

Outils mathématiques en musicologie computationnelle

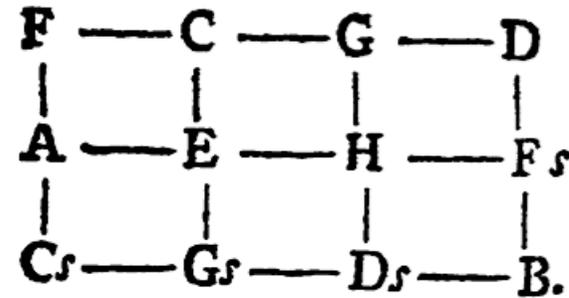
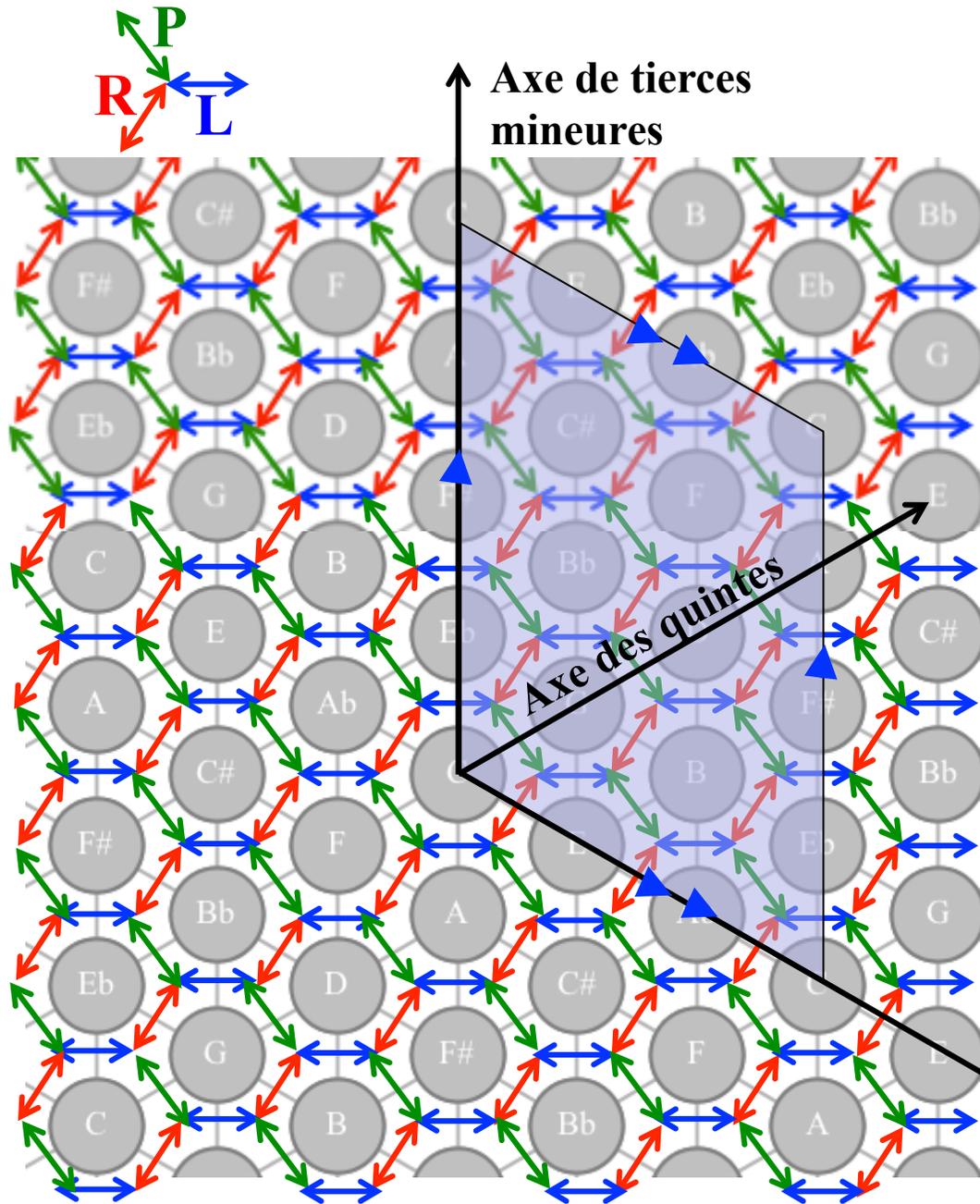
Séminaire inaugural du *Collegium Musicæ*
Sorbonne Universités

Vendredi 13 novembre 2015

Moreno Andreatta
Music Representations Team
IRCAM/CNRS/UPMC

<http://repmus.ircam.fr/moreno>

Du « speculum musicum » aux différents *Tonnetze*



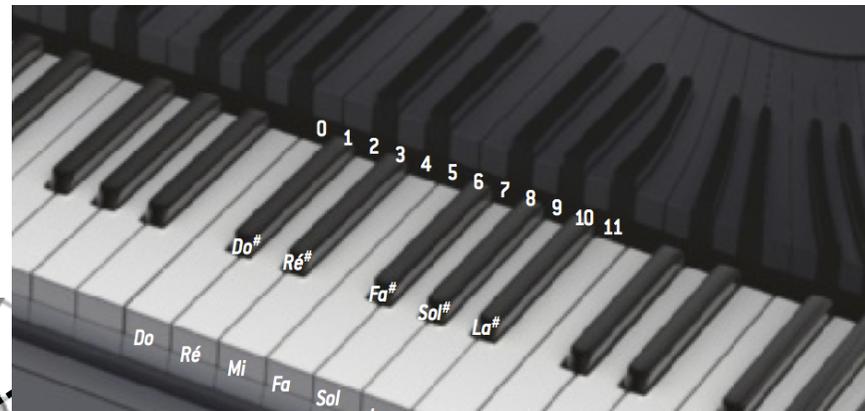
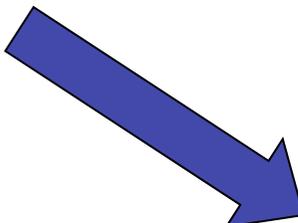
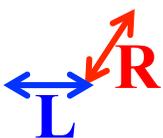
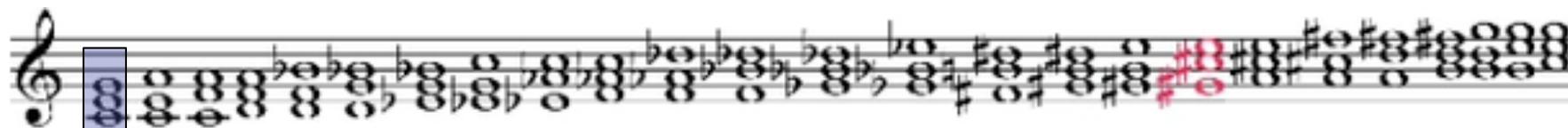
Speculum Musicum

