International Workshop
on

Integrable Systems and Representation Theory

Date: 9-11 March, 2015
Venue: Memorial Hall of the 85th Anniversary,
Tokyo University of Marine Science and Technology
(Etchujima Campus)

9 March (Monday)

10:00-11:00 M.Noumi
TBA
11:15-12:15 V.Spiridonov
The elliptic modular double
14:00-15:00 J.Stokman
Solving boundary qKZ equations and the associated connection problem
15:15-16:15 P.Baseilhac
The q-Onsager algebra and quantum integrable systems: an overview
16:30-17:30 A.Dzhamay
Combinatorics of matrix refactorizations and discrete integrable systems

10 March (Tuesday)

10:00-11:00 M.Bershtein
Conformal field theory of Painleve VI (after Gamayun, Iorgov, Lisovyy)
11:15-12:15 P.Baseilhac
A q-hypergeometric framework for integrable systems related with the q-Onsager algebra
14:00-15:00 V.Spiridonov
The elliptic modular double
15:15-16:15 J.Stokman
Solving boundary qKZ equations and the associated connection problem
16:30-17:30 H. Naruse
Equivariant quantum cohomology of maximal isotropic Grassmannians
18:30- Reception

11 March (Wednesday)

10:00-11:00 C.Ormerod
Spectral curves and discrete Painleve equations
11:15-12:15 M.Bershtein
Bilinear equations on Painleve tau functions from CFT
14:00-15:00 K.Motegi
Quantum integrable combinatorics of Schur and Grothendieck polynomials
15:15-16:15 T.Takenawa
Geometric introduction to discrete Painlev equations

- P.Baseilhac (Univ. of Tours)

  Lecture 1: The q-Onsager algebra and quantum integrable systems: an overview

  Abstract: A review on the q-Onsager algebra and applications to quantum integrable systems will be presented. After a brief historical introduction on the Onsager algebra, I will present the q-Onsager algebra either from the mathematical point of view (in relation with certain coideal subalgebras, the reflection equation, the concept of tridiagonal pairs,...) or its connection with physical problems of recent interest (in relation with the open XXZ spin chain and boundary affine Toda field theories). I will describe the approach and some of the exact results that have been derived up to now for different types of quantum integrable systems (spectrum, eigenstates, classification of boundary conditions, correlation functions and form factors,...). A review based on collaborations with K. Koizumi, K. Shigechi, S. Belliard and T. Kojima.

  Lecture 2: A q-hypergeometric framework for integrable systems related with the q-Onsager algebra

  Abstract: A q-hypergeometric framework for a class of quantum integrable models generated from the q-Onsager algebra will be presented. By analogy with the basic example of the quantum harmonic oscillator which eigenfunctions are the Hermite polynomials, I will show how certain multivariable generalizations of polynomials of the Askey-scheme provide a natural basis for studying integrable models generated from the basic generators of the q-Onsager algebra. Applications and perspectives for the open XXZ spin chain will be described. Work done in collaboration with X. Martin (LMPT Tours).

- M.Bershtein (Landau Inst.Theor.Phys.)

  Lecture 1: Conformal field theory of Painleve VI (after Gamayun, Iorgov, Lisovyy).

  Abstract: In this talk I will explain the main conjecture of the paper http://arxiv.org/abs/1207.0787 and some related results.

  Lecture 2: Bilinear equations on Painleve tau functions from CFT

  Abstract: In this talk I will explain our approach http://arxiv.org/abs/1406.3008 to the Gamayun, Iorgov, Lisovyy conjecture.

- A.Dzhamay (Univ. of Colorado)

  Title: Combinatorics of matrix refactorizations and discrete integrable systems

- K.Motegi (TBA)

  Title: Quantum integrable combinatorics of Schur and Grothendieck polynomials

  Abstract: We study and prove various combinatorial identities for the Schur and Grothendieck polynomials by analyzing partition functions of the integrable five and six-vertex models. First, through the identification of the Grothendieck polynomials with the wavefunction of a five-vertex model, we extract the Cauchy formula for the Grothendieck polynomials from the scalar products. Second, we examine another six-vertex model. By evaluating the wavefunction in two different ways, we find a new combinatorial formula which expresses the Schur polynomials with an additional parameter. Based on joint works with K. Sakai.

