



ISU Algebra Seminar

Time: Thursday, September 29, 1:00 – 1:50pm

Zoom Room ID: 948 5899 6931

Passcode: ISU

Zoom Room Link: <https://illinoisstate.zoom.us/j/94858996931>

Speaker: George H. Seelinger, Ph.D. (U of Michigan)

Title: Diagonal Harmonics and Shuffle Theorems

Abstract: The algebra of multivariate symmetric polynomials over the rational numbers has been used by mathematicians for hundreds of years and contains rich combinatorial structures. In the 1980's, a basis of symmetric polynomials called Macdonald polynomials was introduced with extra parameters that, when specialized, recover various classical bases. The theory of Macdonald polynomials has given rise to many curious identities relating algebraic quantities arising from representation theory with the combinatorics of Dyck paths. The first such identity, relating the bigraded character of the so-called "module of diagonal harmonics" to the combinatorics of Dyck paths lying below a line of slope -1, was conjectured in 2005 and proven in 2018. Recently, many generalizations of this identity have been proven by relating the action of an Elliptic Hall algebra with various infinite sums of symmetric Laurent polynomials. I will start with an overview of symmetric polynomials and how to get symmetric function expressions from spaces of harmonic polynomials. Then I will move on to discussing various shuffle theorems and the framework that has led to their proofs. A good part of this talk should be accessible to undergraduate Math majors and is based on joint work with Jonah Blasiak, Mark Haiman, Jennifer Morse, and Anna Pun.

About the Speaker: George H. Seelinger got his PhD from the University of Virginia in 2021 where he studied algebraic combinatorics. Algebraic combinatorics involves making use of algebraic structures to count various quantities of interest to mathematicians, usually arising from representation theory or algebraic geometry. His thesis primarily used the algebra of symmetric polynomials to show a geometrically distinguished basis of symmetric functions expands with positive integer coefficients into "dual Grothendieck polynomials." He is now a Postdoctoral Assistant Professor at the University of Michigan in Ann Arbor. His research interests currently include questions about symmetric polynomials, as well as other combinatorial questions arising from representation theory and algebraic geometry.