TITLES AND ABSTRACTS

David Ayala - University of Southern California

Factorization homology for links and other things

Various interesting examples of invariants of 3-manifolds and links satisfy a local-to-global expression. In this talk, we will axiomatize invariants satisfying such an expression and classify them in terms of algebraic data. Through this language there is a refinement of Poincaré duality, appearing as an instance of Koszul duality, which leads to some interesting conclusions. A few examples will be explicated. This is a report on joint work with John Francis and Hiro Tanaka.

Nathan Dunfield - University of Illinois at Urbana-Champaign

Integer homology 3-spheres with large injectivity radius

Conjecturally, the amount of torsion in the first homology group of a hyperbolic 3-manifold must grow rapidly in any exhaustive tower of covers (see Bergeron-Venkatesh and F. Calegari-Venkatesh). In contrast, the first betti number can stay constant (and zero) in such covers. Here "exhaustive" means that the injectivity radius of the covers goes to infinity. In this talk, I will explain how to construct hyperbolic 3-manifolds with trivial first homology where the injectivity radius is big almost everywhere by using ideas from Kleinian groups. I will then relate this to the recent work of Abert, Bergeron, Biringer, et. al. In particular, these examples show a differing approximation behavior for L^2 torsion as compared to L^2 betti numbers. This is joint work with Jeff Brock.

Søren Galatius- Stanford University

Cohomology of moduli spaces of high dimensional manifolds

I will discuss recent joint work with Oscar Randal-Williams about the cohomology of a certain space M_g^n, generalizing the moduli space of Riemann surfaces. The generalization replaces the genus g surface with the connected sum of g copies of $S^n \times S^n$, and M_g^n is a classifying space of smooth fiber bundles with that fiber.

Shelly Harvey - Rice University

Filtering smooth concordance classes of topologically slice knots

Recall that two knots are concordant if they cobound a smoothly embedded annulus in $S^3 \times I$. The set of knots modulo concordance forms a group, called the knot concordance group, $\mathcal{C}$. Inside this group lies an interesting subgroup called the group of topologically slice knots, denoted T. In this talk we will define two monoid filtrations of T that approximate how close a knot is to being (smoothly) slice in $\#_m \mathbb{C}P^2$ or $\#_m \overline{\mathbb{C}P}^2$. Their intersection, denoted T_n, is a filtration of T by subgroups. T/T_0 is large, detected by the τ, s, and δ-invariants, while T_0/T_1 is detected by certain Ozsváth-Szabó d-invariants. Going beyond this, our main result is that T_1/T_2 has rank at least one. We also give evidence to believe that T_n/T_{n+1} has positive rank for all n.

Tyler Lawson - University of Minnesota

Elliptic cohomology theories and modular forms with level structure

In this talk I'll discuss how elliptic curves have come to play a role in homotopy theory, through elliptic cohomology theories. In particular, the functoriality of these leads to the theory of topological modular forms. We will discuss different versions of this theory, and how the "old" construction due to Goerss, Hopkins, Miller, et. al. can be generalized. This produces versions related to other modular curves, and relates them to forms of complex K-theory. (This is joint work with Niko Naumann and Michael Hill.)

Michael Mandell- Indiana University

The homotopy theory of cyclotomic spectra

The category of cyclotomic spectra forms (something like) a stable model category. In its triangulated homotopy category, maps out of the sphere spectrum calculates TC. Joint work with Andrew Blumberg.

Peter Ozsváth - Princeton University

TBA

Dylan Thurston - Indiana University

Positive bases for skein algebras

We give a basis for the classical skein algebra of a surface (parametrizing twisted SL_2 representations) which is strongly positive, in the sense that the structure constants for multiplication are positive integers. This basis has a q-deformation, which is conjecturally also strongly positive. We speculate where positivity might come from in terms of a categorification of the skein algebra.

Inna Zakharevich- University of Chicago

Ring structures on scissors congruence spectra

Hilbert's third problem asks the following question: given two polyhedra, when is it possible to dissect them into a finite number of pairwise congruent polyhedra? The answer, given by the Dehn-Sydler theorem (1901,1965) is that it is possible whenever two invariants – the volume and the Dehn invariant – are equal. Generalizing this problem, we can say that two polytopes in a nice enough manifold (such as $\mathbb{R}^n$, S^n, or $\mathbb{H}^n$) are "scissors congruent" if they can be dissected into a finite number of pairwise congruent polytopes and ask for a classification of scissors congruence types. This question was studied by Dupont and Sah, who assigned groups of scissors congruence types on manifolds and analyzed many structures on these groups. In particular, it turns out that in the case of E^n and S^n, the groups assemble into a graded ring. In this talk we give a different perspective on scissors congruence groups by showing that they arise as the 0-th K-group of a particular type of Waldhausen category, and use Dupont and Sah's observations to construct these ring structures directly on the K-theoretic level.