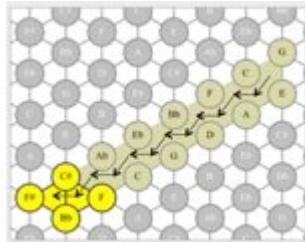


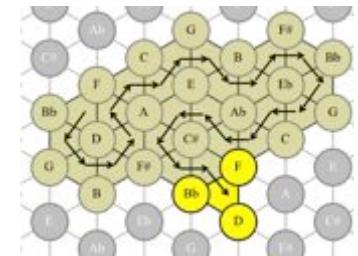
Musique et géométrie : de J.-S. Bach à Paolo Conte en passant par les Beatles et les chansons hamiltoniennes

N/O/D/E

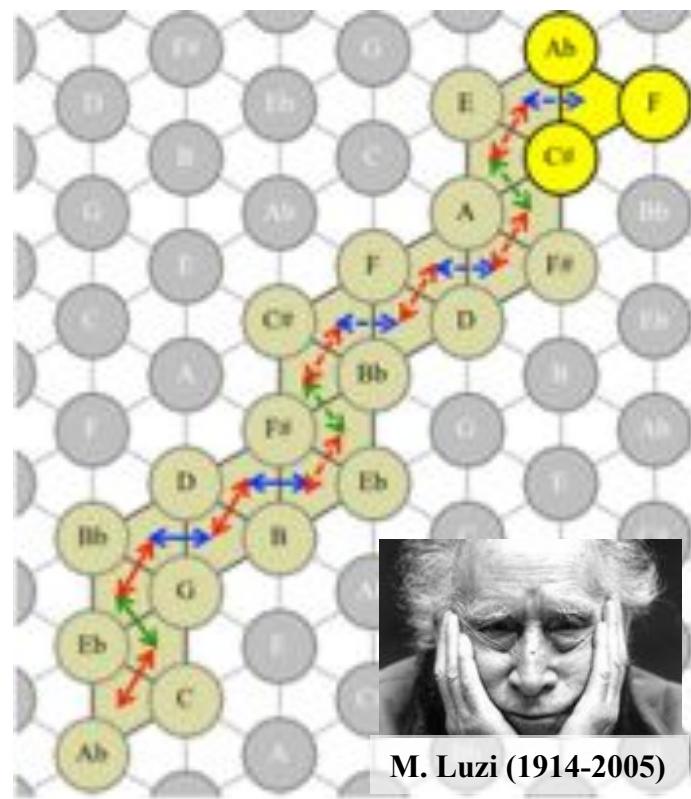
Lausanne - 30 janvier 2016



Moreno Andreatta
Equipe Représentations Musicales
IRCAM / CNRS UMR 9912 / UPMC
Moreno.Andreatta@ircam.fr



La sera non è più la tua canzone : chanson hamiltonienne ‘redondante’



M. Luzi (1914-2005)

**La sera non è più la tua canzone,
è questa roccia d'ombra traforata
dai lumi e dalle voci senza fine,
la quiete d'una cosa già pensata.**

**Ah questa luce viva e chiara viene
solo da te, sei tu così vicina
al vero d'una cosa conosciuta,
per nome hai una parola ch'è passata
nell'intimo del cuore e s'è perduta.**

**Caduto è più che un segno della vita,
riposi, dal viaggio sei tornata
dentro di te, sei scesa in questa pura
sostanza così tua, così romita
nel silenzio dell'essere, (compiuta).**

**L'aria tace ed il tempo dietro a te
si leva come un'arida montagna
dove vaga il tuo spirito e si perde,
un vento raro scivola e ristagna.**

*Le soir n'est plus ta chanson,
c'est ce rochet d'ombre transpercé
par les lumières et les voix sans fin,
la paix d'une chose déjà pensée.*

*Ah, cette lumière vive et claire vient
uniquement de toi, tu es si proche
du vrai d'une chose connue,
tu as pour nom une parole qui est passée
dans l'intimité du cœur où elle s'est
perdue .*

*Tombé est plus qu'un signe de la vie,
tu te reposes, du voyage tu es revenue
à l'intérieur de toi même, tu es
descendue dans cette
pure substance qui est si tienne,
si éloignée
dans le silence de l'être, achevée.*

*L'air se tait et le temps derrière toi
se lève tel une montagne aride
où plane ton esprit et se perd,
un vent rare glisse et stagne.*

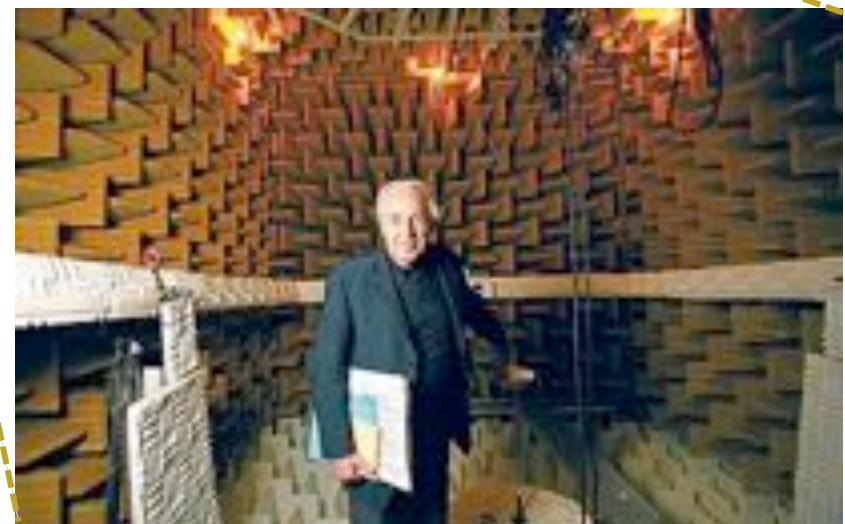
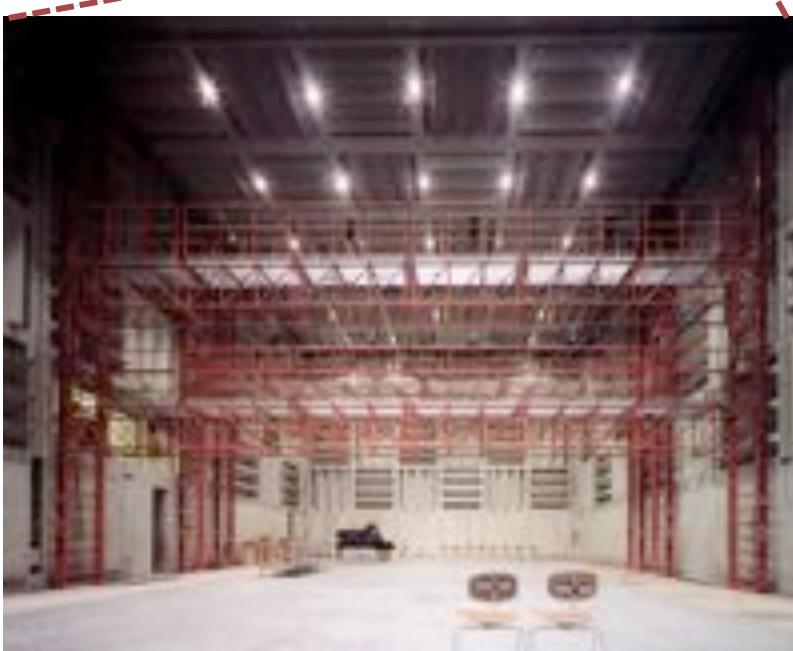
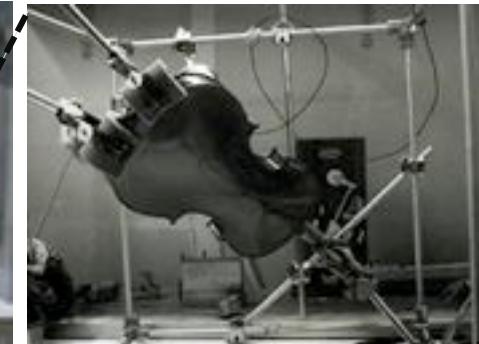
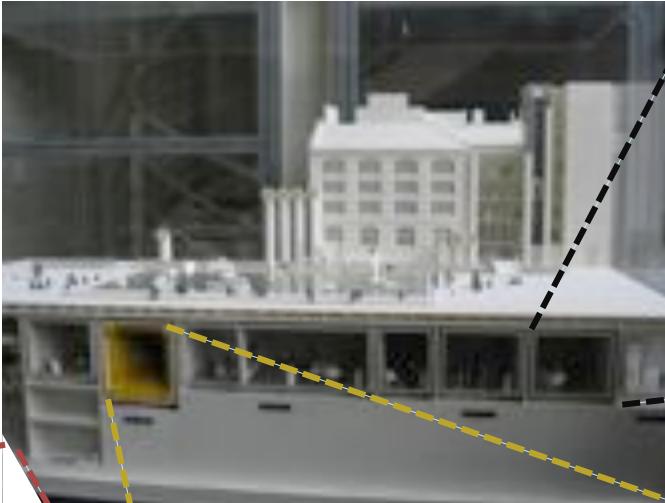
(tr. Antonia Soulez, philosophe et poète)

Musique : M. Andreatta
Arrangements et mixage : M. Bergomi & S. Geravini
(*Perfect Music Production*)
Mastering : A. Cutolo (Massive Arts Studio, Milan)



RTS Radio Télévision Suisse
Vertigo
Pierre Philippe Cadet

La recherche musicale et scientifique à l'IRCAM...



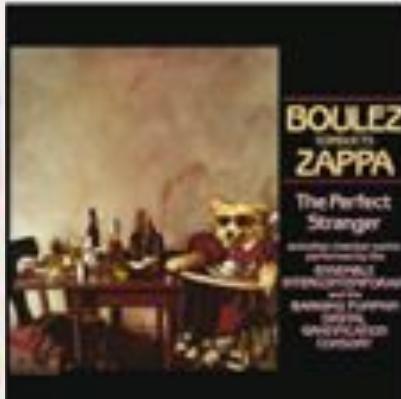
... entre musique savante et *popular music*



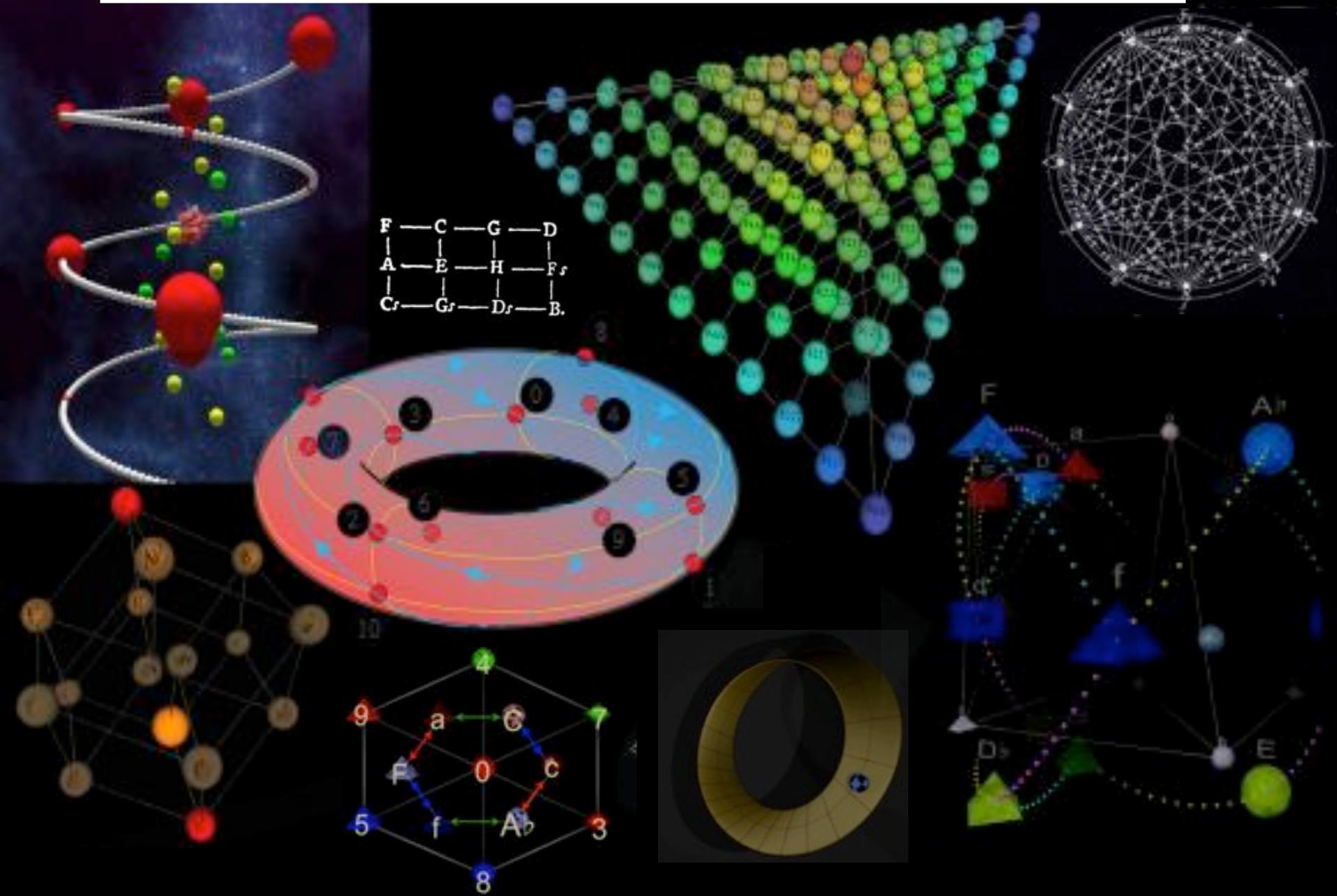
MusiqueLab 2



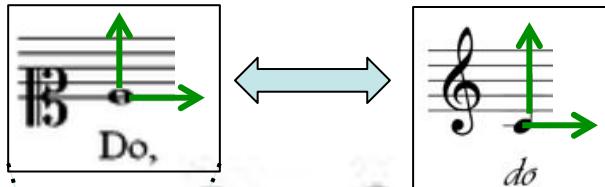
OMAX (logiciel d'improvisation)



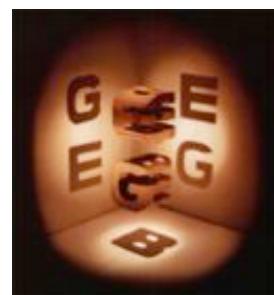
La galaxie des modèles géométriques au service de la musique



Canons énigmatiques chez Bach et géométrie



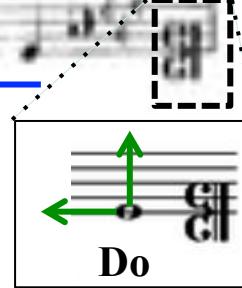
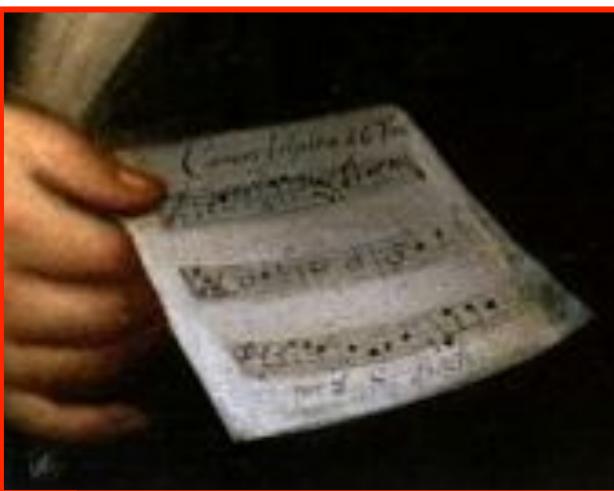
Canones diversi
super thema regium



Canon à 2

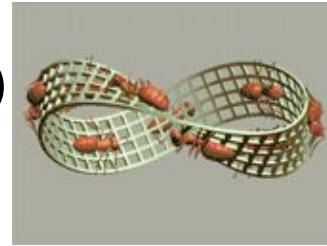
1.

B E





Ma fin est mon début (mais renversé !)



Canones diversi

super thema regium

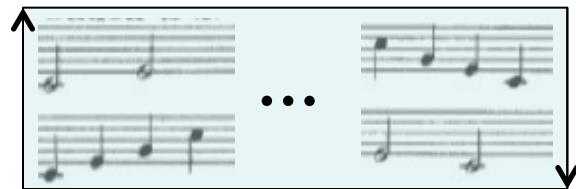
1.

Canon n° 2

E

E

Canones diversi
super thema regium



4.

Canon n° 2

E

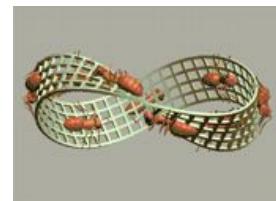
E

E



<http://www.josleys.com/Canon/Canon.html>

[min. 1'14"]



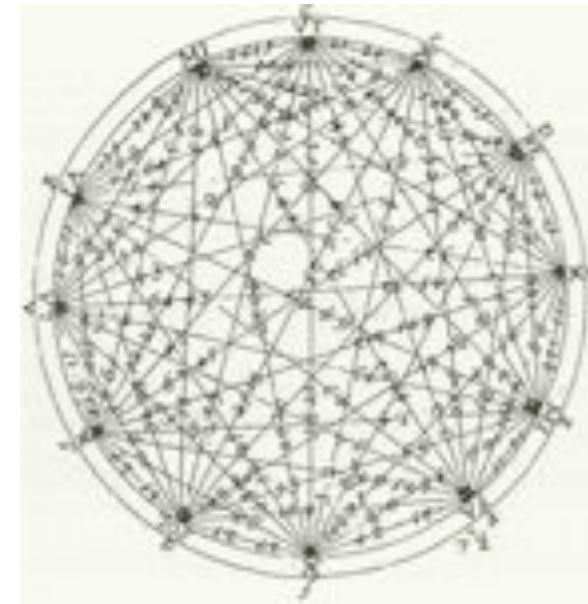
Mersenne et la naissance de la combinatoire musicale

II.4. Marin Mersenne, *Harmonicorum Libri XII*, 1648

LIBER SEPTIMVS. DE CANTIBVS, SEV CANTILENIS, EARVMQ; NVMERO, PARTIBVS, ET SPECIEBVS.

Tabula Combinatoria ab I ad XXI.

I	1
II	2
III	6
IV	24
V	120
VI	720
VII	5040
VIII	40320
IX	362880
X	3628800
XI	39916800
XII	479001600
XIII	6117010800
XIV	8777819200
XV	1107674368000
XVI	10922789833000
XVII	311687418296000
XVIII	6401173705718000
XIX	11164100408181000
XX	1433904008176640000
XXI	31090941171709440000
XXII.	384000737777607680000



abcd
abdc
acbd
acdb
adbc
adcb

...

Varietas, seu Combinatio quartorum notarum.

1 2 3 4 5
6 7 8 9 10 11 12
13 14 15 16 17 18
19 20 21 22 23 24

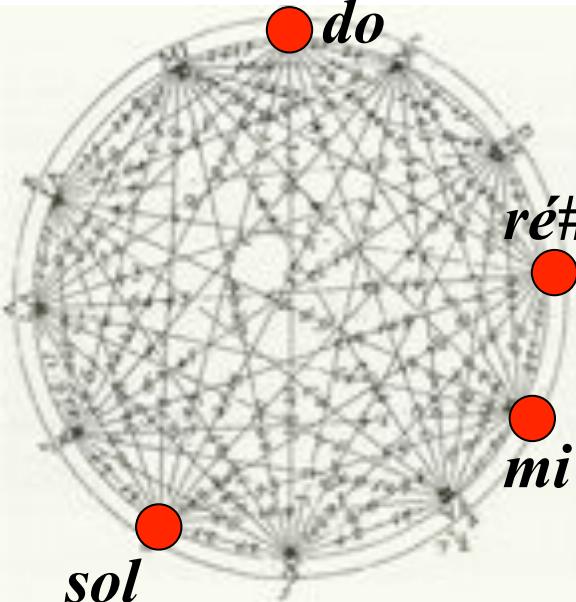
Mersenne et la naissance de la combinatoire musicale

II.4. Marin Mersenne, *Harmonicorum Libri XII*, 1648

LIBER SEPTIMVS. DE CANTIBVS, SEV CANTILENIS, EARVMQ; NVMERO, PARTIBVS, ET SPECIEBVS.

Tablea Combinationis ab I ad XXII.

I	1
II	2
III	6
IV	24
V	120
VI	720
VII	5040
VIII	40320
IX	362880
X	3628800
XI	39916800
XII	479001600
XIII	6117010800
XIV	877819200
XV	1107674368000
XVI	10922789888000
XVII	311687418296000
XVIII	6401173705718000
XIX	11164100408181000
XX	1433904008176640000
XXI	31090941171709440000
XXII.	384000737777607680000



Six Bagatelles
(G. Ligeti, 1953)

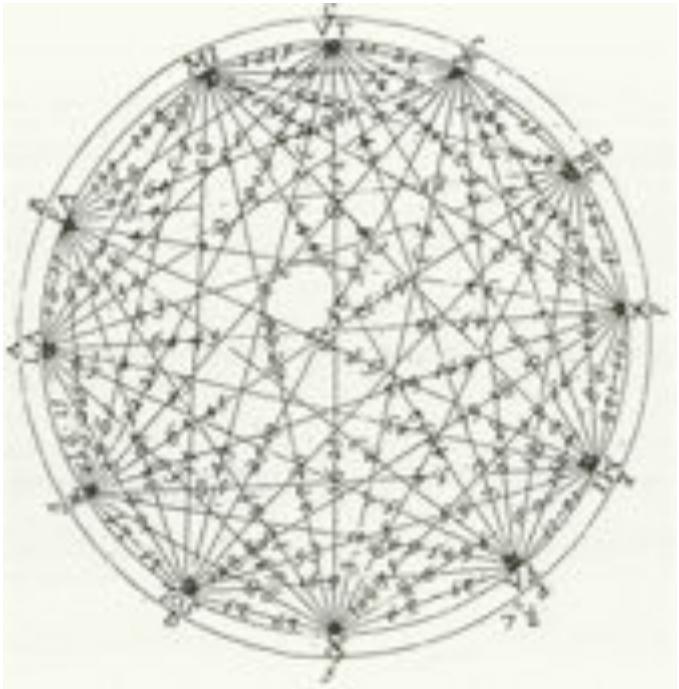


Varietas, seu Combinatio quatuor notarum.

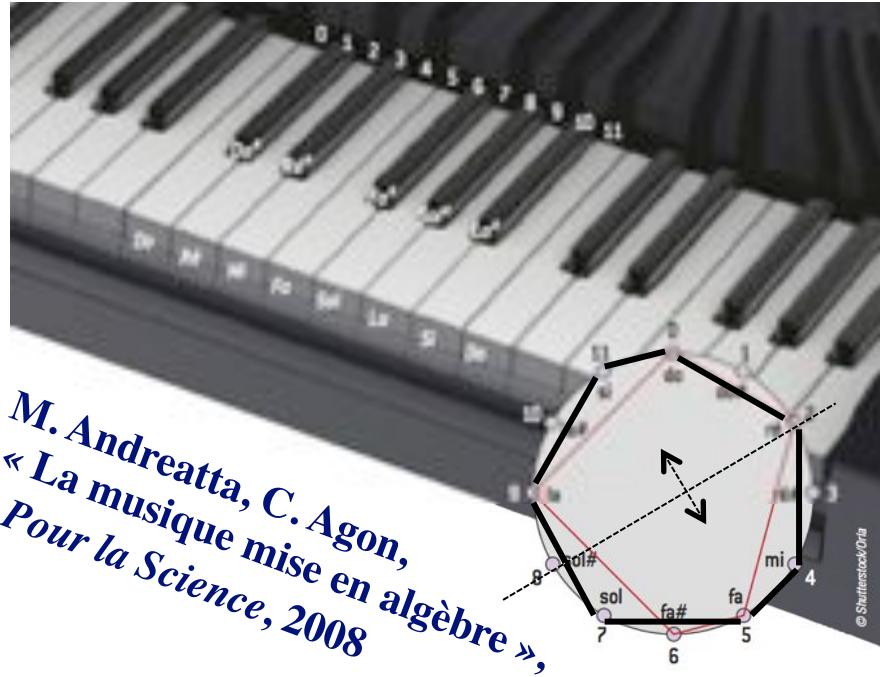
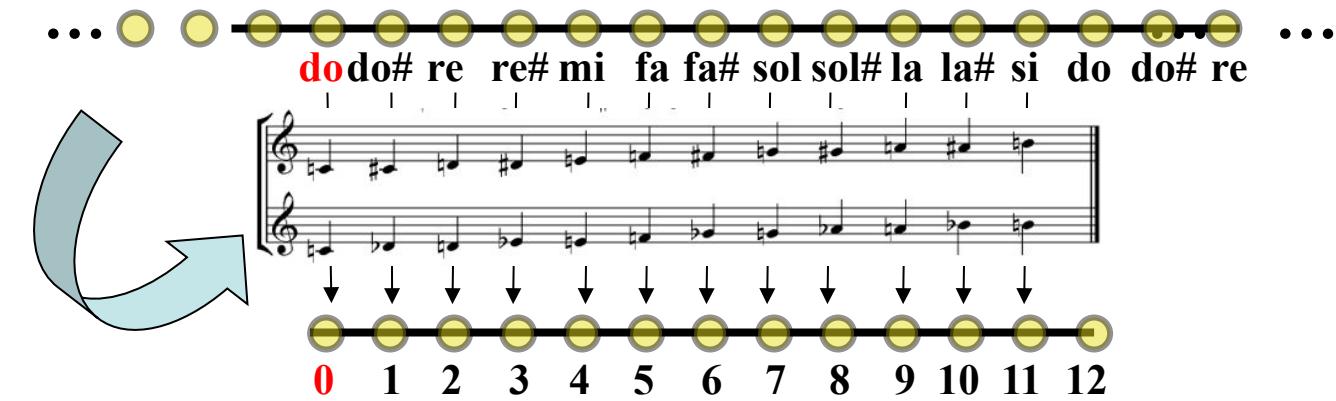
La représentation circulaire et ses *mappings*



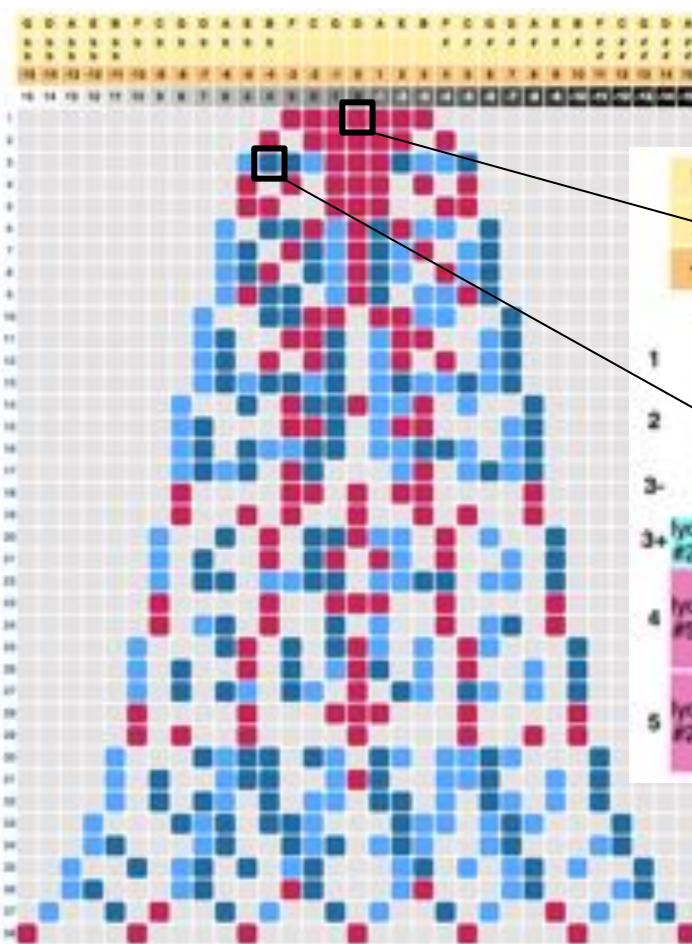
Marin Mersenne



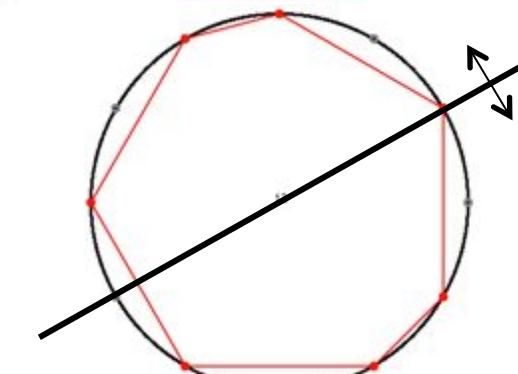
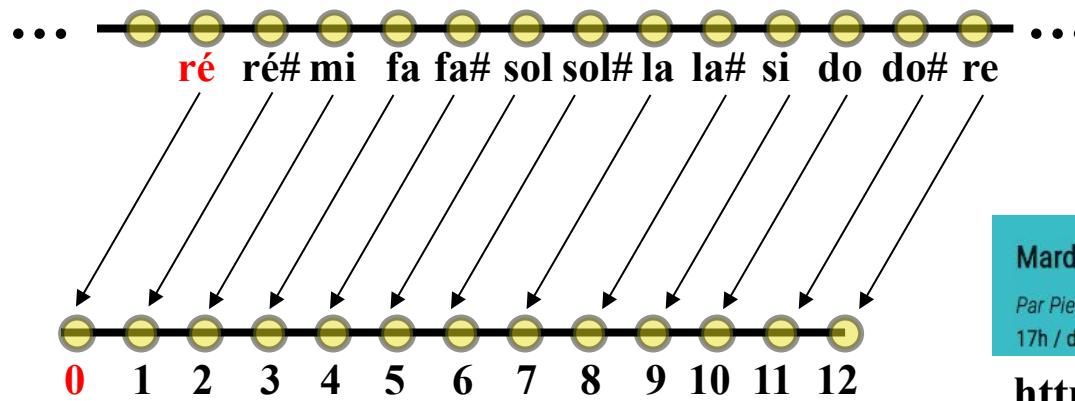
Harmonicorum Libri XII, 1648



