BIRS Workshop
The interaction of finite type and Gromov-Witten invariants.
November 15 - 20, 2003

Disorganized by the new Auckly and new Bryan

MEALS

Breakfast (Continental): 7:00 - 9:00 am, 2nd floor lounge, Corbett Hall, Sunday - Thursday
*Lunch (Buffet): 11:30 am - 1:30 pm, Donald Cameron Hall, Sunday - Thursday
*Dinner (Buffet): 5:30 - 7:30 pm, Donald Cameron Hall, Saturday - Wednesday
Coffee Breaks: As per daily schedule, 2nd floor lounge, Corbett Hall
***Please remember to scan your meal card at the host/hostess station in the dining room for each lunch and dinner.**

MEETING ROOMS

All lectures are held in the main lecture hall, Max Bell 159. *Please note that the meeting space designated for BIRS is the lower level of Max Bell, Rooms 155-159. Please respect that all other space has been contracted to other Banff Centre guests, including any Food and Beverage in those areas.*
A free guided tour of The Banff Centre is offered to all participants and their guests on Sunday starting at 7:00 pm. The tour takes approximately 1 hour. Please meet in the 2nd floor lounge in Corbett Hall.

SCHEDULE

Participants should arrive on Saturday. There is ample time in the evenings and on Thursday morning for people to schedule spontaneous talks.

	Sunday	**Monday**	**Tuesday**	**Wednesday**
7.00-9.00	Continental Breakfast, 2nd floor lounge, Corbett Hall			
9.00-9.45	Marcos Marino 1	Marcos Marino 2	Marcos Marino 3	Marcos Marino 4
9.45-10.00	Question and Answer session			
10.00-10.45	Hans Wenzl 1	Dror Bar-Natan 2	Hans Wenzl 2	Jozef Przytycki
10:45-11:00	Question and Answer session			
11:00-11:20	Coffee Break, 2nd floor lounge, Corbett Hall			
11.20-12.05	Chiu-Chu Liu 1	Conan Leung	Jun Li 2	Justin Roberts
12:05-12:20	Q and A	Group Photo[1]	Q and A	
12:20-13:30	Buffet Lunch, Donald Cameron Hall			
13.30-14.15	Justin Sawon	Chiu-Chu Liu 2	free afternoon	Chiu-Chu Liu 3
14.15-14.30	Question and Answer session		free afternoon	Q and A
14:30-15:15	Jun Li 1	Stavros Garoufalidis	free afternoon	Takashi Kimura
15:15-15:35	Coffee Break, 2nd floor lounge, Corbett Hall			
15:35-16:20	Dror Bar-Natan 1	Michael Hutchings	free afternoon	Jim Bryan
17:30-19:30	Buffet Dinner, Donald Cameron Hall			

[1] A group photo will be taken on Monday at 12:05 pm, directly after the last lecture of the morning. Please meet on the front steps of Corbett Hall.

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ABSTRACTS
(in alphabetic order by speaker surname)

Speaker: **Dror Bar-Natan 1** (University of Toronto)
Title: *Introduction to Perturbative Chern-Simons theory*
Abstract: I will discuss how the same class of trivalent graphs appears in three different places - the theory of Lie algebras, the theory of finite type (Vassiliev) knot invariants, and perturbative Chern-Simons theory. We will thus learn that the three are closely related.

Speaker: **Dror Bar-Natan 2** (University of Toronto)
Title: *Introduction to Khovanov Homology*
Abstract: The Jones polynomial created an industry when it was discovered in the early eighties. Yet only about four years ago Khovanov (arXiv:math.QA/9908171) found that it has a simple yet very intriguing generalization - that it is the Euler characteristic of a complex whose entire homology is invariant. And less than two years ago it was realized by Jacobsson (arXiv:math.GT/0206303) and Khovanov (arXiv:math.QA/0207264) that the resulting homology theory is functorial in the appropriate sense and leads to an invariant of 2-knots in 4-space. (And it's good to keep in mind that functoriality is the key to algebraic topology - without it algebraic topology can do little more than classify surfaces by their genus).

