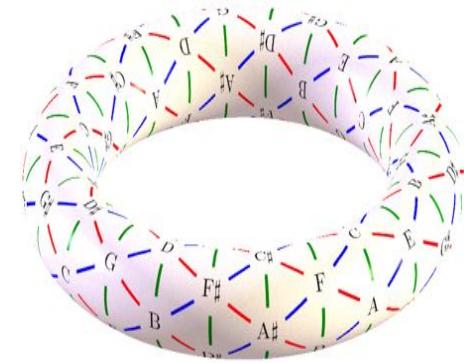
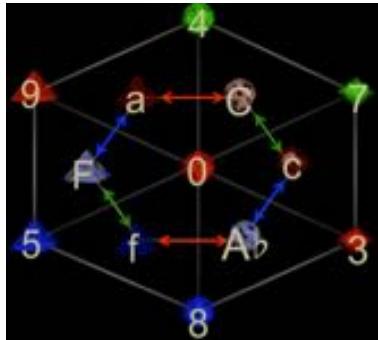
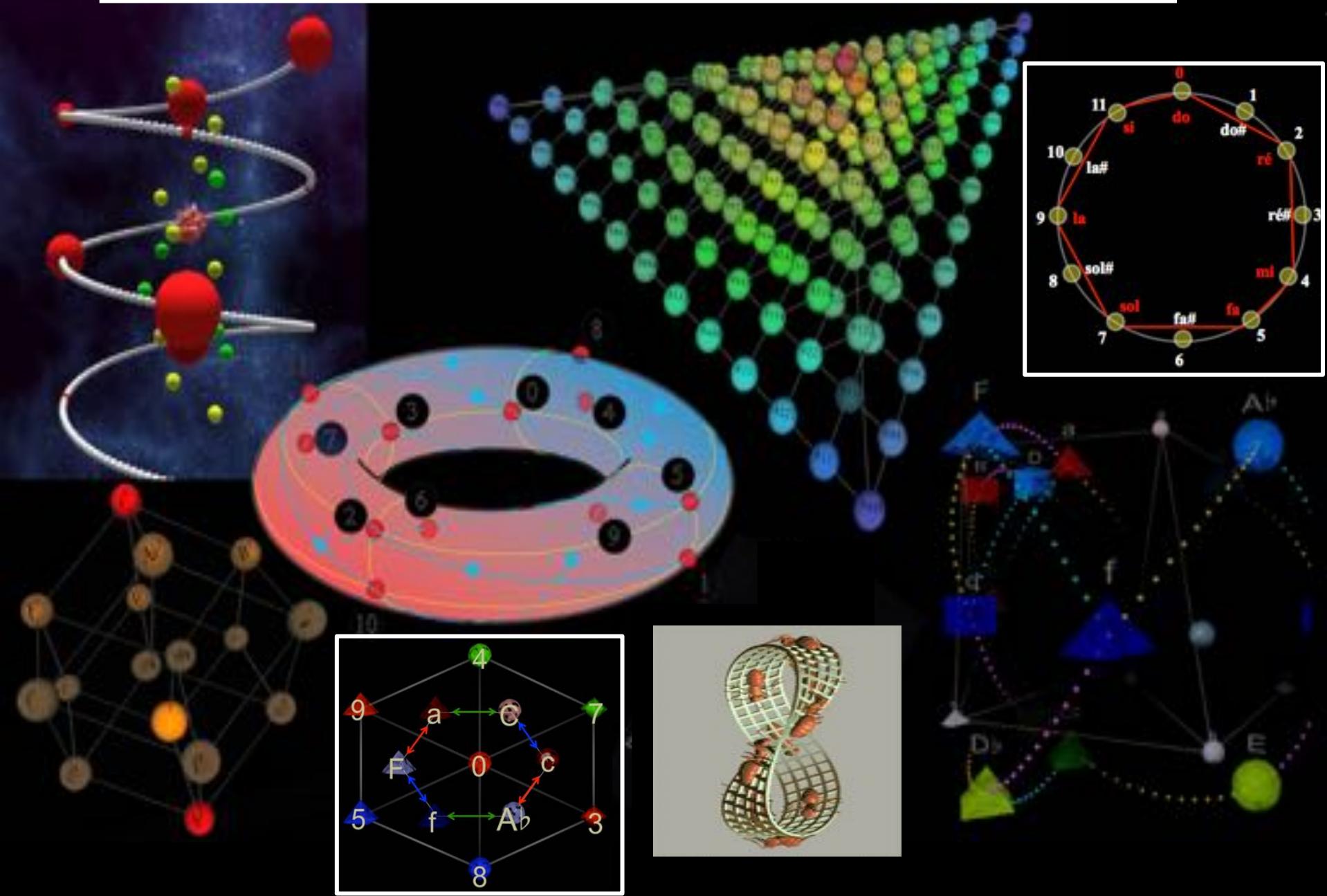


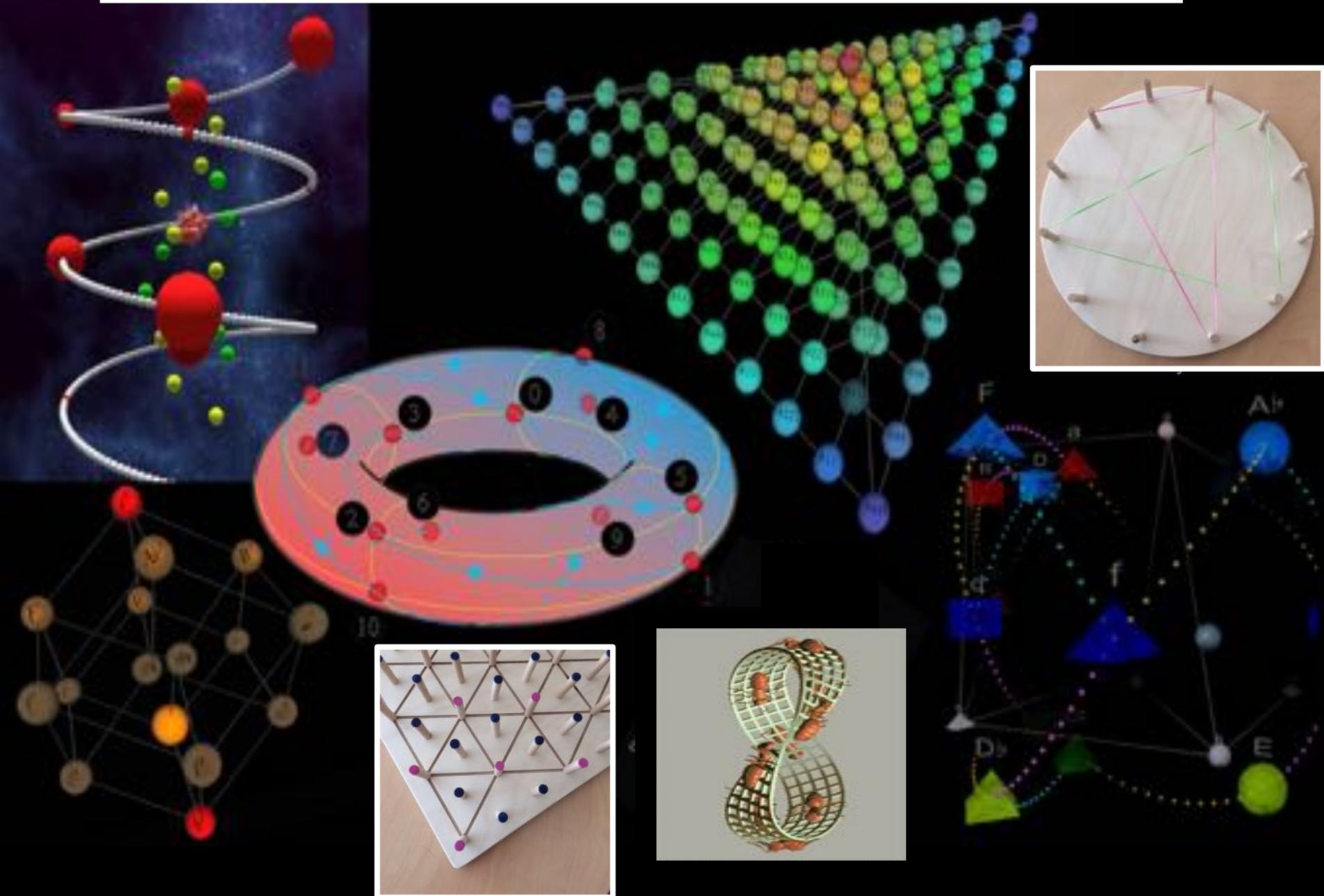
Mathematics, Music and Cognition: A Popular Musical Perspective



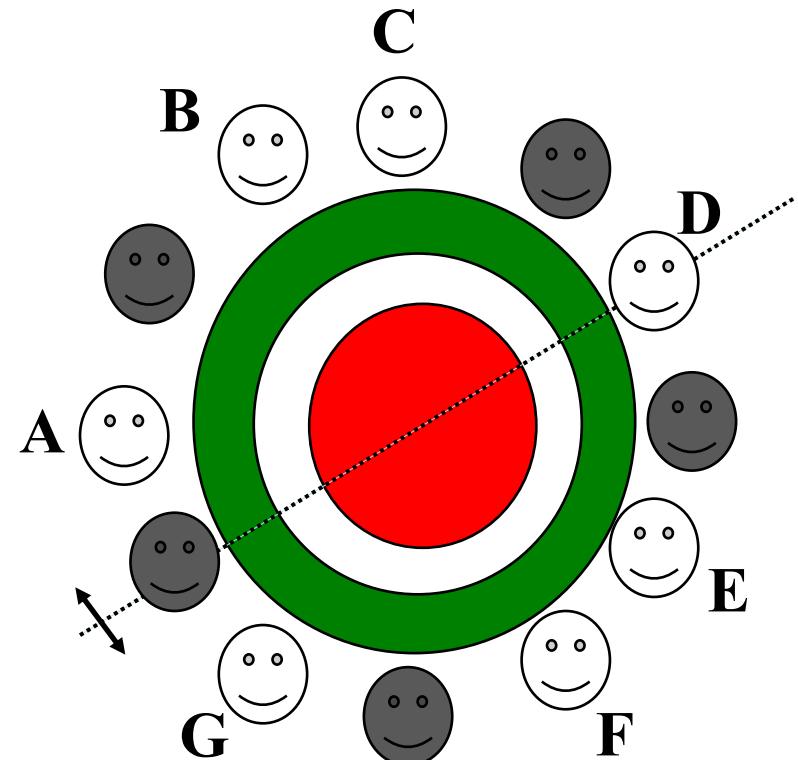
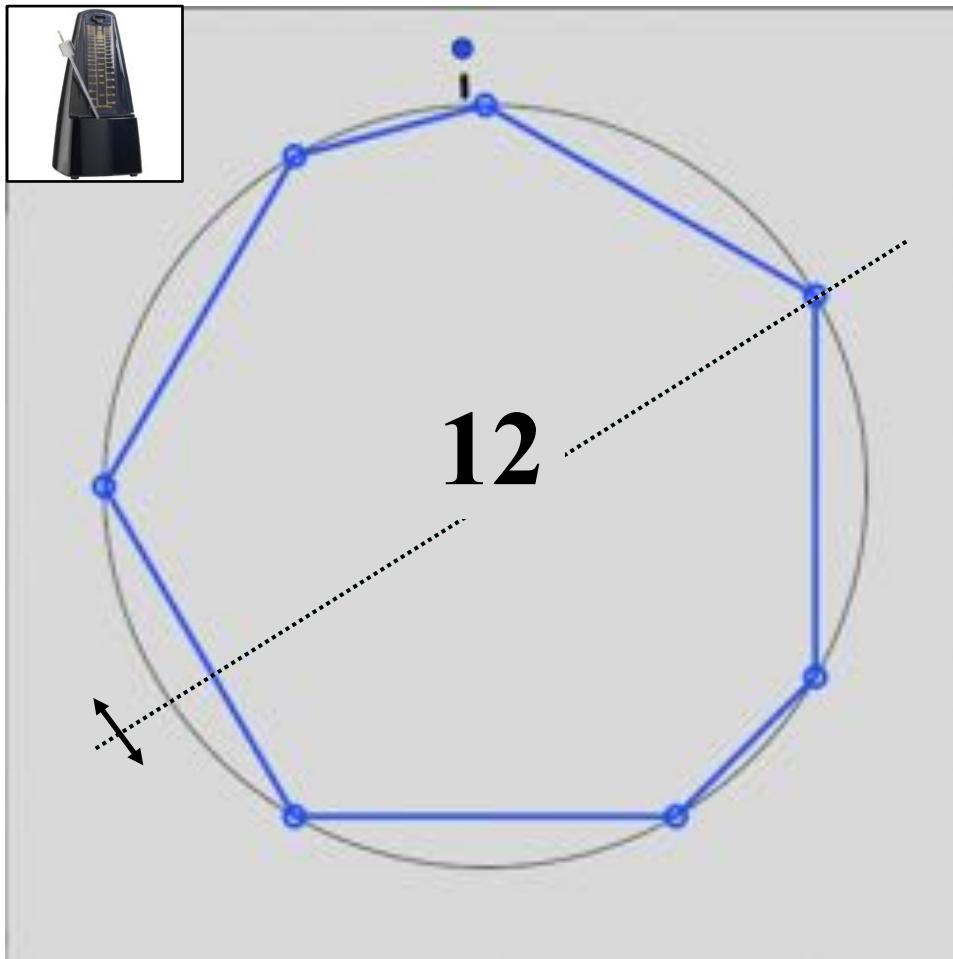
The galaxy of geometrical models at the service of music



The galaxy of geometrical models at the service of music



The circle: a model for periodic rhythms



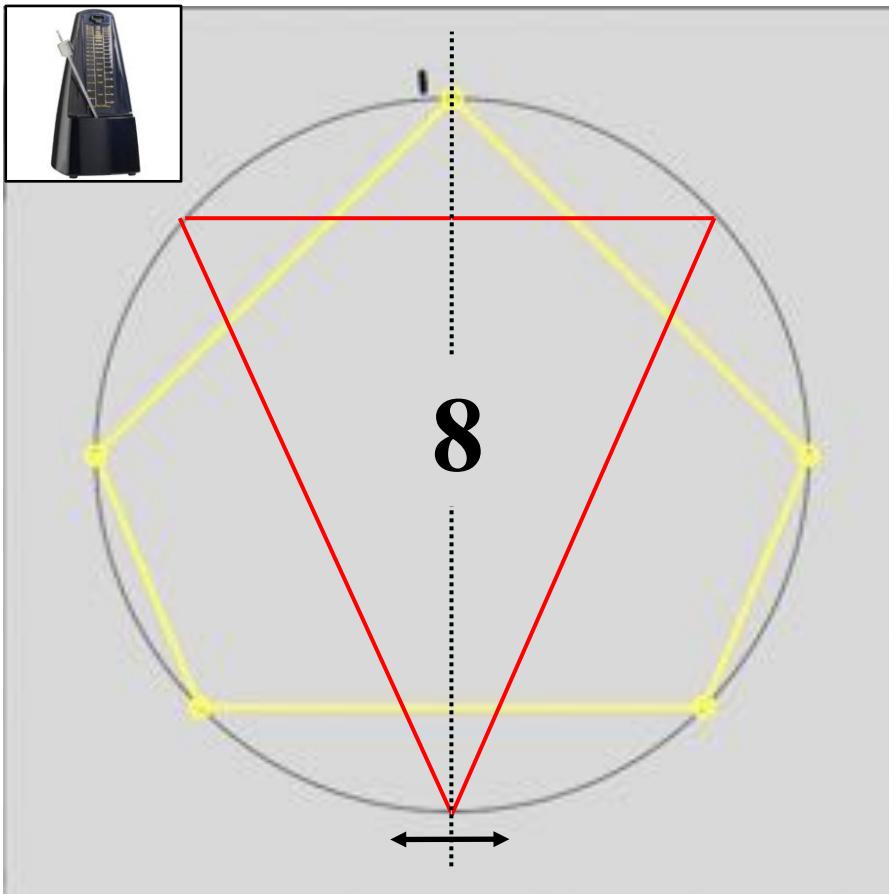
Dinner Table Problem



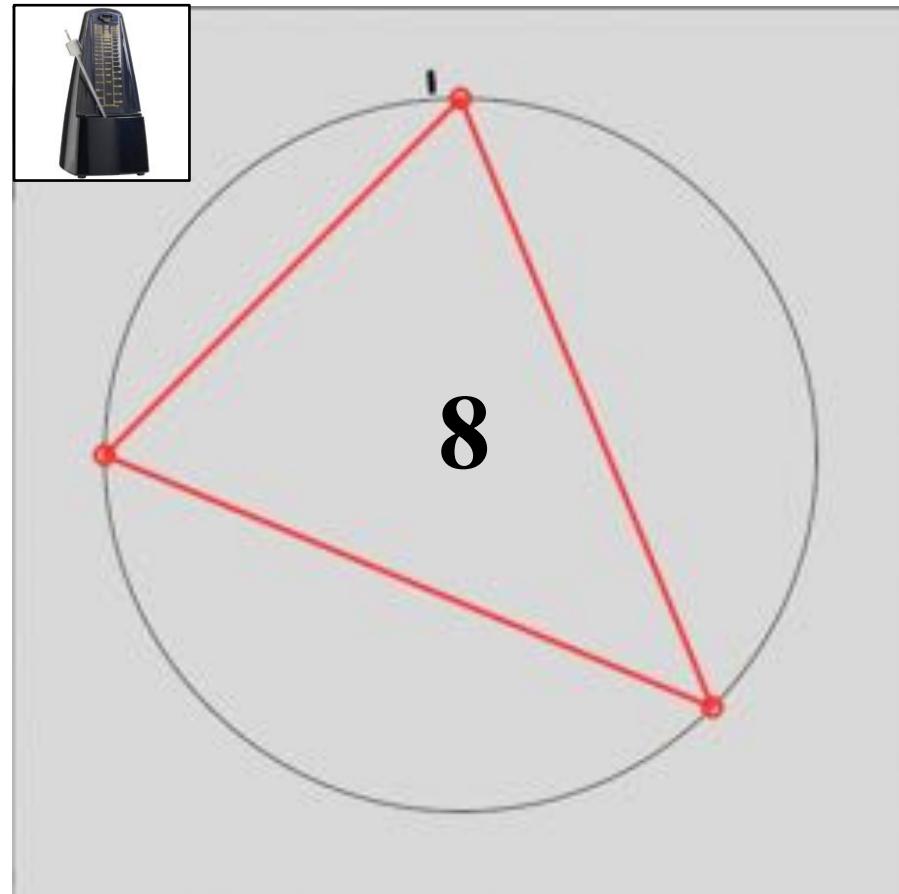
Abadja ou Bembé

African-cuban ME-rhythms

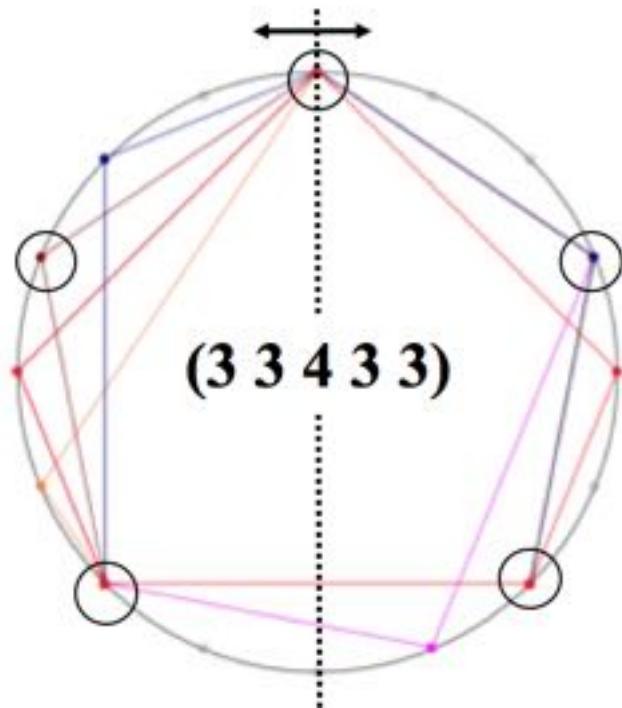
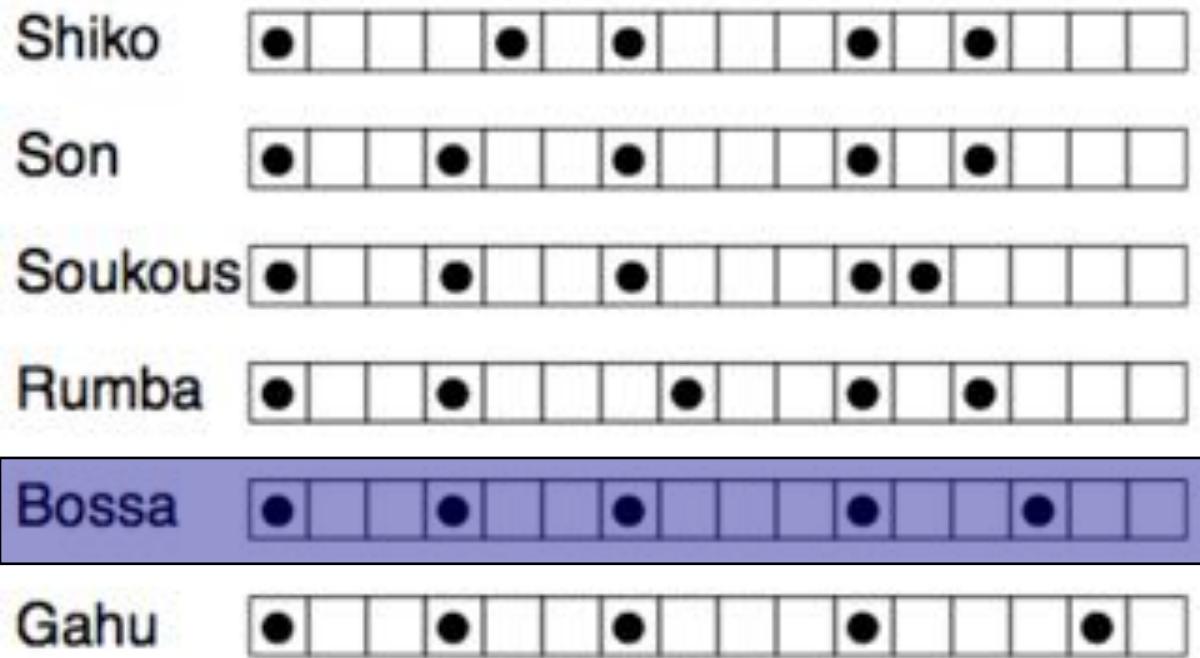
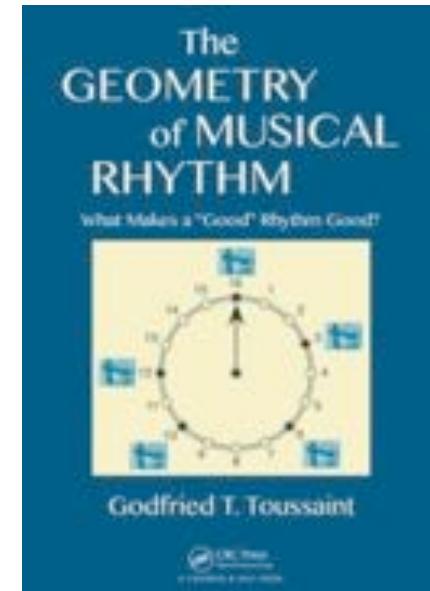
El cinquillo



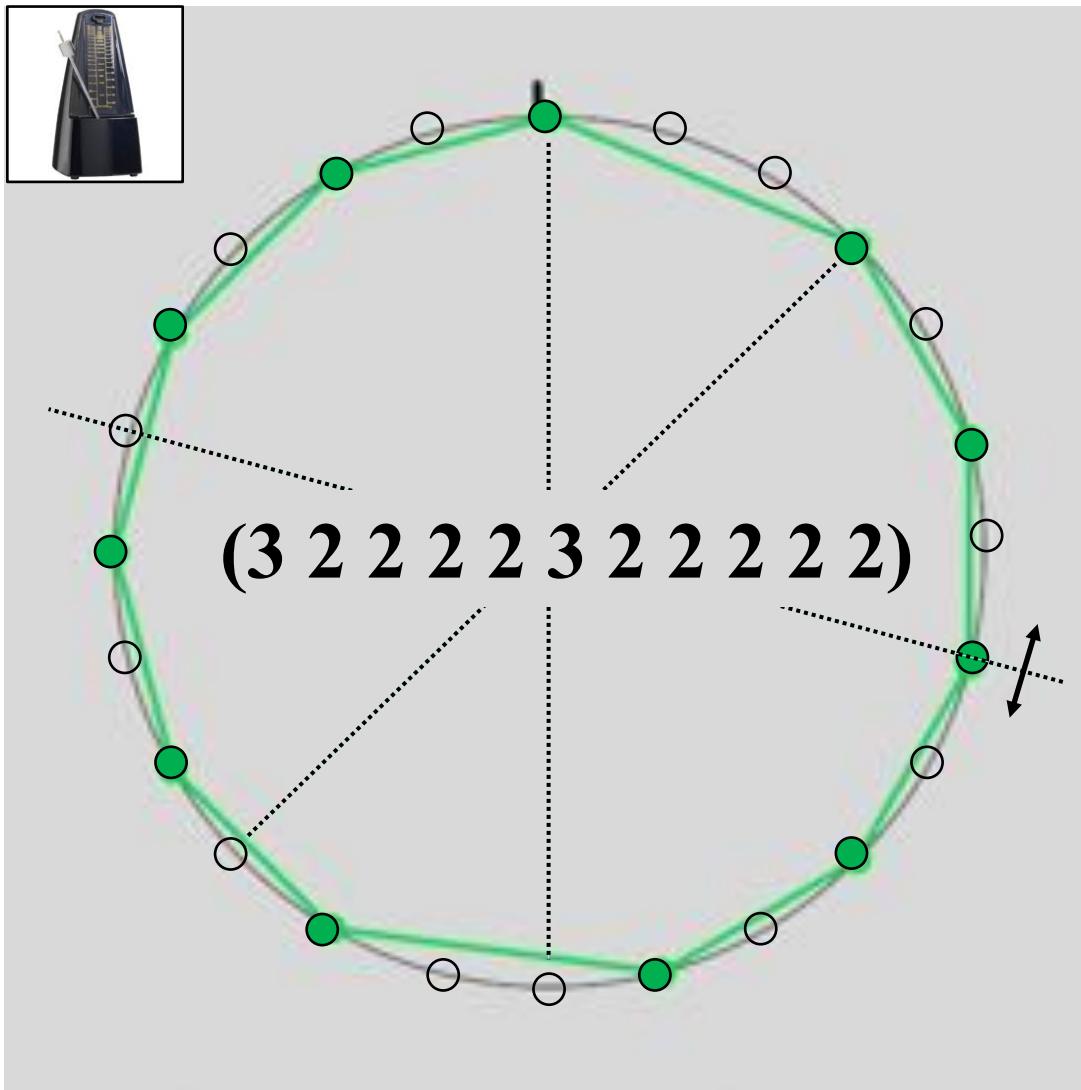
El trecillo



The geometry of African-Cuban rhythms



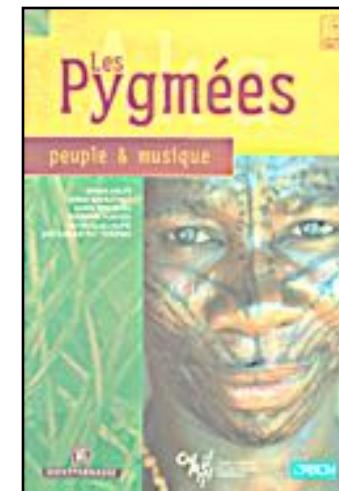
Odditive property of orally-trasmitted practices



