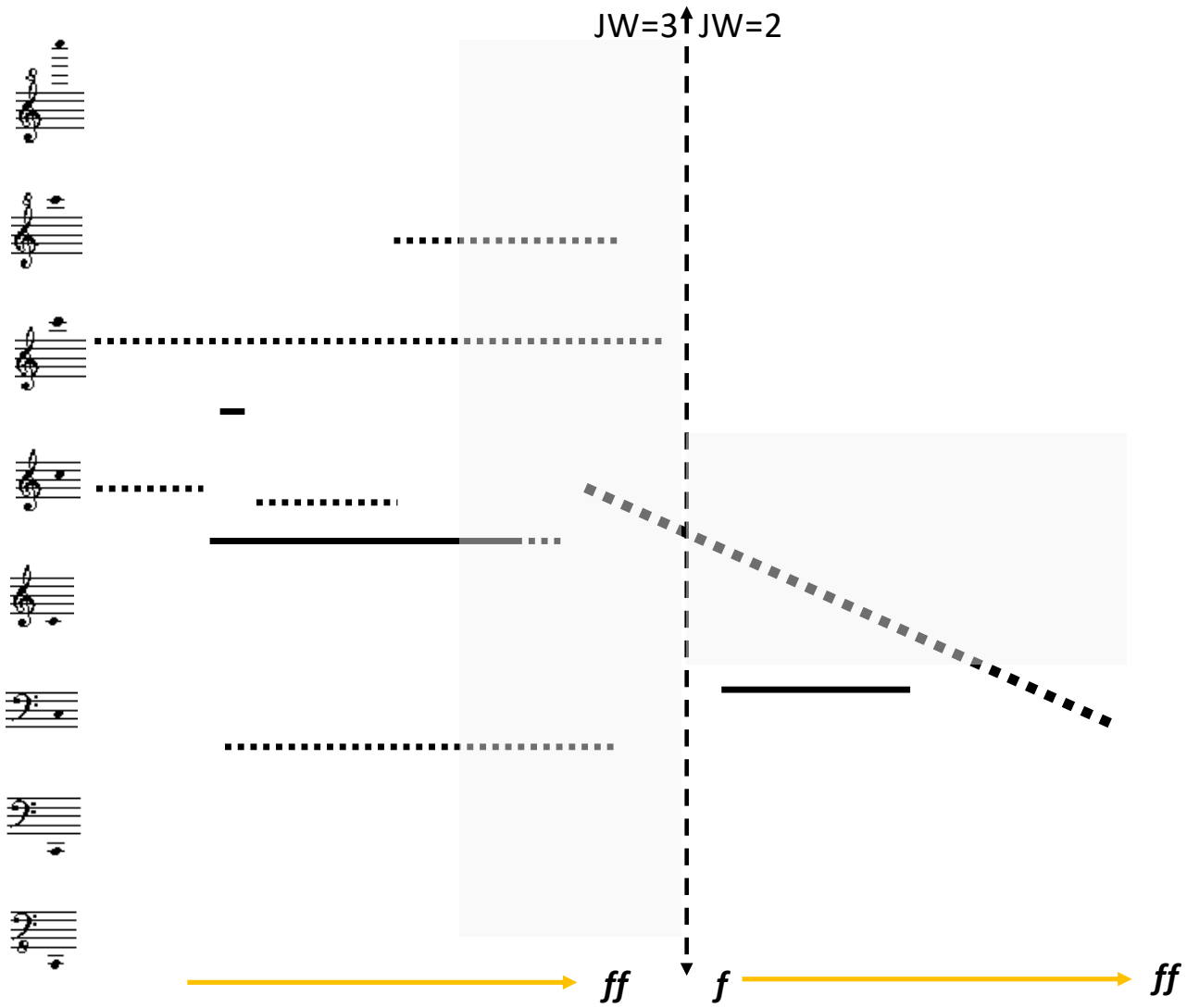
This block shows the musical score for the fourth passage. It includes pianissimo (pp), fortissimo (ff), and piano (p) dynamics. A diagonal line indicates a transition from a higher dynamic to a lower one.