Euler (1707-1783)

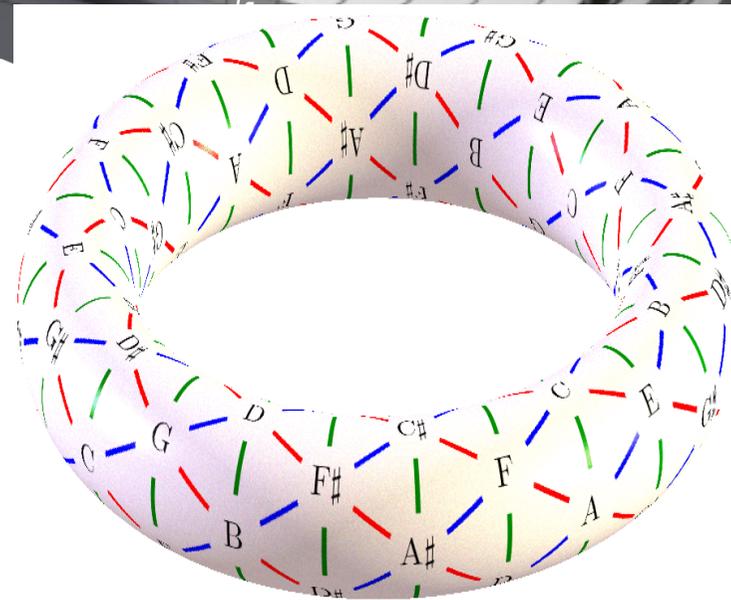
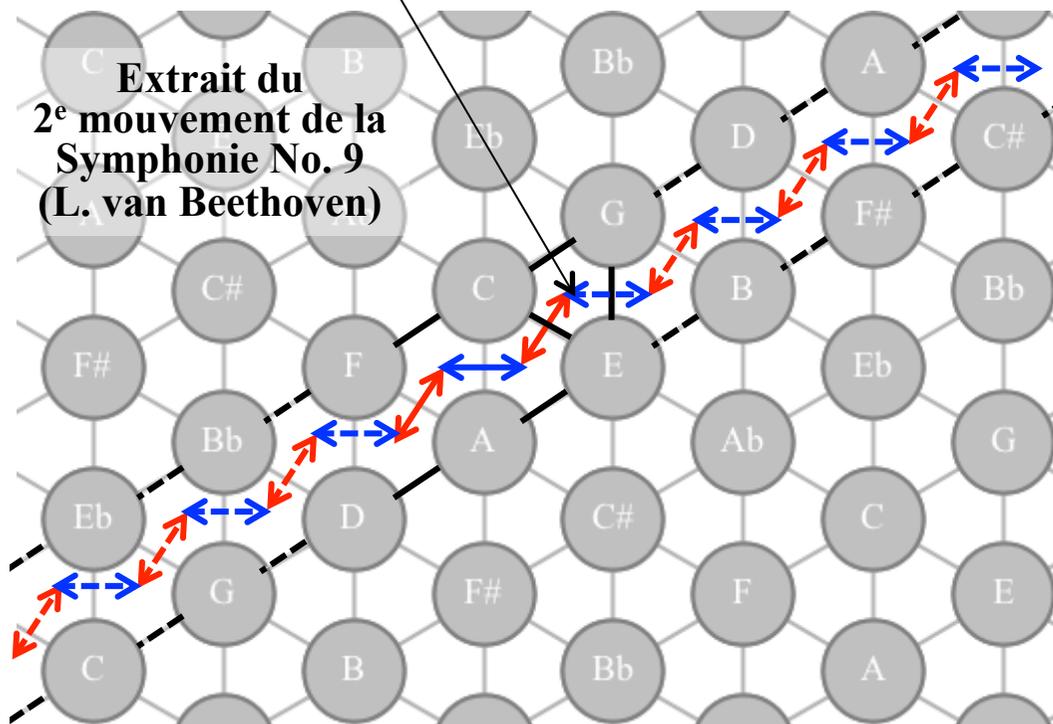


Tore

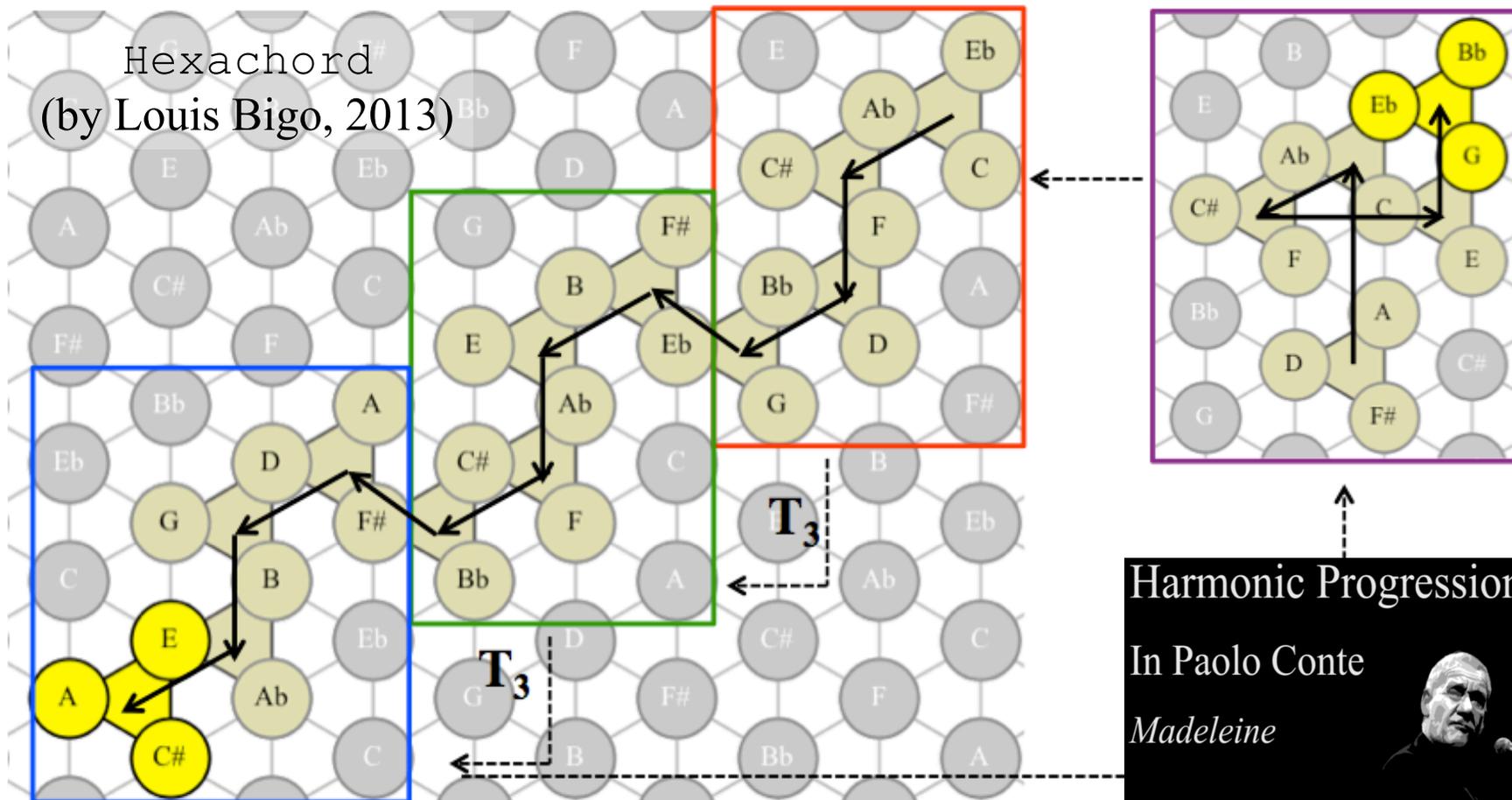
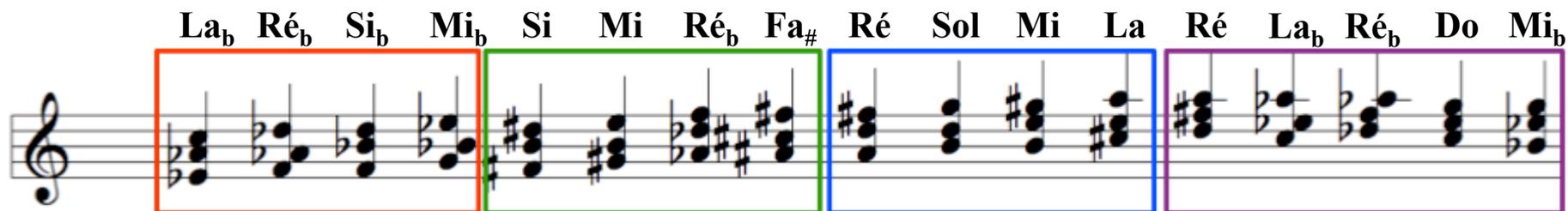
Progressions harmoniques comme trajectoires spatiales