Symétrie du ré et cloche diatonique



	E b	B b	F	C	G	D	A	E b	B	F #	C	
1	-5	-4	-3	-2	-1	0	1	2	3	4	5	
2	5	4	3	2	1	0	-1	-2	-3	-4	-5	
3		lydian	ionian	mixolydian	dorian	aeolian	phrygian	locrian				diatonic
4		lydian	#5		lydian b7	ionian b3	mixolydian b6 or aeolian 3	phrygian b6	locrian 2			minor melodic
5		lydian #2, #5		dorian #2	ionian	dorian #4	aeolian 7	phrygian 3	locrian 6			minor harmonic
6		lydian #5, #0			lydian b3	ionian b6	mixolydian b2	dorian b5				major harmonic
7					lydian b6, b7	ionian b2, b3 or phrygian 6, 7		locrian 2, 3				unitonic
8						aeolian #4, 7	ionian b2, b6 or phrygian 3, 7	mixolydian b2, b5				double harmonic
9												
10												
11												
12												



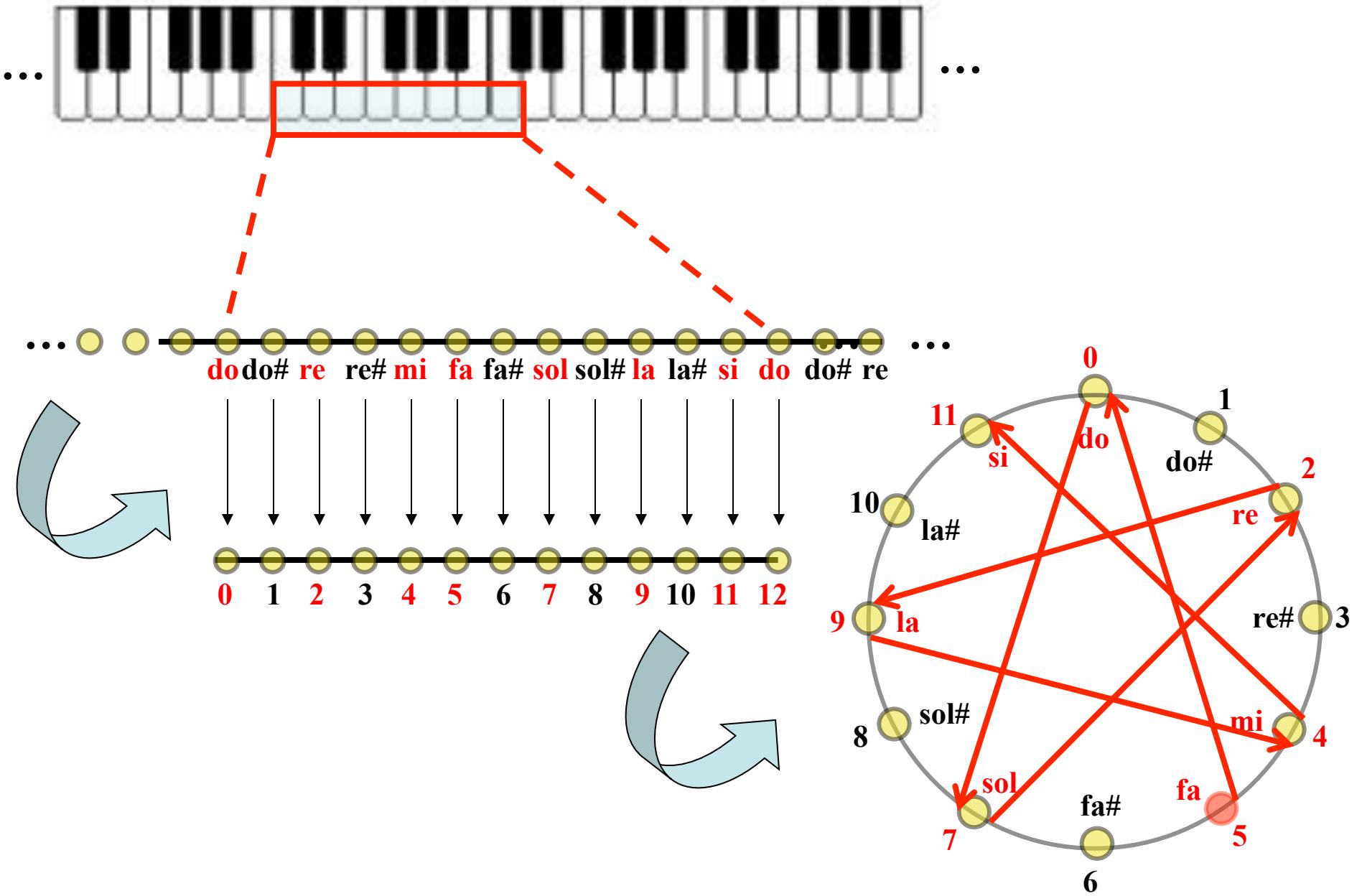
Mardi 26.01.16 - HUG MUSIQUE - La cloche diatonique

Par Pierre Audétat & Julien Junod

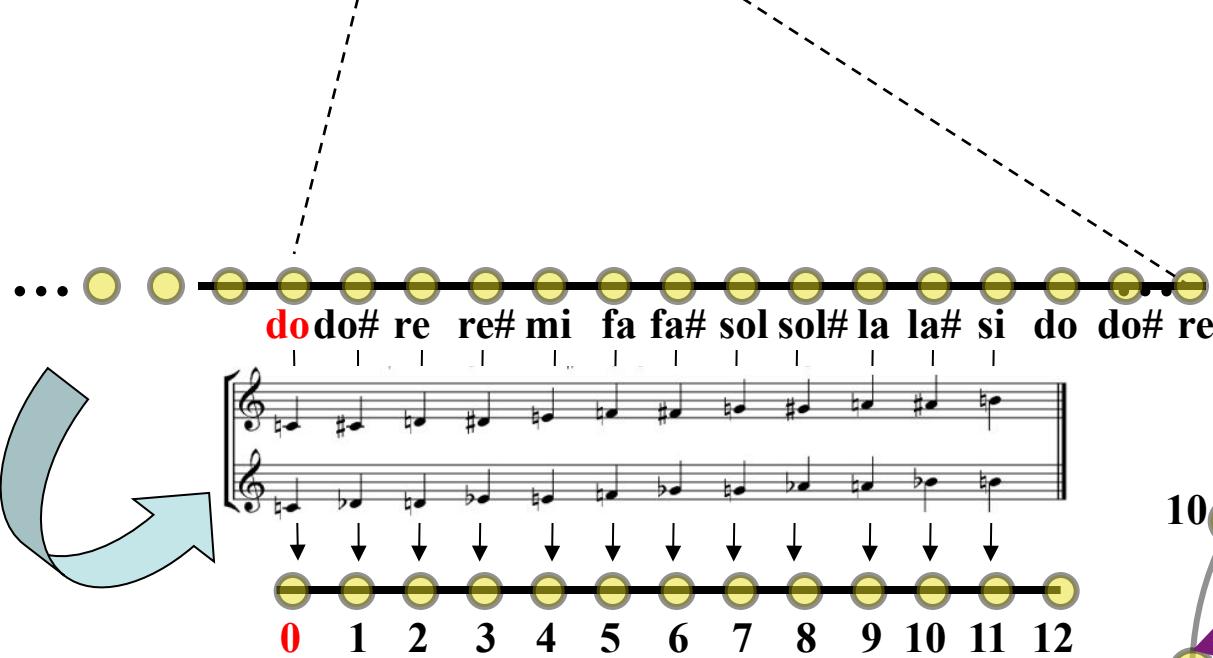
17h / durée 60'

<http://www.cloche-diatonique.ch/>

Le cycle des quintes et la gamme diatonique

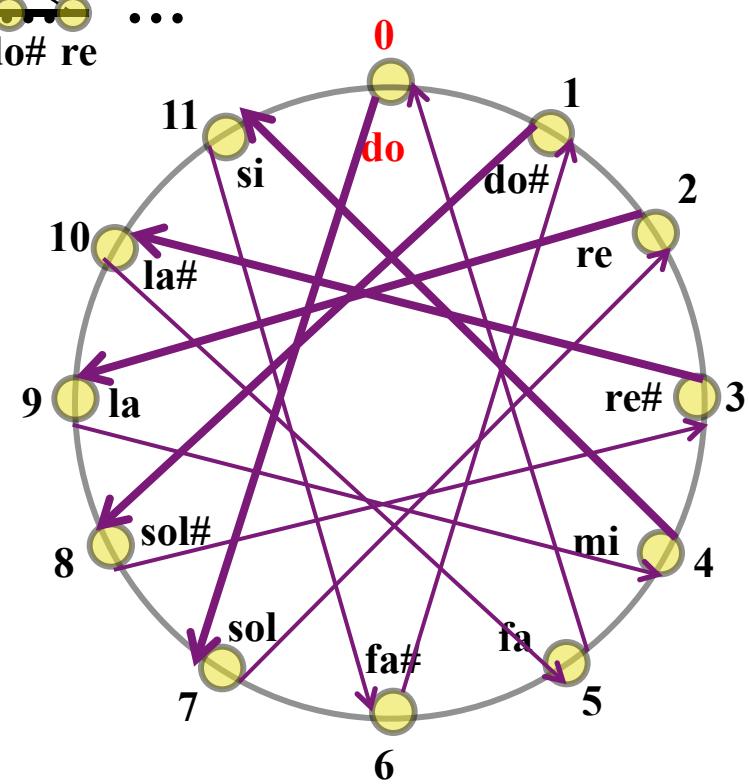


La réduction à l'octave et le cadran d'horloge

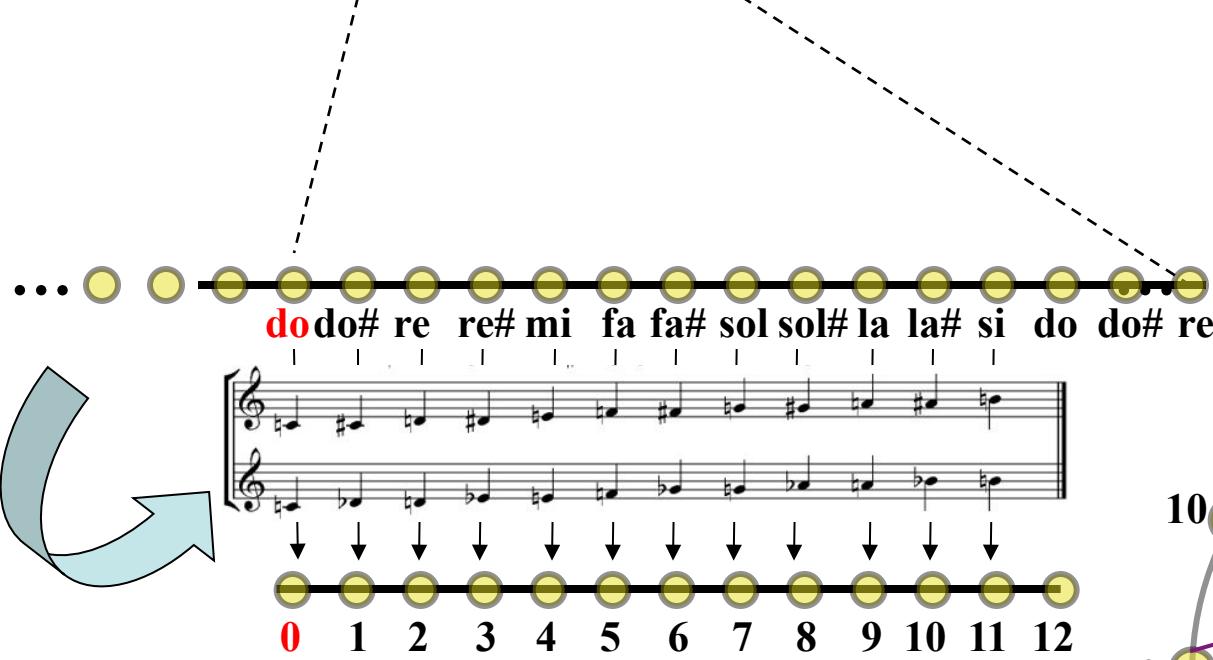


Cycle des quintes

7

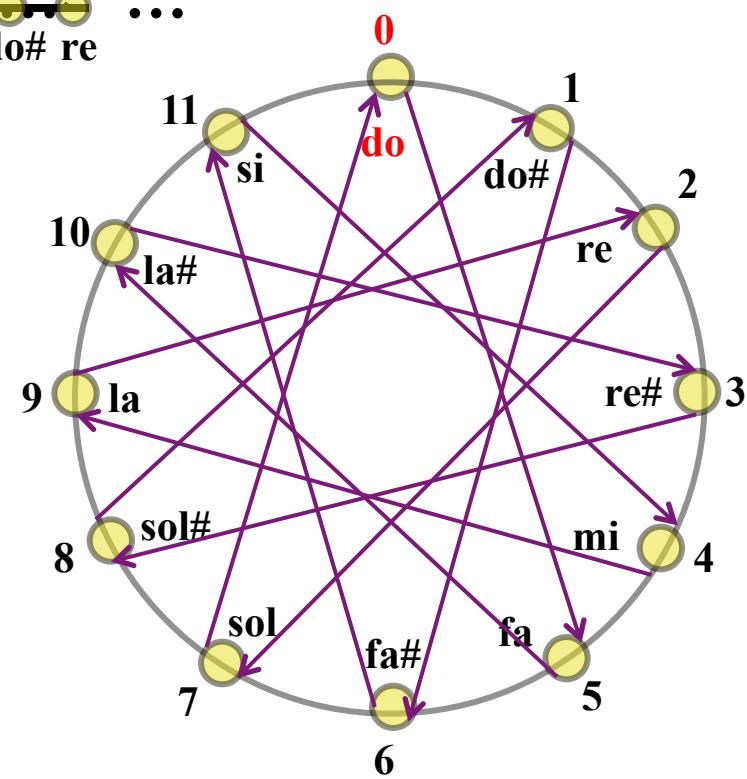


La réduction à l'octave et le cadran d'horloge

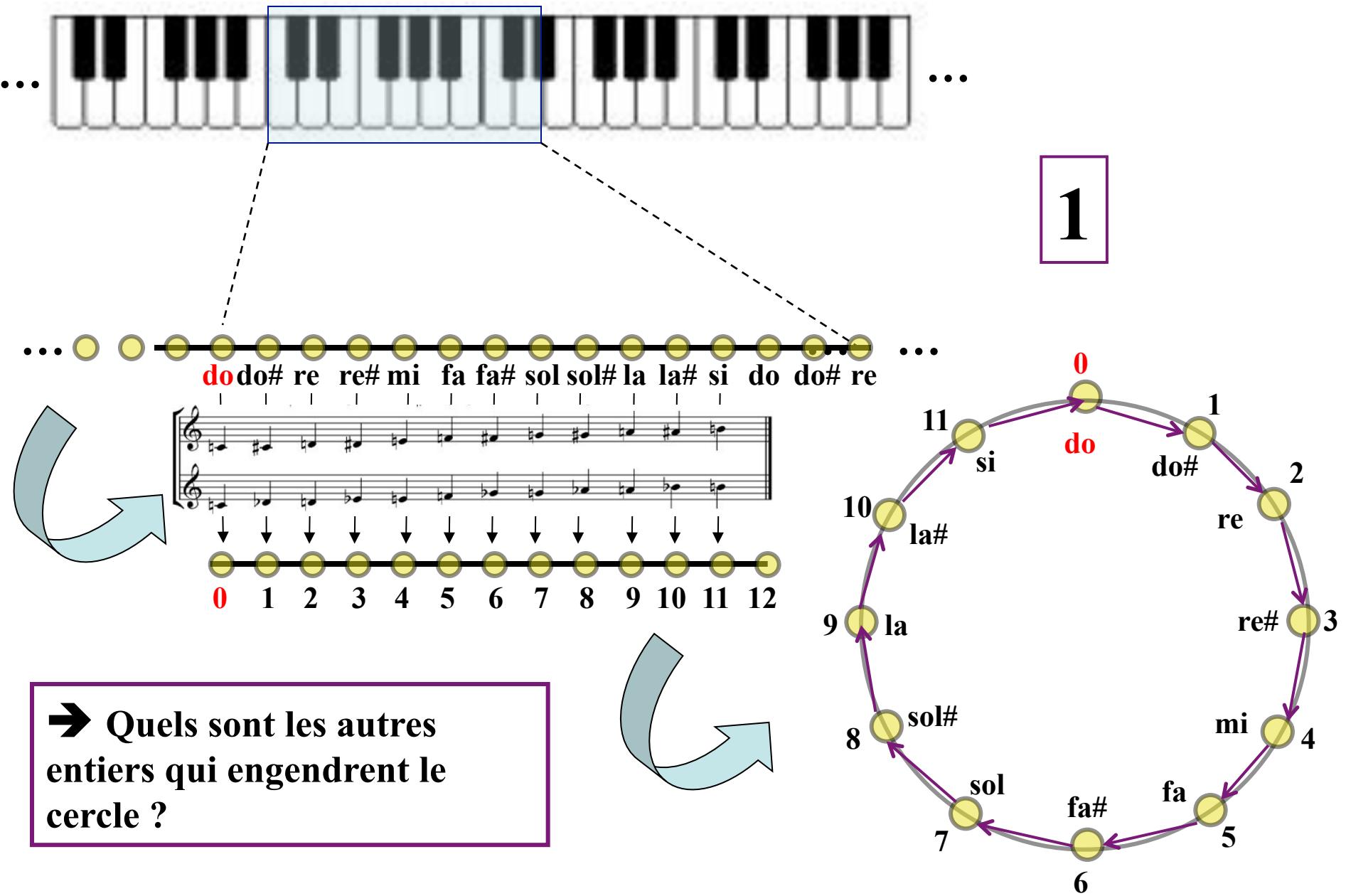


Cycle des quartes

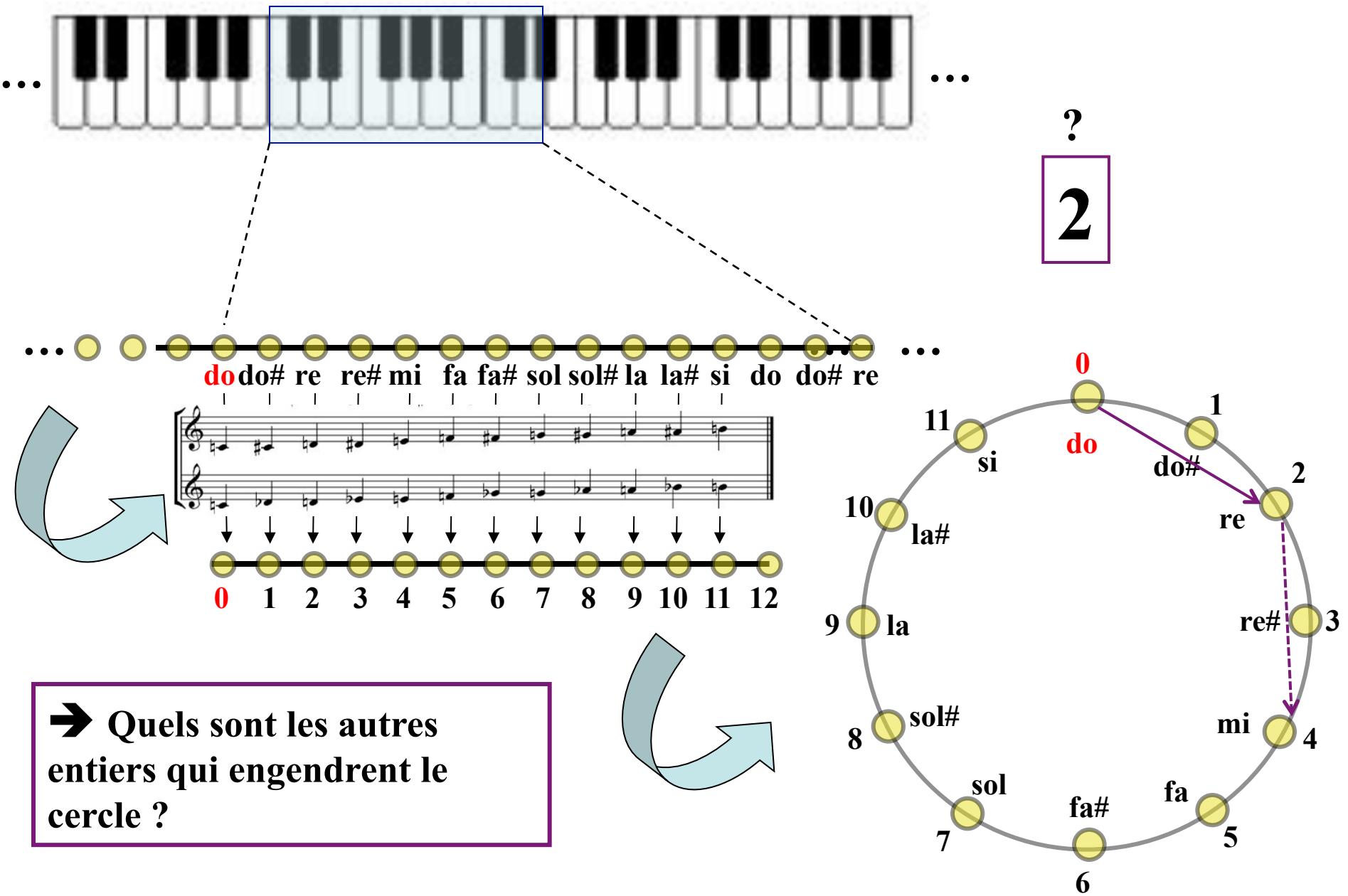
5



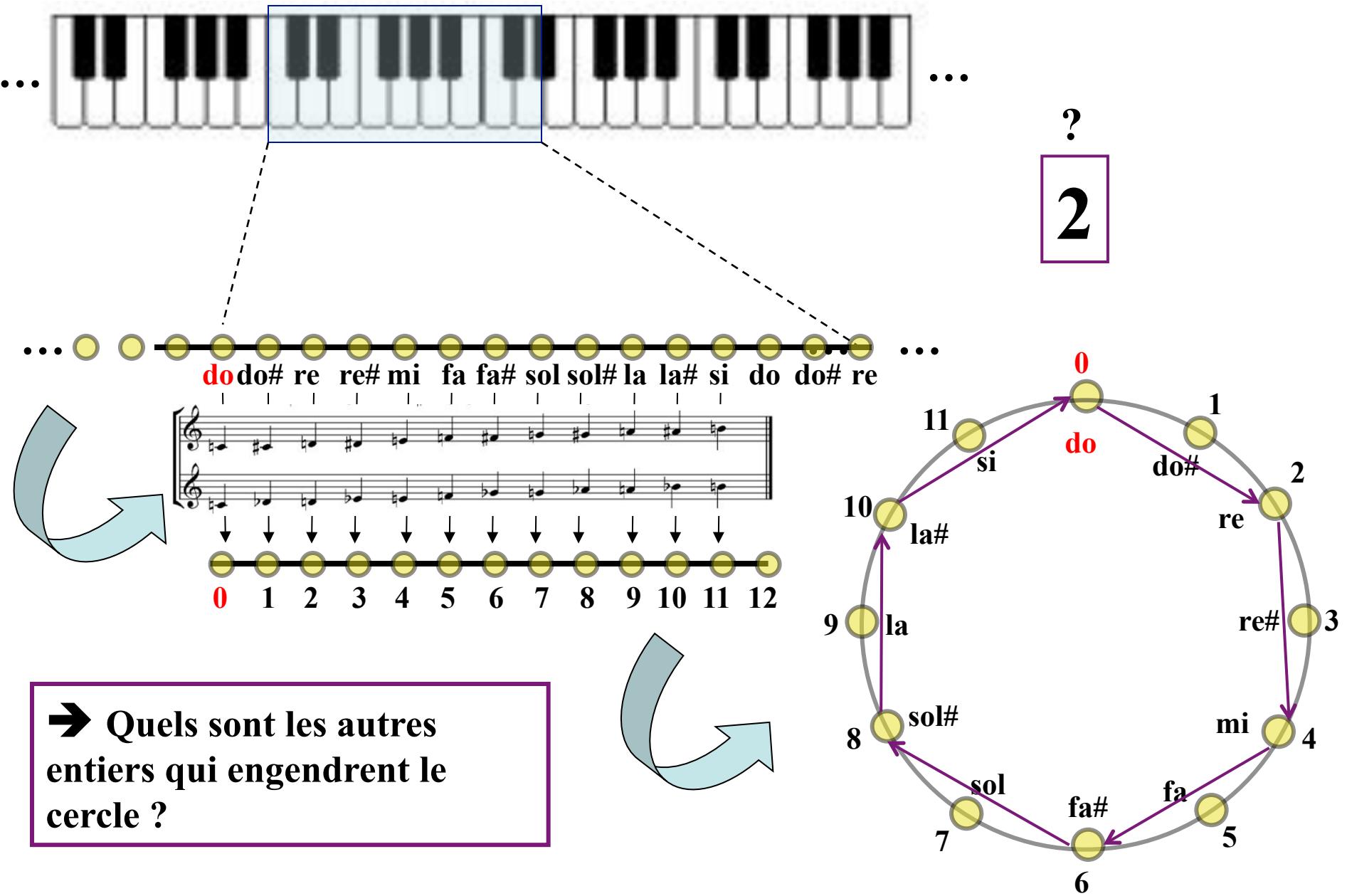
La réduction à l'octave et le cadran d'horloge



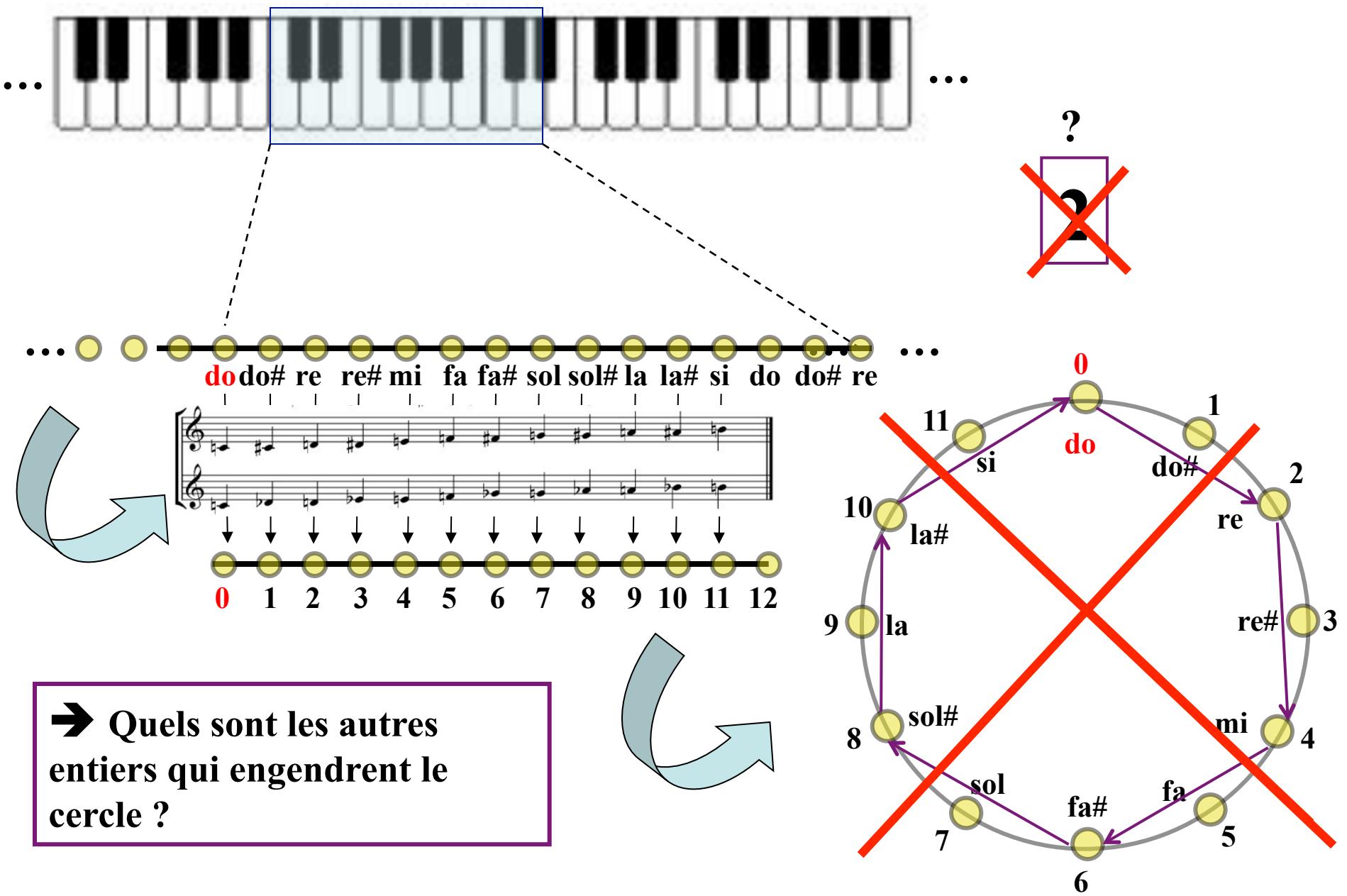
La réduction à l'octave et le cadran d'horloge



