

Fall 2018

▪ August 30

Speaker: **Matt Zaremsky** (University at Albany)

Title: **The Bieri-Neumann-Strebel-Renz invariants of the Houghton groups** *Abstract:* The Houghton groups H_n are a family of groups that are straightforward to define but have a variety of bizarre and interesting properties. In this talk I will discuss my recent computation of the Bieri-Neumann-Strebel-Renz invariants $\Sigma^m(H_n)$ of the H_n . The computation reveals some geometry reminiscent of that expected for metabelian groups by Bieri's Σ^m -Conjecture, and has implications for the finiteness properties of certain subgroups of H_n . This talk will be self-contained, and I will not assume any particular familiarity with the Houghton groups or the BNSR-invariants.

▪ September 6

Speaker: **Jonathan Williams** (Binghamton)

Title: **DGAs and Legendrian knots** *Abstract:* In order to discuss recent work, I will introduce Legendrian contact homology as formulated by Chekanov.

▪ September 13

Speaker: **Julie Bergner** (University of Virginia)

Title: **An introduction to 2-Segal sets via combinatorial examples** *Abstract:* The notion of a 2-Segal object was recently defined by Dyckerhoff and Kapranov, and independently by Gálvez-Carrillo, Kock, and Tonks under the name of decomposition space. Whereas 1-Segal sets model the structure of a category, in which composition is defined and is associative, 2-Segal sets instead encode a more general structure in which composition need not exist or be unique, but is still associative when it is defined. The 2-Segal set associated to a graph gives a nice example where maps can be composed in different ways. In particular, following a definition of Dyckerhoff and Kapranov, this 2-Segal set has an associated Hall algebra which is much smaller than most natural examples of such algebras and has a curious description as a cohomology ring.

▪ September 27

Speaker: **Jonathan Williams** (Binghamton)

Title: **Working topology seminar: DGAs in low-dimensional topology II** *Abstract:* I will continue my discussion of the Chekanov algebra and perhaps introduce my own recent work.

▪ October 18

Speaker: **Moshe Cohen** (Vassar)

Title: **Random knotting and billiard table diagrams** *Abstract:* We begin with a brief introduction to knot theory and proceed to a discussion of various models for randomness used to study knots. We then introduce a truncated model that allows us to get explicit probability formulae. Koseleff and Pecker show that all knots can be parametrized by Chebyshev polynomials in three dimensions. These long knots can be realized as trajectories on billiard table diagrams. We use this knot diagram model to study random knot diagrams by flipping a coin at each 4-valent vertex of the trajectory. We truncate this model to study 2-bridge knots together with the unknot. We give the exact probability of a knot arising in this model. Furthermore, we give the exact probability of obtaining a knot with crossing number c . This is joint work with Chaim Even-Zohar and Sunder Ram Krishnan.

▪ October 25

Speaker: **Jake Blomquist** (Binghamton)

Title: **Bousfield-Kan Completion for Integral Chains, Iterated Suspension, and Stabilization** *Abstract:*

Homology groups and homotopy groups of spaces are two of the main invariants used in algebraic topology to translate questions about spaces into the more rigid and computable setting of algebra. Homology groups are obtained by throwing away information, they are a form of derived abelianization of spaces, making them easier to compute than homotopy groups, but at the cost of losing information. Exploring connections between these invariants, such as the Hurewicz map, are thus very useful in helping to understand homotopy groups. One could ask the question: How much of a space does homology see? I will begin this talk by describing the classical completion of a space with respect to ordinary homology (with coefficients in a ring)—this construction goes back to Sullivan and Bousfield-Kan and provides an answer to this question. One consequence is that in the case of integral completion, these constructions can be understood as arising from a comparison between spaces and simplicial abelian groups equipped with extra coalgebraic structure. In joint work with John E. Harper, we show that the integral chains functor fits into an equivalence of homotopy theories between 1-connected spaces and certain coalgebras of simplicial abelian groups; thus capturing the homotopy category of simply connected spaces as abelian complexes with additional coalgebraic structure. The completion construction and derived equivalence proof ideas, exploiting Goodwillie's higher Blakers-Massey theorems, are sufficiently homotopical to establish similar results in several closely related comparisons including (i) suspension, (ii) iterated suspension, and (iii) stabilization of spaces. Time permitting I'll also discuss how these ideas can be extended to the unstable context of structured ring spectra.

▪ November 1

Speaker: **Ross Geoghegan** (Binghamton)

Title: **The semistability problem for CAT(0) groups** *Abstract:* Proper CAT(0) spaces are natural generalizations of simply connected complete manifolds of non-positive sectional curvature. These spaces have a simple and beautiful metric geometry, and their boundaries at infinity are metric compacta. When a group G acts properly discontinuously and cocompactly on a proper CAT(0) space (and this happens in a variety of important mathematical situations) G is called a CAT(0) group. In this situation the point-set topology of the compact boundary reflects algebraic properties of the group. So this part of geometric group theory is a natural meeting place for algebra and topology. I will discuss the semistability problem for CAT(0) groups, a still-open problem which nicely illustrates this meeting place.

▪ November 8

Speaker: **Olakunle Abawonse** (Binghamton)

Title: **Discrete Morse Theory, Collapsibility and CAT(0) Simplicial Complexes** *Abstract:* We will talk about a sufficient condition under which a finite simplicial complex of dimension three or less and equipped with a piecewise Euclidean geometry collapses to a point according to a result of Katherine Crowley. This will be done using discrete Morse theory, a combinatorial analog to the classical smooth theory.

▪ November 15

Speaker: **C S Aravinda** (TIFR Centre for Applicable Mathematics, Bangalore)

Title: **Geodesic conjugacies in nonpositive curvature** *Abstract:* The question of whether a time-preserving geodesic conjugacy determines a closed, negatively curved Riemannian manifold up to an isometry is one of the central problems in Riemannian geometry. While an answer to the question in this generality has yet remained elusive, this talk will briefly give an overview and discuss a certain improvement of a known result.

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