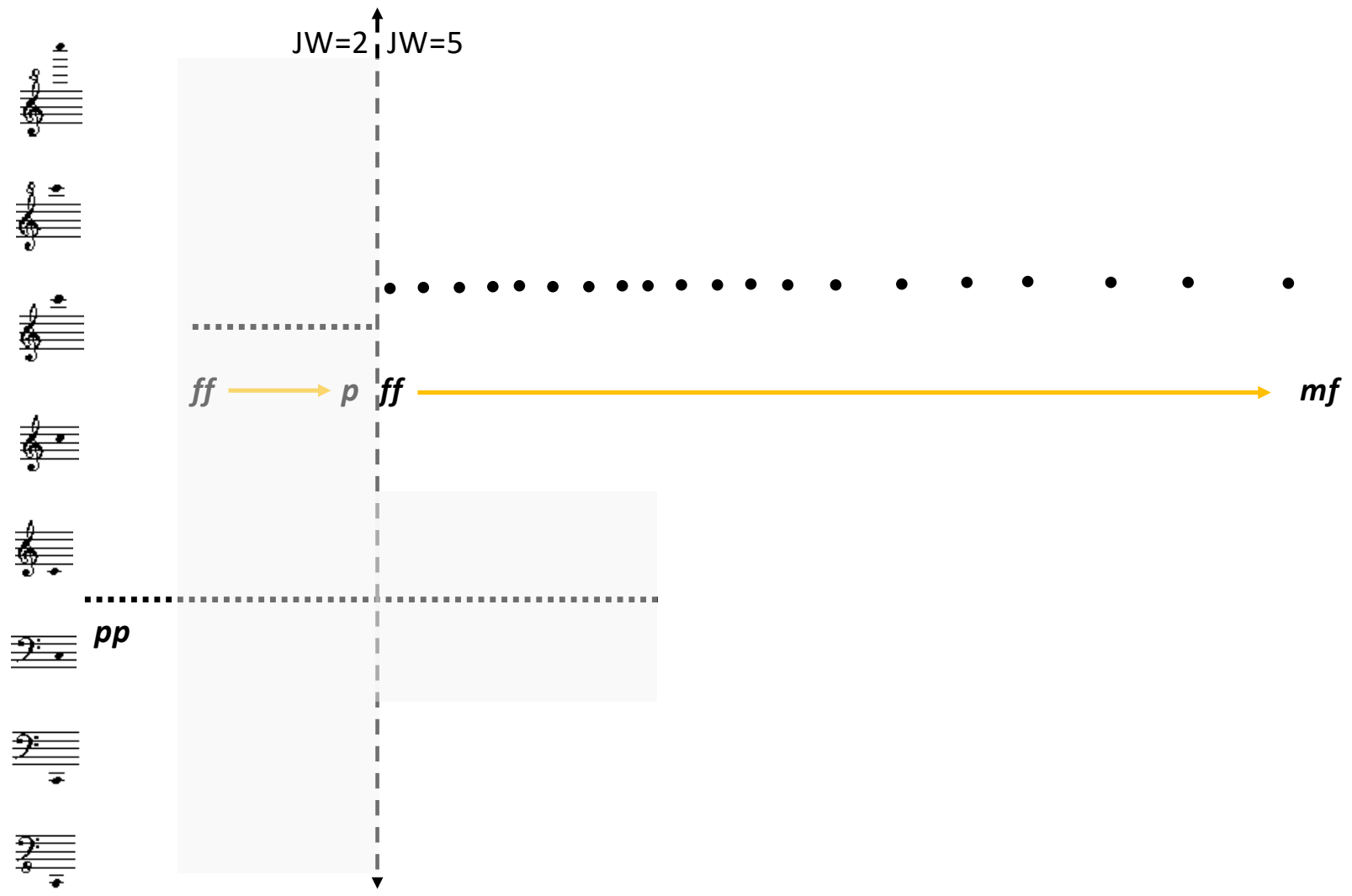
JW=14 | JW=15

This block shows the musical score for the fifth passage. It includes pianissimo (pp), mezzo-forte (f), and mezzo-forte (f) dynamics. A diagonal line indicates a transition from a lower dynamic to a higher one.

