Schedule

	Lunedì/ Monday/ Lundi	Martedì/ Tuesday/ Mardi	Mercoledì/ Wednesday/ Mercredi	Giovedì/ Thursday/ Jeudi	Venerdì/ Friday/ Vendredi
9h30	Welcoming words 9h45: Brlek	Thomas	Hubert	Lecouvey	Foissy
10h30	**Coffee break on the patio**				
11h	D'Andrea	Parkinson	Papi	Sentinelli	D'Alessandro
11h45-12h30	Siconolfi	Gobet	Guilhot	Chapelier	Patras Closing words
13h	**Lunch at the beach**				
PM	Collaborative work				Collaborative work
17h30-18h30	Reutenauer	Biagioli	Procesi	Delcroix-Ogier	
Around 20h30	**Dinner**		**Banquet**	**Dinner**	

Please, note that trousers are mandatory for gentlemen at dinner in the evening (and for the banquet).

Abstracts of talks

- **Riccardo Biagioli** (Università di Bologna): *Diagrammatic representations of affine Temperley-Lieb algebras*

Abstract: TBA

- **Srecko Brlek** (LACIM UQAM): *De Cetraro 2013 à la conjecture de Fraenkel et Simpson: une identité remarquable sur les mots lie diverses mesures de complexité: en facteurs, palindromique, pseudo-palindromique, facteurs carrés.*

Abstract: Lors de l'exposé TBA dédié à Christophe Reutenauer, l'identité de BR palindromique a été étendue aux pseudo-palindromes, et plus tard (2017) aux carrés. Cette identité suggère une approche pour démontrer la conjecture de Fraenkel et Simpson, à savoir que le nombre de facteurs carrés non vides de tout mot fini de longueur n est au plus n. A l'aide de la construction des graphes d'un mot (Rauzy - De Bruijn - Flye Sainte-Marie) la solution est remarquablement simple: à chaque facteur carré est associé un unique circuit dans un unique graphe et donc le nombre cyclomatique est une borne (large) et naturelle. Ceci ouvre de nouvelles perspectives pour l'amélioration de la borne supérieure et également pour l'estimation de la complexité d'autres motifs.

- **Nathan Chapelier** (Université de Tours): *TBA*

Abstract: TBA

- **Alessandro D'Andrea** (Sapienza Università di Roma): *An invitation to Hecke-Kiselman monoids*

Abstract: The q=0 version of Hecke algebras may be read as the monoid algebra of semigroups known as Hecke monoids. They admit special quotients which were first introduced by Kiselman in a convexity theory setting. I will give a brief introduction to Kiselman quotients of Hecke monoids, discussing their finiteness and describing some natural monoid action realizing them in terms of dynamical systems on graphs.

- **Bérénice Delcroix-Ogier** (Université de Paris): *A spoonful of dendrology: from hypertrees to Cayley trees*

Abstract: Hypertrees are generalizations of trees introduced by Berge in the 1980s. McCammond, Meier and their coauthors introduced and studied a poset structure on hypertrees in a series of papers in the 2000s to study automorphisms of free groups and free products. In particular, they computed the Euler characteristic of the hypertree poset on n vertices, which is precisely the number of Cayley trees on n-1 vertices. Chapoton conjectured in 2007 than the action of the symmetric group on the homology of the hypertree poset is exactly the same as the anticyclic one on Cayley trees. This conjecture was proven in 2012 using species theory. In a work in progress with Clement Dupont (IMAG), we study more deeply the link between hypertree posets and operads in terms of Lie brackets of planar trees. We will first introduce in the talk the notions of hypertrees, species, operads and posets before fully explaining the link between hypertrees and the other mentioned trees.

- **Thomas Gobet** (Université de Tours) : *Toric reflection groups*

Abstract: We introduce and study a three-parameter family of (in general infinite) reflection-like groups that includes, among other, finite complex reflection groups of rank two with a single conjugacy class of reflecting hyperplanes, as well as Coxeter's truncated braid groups on three strands. We give a classification of these groups, and show that they can naturally be associated with a torus knot group that behaves like their "braid group". We also show that they have a cyclic center, and that the quotient by their center is an alternating subgroup of a Coxeter group of rank three. This gives a new explanation of a phenomenon which was previously observed on a case-by-case basis for some finite complex reflection groups of rank two.