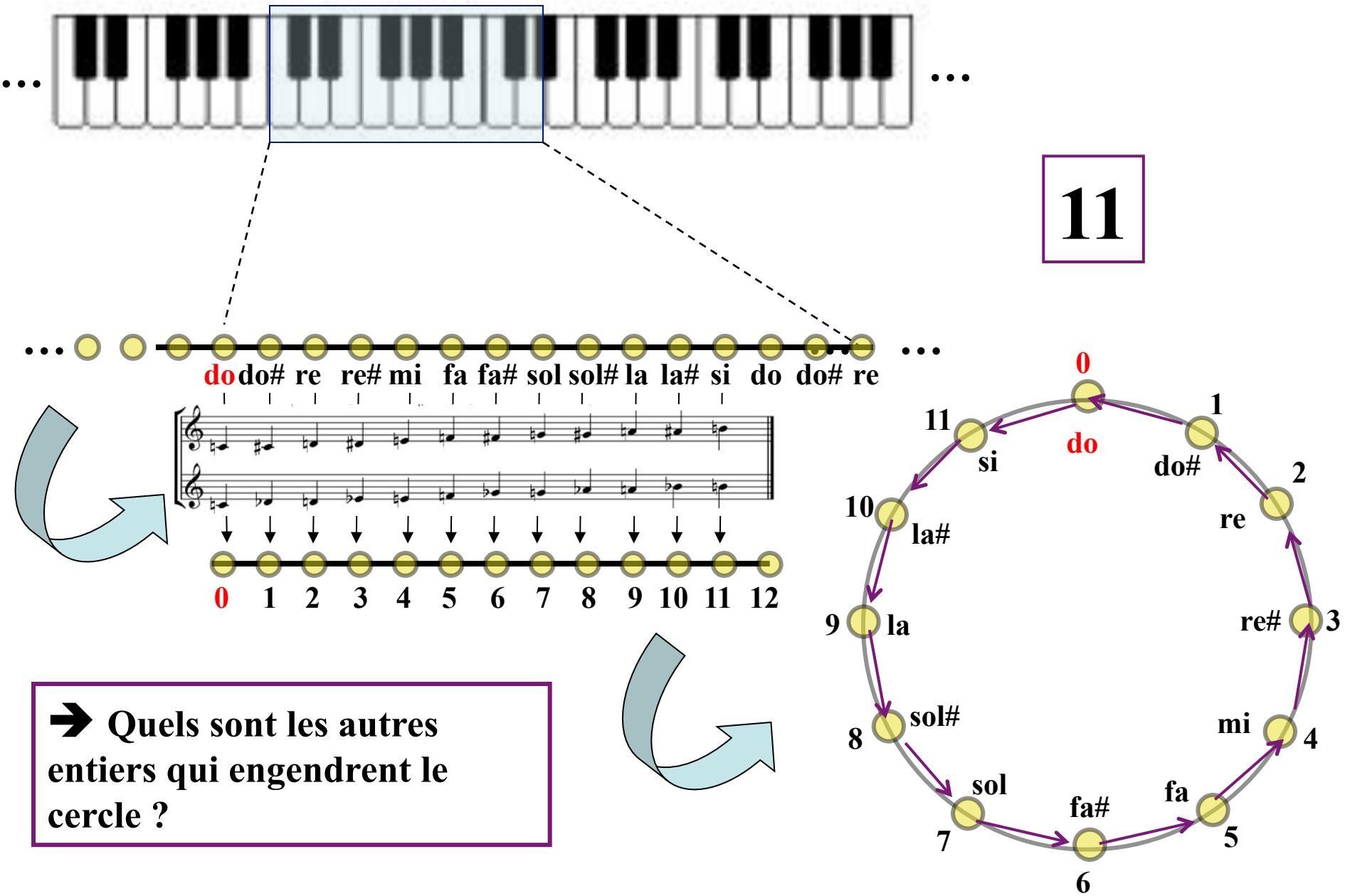
La réduction à l'octave et le cadran d'horloge



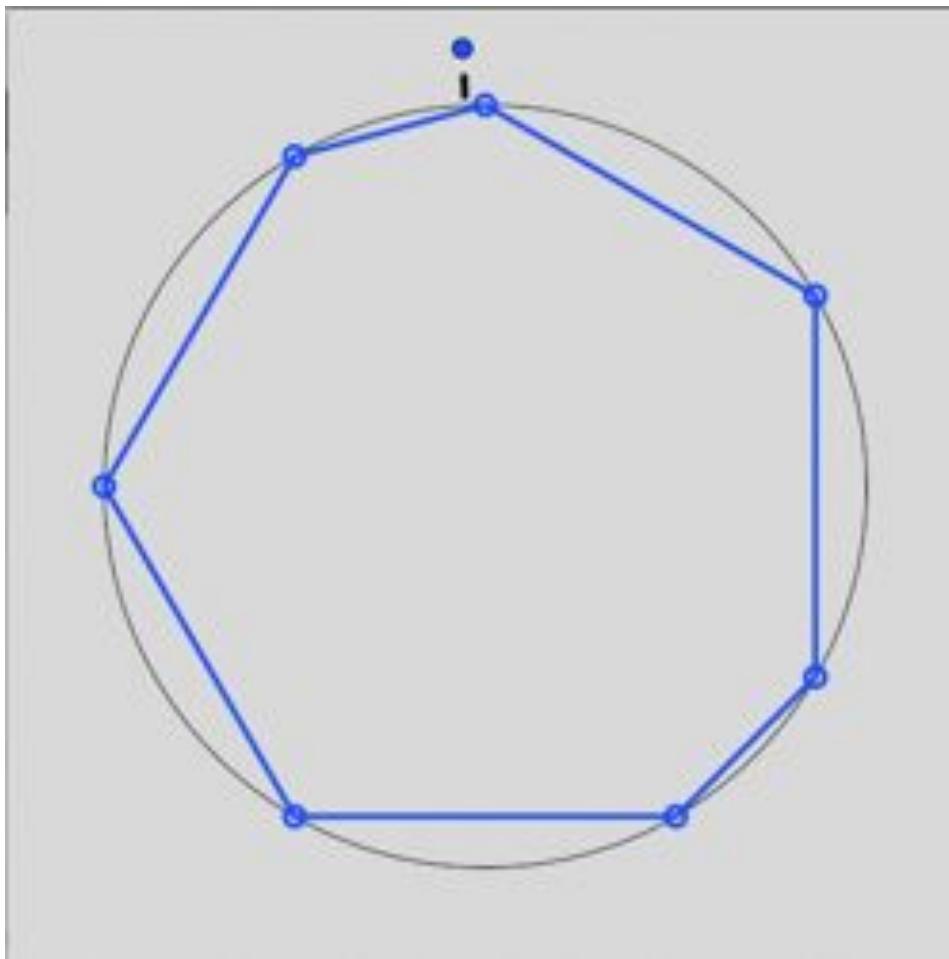
La réduction à l'octave et le cadran d'horloge



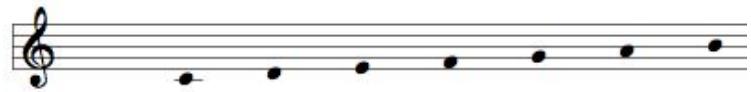
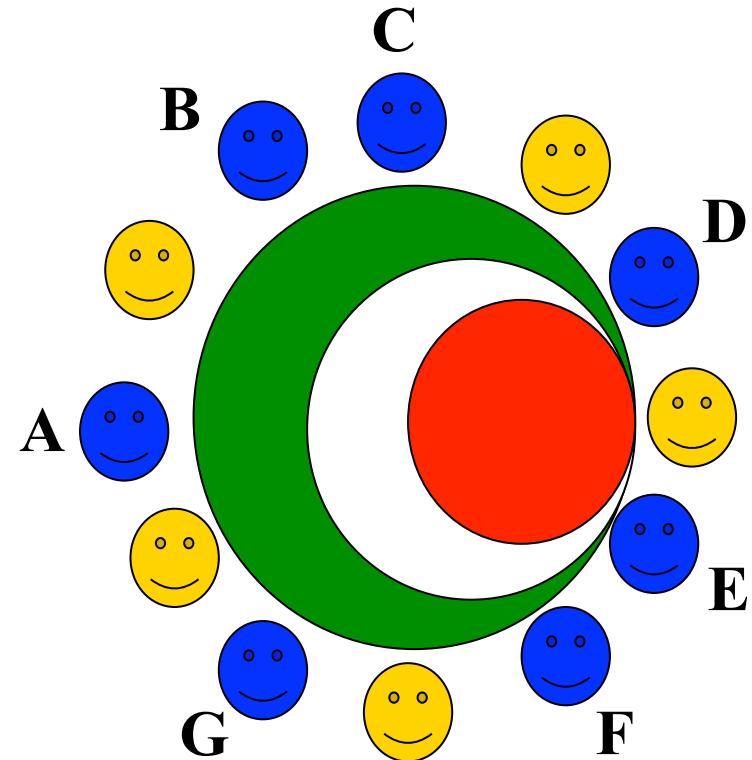
La réduction à l'octave et le cadran d'horloge



Isomorphisme hauteurs/rythmes



Abadja ou Bembé



Dinner Table Problem

Isomorphisme cognitif entre hauteurs et rythmes

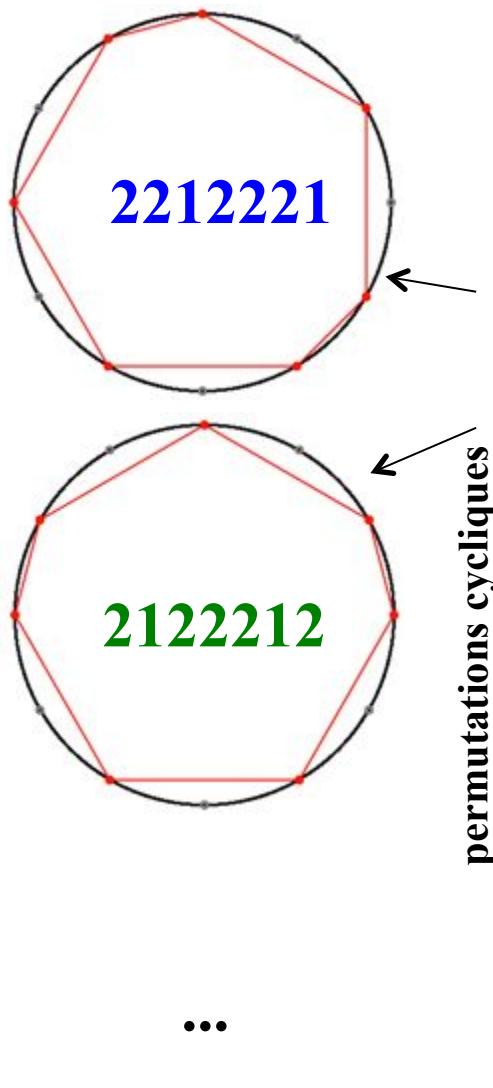


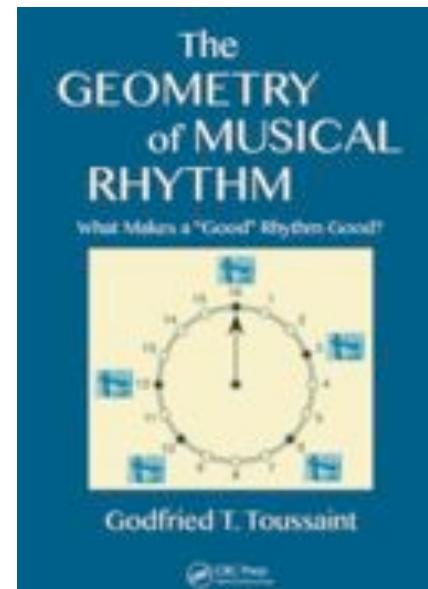
TABLE I
Comparison of $M = 7$, $L = 12$ patterns for pitch (scales) and rhythm (time-lines)

pattern	pitch domain name and notation (in C)	rhythm domain notation	examples from West Africa	references
1. 2212221	major scale (Ionian) CDEFGAB	↓↓ ↓↓ ↓↓	Ewe (Atsiabek, Sogba, Atsia) also Yoruba	Jones (1959), C. K. Ladzekpo, S. K. Ladzekpo and Pantaleoni, Locke
2. 2122212	Dorian CDE ^b FGAB ^b	↓↓↓↓ ↓↓	Bemba—Northern Rhodesia	Jones (1965), (Ekwueme)
3. 1222122	Phrygian CD ^b E ^b FGA ^b B ^b	↓↓↓↓ ↓↓	—	—
4. 2221221	Lydian CDEF#GAB	↓↓ ↓↓↓↓	Ga-Adangme (common) also common Haitian pattern, Akan (Ab fo)	C. K. Ladzekpo, Combs (1974), R. Hill, Asiamah
5. 2212212	Mixolydian CDEFGAB ^b	↓↓ ↓↓ ↓↓	Yoruba sacred music from Ekiti	King
6. 2122122	Aeolian CDE ^b FGA ^b B ^b	↓↓↓↓ ↓↓	Ashanti (Ab fo , Mpre)	Koetting
7. 1221222	Locrian CD ^b E ^b FG ^b A ^b B ^b	↓↓↓↓↓↓	Ghana*	Nketia (1963a)
8. 2121222	(#2 Locrian) CDE ^b FG ^b A ^b B ^b	↓↓↓↓↓↓	Ashanii (Asedua)	C. K. Ladzekpo
9. 2112123	— CDD#EF#GA	↓↓↓↓↓↓	Akan (juvenile song)	Nketia (1963b)

* clap pattern

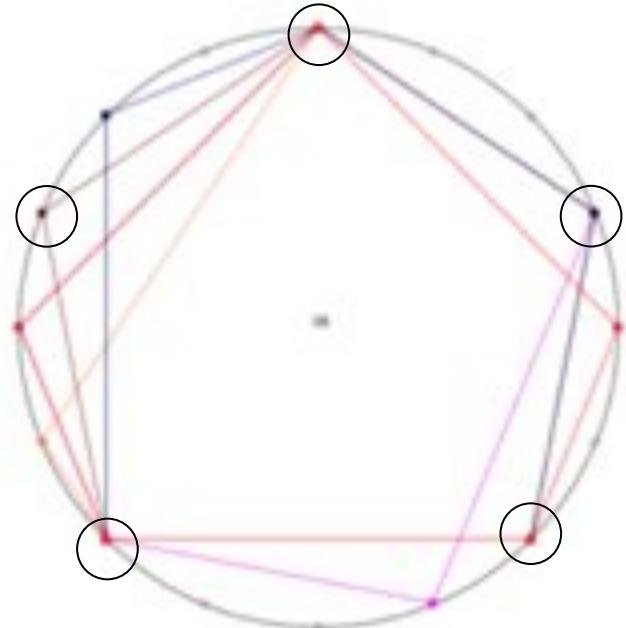
† mute stroke on bell

La géométrie du rythme musical



Shiko	A horizontal timeline with 12 boxes. The 1st, 4th, 7th, and 10th boxes contain a black dot, representing a repeating pattern of quarter notes.
Son	A horizontal timeline with 12 boxes. The 1st, 4th, 7th, and 10th boxes contain a black dot, representing a repeating pattern of quarter notes.
Soukous	A horizontal timeline with 12 boxes. The 1st, 4th, 7th, and 10th boxes contain a black dot, representing a repeating pattern of quarter notes.
Rumba	A horizontal timeline with 12 boxes. The 1st, 4th, 7th, and 10th boxes contain a black dot, representing a repeating pattern of quarter notes.
Bossa	A horizontal timeline with 12 boxes. The 1st, 4th, 7th, and 10th boxes contain a dark blue dot, representing a repeating pattern of quarter notes.
Gahu	A horizontal timeline with 12 boxes. The 1st, 4th, 7th, and 10th boxes contain a black dot, representing a repeating pattern of quarter notes.

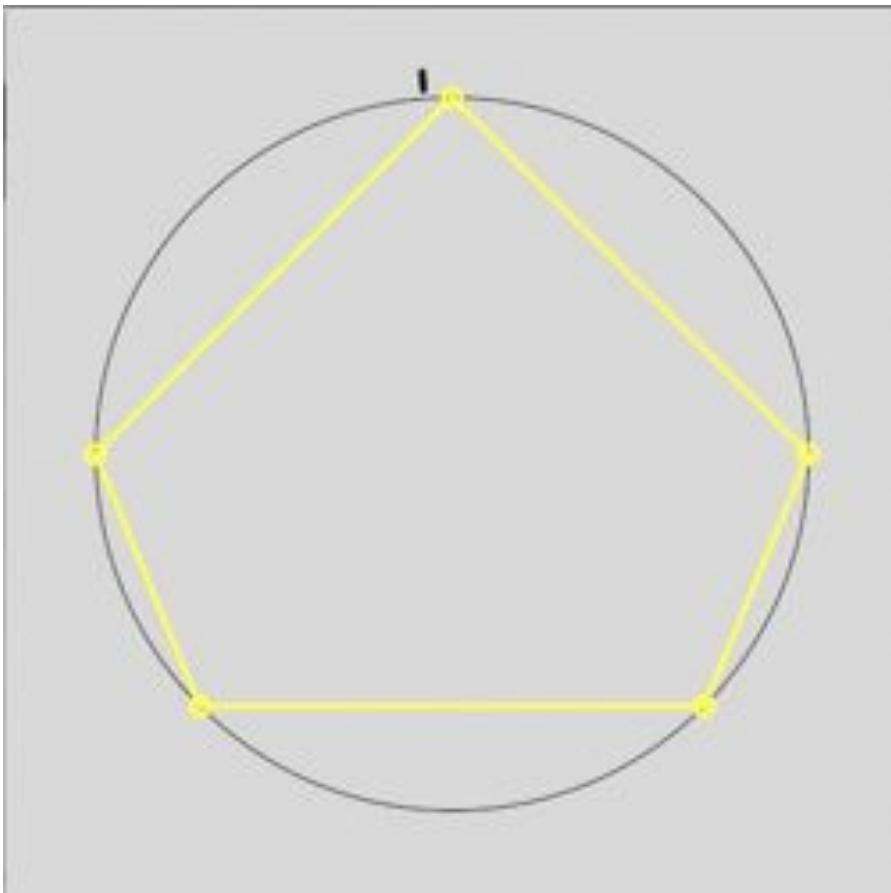
→ Quel est le rythme le plus régulier ?



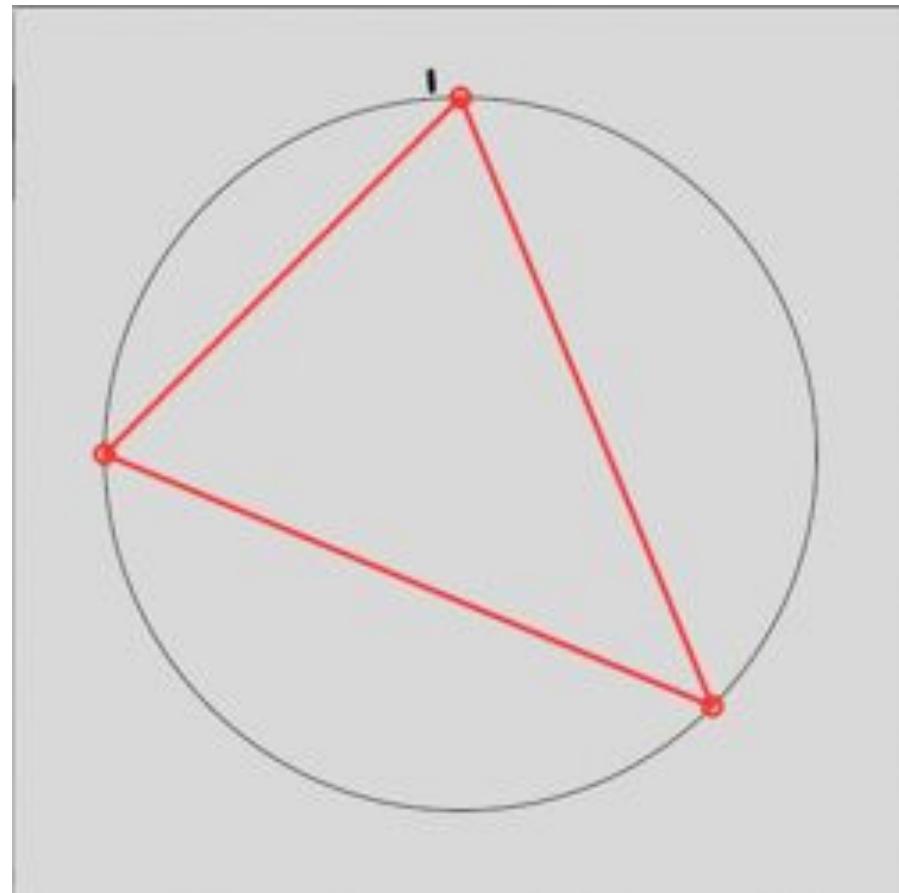
Mercredi 27.01.16 - HEMU - Les rythmes non-euclidiens
Par Malcom Braff (CH) / Salle BCV concert Hall
10h-12h30 / 13h30-16h

Rythmes afro-cubains

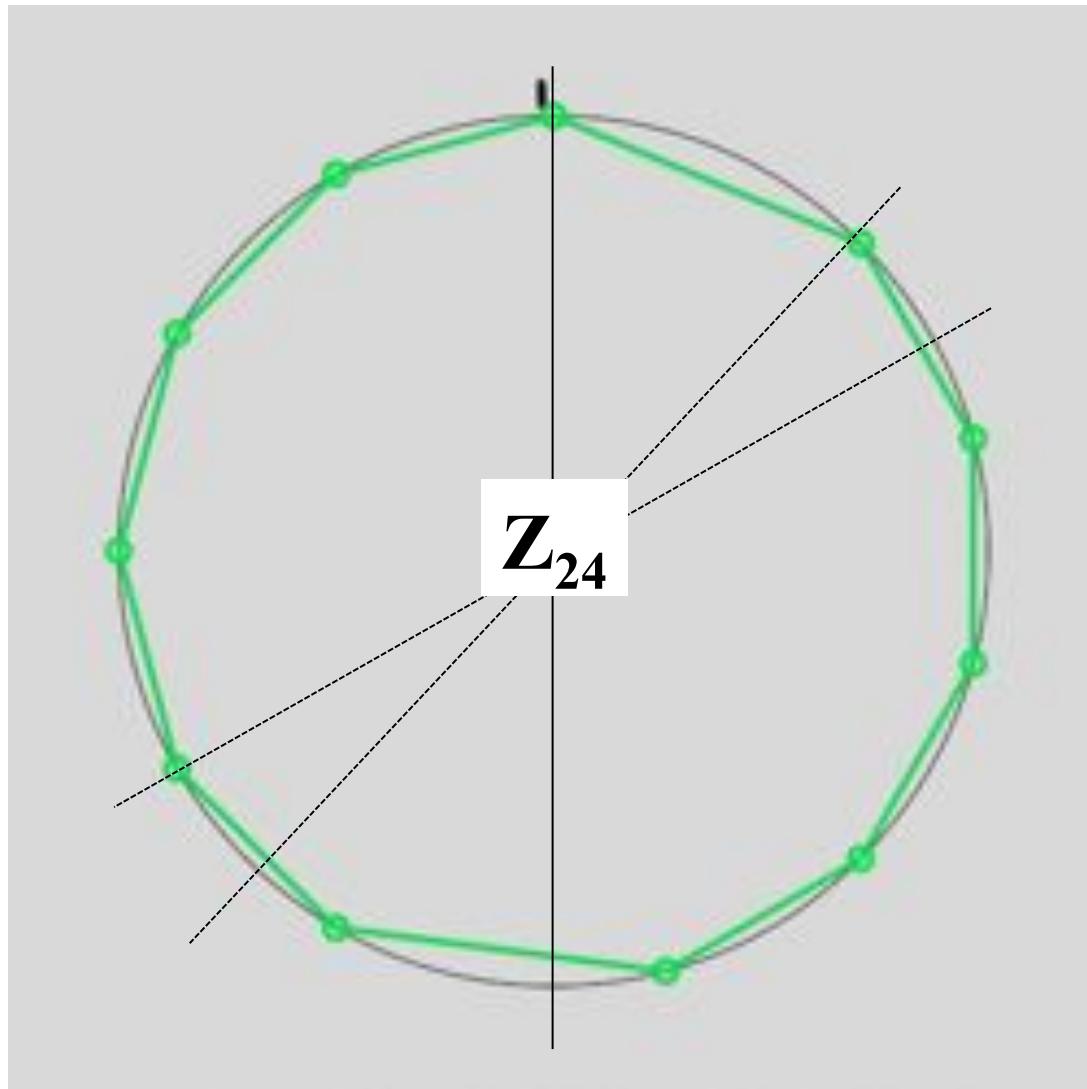
El cinquillo



El trecillo



L'imparité rythmique et les musiques de tradition orale



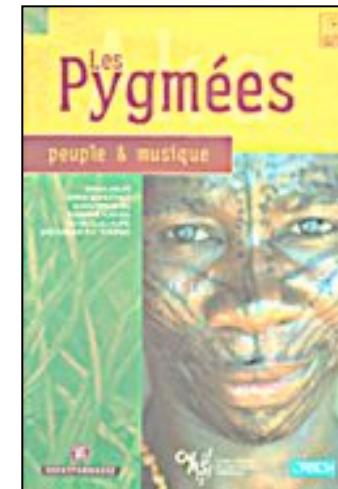
(3 2 2 2 2 3 2 2 2 2 2)



Simha Arom



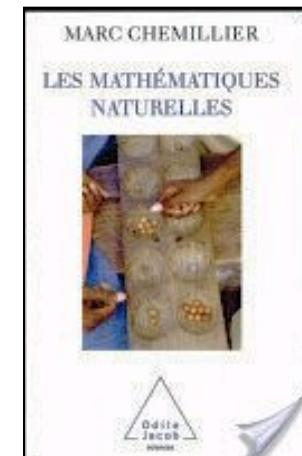
Marc Chemillier



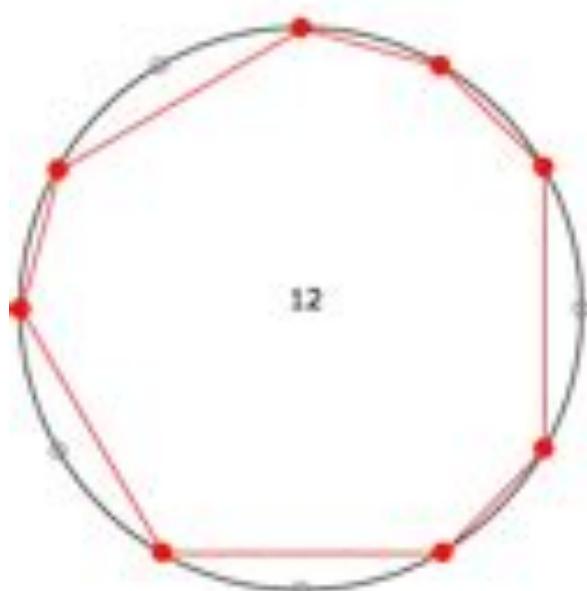
musimédiane

publiée avec le concours de la SFAM

revue audiovisuelle et multimédia d'analyse musicale



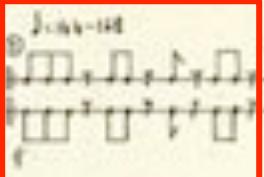
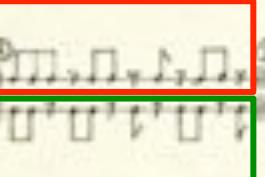
Le « cercle rythmique » et ses rotations

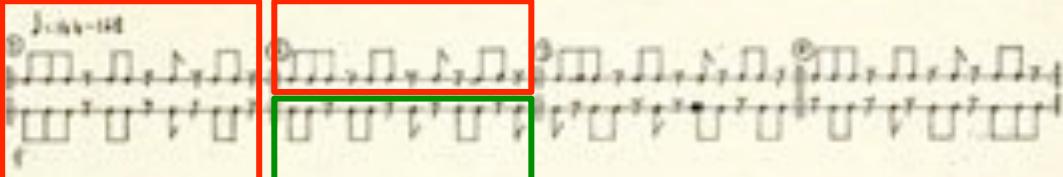


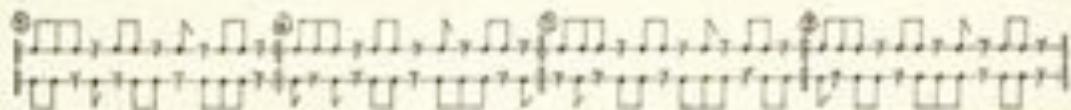
Le « cercle rythmique » et ses rotations

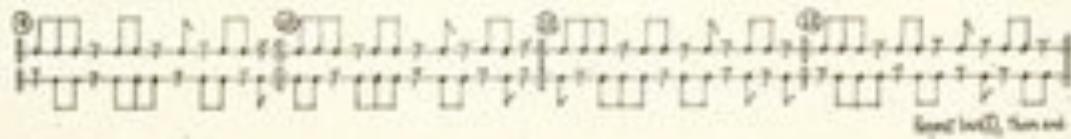
CLAPPING MUSIC

FOR TWO PERFORMERS

1. $\frac{2}{4}$ - 168
C1: 
C2: 

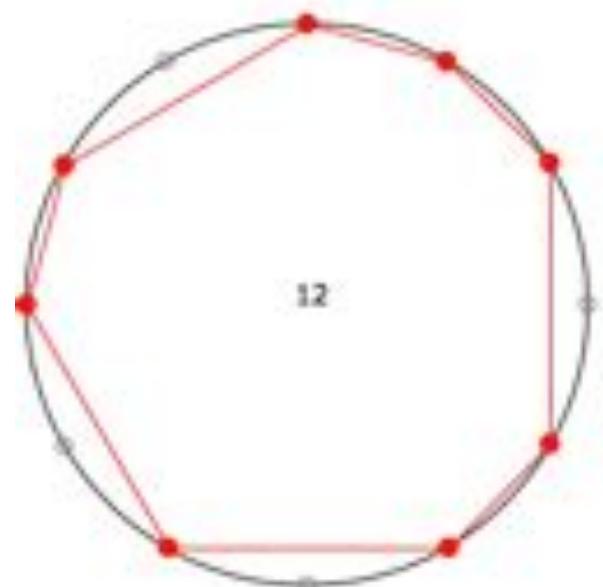
2. 