MOMENT	TRANSITION	OBSERVATION
JW=1→ JW=3	Straight cut	JW1 have a directional plot with slow evolution texture, which is slowly transformed by insertions of objects of longer duration. It arrives to a configuration
JW=3→ JW=2	Targeted transition	Fixed note trembling is converted into glissando
JW=2→ JW=5	Overlapping and directed transition	Flickering, trembling pedal that becomes an eighth note.
JW=8→ JW=9	Interlacing / overlapping	Both moments have directional configuration even in different sense and can be listened having a crescendo-decrescendo profile. Note that two instruments cross from JW=8 to JW=9, while the others anticipate JW=9 into JW=8.
JW=9→ JW=10	Overlapping	Use of pedal note.
JW=10→ JW=11	Cutting with a pause	Use of dynamics to distinguish pp ff frames
JW=11→ JW=12	Overlapping by anticipation and directed transition	Long note texture with the presence of sparse points, glissando leading to bass in JW11 which flows into bass note and points that concentrate in descending pizz.
JW=12→ JW=13	Overlapping	Trembling pedal note with crescendo (viola) that crosses the two frames and interlacing of similar objects.
JW=14→ JW=15	Striking cut	Chord with long notes abruptly converted into scattered dots.
JW=15→ JW=16	Continuity by coincidence of objects	







JW=8 JW=9

musical score with dynamic markings: *f*, *p*, *pp*, *f*, *ff*, *p*, *ff*, *f*

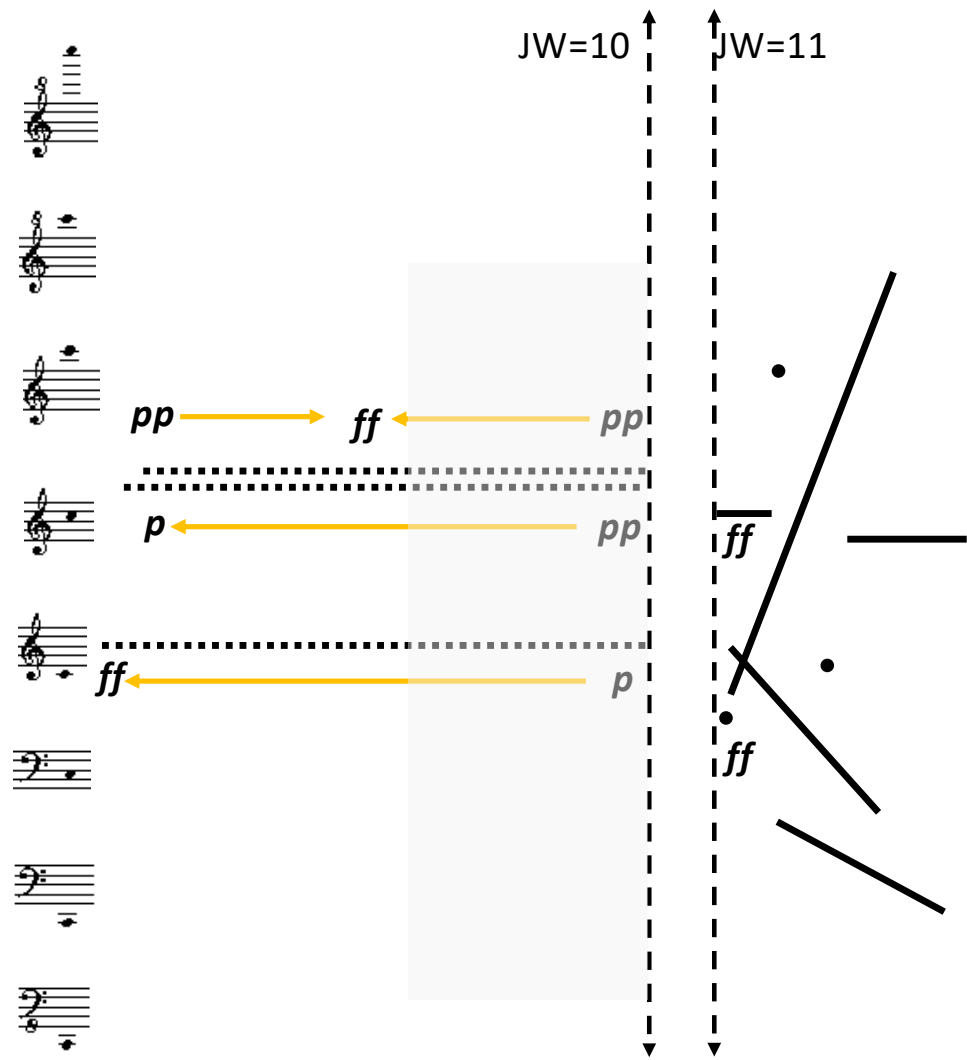
musical score with dynamic markings: *pp*, *f*, *pp*, *f*, *pp*, *f*