Simha Arom



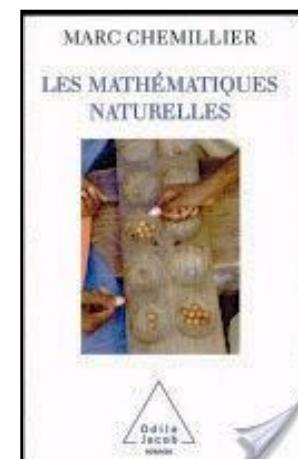
Marc Chemillier



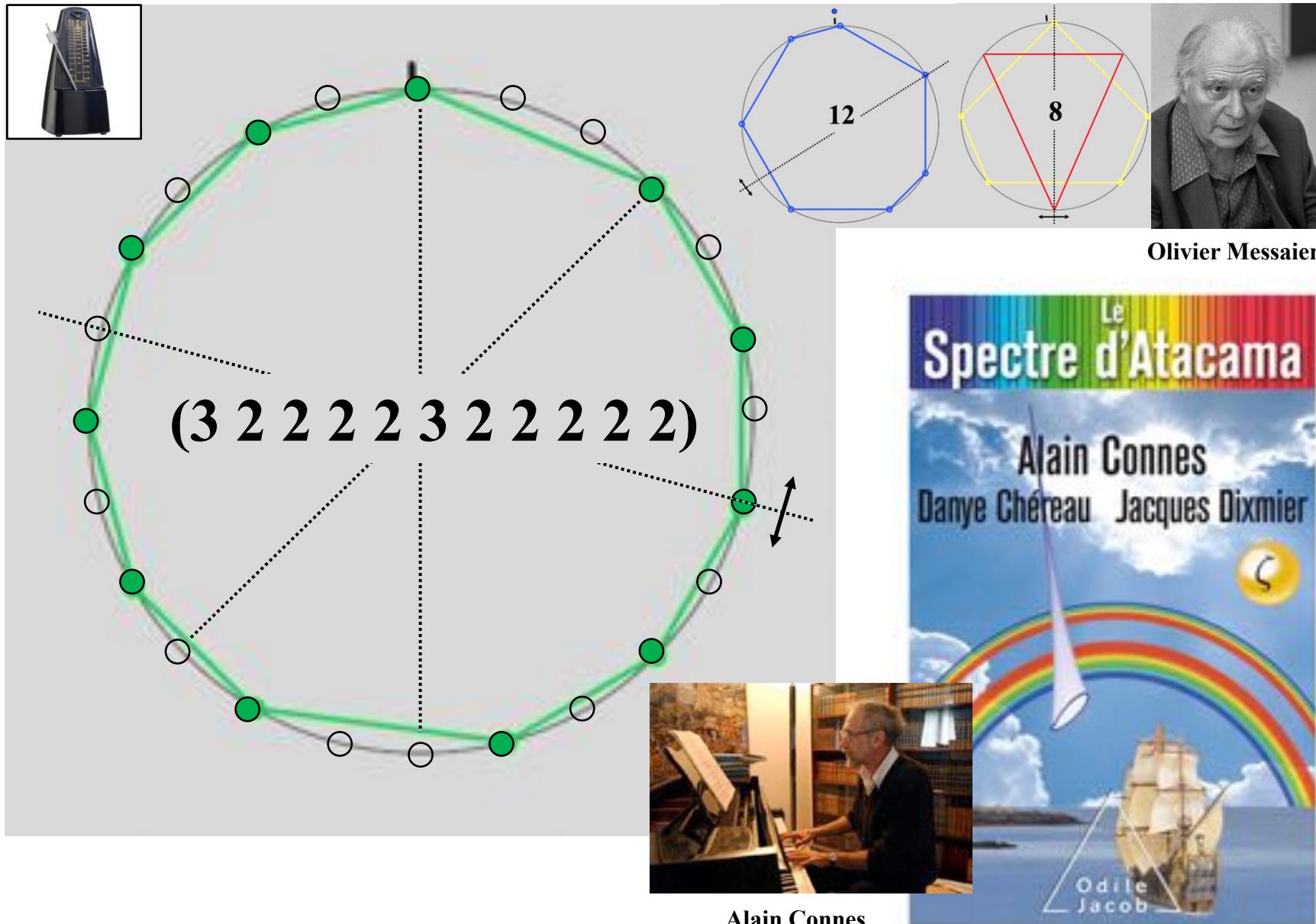
musimédiane

publiée avec le concours de la SFAM

revue audiovisuelle et multimédia d'analyse musicale



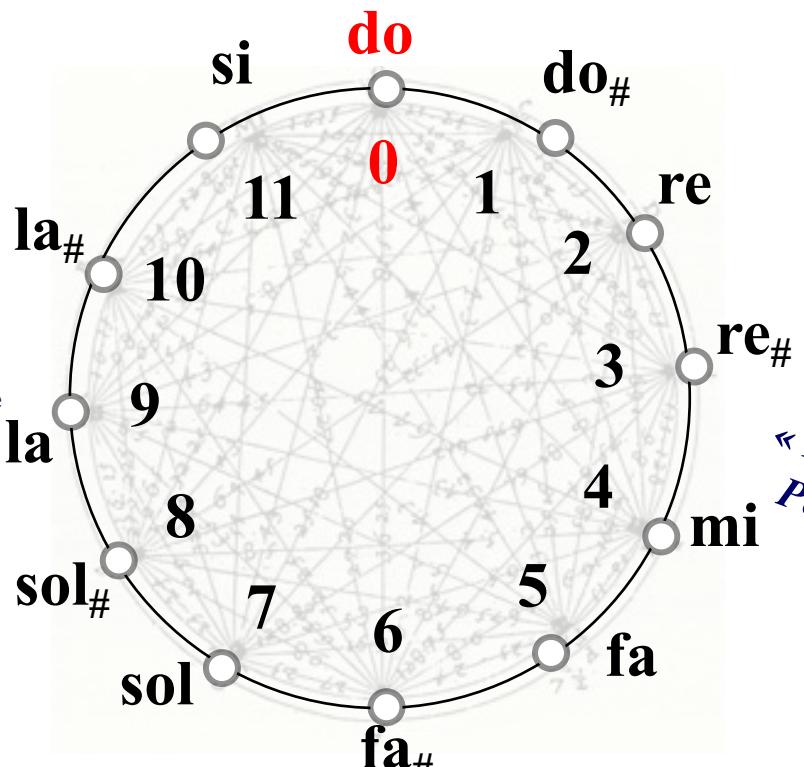
Olivier Messiaen's non-invertible rhythms



Music and the birth of combinatorics



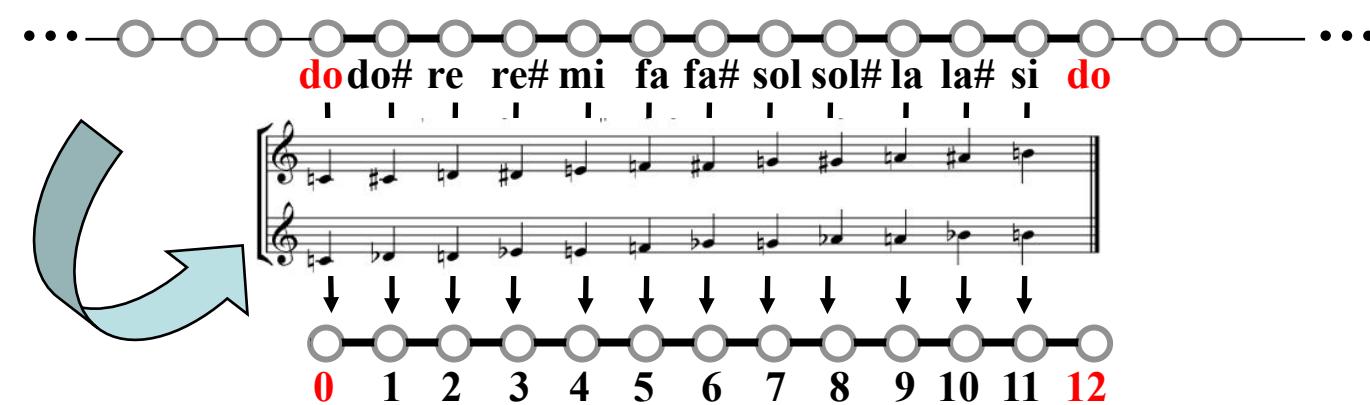
Marin Mersenne



Harmonicorum Libri XII, 1648



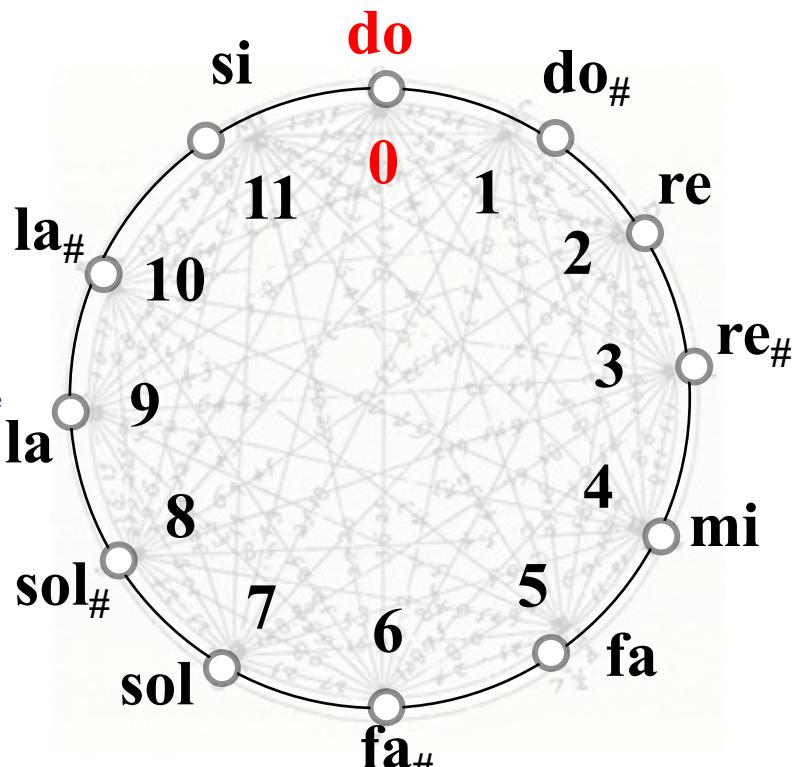
M. Andreatta, C. Agon,
« La musique mise en algèbre »,
Pour la Science, 2008



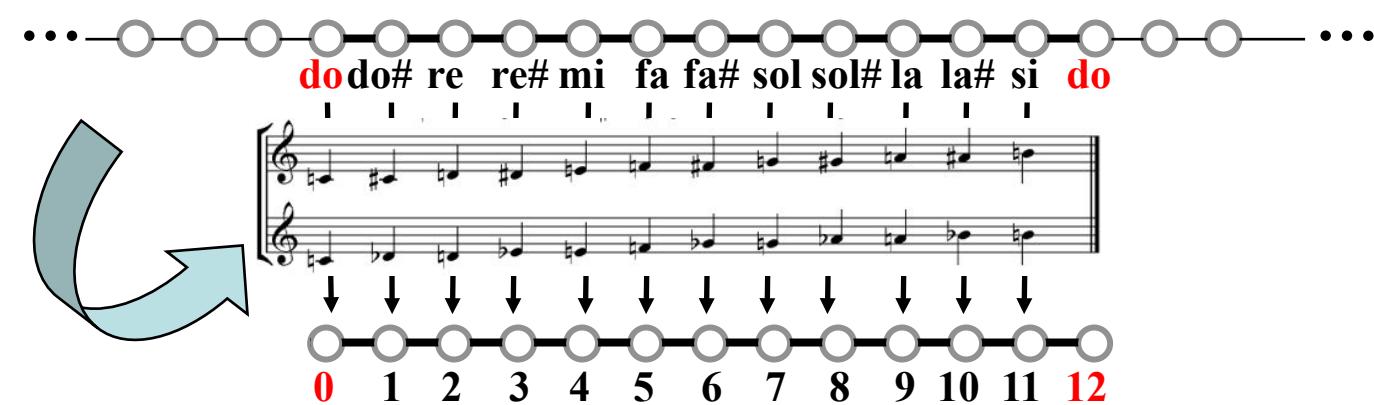
Music and the birth of combinatorics



Marin Mersenne



Harmonicorum Libri XII, 1648



M. Andreatta, C. Agon,
«Algèbre et géométrie :
sont-elles inscrites dans le
cerveau ?»,
Pour la Science, 2018



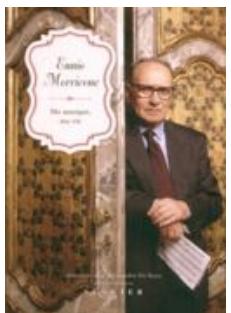
→ DEMO

A permutteral hit of the 1960s

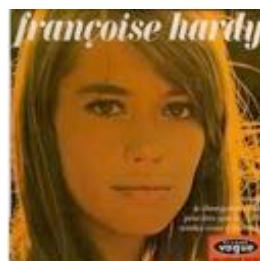
Se telefonando, 1966 (Maurizio Costanzo/Ennio Morricone) / Mina



(min. 0'53")

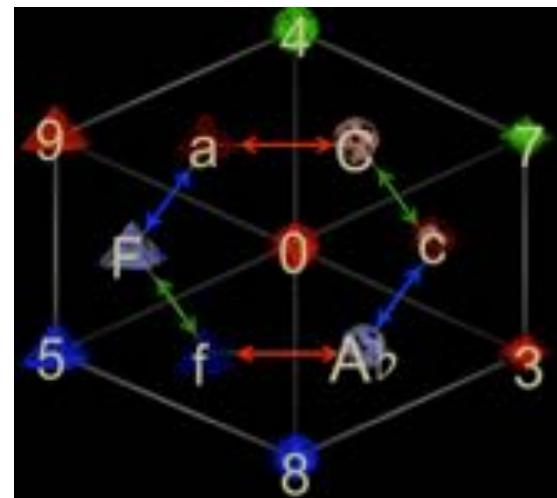


Ennio Morricone, Ma musique, ma vie.
Entretiens avec Alessandro De Rosa,
éditions Seguier, 2018. Traduit de
l'italien par Florence Rigollet.



Je changerais d'avis,
(Françoise Hardy)

The harmonic space



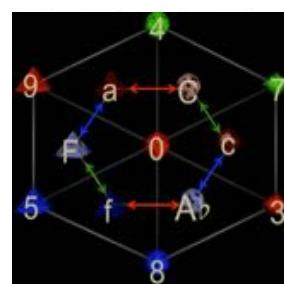
Chord enumeration

C	c	C_#	c _#	D	d
E _b	e_b	E	e	F	f
F _#	f _#	G	g	G _#	g _#
A	a	B_b	b_b	B	b

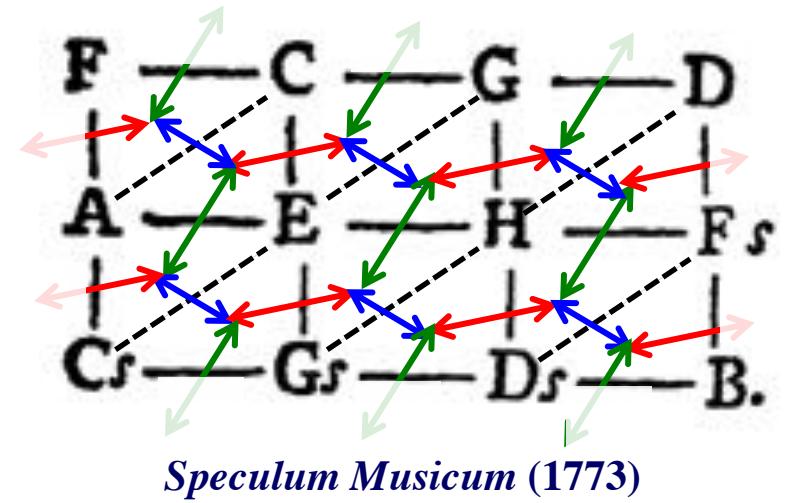
The Tonnetz

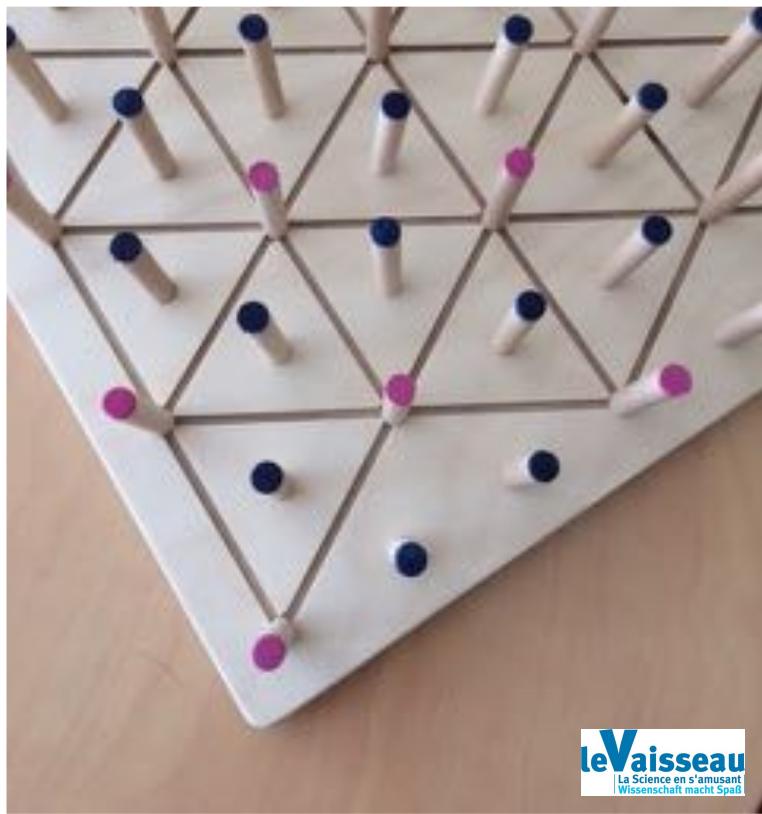


Gilles Baroin

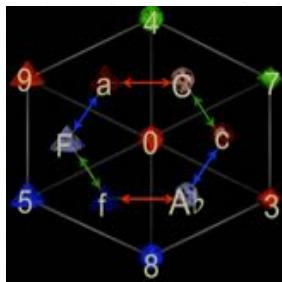


Leonhard Euler

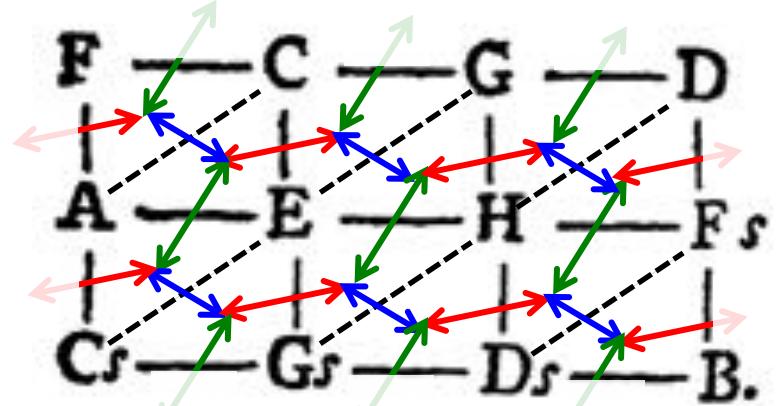




leVaisseau
La Science en s'amusant
Wissenschaft macht Spaß



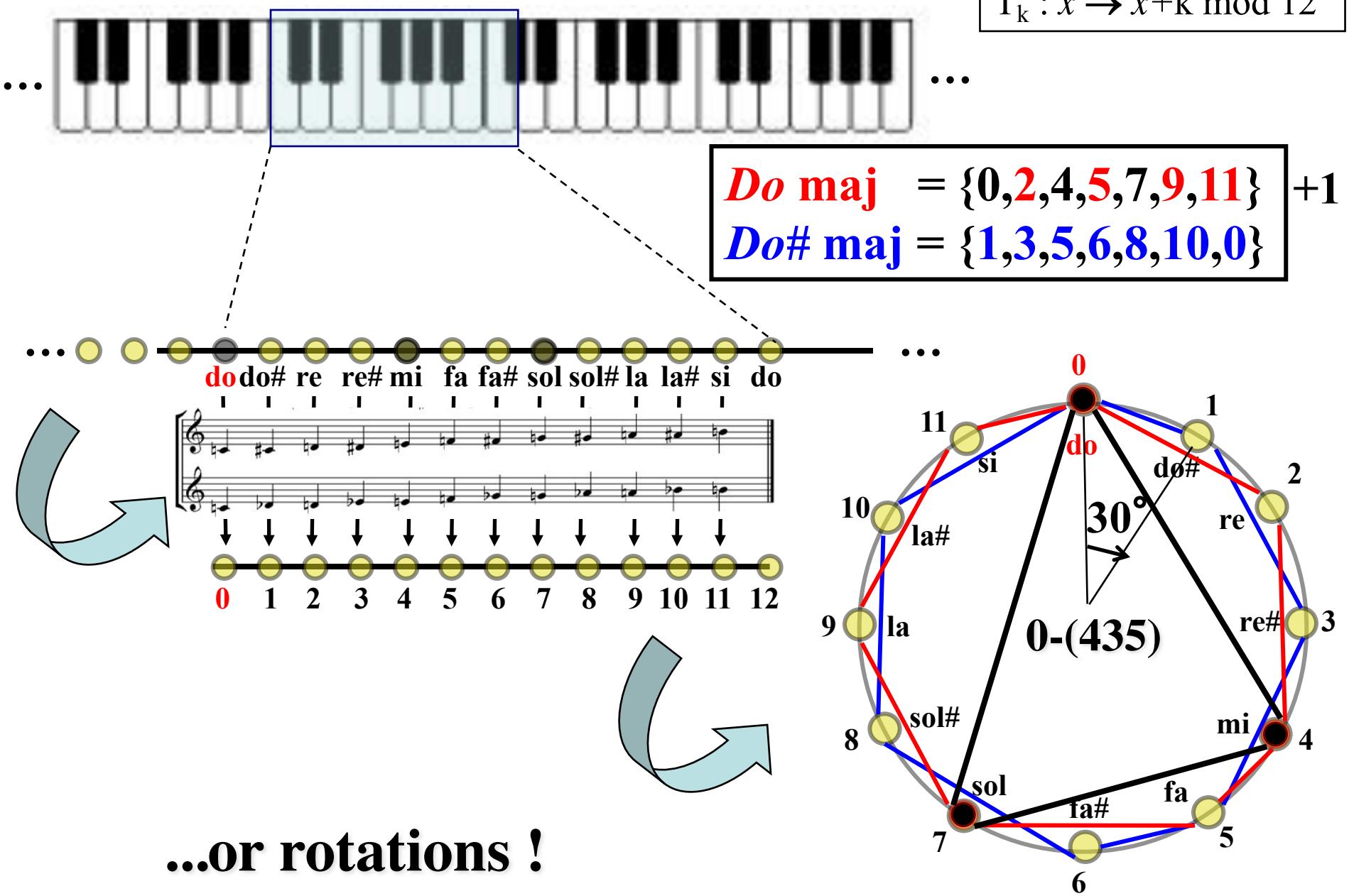
Leonhard Euler



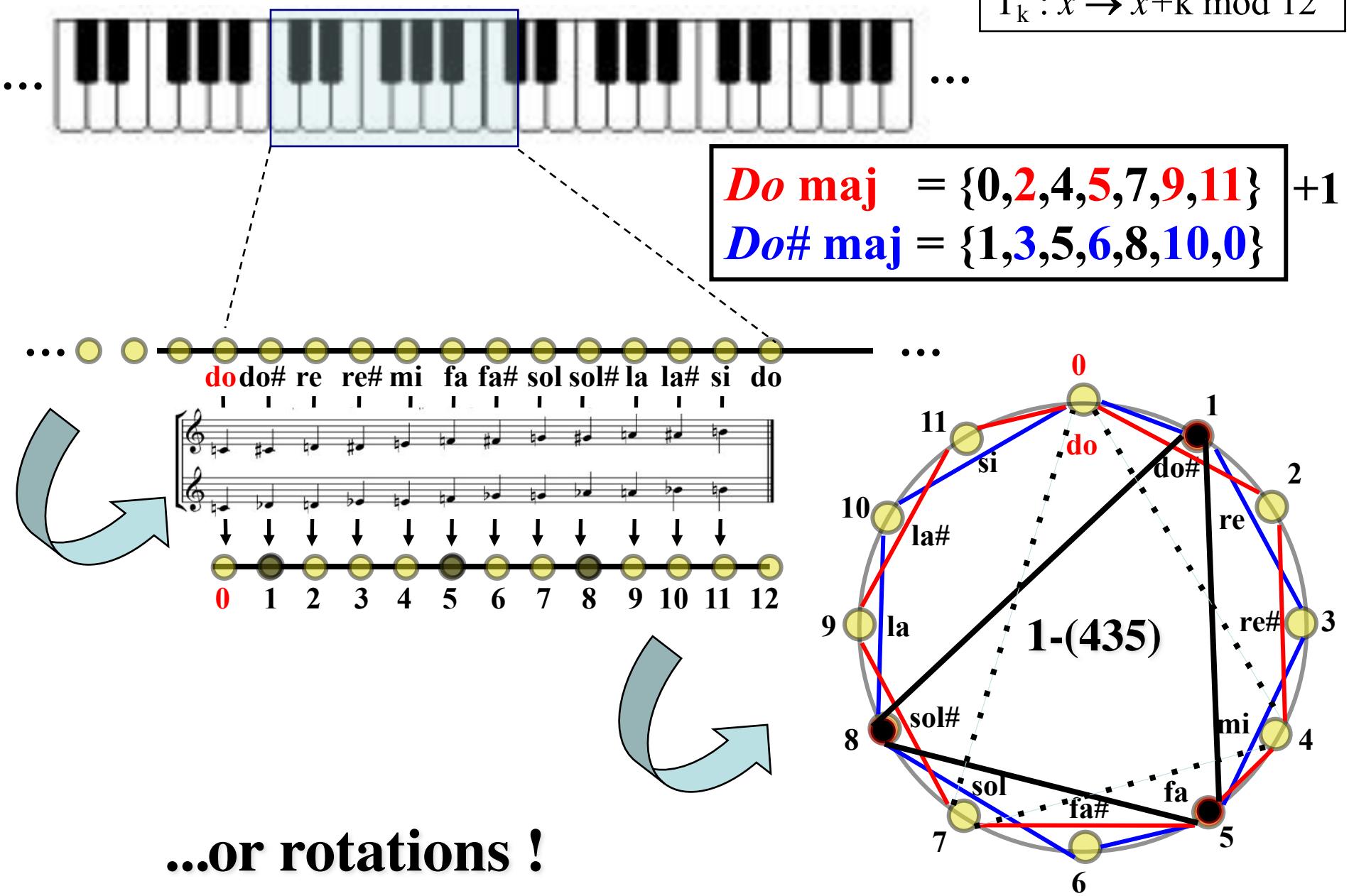
Speculum Musicum (1773)

