Jorgen Andersen: Borel dual TQFT axioms and resurgence

In this talk we will review various selected aspects of earlier work on Quantum Chern-Simons theory and then focus on finite dimensional integral formulae for coloured Jones polynomials and the WRT-invariants of closed oriented 3-manifolds. After a short review of the program of resurgence, we will present the main resurgence conjecture and review various advanced on this conjecture. Finally, we will formulate a new set of Borel dual TQFT axioms and discuss the construction of its fundamental building blocks.

Dror Bar-Natan: Homework

I'll start with a review of my recent paper with van der Veen,
"A Fast, Strong, Topologically Meaningful, and Fun Knot Invariant", and
then assign some homework. Much of what I'll say follows earlier work by
Rozansky, Kricker, Garoufalidis, and Ohtsuki.

Anna Beliakova: On Algebraisation of Low-Dimensional Topology

The categories of n-cobordisms are among the most studied objects in low dimensional topology. For n=2 we know that 2Cob is a monoidal category freely generated by its commutative Frobenius algebra object: the circle. This result also classifies all TQFT functors on 2Cob. In this talk, I will construct similar algebraic presentations and prove classification results for special categories of 3- and 4-cobordisms. Here, the role of Frobenius algebra is taken by a braided Hopf algebra. The results are obtained in collaboration with Marco De Renzi, Ivelina Bobtcheva and Riccardo Piergallini.

Adrian Brochier: Swiss-cheese, Etingof-Kazhdan and Kashiwara-Vergne

In this talk we'll revisit various universal/diagrammatic constructions related to Etingof--Kazhdan's quantization of Lie bialgebras, with an emphasis on the finite dimensional case. Our main goal will be to explain something left somewhat implicit in work of Alekseev--Torrossian and of Bar-Natan--Dancso, namely that the Duflo isomorphism and (solutions of) the Kashiwara--Vergne conjecture have a natural interpretation (and generalization) in that framework. In turn they essentially follows from the compatibility of Etingof--Kazdhan's construction with certain duality operations. Time permitting, I'll explain how this can be interpreted in terms of boundary conditions for a certain 2d skein topological field theory.

Alberto Cattaneo: Surface observables in 4D BF, 2-knot invariants, nonabelian electric fluxes

In this talk, I will review the construction of surface observables in four-dimensional BF theory via the BV formalism. For vanishing cosmological constant, these observables were developed by the author with C. Rossi, are related to the Alexander invariant, and

should be related to Dror's balloons and hoops. The construction for nonvanishing cosmological constant is new, potentially produces new 2-knot invariants, and can be used to produce electric observables in nonabelian Yang–Mills theory.

Luke Conners: Fast Colored Khovanov-Rozansky Homology Computations

I will present a recursive algorithm for computing the reduced wedge-colored HOMFLY homology of positive torus knots. Somewhat surprisingly, the computation passes through the much larger y-ified homology of Gorsky--Hogancamp using several comparison theorems. I will also demonstrate that this invariant satisfies a doubly-graded exponential growth property, resolving a 2013 conjecture of Gorsky--Gukov--Stošic.

Benjamin Enriquez: On double shuffle relations between multiple zeta values and associators

We will review the proof the inclusion of the scheme of associators in the scheme of double shuffle relations between multiple zeta values (done jointly with H. Furusho in 2023, and independently of the latter's result on the subject from 2011). Its two main ingredients are: (a) an interpretation of the double shuffle formalism in terms of (infinitesimal) braids, due to Deligne and Terasoma (2005); (b) an appropriate use of Bar-Natan's interpretation of associators as isomorphisms between the "twin towers" of braids and their infinitesimal counterparts. Time permitting, we will report on progress on the analogue of (a) in the case of cyclotomic multiple zeta values (jointly with K. Yaddaden).

Hidekazu Furusho: Profinite knots and GT

I will introduce the notion of profinite knots as a natural profinite extension of topological knots and explain their basic properties. Then I will describe how the Grothendieck–Teichmüller group acts on profinite knots, by extending its classical action on profinite braid groups.

Tamara Hogan: Non-unique Seifert smoothings of tangles and Oriented Temperley–Lieb*

One of the steps in the algorithm for constructing the Seifert surface of a knot involves doing a 'smoothing' procedure at each of the crossings. One can generalise this smoothing procedure to tangles, and if one does, they can discover that the Seifert smoothing of the tangle is not unique. This short talk explores how any two smoothings are connected by a finite sequence of cyclic Reidemeister 2 moves.

* - the name Oriented Temperley–Lieb is not Dror-approved.

Rinat Kashaev: Braided Hopf structures on exterior algebras and R-matrices

Braided Hopf algebras equipped with automorphisms are known to give rise to constant solutions of the Yang--Baxter equation. In this talk, I will explain how this construction works in the case of exterior algebras realised as Nichols algebras with non-diagonal braiding. This is joint work with Vladimir Mangazeev.