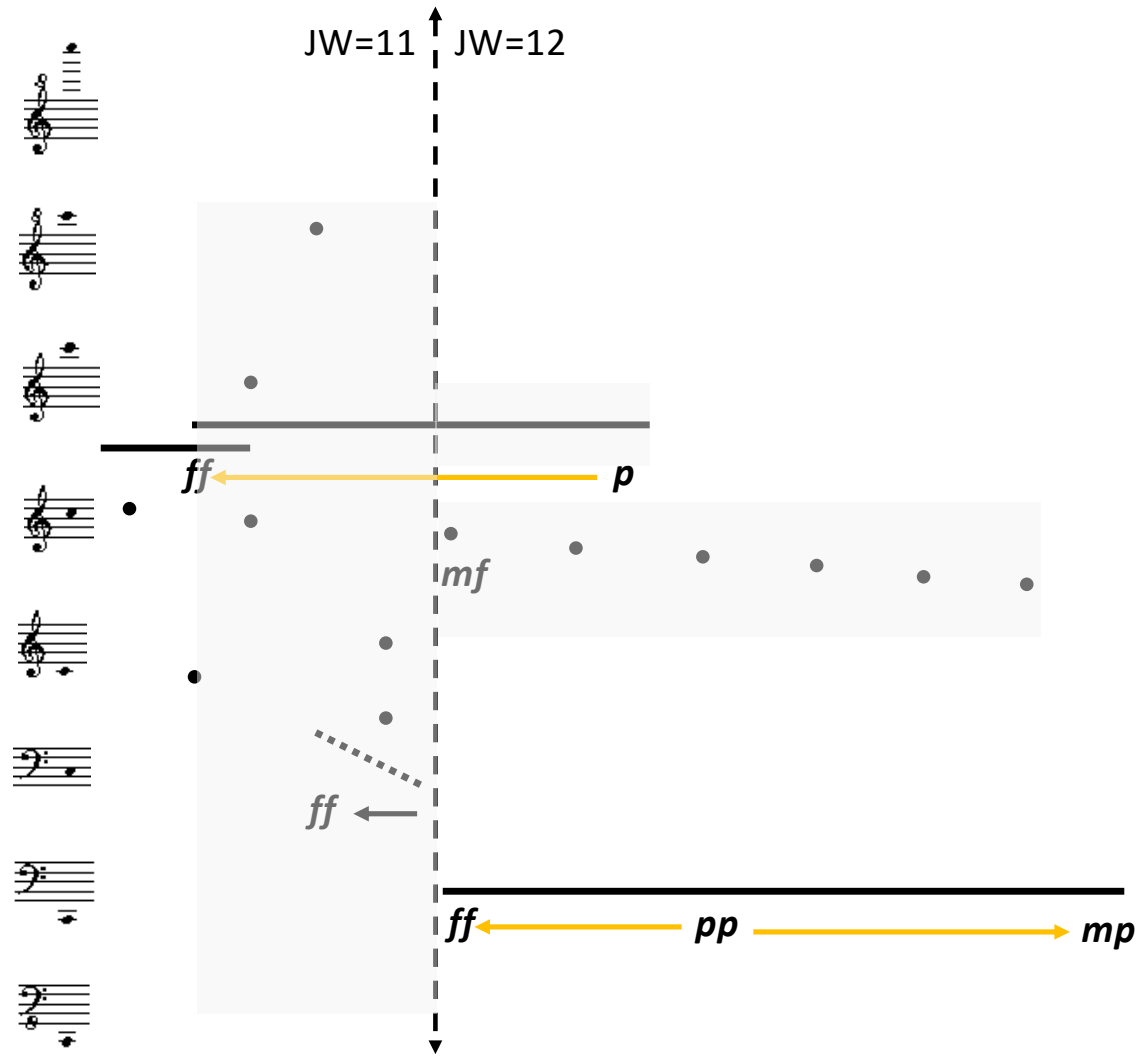
musical score with dynamic markings: *f*, *ff*, *p*, *ff*, *f*