3. 

4. 

The performers begin and end with both performers in unison at bar (1). The number of repeats of each bar should be fixed at twelve repeats per bar. Since the first performer part does not change, it is up to the second performer to make some relation to the first. The second performer should try to keep his own character while also writing in on the first beat of each measure (but on the last beat of the group of three steps), so that his character always falls in a number of bars in a fluctuating pattern.

The choice of a particular clapping sound, i.e., with clapped on flat hands, or left up for the performer, whichever takes it easier, both performers should try to get the same one so that their two parts will blend together and create one overall steady pattern.



Le « cercle rythmique » et ses rotations

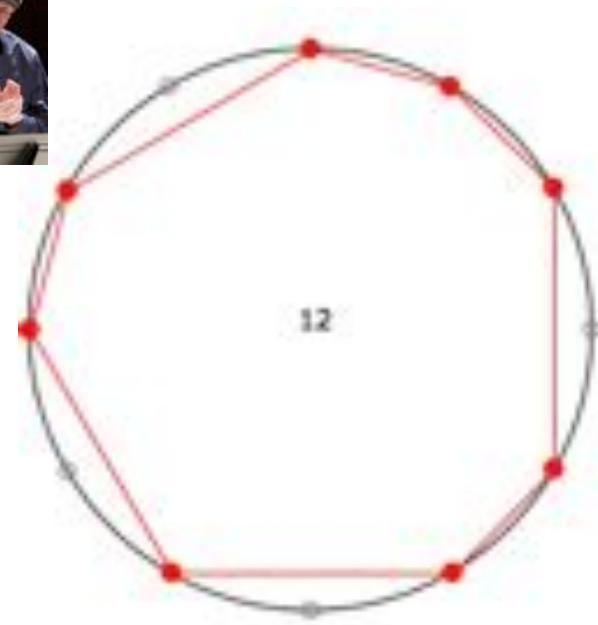
CLAPPING MUSIC

FOR TWO PERFORMERS

120 BPM

CLAP 1 CLAP 2

Repeat back, then end.



The performers begin and end with both performers in unison at bar ①. The order of attack of each bar should be fixed at twelve separate positions. Since the first performer part does not change, it is up to the second performer to move from position to the next. The second performer should try to keep his own dominant when it is written, i.e. on the first beat of each measure (but on the last beat of the group of three steps), so that his dominant always falls on a member of his own underlying pattern.

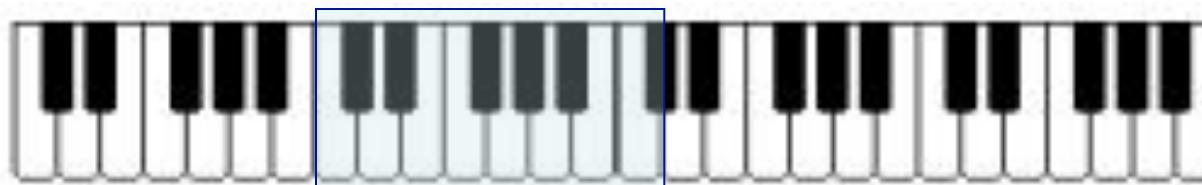
The choice of a particular clapping sound, i.e. with fingers or flat hands, is left up to the performers, whichever technique chosen, both performers should try to get the same one so that their two parts will blend together and create one overall steady pattern.

Clapping Music (1972)

*George Brecht
orignal 1972*

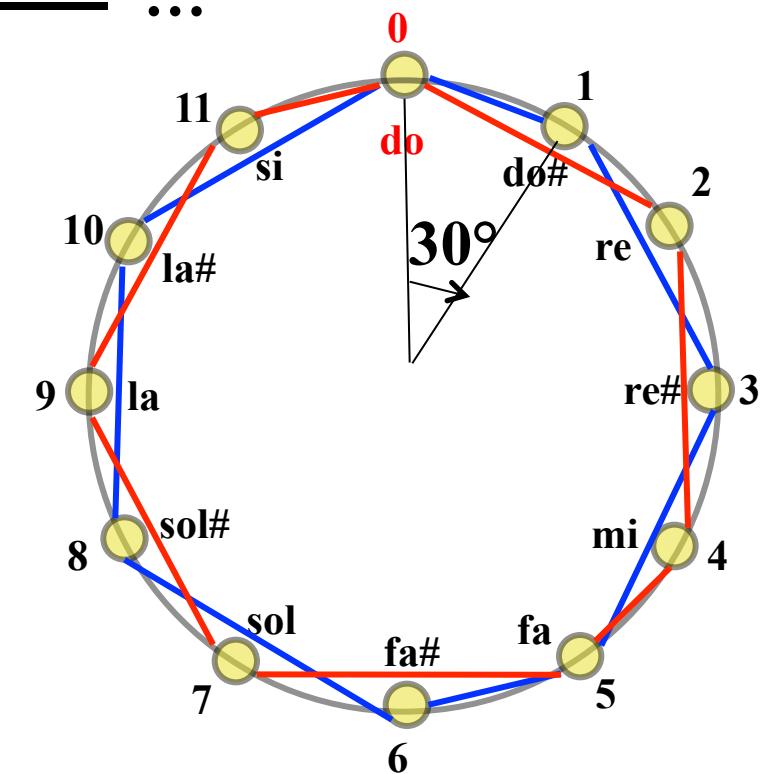
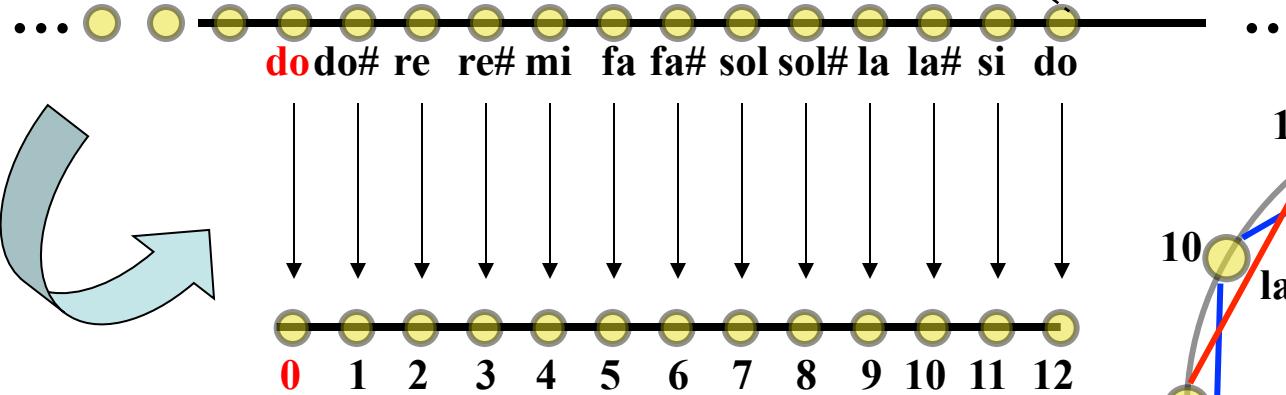
Gerubach's Scrolling Score Project
<http://www.gerubach.com>

Les transpositions sont des additions...



Do maj = {0,2,4,5,7,9,11}
Do# maj = {1,3,5,6,8,10,0}

+1



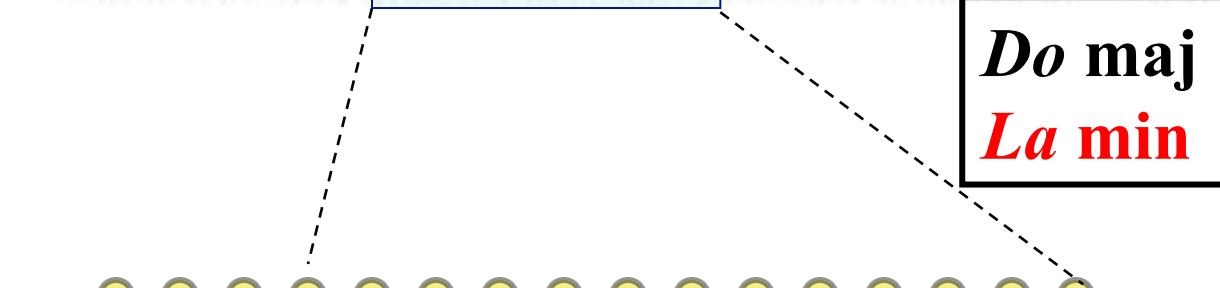
... ou des rotations !

Les inversions sont des soustractions...

...  ...

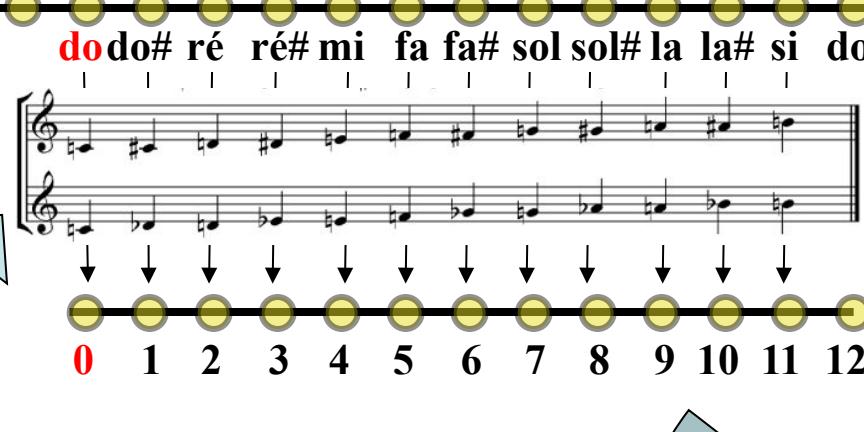
Do maj = {0,4,7}
La min = {0,4,9}

$I_4(x) = 4 - x$

...  ...

do do# ré ré# mi fa fa# sol sol# la la# si do

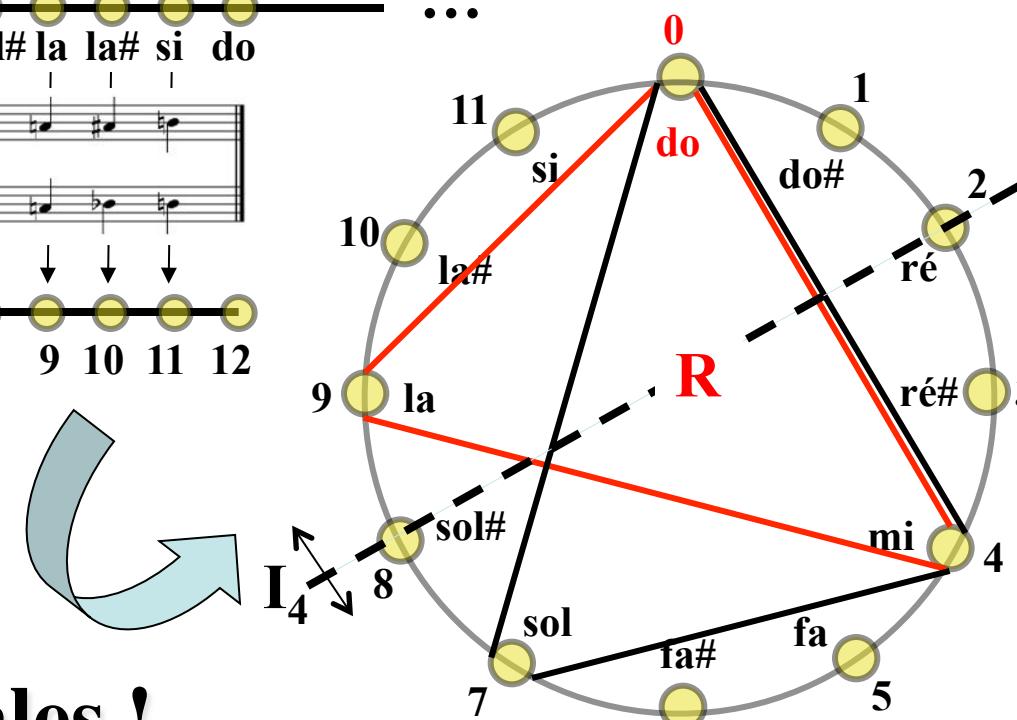
0 1 2 3 4 5 6 7 8 9 10 11 12

...  ...

0 1 2 3 4 5 6 7 8 9 10 11 12

do si do# ré ré# mi fa la# sol# la sol fa# ta#

0 1 2 3 4 5 6 7 8 9 10 11 12

...  ...

0 1 2 3 4 5 6 7 8 9 10 11

do si do# ré ré# mi fa la# sol# la sol fa# ta#

0 1 2 3 4 5 6 7 8 9 10 11

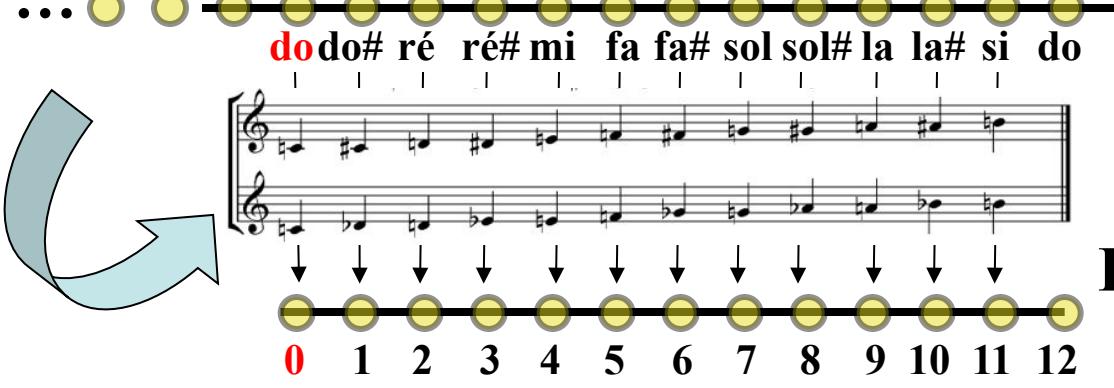
... ou des symétries axiales !

Les inversions sont des soustractions...

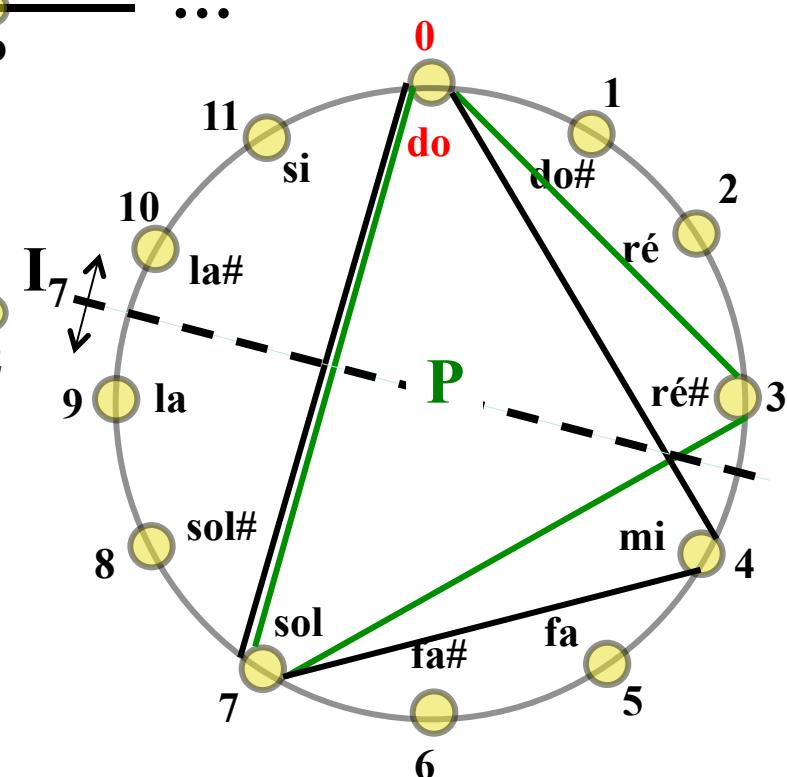
...  ...

Do maj = {0,4,7}
Do min = {0,3,7}

$I_7(x) = 7 - x$

...  ...





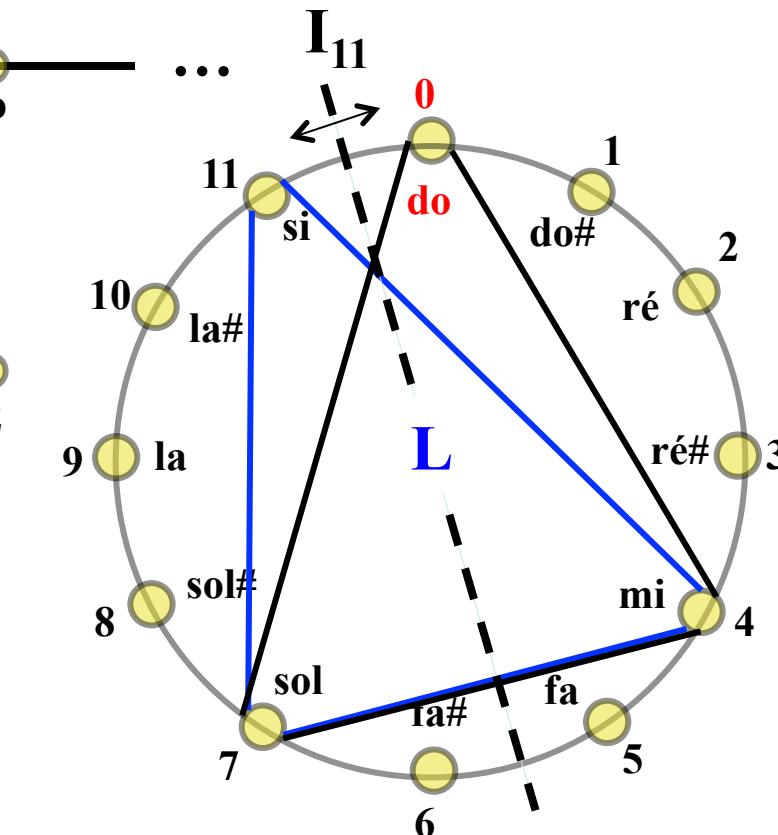
... ou des symétries axiales !

Les inversions sont des soustractions...

... 

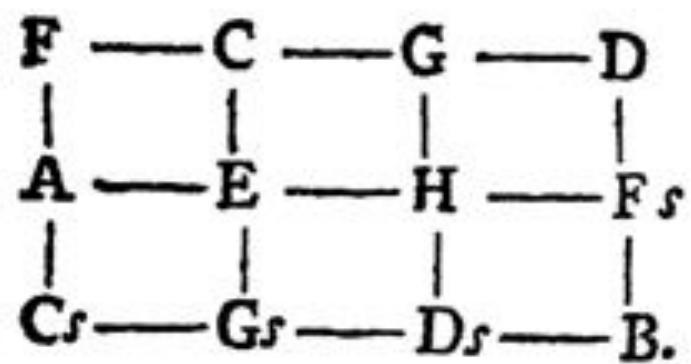
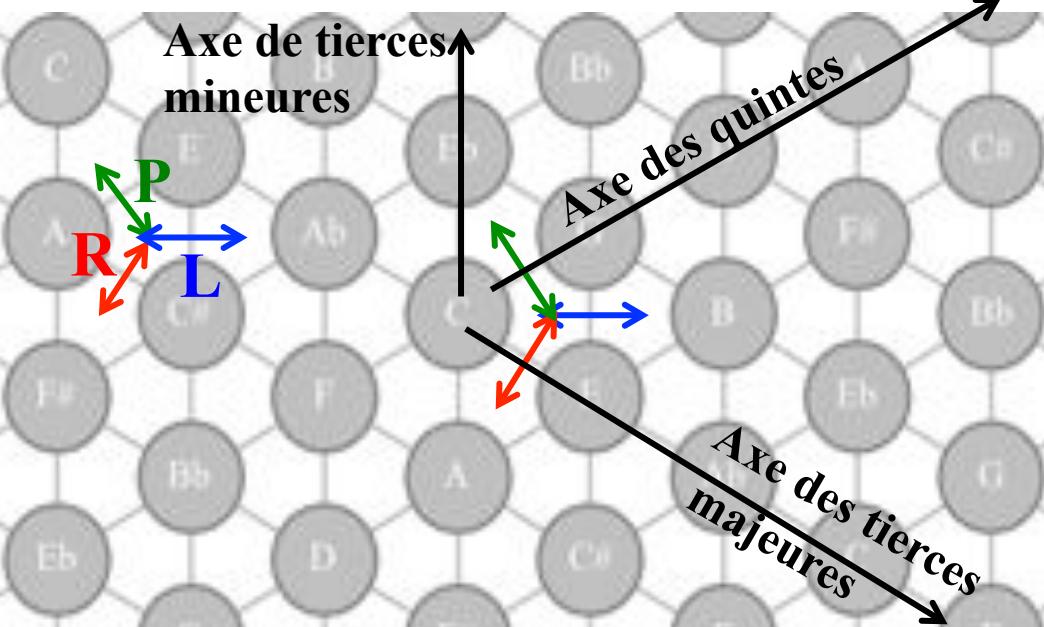
Do maj = {0,4,7}
Mi min = {4,7,11} $I_{11}(x) = 11 - x$

... 

... 

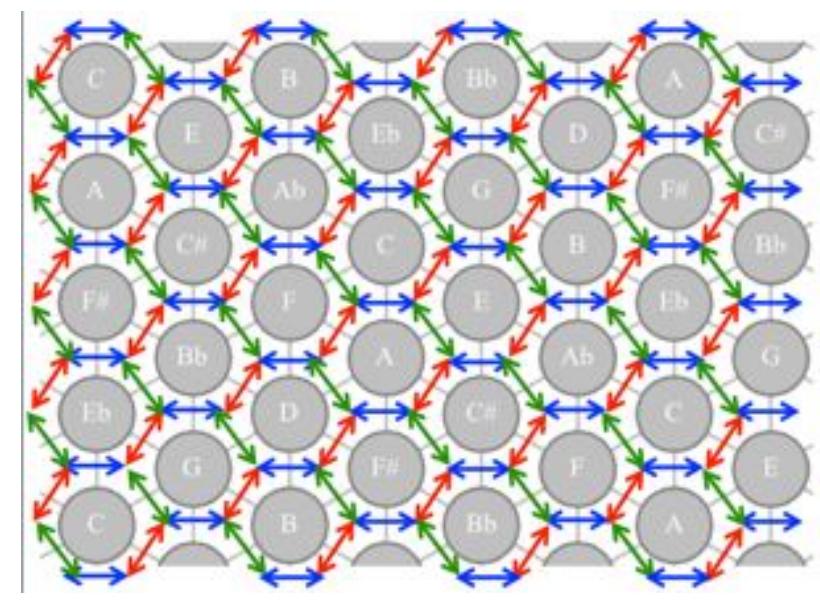
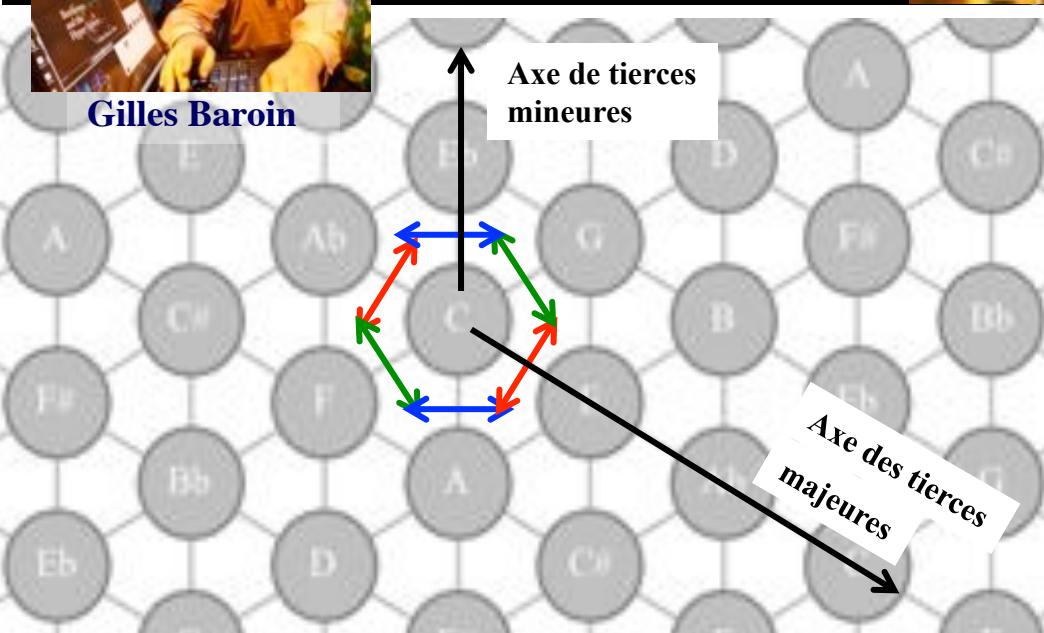
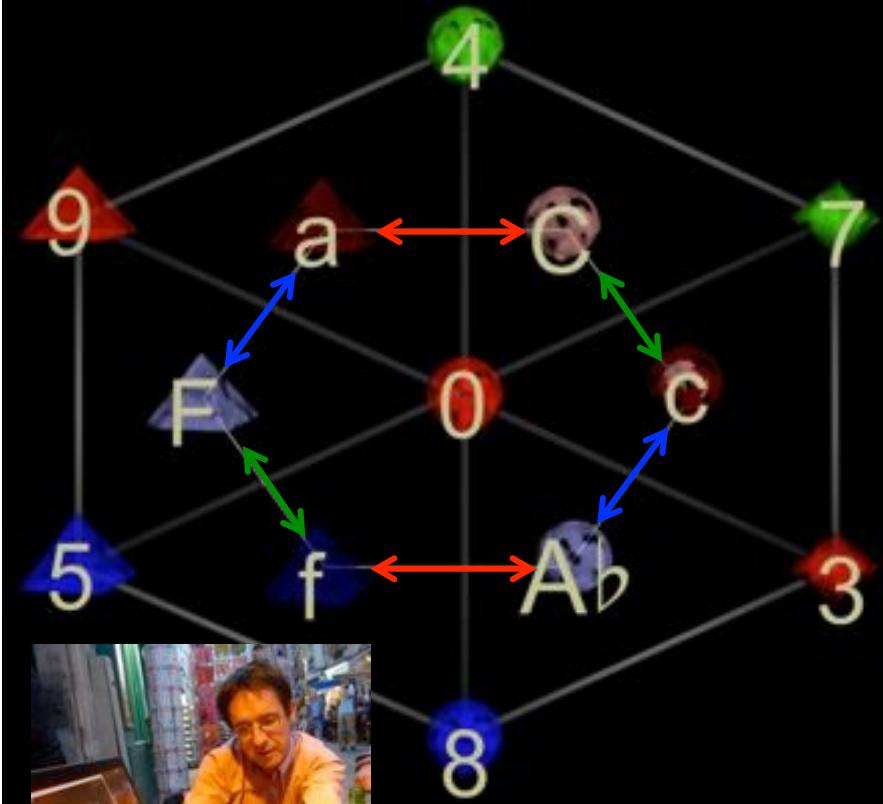
... ou des symétries axiales !

