Stringy Topology in Morelia
Week 2 Titles and Abstracts

J. Devoto
Title: K3-cohomology and elliptic objects

Abstract : K3-cohomology is a generalized cohomology associated to K3 surfaces. We shall discuss the definition and construction of K3-cohomology and outline a possible geometric interpretation which generalize the idea of elliptic objects of G. Segal.

F. Cohen
Title: On the homology of spaces of knots in dimension 3 (joint work with R.~Budney)

Abstract: Let $\K_{3,1}$ denote the space of ``long knots" in $\R^3$ with the path-component of the `long knot" f denoted $\K_{3,1}(f)$

(1) The homology of the space of $\K_{3,1}$ with (a) coefficients in the rationals is a free Poisson algebra and (b) with coefficients in the field with p elements is a ``free restricted Poisson algebra".

(2) The growth of p-torsion in the integral homology of $\K_{3,1}(f)$ is a reflection of a kind of ``complexity" of the knot.

(3) Related speculation will be given concerning the above and connections to a Lie algebra of T.~Kohno together with results of Berrick, Wong, Wu and the speaker regarding braid groups and the loop space of the 2-sphere.

D. Freed, TBA

K. Fukaya
Title: Loop space and Floer theory of Lagrangian submanifold

Abstract: Using the $L_{¥infty}$ algebra of Loop space homology introduced by Chas-Sullivan, a de Rham version of Floer homology of Lagrangian submanifold will be discussed. It has several application to symplectic topology. But in this talk I would like to focus its application to some aspects of Mirror symmetry and also explain how it unifies various approaches to study Lagrangian submanifolds using psudo-holomorphic

discs. I will also exmplain how to include interior marked points to the story based on the resent progress of the joint work with Oh-Ohta-Ono.

S. Galatius
Title: "The space of graphs and homology of Aut(F_n)"

N. Ganter, TBA

E. Getzler
Title:Homotopy Frobenius manifolds and homotopy BV algebras

Abstract:Stasheff introduced A-infinity algebras as a homotopy generalization of differential graded associative algebras: a complex chain homotopy equivalent to an A-infinity algebra is an A-infinity algebra. In this talk, I present analogous constructions for Frobenius manifolds and Batalin-Vilkovisky algebras, due respectively to myself and to Tamarkin and Tsygan. It turns out that Frobenius-infinity manifolds form a subcategory of BV-infinity algebras, an analogue in homotopical algebra of coupling to topological gravity.

V. Gorbounov
Title: Elliptic genus test for mirror symmetry

Abstract: At the level of topological quantum field theories mirror symmentry partners have been identified for a large class of manifolds.
The work of Hori and Vafa is a good reference for these results. Investigations beyond the level of the topological theories is difficult becase the lack of mathematical structure describing quantum field theories. Chiral De Rham complex is a good approximation to such a description. The elliptic genus is an important characteristic of the Chiral de Rham complex. In this talk we describe the test for Hori-Vafa's construction of mirror partners from the point of view of the Chiral de Rham complex. Our results refine Hori-Vafa's concludions. As an application to topology we calculate the elliptic genus for a large class of complete intersections in toric variaties in terms of the mirrror Landau-Ginsburg orbifold.

M. Hopkins
Title: Topological Examples of Topological Field Theories

Abstract: I will describe open-closed topological conformal field theories and several examples that come up in homotopy theory.

E. Lupercio
Title: Orbifold String Topology

Abstract: In this talk we put forward a generalization of String Topology in which the manifold is replaced by an orbifold. Several themes that appear both in orbifold string theory and in the Chen-Ruan cohomology make their appearance here as well, discrete torsion and twisted sectors for example. The theory can be thought of as a sort of equivariant version of String Topology. This is joint work with Bernardo Uribe and Miguel Xicoténcatl.

I. Moerdijk
Title: Extensions of Lie Groupoids and Non abelian cohomology

Abstract: I will present a classification of regular Lie groupoids. The main ingredients are extensions of bundles of Lie groupoids on which the holonomy of a certain foliation acts, and principal bundles under bitorsors over such a bundle of Lie groupoids.

P. Norbury,
Title: Volumes of moduli spaces of hyperbolic surfaces

Abstract: The moduli space of genus g curves with n marked points can be reformulated as the moduli space of genus g hyperbolic surfaces with n cusps. This viewpoint brings a symplectic structure to the moduli space, so in particular volume makes sense. Mirzakhani calculated the volume of a more general moduli space - the moduli space of genus g hyperbolic surfaces with n geodesic boundary components of specified lengths - and showed that it is a polynomial in the boundary lengths. Mirzakhani showed the coefficients in these polynomials are related to the intersection numbers on the moduli space and used this to reprove the Witten-Kontsevich theorem. I will explain this work and further consequences of the hyperbolic geometry on intersection numbers.

D. Sullivan
Title: “String Topology I, II, III”

Abstract: the idea of these presentations is to contrast the theories mentioned in the title. the loop space homology has infinite rank and and the spectral sequence for equivariant homology is nontrivial. this provides an obstruction to extending string topology operations to a structure like those of topological string theory

P. Teichner, S. Stolz, TBA

C. Teleman
Title: "The structure of Semi-Simple 2D field theories"

B. Uribe
Title: Extended tangent bundles in Generalized complex geometry

Abstract: I will talk on my recent work with Shengda Hu, on the equivalence ongeneralized extended structures and twisted generalized complex structures This relation could be seen as a duality on which one side is a geometric construction and on the other is algebraic. To make the talk accesible I will give a brief summary on the work of Hitchin and Gualtieri in generalized complex manifolds.

C. Westerland
Title: Equivariant operads and string topology.

Abstract: The free loop space LM of a manifold M admits an action of the circle by rotating loops. We show that its equivariant homology is an algebra over the Getzler's gravity operad, constructed from the moduli spaces of points in the Riemann sphere. Moreover, we describe a general procedure for constructing new operads akin to the gravity operad and makesome conjectures regarding their application to higher dimensional analogues of string homology.

A. Ramirez
Title: "Open-closed string topology".

Abstract: The area of string topology began with a construction by Chas and Sullivan of previously undiscovered algebraic structure on the homology H_*(LM) of the free loop space of an oriented manifold M. Among other results, Chas and Sullivan showed that H_*(LM), suitably regraded, carries the structure of a graded-commutative algebra. The product pairing was subsequently extended by Cohen and Godin into a form of topological quantum field theory (TQFT). Open-closed string topology, first sketched by Sullivan, arises when considering spaces of paths in M with endpoints constrained to lie on given submanifolds (the so-called D-branes). In this talk, I describe a way to extend the TQFT structure of string topology into an analogue of TQFT which incorporates open strings. The method of construction is homotopy theoretic, and it makes use of constrained mapping spaces from fat B-graphs (which I define) into the ground manifold M.

A. Voronov
Title: The master equation of open-closed sigma-model

Abstract: We report on a joint work with Javier Zuniga, which describes the quantum master equation of open-closed sigma-model, generalizing results of Zwiebach and Sullivan to the open-closed case. Mathematicall speaking, the master equation governs the boundary structure of the moduli space of holomorphic maps from Riemann surfaces

with boundary to a fixed compact, complex manifold, subject to boundary conditions given by a set of Lagrangian submanifolds (a.k.a. D-branes).

C. Douglas, TBA

V. Godin, TBA

U. Tillmann, TBA

N. Wahl
Title: Mapping class groups of non-orientable surfaces

M. Xicotencatl, TBA