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



Progressions harmoniques et symétries chez Paolo Conte



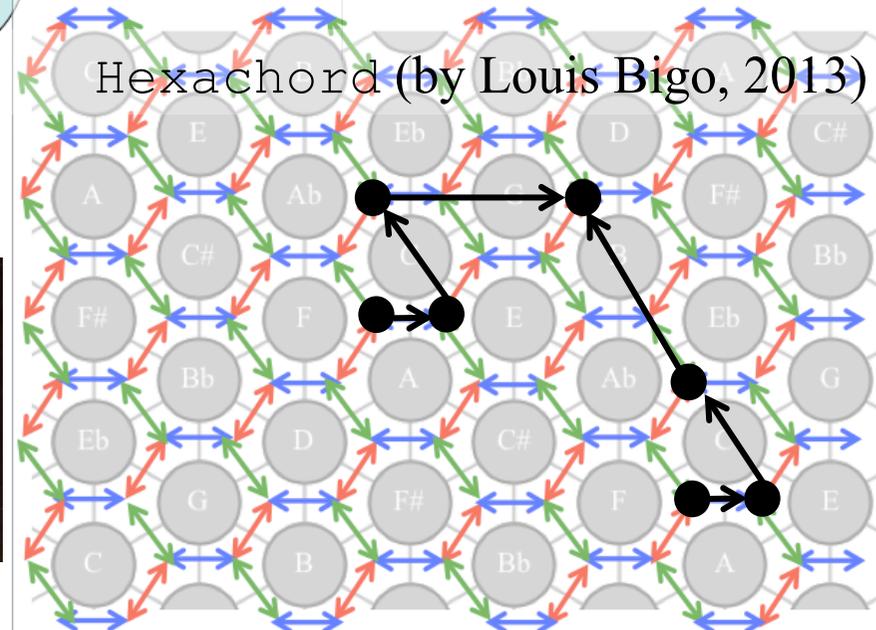
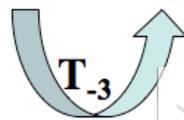
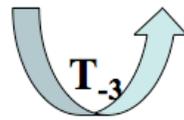
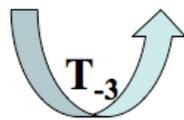
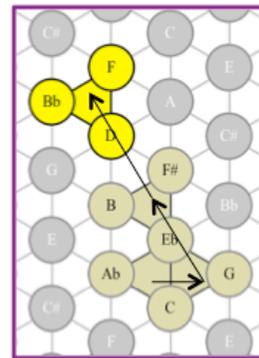
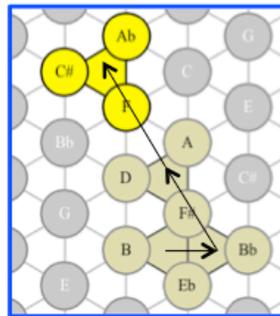
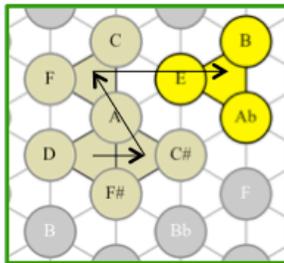
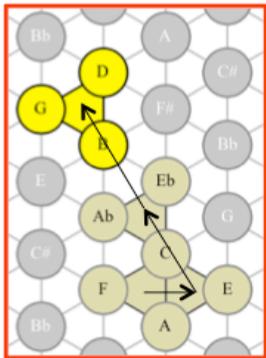
Progressions harmoniques et symétries chez Zappa

