<Title and Abstract>

April 25

Michio Jimbo

Title: Integrals of motion from quantum toroidal algebras

Abstract: Integrals of motion in CFT is a remarkable integrable system whose spectrum has been studied in great detail (Bazhanov et al.). We revisit their elliptic version due to Feigin et al.(2007) and establish the Bethe ansatz equation via representations of quantum toroidal algebras. This is a joint work with Feigin, Miwa and Mukhin.

Alexander Varchenko

Title: Elliptic dynamical quantum group $E_{¥tau,y}(gl_2)$ and elliptic equivariant cohomology of cotangent bundles of Grassmannians

Abstract: The torus T equivariant elliptic cohomology defines a functor $Ell_T : ¥{T-¥text{spaces}¥, X¥}¥to ¥{¥text{schemes}¥}$. For the cotangent bundle of a Grassmannian the scheme $Ell_T(T^*Gr(k,n))$ is some explicitly given sub-scheme of $S^k E¥times S^{n-k}E¥times E^n¥times E^2$ with coordinates $t_1,¥dots,t_k$, $s_1,¥dots,s_{n-k}$, $z_1,¥dots,z_n,y,¥lambda$, where t_i,s_i correspond to the Chern roots of the two standard vector bundles over the Grassmannian, z_i,y correspond to the torus T parameters, $¥lambda$ is the dynamical parameter also called the K¥"ahler parameter, and E is an elliptic curve.

I will define a class of line bundles on the scheme $¥cup_{k=0}^n Ell_T(T^*Gr(k,n))$ such that the operator algebra of the elliptic dynamical quantum group $E_{¥tau,h}(gl_2)$ will act on sections of those line bundles (a generator of the operator algebra will send a section of such a line bundle to a section of possibly another line bundle). That construction is an analog of the Yangian $Y(gl_2)$ action on the direct sum $¥oplus_{k=0}^n H^*_T(T^*Gr(k,n))$ of equivariant cohomology.

This is a joint work with G.Felder and R.Rimanyi.

Morihiko Saito

Title: Recent developments around b-functions

Abstract: I will survey some recent topics related to b-functions as follows:

1. Relation with D-modules generated by rational powers of a holomorphic function.

2. Relation between the microlocal V-filtration and the Hodge ideals.

3. Computation of the roots of b-function for a homogenous polynomial with one-dimensional singular locus using the pole order spectral sequence.

Takuro Mochizuki

Title: A Hukuhara-Levelt-Turrittin type theorem

Abstract: Let M be the moduli space of line bundles with a connection on an elliptic curve. We have the natural compactification of M denoted by $¥overline{M}$.

We shall explain a theorem on the structure of the formal completion of vector bundles on $¥overline{M}$ along the infinity, which is an analogue of the Hukuhara-Levelt-Turrittin theorem for meromorphic flat bundles on curves.

It is motivated by the study of doubly periodic instantons, and we shall discuss something related.

April 26

Nikita Nekrasov

Title: The Magnificent Four

Abstract: In studying gauge theories in various dimensions one comes across various enumerative problems: counting of holomorphic curves in Calabi-Yau manifolds, intersection theory on moduli spaces of instantons, limit shapes for random Young diagrams in two and three dimensions. The latter problem is related to dimer models and the models of crystal melting. We shall report on the recent developments in four dimensions, the ultimate dimension for crystal melting coming from supersymmetric gauge theory. The string theory context of the problem is the counting the bound states of D0 branes in the presence of the D8 brane and a B-field. The random configurations are tilings of the 3-space by four types of squashed cubes. The similar problem of D0-D6 brane counting led to the partition function which was conjectured in 2004 to be given by the Witten index of 11d supergravity. The conjecture was proven in 2015 by A.Okounkov. I will present the conjecture on the partition function of the new model. It hints at the twelve-dimensional origin of the problem.

Aleksander A. Belavin

Title: Superstring compactification and Frobenius manifold structures on the deformations of Gepner chiral rings.

Abstract: The requirement of $N=2$ superconformal symmetry (SCFS) in the compact sector of Super String theory is equivalent to the geometrical condition of the compactification six dimensions on Calabi-Yau threefolds.

The massless sector of Superstring theory corresponds to the set of chiral fields of N=2 Super CFT and this sector is described by Topological CFT (TCFT).

The properties of the Lagrangian of the corresponding sigma model for this massless sector are defined in terms of the mirror pairs of Calaby-Yau manifolds linked to the same TCFT.