- **Jérémie Guilhot** (Université de Tours) : *Recognizing Kazhdan-Lusztig cells using representations*

The aim of this talk is to show on various examples that one can recognize Kazhdan-Lusztig cells using representations of Hecke algebras. This idea is especially interesting in the case of affine Weyl groups where one can use representations that have a very nice combinatorial descriptions in terms of alcove paths. (Joint work with James Parkinson)

- **Loïc Foissy** (Université du Littoral Cote D'Opale Calais): *Cointeracting bialgebras*

Abstract: Pairs of cointeracting bialgebras appear recently in the literature of combinatorial Hopf algebras, with examples based on formal series, on trees (Calaque, Ebrahimi-Fard, Manchon and Bruned, Hairer, Zambotti), graphs (Manchon), posets… These objects have one product (a way to combine two elements in a single one) and two coproducts (the first one reflecting a way to decompose a single element into two parts, maybe into several ways, the second one reflecting a way to contract parts of an element in order to obtain a new one). All these structures are related by convenient compatibilities.

We will give several results obtained on pairs of cointeracting bialgebras: actions on the group of characters, antipode, morphisms to quasi-symmetric functions… and we will give applications to Hopf algebras of graphs, posets, multigraphs or mixed graphs.

- **Evelyne Hubert** (INRIA): *Polynomial description for the T-Orbit Spaces ofMultiplicative Actionsof Weyl groups*

Abstract: A finite group with an integer representation has a multiplicative action on the ring of Laurent polynomials, which is induced by a nonlinear action on the complex torus, leaving the compact torus T invariant. The associated T-orbit space is well described by the image of the compact torus by the fundamental invariants. For the Weyl groups of types A, B, C and D, this image is a basic semi-algebraic set and we present the defining polynomial inequalities explicitly. We show how orbits correspond to solutions in the complex torus of symmetric polynomial systems and give a characterization of the orbit space as the positivity-locus of a symmetric real matrix polynomial.

The resulting domain is the region of orthogonality for a family of generalized Chebyshev polynomials, which have connections to topics such as Fourier analysis and representations of Lie algebras. We shall present how our results can be used to approach the spectral bound on the chromatic number of some infinite graphs by polynomial optimization. (Joint work with Tobias Metzlaf and Cordian Riener)

- **Cédric Lecouvey** (Université de Tours) : *Positively multiplicative graphs, representation theory and random walks in alcoves*

Abstract: Positively multiplicative graphs are graphs whose adjacency matrix can be embedded in a matrix algebra admitting a distinguished basis labelled by its vertices with nonnegative structure constants (or polynomials with nonnegative coefficients as structure constants). It is easy to get such graphs from the group algebra of the character algebra of a finite group. Other simple examples are obtained from classical bases of symmetric functions. More subtly, it is also possible to define numerous multiplicative graphs from the affine Grassmannian associated to an affine Weyl group. These graphs are then related to interesting probabilistic models (random walks in alcoves, TASEP etc.). The talk will consist in an introduction to these notions and problems. This is a work in collaboration with J. Guilhot and P. Tarrago.

- **Paolo Papi** (Sapienza Università di Roma): *Minimal inversion complete sets in finite reflection groups*

Abstract: I will discuss the generalization of a problem in extremal combinatorics of the symmetric group, arising in Operational Research, to finite reflection groups and its relationships with the theory of abelian ideals in Borel subalgebras. The talk is based on a joint work with Malvenuto, Orsina, Moseneder; Panyushev's deepening of our work will also be discussed

- **James Parkinson** (University of Sydney): *Cone types, automata, and regular partitions in Coxeter groups*

Abstract: In 1993 Brink and Howlett showed that finitely generated Coxeter groups are automatic. One ingredient was the construction of a finite state automaton recognizing the language of reduced words in the Coxeter group using the remarkable (finite!) set of roots of "elementary roots" of the associated root system. Recently Dehornoy, Dyer, and Hohlweg introduced the notion of a Garside shadow in a Coxeter group. Their work resulting in further constructions of automata recognizing the language of reduced words, and interesting conjectures arose. In this talk we outline recent joint work with Y. Yau directed towards these conjectures. This work centres around the notion of a "regular partition" of a Coxeter group, and we show that such partitions are essentially equivalent to the class of automata recognising the language of reduced words. Moreover, we use this framework to prove

some fundamental facts about the minimal automata recognizing the language of reduced words, and study the associated "cone types" in Coxeter groups. (Joint with Yeeka Yau)