Fa la_m La_b Sol Ré fa_{#m} Fa Mi Si la_{#m} Ré Ré_b La_b do_m Si Si_b

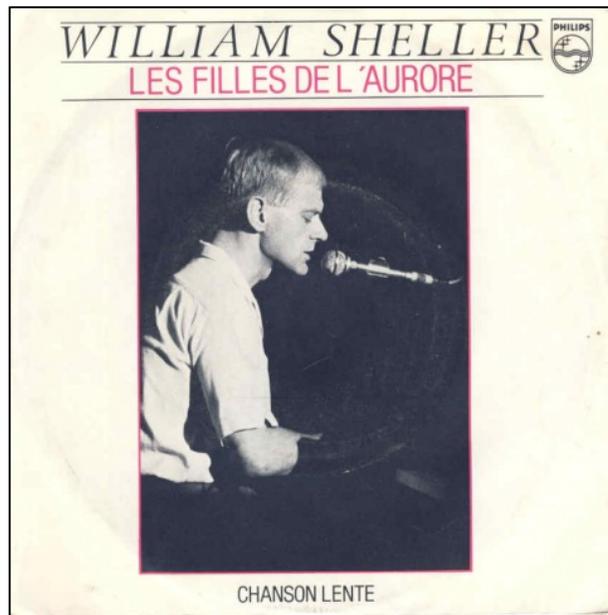


F. Zappa,
« Easy Meat » - 1981
min. 1'44" – 2'39"

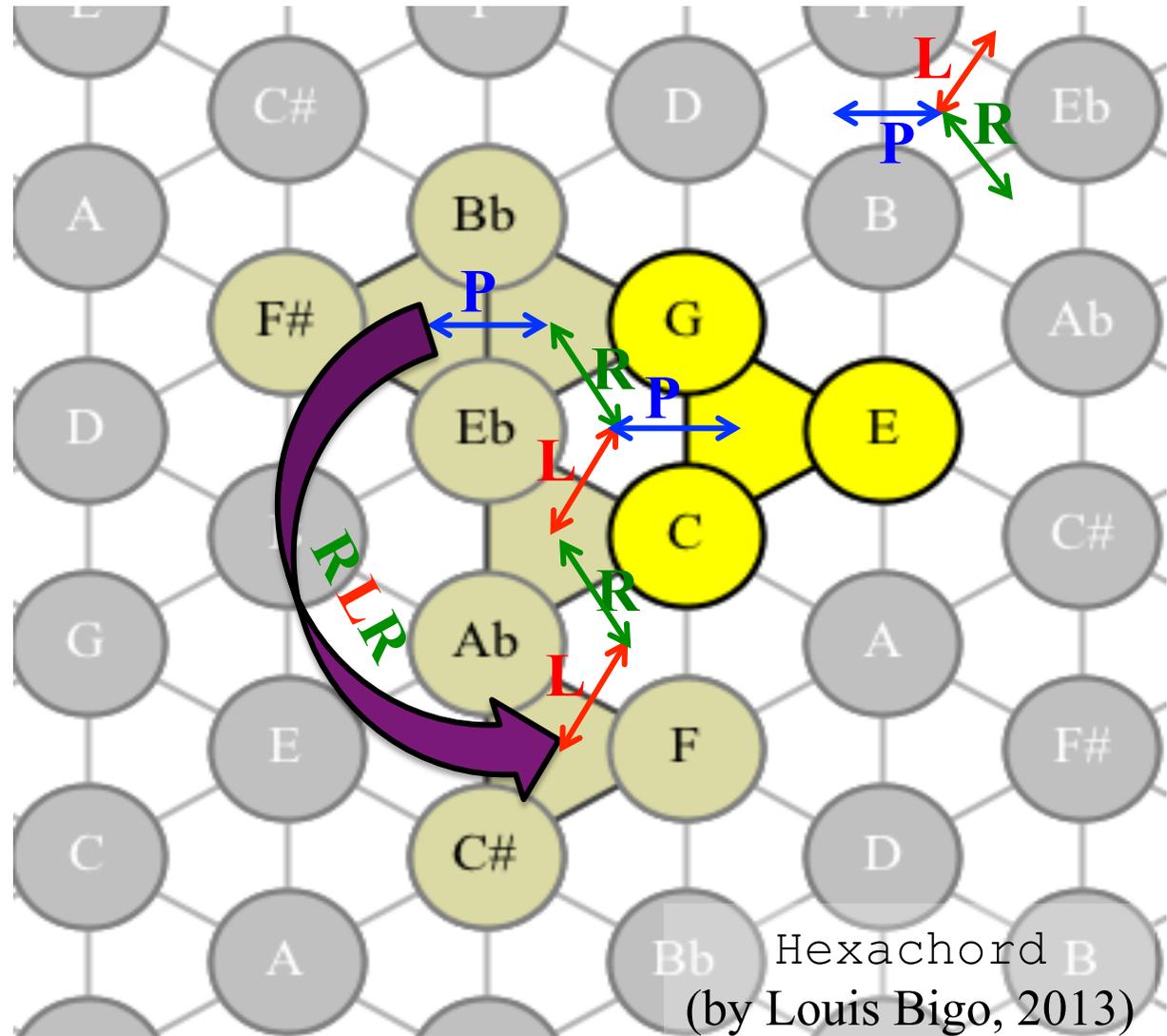
➔ www.youtube.com/watch?v=-MyVgK3osVk



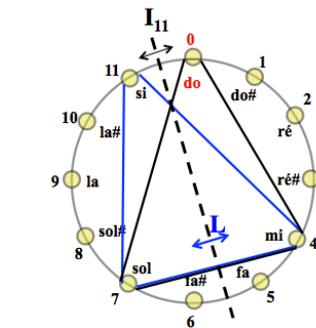