In my talk I will display one complicated picture and discuss it at length. Applying a certain 2D TQFT, we will get a homology theory whose Euler characteristic is the Jones polynomial. Not applying it, very cheaply we will get an invariant of tangles which is functorial under cobordisms and an invariant of 2-knots.

Speaker: **Jim Bryan** (University of British Columbia)
Title: *Topological Quantum Field Theory and local Gromov-Witten invariants of curves*
Abstract:

Speaker: **Stavros Garoufalidis** (Georgia Institute of Technology)
Title: *BPS invariants of links and a conjecture of Labastida-Marino-Ooguri-Vafa.*
Abstract:

Speaker: **Michael Hutchings** (University of California - Berkeley)
Title: *The embedded contact homology of* T^3
Abstract: Embedded contact homology counts embedded pseudoholomorphic curves in the symplectization of a contact 3-manifold, and conjecturally agrees with the Seiberg-Witten Floer homology of the 3-manifold. We compute the embedded contact homology of T^3 in terms of some amusing combinatorics involving plane polygons with vertices on the integer lattice. (joint w/ M. Sullivan)

Speaker: **Takashi Kimura** (Boston University)
Title: *Admissible covers, equivariant topological field theories, and orbifolding*
Abstract: Let G be a finite group. An admissible G-cover is essentially a principal G-bundle over a stable curve except that the G action need no longer be free over the marked points and nodes. A suitably pointed version of such data forms a moduli space which is responsible for G-equivariant (1+1)-dimensional topological field theories. We prove that by taking "G invariants," one obtains a (1+1)-dimensional TFT. This procedure can be promoted to a G equivariant version of a cohomological field theory, in the sense of Kontsevich-Manin. Such theories arise when considering the Chen-Ruan orbifold cohomology of a global quotient by G.

Speaker: **Conan Leung** (University of Minnesota)
Title: *Branes and Instantons for vector cross products*
Abstract:

Speaker: **Chiu-Chu Liu 1** (Harvard University)
Title: *Open Gromov-Witten Theory*
Abstract:

Speaker: **Chiu-Chu Liu 2** (Harvard University)
Title: *Virtual Localization*
Abstract:

Speaker: **Chiu-Chu Liu 3** (Harvard University)
Title: *Formulas of one-partition and two-partition Hodge integrals*
Abstract: Marcos Marino and Cumrun Vafa conjectured a remarkable formula of one-partition Hodge integrals based on duality between open-string theory and Chern-Simons theory. Motivated by the Marino-Vafa formula, Jian Zhou conjectured a formula of two-partition Hodge integrals. I will describe proofs of the above two formulas based on joint works with Kefeng Liu and Jian Zhou.

Speaker: **Jozef Przytycki** (George Washington University)
Title: *Khovanov homology of tangles and I-bundles over surfaces.*
Abstract: In this talk we generalize Khovanov homology to links in products of surfaces and an interval and in twisted I-bundles over unorientable surfaces (excluding RP^2). We define also generalized Khovanov homology for relative links (including tangles).

In the case of oriented surface F, we define the stratified Khovanov homology and show that for any link L in $F \times I$ one can recover coefficient of L in the natural basis of the Kauffman Bracket skein module of $F \times I$ from polynomial Euler characteristics of stratified Khovanov homology. (Joint work with Marta M.Asaeda and Adam S.Sikora)

Speaker: **Hans Wenzl 1** (UC San Diego)
Title: *Knot and 3-Manifold Invariants from Quantum Groups*
Abstract: We review the by now well-known approach of constructing topological invariants using modular tensor categories. Such categories can be obtained using Drinfeld-Jimbo quantum groups or, more difficult but closer to conformal field theory, loop groups. The talks will mostly concentrate on the quantum group approach.