VAINTROBFEST: UNIVERSITY OF OREGON, DEPARTMENT OF MATHEMATICS, FENTON HALL, ROOM 117, NOVEMBER 5-6, 2016

REPRESENTATIONS, COMBINATORICS, KNOTS AND GEOMETRY

A miniconference dedicated to A. Vaintrob's 60th birthday

Organizing committee:
P. Etingof (MIT), A. Kleshchev (UO), V. Ostrik (UO), A. Polishchuk (UO).

Schedule

Saturday, November 5

8.50am Opening
9.00-9.50 **Vadim Vologodsky**
9.50-10.00 Break
10.00-10.50 **Eric Larson**
10.50-11.10 Coffee break
11.10-12.00 **Eugene Tevelev**
12.00-12.10 Break
12.10-1.00 **Alexander Polishchuk**

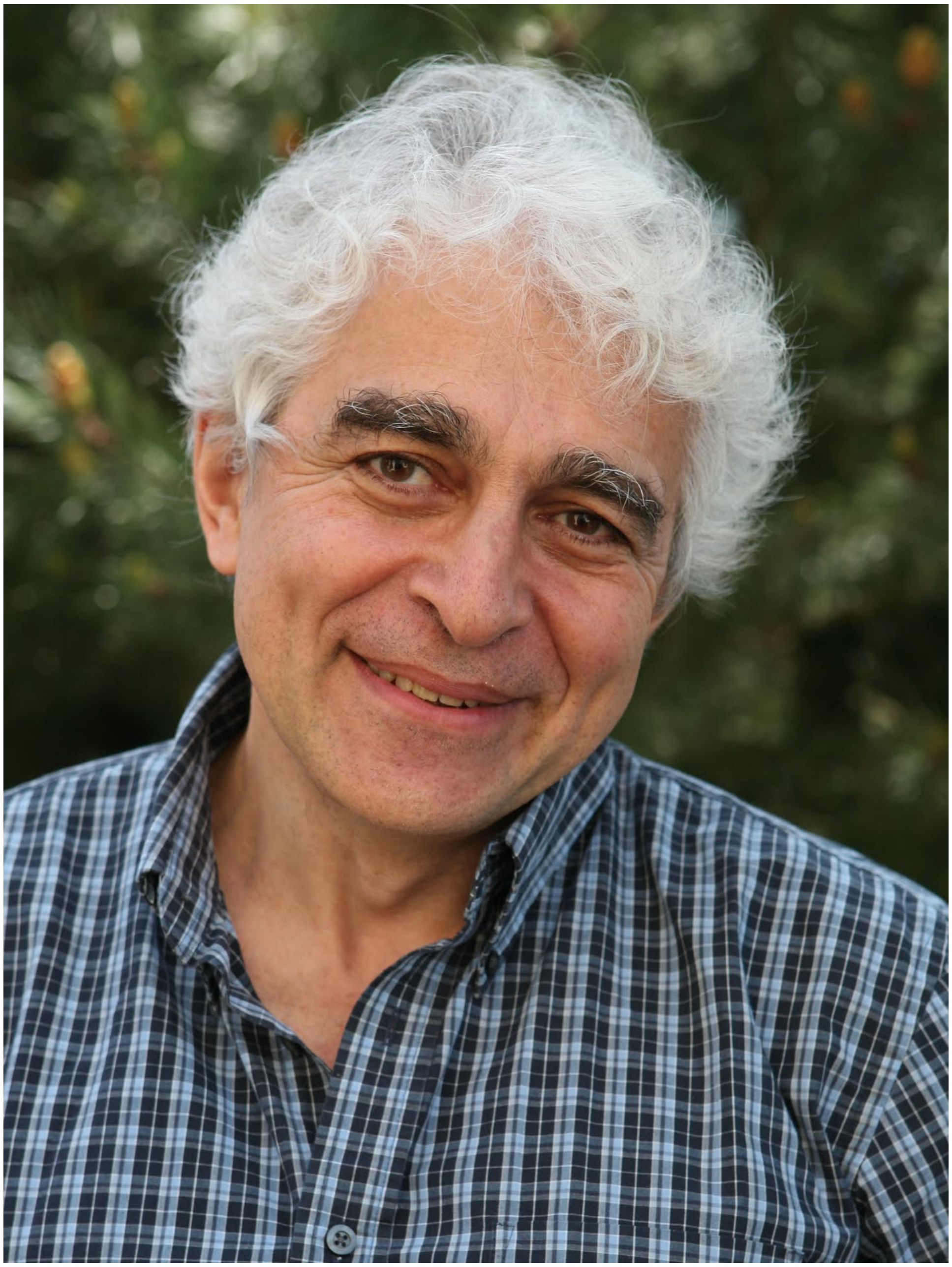
1.00-2.30 Lunch

2.30-3.20 **Dmitry Vaintrob**
3.20-3.30 Break
3.30-4.20 **Roman Bezrukavnikov**
4.20-4.40 Coffee break
4.40-5.30 **Alexander Givental**

5.30 **Party in Fenton Hall Lounge**

Sunday, November 6

1.30-2.20 **Ben Elias**
2.20-2.30 Break
2.30-3.20 **Alexander Kleshchev**
3.20-3.40 Coffee break
3.40-4.30 **Vera Serganova**
4.30-4.40 Break
4.40-5.30 **Victor Ostrik**



Arkady Vaintrob

Abstracts

Vadim Vologodsky (University of Oregon)

The Gauss-Manin connection on the periodic cyclic homology

This is a joint work with Alexander Petrov and Dmitry Vaintrob. It is expected that the periodic cyclic homology of a DG algebra over the field of complex numbers (and, more generally, the periodic cyclic homology of a DG category) carries a lot of additional structure similar to the mixed Hodge structure on the de Rham cohomology of algebraic varieties. Whereas a construction of such a structure seems to be out of reach at the moment, its counterpart in finite characteristic is much better understood thanks to recent groundbreaking works of Kaledin. I will describe a relative version of Kaledin's theory for DG algebras over a base scheme in finite characteristic incorporating in the picture the Gauss-Manin connection on the relative periodic cyclic homology constructed by Getzler. As an application, I will prove, using the reduction modulo p technique, that for a smooth and proper DG algebra over a complex punctured disk the monodromy of the Gauss-Manin connection on its periodic cyclic homology is quasi-unipotent.