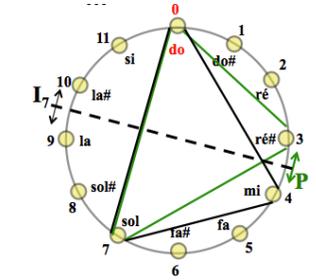
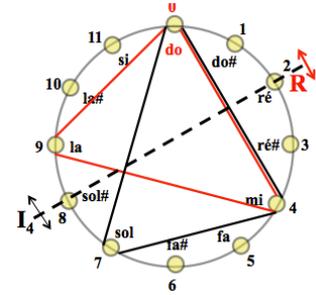
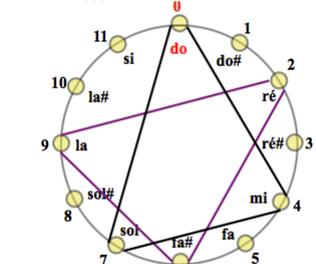
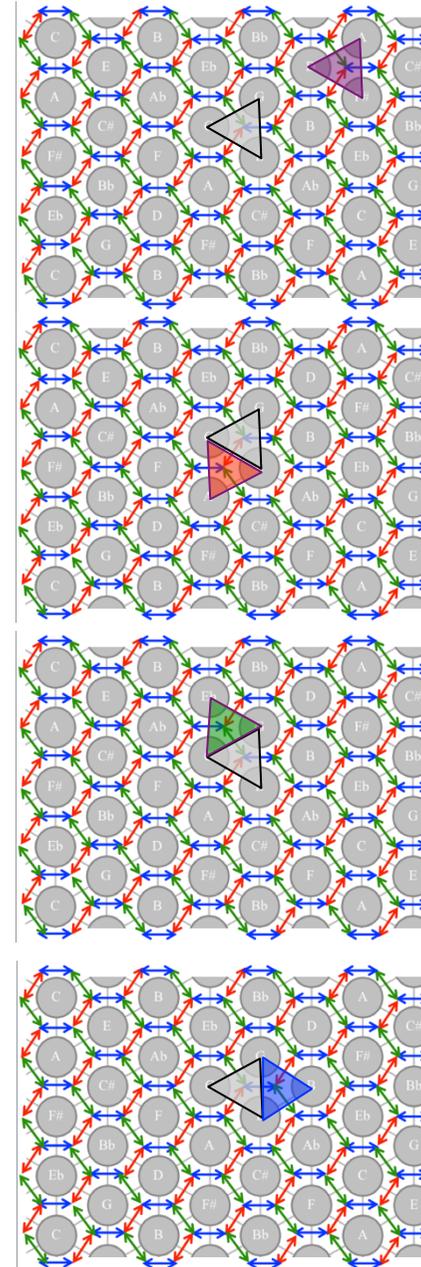
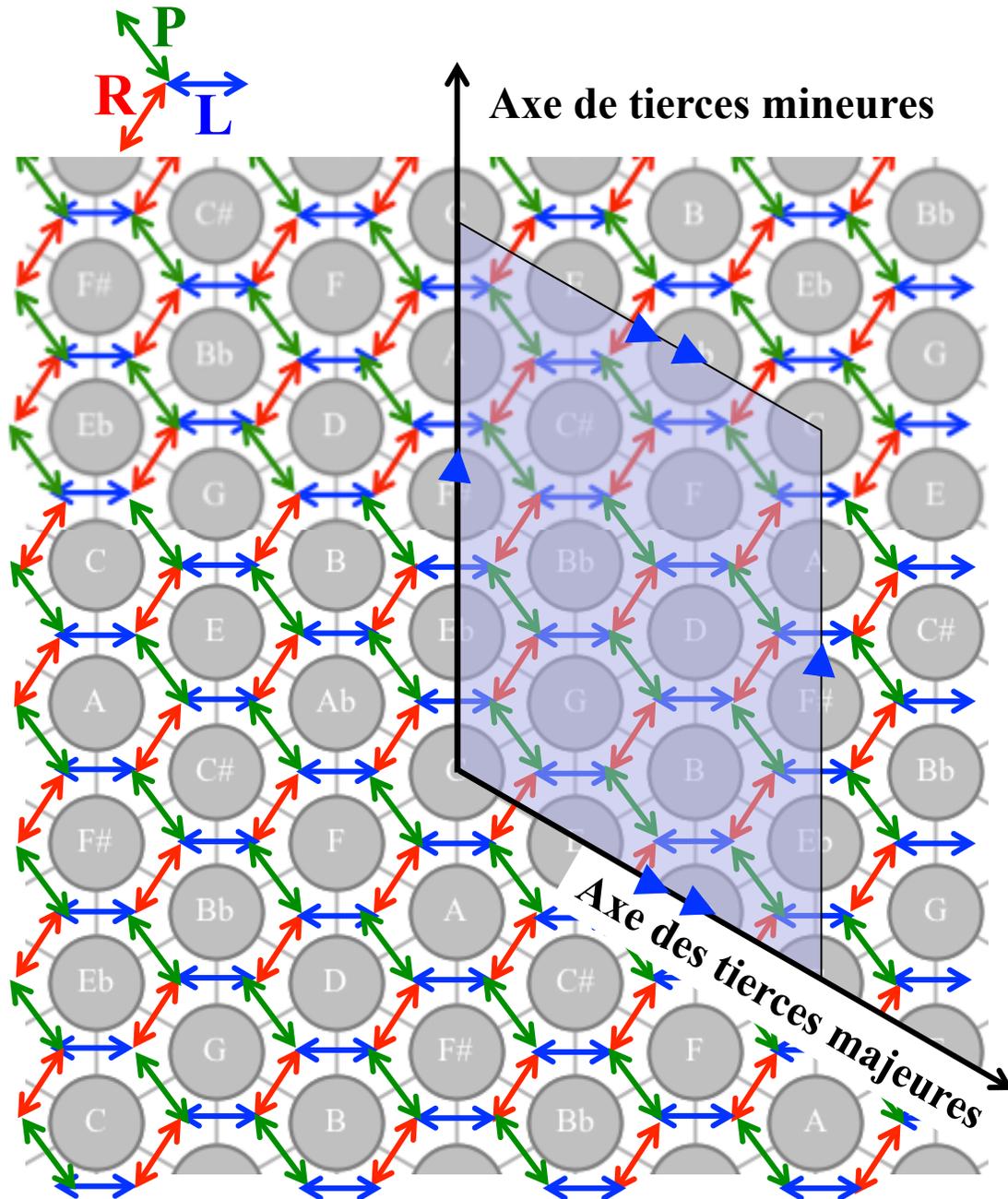
Symétries et asymétries dans chanson française



min. 0'33''