Mikhail Khovanov: Diagrammatics of the Delannoy category

NilHecke algebra categorifies the ring of divided powers. We explain how to use the Delannoy category to categorify the ring of shifted divided powers of a single generator. Diagrammatics of the Delannoy category will also be explained.

Yusuke Kuno: Emergent version of Drinfeld's associator equations

In 2012, Alekseev and Torossian proved that any solution of Drinfeld's associator equations gives rise to a solution of the Kashiwara-Vergne equations. Both equations arise in natural topological contexts. For the former, these are knots and braids in 3-space, and for the latter there are at least two contexts: one is the w-foams, a certain Reidemeister theory of singular surfaces in 4-space, and the other is the Goldman-Turaev loop operations on oriented 2-manifolds. With the hope of getting a better understanding of the relations among these topological objects, we introduce the concept of emergent braids, a low-degree Vassiliev quotient of braids over a punctured disk. In fact, it was Dror who coined the notion of "emergent knotted objects." Then we discuss a work in progress on the associated formality equations, the emergent version of Drinfeld's associator equations. This talk is partially based on a joint work with D. Bar-Natan, Z. Dancso, T. Hogan and D. Lin.

Ruth Lawrence-Naimark: Transverse intersection algebra and fractional linking

According to folklore, it is impossible to construct a faithful finite dimensional algebraic model of differential forms which preserves all three properties of (graded) commutativity, associativity and Leibniz rule. In this talk we will demonstrate how by enlarging a cubical complex by adding certain `ideal' elements, a combinatorial transverse intersection algebra (TIA) model of a torus can be constructed which does have graded commutativity and associativity while the product rule holds for elements of the original complex. The corresponding linking form now takes fractional values. This TIA has been used to construct a finite-dimensional fluid algebra and thereby a proposal for a natural discretisation of Euler's equation which comes with exact conservation of energy and helicity. This is joint work with Dennis Sullivan.

Christine Lescop: On elementary invariants of genus one knots and Seifert surfaces

I will present easy-to-manage invariants of genus one knots in homology 3-spheres. Their invariance relies on the properties of a degree three

Vassiliev knot invariant and of an invariant of 3-dimensional genus two homology handlebodies called the Alexander form. The Alexander form of a 3-manifold E with boundary contains all Reidemeister torsions of link exteriors obtained by attaching 2-handles along the boundary of E. I will introduce this useful tool for studying Alexander polynomials and Reidemeister torsions and show how to extract invariants of genus one Seifert surfaces from the Alexander form of their exteriors.

Gwenael Massuyeau: On the Lie algebra of homology cylinders and the Sp-module structure of its torsion part

Let S be a compact oriented surface with first homology group H. The monoid of homology cylinders over S carries a natural filtration, known as the "Y-filtration", which is the 3-dimensional analogue of the lower central series of the Torelli group and is closely connected to the theory of finite-type invariants. The associated graded object of this filtration is the "Lie algebra of homology cylinders", which naturally carries an Sp(H)-module structure.

In this talk, I will survey the main results regarding this Lie algebra, many of which rely on clasper calculus and on the use of the LMO functor as a universal finite-type invariant. I will also discuss joint work in progress with Q. Faes and M. Sato, which focuses more specifically on the Sp(H)-module structure of the 2-torsion part of the Lie algebra of homology cylinders in odd degrees.

Jun Murakami: Volume conjecture for double twist knots

In this talk, I would like to give a proof of the volume conjecture for the double twist knots. We first focuses on the action of the fundamental group of the complement to the hyperbolic space. A fundamental domain of this action is given as a union of two congruent complexified hyperbolic tetrahedrons. At each edge of usual tetrahedron, a length and a dihedral angle are assigned. For the complexified tetrahedron, these parameters are complexified so that they correspond to the eigenvalues of certain elements of the fundamental group. By using this fundamental domain, the volume conjecture for the double twist knots is proved.

Muze Ren: What is ... the double shuffle associator?

I would like to introduce the notion of the double shuffle associator and discuss its properties. By D. Bar-Natan's work, each Drinfeld associator induces an isomorphism between PaB and PaCD. By the work of D.Bar-Natan and Z. Dancso, each Kashiwara-Vergne associator induce a homomorphic expansions of welded foams. I will discuss similar property for double shuffle associator (if time permits).

Louis-Hadrien Robert: sl(2) action on foams and on link homology

I'll explain how the foam evaluation formula enables to endow foamy state spaces with sl(2)-module structures and how to transfer these structures to Khovanov-Rozansky homology. I'll try to motivate the interest of such structures and to give some of their topological incarnations. joint with Y. Qi, J. Sussan and E. Wagner.