Le Tonnetz (ou nid musical d'abeilles)

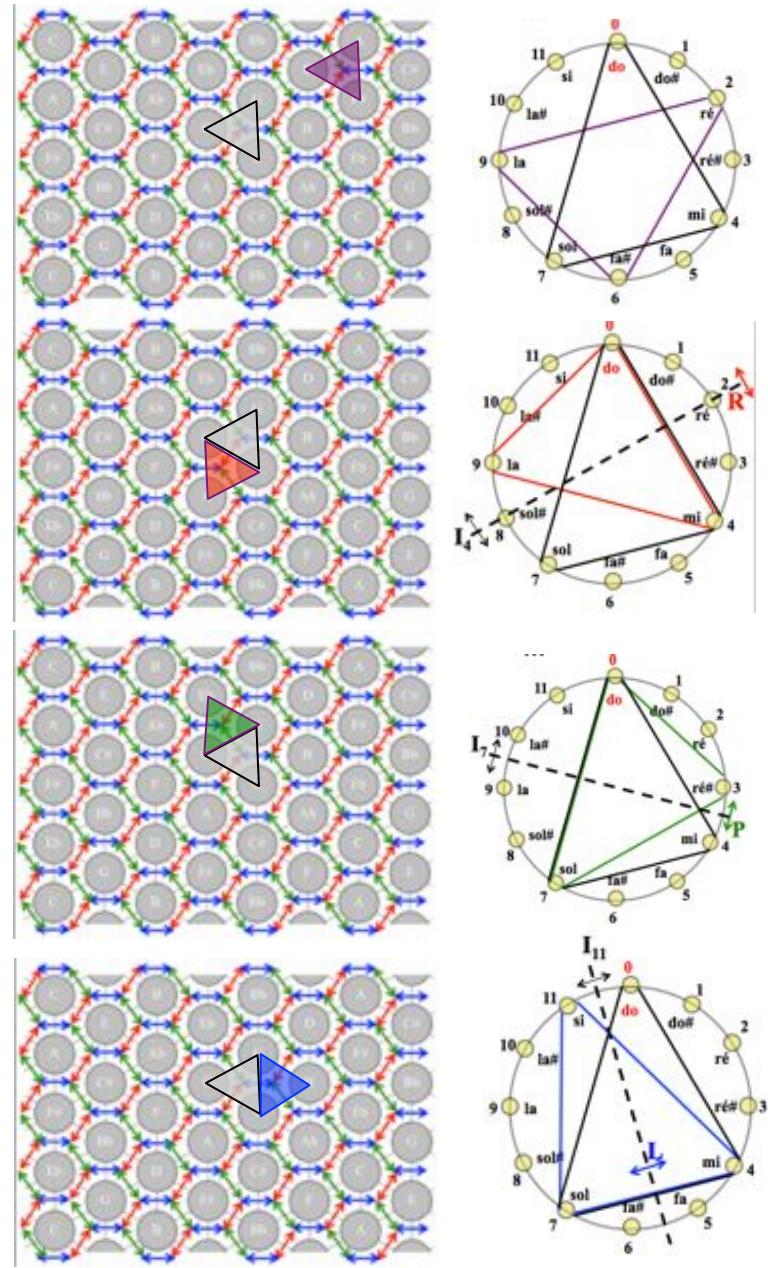
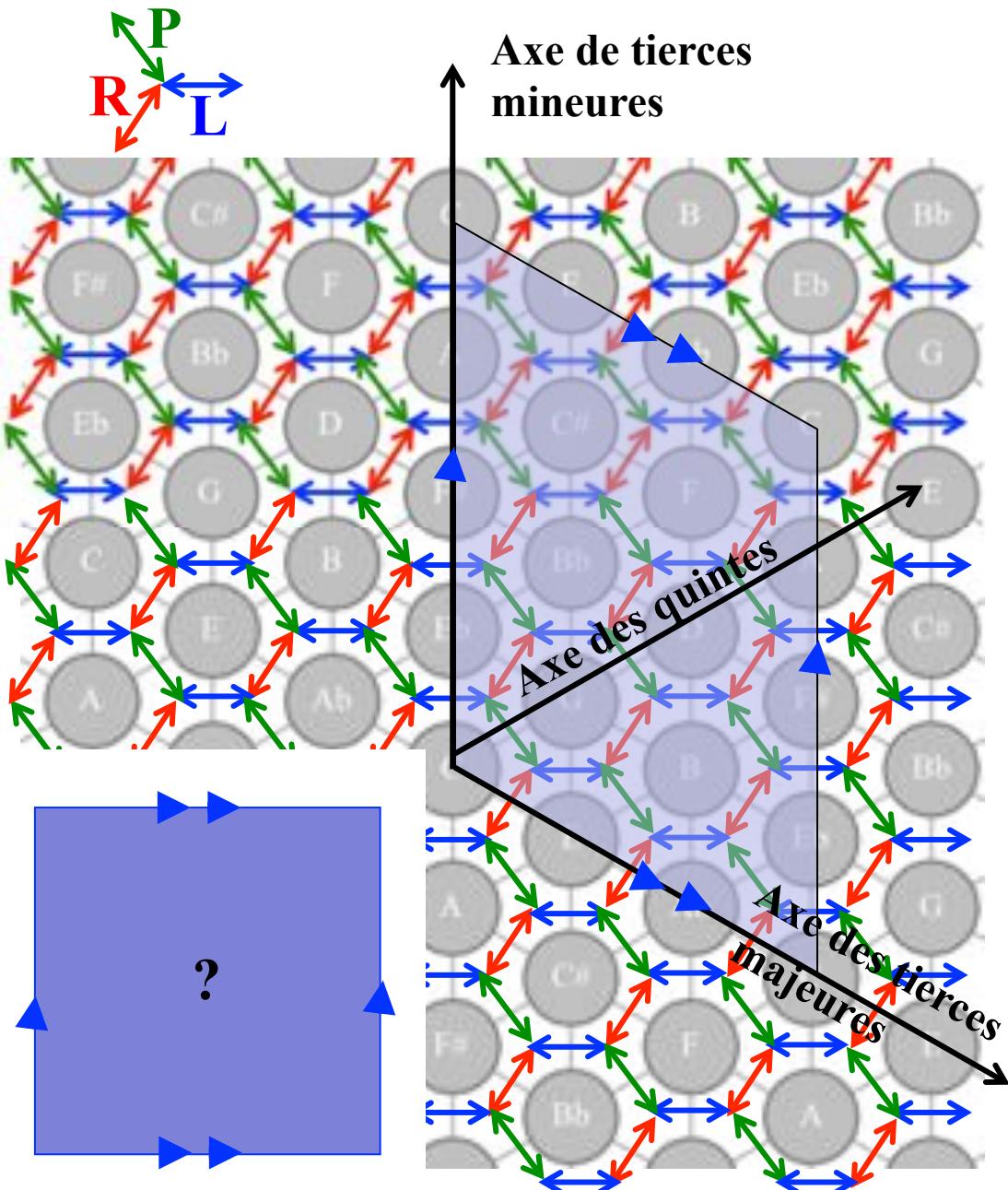


Speculum Musicum (Euler, 1773)

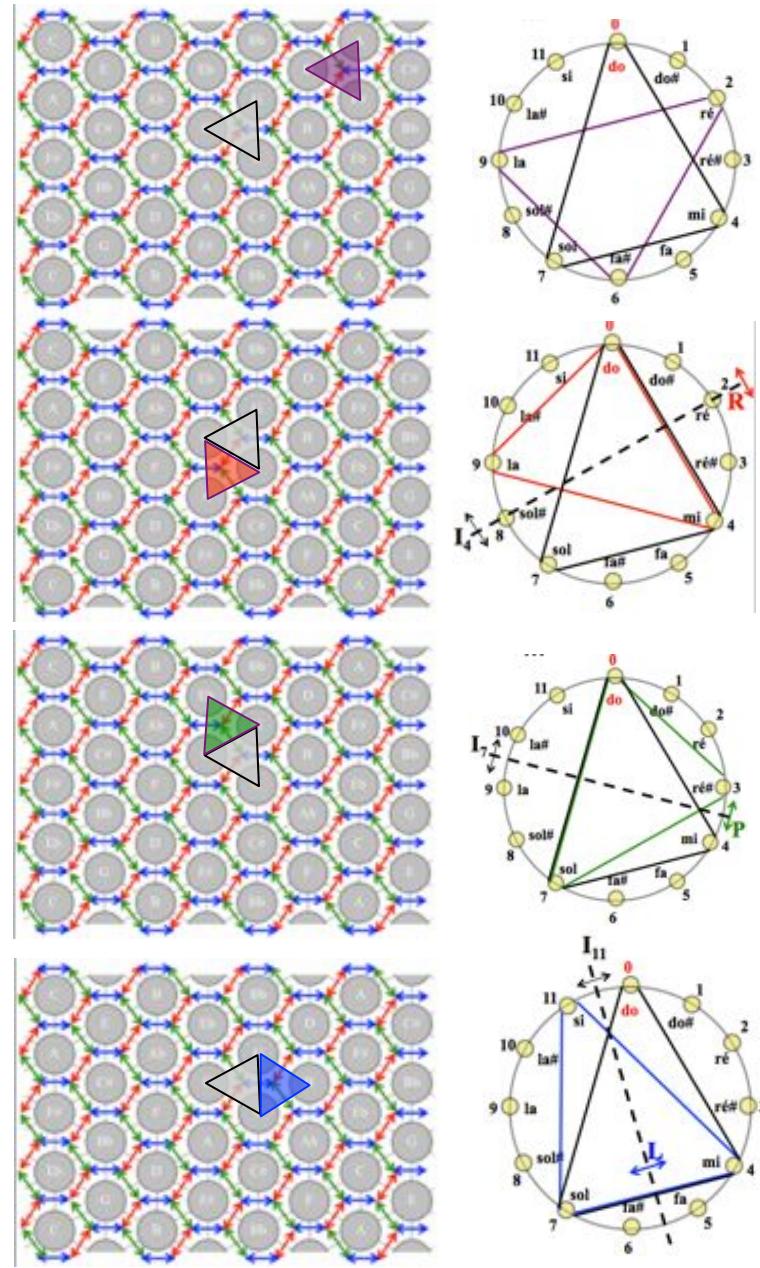
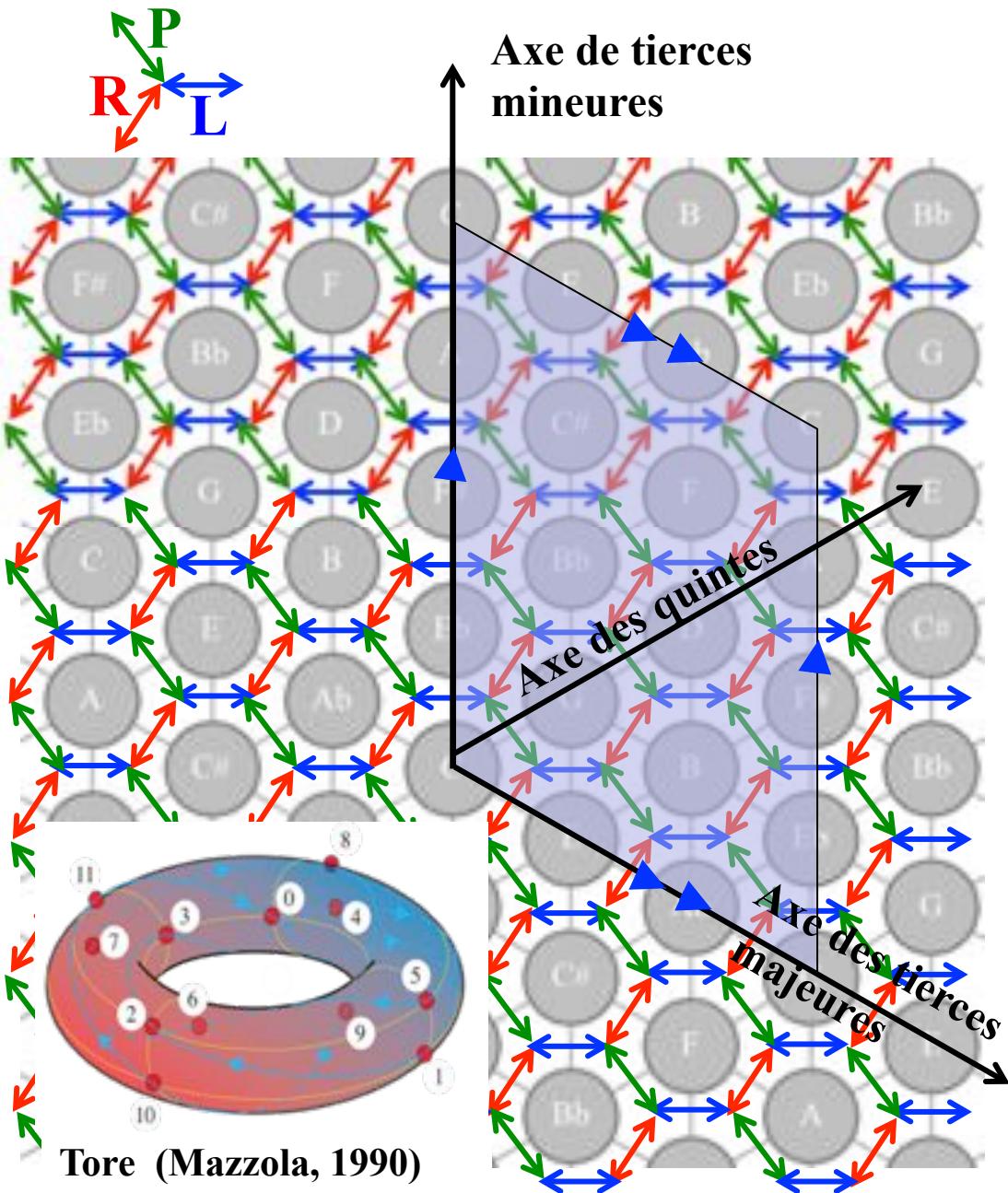
Le Tonnetz... ...un jeu d'enfants !



Le Tonnetz et ses symétries



Le Tonnetz et ses symétries



Harmonies géométriques dans « Madeleine » (Paolo Conte)



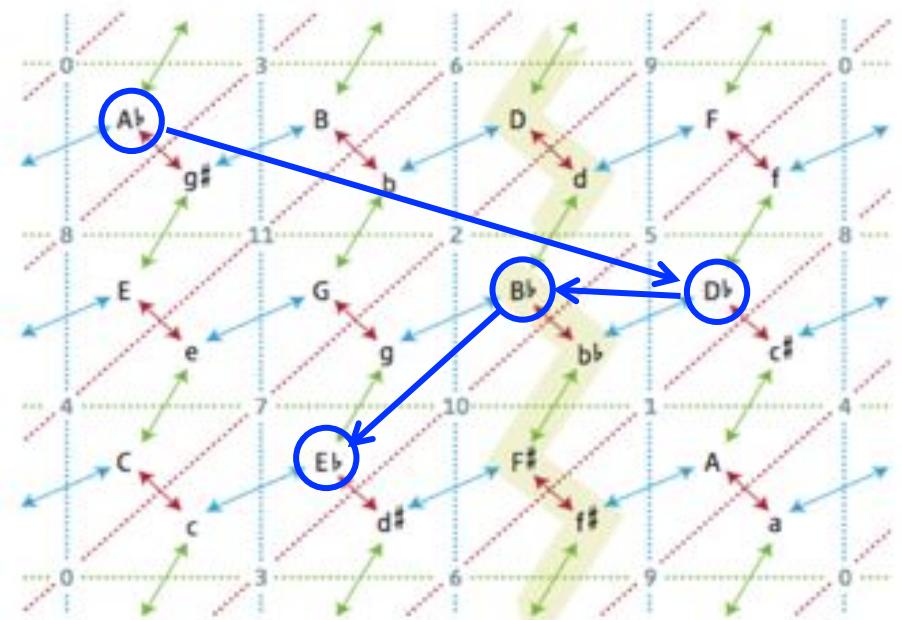
Lab → Réb/Fa → Sib⁷ → Mib⁷/Réb



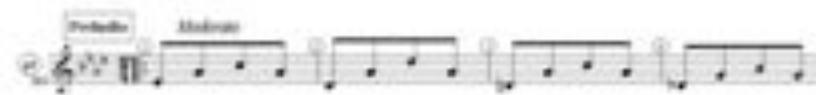
www.mathemusic.net

S. La Via, *Poesia per musica e musica per poesia.*
Dai trovatori a Paolo Conte, Carocci, 2006

- Lab → Réb/Fa → Sib⁷ → Mib⁷/Réb
- Si/Ré# → Mi → Do# → Fa#
- Ré/La → Sol → Mi⁷ → La⁷
- Ré → Lab⁷ → Réb → Do⁷ → Mib



Harmonies géométriques dans « Madeleine » (Paolo Conte)



Lab → Réb/Fa → Sib⁷ → Mib⁷/Réb



www.mathemusic.net

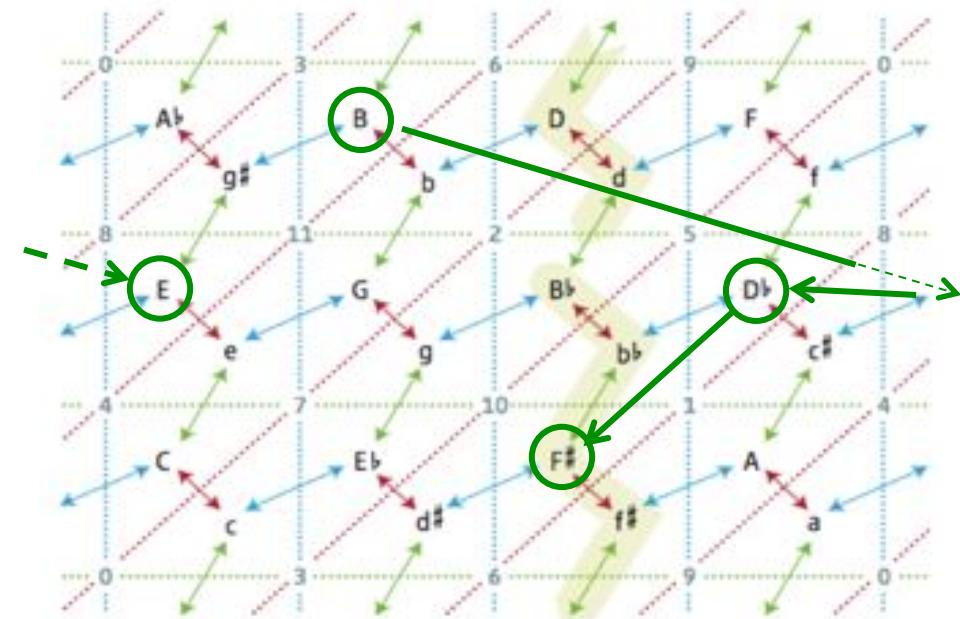
S. La Via, *Poesia per musica e musica per poesia.*
Dai trovatori a Paolo Conte, Carocci, 2006

→ Lab → Réb/Fa → Sib⁷ → Mib⁷/Réb

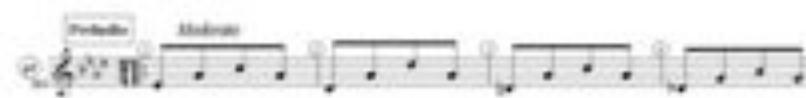
→ Si/Ré# → Mi → Do# → Fa#

→ Ré/La → Sol → Mi⁷ → La⁷

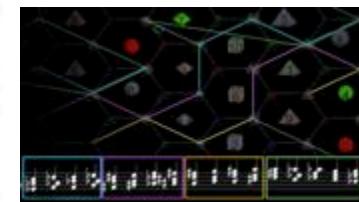
→ Ré → Lab⁷ → Réb → Do⁷ → Mib



Harmonies géométriques dans « Madeleine » (Paolo Conte)



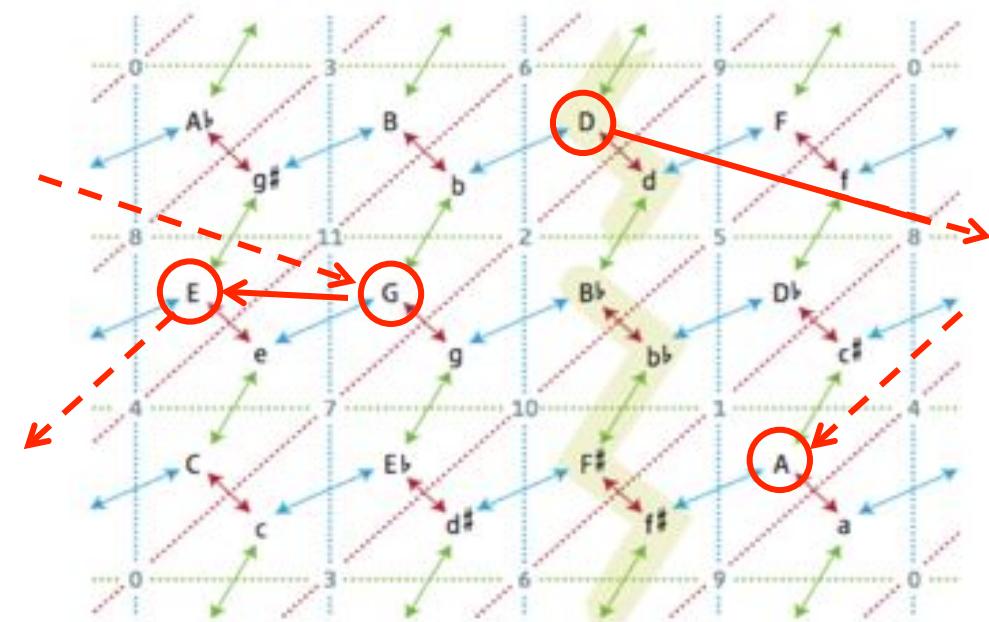
Lab → Réb/Fa → Sib⁷ → Mib⁷/Réb



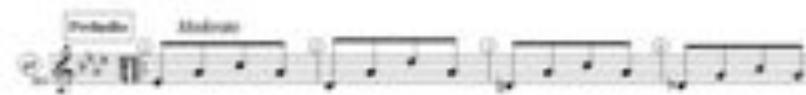
www.mathemusic.net

S. La Via, *Poesia per musica e musica per poesia.*
Dai trovatori a Paolo Conte, Carocci, 2006

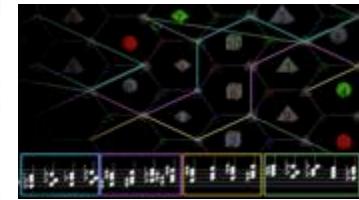
- Lab → Réb/Fa → Sib⁷ → Mib⁷/Réb
- Si/Ré# → Mi → Do# → Fa#
- Ré/La → Sol → Mi⁷ → La⁷
- Ré → Lab⁷ → Réb → Do⁷ → Mib



Harmonies géométriques dans « Madeleine » (Paolo Conte)

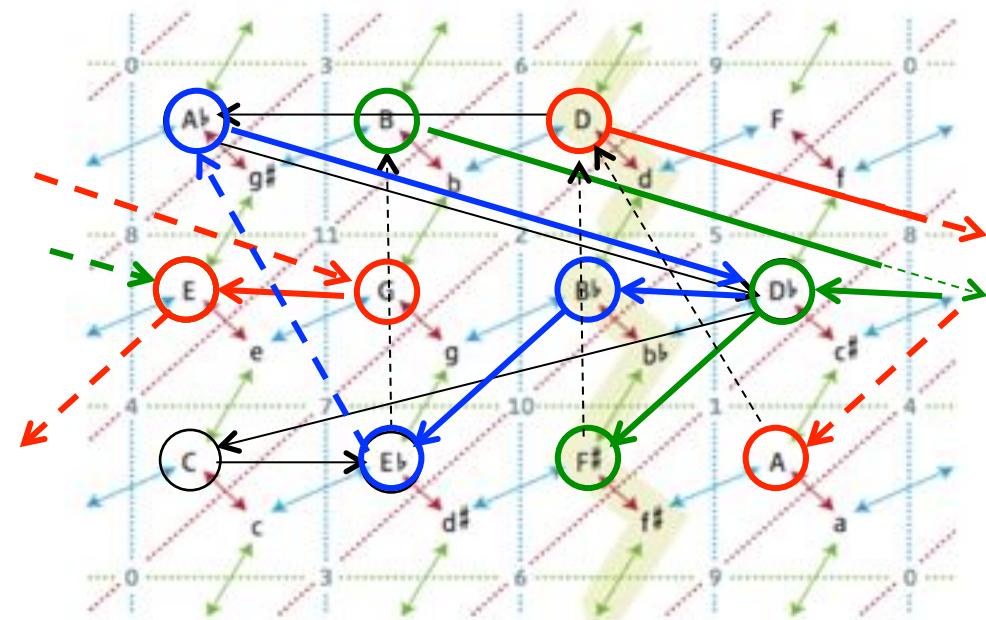
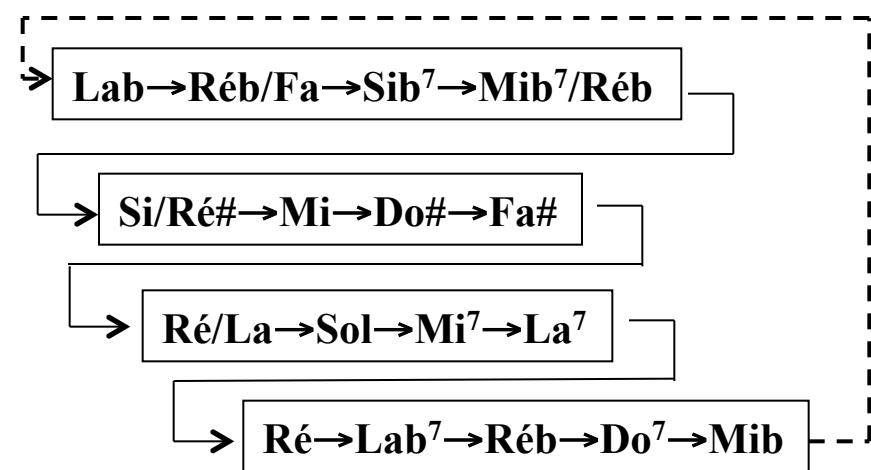


Lab → Réb/Fa → Sib⁷ → Mib⁷/Réb



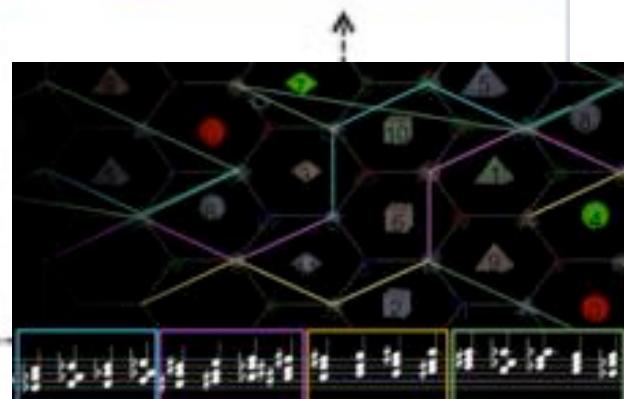
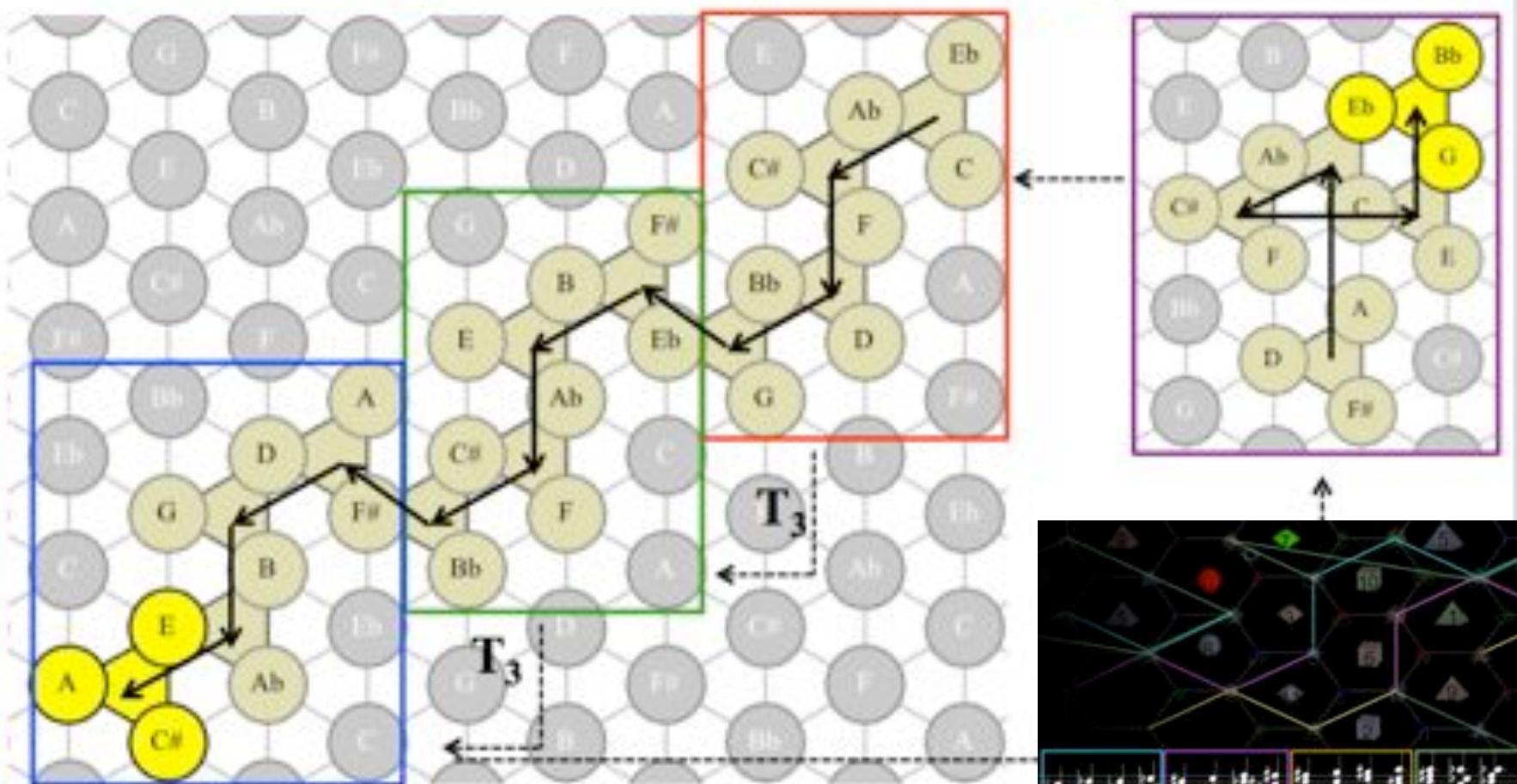
www.mathemusic.net

