

# CombinaTexas 2021

## Feb 20–21, 2021

(Central Standard Time Zone)

This is a virtual conference. ZOOM links will be sent to registered participants in advance.

### Saturday Morning, February 20, 2021

- 08:20–08:30: **Opening Remarks**
- 08:30–09:30: Plenary Talk 1: Miklos Bona
- 09:30–10:50: Contributed Session I
- 10:50–11:10: **Break**
- 11:10–12:10: Plenary Talk 2: Chun-Hung Liu
  
- 12:10–02:00: **Lunch Break (on your own)**
  
- 02:00–03:00: Plenary Talk 3: Nathan Reading
- 03:00–04:20: Contributed Session II
- 04:20–04:40: **Break**
- 04:40–05:40: Plenary Talk 4: Stephine van Willigenburg
  
- 06:00–07:00: **Social Time @Gather Town**

### Sunday, February 21, 2021

- 08:20–09:40: Contributed Session III
- 09:40–10:00: **Break**
- 10:00–11:00: Plenary Talk 5: Josephine Yu
- 11:00–12:00: Plenary Talk 6: Tri Lai
  
- 12:00–1:50: **Lunch Time**
- (12:30–1:30) **Social Time @ Gather Town**
  
- 02:00–03:20: Contributed Session IV

## Schedule for Contributed Talks

<b>Saturday Morning, Contributed Session I</b>		
	Session A	Session B
	Chair: Byeongsu	Chair: Zhaobidan
09:30–09:50	H. Wang	J. Schmidt
09:50–10:10	P. Liscio	L. Warnke
10:10–10:30	L. Snider	N. Saldanha
10:30–10:50	A. Aderinan	S. Zayat
<b>Saturday Afternoon, Contributed Session II</b>		
	Session A	Session B
	Chair: Hannah	Chair: Zhaobidan
3:00–3:20	B. Yu	C. Merino
3:20–3:40	D. Villamizar	C.H. Yip
3:40–4:00	C. Wu	S. Yoo
4:00–4:20	J. Swanson	N. Khan
<b>Sunday Morning, Contributed Session III</b>		
	Session A	Session B
	Chair: Lauren	Chair: Kelly
8:20–8:40	A. Chandler	S. Hayat
8:40–9:00	J. Jung	S. Chueluecha
9:00–9:20	E. Ordog	A. Trujillo
9:20–9:40	Y. She	H. Guo
<b>Sunday Afternoon, Contributed Session IV</b>		
	Session A	Session B
	Chair: Hannah	Chair: Kelly
2:00–2:20	A. Bingham	C. Alfaro
2:20–2:40	M. Samuel	J. Reynes
2:40–3:00	C. Wolfe	E. Nastas
3:00–3:20	G. Nasr	C. Schlortt

## Abstracts of Plenary Talks

1. **Miklos Bona**, University of Florida.

Title: *Permutation patterns and nonrational generating functions*

Abstract: The solution of an enumeration problem is very often a generating function  $F$ . Some problems are too difficult for us to find the explicit form of  $F$ . This is almost always so in the theory of pattern avoiding permutations. In this talk, we will introduce a method that leads to negative results that are rare in this part of combinatorics. When our method applies, it shows that  $F$  is not a rational function, which provides at least some explanation of the fact that the original enumeration problem is difficult. As an example, we will prove that for the overwhelming majority of permutation patterns, the generating function of the corresponding generating function is not rational.

2. **Tri Lai**, University of Nebraska- Lincoln. Title: *Tilings of Semi-hexagons, Plane Partitions, Young Tableaux, and Classical Group Characters*

Abstract: We will talk about the fundamental connections between the tilings of semi-hexagons and various mathematical objects, including plane partitions, Young tableaux, and classical group characters. This is based on joint works with Sam Hopkins, Alejandro Morales, and Igor Pak.

3. **Chun-Hung Liu**, Texas A&M University

Title: *Clustered coloring for Hadwiger-type conjectures*

Abstract: Hadwiger (Hajos, and Gerards and Seymour, respectively) conjectured that the vertices of every graph with no  $K_{t+1}$  minor (topological minor, and odd minor, respectively) can be colored with  $t$  colors such that any pair of adjacent vertices receive different colors. These conjectures are stronger than the Four Color Theorem and are either open or false in general. A weakening of these conjectures is to consider clustered coloring which only requires every monochromatic component to have bounded size instead of size 1. It is known that  $t$  colors are still necessary for the clustered coloring version of those three conjectures. Joint with David Wood, we prove a series of tight results about clustered coloring on graphs with no subgraph isomorphic to a fixed complete bipartite graph. These results have a number of applications. In particular, they imply that the clustered coloring version of Hajos' conjecture is true for bounded treewidth graphs in a stronger sense. They also lead to the first linear upper bound for the clustered coloring version of Hajos' conjecture and the currently best upper bound for the clustered coloring version of the Gerards-Seymour conjecture.

4. **Nathan Reading**, North Carolina State University

Title: *Lattice congruences of the weak order: Algebra, combinatorics, and geometry*

Abstract: The talk will begin with a crash course on congruences on a finite lattice and the corresponding lattice quotients. To make the case that combinatorialists should care about congruences and quotients, we'll flip through some examples of lattice quotients of the weak order. I will sketch a complete combinatorial model for congruences on (and quotients of) the weak order on permutations and talk about how it generalizes

to other Coxeter groups. The talk will conclude with a discussion of the connections to geometry, representation theory, and string theory and a mention of current and future work.

5. **Stephanie van Willigenburg**, University of British Columbia

Title: *The e-positivity of chromatic symmetric functions*

Abstract: The chromatic polynomial was generalized to the chromatic symmetric function by Stanley in his seminal 1995 paper. This function is currently experiencing a flourishing renaissance, in particular the study of the positivity of chromatic symmetric functions when expanded into the basis of elementary symmetric functions, that is, e-positivity.

In this talk we approach the question of e-positivity from various angles. Most pertinently we resolve the 1995 statement of Stanley that no known graph exists that is not contractible to the claw, and whose chromatic symmetric function is not e-positive.

This is joint work with Soojin Cho, Samantha Dahlberg, Angele Foley and Adrian She, and no prior knowledge is assumed.

6. **Josephine Yu**, Georgia Institute of Technology

Title: *Topics in Real Tropical Geometry*

Abstract: I will introduce tropical geometry and discuss some recent developments and future directions at the intersection of tropical geometry and real algebraic or convex geometry.