Les symétries en musique : *Tonnetz* vs cercle

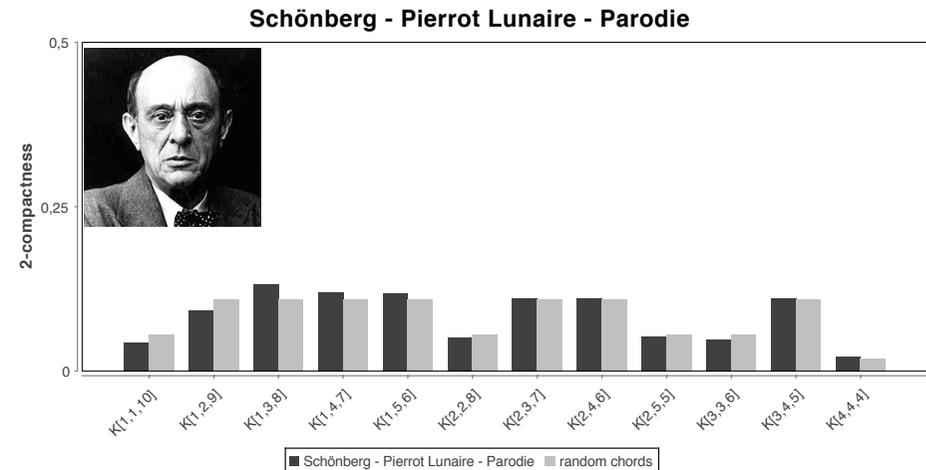
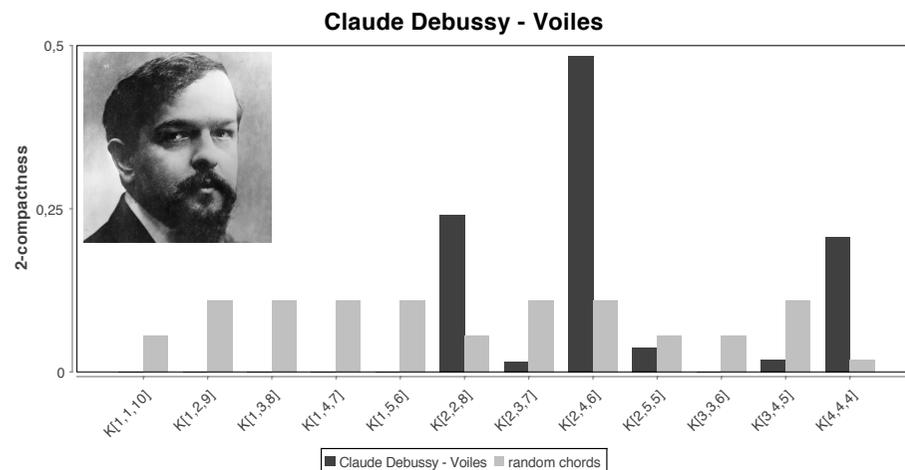
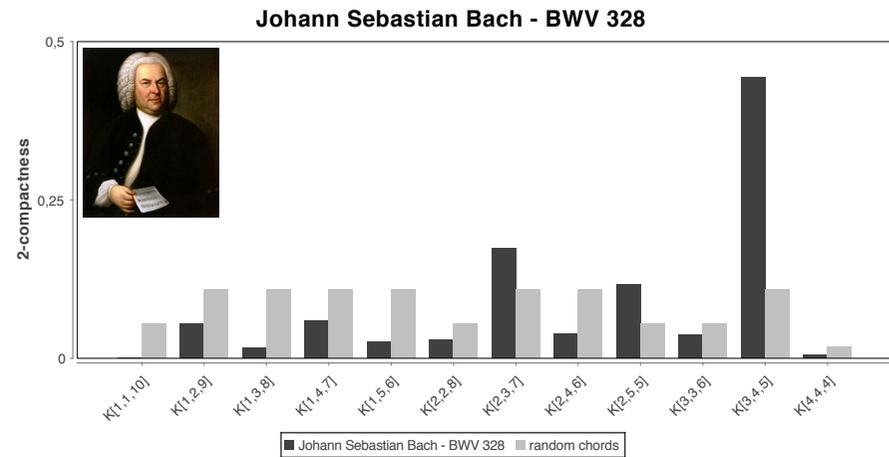
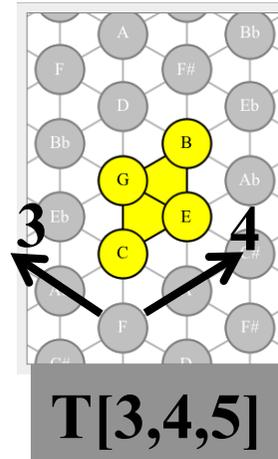
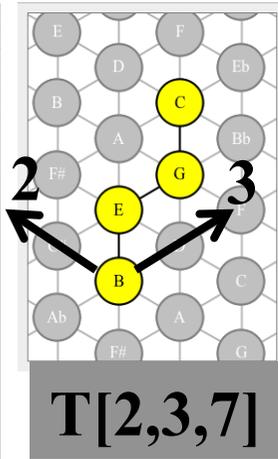
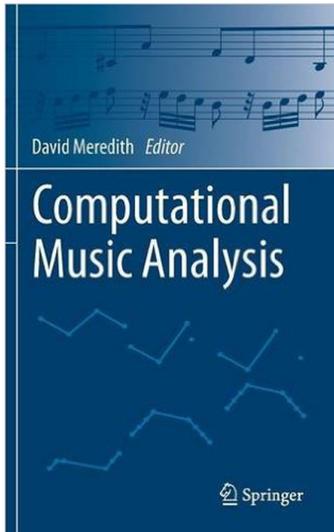


Le caractère spatial de la « logique musicale »

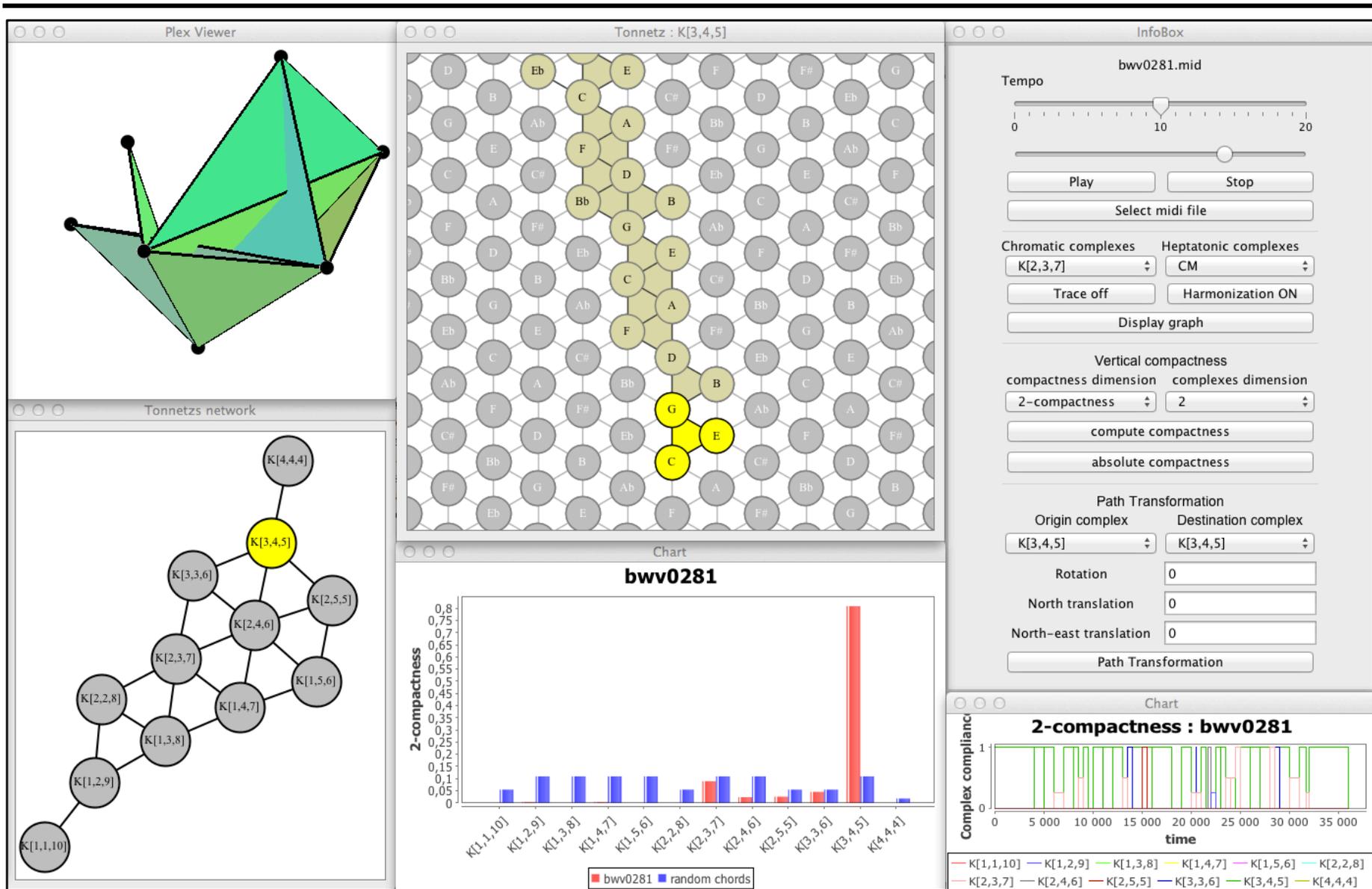
Bigo L., M. Andreatta, « Musical analysis with simplicial chord spaces », in D. Meredith (ed.), *Computational Music Analysis*, Springer, 2015