The explicit form of the flat coordinates is important also for the solution of the TCFT models related to the Gepner chiral rings which are a subset of Kazama--Suzuki connected with a certain class of the isolated singularities.

Thus, the computation of the Flat coordinates and the Saito primitive form for Frobenius manifolds is the important part of the solution of the above mentioned physical problems.

We propose a new simple method for computing flat coordinates on the Frobenius manifolds linked with TCFT.

Approach is based on using a Conjecture about integral representations for the flat coordinates and on the Saito cohomology theory.

It helps to reduce the problem of the computation of the flat coordinates to a simple linear problem.

Si Li

Title: Vertex algebra, BV master equation and quantum primitive form.

Abstract: We study the effective BV quantization theory for chiral deformation of two dimensional conformal field theories. We establish an exact correspondence between renormalized quantum master equations for effective functionals and Maurer-Cartan equations for chiral vertex operators. The generating functions are proven to be quasi-modular forms. As an application, we construct an exact solution of quantum B-model (BCOV theory) in complex one dimension that solves the higher genus mirror symmetry conjecture on elliptic curves. This can be viewed as a compact CY example of quantization of Saito's primitive form. Based on arXiv: 1612.01292[math.QA].

Shigeru Mukai

Title: Enrique surfaces whose automorphism groups are virtually free

Abstract: An Enriques surface is an algebraic surface obtained from a K3 surface taking quotient by a fixed point free involution. The automorphism group Aut(S) of an Enriques surface is always discrete, and shrinks from very infinite to mildly infinite and to finite under specialization, just like the Mordell Weil group of an elliptic fibration. In this talk I discuss the the virtual cohomological dimension (vcd) of Aut(S) and present some examples of Aut(S) with vcd 1 (and 0) using infinite Coxeter groups acting on the 9-dimensional hyperbolic space. This is a joint work with H. Ohashi.

April 27

Kentaro Hori

Titile: Grade Restriction Rule from Hemisphere

Abstruct: Abstract: The grade restriction rule is a constraint on possible boundary conditions in 2d (2,2) supersymmetric gauge theories. I describe how to determine it using the hemisphere partition function. The rule can be used to find the equivalence of categories of branes for each path or loop in the FI-theta parameter space and to formulate homological Seiberg duality between pairs of theories with classical gauge groups.

Yukinobu Toda

Title: Donaldson-Thomas invariants on abelian 3-folds and Fourier-Mukai transforms

Abstract: I will show that Donaldson-Thomas invariants on abelian 3-folds have symmetric properties with respect to their autoequivalence groups, and explain the relationship to the conjecture of Bryan-Oberdieck-Pandharipande-Yin on curve counting DT invariants on abelian 3-folds. This is a work in progress with G. Oberdieck and D. Piyaratne.

Alexey Bondal

Title:

Abstract:

Kyoji Saito

Title: Highest weight Integrable Representations of Elliptic Lie algebra

Abstract: Even though an elliptic Lie algebra is not a Kac-Moody algebra, it admits highest weight integrable representations which are determined by dominant integral weights in the elliptic Tits cone. Owing to this integrability, we obtain the construction of the elliptic Lie group. If the time permits, we show that the elliptic group admits Bruhat type decomposition, depending on a choice of a marking on the elliptic root system. This study is a part of long project, which is on progress, to construct an elliptic primitive form by the use of Kostant-Kilirov form on the elliptic Lie algebra.

April 28

Hiroshi Iritani

Title: Hodge-theoretic mirror symmery for toric Deligne-Mumford stacks

Abstract: We discuss mirror symmetry for quantum cohomology Frobenius manifolds of toric Deligne-Mumford stacks. We construct a formal and logarithmic Saito structure associated with the mirror Landau-Ginzburg model.

We discuss the analyticity of the Saito structure and that the pairings match under mirror symmetry. This is based on joint work with Coates, Corti and Tseng.

Claus Hertling

Title: Marked singularities, Teichmüller spaces and Torelli type conjectures for them.

Abstract: A marked singularity is an isolated hypersurface singularity with an isomorphism of its Milnor lattice to a reference Milnor lattice. The moduli space of all marked singularities in one mu-homotopy class turns out to be a geometric quotient and is an analogue of the Teichmüller spaces. Though it is not always connected.

There is a period map to a classifying space of Brieskorn lattices.

Its injectivity is a Torelli type conjecture. It is proved for the singularities with modality 0,1,2. All this lifts old work to marked singularities. Partly it is joint work with F. Gauss.

If time permits, also a natural hermitian form on the base space of a universal unfolding will be mentioned.