→ DEMO

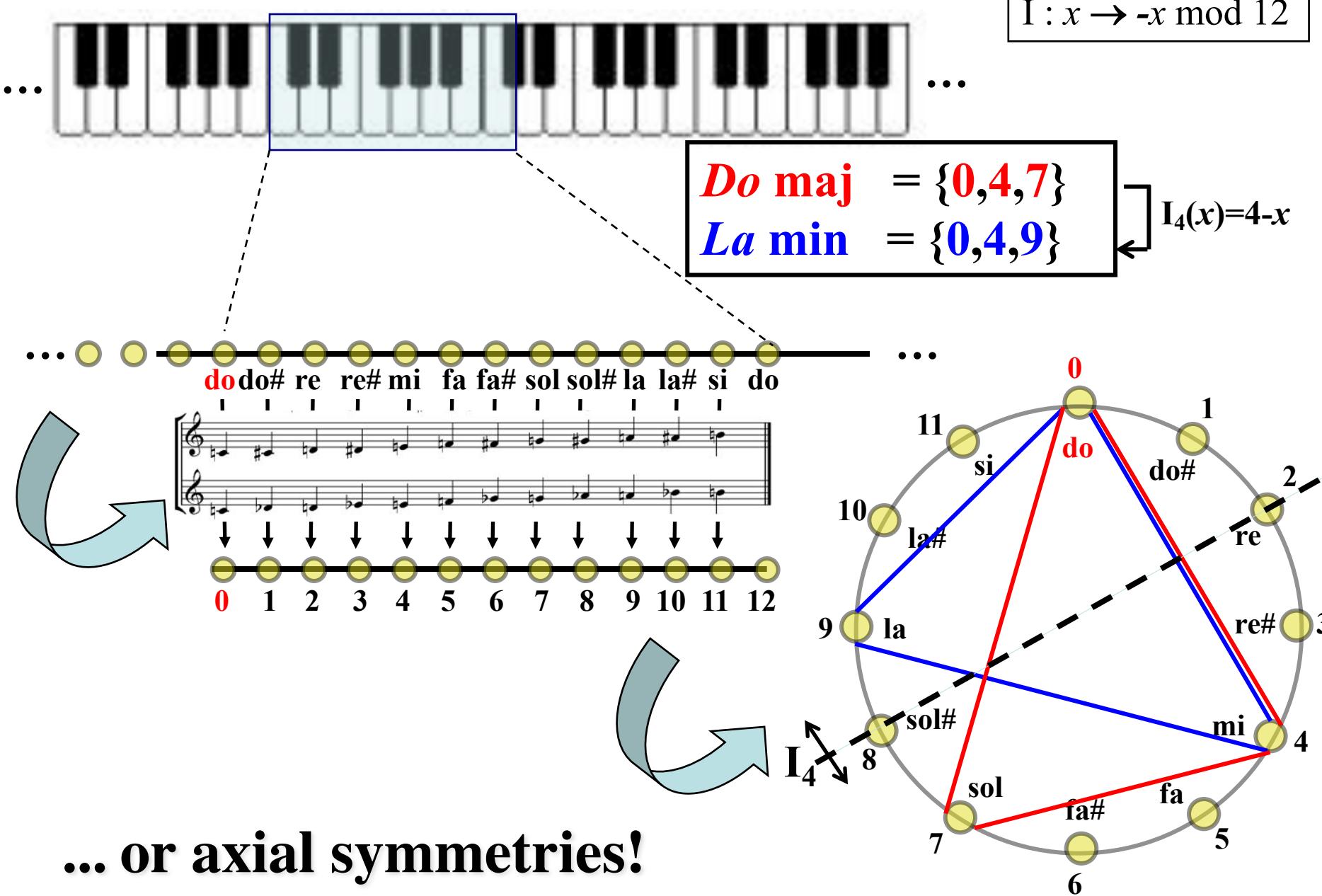
Musical transpositions are additions...



Musical transpositions are additions...



Musical inversions are differences...



Musical inversions are differences...

... or axial symmetries!

The diagram illustrates musical inversions and axial symmetries using a piano keyboard, a circle of fifths, and a musical staff.

Piano Keyboard: A horizontal piano keyboard is shown with a blue box highlighting a segment of keys. Dashed arrows point from this segment to a circle of fifths and a musical staff.

Circle of Fifths: A circular diagram showing the 12 notes of the chromatic scale. The notes are labeled: do, do#, re, re#, mi, fa, fa#, sol, sol#, la, la#, si, do. The circle is divided into 12 equal segments, each representing an interval of a fifth. A red arrow labeled $I_7(x) = 7 - x$ points from the top note "do" to the note at position 7, "sol". A blue arrow labeled I_7 points from the note at position 7, "sol", back to the top note "do".

Musical Staff: A musical staff with two staves is shown. The notes are labeled: do, do#, re, re#, mi, fa, fa#, sol, sol#, la, la#, si, do. Arrows point from the notes on the staff down to the corresponding positions on the circle of fifths.

Equation: $I : x \rightarrow -x \bmod 12$

Set Definitions:

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

$I_7(x) = 7 - x$

Musical inversions are differences...

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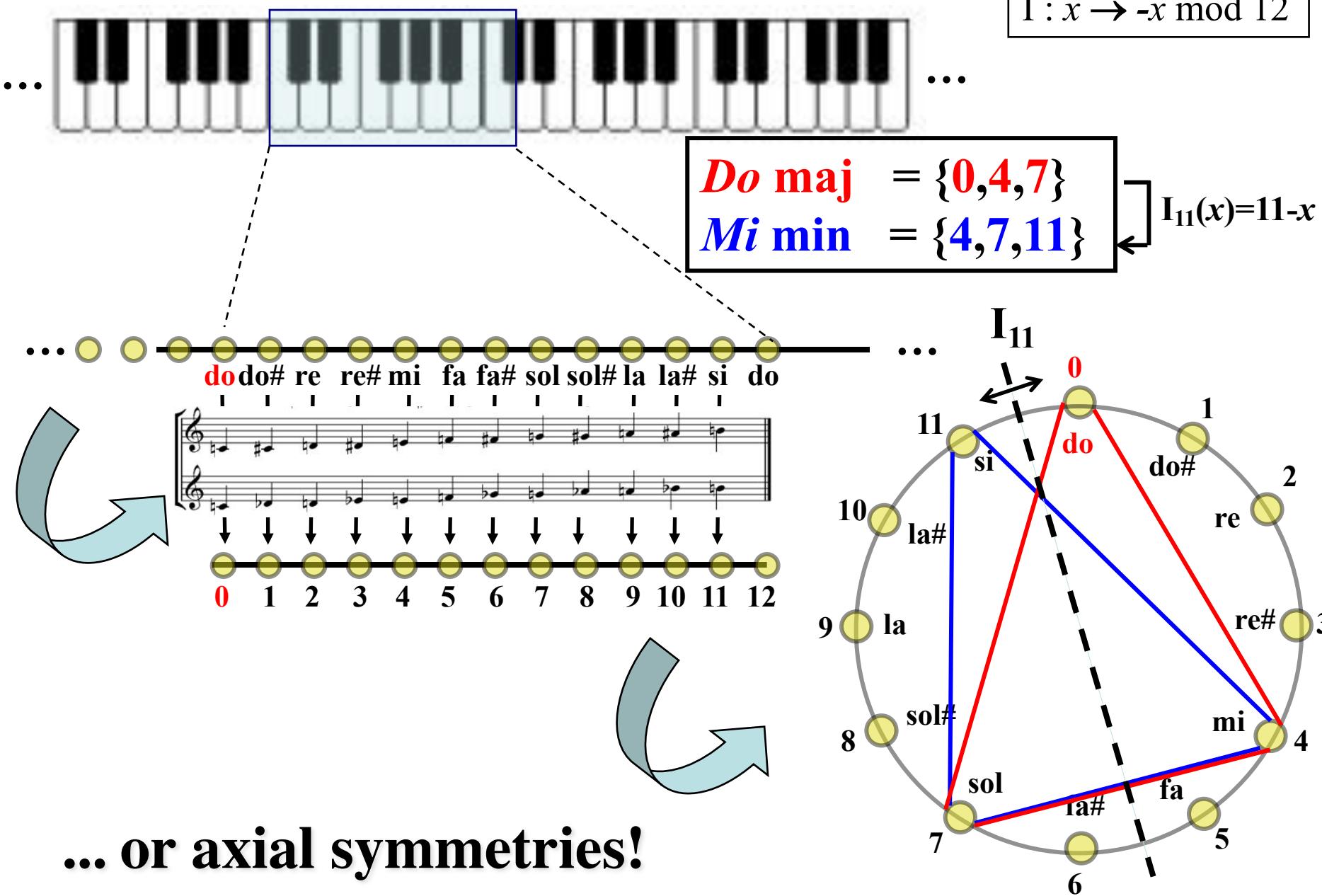
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Musical inversions are differences...

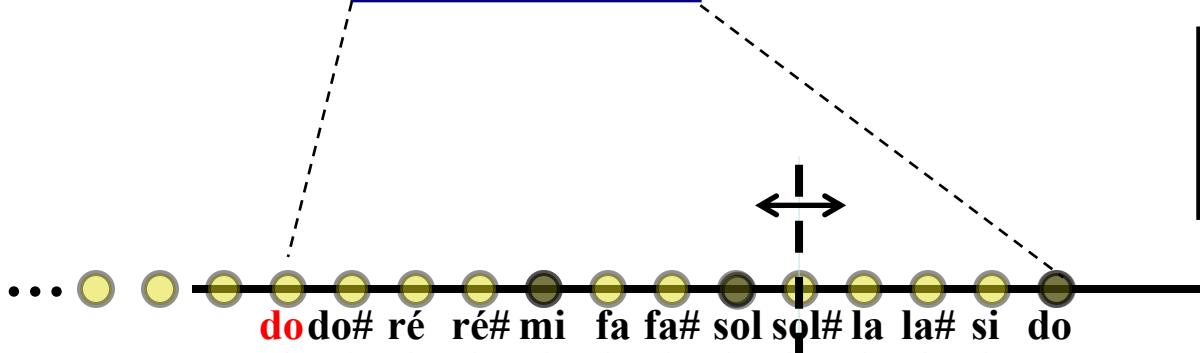


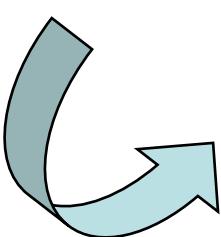
Les inversions sont des symétries axiales

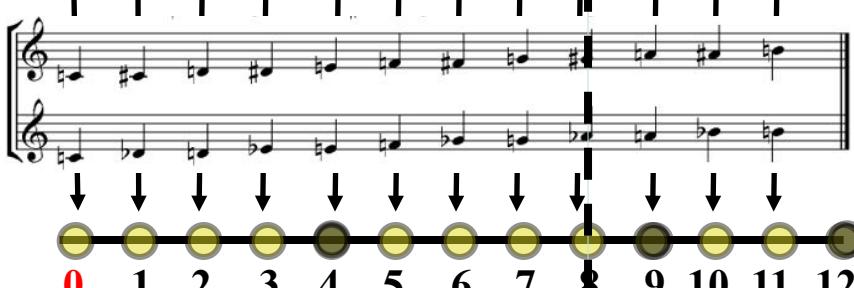
...  ...

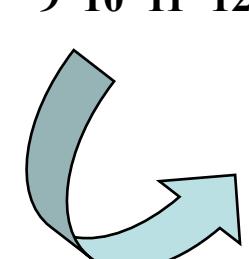
R comme relatif

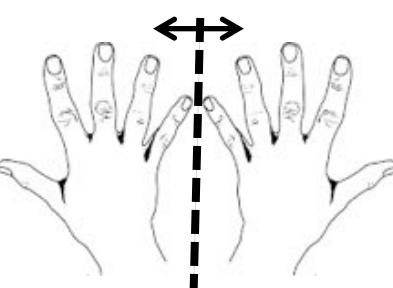
Do maj = {0,4,7}
La min = {0,4,9}

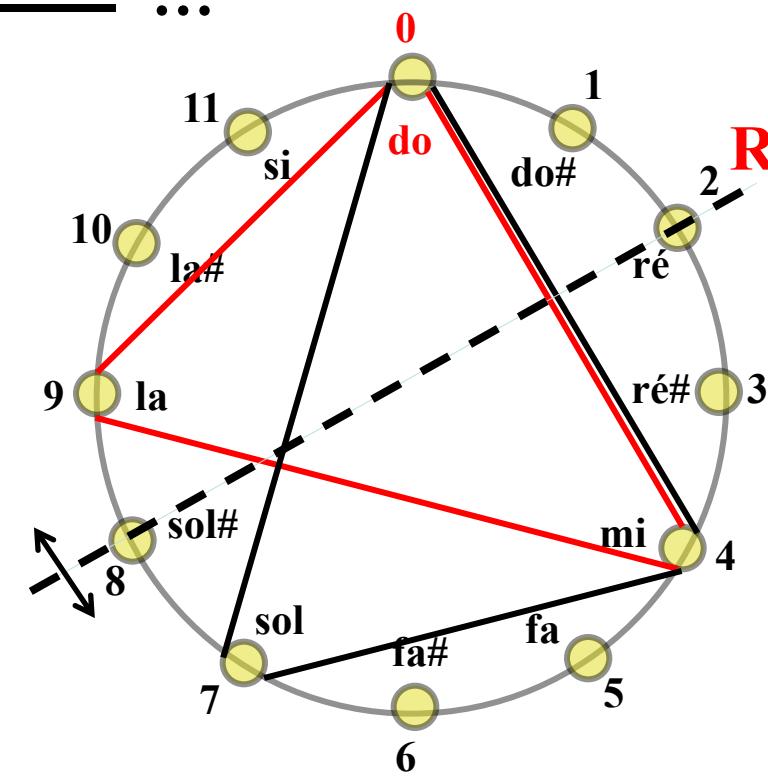
...  ...











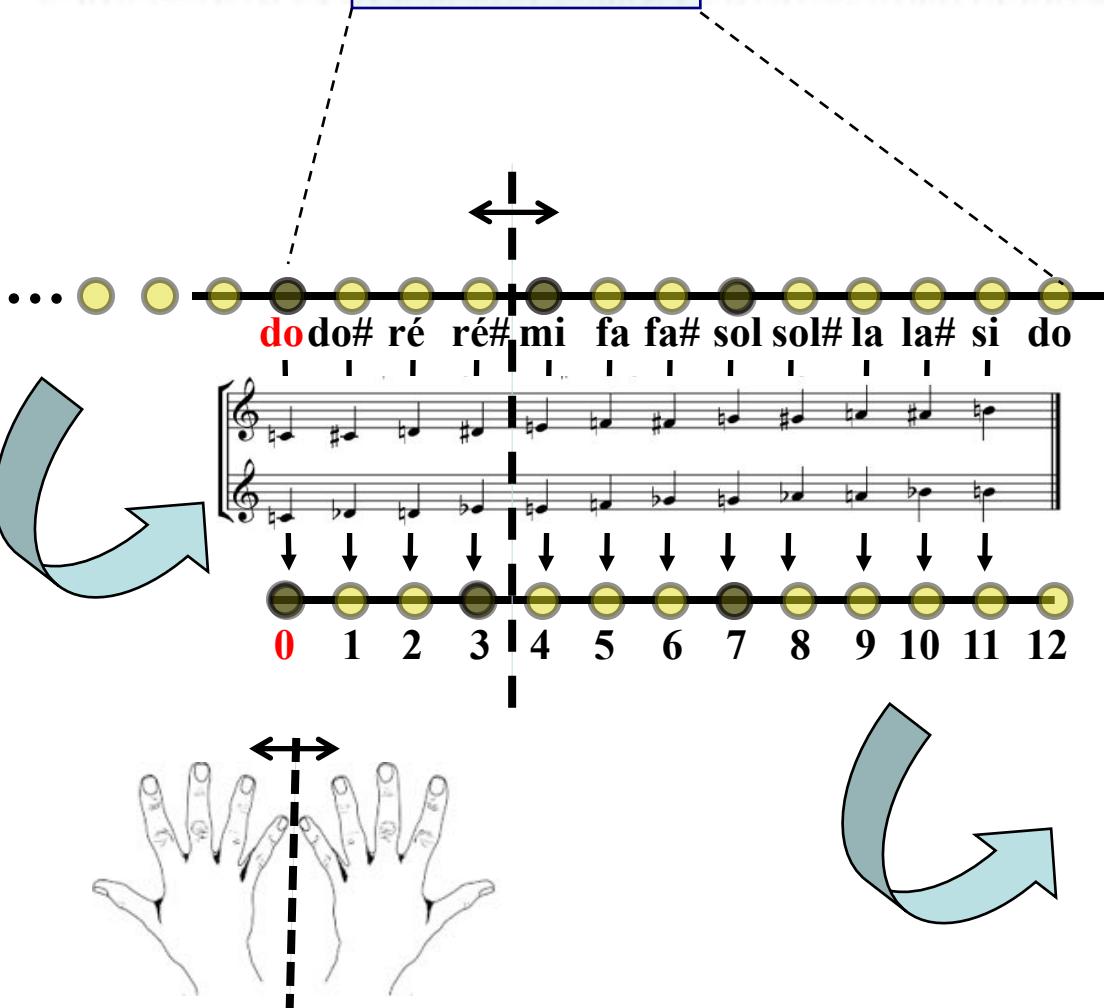
Les inversions sont des symétries axiales

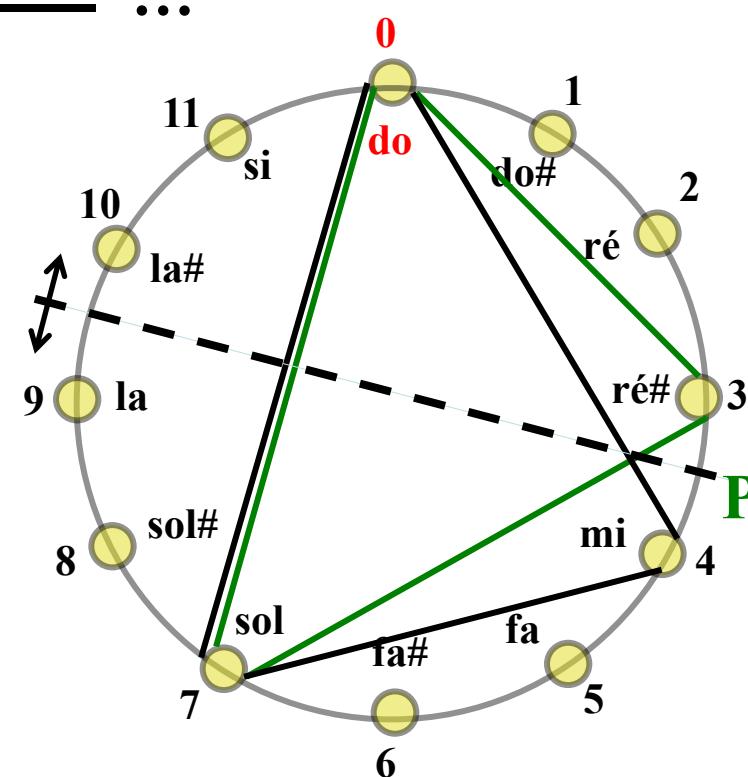
...  ...

P comme parallèle

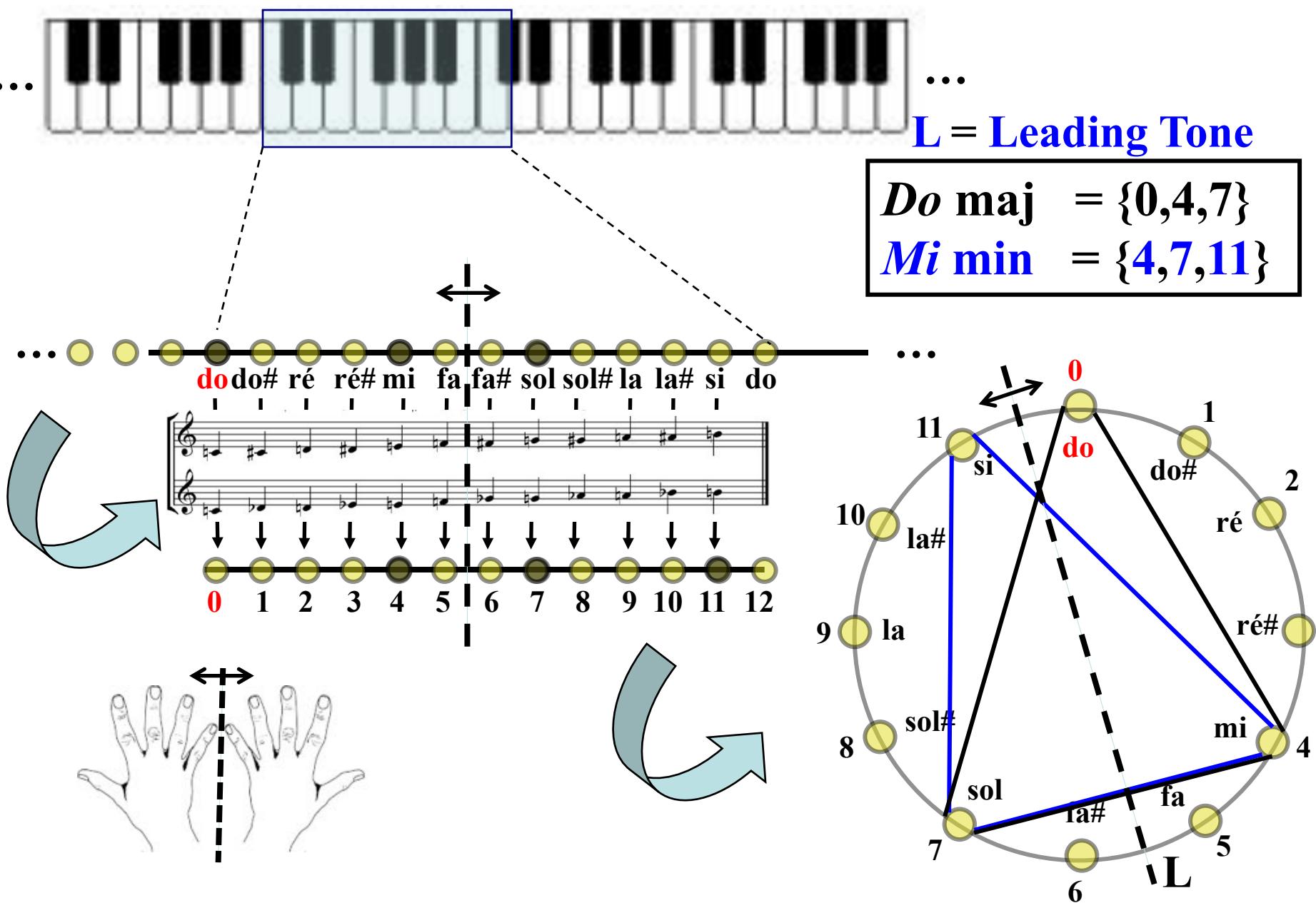
Do maj = {0,4,7}

Do min = {0,3,7}

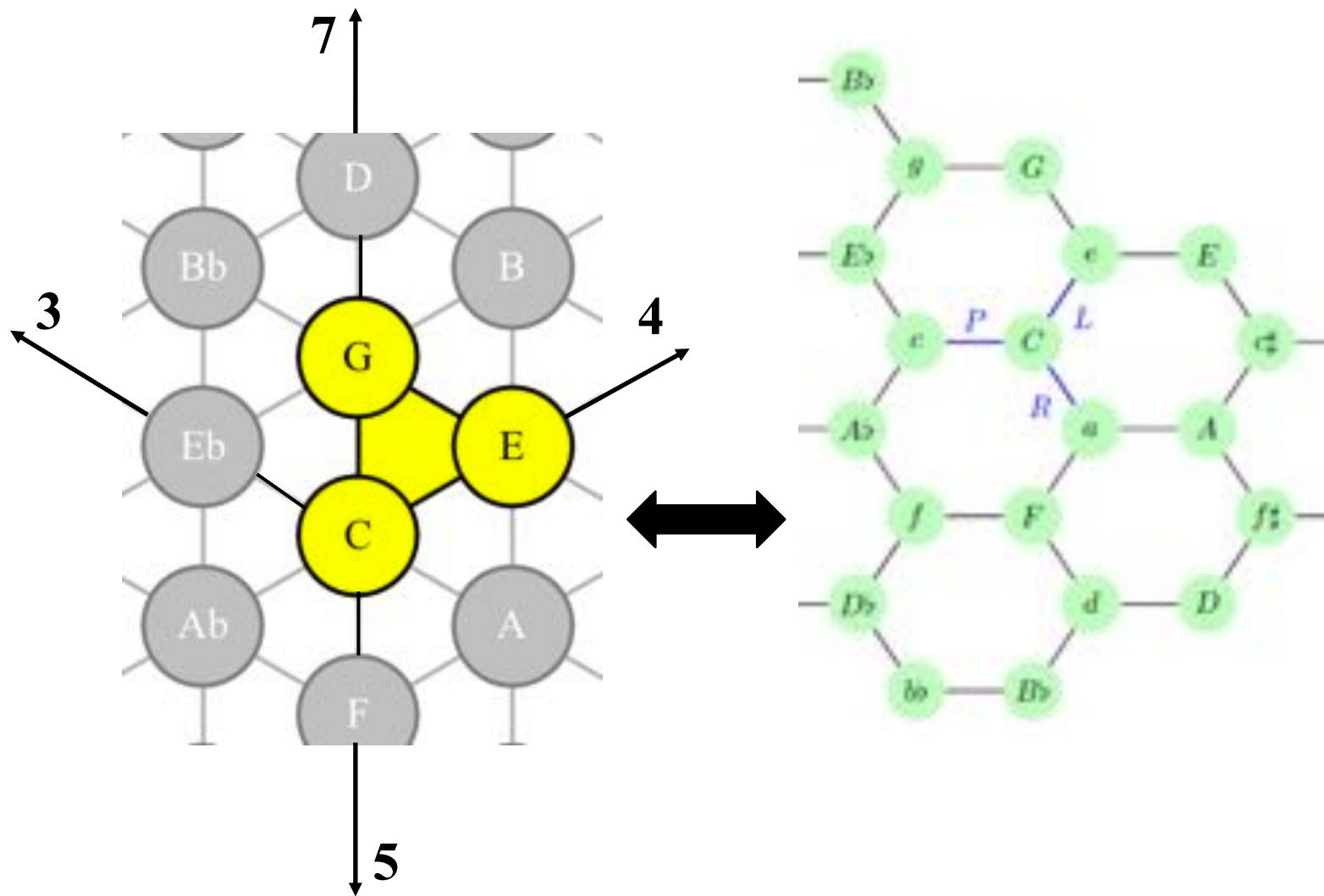
...  ...