Louis Bigo

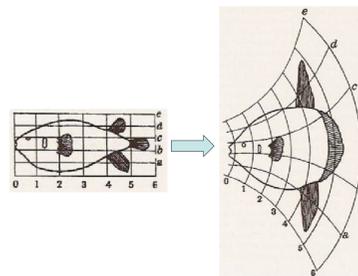
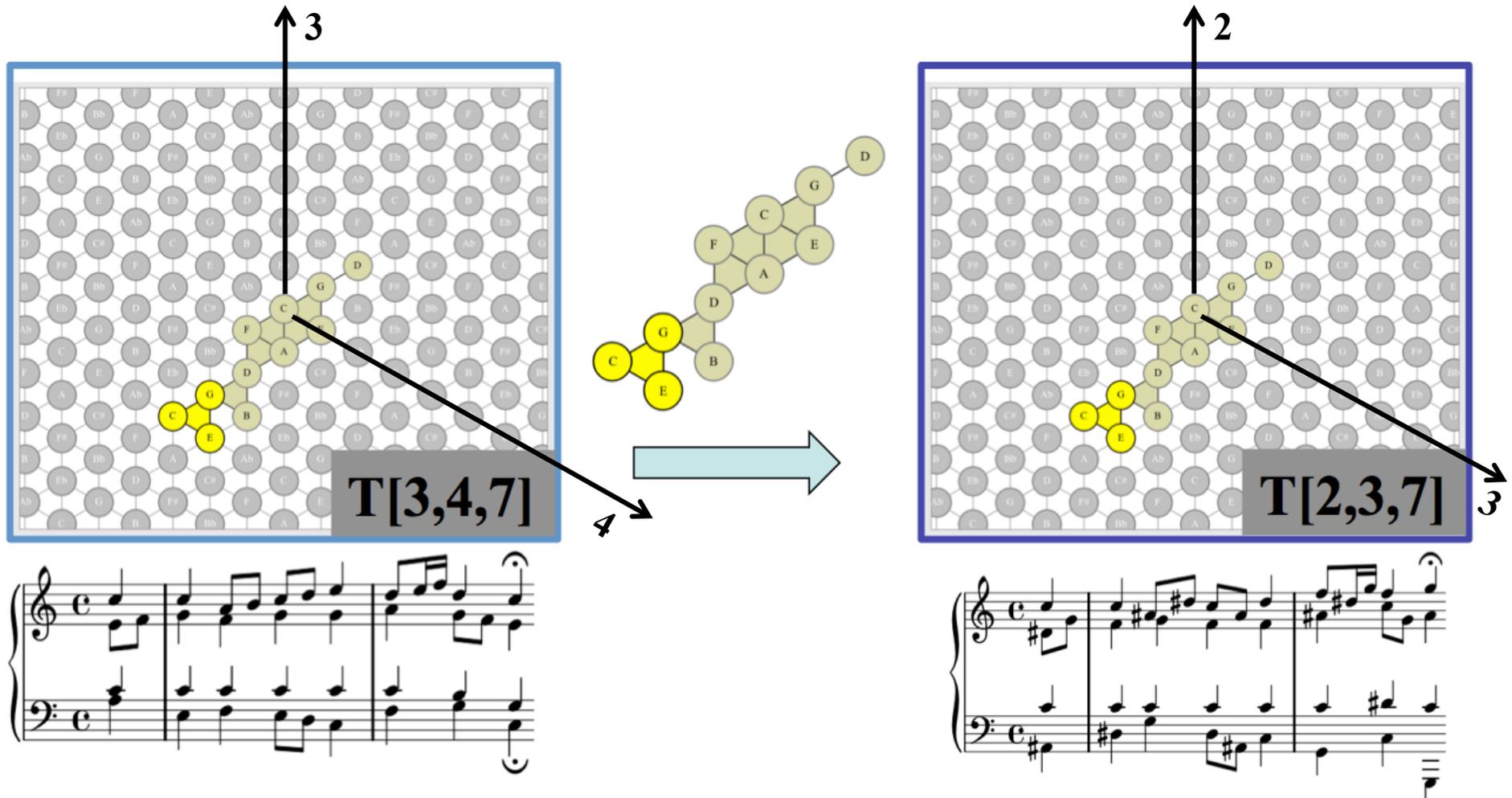


Analyse « géométrique » assistée par ordinateur

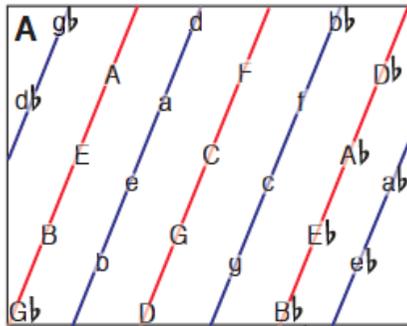


➔ <http://www.lacl.fr/~lbiggo/hexachord>

Transformations géométriques de l'espace



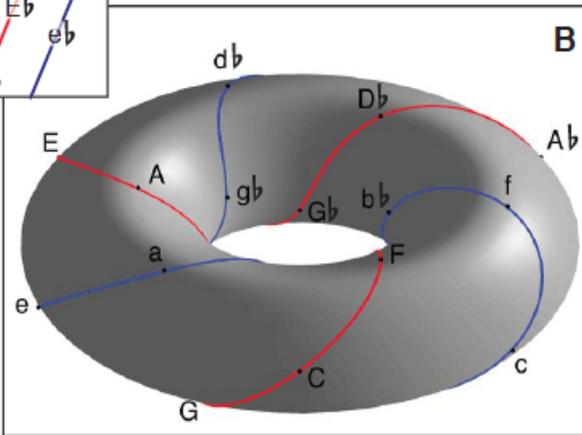
Neurosciences et maillage hexagonal des hauteurs