- **Frédéric Patras** (Université de Nice Sofia Antipolis): *The Magnus formula revisited*

Abstract : The BCH and Magnus formula solve the BCH problem for matrix linear differential equations: find a combinatorial expression for the logarithm of a solution. Whereas the BCH formula is usually expressed using descents in symmetric groups or a basis of the free Lie algebra, the Magnus formula has a different structure and is best expressed by lifting computations to preLie algebras. In this talk we present general combinatorial methods in preLie algebras that allow to provide closed expression for the Magnus and other similar formulas. Based on a joint work with Adrian Celestino.

- **Claudio Procesi** (Sapienza Università di Roma) *: Swap Polynomials*

Abstract: We discuss several constructions of {\em swap polynomials} that is non commutative polynomials in matrix variables $x_i\in M_d(\mathbb Q)$ with values in $M_d(\mathbb Q)^{\otimes 2}$ which are multiples of the transposition operator $(1,2)$.

- **Christophe Reutenauer** (LACIM, UQAM): *On the three-gap theorem*

Abstract: Let a be a real number and k be a natural integer. Reorder the remainders modulo 1 of the numbers 0, a ,2a,…, ka; one obtains a sequence 0 = a_0 < a_1 < a_2 <…< a_k < a_{k+1} = 1. Then the gaps a_{i+1} - a_i take at most three values, and if there are three, then the largest is the sum of the two smallest (Theorem of Vera Sos and others, 1958, solving a conjecture of Steinhaus). In this talk we give a noncommutative interpretation of this result, using the notion of Christoffel word. (Work in collaboration with Valérie Berthé)

- **Paolo Sentinelli** (Politecnico di Milano) : *Special idempotents and projections*

Abstract: We introduce the notions of special idempotent and projection for a finite graded poset, as elements of the monoid of regressive endomorphisms (in the category of posets).
The most important examples of special idempotents are the projections on the parabolic quotients (and double quotients) of a finite Coxeter group. For symmetric groups with the Bruhat order, these are the only examples of special idempotents. The notion of special projection is stronger and implies, for Eulerian posets, that its image and the complement of its image (as induced subposets) are graded. To be a projection is the same as the existence of a parabolic map, in the meaning of Billey, Fan e Losonczy. Important examples of special projections are the projections on the parabolic quotients of a finite Coxeter group.

- **Viola Siconolfi** (Università di Pisa): *On the Cohomology of the Toric Compact Model of Type A_n*

Abstract: I will start by presenting the wonderful compactification of a toric arrangement and some results on its cohomology ring, this first part is based on a paper from De Concini and Gaiffi. I will then focus on the toric arrangement of type A_n and give a combinatorial description of a monomial basis for the cohomology ring of its wonderful model.
Such a description offers a geometrical point of view on the relation between some Eulerian statistics on the symmetric group. (This is a joint work with G. Gaiffi and O. Papini)

- **Hugh Thomas** (LACIM, UQAM): *Realizing quotients of weak order as one-skeleta of polytopes via representation theory*

Abstract: Given a quotient of weak order on a Coxeter group, the problem of producing a polytope whose one-skeleton, suitably ordered, yields the Hasse diagram of the poset, has attracted considerable attention over the past two decades. One notable motivation was the problem of constructing generalized associahedra, which yield realizations of the Cambrian lattices. In recent work, Padrol, Pilaud, and Ritter show that, in types A and B, it is possible to associate a "shard polytope" to each join-irreducible of weak order on the Coxeter group, such that the Hasse diagram of any quotient can be realized as the Minkowski sum of the shard polytopes corresponding to the non-contracted join-irreducibles. In my talk, I will explain how this construction can be understood in terms of the representation theory of preprojective algebras of type A. We conjecture that the same representation-theoretic approach will work in the other simply-laced cases. With Eric Hanson, I am actively working on resolving this conjecture.