

**Bialgebras in Free Probability****February 1 - April 22, 2011****Workshop on “Combinatorial, Bialgebra, and Analytic Aspects”****February 14 - 25, 2011****organized by M. Aguiar, F. Lehner, R. Speicher, D. Voiculescu**• **Monday, February 14****10:00 – 10:30:** Coffee**10:30 – 11:30:** R. Speicher: **Combinatorial aspects of free probability 1****11:30 – 12:30:** V. Feray: **Characters of symmetric groups, free cumulants and a combinatorial Hopf algebra**

*Abstract:* Representation theory of symmetric groups is a research field connected to free probability. Indeed, P. Biane and S. Kerov have shown that irreducible character values (which are central quantities in representation theory) can be expressed nicely in terms of the free cumulants of some natural measure. In this talk, we present a combinatorial Hopf algebra containing these objects.

**14:00 – 15:00:** M. Anshelevich: **Convolution semigroups with linear Jacobi parameters**

*Abstract:* For a convolution semigroup of measures, the dependence of the Jacobi parameters of the measure on the convolution parameter is typically quite complicated. However for some examples, such as the heat semigroup, the dependence is linear. I will show that the dependence is polynomial if and only if the measures lie in the Meixner class. The proof is simple but indirect. For the corresponding question for free convolution, there is a more explicit proof, based on non-crossing partitions machinery developed by Wojciech Młotkowski (with whom this work is joint). Time permitting, I will also mention the corresponding result for the two-state free convolution.

**15:00 – 15:30:** Coffee**15:30 – 16:30:** M. Bożejko: **New characterisation of free Meixner processes**

*Abstract:* We will present generalized stochastic processes with freely (classically) independent values.

They have representation as

$$P(t) = a^*(t) + a(t) + \lambda(t)a^*(t)a(t) + \eta(t)a^{2*}(t)a^2(t),$$

here  $a(t)$  and  $a^*(t)$  are free(classical) annihilation and creation distribution in the Hida (distribution) sense and  $\lambda$  and  $\eta$  are continuous functions on a non-atomic locally compact measure space  $(T, dx)$ . If that functions are constant we get the free(classical) representation of exactly Brownian motion, Poisson, gamma-case when  $\eta = 0$  and Pascal and Meixner processes, when  $\eta > 0$ . We will present the free version of results of E. Lytvynov and we get a new characterization of that class of processes. Some relations with the papers with Demni on Meixner families will be also done.

**16:30 – 17:30: O. Arizmendi:  $k$ -divisible Non-Crossing Partitions and Free Probability**

*Abstract:* In this talk we will give some results involving the combinatorics of  $k$ -divisible non-crossing partitions and explain consequences on Free Probability. More specifically, let  $NC$  and  $NC_k$  be the sets of non crossing partitions and  $k$ -divisible non-crossing partitions. If we can look at  $NC_k$  as a sublattice of  $NC$ , it turns out that the (combinatorial) convolution with the zeta function in  $NC_k$  can be calculated by looking at the  $k$ -fold convolution of the convolution with the zeta function in  $NC_k$ . Using this result we can recover many counting results involving  $k$ -divisible partitions,  $k$ -equal partitions,  $k$ -multichains in  $NC$  and  $l$ -multichains in  $NC_k$ . After this we will define naturally the notion of a  $k$ -divisible element  $x$  and derive a formula the free cumulants of  $x^s$  in terms of the free cumulants of  $x$ . Finally we will explain some consequences on free multiplicative convolution with symmetric measures and free infinite divisibility.

**All lectures take place in the ESI Boltzmann Lecture Hall**