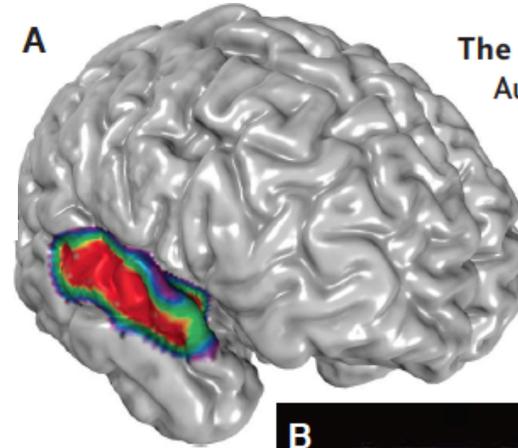
PERSPECTIVES: NEUROSCIENCE

Mental Models and Musical Minds

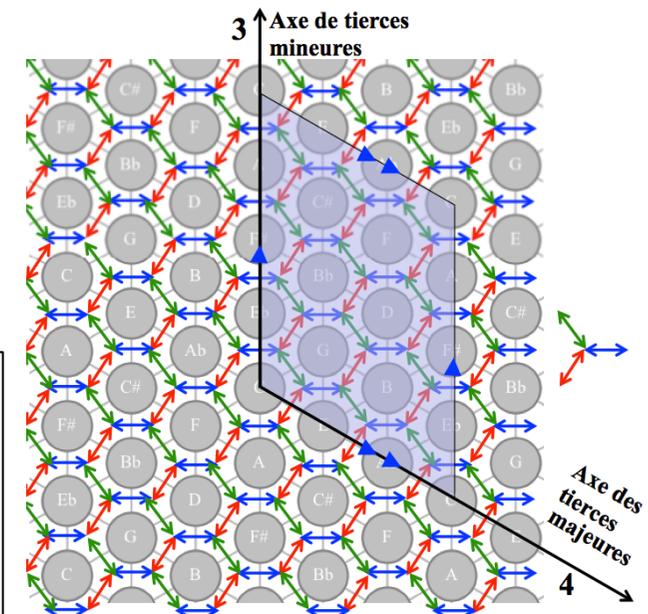
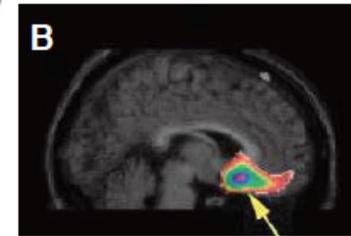
Robert J. Zatorre and Carol L. Krumhansl



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.



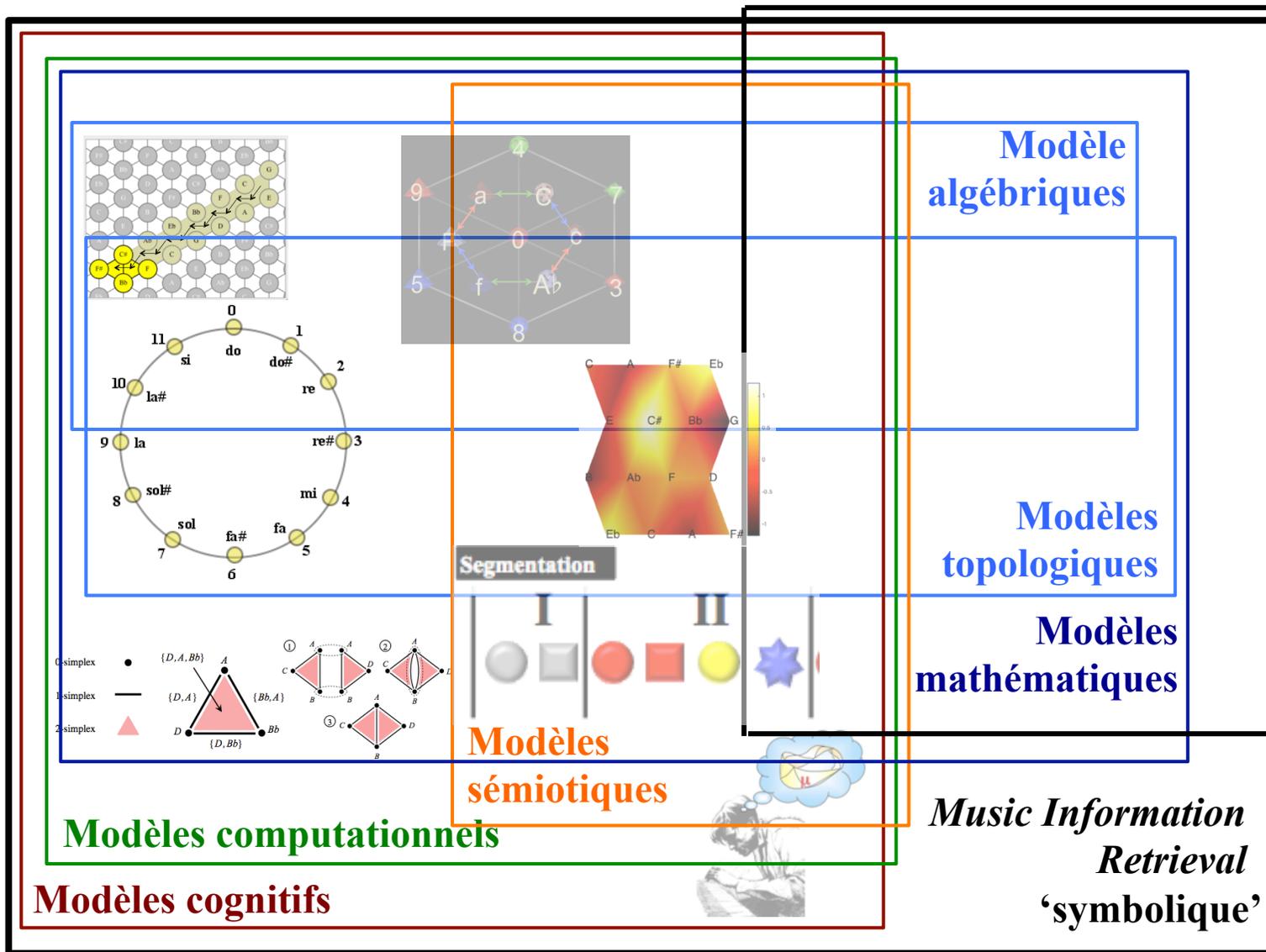
The sensation of music. (A) Auditory cortical areas in the superior temporal gyrus that respond to musical stimuli. Regions that are most strongly activated are shown in red. **(B)** Metabolic activity in the ventromedial region of the frontal lobe increases as a tonal stimulus becomes more consonant.



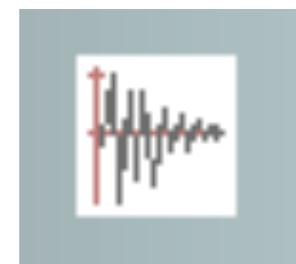
Acotto E. et M. Andreatta (2012),
 « Between Mind and Mathematics.
 Different Kinds of Computational
 Representations of Music », *Mathematics and Social Sciences*, n° 199,
 2012(3), p. 9-26.



Articulation Signe/Signal en Analyse Computationnelle



*Music
Information
Retrieval
orienté signal*



Mattia Bergomi

M. Bergomi, *Dynamical and Algebraic Topological Tools for (Modern) Music Analysis*, thèse cotutelle LIM/UPMC, Ircam, 10 décembre 2015



MERCI DE VOTRE ATTENTION !

Moreno Andreatta

Equipe Représentations Musicales

IRCAM/CNRS UMR 9912