Department of Mathematics
University of Notre Dame

TOPOLOGY SEMINAR

Guest Speaker: Mark Penney
Max Planck Institute for Mathematics

Date: Tuesday, September 19, 2017
Time: 2:30 PM
Location: 258 Hurley Hall

Lecture Title:
The Hall bimonoidal category of an abelian category

Abstract
In the 90s Crane--Frenkel proprosed the construction of a 4d TQFT from a bimonoidal category, that is, a category equipped with both a monoidal and comonoidal structure so that the data defining the comonoidal structure is itself monoidal. Despite being an influential proposal it took nearly 20 years for the first interesting examples of bimonoidal categories to appear. In this talk I will describe how to extend the classical construction of the Hall algebra of an abelian category to produce new examples of bimonoidal categories: the Hall bimonoidal categories. The approach we take is based on a new perspective on the Hall construction introduced by Dyckerhoff--Kapranov and G\'alvez-Carrillo--Kock--Tonks. In the first talk I will give a direct construction of the Hall bimonoidal category of an abelian category A. I begin by describing how the Hall construction can be broken into three steps: First taking the Waldhausen S-construction of A to produce a simplicial space S(A), then building the universal Hall algebra of S(A) which, in the final step, is linearised. Our construction of the Hall bimonoidal category proceeds by modifying each of these three steps: Iterating twice the Waldhausen S-construction to get a bisimplicial space, building from the bisimplicial space a universal Hall bialgebra, and then applying a categorical linearisation. In the second talk I will describe how the second step of the preceding construction is actually a special case of the universal Hall bialgebra of a double 2-Segal space. A double 2-Segal space is a bisimplicial space satisfying a 2-dimensional analogue of the usual Segal conditions in each variable. Examples include (oo,2)-categories and the iterated Waldhausen S-construction of exact oo-categories.

Mark Penney - Max Planck Institute for Mathematics