S. La Via, *Poesia per musica e musica per poesia.*
Dai trovatori a Paolo Conte, Carocci, 2006



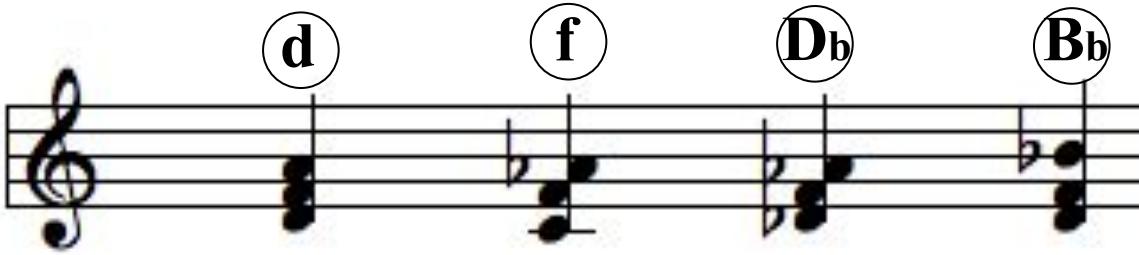
Harmonies géométriques dans « Madeleine » (Paolo Conte)

La_b Ré_b Si_b Mi_b Si Mi Ré_b Fa_# Ré Sol Mi La Ré La_b Ré_b Do Mi_b



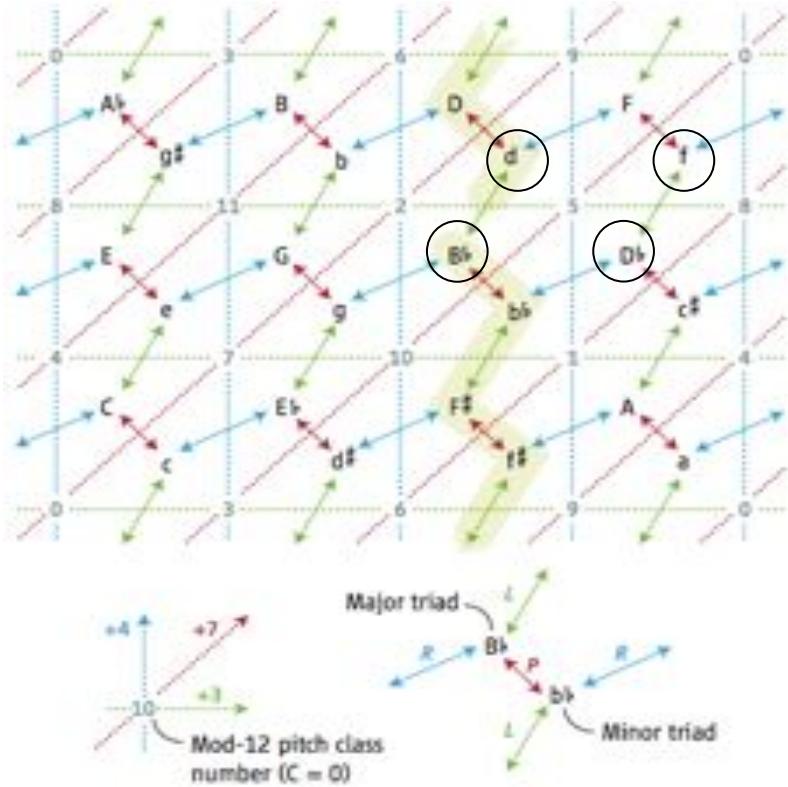
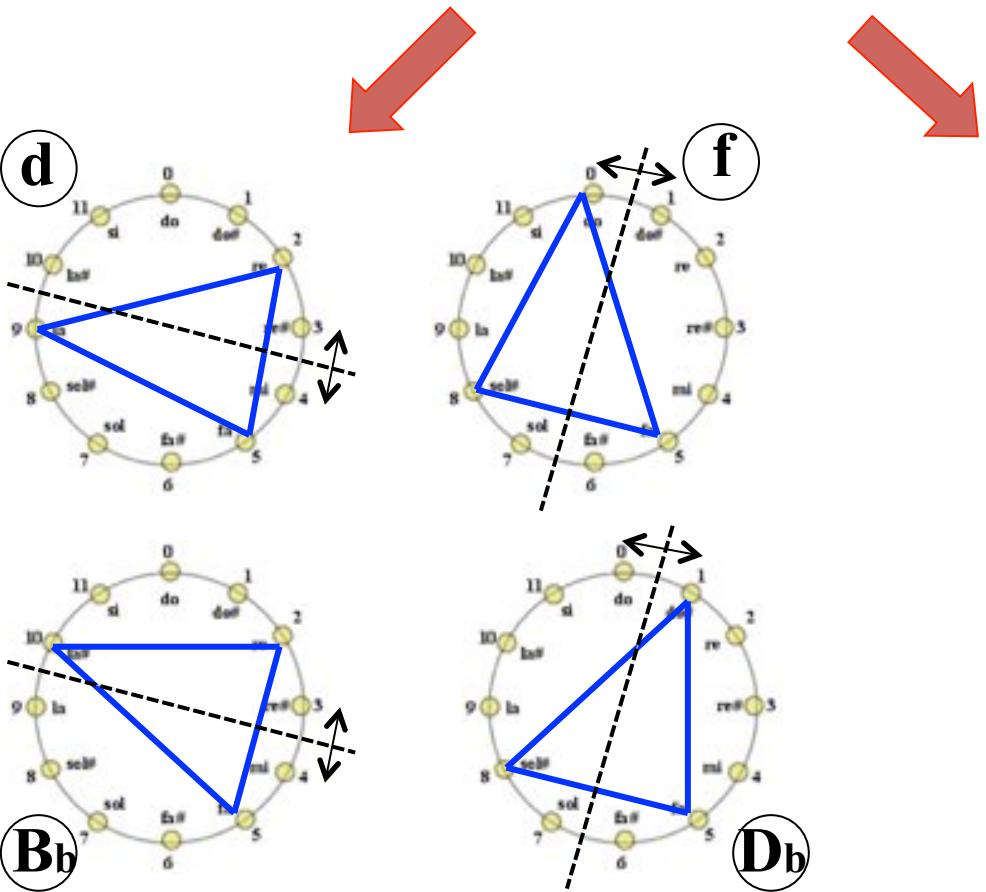
Symétries spatiales dans la musique pop

Guy Capuzzo, "Neo-Riemannian Theory and the Analysis of Pop-Rock Music", Music Theory Spectrum 26(2), 177-199, 2004



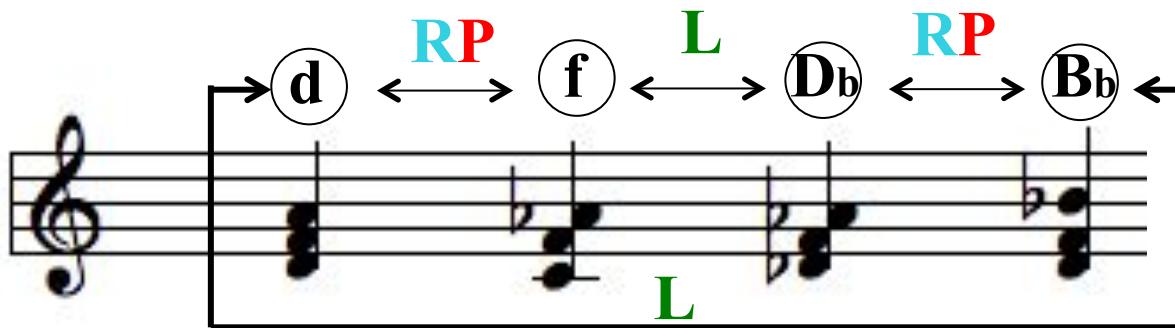
Shake the disease - 1985

(Depeche Mode) – min. 2'17"



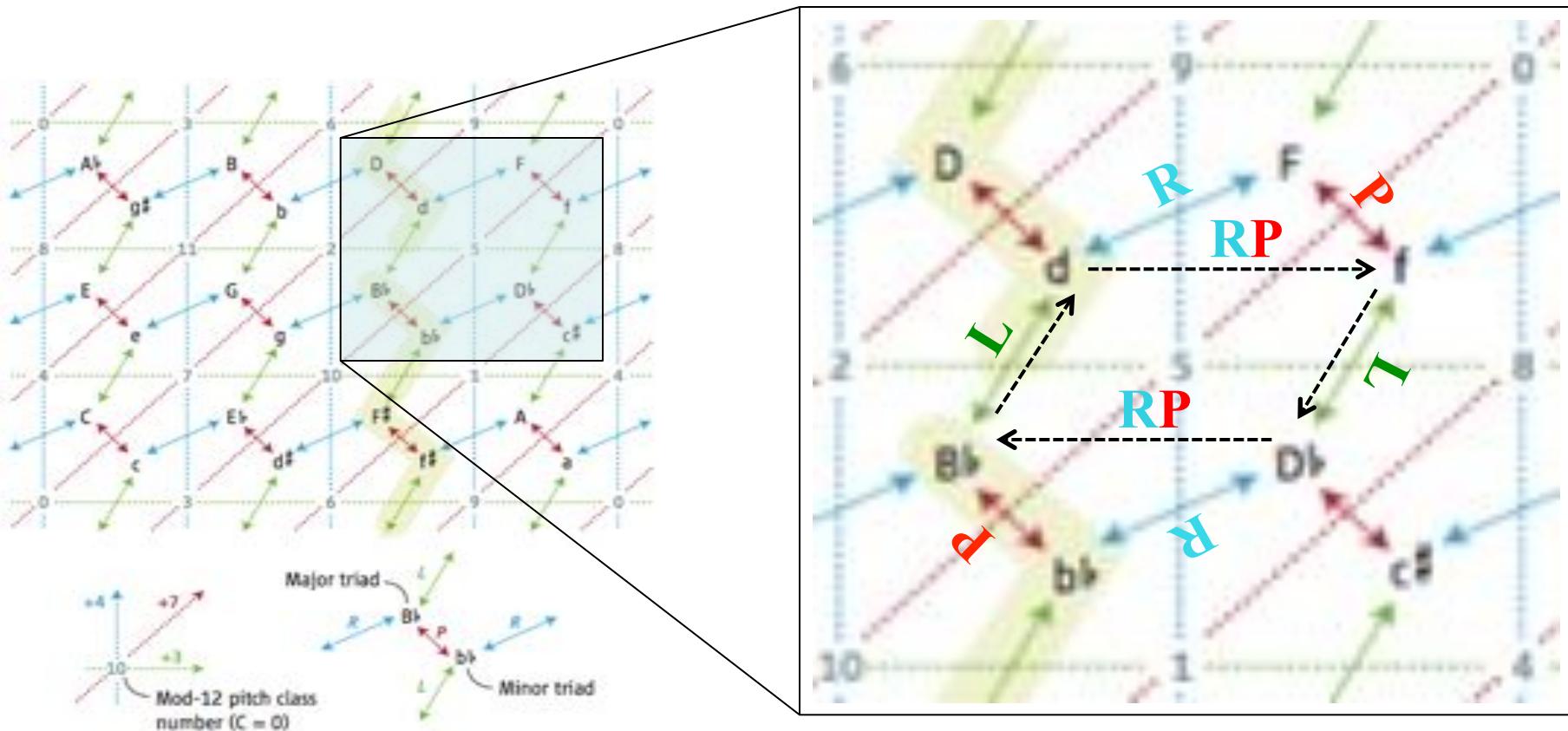
Le parcours harmonique et ses raccourcis...

Guy Capuzzo, "Neo-Riemannian Theory and the Analysis of Pop-Rock Music", Music Theory Spectrum 26(2), 177-199, 2004



Shake the
disease - 1985
(Depeche Mode)

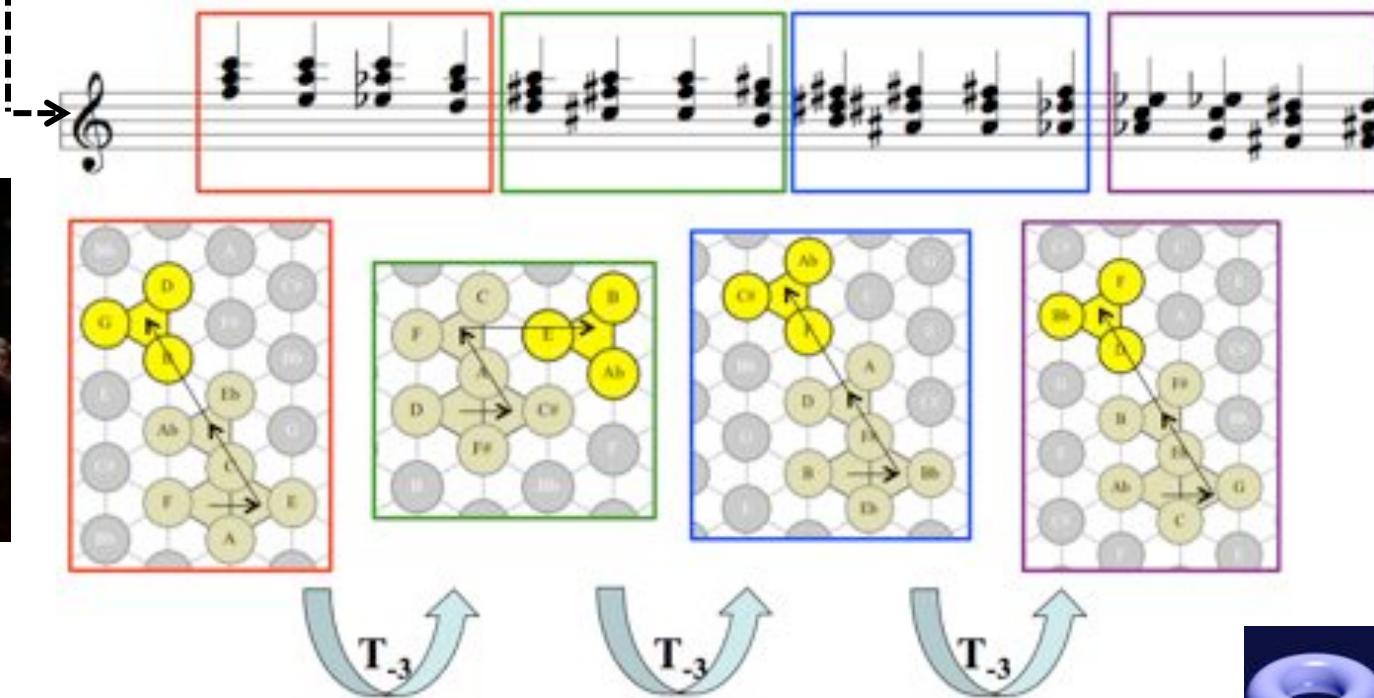
Séquence: **RPLRPL**



Progressions harmoniques et symétries chez Zappa

Musical score for 'Synthesizer' showing harmonic progressions. The score consists of two staves. The top staff shows chords G+, A+, F+, A-, Ab+, G+, D+, F#-, F+, E+ over measures 5/3, 6/4, 5/3, 5/3, 6/4, 5/3. The bottom staff shows chords B+, D#-, D+, C#+, A#-, C-, B+, B#- over measures 5/3, 6/4, 5/3. A dashed box encloses the first half of the score. The second half begins with a 'Fine' instruction and continues with chords E+, B+, F#-, C#+, F#+, A+, E+, E- over measures 5/3, 6/4, 5/3.

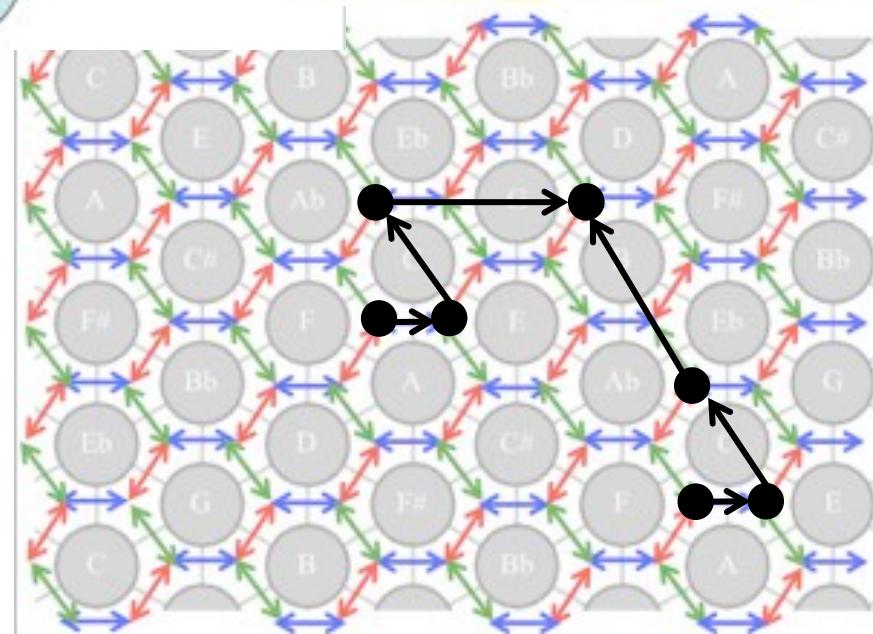
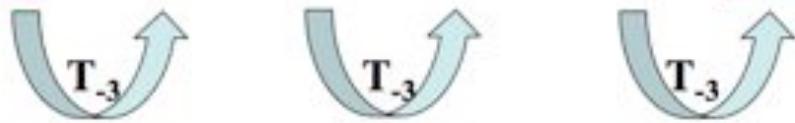
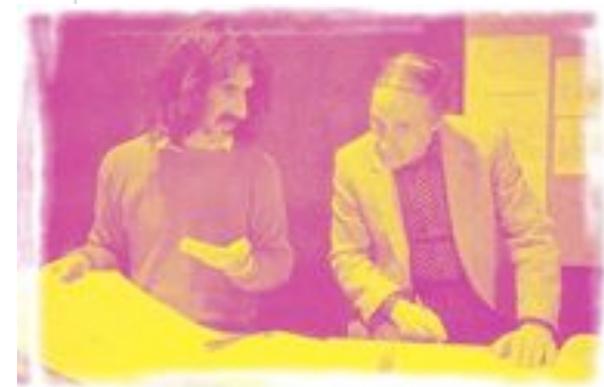
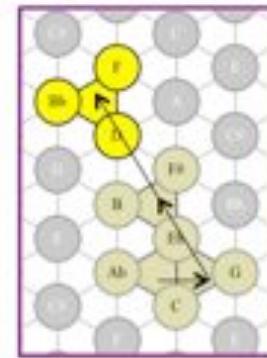
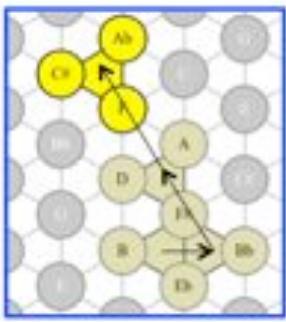
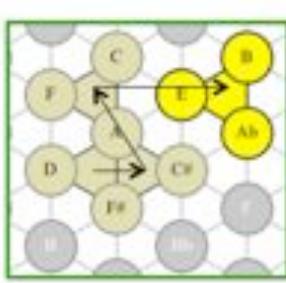
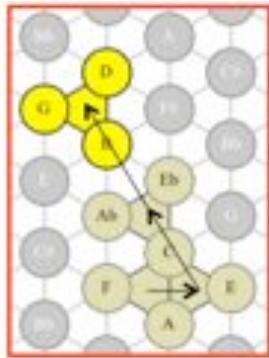
Guy Capuzzo, Neo-Riemannian Theory and the Analysis of Pop-Rock Music, *MTS*, 26/2, 2004, 177–200



« Easy Meat » - 1981 (F. Zappa)
min. 1'44" – 2'39"

La trajectoire spatiale comme signature

Fa la_m La_b Sol Ré fa#_m Fa Mi Si la#_m Ré Ré_b La_b do_m Si Si_b



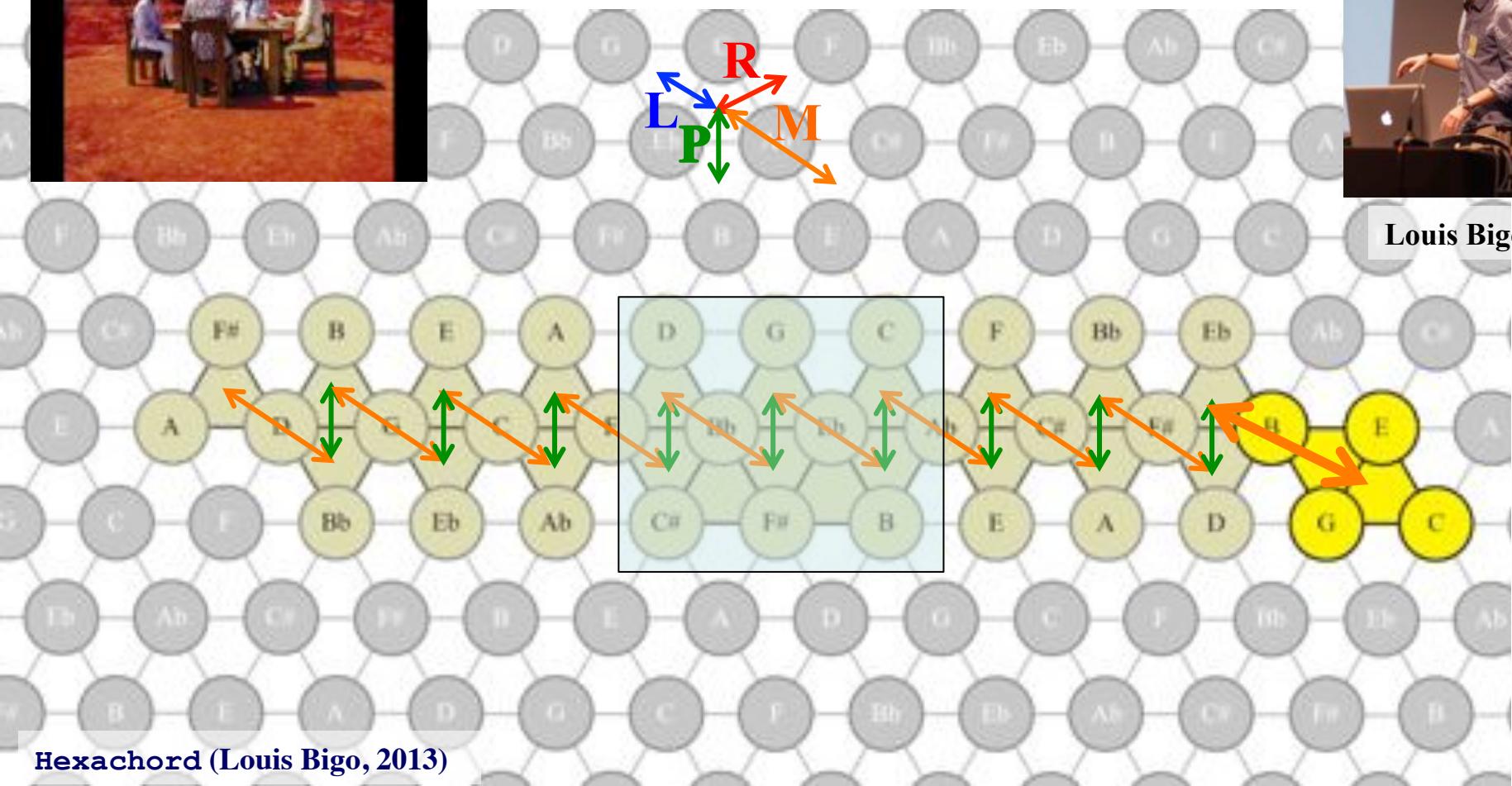
Symétries et procédés algorithmiques chez *Muse*



« Take a bow » (*Black Holes and Revelations*, 2006)



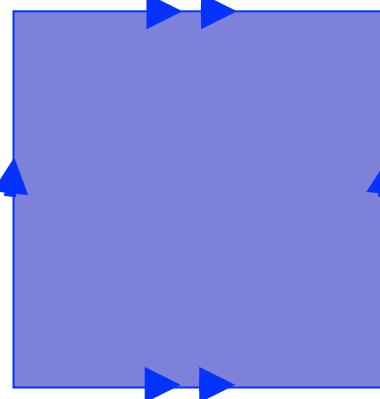
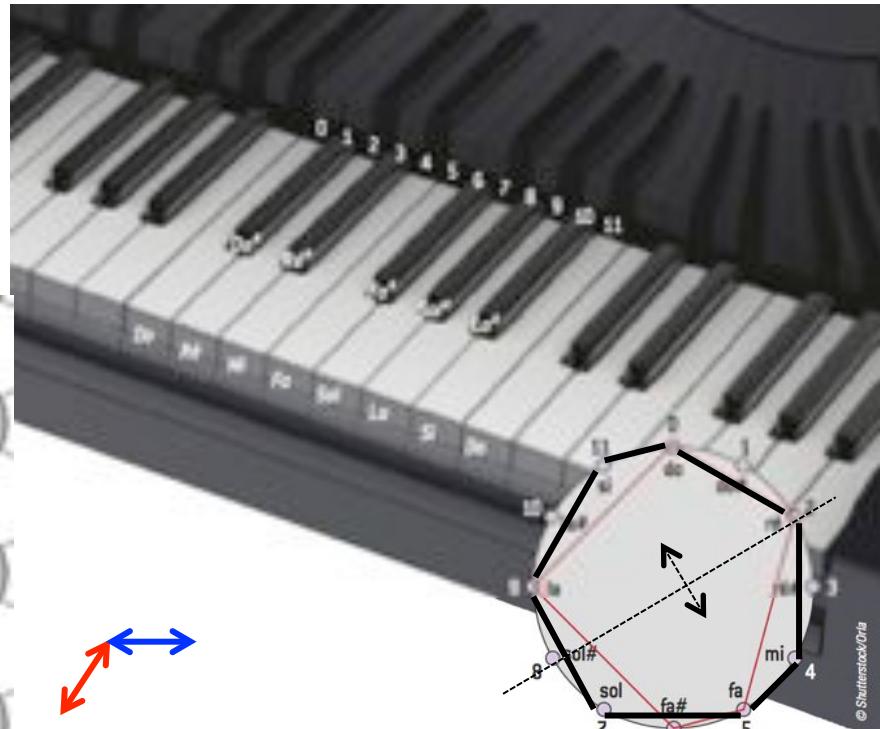
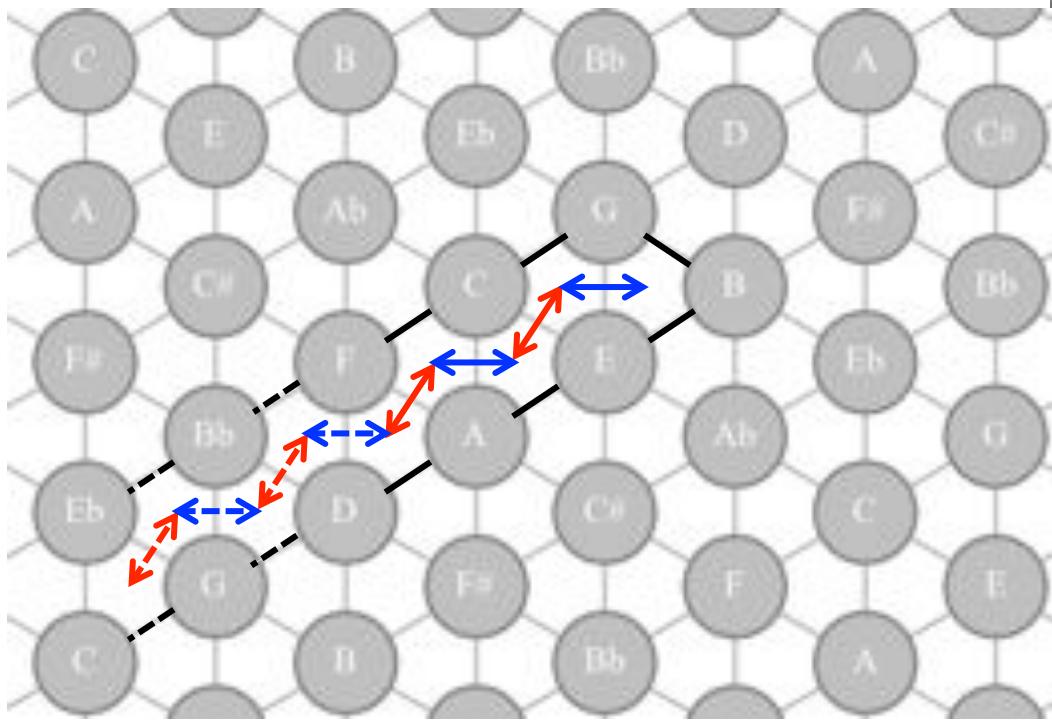
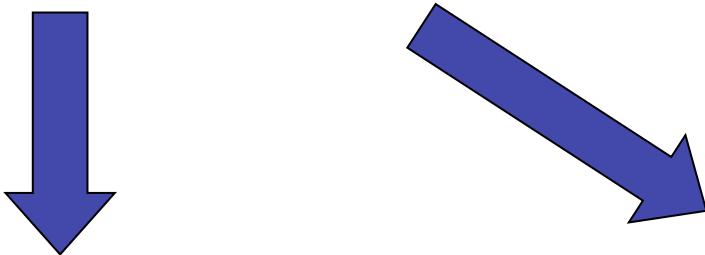
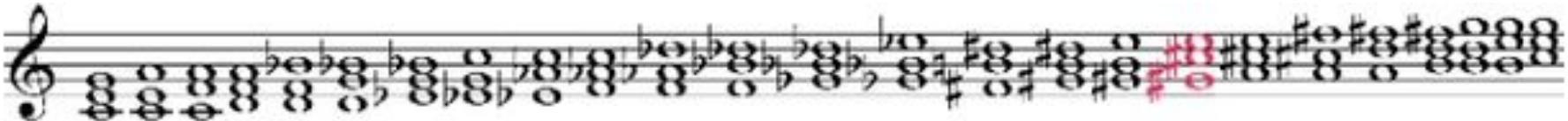
Louis Bigo



