94th Séminaire Lotharingien de Combinatoire

Organisers: Christian Stump (Bochum), Christian Krattenthaler (Wien) &
Drew Armstrong (Miami/Bochum)

Programme

	Mon, Sep 15	Tue, Sep 16	Wed, Sep 17
8:00 - 9:00	*Breakfast*	*Breakfast*	*Breakfast*
9:00 - 10:00	**Kim**	**Kim**	**Kim**
10:00 - 10:30	**Jang**	**Garber**	**Hoster**
10:30 - 11:00	*Coffee* *Café Heuss*	*Coffee* *Café Heuss*	*Coffee* *Café Heuss*
11:00 - 12:00	**Beck**	**Beck**	**Beck**
12:00 - 12:30	**Robago**	**Soares**	**Armstrong**
12:45 - 13:45	*Lunch*	*Lunch*	*Lunch*
13:45 - 15:30	*Break*	*Break*	
15:30 - 16:00	**Dequêne**	**Schlosser**	
16:00 - 16:30	**Tzanaki**	**Smoot**	
16:30 - 17:00	*Coffee* *Symposion*	*Coffee* *Symposion*	
17:00 - 17:30	**Jal**	**Kleinau**	
17:30 - 18:00	**Schwob**	**Klász**	
18:00 - 18:30	**Dombos**	**Zafeirakopoulos**	
18:30 - 19:00	*Break*	*Break*	
19:00 - 20:00	*Dinner*	*Dinner*	
20:00 - 21:00	*ScienceBench*		

All talks will be in **Vortragssaal Müller**. Breakfast, lunch and dinner are served at the **Symposium**. Drinks are available after dinner at **Café Heuss**.

Main lectures

Matthias Beck (San Francisco)
q-Polynomials

Jang Soo Kim (Suwon)
Combinatorics of Orthogonal Polynomials

Abstracts

Matthias Beck   Chapoton initiated the study of q-Ehrhart polynomials: given a lattice polytope P (i.e., P is the convex hull of finitely many integer points in Rd), we fix an integral linear form l and sum ql(m) over all integer lattice points m in the dilate nP, as a function ehr(q,n). For q=1, this recovers the usual Ehrhart polynomial of P, counting integer lattice points in nP. From the viewpoint of the multigraded Hilbert series of the homogenization of P, the generating function of ehr(q,n) is a simple specialization. However, ehr(q,n) still carries an (a priori surprising) polynomial structure: Chapoton proved that that there exists a polynomial chap(x), whose coefficients are rational functions of q, such that ehr(q,n) equals the evaluation of chap(x) at the q-integer [n]q. Our plan is to start with an introduction to Ehrhart theory, including recent results. Second, we will show how Chapoton's results follow somewhat organically from Brion's Theorem, which decomposes the integer-point structure of P into that of its vertex cones. This ansatz also yields several immediate extensions of Chapoton's work. Third, we will outline how similar q-polynomials might be useful in other settings, such as generalizing the chromatic polynomial of a graph, with connections to chromatic symmetric functions and the arithmetic of order cones.

Novel results in these lectures are based on joint projects with Esme Bajo, Ben Braun, Alvaro Cornejo, Thomas Kunze, and Andrés Vindas-Meléndez.

Jang Soo Kim   Orthogonal polynomials are classical objects arising from the study of continued fractions. Due to the long history of orthogonal polynomials, they have now become important objects of study in many areas: classical analysis and PDE, mathematical physics, probability, random matrix theory, and combinatorics. The combinatorial study of orthogonal polynomials was pioneered by Flajolet and Viennot in the 1980s. In this lecture series, we study fascinating combinatorial properties of orthogonal polynomials. We first study basic properties of univariate orthogonal polynomials including Viennot's combinatorial theory. Some of these properties can be naturally generalized to orthogonal polynomials of type R1 and R2. We will show that moments of multivariate little q-Jacobi polynomials are generating

functions for lecture hall tableaux, which are 2-dimensional generalizations of lecture hall partitions. These moments are closely related to q-Selberg integrals. We will also show that such an approach can be generalized to all orthogonal polynomials in the q-Askey scheme.

This is based on several joint papers with Sylvie Corteel, Bhargavi Jonnadula, Jon Keating, Minho Song, and Dennis Stanton.

Contributed talks

Aryaman Jal
Rook matroids and log-concavity of P-Eulerian polynomials

Benedek Dombos
Bijections between grounded partitions and overpartitions

Benjamin Dequêne
Rainbow meanders on Dyck paths

David Garber
On the Schur-positivity of set partitions

Diego Robayo
Divisors on graphs and tropical admissible covers

Diogo Soares
On the Number of Shellable Arrangements of Pseudolines

Drew Armstrong
Brion's theorem and q-Catalan numbers

Elena Hoster
Real-Rooted Chow Polynomials

Eleni Tzanaki
On the bond lattice of complete bipartite graphs

Jihyeug Jang
Andrews–Gordon and Stanton type identities:
 Bijective and Bailey lemma approaches

Ludovic Schwob
Middle orders: all distributive lattices between weak and Bruhat orders

Markus Kleinau
Quiver representations over the field with one element

Michael Schlosser
 A bilateral extension of the Ramanujan function

Nicolas Allen Smoot
Multiplicities Between Modular Congruences

Viktória Klász
Auslander regularity and Coxeter matrices for incidence algebras of lattices

Zafeirakis Zafeirakopoulos
Using Polyhedral Omega for Integer Partition Problems

List of participants

	Name	City
1.	Aryaman Jal	Bochum
2.	Benedek Dombos	Geneva
3.	Benjamin Dequêne	Leeds
4.	Christian Krattenthaler	Wien
5.	Christian Stump	Bochum
6.	David Garber	Holon
7.	Diego Robayo	Kaiserslautern
8.	Diogo Soares	Coimbra
9.	Drew Armstrong	Miami/Bochum
10.	Eleni Tzanaki	Heraklion
11.	Jang Soo Kim	Suwon
12.	Jihyeug Jang	Geneva
13.	Julia Hörmayer	Vienna
14.	Ludovic Schwob	Champs-sur-Marne
15.	Marcus Schönfelder	Wien
16.	Markus Kleinau	Bonn
17.	Martin Rubey	Vienna
18.	Matthias Beck	San Francisco
19.	Michael Schlosser	Vienna
20.	Nathan Chapelier-Laget	Calais
21.	Nicolas Allen Smoot	Linz
22.	Olga Azenhas	Coimbra
23.	Philippe Nadeau	Lyon
24.	Rene Marczinzik	Bonn
25.	Soichi Okada	Nagoya
26.	Theresia Eisenkölbl	Wien
27.	Thomas Gerber	Lyon
28.	Viktória Klász	Bonn
29.	Zafeirakis Zafeirakopoulos	Athens