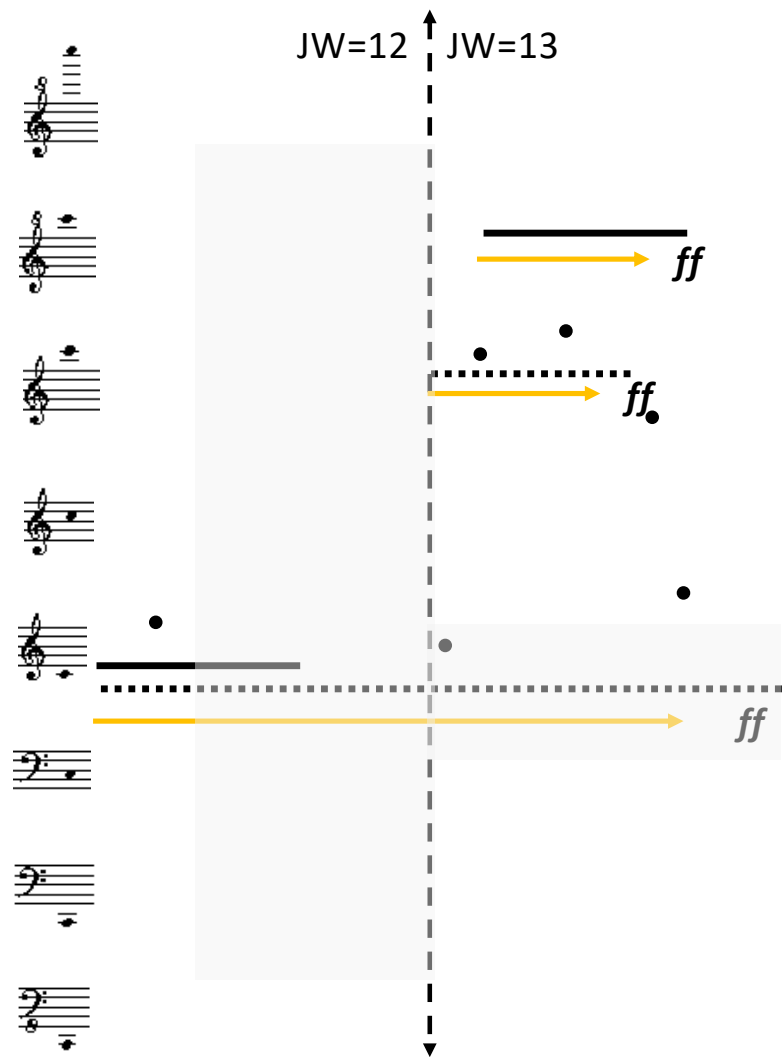
musical score with dynamic markings: *ff*, *p*

ff ← *p*

f → *ff* ← *p* → *ff* ← *f*

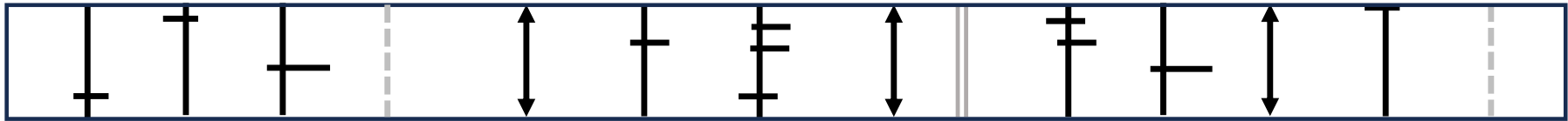
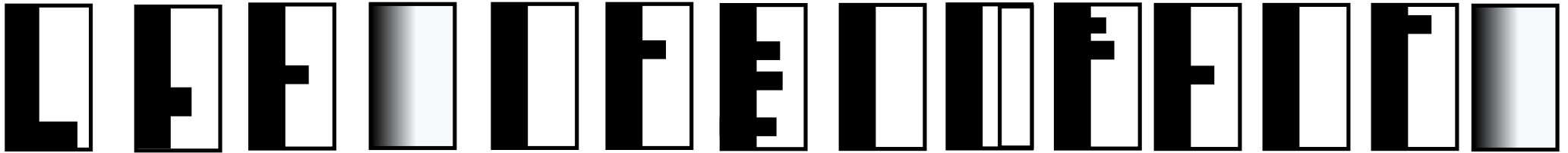






JW=14 JW=15

The image shows a musical score with eight staves. A vertical dashed line is positioned between JW=14 and JW=15. A large grey shaded area covers the staves from JW=14 to JW=15. In the fourth staff, there are two horizontal lines: the upper one is labeled *pp* and the lower one is labeled *f*. A yellow arrow points from the *p* dynamic marking to the *f* marking. In the fifth staff, there is a horizontal line labeled *f*. In the sixth staff, there are three dots with an upward-pointing arrow, and a dynamic marking *f* is placed above them. In the seventh staff, there is a horizontal line labeled *f*.



Passages between JW moments (interlaced, continuous, cut-off, silence)