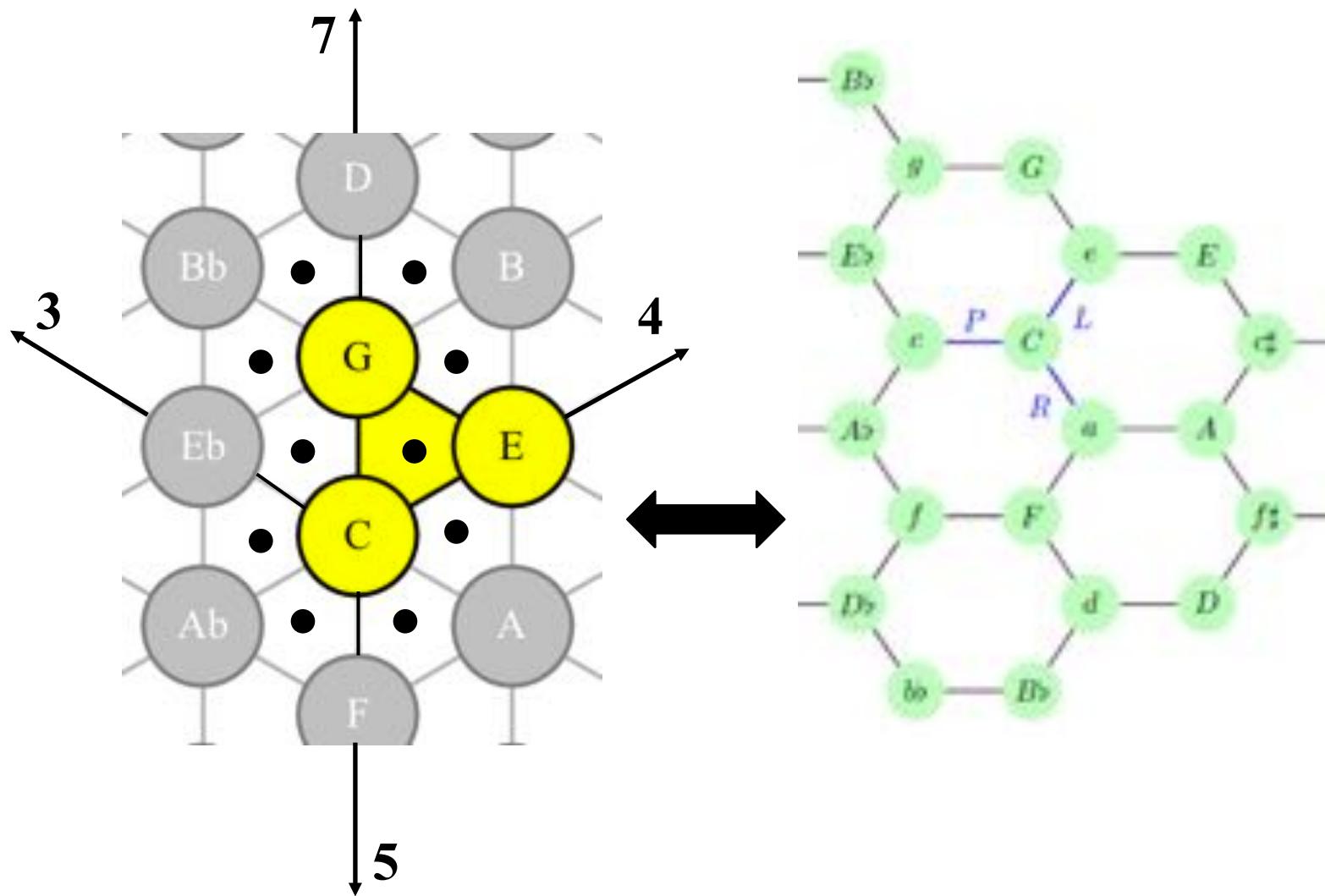
Les inversions sont des symétries axiales



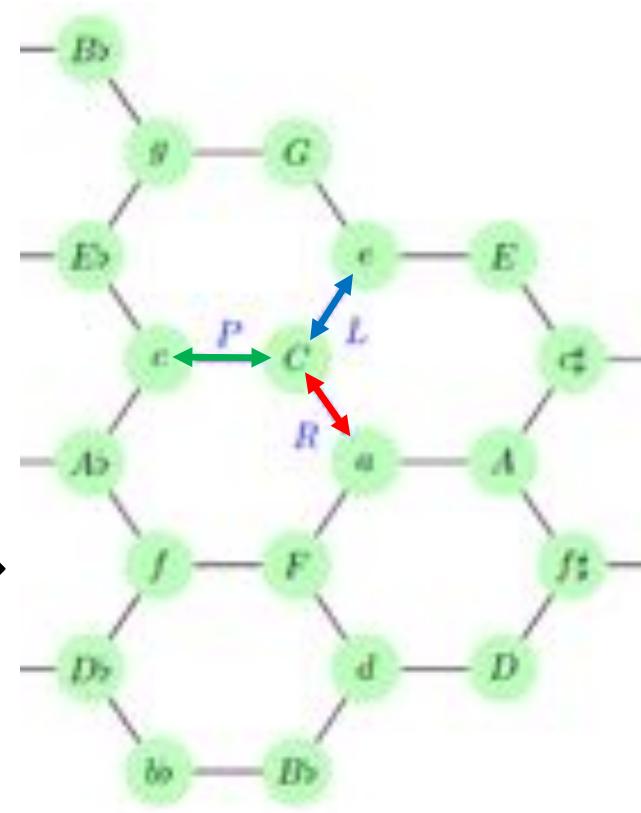
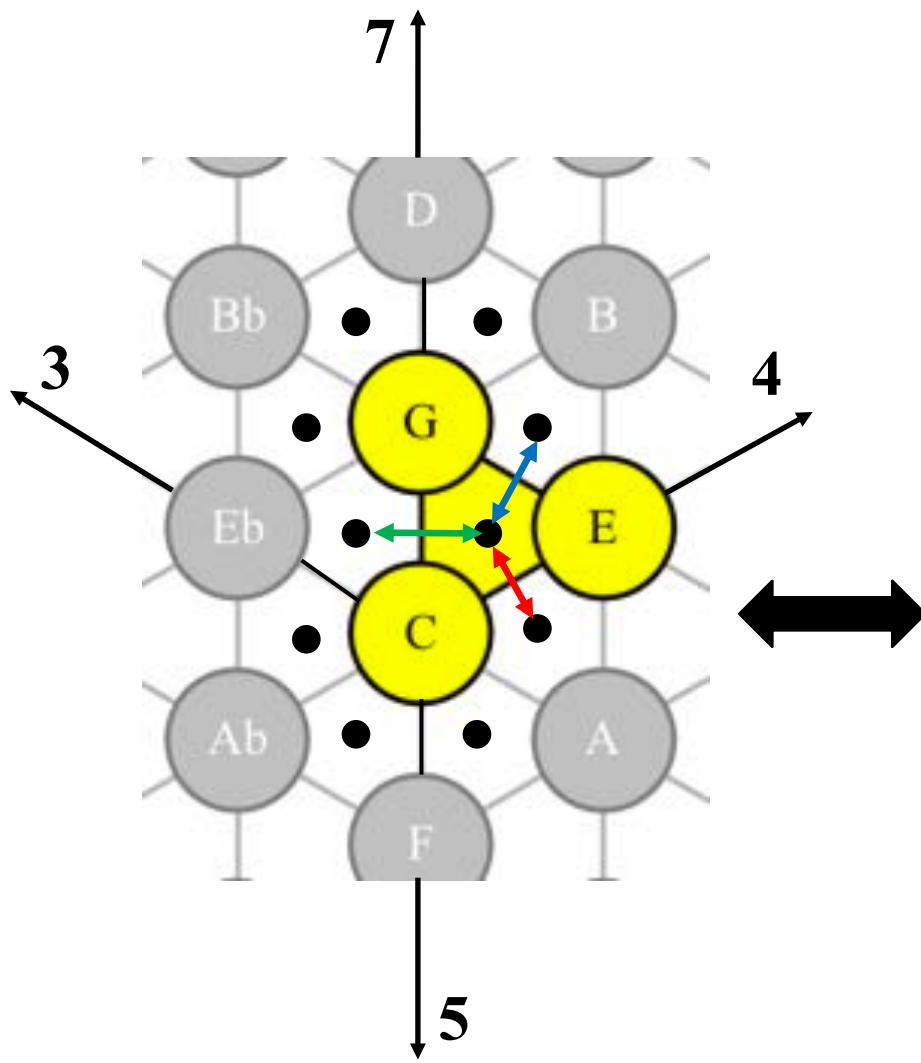
Le Tonnetz (ou nid musical d'abeilles)



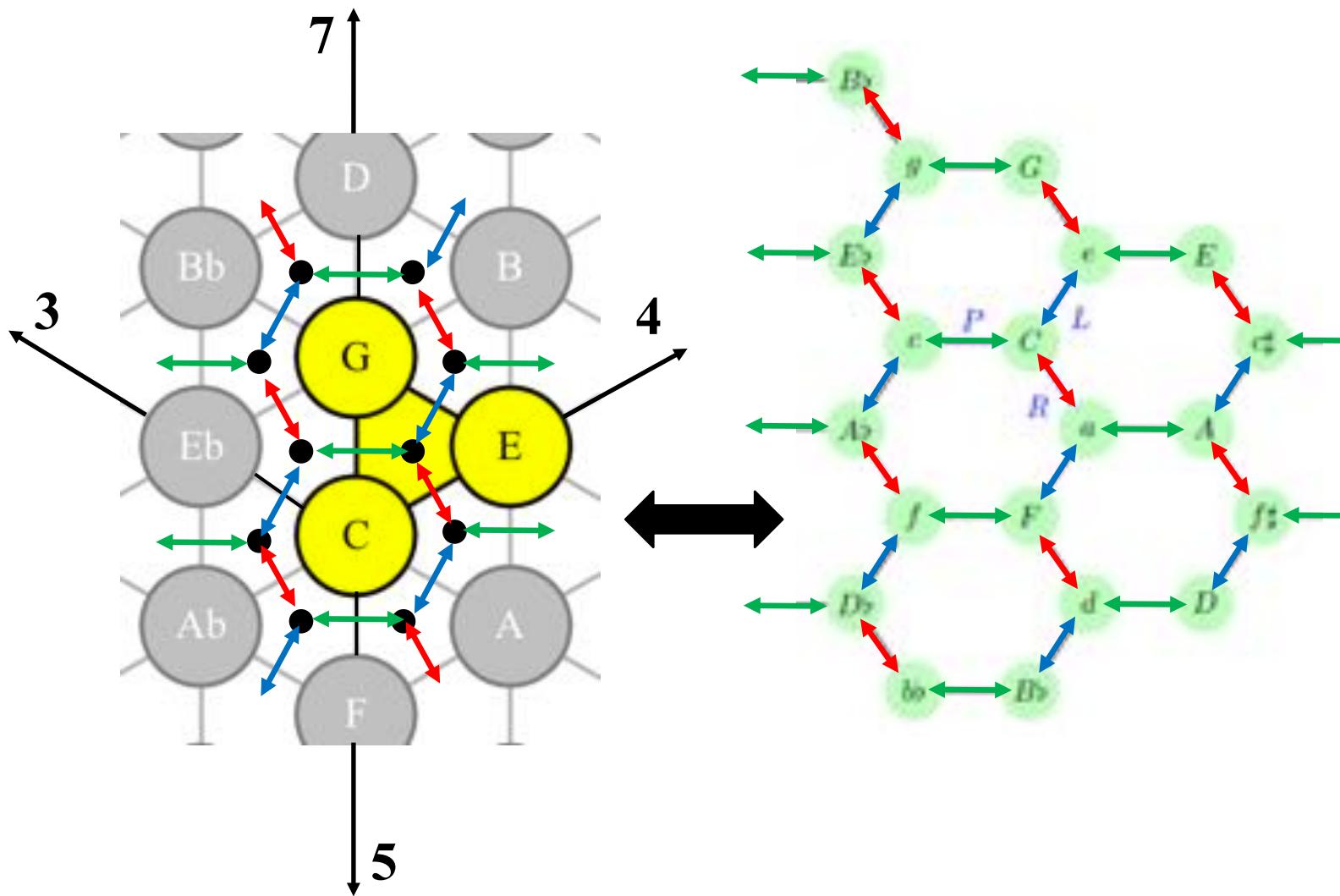
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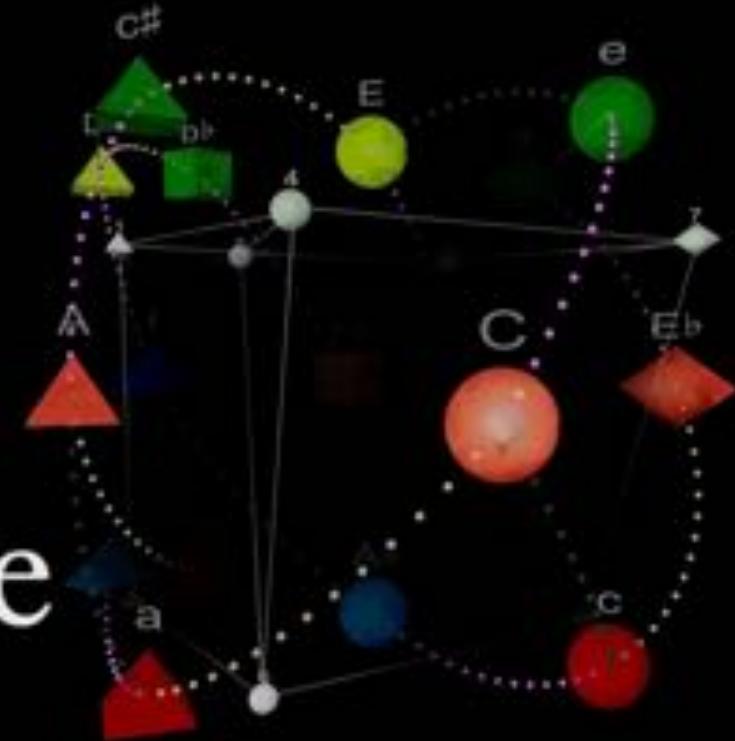
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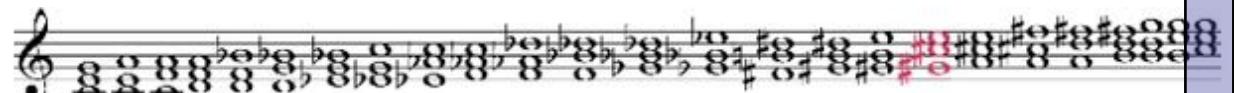


Beethoven and the Hypersphere *(and the Tonnetz)*



Gilles Baroin 2016
www.MatheMusic.net

Reading Beethoven backwards

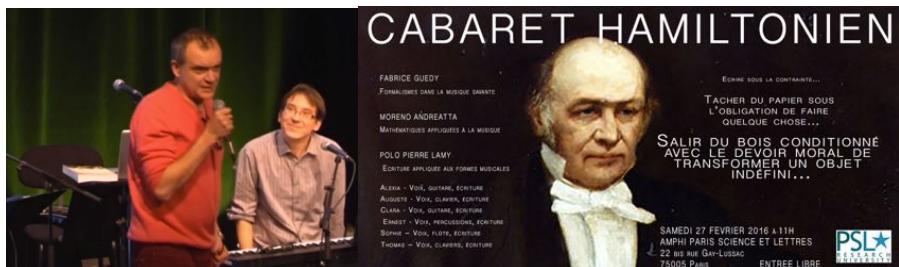
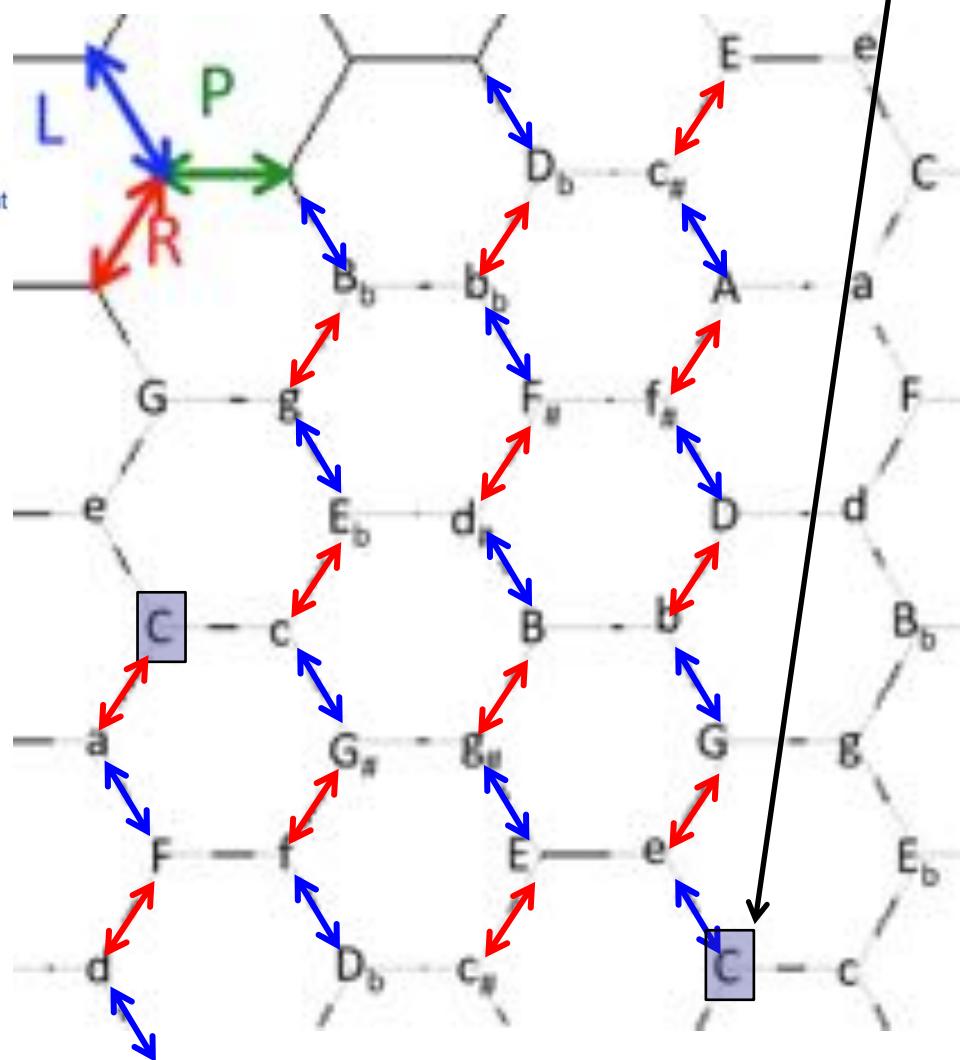


← time

Le Blé en Herbe

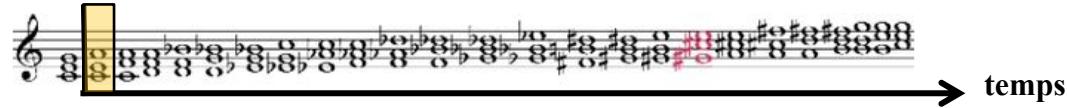
(Polo/Moreno/Dieu)

- | | |
|--|--|
| Plonger comme un enfant, cheveux au vent | Croiser matin dans l'herbe folle |
| Sous l'océan du blé en herbe | Deux tourterelles qui s'envolent |
| Marée d'épis couleur d'amande | Suivre les jeux des hirondelles |
| Qui tendent à caresser le ciel | Sur le paysage éternel |
| Algues tendres de mille plages | Nager comme un enfant, cheveux au vent |
| Frôlant le ventre des nuages | Sous l'océan |
| Cheveux de pluie, dos de poissons | Du blé en herbe |
| Qui frissonnent à l'unisson | Marée de fruits au goût amer |
| Suivre le bord des continents | Acide et salée comme la mer |
| Dans l'océan du blé en herbe | Vers l'îlot d'un petit village |
| Pêcher le corail du pavot | Vers un château d'eau sur la plage |
| Dans le sang des coquelicots | Quand tout s'éteint avant l'orage |
| | Quand se lève le vent du large |
| | Sur le blé vert |





Changing the starting point of the zig-zag



A part (Andrée Chedid, poème tiré du recueil *Rythmes* Collection Poésie/Gallimard (n. 527), Gallimard, 2018)

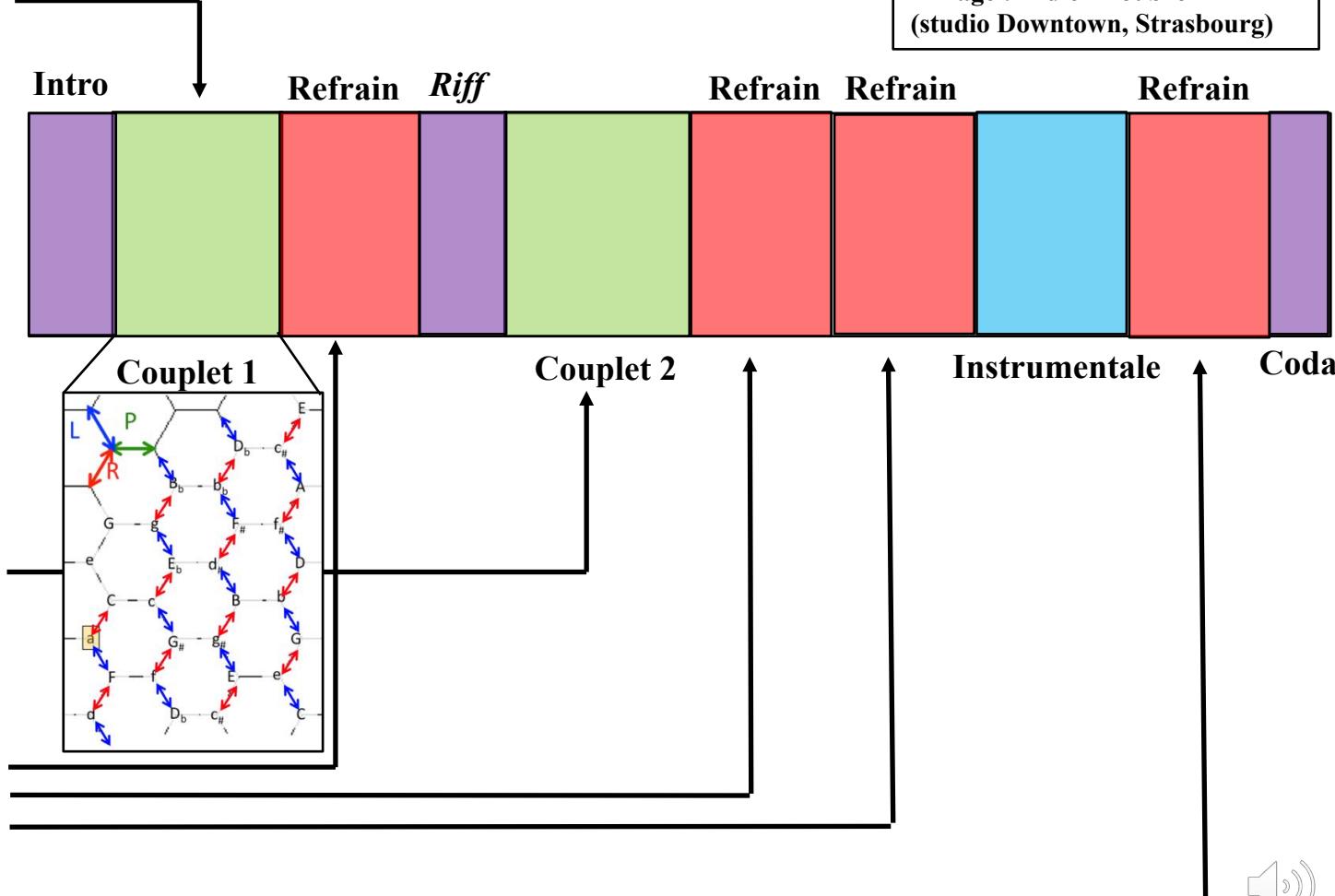
Composition : Moreno Andreatta
Arrangement : Benoît Messinger
Mixage : Didier Houbre
(studio Downtown, Strasbourg)

À part le temps
Et ses rouages
À part la terre
En éruptions
À part le ciel
Pétrisseur de nuages
À part l'ennemi
Qui génère l'ennemi

À part le désamour
Qui ronge l'illusion
À part la durée
Qui moisit nos visages

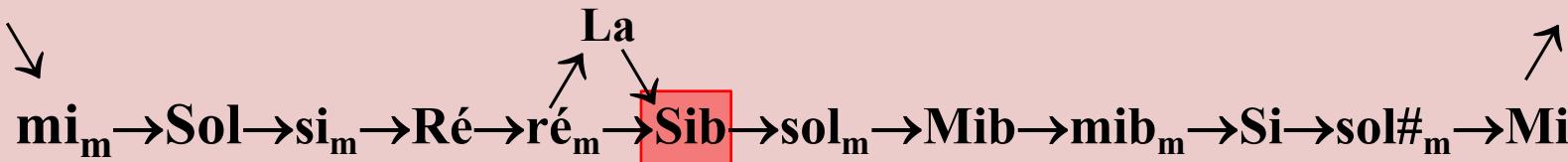
À part les fléaux
À part la tyrannie
À part l'ombre et le crime
Nos batailles nos outrages

Je te célèbre ô Vie
Entre cavités et songes
Intervalle convoité
Entre le vide et le rien