Hexachord (Louis Bigo, 2013)

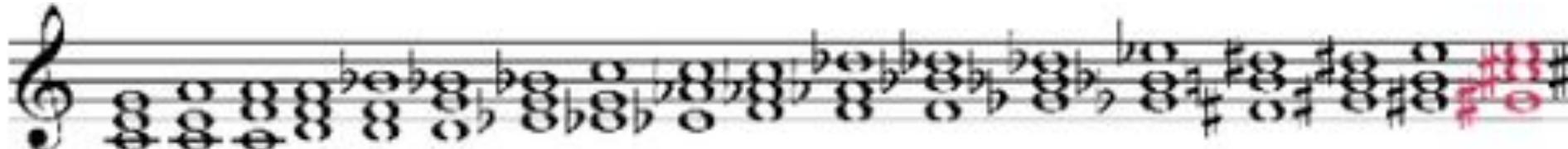
→
temps (logique)

Progressions harmoniques comme trajectoires spatiales

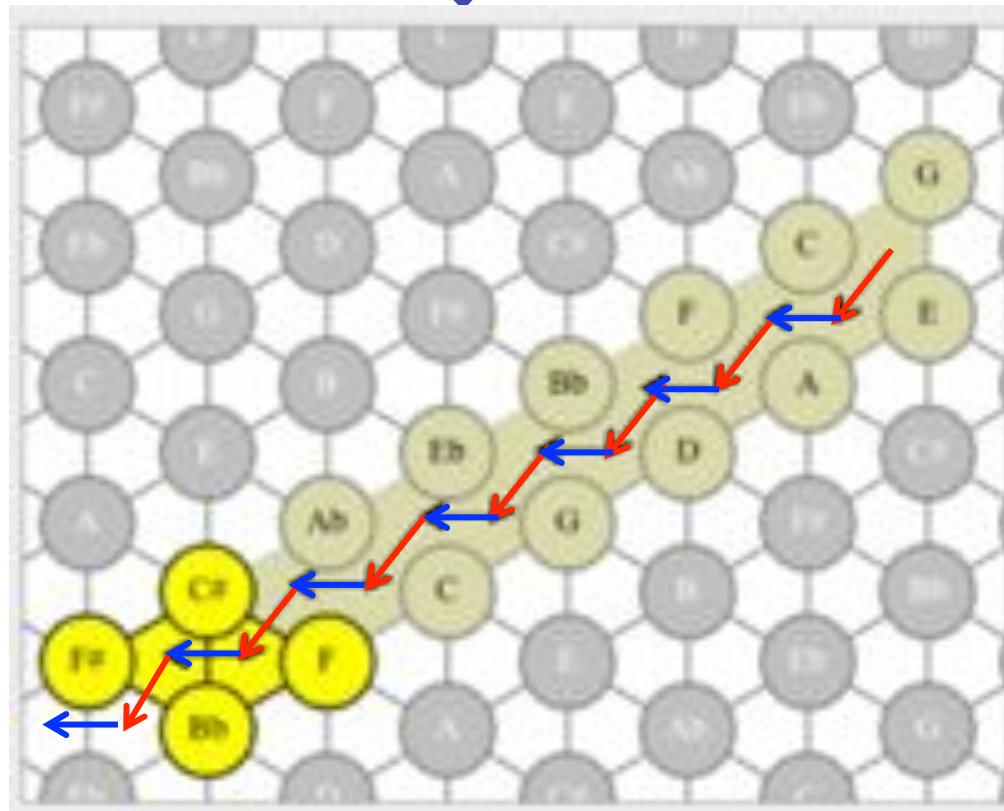
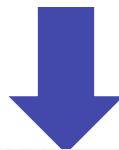


Hexachord (Louis Bigo, 2013)

Extrait du 2^e mouvement de la Symphonie No. 9 (L. van Beethoven)

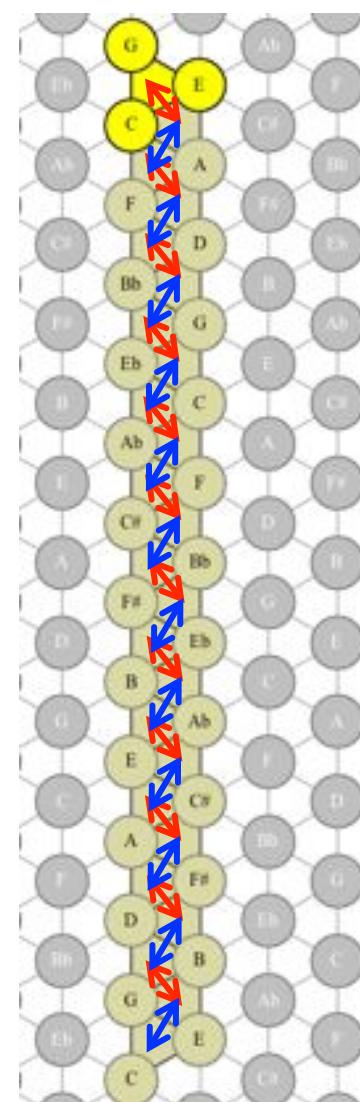
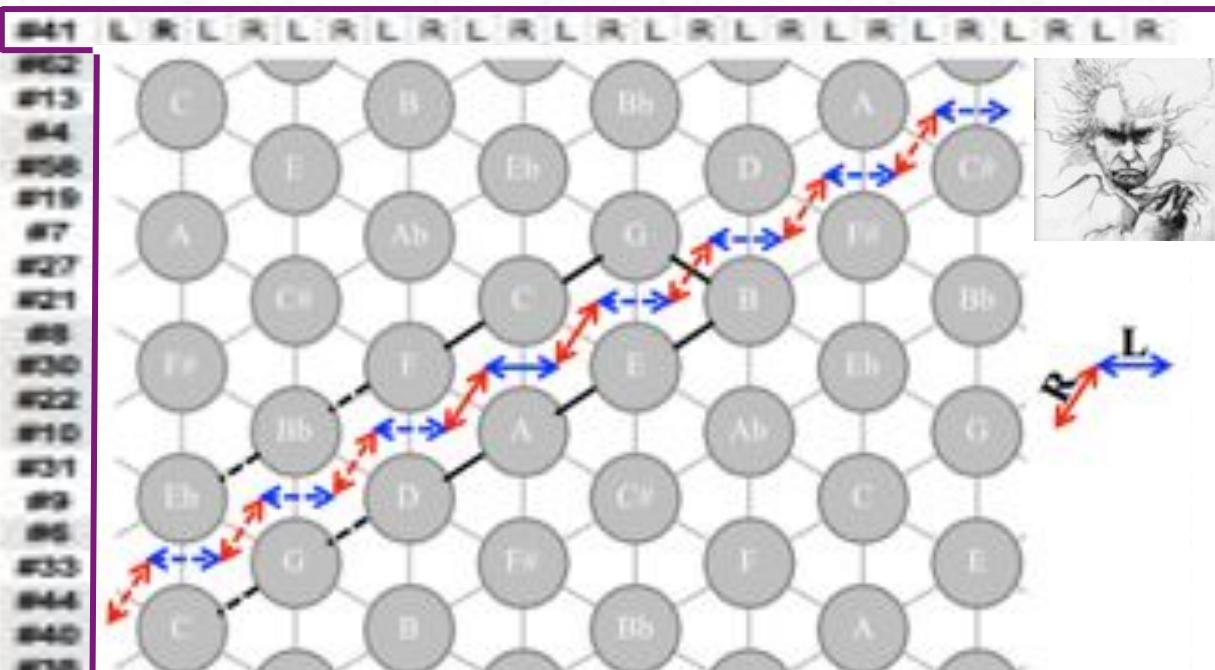
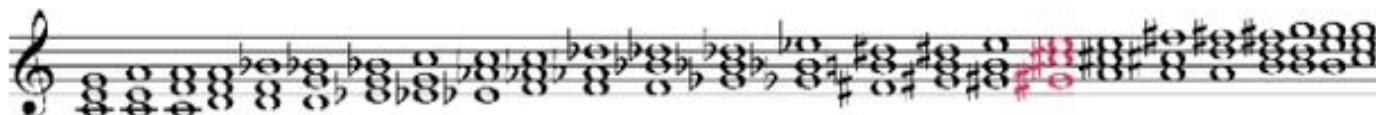


→ → → → → → → → → ...



L
R

A la recherche des cycles hamiltoniens (et leurs retrogrades)



Le blé en herbe

(Polo/Moreno/Dieu)

Plonger comme un enfant, cheveux au vent
Sous l'océan du blé en herbe
Marée d'épis couleur d'amande
Qui tendent à caresser le ciel

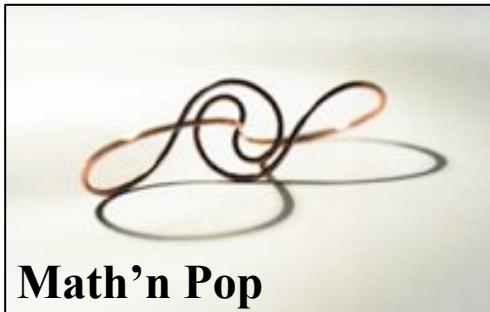
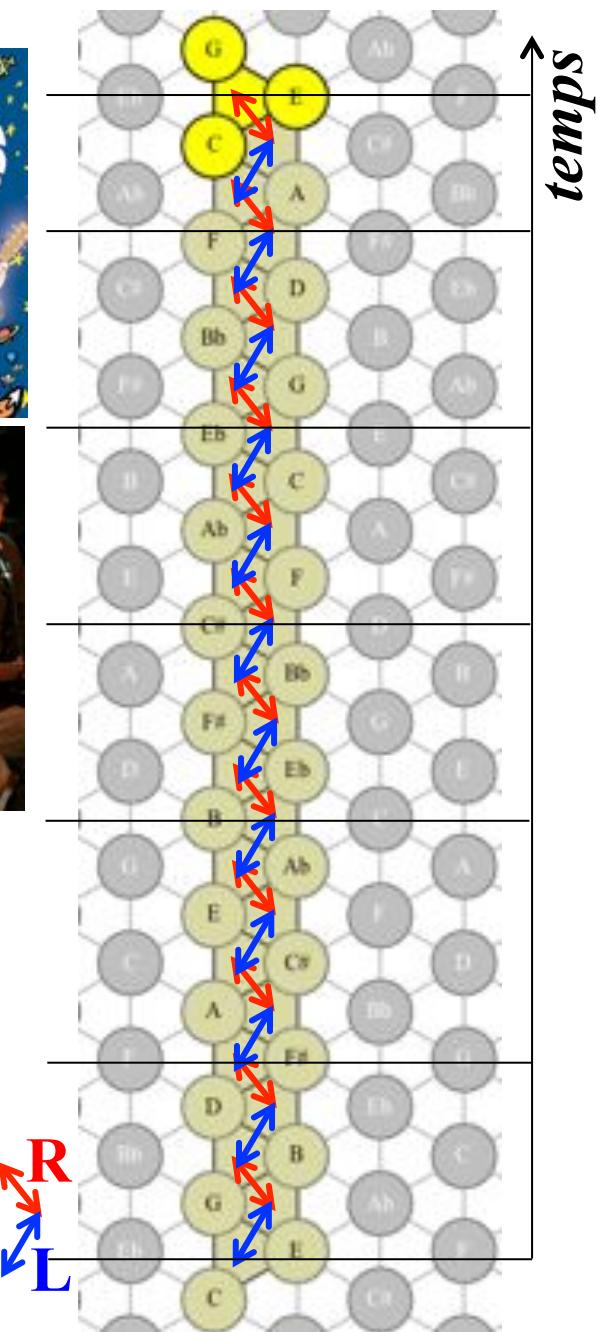
Algues tendres de mille plages
Frôlant le ventre des nuages
Cheveux de pluie, dos de poissons
Qui frissonnent à l'unisson

Suivre le bord des continents
Dans l'océan du blé en herbe
Pêcher le corail du pavot
Dans le sang des coquelicots

Croiser matin dans l'herbe folle
Deux tourterelles qui s'envolent
Suivre les jeux des hirondelles
Sur le paysage éternel

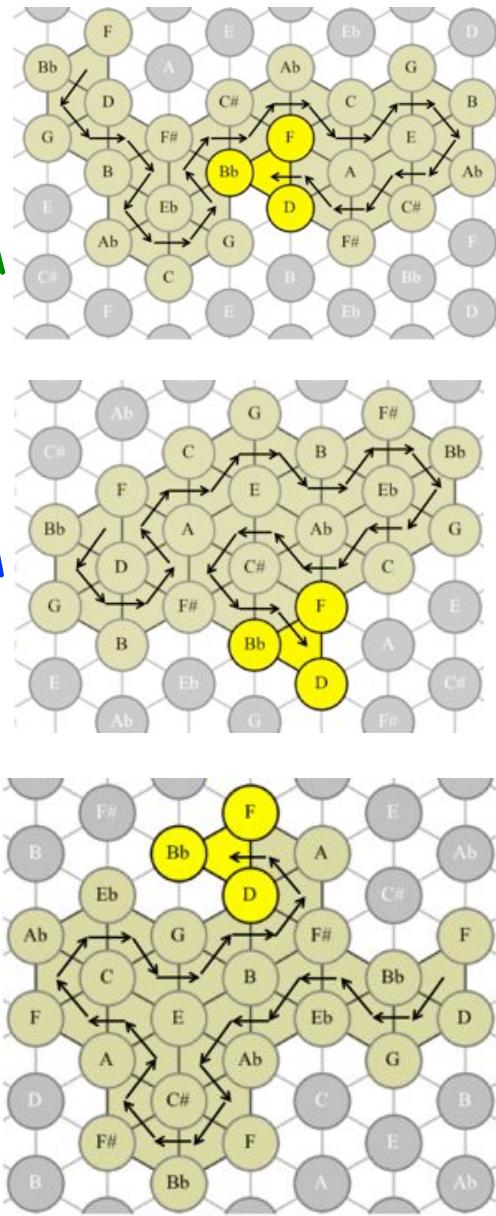
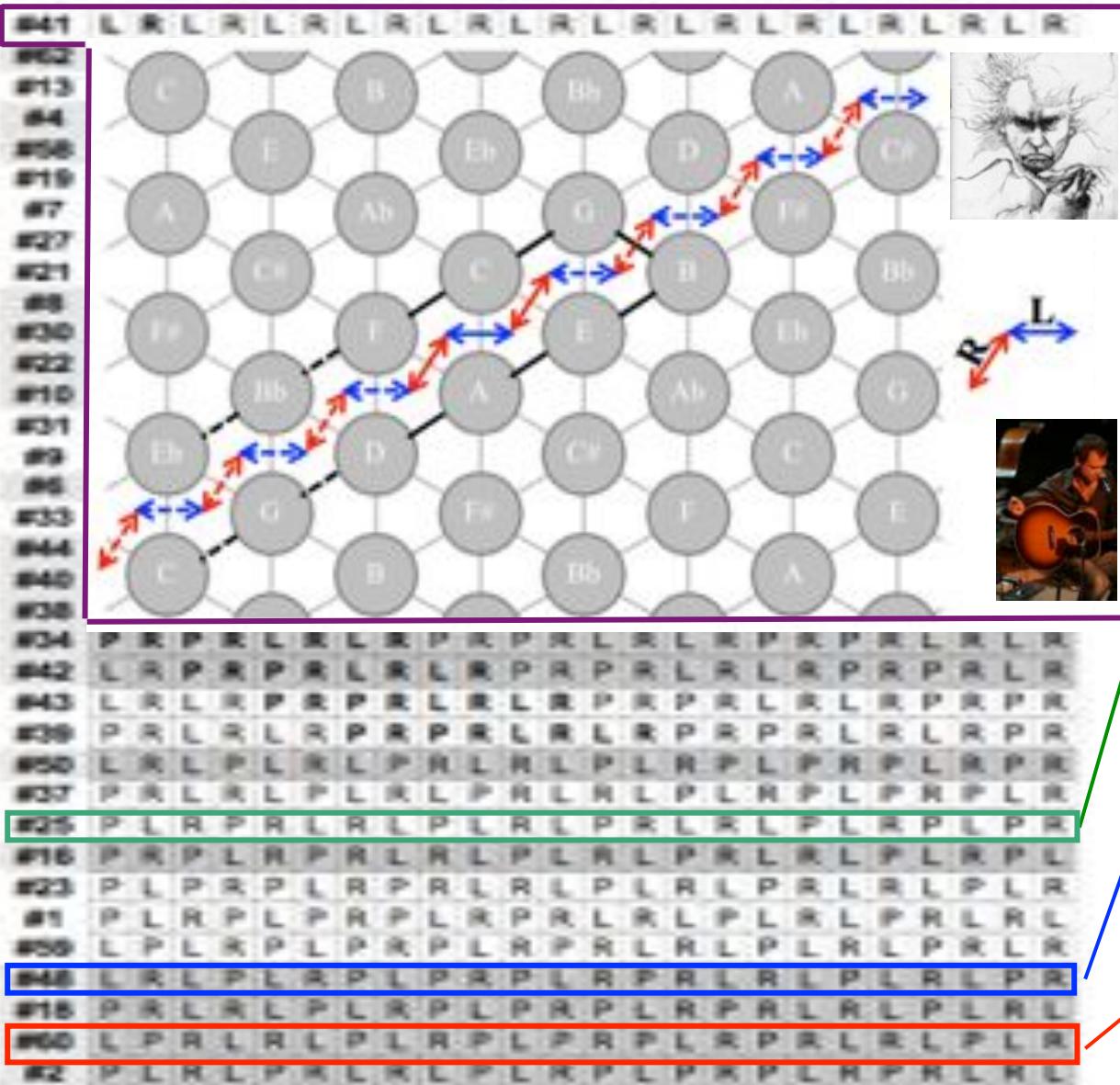
Nager comme un enfant, cheveux au vent
Sous l'océan
Du blé en herbe
Marée de fruits au goût amer
Acide et salée comme la mer

Vers l'îlot d'un petit village
Vers un château d'eau sur la plage
Quand tout s'éteint avant l'orage
Quand se lève le vent du large
Sur le blé vert



→ Le Blé en Herbe

Cycles hamiltoniens sans périodicité interne



Aprile (d'après Gabriele D'Annunzio)**Aprile**

4D & 2D Visualizations
Hamiltonian Cycles
M.Andreatta, GBaroën 2013

Lyrics: Gabriele d'Annunzio
Music and Vocals: Moreno Andreatta
Hypersphere and Ideogramms: Gilles Baroën
Original "Chicken Wire" graph: J.Douthett, PSteinbach

<http://www.mathemusic.net>

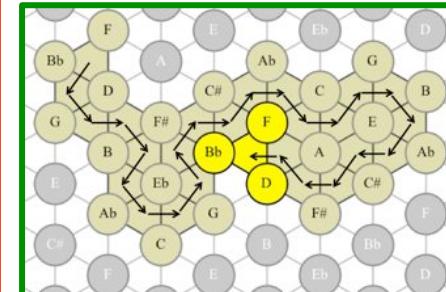
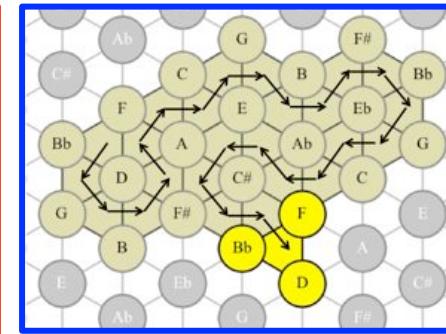
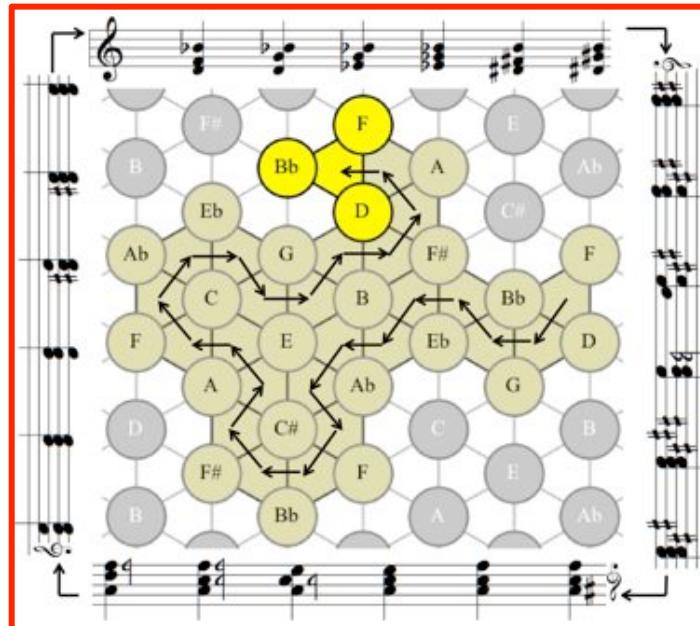
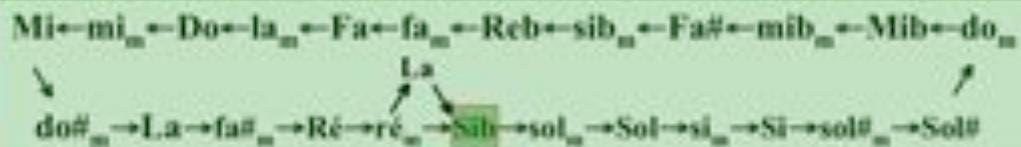
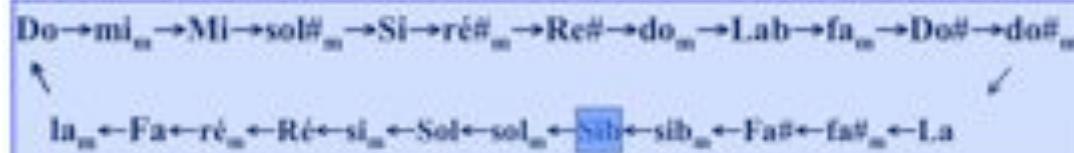
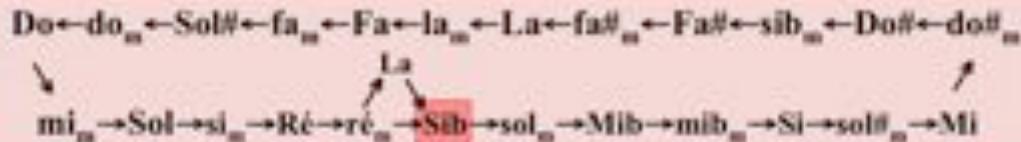
La fenêtre est entr'ouverte, sur le jardin.
Une heure passe, lente, somnolente.
Et elle, d'abord attentive, finit par s'endormir.

À cette voix qui là-bas se lamente,
Qui se lamente au fond de ce jardin.

Ce n'est qu'une voix d'eau sur la pierre,
Et combien de fois, combien de fois entendue !
Cet amour et cette heure s'abiment dans cette vie
Comme s'abiment dans l'onde sans fin
Le cadavre et la pierre liés ensemble.

Elle détend son angoisse dans le sommeil.
Mais l'angoisse est forte, et le sommeil est si léger !
(La lumière d'avril ressemble presque à une neige
qui serait tiède.)

Et certes elle doit souffrir,
Vaguement souffrir, aussi dans le sommeil.



La sera : chanson hamiltonienne redondante

#41 L R L R L R L R L R L R L R L R L R L R
 #62 L P L P L P L P L P L P L P L P L P L P L
 #13 P L R L P L P L P L P L P L P L P L P L P L
 #44 P L P L R L P L P L P L P L P L P L P L P L
 #66 L P L P L P L P L P L P L P L P L P L P L P R

Luzi



(min. 1'19")



L P L P L R L P L P L R ...
 P L P L R L ...
 L P L R L P ...
 P L R L P L ...
 L R L P L P ...
 R L P L P L ...

La sera non è più la tua canzone
 (Mario Luzi, 1945, tratto da *Poesie sparse*)

La sera non è più la tua canzone,
 è questa roccia d'ombra traforata
 dai lumi e dalle voci senza fine,
 la quiete d'una cosa già pensata.

Ah questa luce viva e chiara viene
 solo da te, sei tu così vicina
 al vero d'una cosa conosciuta,
 per nome hai una parola ch'è passata
 nell'intimo del cuore e s'è perduta.

Caduto è più che un segno della vita,
 riposi, dal viaggio sei tornata
 dentro di te, sei scesa in questa pura
 sostanza così tua, così romita
 nel silenzio dell'essere, (compiuta).

L'aria tace ed il tempo dietro a te
 si leva come un'arida montagna
 dove vaga il tuo spirito e si perde,
 un vento raro scivola e ristagna.