- H.Naruse (Okayama Univ.)

  Title: Equivariant quantum cohomology of maximal isotropic Grassmannians

Abstract: We describe the ring of equivariant quantum cohomology of maximal isotropic Grassmannians using factorial version of Schur P- and Q- functions. This is both quantum and equivariant deformation of the usual cohomology ring.

- M.Noumi (Kobe Univ.)

  TBA

- C.Ormerod (Caltech)

  Title : Spectral curves and discrete Painleve equations

  Abstract: We wish to discuss some aspects of the geometry of Lax pairs for QRT maps and the Painleve equations. We find that the evolution of the these systems may expressed succinctly in terms of the spectral curve of the Lax matrices. We show cases in which this spectral curve defines the Hamiltonian of some Painleve equations, the biquadratic invariant for some QRT maps and a moving biquadratic in the case of some discrete Painleve equations.

- V.Spiridonov (BLTP JINR, Dubna, Russia)

  Lecture 1&2: The elliptic modular double

  Abstract: The elliptic modular double was defined by the speaker in 2008 as an algebra formed from two Sklyanin algebras with the structure constants related by a modular transformation. It can be reduced to Faddeev's modular double for $U_q(sl_2)$ in a particular limit. An integral operator intertwining equivalent representations of the elliptic modular double was introduced in 2003 for building an integral analogue of the Bailey chains techniques. Corresponding Bailey lemma yields a star-triangle relation which plays a key role in building the most complicated known solution of the Yang-Baxter equation in the form of an integral operator with an elliptic hypergeometric kernel. The elliptic modular double allows one to fix this solution uniquely. A finite-dimensional invariant null-space of the intertwining operator emerging for particular two-index lattices of values of the spin is described by products of Jacobi theta functions with two different modular parameters. It yields new elliptic solutions of the Yang-Baxter equation through a reduction procedure. The talk is partially based on joint works with D. Chicherin and S. Derkachov.

- J.Stokman (Univ. of Amsterdam)

  Lecture 1&2: Solving boundary qKZ equations and the associated connection problem.

  Abstract: Boundary quantum Knizhnik-Zamolodchikov (qKZ) equations are compatible systems of difference equations arising naturally in the study of solvable lattice models with boundaries. They for instance appear as compatibility conditions for correlation functions of semi-infinite Heisenberg spin chains. In the first lecture I will explain how boundary qKZ equations can be attached to representations of the affine Hecke algebra of type C. It ties the study of a rich class of boundary qKZ equations to the theory of double affine Hecke algebras. I will show that boundary qKZ equations obtained from the integrable data of the Heisenberg XXZ spin-1/2 chain with general reflecting boundary conditions belong to this class. In the second lecture I will focus on the boundary qKZ equations attached to principal series representations. For each asymptotic sector I will construct a basis of solutions. I will solve the associated connection problem by explicitly computing the change-of-basis matrix relating the bases for different asymptotic sectors. I will show how this leads to an explicit 4-parameter family of elliptic dynamical K-matrices for Baxter's 8-vertex face model.

- T. Takenawa (Tokyo Univ. of Marine Science and Technology)

  Title: Geometric introduction to discrete Painleve equations

  This talk is a brief introduction to geometric studies on continuous and discrete Painlevé equations. While Painlevé equations are defined by the Painlevé property, i.e. the branch points of solutions are independent to the initial conditions, discrete Painlevé equations are characterized by so called the singularity confinement criterion proposed by Grammaticos and Ramani. In this talk we will show that these two properties are closely related to each other through the space of initial conditions in the sense of Okamoto.