Aprile, a Hamiltonian « decadent » song

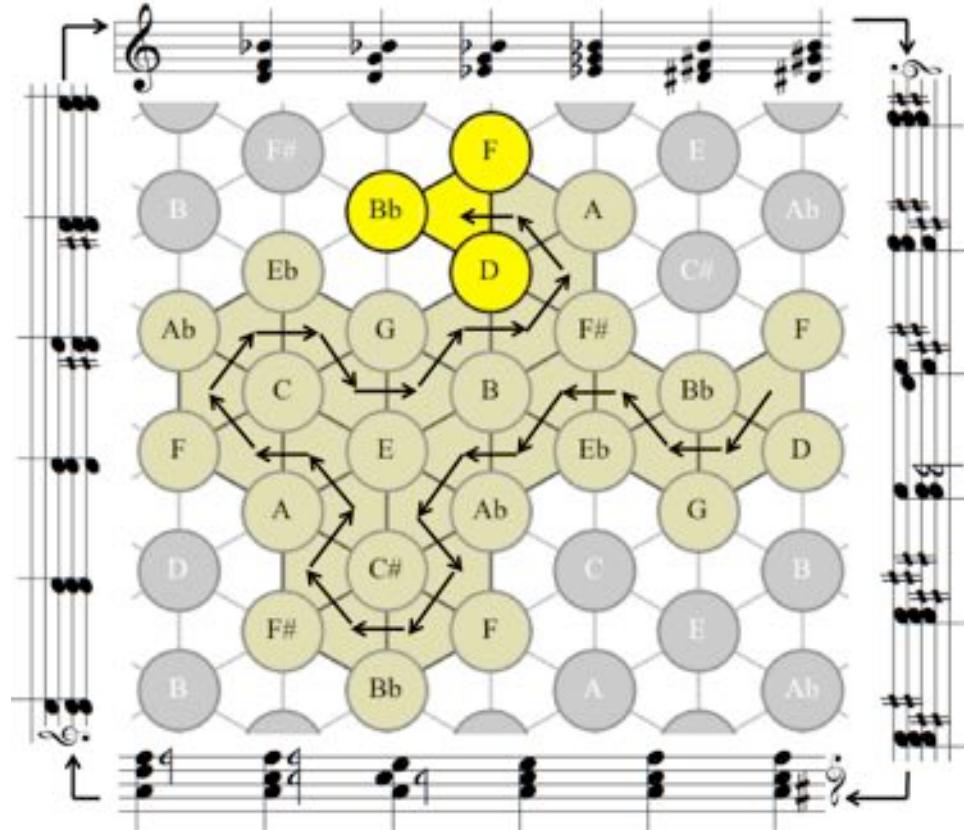
Do←**do**_m←**Sol#**←**fa**_m←**Fa**←**la**_m←**La**←**fa#**_m←**Fa#**←**sib**_m←**Do#**←**do#**_m



*Socchiusa è la finestra, sul giardino.
Un'ora passa lenta, sonnolenta.
Ed ella, ch'era attenta, s'addormenta
A quella voce che già si lamenta,
Che si lamenta in fondo a quel giardino.*

*Non è che voce d'acque su la pietra:
E quante volte, quante volte udita!
Quell'amore e quell'ora in quella vita
S'affondan come ne l'onda infinita
Stretti insieme il cadavere e la pietra.*

*Ella stende l'angoscia sua nel sonno.
L'angoscia è forte, e il sonno è così lieve!
(Par i' luce d'aprile quasi una neve
che sia tiepida.)
Ed ella certo deve soffrire,
Vagamente, anche nel sonno.*

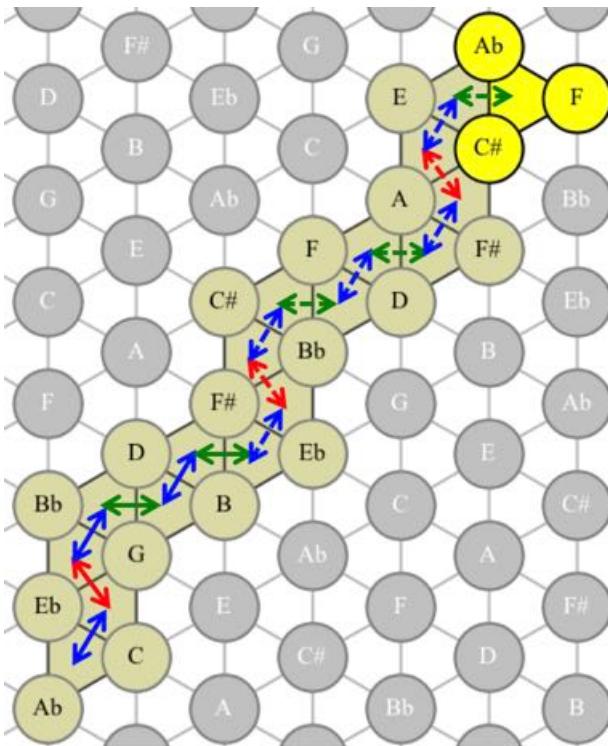


ACTIONS

Math'n'pop

G. D'Annunzio (1863-1938)

La sera non è più la tua canzone (after Mario Luzi)

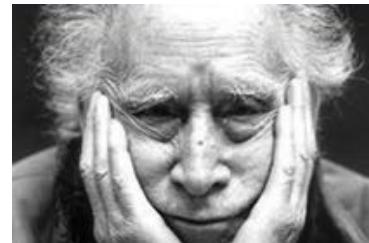


**La sera non è più la tua canzone,
è questa roccia d'ombra traforata
dai lumi e dalle voci senza fine,
la quiete d'una cosa già pensata.**

**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.**



M. Luzi (1914-2005)

*Le soir n'est plus ta chanson,
c'est ce rocher 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)

Music: M. Andreatta
Arrangement and mix: M. Bergomi & S. Geravini
(Perfect Music Production)
Mastering: A. Cutolo (Massive Arts Studio, Milan)

Luzi



Hamiltonian Song
on
SpinnenTonnetz
2014

Lyrics by Mario Luzi

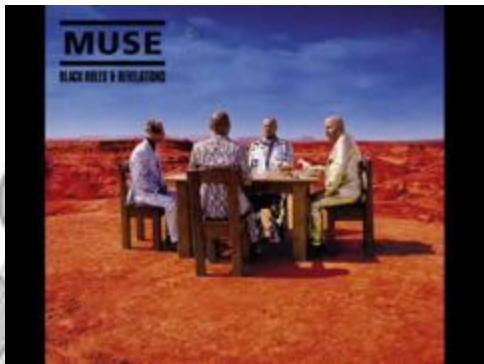
Music and Vocals by Moreno Andreatta

Graphics and Animation by Gilles Baroin

SpinnenTonnetz by Gilles Baroin, Hugò Seress

Original "Chicken Wire" graph by J.Douthett, P.Steinbach

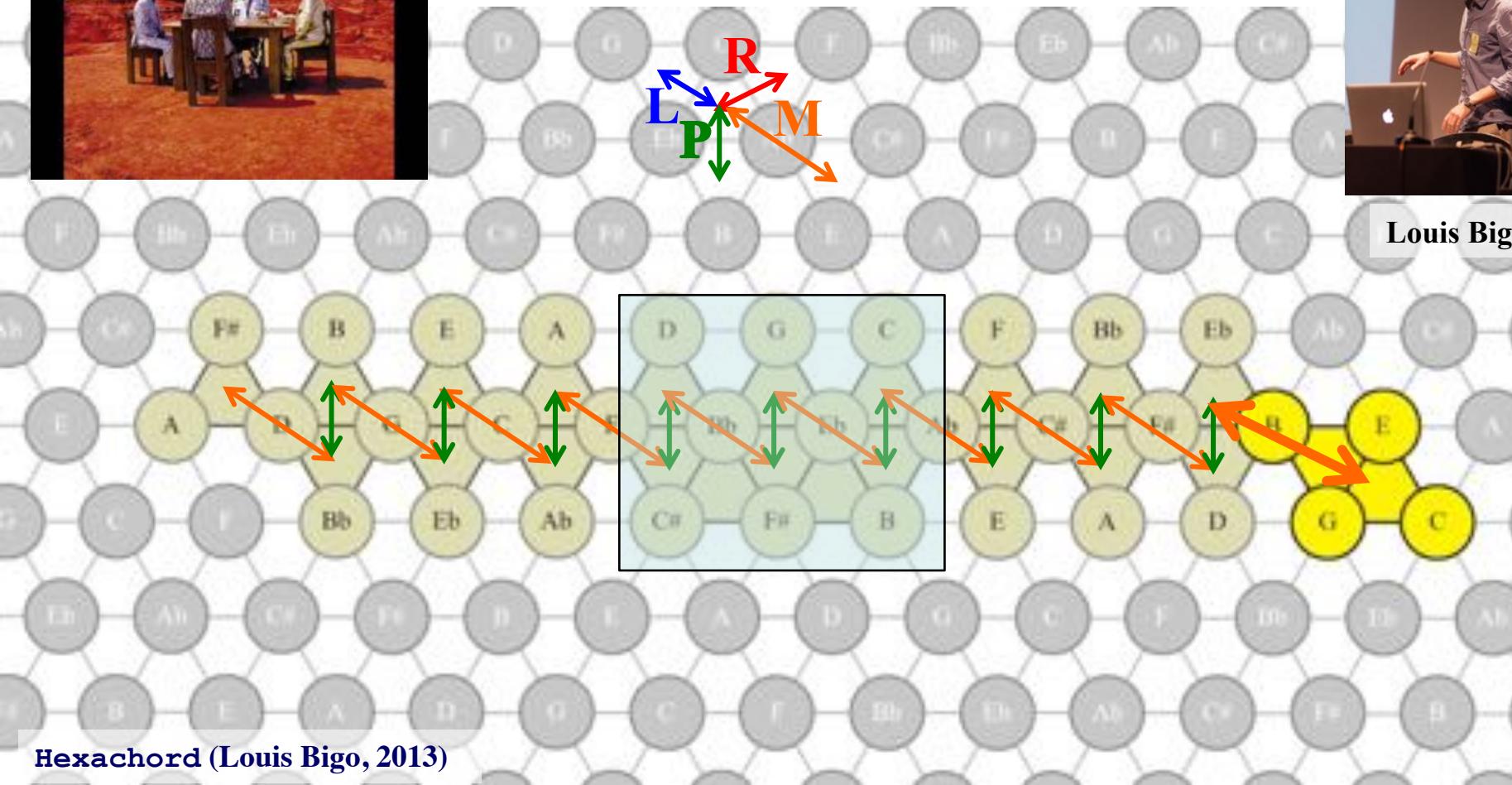
Symmetries and algorithmic processes in *Muse*



“Take a bow” (*Black Holes and Revelations*, 2006)



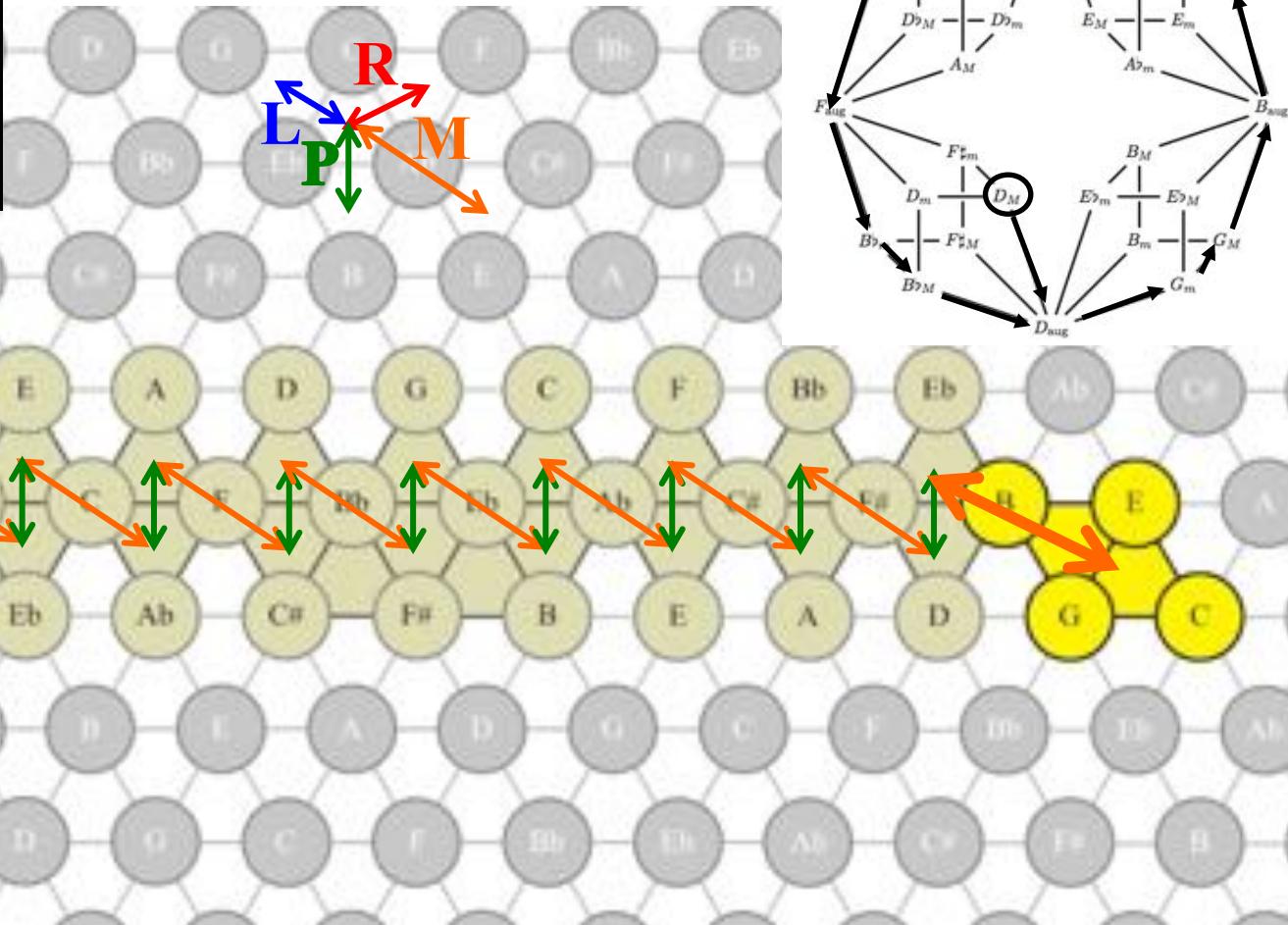
Louis Bigo



Symmetries and algorithmic processes in *Muse*

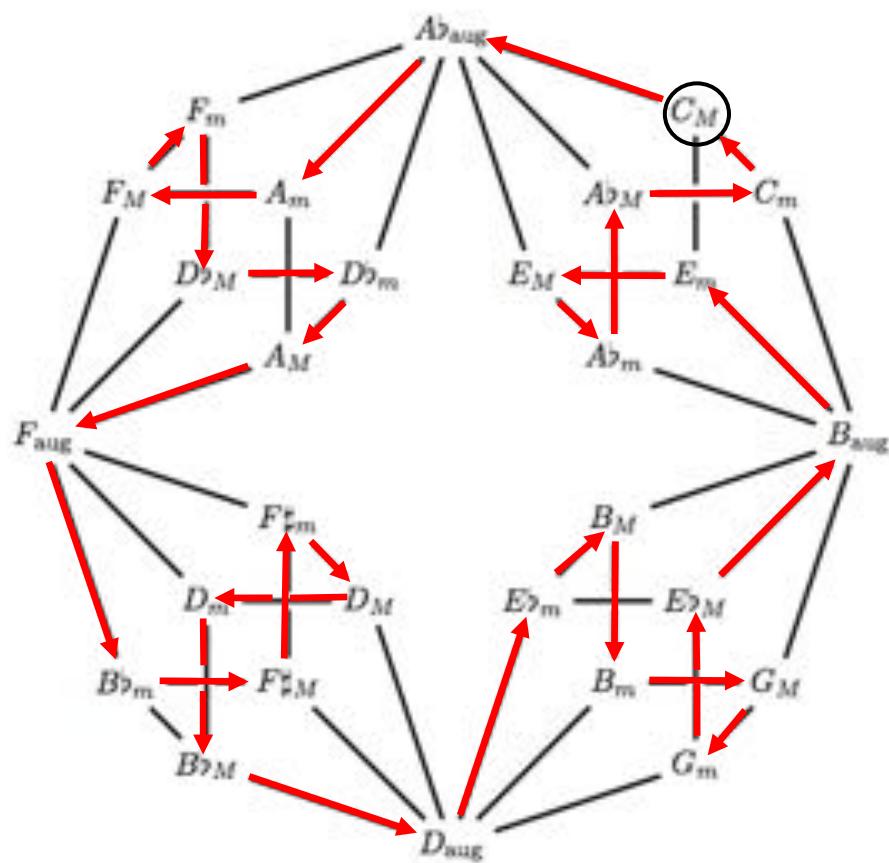


“Take a bow”
(*Black Holes and Revelations*, 2006)



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

The Gunner's Hamiltonian Dream (an *oumouopian* experiment on a song by Pink-Floyd)



The three main hamiltonian cycles ($C_M = C$, $C_m = Cm$, $C_{aug} = C+$)

$C \rightarrow C+ \rightarrow Am \rightarrow F \rightarrow Fm \rightarrow C\#m \rightarrow C+ \rightarrow A \rightarrow F+ \rightarrow Bbm \rightarrow F\# \rightarrow F\#m \rightarrow D \rightarrow Dm \rightarrow Bb \rightarrow D+ \rightarrow Ebm \rightarrow B \rightarrow Bm \rightarrow G \rightarrow Gm \rightarrow Eb \rightarrow G+ \rightarrow Em \rightarrow E \rightarrow G\#m \rightarrow G\# \rightarrow Cm \rightarrow C$

$C \rightarrow C+ \rightarrow Am \rightarrow F \rightarrow Fm \rightarrow C\# \rightarrow C\#m \rightarrow A \rightarrow F+ \rightarrow F\#m \rightarrow F\# \rightarrow Bbm \rightarrow Bb \rightarrow Dm \rightarrow D \rightarrow D+ \rightarrow Ebm \rightarrow B \rightarrow Bm \rightarrow G \rightarrow Gm \rightarrow Eb \rightarrow G+ \rightarrow Em \rightarrow E \rightarrow G\#m \rightarrow G\# \rightarrow Cm \rightarrow C$

$C \rightarrow C+ \rightarrow Am \rightarrow F \rightarrow Fm \rightarrow C\# \rightarrow C\#m \rightarrow A \rightarrow F+ \rightarrow F\#m \rightarrow D \rightarrow Dm \rightarrow Bb \rightarrow Bbm \rightarrow F\# \rightarrow D+ \rightarrow Ebm \rightarrow B \rightarrow Bm \rightarrow G \rightarrow Gm \rightarrow Eb \rightarrow G+ \rightarrow Cm \rightarrow G\# \rightarrow G\#m \rightarrow E \rightarrow Em \rightarrow C$

The Gunner's dream (R. Waters, 1983 / M. Andreatta, 2018)

(C)

C+
Floating down through the clouds

Am

F

Memories come rushing up to meet me now.

Fm

In the space between the heavens

C#

and in the corner of some foreign field

A

F+

Bbm

I had a dream.

C#m

F#m D Dm

I had a dream.

Bb

Good-bye Max.

D+

Good-bye Ma.

Ebm

B

After the service when you're walking slowly to the car

Bm

G

And the silver in her hair shines in the cold November air

Gm

You hear the tolling bell

Eb

And touch the silk in your lapel

G+

Em

And as the tear drops rise to meet the comfort of the band

G#

E

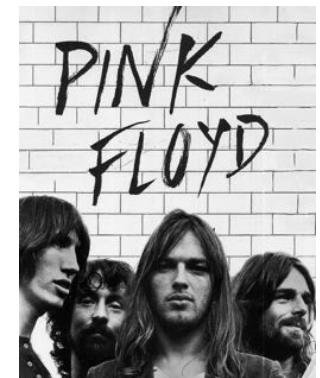
Cm

You take her frail hand

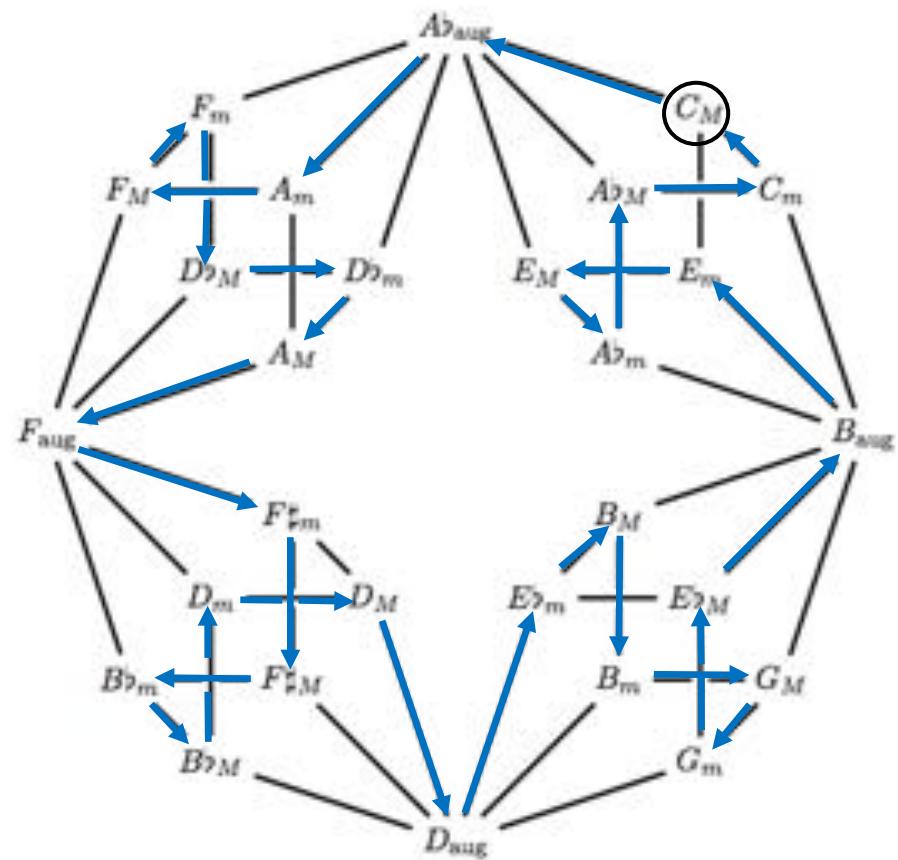
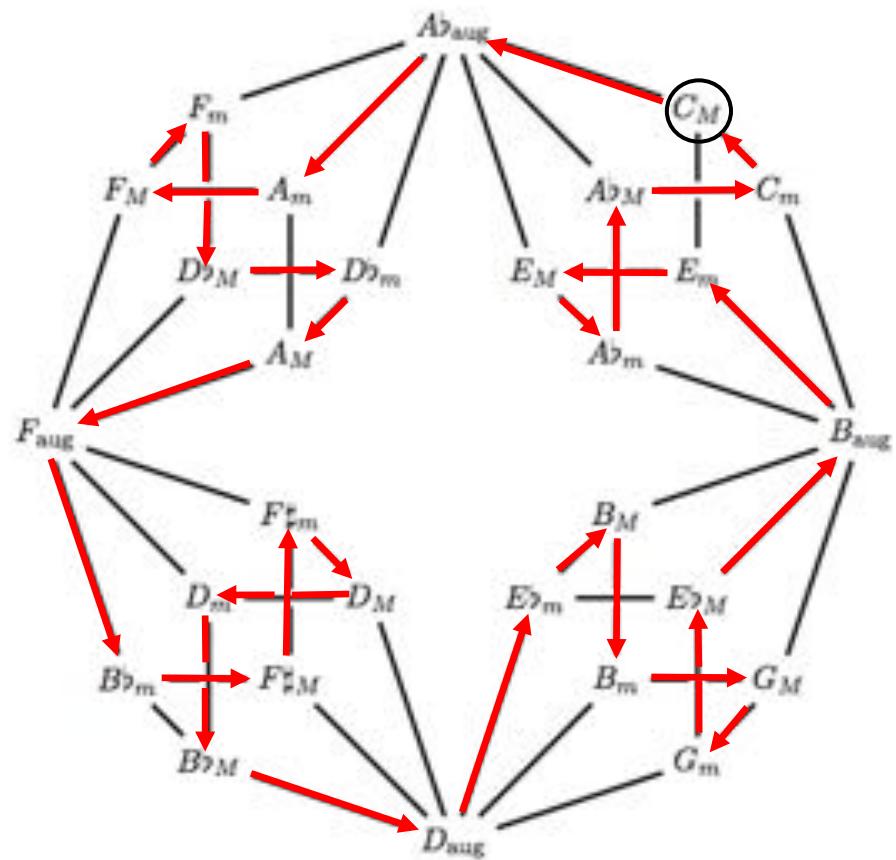
C

G#m

And hold on to the dream.