Eric Larson (MIT)

Interpolation for normal bundles of general curves

This talk will address the following question: When does there exist a curve of given degree d and genus g, passing through n general points p_1, p_2,..., p_n in $\mathbb{P}^r$?

Alexander Polishchuk (University of Oregon)

Moduli spaces of A-infinity structures

In this talk I will present a criterion on the existence of a nice moduli space parametrizing A-infinity structures on a given finite-dimensional graded associative algebra. I will consider two examples involving such moduli spaces: one is related to moduli spaces of curves and another — to solutions of the associative Yang-Baxter equation.

Eugene Tevelev (University of Massachusetts at Amherst)

Moduli of stable algebraic surfaces

Higher-dimensional analogues of the Deligne-Mumford moduli space of stable curves were introduced by Kollar, Shepherd-Barron, and Alexeev. I will give a survey of their applications to topology of smooth algebraic surfaces. One example will be a recent joint result with Julie

Rana and Giancarlo Urzua that the Craighero-Gattazzo surface, the minimal resolution of an explicit complex quintic surface with four elliptic singularities, is simply-connected. This was conjectured in 1997 by Dolgachev and Werner, who proved that its fundamental group has a trivial profinite completion. This makes the Craighero-Gattazzo surface the only explicitly known smooth simply-connected complex algebraic surface of geometric genus zero with an ample canonical divisor.

Dmitry Vaintrob (IAS)

Compact trace, the Mukai pairing and character formulas.

