MARK BEHRENS
MIT

Isogenies of elliptic curves and the K(2)-local sphere

Jack Morava showed that one could study the $K(n)$-local sphere in terms of the action of the group automorphisms of a height n formal group on its Lubin-Tate moduli space of deformations. For $n = 2$, one can take the height 2 formal group to be the formal completion of a supersingular elliptic curve. I will describe a piece of the $K(2)$-local sphere that you get from considering certain isogenies of this elliptic curve, and how it relates to the whole sphere. This approach will be compared to that of Goerss, Henn, Mahowald, and Rezk.

DAVID BEN-ZVI
University of Texas

The Geometric Langlands Program

I will present an introduction to the geometric Langlands program, or the harmonic analysis of sheaves on moduli spaces. Time permitting, I will describe recent work with David Nadler (U.Chicago) applying the geometric Langlands philosophy to the representation theory of real Lie groups.

MICHAEL CHING
MIT

Operadic bar constructions and the Goodwillie derivatives of the identity

I will explain how the Goodwillie derivatives of the identity functor on based spaces are given by a cobar construction and form an operad in spectra. A based space gives rise to a 'module' over this operad and we will look at spectral sequences for computing the homology of the resulting spectra as a 'module' over the suspension of the Lie operad.

RALPH L. COHEN
Stanford University

String topology and Gromov-Witten theory of cotangent bundles

In this lecture I describe a Morse theoretic viewpoint of string topology. This involves representing certain moduli spaces by categories of graphs, and studying spaces of graph flows in the loop space of a manifold. Using analytic work of Salaman and Weber, we relate moduli spaces of gradient flows in the loop space to moduli spaces of J-holomorphic curves in the cotangent bundle.

VERONIQUE GODIN
Institute for Advanced Study

Fat graphs and the mapping class group of a surface with boundary

I first construct a category of bordered fat graphs. I then give a bordered version of Kontsevich's graph complex which computes the integral cohomology of the bordered mapping class group. Finally I discuss a possible stable application.

VASSILY GORBOUNOV
University of Kentucky

Mirror symmetry formula for elliptic genus of some Fano varieties

Hori and Vafa recently suggested a mirror symmetry construction for some manifolds with non-negative first Chern class. The mirror partner of such a manifold is a Landau Ginzburg theory (LG for short) or its orbifold with respect to a finite groups action. The proof of validity of this construction was based on calculation of some physical quantities like the ac, cc rings, BPS structure of solitons, D-brane structure, for both of the objects and observing that these coincide. One of the main examples of manifolds fitting the Hori and Vafa construction is hypersurfaces with positive first Chern class.

There is a topological quantity which should be related for both objects if they are mirror partners. This is the elliptic genus. Earlier Witten examining the Gepner and Vafa constructions, which preceded the work of Hopi and Vafa, calculated the elliptic genus of the appropriate LG theories. Witten also suggested the exact relation of the elliptic genus of LG and the topological elliptic genus of the appropriate hypersurface. Namely, for a Calabi-Yau hypersurface the so called two parameter elliptic genus coincides with the two parameter elliptic genus for the appropriate LG, and for hypersurfaces with spin structure the one parameter elliptic genera coincide.

The purpose of this talk is to prove the Witten statement, offering therefore yet another positive test for the Hori-Vafa mirror symmetry construction. We emphasize the role of the chiral de Rham complex in the proof.

PO HU
Wayne State University

On algebraic analogues of string topology

I will discuss algebraic analogues of the string topology of Chas-Sullivan. I will talk about some older work of mine on Koszul duality and structures on higher Hochschild cohomology complexes of algebras over the k-dimensional little cubes operad. I will also talk about some new work I did on cactus sets and Batalin-Vilkovisky structure on the Hochschild cohomology of Poincare algebras.

IGOR KRIZ
University of Michigan

Conformal field theory, Grothendieck-Teichmueller theory and other structures

I will talk about two recent results related to the lax commutative monoid with cancellation approach to conformal field theory. Jointly with Po Hu, we reinterpret of a result of Hatcher-Lochak-Schneps to show that a Galois group of a number field acts on the category of modular functors. Jointly with Tom Fiore, we found a notion of 'Jacobian of a worldsheet with boundary' which lets us talk formally about Siegel-modular conformal field theories.

JACOB LURIE
Harvard University

Elliptic Cohomology and Derived Algebraic Geometry

In this talk, we will describe a new construction of the spectrum of topological modular forms, which avoids the use of complicated obstruction-theoretic calculations. The construction requires certain ideas from "derived algebraic geometry", which will be introduced and discussed. As an application, we will explain how the same ideas give rise to equivariant versions of elliptic cohomology.

JIM MCCLURE
Purdue University

The intersection pairing for PL chains, with applications to string topology

After an introduction to the intersection pairing for PL chains, I'll discuss four main results. Let M be a compact oriented PL manifold, let C_*M be its PL chain complex, and let LM be its free loop space.

1) The domain of the intersection pairing is quasi-isomorphic to the tensor product of C_*M with itself; similarly for the iterated intersection pairing.

2) C_*M is canonically quasi-isomorphic to an E-infinity chain algebra, by a quasi-isomorphism that respects the intersection pairing.

3) The Eilenberg-Moore spectral sequence whose abutment is $H_*(LM)$ is a spectral sequence of Batalin-Vilkovisky algebras, and the operations on the spectral sequence are compatible with the operations on H_*LM defined by Chas and Sullivan.

4) The Chas-Sullivan operations on H_*LM are induced by a chain-level action of the framed little 2-disks operad on a chain complex quasi-isomorphic to the singular chains of LM.

GORO NISHIDA
Kyoto University

Steenrod algebra, Dickson invariants and the automorphism groups of the additive group law

We consider the Steenrod algebra as an algebraic group and give a relation with the group of automorphisms of the additve group law. We then give a proof of the Milnor's theorem on the structure of the dual Steenrod algebra without using the explicit Adem relation.

ERIC SHARPE
University of Utah

D-branes and derived categories

In this talk we shall outline some progress in using derived categories to model the physics of off-shell D-branes in the open string B model.

ANDREW STACEY
NTNU (Trondheim)

A Construction of a Dirac Operator on Loop Space

In this talk I describe a method by which one can construct over a suitable loop space an operator which is the analogue of the Dirac operator on a finite dimensional manifold.

The key step is to adapt an idea due to Jack Morava to construct an inner product on the cotangent bundle of the loop space. There is then a Hilbert bundle which is the fibrewise completion of the cotangent bundle. This bundle is used to construct the spin bundle so that the Clifford multiplication map extends to the domain of a connection allowing one to define the Dirac operator.

STEPHAN STOLZ
University of Notre Dame

Elliptic cohomology via conformal field theories?

This is a report on joint work with Peter Teichner with the eventual aim of finding a geometric description of elliptic cohomology by relating it to conformal field theories.

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ABSTRACTS 1.2

CONSTANTIN TELEMAN
Cambridge University

Twistings in Gromov-Witten theory

We discuss the appearance of twistings in Gromov-Witten theory, with reference to K-theory and BG.

TAKESHI TORII
Fukuoka University

Degeneration of formal groups and generalized Chern characters

I will explain how a degeneration of formal groups relates to the chromatic filtration on the stable homotopy category. Then I will give some applications. For example, it is shown that the Morava K-theory K(n) with action of the stabilizer group G(n) can be recovered from some height (n+1) cohomology theory with action of G(n+1).