The Gunner's Hamiltonian Dream (an *oumouopian* experiment on a song by Pink-Floyd)

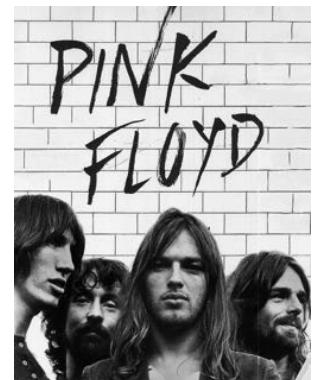


The three main hamiltonian cycles ($C_M = C$, $C_m = Cm$, $C_{aug} = C+$)

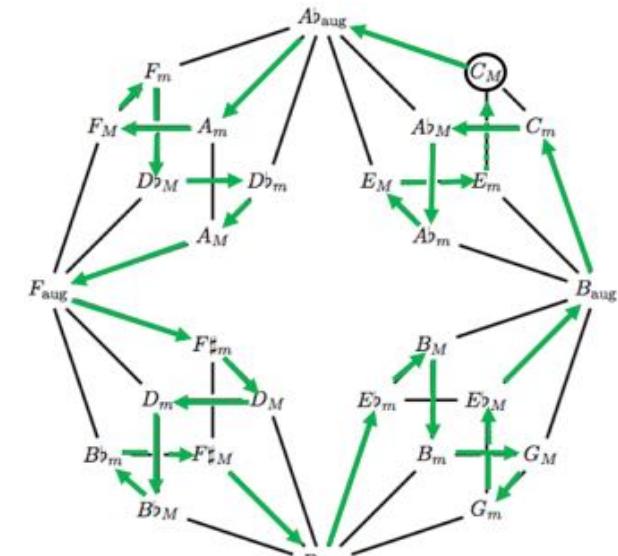
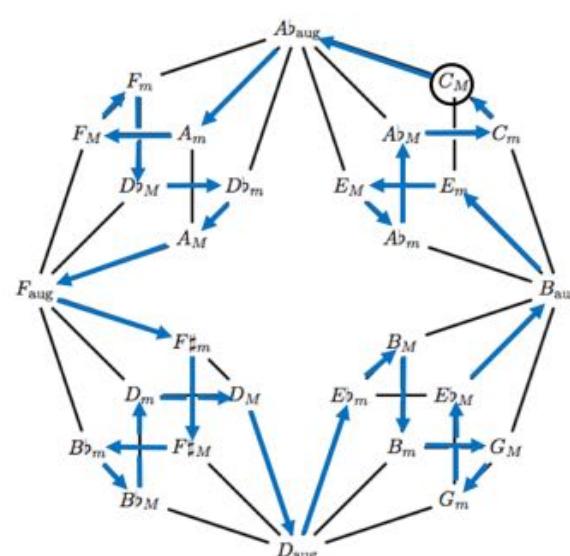
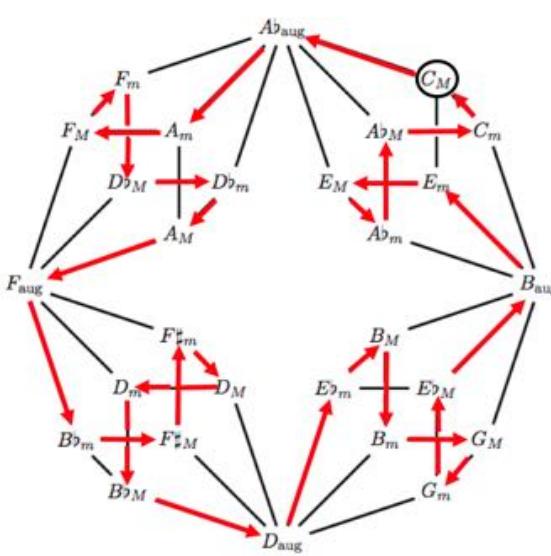
$C \rightarrow C+ \rightarrow Am \rightarrow F \rightarrow Fm \rightarrow C\# \rightarrow C\#m \rightarrow A \rightarrow F+ \rightarrow Bbm \rightarrow F\# \rightarrow F\#m \rightarrow D \rightarrow Dm \rightarrow Bb \rightarrow D+ \rightarrow Ebm \rightarrow B \rightarrow Bm \rightarrow G \rightarrow Gm \rightarrow Eb \rightarrow G+ \rightarrow Em \rightarrow E \rightarrow G\#m \rightarrow G\# \rightarrow Cm \rightarrow C$

$C \rightarrow C+ \rightarrow Am \rightarrow F \rightarrow Fm \rightarrow C\# \rightarrow C\#m \rightarrow A \rightarrow F+ \rightarrow F\#m \rightarrow F\# \rightarrow Bbm \rightarrow Bb \rightarrow Dm \rightarrow D \rightarrow D+ \rightarrow Ebm \rightarrow B \rightarrow Bm \rightarrow G \rightarrow Gm \rightarrow Eb \rightarrow G+ \rightarrow Em \rightarrow E \rightarrow G\#m \rightarrow G\# \rightarrow Cm \rightarrow C$

$C \rightarrow C+ \rightarrow Am \rightarrow F \rightarrow Fm \rightarrow C\# \rightarrow C\#m \rightarrow A \rightarrow F+ \rightarrow F\#m \rightarrow D \rightarrow Dm \rightarrow Bb \rightarrow Bbm \rightarrow F\# \rightarrow D+ \rightarrow Ebm \rightarrow B \rightarrow Bm \rightarrow G \rightarrow Gm \rightarrow Eb \rightarrow G+ \rightarrow Cm \rightarrow G\# \rightarrow G\#m \rightarrow E \rightarrow Em \rightarrow C$



The Gunner's Hamiltonian Dream (an *oumouopian* experiment on a song by Pink-Floyd)



The three main hamiltonian cycles ($C_M = C$, $C_m = Cm$, $C_{aug} = C+$)

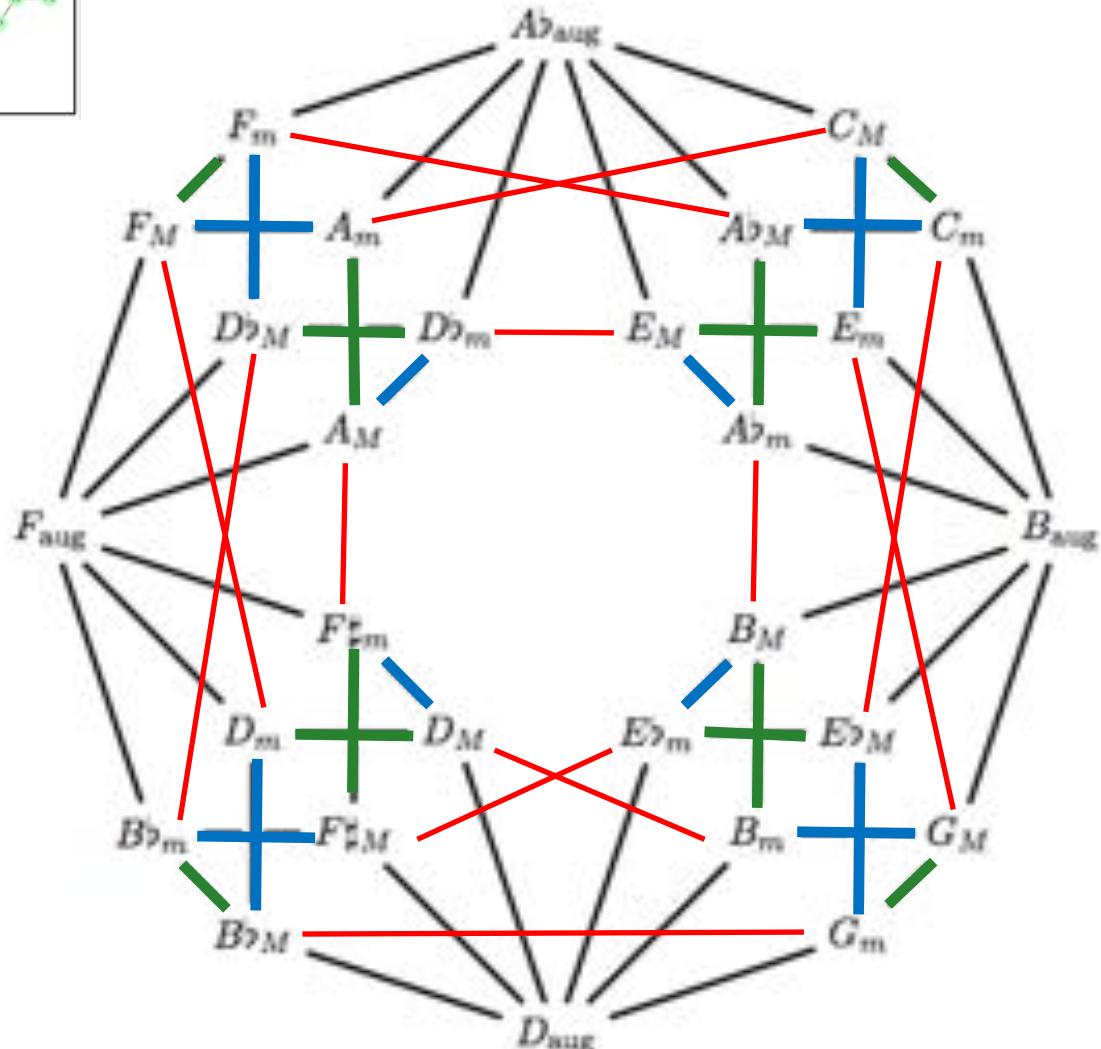
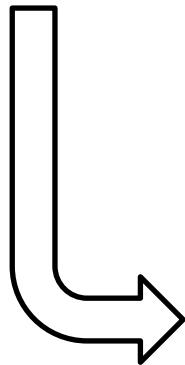
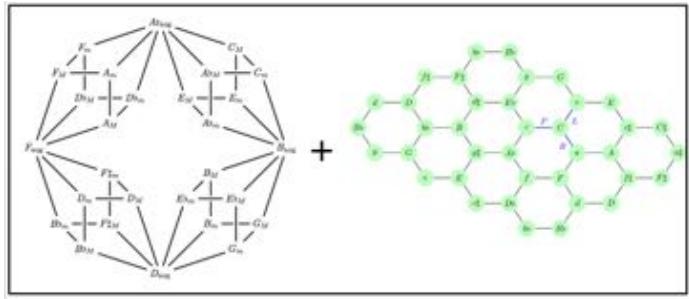


C-->C+-->Am-->F-->Fm-->C#m-->A-->F+->Bbm-->F#-->F#m-->D-->Dm-->Bb-->D+->Ebm-->B-->Bm-->
-->G-->Gm-->Eb-->G+->Em-->E-->G#m-->G#-->Cm-->C

C->C+->Am-->F-->Fm-->C#m-->A-->F+->F#m-->F#-->Bbm-->Bb-->Dm-->D-->D+->Ebm-->B-->Bm-->-->G-->Gm-->Eb-->G+->Em-->E-->G#m-->G#-->Cm-->C

C->C+->Am-->F-->Fm-->C#-->C#m-->A-->F+->F#m-->D-->Dm-->Bb-->Bbm-->F#-->D+->Ebm-->B-->Bm-->G-->Gm-->Eb-->G+->Cm-->G#-->G#m-->E-->Em-->C

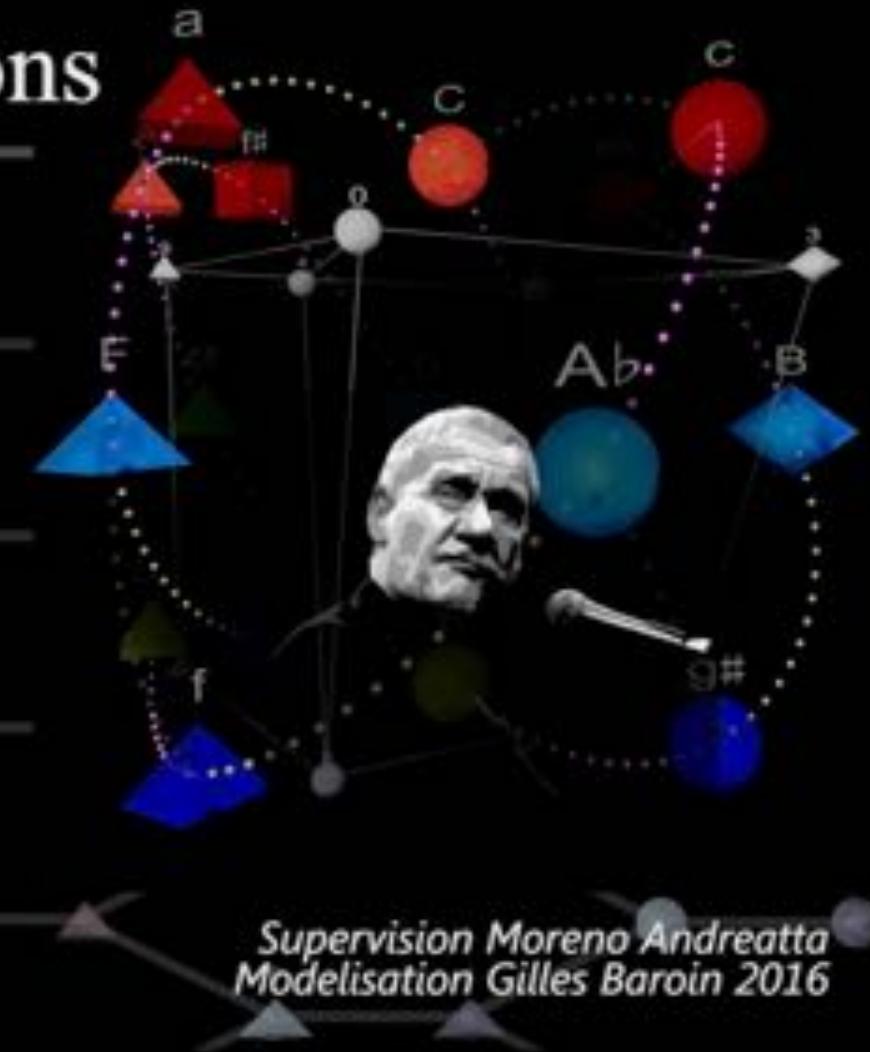
Embedding the Cube Dance into the Tonnetz



Harmonic Progressions

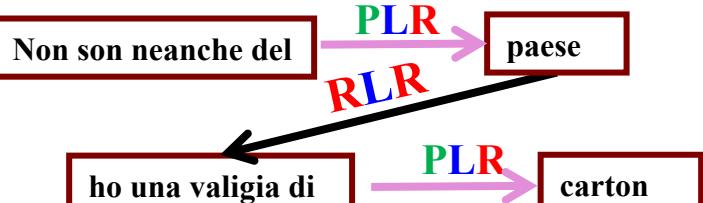
In Paolo Conte

Madeleine



A zig-zag in Paolo Conte's *Regno del Tango*

IL REGNO DEL TANGO (Paolo Conte)



sono vestito, sì in borghese,
RLR
PLR

ma dentro c'è il bandoneon...
RLR
PLR

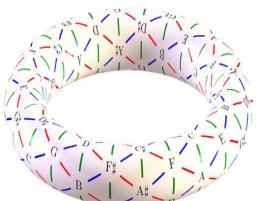
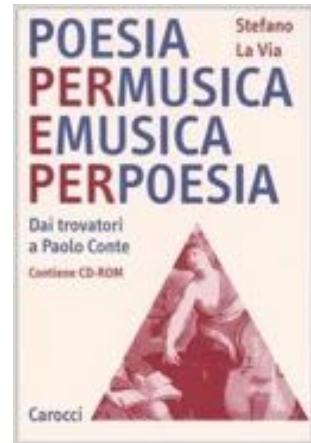
potrei sembrare un ragioniere,
RLR
PLR

anche un geometra potrei,
RLR
PLR

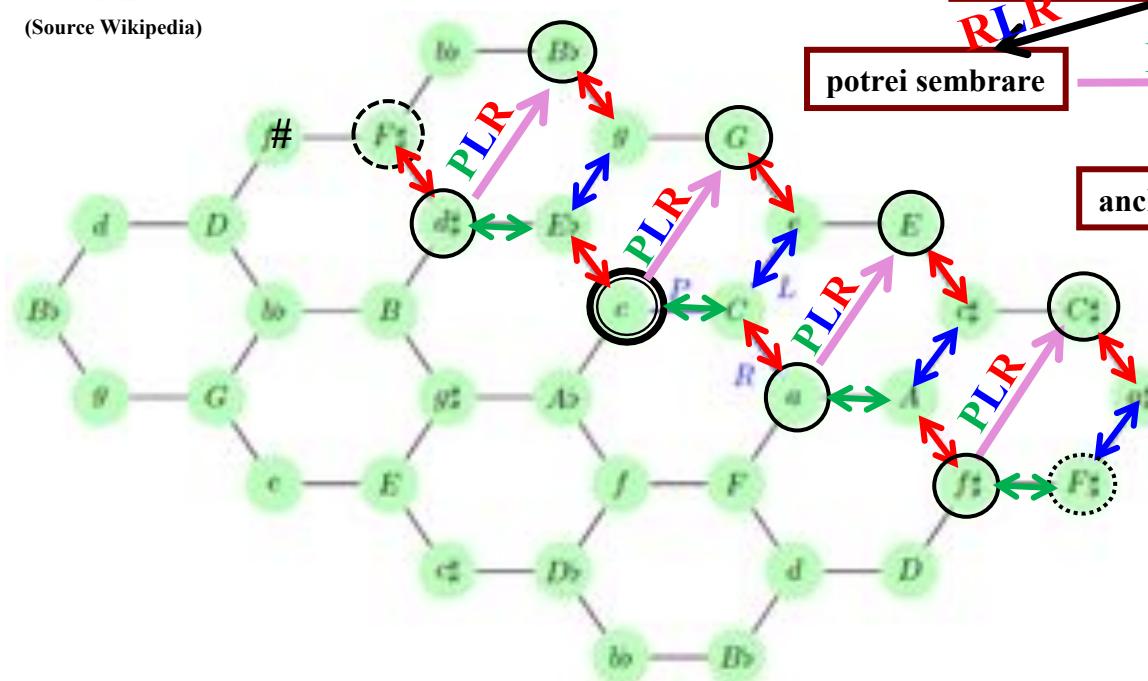
ma un tango sento io gridare
RLR
PLR

in fondo ai sentimenti miei
RLR
PLR

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



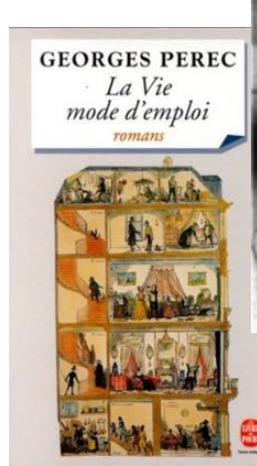
(Source Wikipedia)



OuLiPo or the use of constraints in arts



Cent mille milliards de poèmes, 1961



La vie mode d'emploi,



Georges Perec

*Georges
Perec*

Roman

La disparition

Les Lettres Nouvelles

Denoël



Raymond Queneau

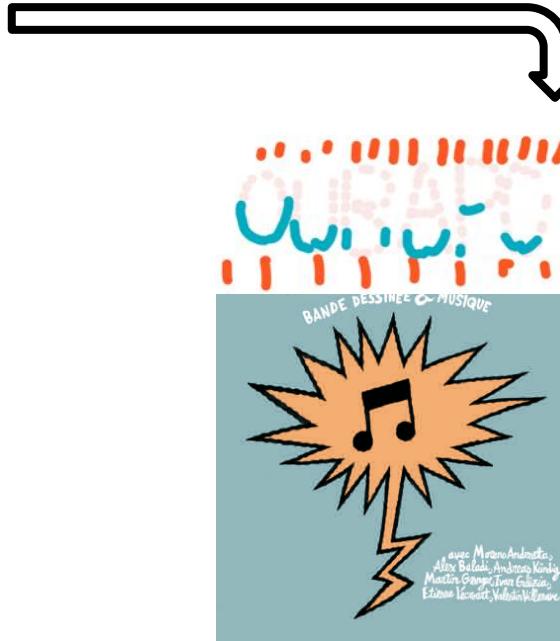


Italo Calvino
Il castello dei destini incrociati, 1969

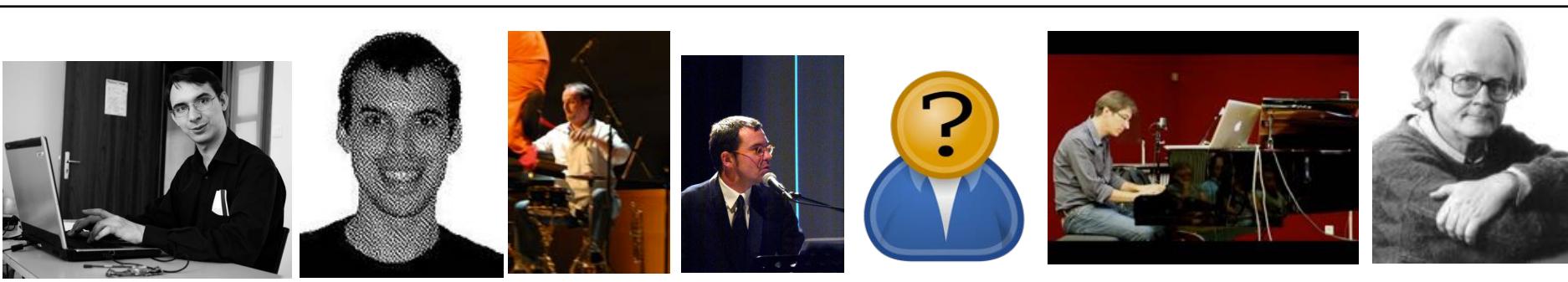


LN

From the OuLiPo to the OuMuPo (ouvroir de musique potentielle)



M. Andreatta et al., « Music, mathematics and language: chronicles from the Oumupo sandbox », in Kapoula, Z., Volle, E., Renault, J., Andreatta, M. (Eds.), *Exploring Transdisciplinarity in Art and Sciences*, Springer, 2018



Valentin Villenave

Mike Solomon

Jean-François
Piette

Martin
Granger

Joseph Boisseau

Moreno Andreatta

Tom Johnson

Une chanson permutationnelle : une phrase...

Una volta soltanto una storia d'amore finisce (M. Andreatta. tr. E. Lecroart, OuBaPo)

Una volta una storia d'amore
soltanto una storia

Una storia d'amore
soltanto una storia d'amore

Una storia
soltanto una storia

Una storia d'amore
soltanto

Una volta soltanto
una storia d'amore soltanto

Un amore soltanto una volta
soltanto una storia d'amore soltanto

Una storia d'amore
soltanto una volta una storia

Un amore
una volta soltanto

Un amore finisce
soltanto

Una volta una storia d'amore finisce
Un amore soltanto

Una volta soltanto una storia d'amore
finisce

Une fois une histoire d'amour
rien qu'une histoire
Une histoire d'amour
rien qu'une histoire d'amour
Une histoire
rien qu'une histoire
Rien qu'une histoire
d'amour
Rien qu'une fois
rien qu'une histoire d'amour

Un amour, rien qu'une fois
rien qu'une histoire d'amour, rien que ça
Une histoire d'amour
rien qu'une fois une histoire
Un amour
rien qu'une fois
Un amour ne se termine
rien...
...qu'une fois une histoire d'amour ne se termine
Rien qu'un amour

Une fois rien qu'une fois une histoire d'amour
se termine

Une chanson permutationnelle : une phrase, une note...

Una volta soltanto una storia d'amore finisce (M. Andreatta)

Una volta una storia d'amore
soltanto una storia

Una storia d'amore
soltanto una storia d'amore

Una storia
soltanto una storia

Una storia d'amore
soltanto

Una volta soltanto
una storia d'amore soltanto

Un amore soltanto una volta
soltanto una storia d'amore soltanto

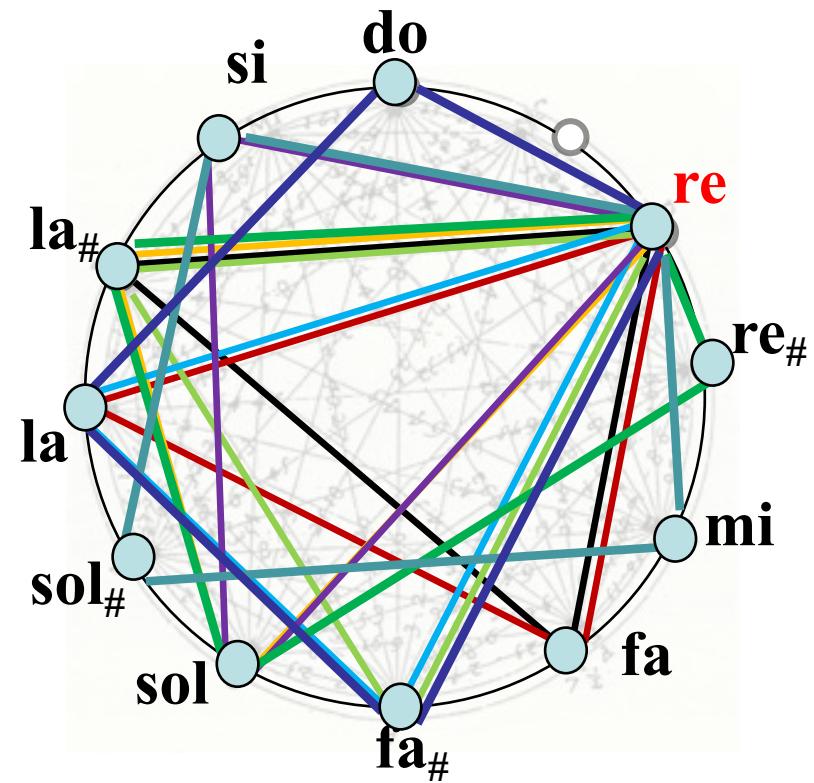
Una storia d'amore
soltanto una volta una storia

Un amore
una volta soltanto

Un amore finisce
soltanto

Una volta una storia d'amore finisce
Un amore soltanto

Una volta soltanto una storia d'amore finisce



Une chanson permutationnelle : une phrase, une note (moins une note !)

