# THE 2ND MID-ATLANTIC TOPOLOGY CONFERENCE

## Saturday, March 12

**John Francis — The cobordism hypothesis and factorization homology.**

The cobordism hypothesis—after Baez–Dolan, Costello, Hopkins–Lurie, and Lurie—roughly asserts that for a suitable target $C$, there is an equivalence

$$\mathrm{TQFT}(C) = \mathrm{obj}(C)$$

between $C$-valued extended topological field theories and objects of $C$. Proofs of results like this usually use Morse theory or handlebody presentations: one defines a value using this extra presentation data and then tries to prove that this value is independent of the extra data. (Think of proving that cellular homology is homotopy invariant.) I will describe a proof of the cobordism hypothesis that isn't like this: instead of using Morse theory, it uses an enhancement of factorization homology. This souped-up factorization homology works as a kind of integration over a "moduli space of stratifications" of a manifold, and the proof gives a construction of an inverse $\mathrm{obj}(C) \to \mathrm{TQFT}(C)$ which is manifestly well-defined. (Think of the manifest homotopy invariance of homology when expressed in terms of Eilenberg–MacLane spectra.) This is joint work with David Ayala.

**David Gepner — On the stable homotopy theory of stacks and elliptic cohomology.**

In this talk, we'll discuss what it means to be a cohomology theory for topological stacks, using a notion of local symmetric monoidal inversion of objects in families. While the general setup is abstract, it specializes to many cases of interest, including Schwede's global spectra. We will then go on to discuss various examples with particular emphasis on elliptic cohomology. It turns out that TMF sees more objects as dualizable (or even invertible) than one might naively expect.

**Vesna Stojanoska — Comparing flavors of self-duality and their descent properties.**

There are many different ways to import algebraic notions of duality to homotopy theory, and depending on the intended applications, these notions can have quite different flavors. At the same time, spectra such as complex or real K-theory have many versions themselves, but all seem to be self-dual with respect to some kind of duality. In this talk, I will discuss an explicit way to relate Gorenstein duality for connective ring spectra in the sense of Dwyer–Greenlees–Iyengar, and Anderson duality. The relation will be crucial in studying descent properties for either version of duality. This is based on joint work in progress with John Greenlees.

**Jeremiah Heller — Equivariant motivic cohomology.**

Motivic cohomology is an important invariant of smooth varieties and a fundamental tool for understanding algebraic K-theory. Joint with Mircea Voineagu and Paul Arne Ostvaer we construct a "Bredon-style" equivariant motivic cohomology, for a finite group $G$. The motivating case is $G = \mathbb{Z}/2$, where these are expected to be related to Hermitian K-theory of rings with involution. In this talk I'll discuss these invariants, some properties, and an equivariant version of the Beilinson–Lichtenbaum conjectures.

**Michael Shulman — Abstracting away from cell complexes.**

At many places in homotopy theory we find infinite cell complexes and the small object argument: fibrant replacement, Postnikov sections, localization, spectrification. Many of these are subsumed by the notion of "higher inductive type" (HIT) in homotopy type theory, which provides a syntax for reasoning about them that avoids explicit cell complex constructions. However, the category-theoretic techniques used to construct models of HITs can also be used directly, obtaining many of the same benefits without the need to understand any type theory. In this talk I will introduce these techniques from a model-categorical perspective. This is joint work with Peter LeFanu Lumsdaine.

SUNDAY, MARCH 13

**Eric Peterson — Cocycle schemes and $\mathrm{MU}[2k,\infty)$-orientations.**

We recall the study of $\mathrm{MU}[2k,\infty)$-orientations as elucidated by Ando, Hopkins, and Strickland. Their work prompts us to investigate a particular algebraic moduli which, after 2-localization, we (together with Adam Hughes and JohnMark Lau) fully describe for all values of k. It gives a strikingly good (but imperfect) approximation of our topological motivator.

**Inna Zakharevich — Deriving Zeta Functions.**

The zeta function of a variety $X$ over a finite field $\mathbf{F}_q$ is defined by

$$\zeta_X(t) = \exp \sum_{n\geq 1} X(\mathbf{F}_{q^n})/nt^n.$$

This is an additive invariant and therefore depends only on the class of $X$ in the Grothendieck ring of varieties. Using algebraic K-theory we show how to extend $\zeta.$ to the entire Grothendieck spectrum of varieties and use this to show that $K_1$ of the Grothendieck spectrum of varieties. If time permits we will also show an alternate construction of $\zeta.$ which allows us to extend the cohomological definition of $\zeta.$.

**Gonçalo Tabulda — Noncommutative Artin motives.**

The theory of Artin motives, which linearizes the classical Galois–Grothendieck correspondence, is ubiquitous in modern mathematics. In this talk I will present the noncommutative analogue of this theory, where algebraic varieties are replaced by (dg) algebras. Among other applications, I will address some conjectures concerning Severi–Brauer varieties and secondary K-theory.