Plenary Lectures
Conférences plénières

MICHAEL GEKHTMAN, University of Notre Dame
Generalized Cluster Structures

Cluster algebras were discovered by S. Fomin and A. Zelevinsky just over twenty years ago. They quickly found applications in various fields of mathematics and mathematical physics, including representation theory, combinatorics, higher Teichmüller theory, integrable systems and mirror symmetry. Generators of a cluster algebra are subdivided into overlapping subsets (clusters) of the same cardinality subject to certain polynomial relations (exchange relations). These are reminiscent of identities of classical mathematics - Ptolemy's identity, short Plücker relations, Desnanot-Jacobi determinantal identities etc. In fact, all the aforementioned identities and their generalizations were instrumental in constructing cluster structures in rings of regular functions on many varieties of interest in Lie theory. It turns out, however, that the structure of exchange relations postulated in the original definition of a cluster algebra is sometimes too restrictive to include some natural and important geometric examples. The notion of a generalized cluster transformation allows one treat such examples while retaining key features of cluster algebras, such as the Laurent phenomenon.

I will discuss the definition and properties of generalized cluster transformations and examples of their occurrence in various contexts: surfaces with orbifold points, Poisson-Lie groups, periodic difference operators, cyclic symmetry loci in Grassmannians , and representations of quantum affine algebras at roots of unity.

Most of the talk is based on joint projects with M. Shapiro, A. Vainshtein, C. Fraser, K. Trampel and D. Voloshyn.

STEPHANIE VAN WILLIGENBURG, University of British Columbia
De-clawing graph theory

This talk requires no prior knowledge and will be a gentle introduction to colouring graphs. It will be suitable for a broad audience including undergraduates. We will start with some historical tales, including the four colour map problem and the chromatic polynomial. We will then meet the chromatic symmetric function, dating from 1995, which is a generalization of the chromatic polynomial. A famed conjecture on it, called the Stanley-Stembridge (3+1)-free conjecture, has been the focus of much research lately including resolving another problem of Stanley of whether the (3+1)-free conjecture can be widened. The resulting paper on the latter problem was recently awarded the 2023 David P. Robbins Prize, and we will hear this story too.

ERICA WALKER, University of Toronto
Representations of Mathematical Merit in American Life

In this talk, I share insights from an ongoing research study on the narratives and stories we share about mathematics and how they influence the mathematical work and understanding of teachers, students, and the lay public. The talk will include emerging findings from K-16+ students and teachers about the impact of viewing short videos of mathematicians describing formative, educational, and professional experiences with mathematics.