Una volta soltanto una storia d'amore finisce (M. Andreatta)

Una volta una storia d'amore
soltanto una storia

Una storia d'amore
soltanto una storia d'amore

Una storia
soltanto una storia

Una storia d'amore
soltanto

Una volta soltanto
una storia d'amore soltanto

Un amore soltanto una volta
soltanto una storia d'amore soltanto

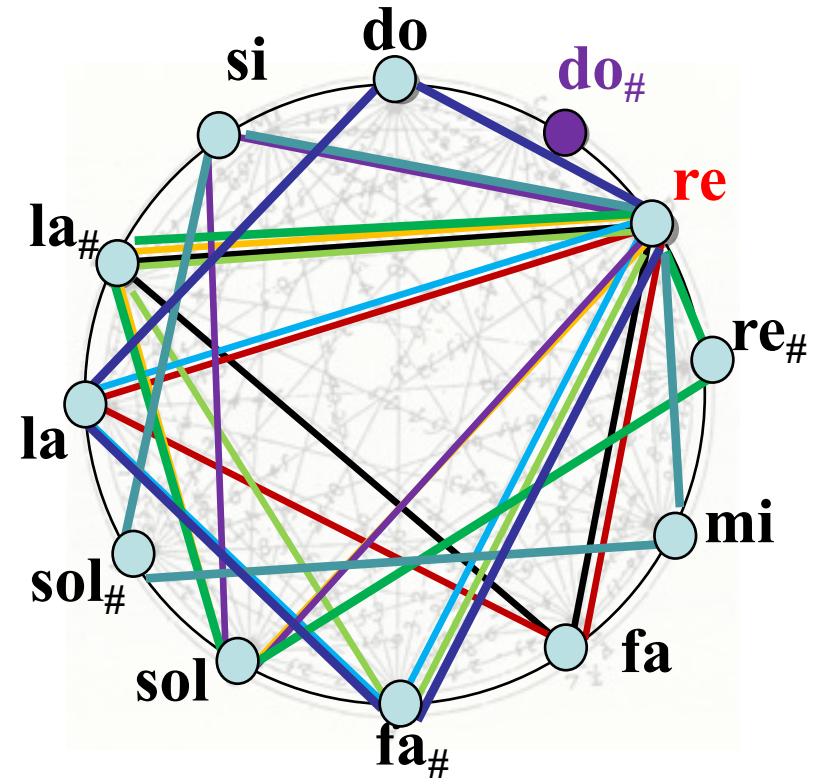
Una storia d'amore
soltanto una volta una storia

Un amore
una volta soltanto

Un amore finisce
soltanto

Una volta una storia d'amore finisce
Un amore soltanto

Una volta soltanto una storia d'amore finisce

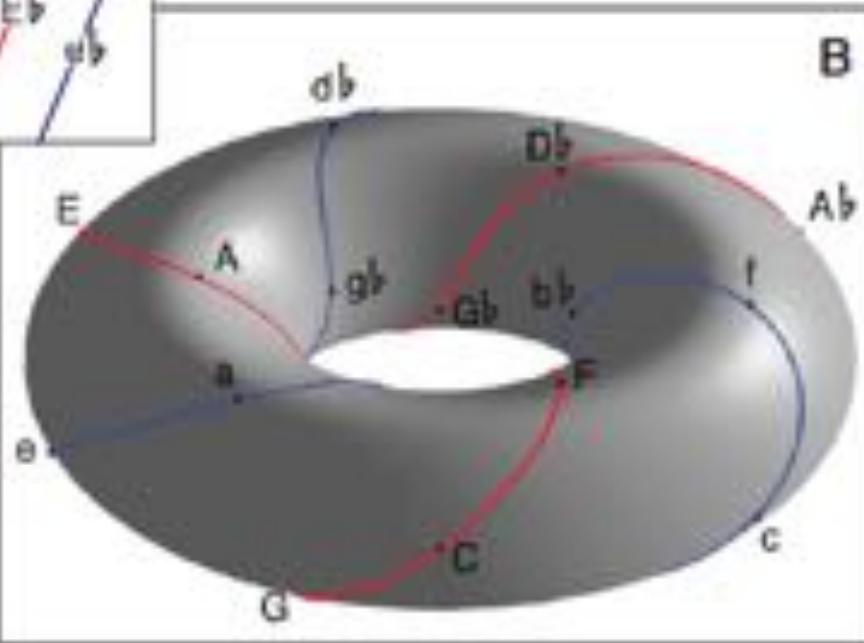
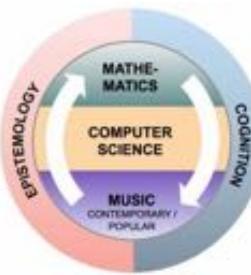
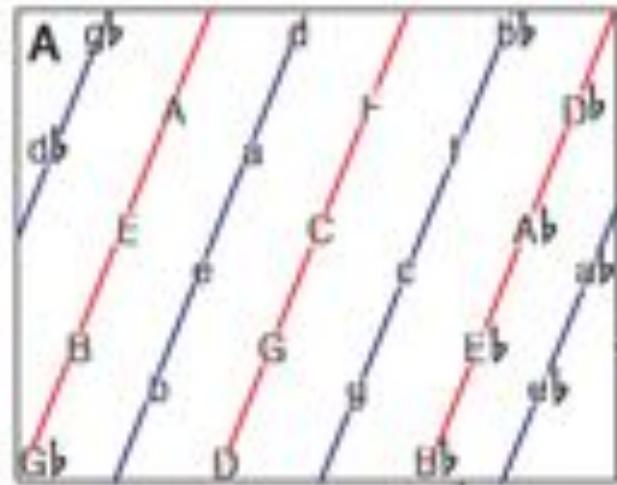


Some cognitive implications of mathemusical research

PERSPECTIVES: NEUROSCIENCE

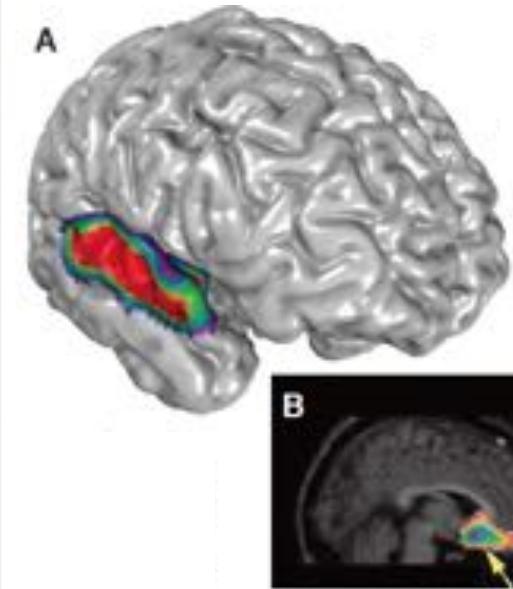
Mental Models and Musical Minds

Robert J. Zatorre and Carol L. Krumhansl

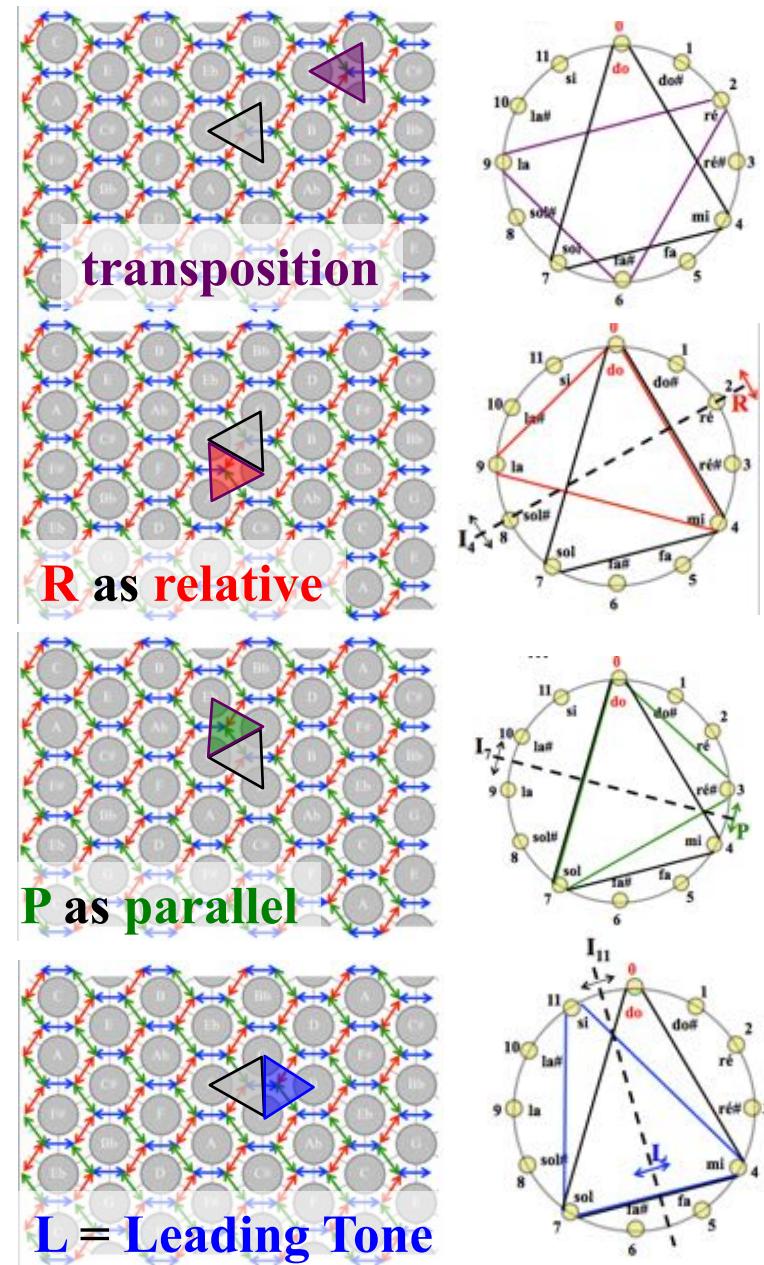
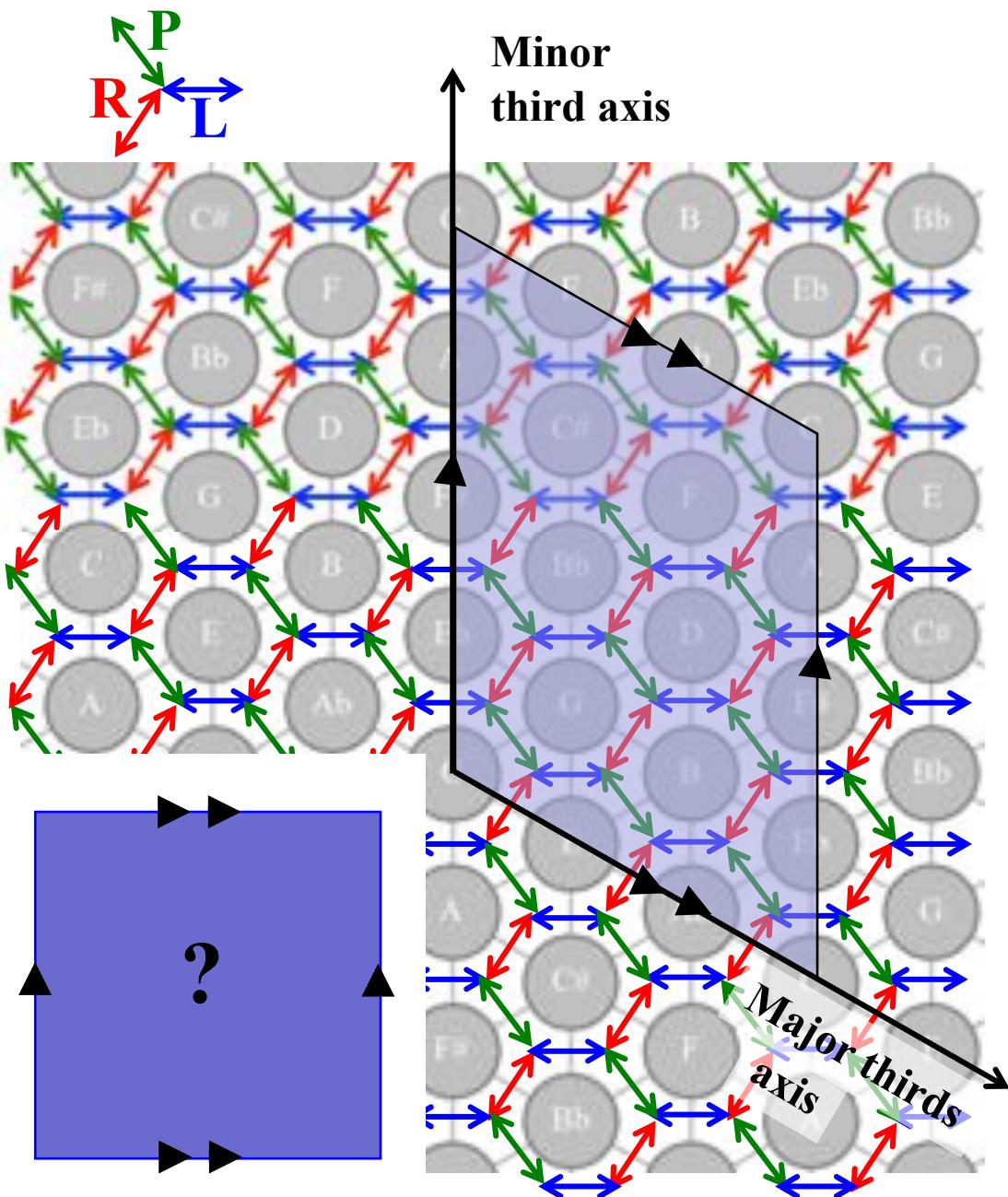


Mental key maps. (A) Unfolded version of the key map, with opposite edges to be considered matched. There is one circle of fifths for major keys (red) and one for minor keys (blue), each

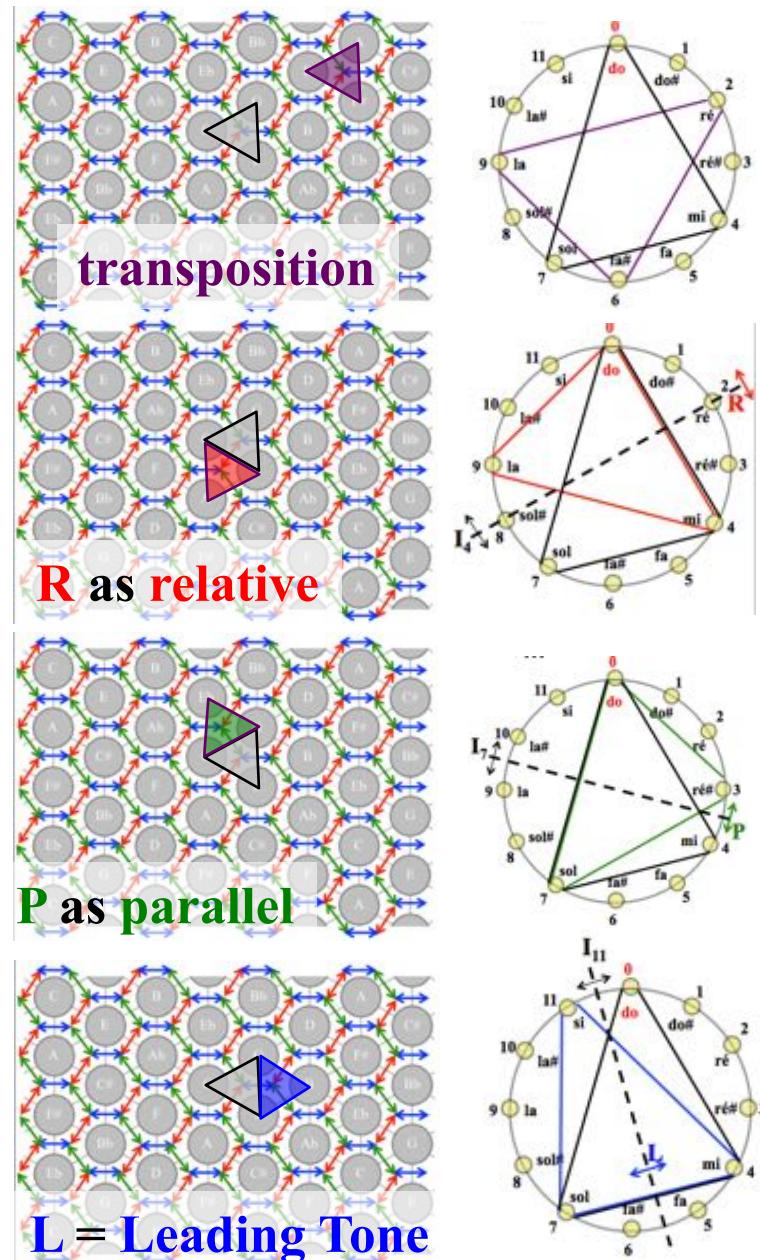
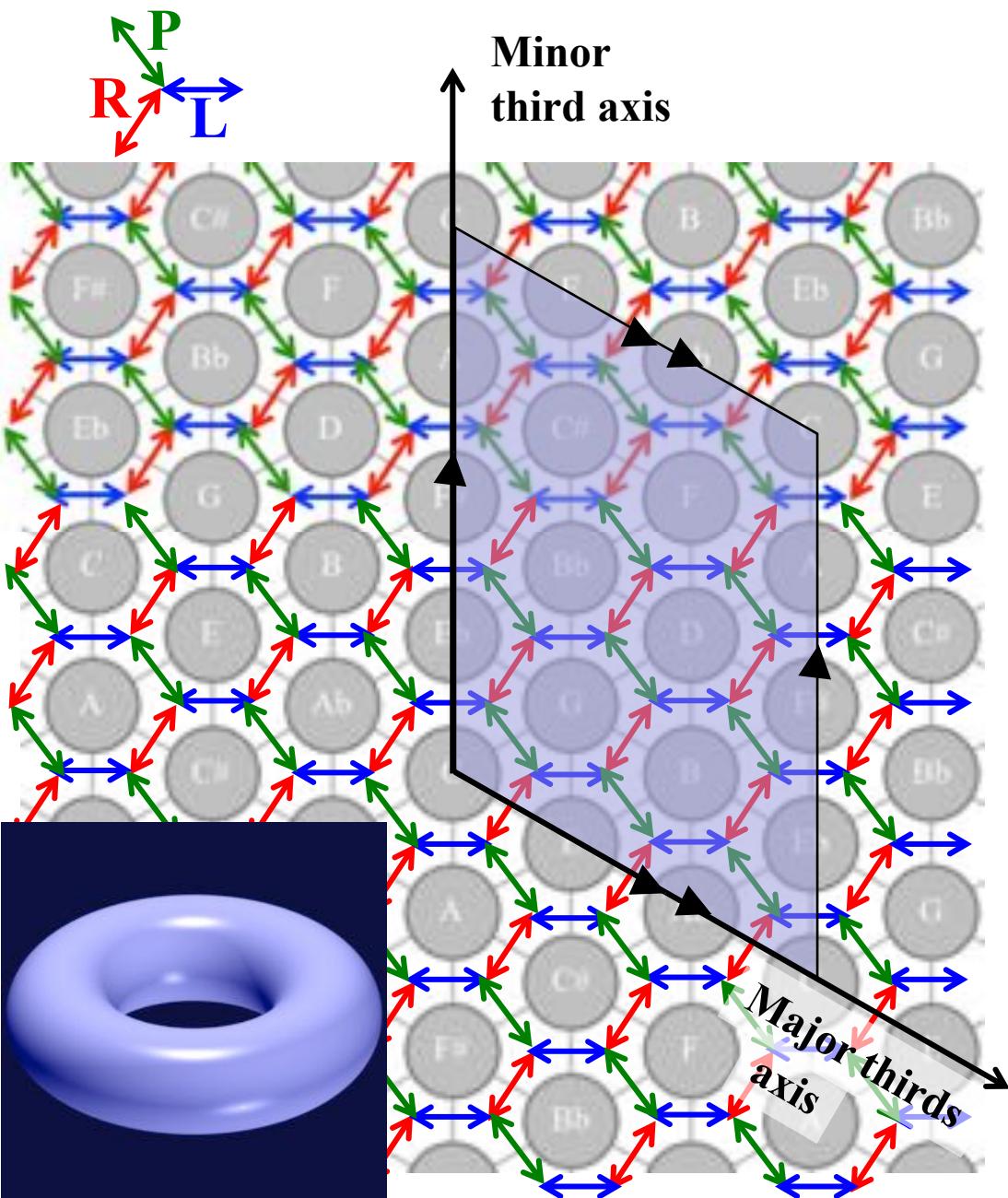
wrapping the torus three times. In this way, every major key is flanked by its relative minor on one side (for example, C major and a minor) and its parallel minor on the other (for example, C major and c minor). (B) Musical keys as points on the surface of a torus.



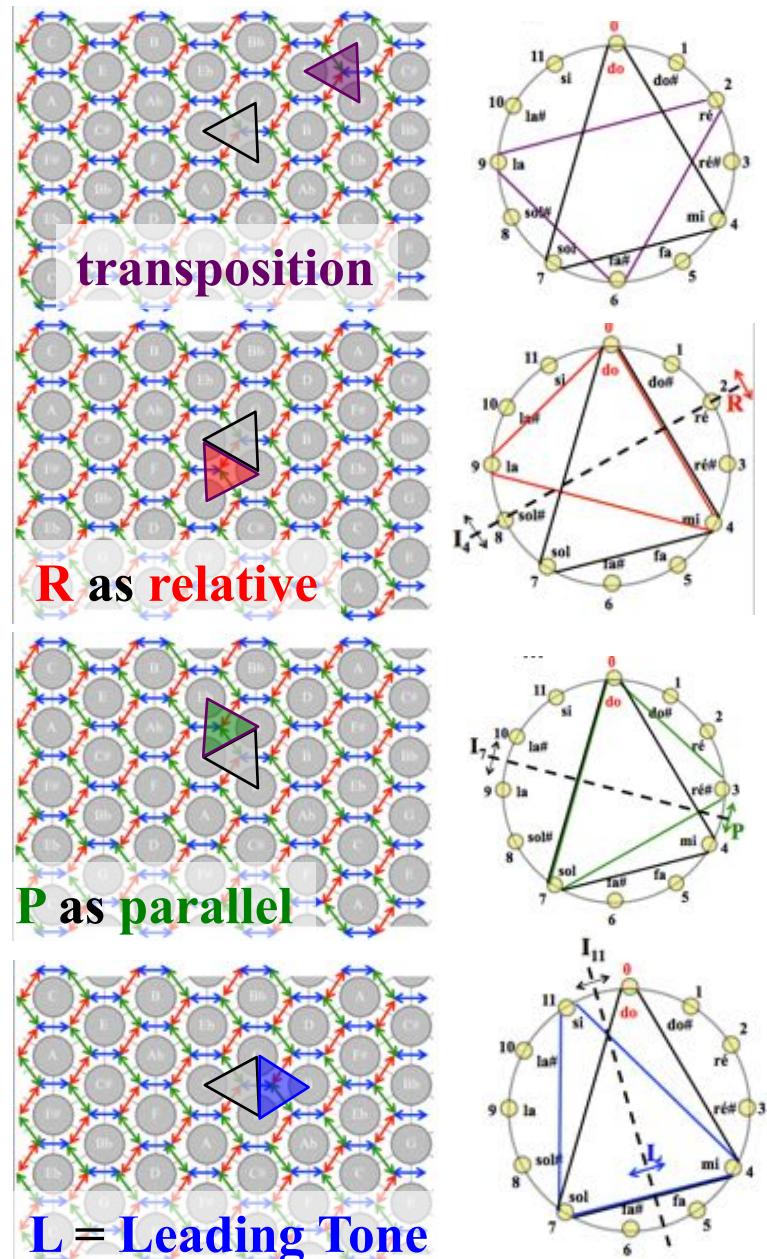
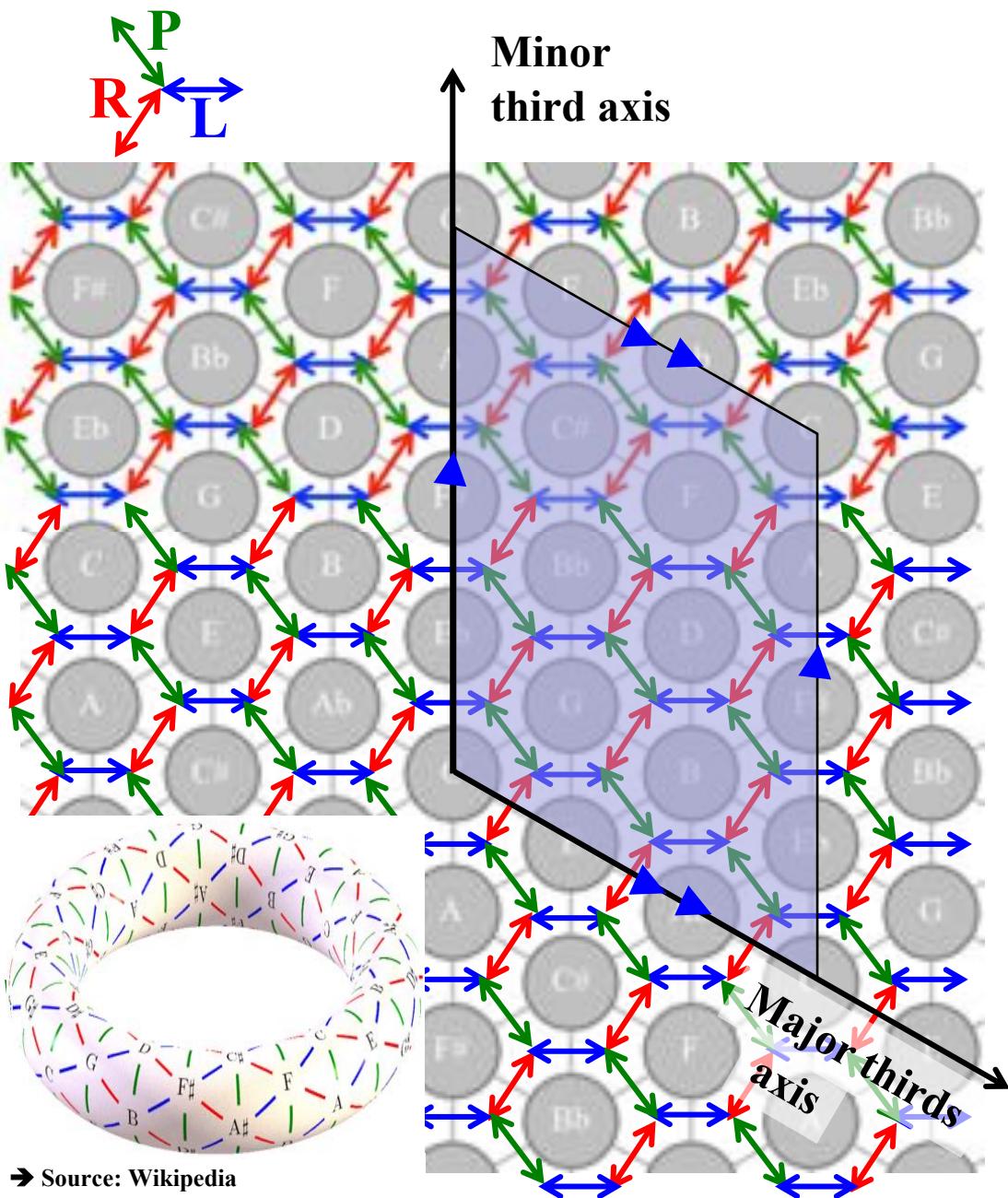
The Tonnetz, its symmetries and its topological structure



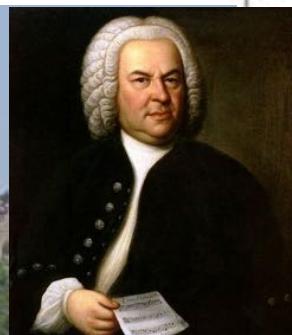
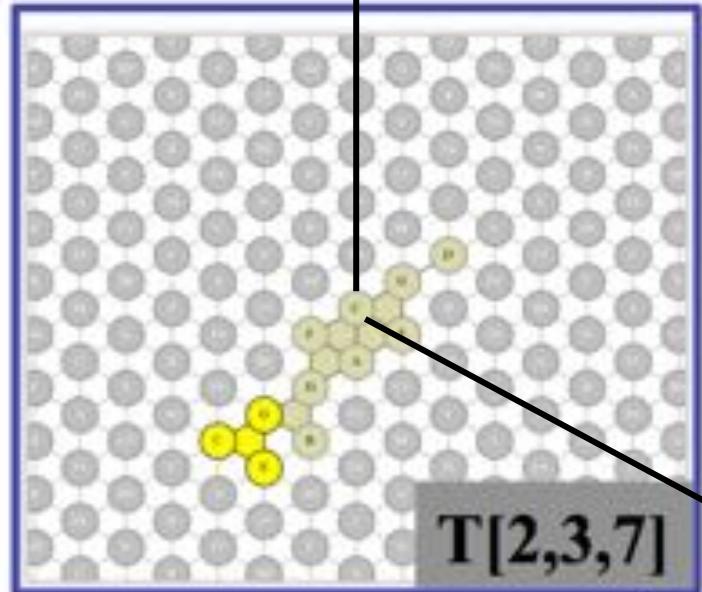
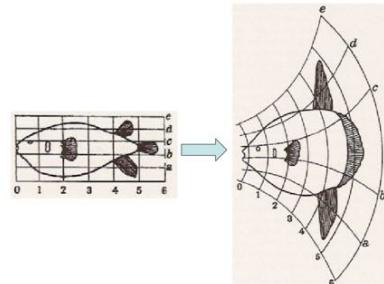
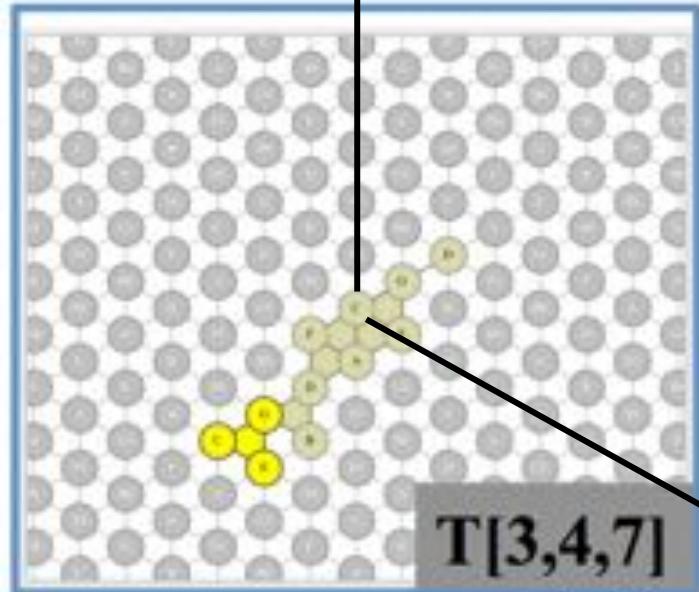
The Tonnetz, its symmetries and its topological structure



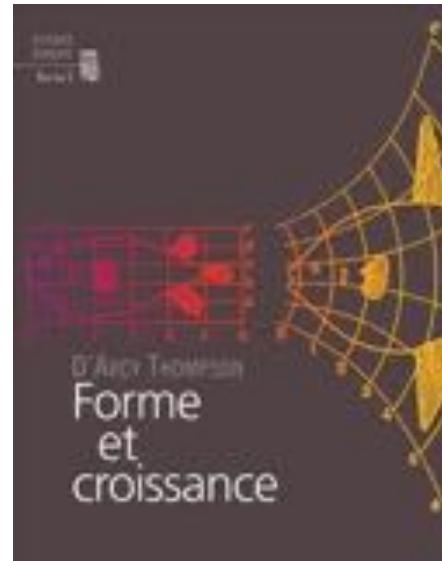
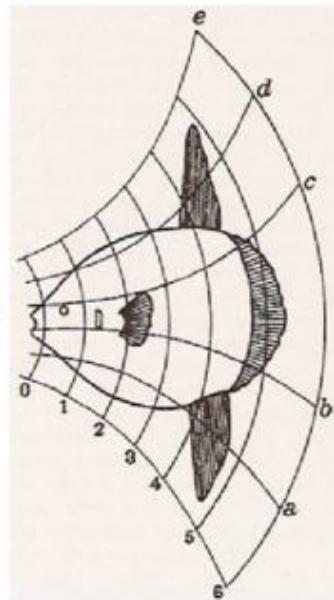
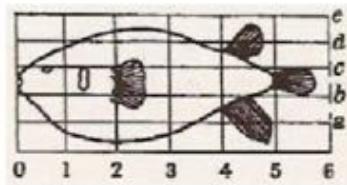
The *Tonnetz*, its symmetries and its topological structure



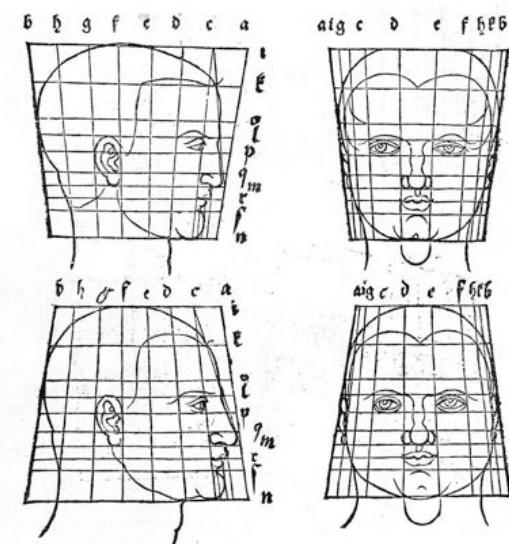
The musical style...is the space!