Pavol Severa: KZ connection and its holonomy as morphisms of operads

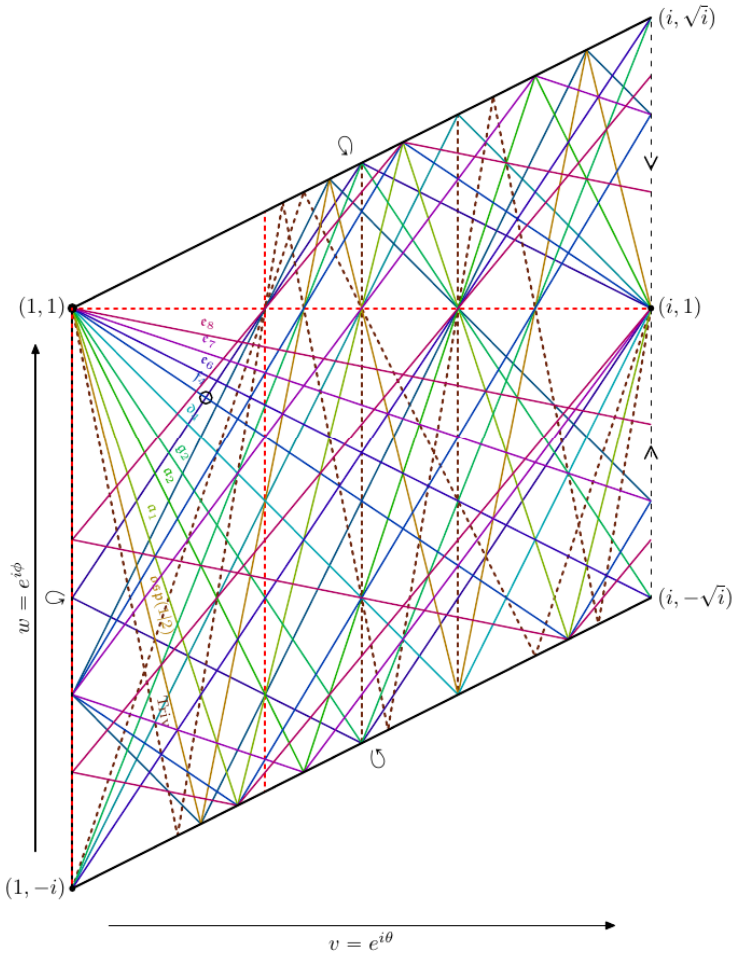
Drinfeld associators can be conceptually understood as morphisms of operads, as discovered by Dror Bar-Natan in late 90's (with a little addition by Dmitry Tamarkin). I will talk about a particular model of the framed little disks operad (within a suitable category of holomorphic manifolds with divisors with normal crossings) which makes the (framed) KZ-connection and its regularized holonomies to (cyclic) operad morphisms and in this way realizes the KZ associator as an operad morphism in a fully natural way. Based on a joint work (maybe) with Florian Naef (definitely).

Chandan Singh: Grothendieck–Teichmüller Symmetries of Tangles

The Grothendieck-Teichmüller group GT, introduced by Drinfeld in the 1990s, is an automorphism group of certain completion of braid groups that satisfies certain algebraic equations called the pentagon and hexagons equations. The profinite version of GT is conjectured to be isomorphic to the absolute Galois group of rationals. Bar-Natan's systematic categorical and diagrammatic study of GT influenced our modern understanding this group from homotopy-theoretic perspective using operads – algebraic structures that model operations with multiple inputs and one output. In this talk I will present a new characterization of the profinite GT using cyclic operads and explain how GT acts on the category of quantum tangles. This is joint work with Marcy Robertson.

Dylan Thurston: Towards a quantum exceptional polynomial

Each of the classical series of Lie groups, SL(n) and OSp(n), gives a two-parameter quantum invariant. There is also a conjectural third classical series, the exceptional series, containing all the exceptional Lie groups (and thus having only finitely many points). We look at the quantum version of this third series, and show that it satisfies a simple quantum Jacobi relation, giving a (conjectural) skein-theoretic description for a third two-parameter quantum exceptional polynomial invariant. We can unconditionally use these to compute previously out-of-reach knot polynomials (for particular exceptional groups) for all knots with 12 or fewer crossings. This is joint work with Kim Morrison and Noah Snyder.



Roland van der Veen: A genus bound for Theta

One of the key features of the Alexander polynomial is that it can be computed directly from a Seifert surface. An direct consequence is that the degree of the Alexander polynomial must be bounded above by the genus of the knot. The aim of this talk is to extend this theme to other quantum invariants such as the ADO, Links-Gould and in particular the invariant Theta that was the subject of the previous talk.
This is joint work in progress with Dror Bar-Natan. A handout for this talk will be available at www.rolandvdv.nl/Talks/Dia26