Suppose that M is a representation of an algebra A defined over a base field k. Associated to M we have a pair of adjoint functors between the category A-mod of modules and the category k-mod of vector spaces. The first is the functor $V \mapsto V \otimes M$ from vector spaces to modules, and the second is $N \mapsto \mathrm{Hom}(M, N)$ from modules to vector spaces. Under suitable finiteness conditions on M, the two of them induce maps in opposite directions on Hochschild homology spaces. Unless A satisfies a very strong finiteness condition, these maps are not very closely related to each other. We salvage this situation by "enhancing" one of the maps using an algebro-geometric theory of sections of coherent sheaves with compact support (originally due to Deligne). From this we get a relationship between the two maps above in a much more general context, which in some representation-theoretic contexts recovers and extends known orbital-integral formulas. This is a work in progress.

Roman Bezrukavnikov (MIT)

Localization theorems for modular representations

I will discuss (derived) localization theorems for (restricted) representations of modular Lie algebras, as well as possible generalizations and applications.

Alexander Givental (Berkeley)

Permutation-equivariant quantum K-theory

We will give an overview of K-theoretic Gromov-Witten invariants cognizant about the action of permutations of the marked points on the sheaf cohomology of moduli spaces of stable maps.

Ben Elias (University of Oregon)

Categorical diagonalization in representation theory

The representation theory of the Hecke algebra in type A can be understood by examining the Young-Jucys-Murphy (YJM) operators, which form a large commutative subalgebra. One proves that these operators are (simultaneously) diagonalizable, and classifies their spectrum via standard tableaux. Alternatively, one can use full twists of parabolic subgroups to replace YJM operators, with the same results.

Given a categorical representation of the Hecke algebra, one obtains a categorical representation of the braid group, and thus categorical versions of the YJM operators and the full twists. We describe what it means for these operators to be "categorically diagonalizable," and conjecture that the full twist of any finite Coxeter group is categorically diagonalizable. We have proven this conjecture in type A and for dihedral groups. (On the other hand, the categorical YJM operators are not diagonalizable.)

Given a diagonalizable operator F whose spectrum is known, linear algebra tells one how to construct operators which project to the eigenspaces of F. This construction lifts for categorically diagonalizable functors. For example, projection to eigenspaces of YJM operators gives any representation a canonical decomposition whose summands are isotypic. Upstairs, any categorical representation has a canonical and explicit filtration whose subquotients are isotypic categorifications.

This is joint work with Matt Hogancamp. If time permits, we'll discuss the recent work of Gorsky-Negut-Rasmussen.

Alexander Kleshchev (University of Oregon)

Blocks of symmetric groups and Hecke algebras

We present a joint result with Anton Evseev, which describes every block of a symmetric group up to derived equivalence as a certain Turner double algebra. Turner doubles are Schur-algebra-like 'local' objects, which replace wreath products of Brauer tree algebras in the context of the Broué abelian defect group conjecture for blocks of symmetric groups with non-abelian defect groups. This description was conjectured by Will Turner. It relies on the work of Chuang-Kessar and Chuang-Rouquier. A key idea is a connection with Khovanov-Lauda-Rouquier algebras and their semicuspidal representations.

Vera Serganova (Berkeley)

On representations of the Lie superalgebra P(n).

We study the category F of finite-dimensional integrable representations of the periplectic Lie superalgebra $P(n)$. We define the action of Temperley–Lieb algebra with infinitely many generators and defining parameter 0 on this category by translation functors. We also introduce combinatorial tools, called weight diagrams and arc diagrams. Using the Temperley–Lieb algebra action and combinatorics of weight and arc diagrams, we calculate the multiplicities of standard and costandard modules in indecomposable projective modules and classify the blocks. We also prove that indecomposable projective modules in this category are multiplicity free.

Victor Ostrik (University of Oregon)

Symplectic level rank duality

This talk is based on joint work with Michael Sun and Eric Rowell. We consider modular tensor categories associated with integrable highest weight representations of affine Lie algebras at fixed positive integral level. The main result is a precise description of relationship of such categories associated with symplectic Lie algebras related by level rank duality.