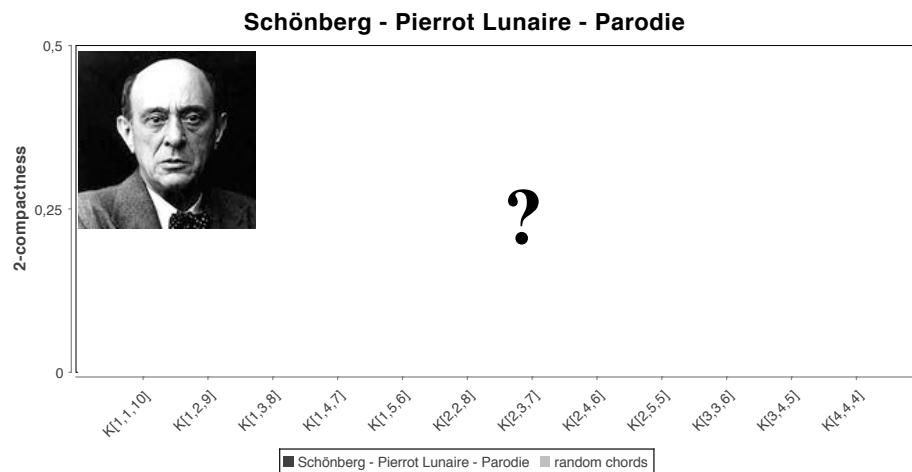
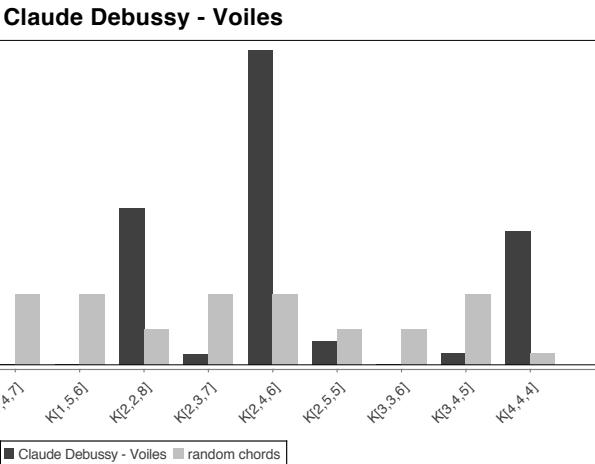
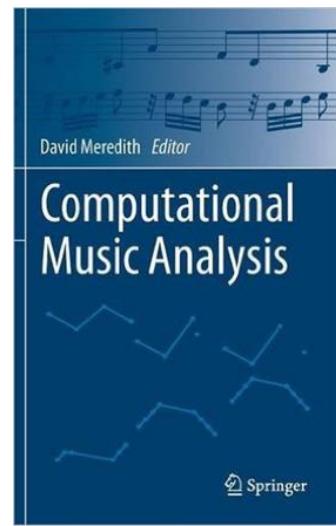
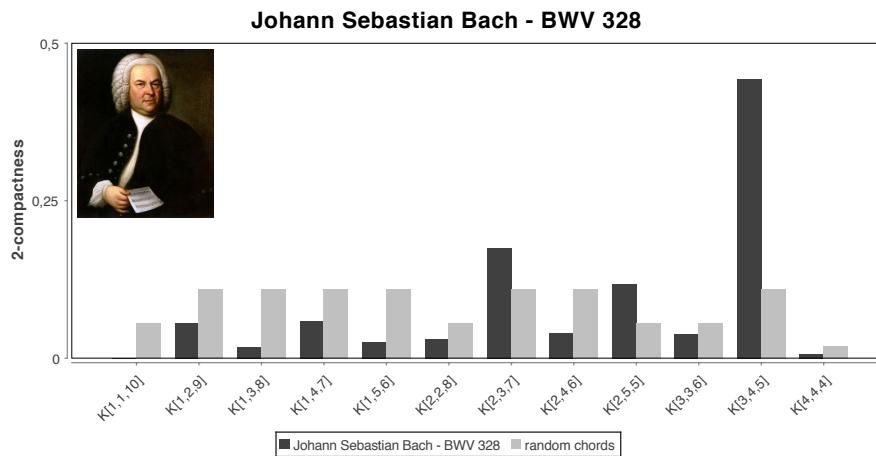
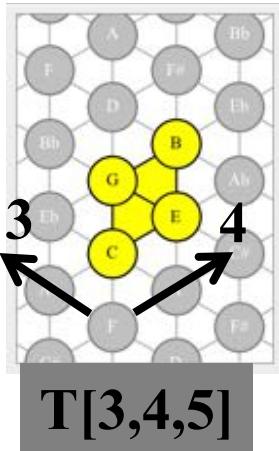
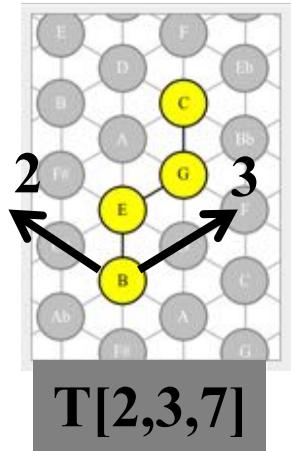
The morphological vs the mathematical genealogy of the structuralism



“[The notion of **transformation**] comes from a work which played for me a very important role and which I have read during the war in the United States : *On Growth and Form*, in two volumes, by **D'Arcy Wentworth Thompson**, originally published in 1917. The author (...) proposes an interpretation of the visible transformations between the species (animals and vegetables) within a same gender. This was fascinating, in particular because I was quickly realizing that this perspective had a long tradition: behind Thompson, there was **Goethe's** botany and behind Goethe, **Albert Dürer** with his *Treatise of human proportions*” (Lévi-Strauss, conversation with Eribon, 1988).

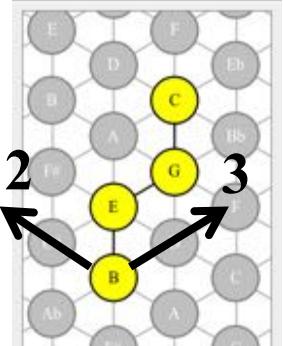


The geometric character of musical logic

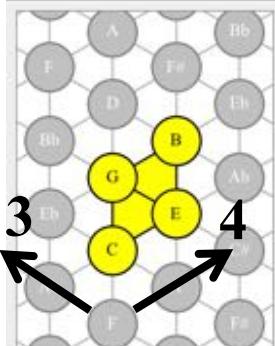


The geometric character of musical logic

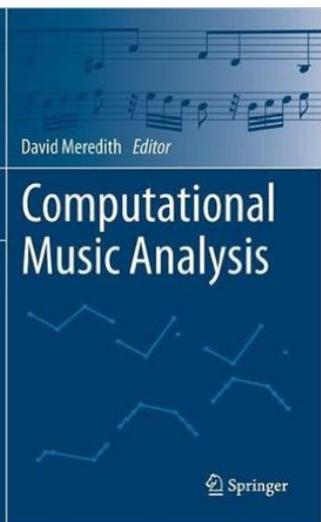
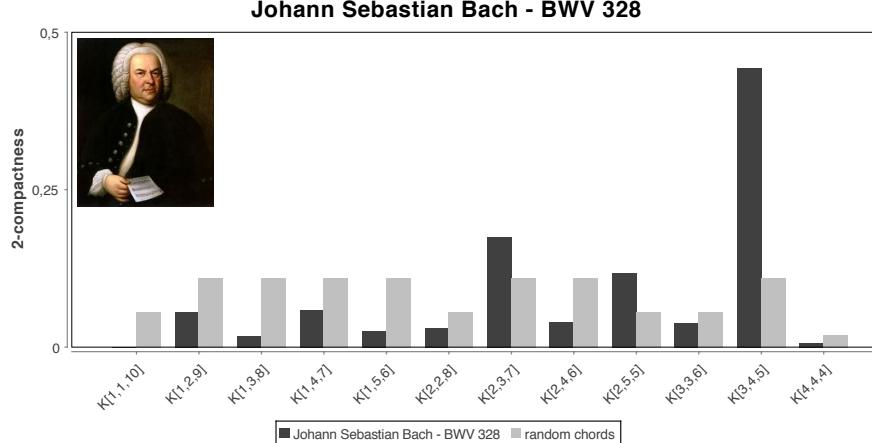
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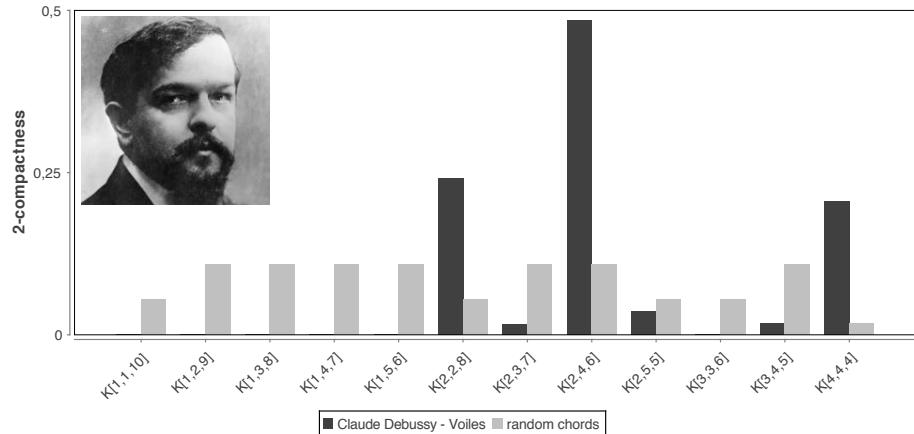
T[2,3,7]



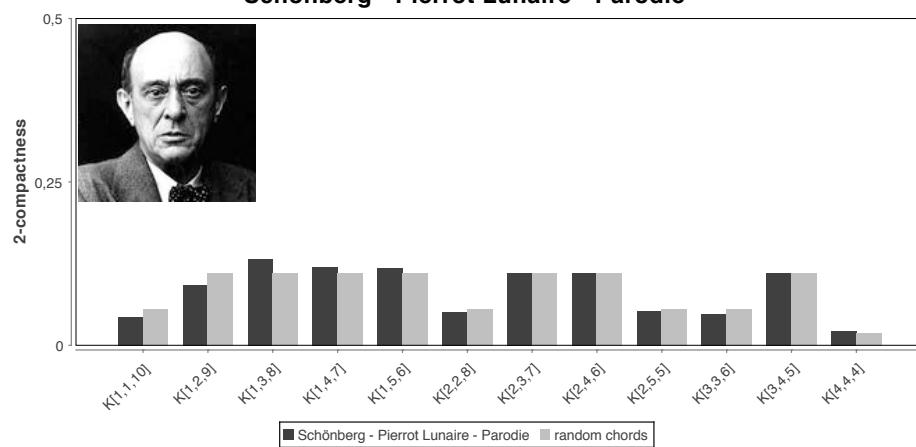
T[3,4,5]



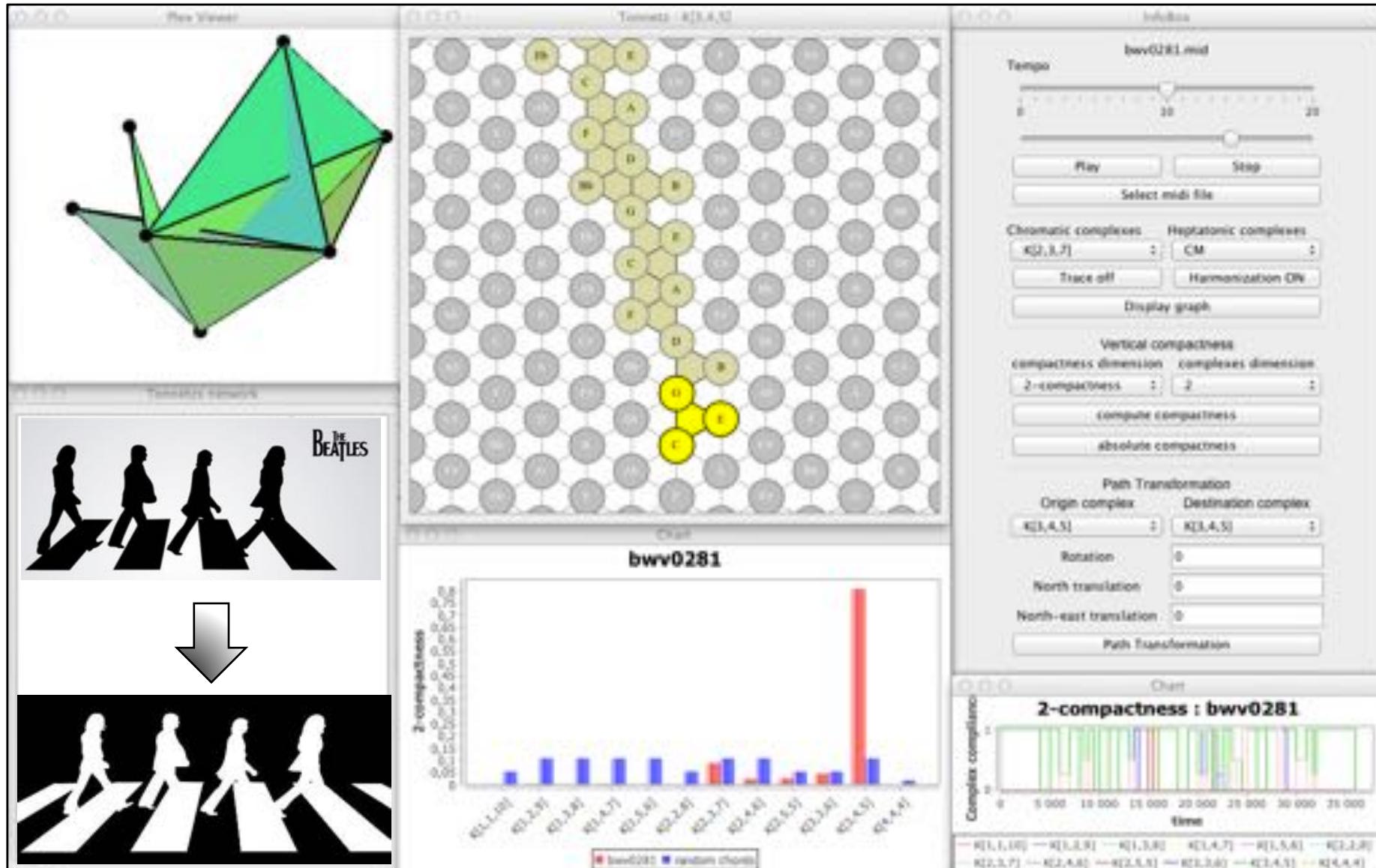
Claude Debussy - Voiles



Schönberg - Pierrot Lunaire - Parodie

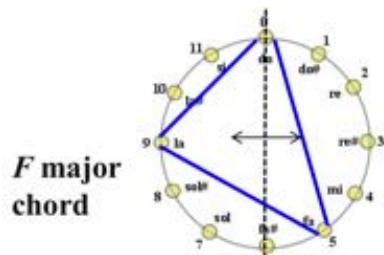
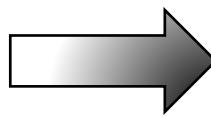


Keeping the space...but changing the trajectory!

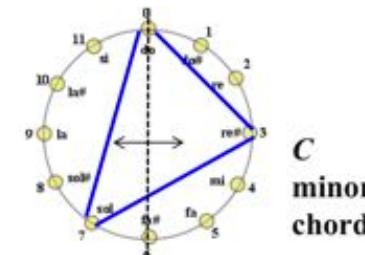


→ <http://www.lacl.fr/~lbigo/hexachord>

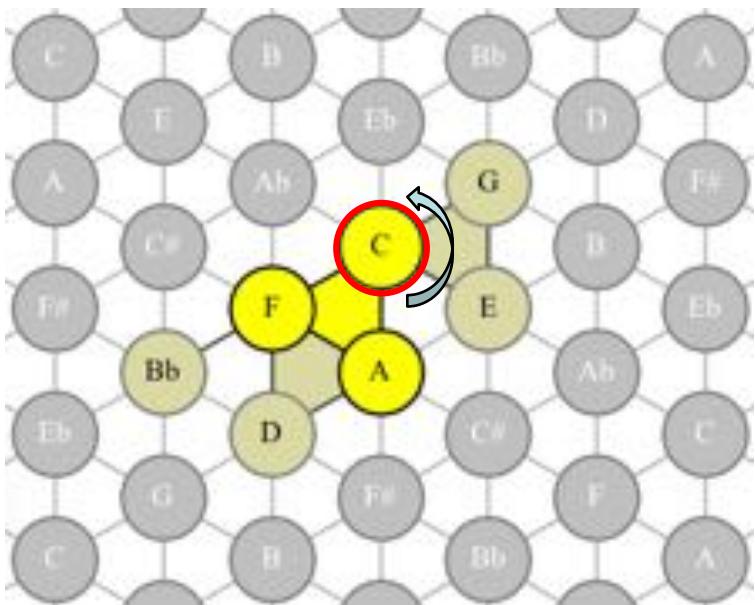
Keeping the space...but changing the trajectory!



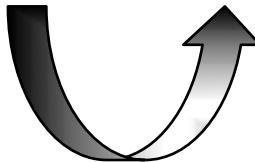
F major
chord



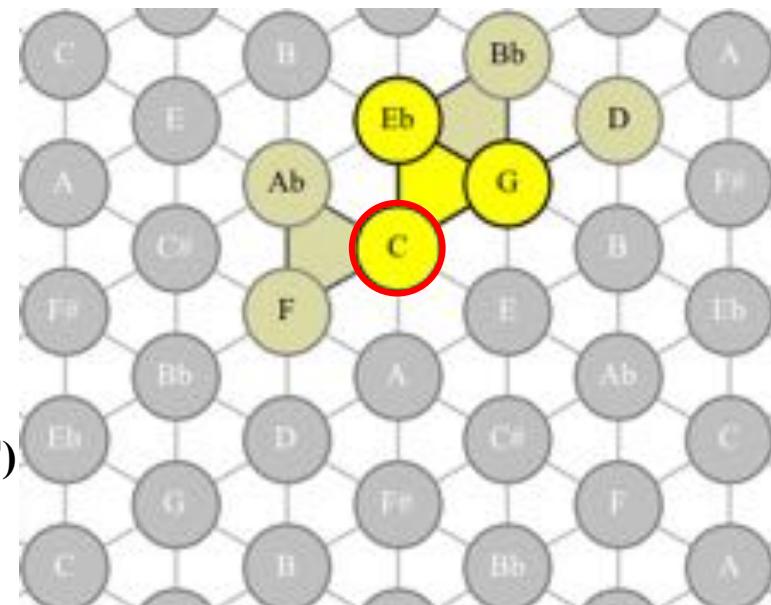
C
minor
chord



Beatles, Hey Jude (orig. version)

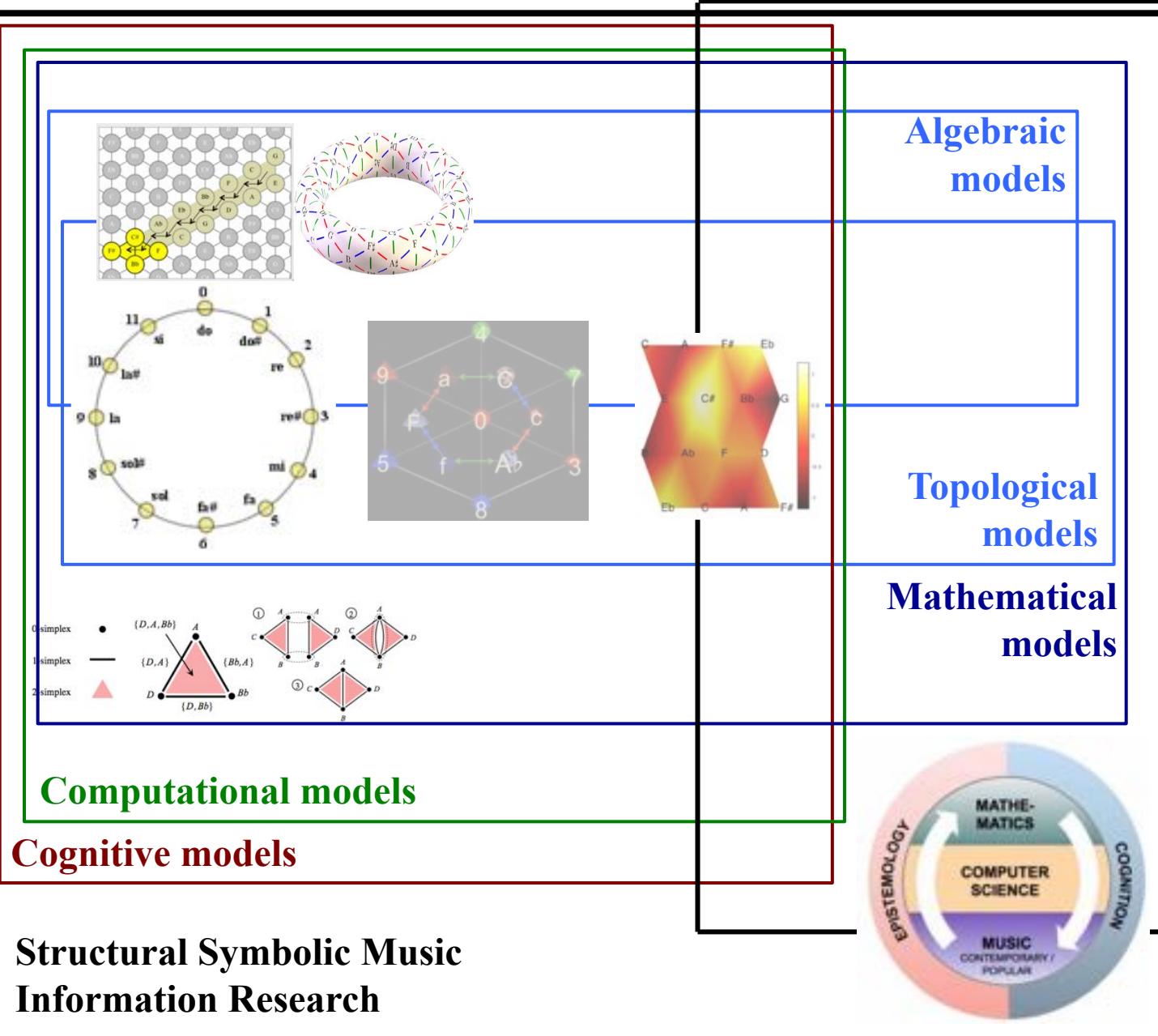


Rotation
(around the C)

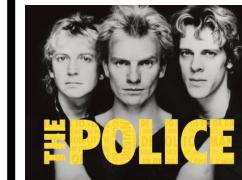


Beatles, Hey Jude (transformed version)

The SMIR Project: Structural Music Information Research



Signal-based
Music
Information
Retrieval



Oleg Berg



Rotational symmetry applied to traditional Brazilian music

Sonoroso

K. Ximbinho

Brejeiro

Maxixe

Intrad.

Ernesto Nazareth

Doce de Côco

Jacob do B
(Jacob B)

§ G6 C/E G6 Dm7 E7 Am Am/G E

Am7 Am7 D7 G7m G7 F#7 F6 Bm7 E7

Am E7/B Am Cm7/E7 D7 Gm Gm5+ Gm6 Gm Gm5+

Gm6 Gm5+ G7 G7 Cm Cm E9 E9

G/D E7 Am7 D7 G6 Bm7 Bb9 Am7

§ C6 G6 D7

Aeroporto do Galeão

Altamiro Carrilho

Apanhei-te Cavaquinho

Ernesto Nazareth
Báldoman

Escovado
Tango Brasileiro

Ernesto Nazareth
1905



Thank you for your attention!

