LOW DIMENSIONAL TOPOLOGY
A COLLOQUIUM
IN HONOUR OF CHRISTIAN BLANCHET

Schedule

Tuesday		**Wednesday**	
9:00 – 9:45	Welcome/Coffee	9:00 – 9:30	Welcome/Coffee
9:45 – 10:45	Anna Beliakova	9:30 – 10:30	Ramanujan Santharoubane
Coffee break		Coffee break	
11:15 –12:15	Emmanuel Wagner	11:00 –11:30	Pierre Vogel
		11:30 –12:30	Christine Lescop
Lunch break		Lunch break	
14:15 –15:15	Nicolas Bergeron	14:15 –15:15	Vincent Colin
Coffee break		Coffee break	
15:45 –16:45	François Costantino	15:45 –16:45	Vladimir Turaev
16:45 –17:45	Gregor Masbaum		

Venue:
Université Paris Diderot, Bâtiment Sophie Germain
8 place Aurélie Nemours, Paris 13ème
Amphi Turing.

Titles and abstracts

Anna Beliakova: Blanchet-Khovanov algebras and functoriality of the Khovanov homology

In this talk I will present our new view on the Christian Blanchet solution of the functoriality problem for the Khovanov homology. It results in the construction of the Blanchet-Khovanov algebras and few new functorial theories such as sl(2) tangle homology, quantum annular homology and a categorification of the colored Jones polynomial.

The proofs are based on a simple geometric idea: replacing a foam with two intersecting surfaces and analyzing how deformations of these surfaces affect the foam.

This is joint work with Kris Putyra, Matt Hogancamp and Stephan Wehrli.

Emmanuel Wagner: Categorification of 1 and of the Alexander polynomial

I'll give a combinatorial and down-to-earth definition of the symmetric gl(1) homology. It is a (non-trivial) link homology which categorifies the trivial link invariant (equal to 1 on every link). Then I'll explain how to use this construction to categorify the Alexander polynomial. Finally, if time permits, I will relate this construction to the Hochschild homology of Soergel bimodules (joint with L-H. Robert)

Nicolas Bergeron: Growth of homological torsion of arithmetic groups

A conjecture, stated jointly with Akshay Venkatesh, predicts the degrees in which one should expect that the homology of an arithmetic group has "a lot", or fairly "little", torsion. There is very little clear evidence supporting this conjecture. After recalling its statement, I'll explain how, in work in progress with Miklos Abert, Mikolaj Fraczyk et Damien Gaboriau, we check that there is "little" torsion in the homology of congruence subgroups of $SL_N(\mathbb{Z})$ in degree $< N-1$. Our technics apply to other arithmetic groups, as well as to finite index subgroups of the mapping class group of a genus 2 surface.

François Costantino: TQFTs and non semi-simple invariants

I will review the construction of link invariants from ribbon categories and explain how the non semi-simple case differs from the standard one by recalling what a modified trace is. I will provide two examples of categories with modified traces : the modules over the unrolled version of $Uq(\mathfrak{sl}_2)$ and modules over a finite dimensional Hopf algebras. Then I will outline how one can produce invariants of three manifolds from these categories and possibly even TQFTs. (These results are taken from multiple joint collaborations with C. Blanchet, N. Geer and B. Patureau-Mirand).

Gregor Masbaum: On the skein module of the product of a surface and a circle

We show how to use Witten-Reshetikhin-Turaev invariants and Topological Quantum Field Theory to study skein modules of 3-manifolds. As an application, we obtain a lower bound for the dimension, over the fraction field, of the Kauffman bracket skein module of the product of a closed oriented surface and a circle.

Ramanujan Santharoubane: About the AMU conjecture

Surface mapping class groups act on finite dimensional complex vector spaces arising from Witten Reshetikhin-Turaev TQFT's. For a given mapping class group, theses actions are indexed by an integer called the level. One of their main features is that the action of single a Dehn twist is always of finite order although the action of the whole mapping class group is non trivial. In 2005 Andersen, Masbaum and Ueno conjectured that a pseudo-Anosov homeomorphism should act with infinite order for all but finitely many levels. In some sense, this conjecture says that the Nielsen-Thurston classification of surface homeomorphisms is nicely packaged in TQFT. This is still an open problem but I will present the different known approaches and results in this direction.

Pierre Vogel: Quelques mots sur le parcours de Christian

Christine Lescop: Counting graph configurations in 3-manifolds

We will show several ways of counting graph configurations in homology 3-spheres, in order to obtain topological invariants of these 3-manifolds, and of their links. The study of these invariants is inspired by the Witten study of the perturbative expansion of the Chern-Simons theory, and our ways of counting come from a discretization of a topological construction proposed by Kontsevich for these invariants. We will show concrete examples of computations for these invariants.

Vincent Colin: Low-dimensional invariants via contact topology

I will discuss some topological invariants of knots (Heegaard Floer or Khovanov homologies) that can be expressed via contact topology.

This involves joint works with Paolo Ghiggini, Ko Honda, Gilberto Spano and Yin Tian.

<u>Vladimir Turaev</u>: Topological constructions of tensor fields on moduli spaces

I will explain how topology of a space may lead to tensor fields on (the smooth part of) moduli spaces of the fundamental group.