Les contraintes dans l'art : l'OuLiPo (Ouvroir de Littérature Potentielle)



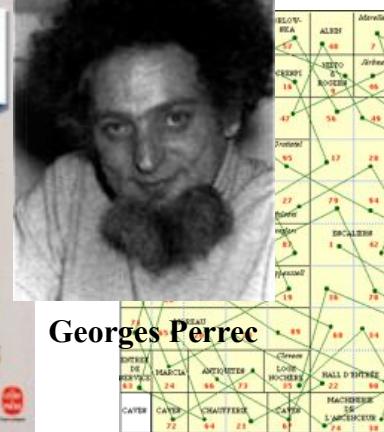
Cent mille milliards de poèmes, 1961



La vie mode d'emploi,



Georges Perec



Georges
Perec

Roman

La disparition

Les Lettres Nouvelles

Denoël



Raymond Queneau

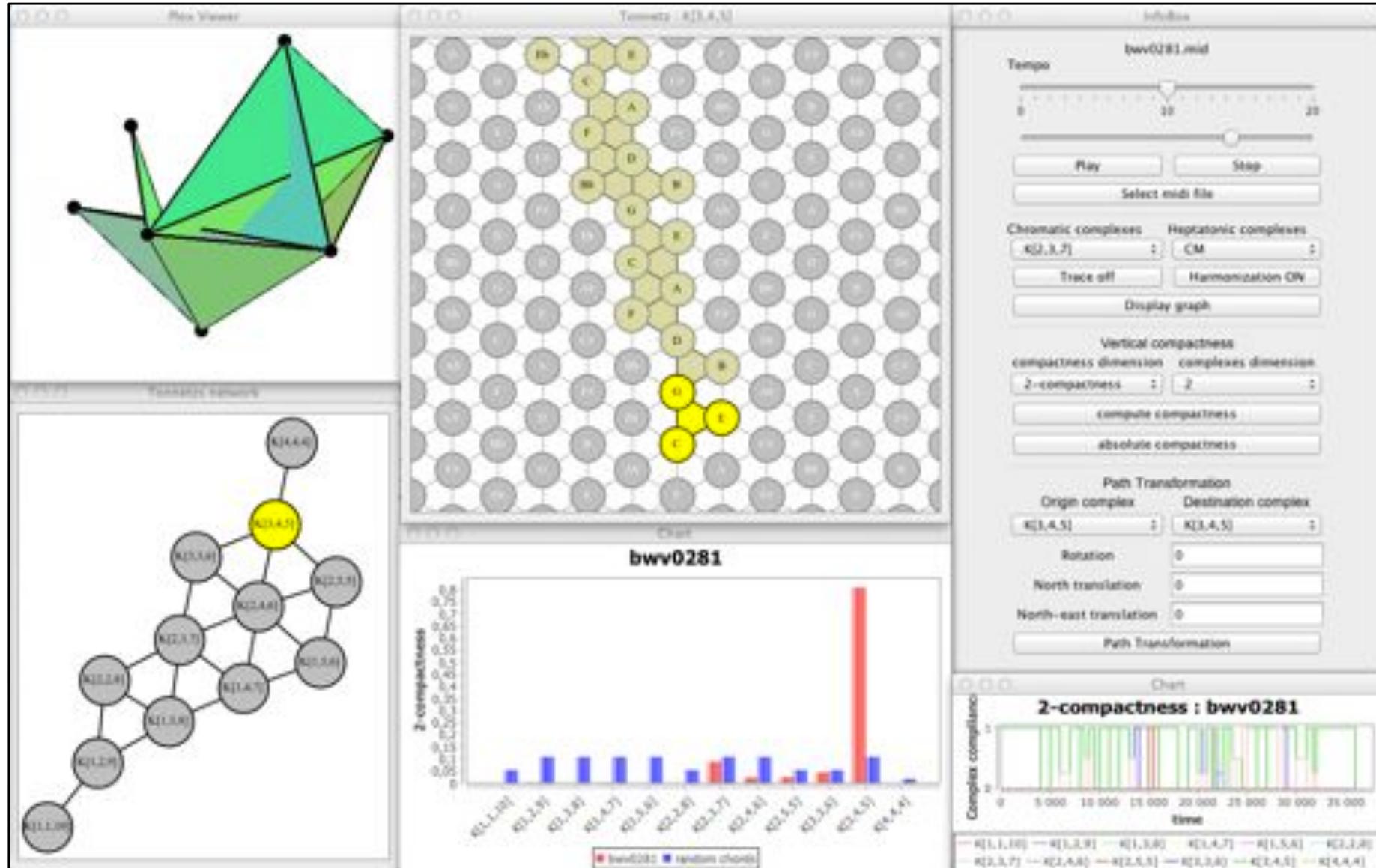


Italo Calvino

*Le Château des
destins croisés*, 1969



Hexachord et la classification stylistique



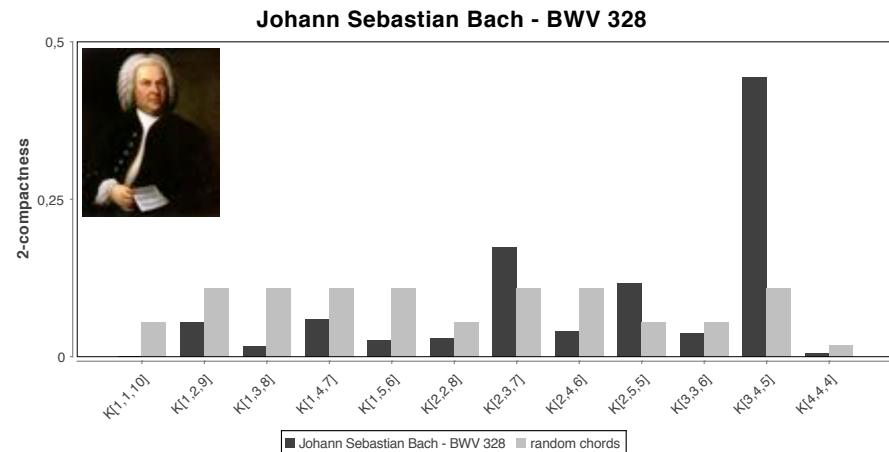
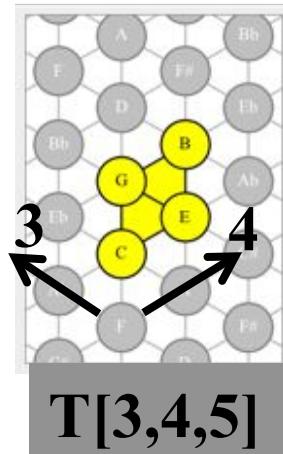
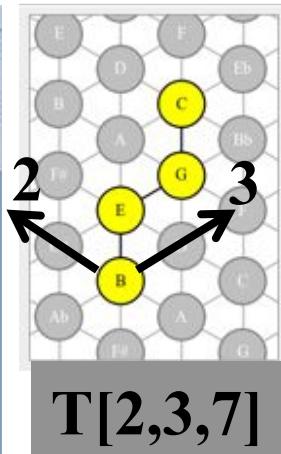
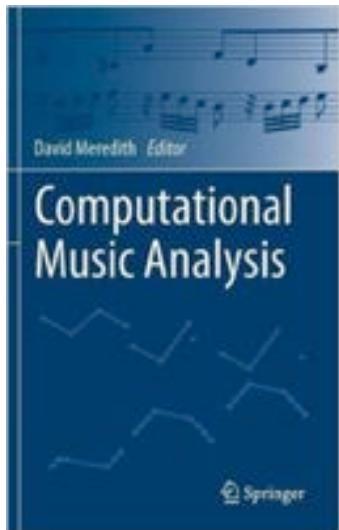
→ <http://www.lacl.fr/~lbigo/hexachord>

Le caractère spatial de la « logique musicale »

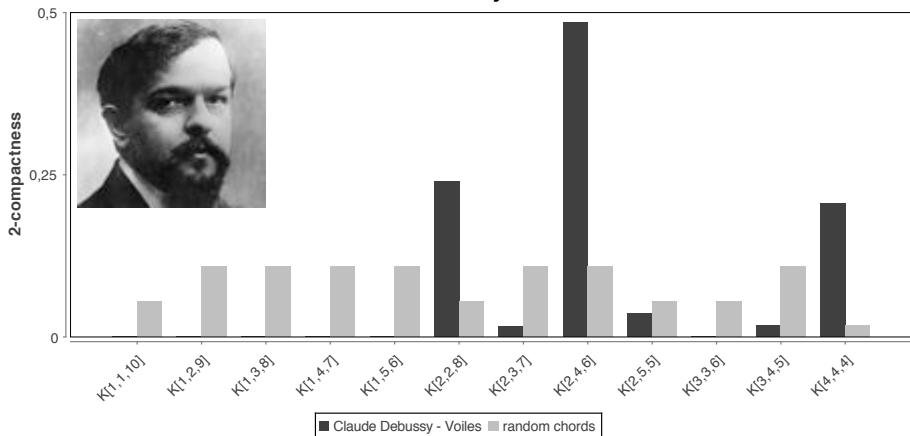
Bigo L., M. Andreatta, « Musical analysis with simplicial chord spaces », in D. Meredith (ed.), *Computational Music Analysis*, Springer, 2015



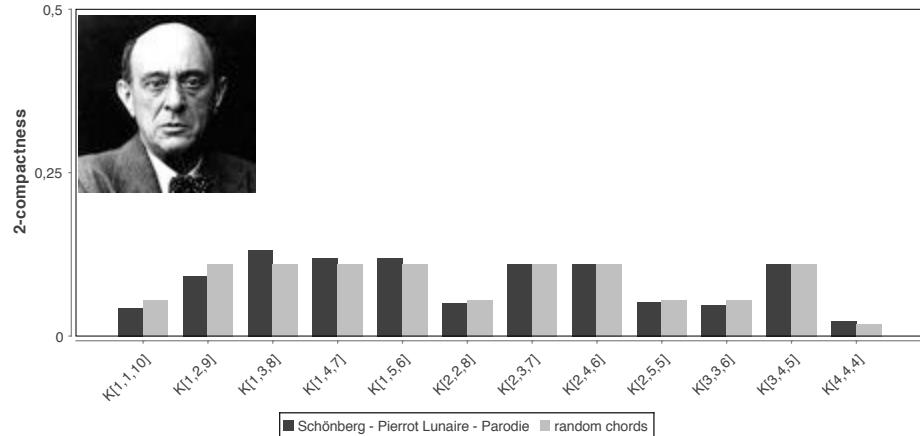
Louis Bigo



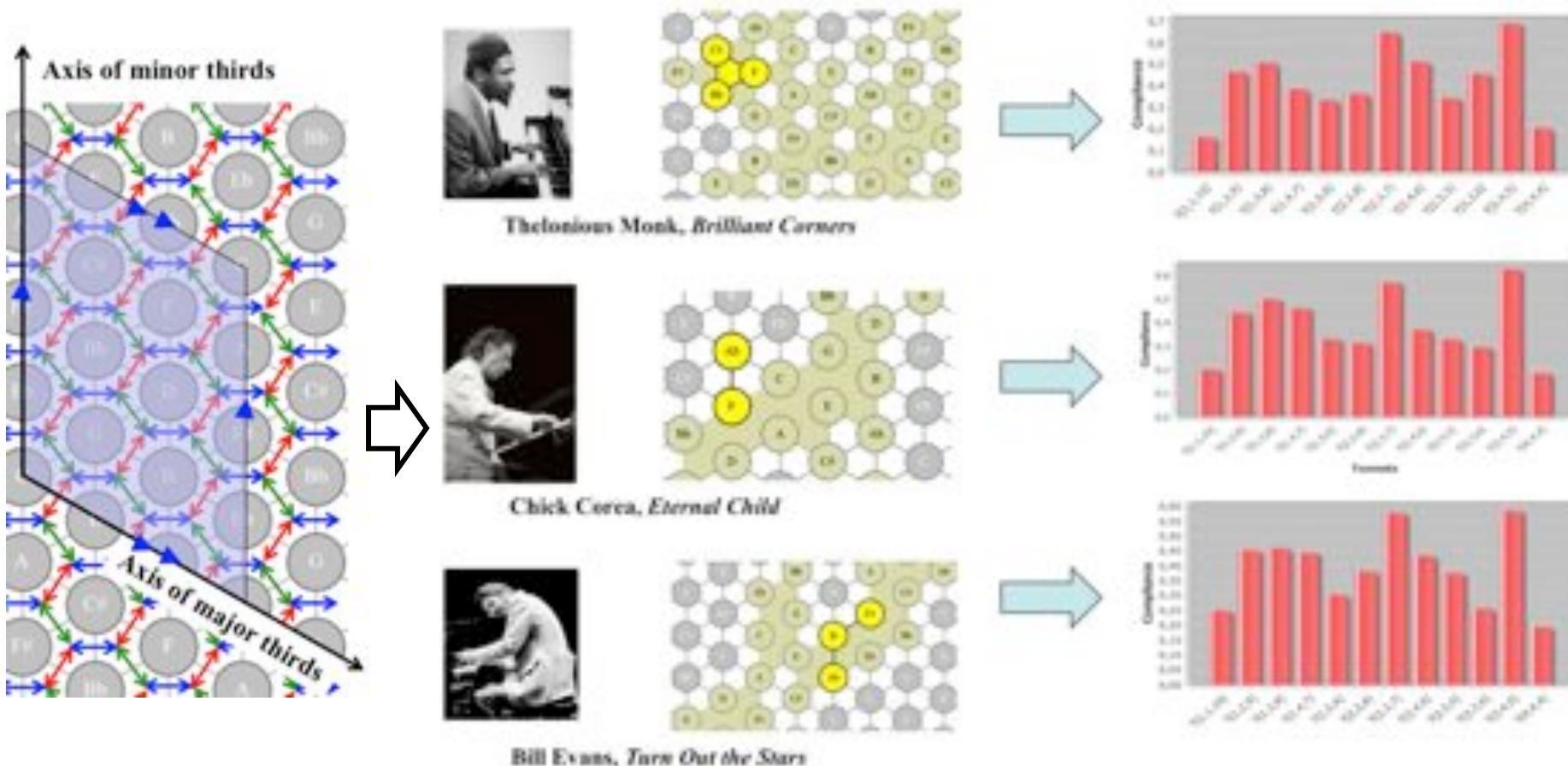
Claude Debussy - Voiles



Schönberg - Pierrot Lunaire - Parodie



L'espace comme paramètre de style

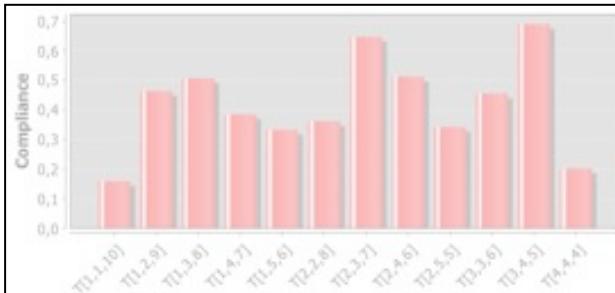
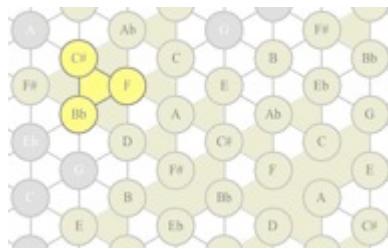


→ Vers une classification automatique géométrique des genres musicaux?

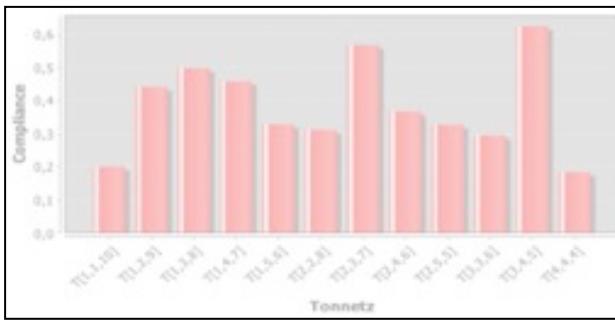
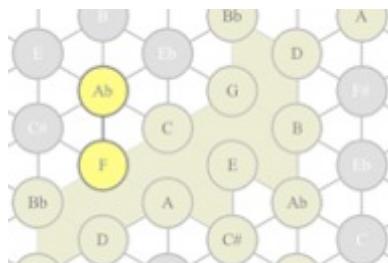
L'espace géométrique comme paramètre de style



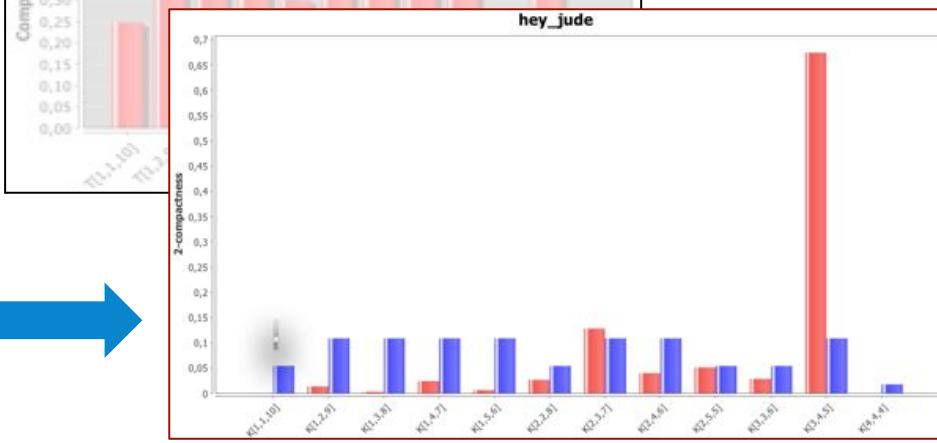
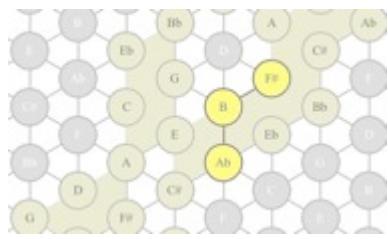
Thelonious Monk,
Brilliant Corners



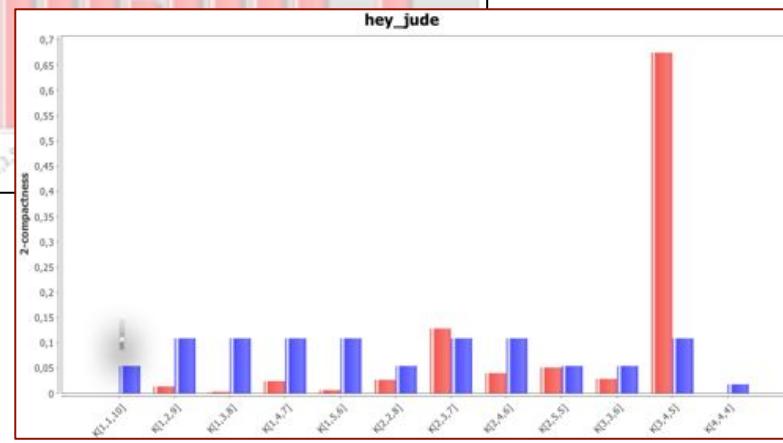
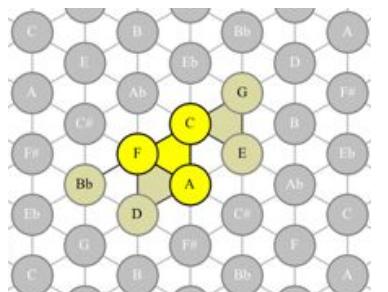
Chick Corea,
Eternal Child



Bill Evans,
Turn Out the Stars



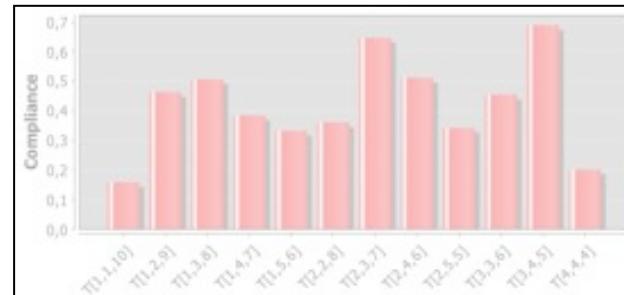
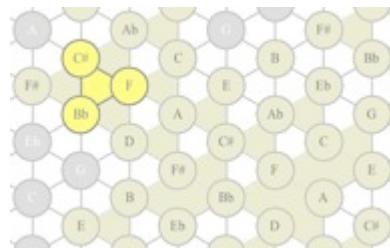
The Beatles,
Hey Jude



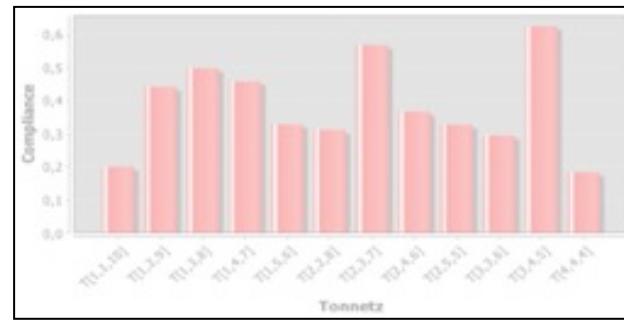
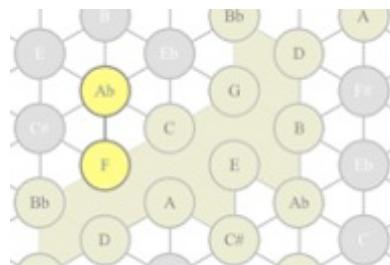
L'espace géométrique comme paramètre de style



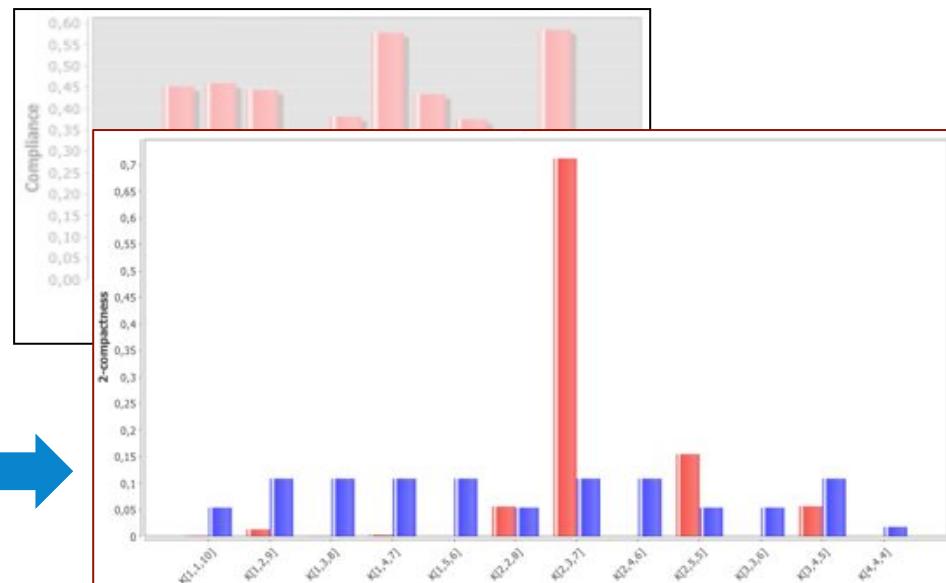
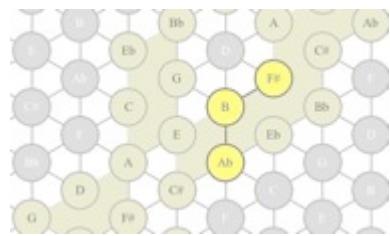
Thelonious Monk,
Brilliant Corners



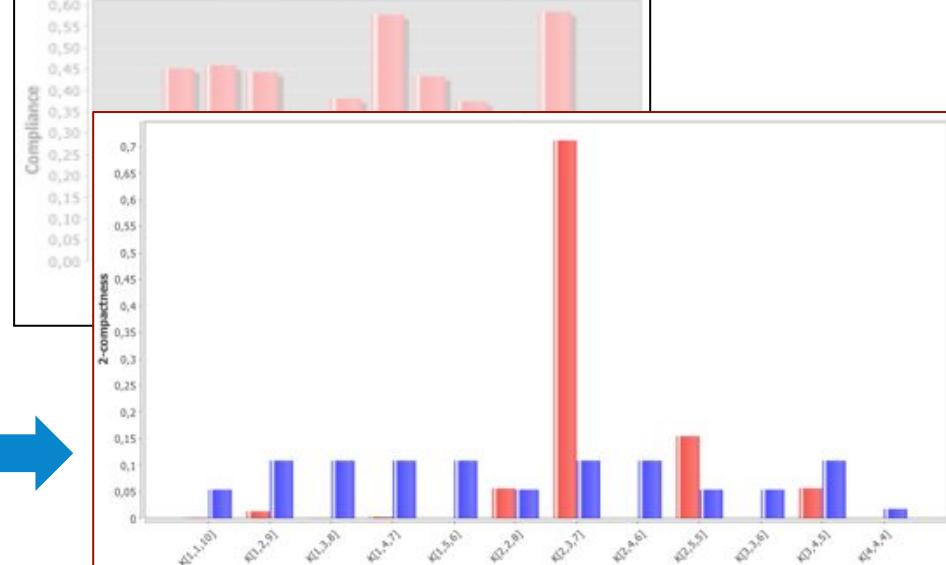
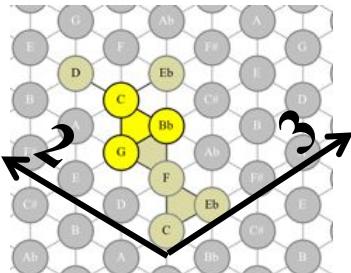
Chick Corea,
Eternal Child



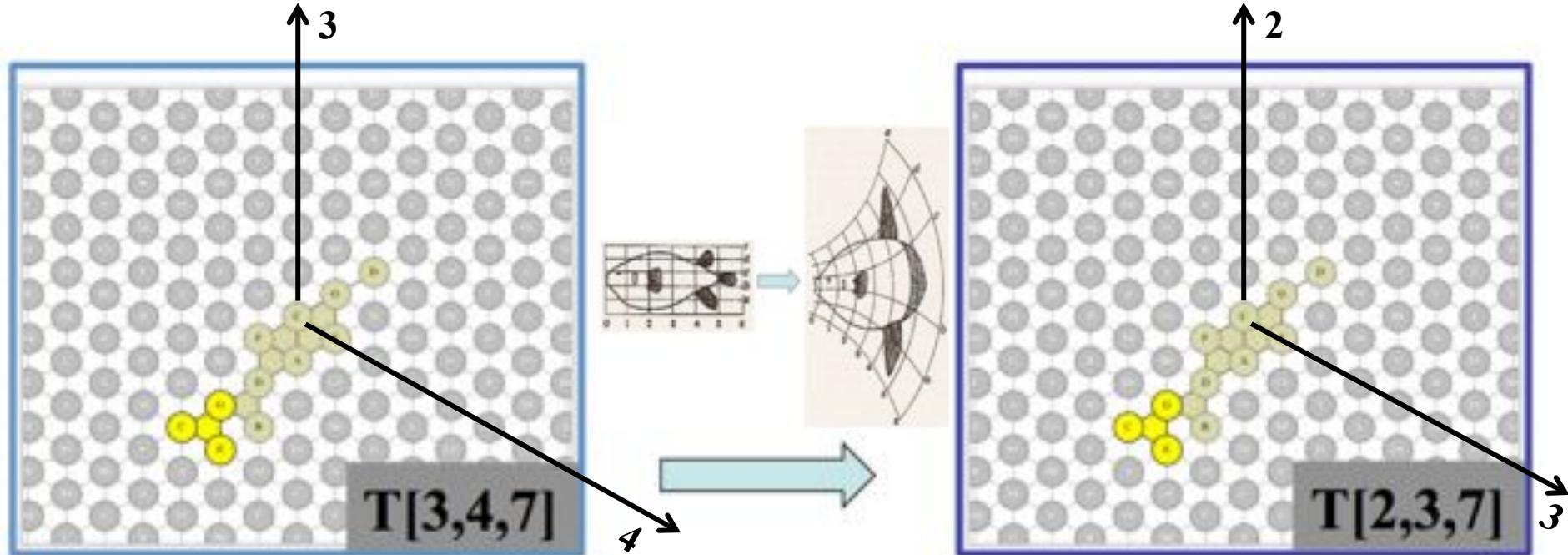
Bill Evans,
Turn Out the Stars



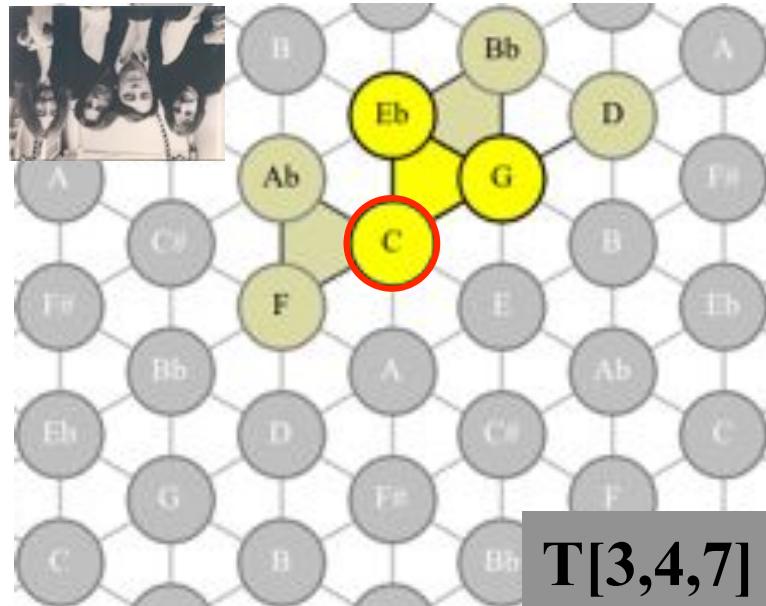
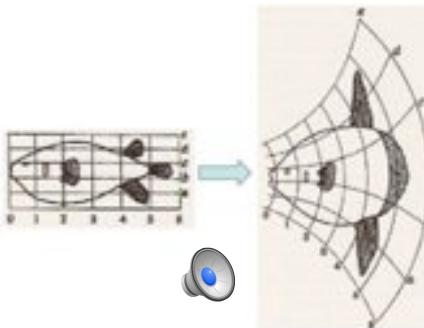
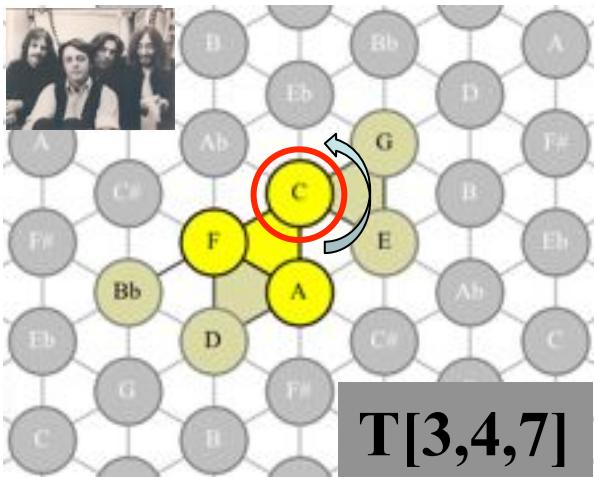
'The Beatles',
Hey Jude



Le style...c'est l'espace !



Transformations stylistiques sur les Beatles





MERCI DE VOTRE ATTENTION !

Moreno Andreatta
Equipe Représentations Musicales
IRCAM/CNRS UMR 9912