Integrable systems and quantization
Systèmes intégrables et quantification

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KUNTAL BANERJEE, University of Saskatchewan

Iterated spectral curves and Lax pairs: A brief overview

We appeal to an iterated version of the classical spectral correspondence starting from a composite 'push-pull' projection formula of locally free sheaves and observe further consequences in solving the equation of the Lax pairs. We will limit our discussions to the cyclic spectral covers of the complex projective line.

RAPHAËL BELLIARD, University of Alberta

Quantum Riemann bilinear relations.

Upon a slight extension of Goldman's homology with local coefficients, meromorphic lambda-connections in trivial principal bundles over Riemann surfaces are interpreted as quantisations of certain emergent classical algebraically integrable systems. This allows for a natural notion of quantum periods satisfying quantum counterparts to the classical Riemann bilinear relations.

PETER CROOKS, Utah State University

Abelianization in integrable systems and quantization

Guillemin and Sternberg's Gelfand-Cetlin systems are related to important topics at the interface of symplectic geometry and representation theory. I will propose and partially substantiate a generalization of these systems and their broader implications. A key technical ingredient will be an abelianization theorem for symplectic quotients in arbitrary Lie type. This represents joint work with Jonathan Weitsman.

IVA HALACHEVA, Northeastern University

Families of maximal commutative subalgebras in quantum groups

A useful approach to decomposing a representation of an algebra into manageable pieces is through the action of its maximal commutative subalgebras. I will discuss several families of such subalgebras in the context of Lie theory, in particular the shift-of-argument as well as Bethe algebras. These families are parametrized by interesting geometric spaces, such as the Deligne-Mumford moduli space. For a given representation, their action leads to a covering space with associated monodromy realized by the cactus group acting on the crystal for that representation. The talk will focus on the case of gl(n).

REINIER KRAMER, University of Alberta

How should we quantise cycles in symmetric groups?

Hurwitz numbers are counts of covers of Riemann surfaces with given ramification. For maps from the sphere to itself, we may require most ramifications are $(r+1)$-cycles. Generating functions of these numbers naturally live on the spectral curve

$$y - e^{x^r y^r} = 0.$$

We want to quantise this curve to obtain an operator $P(\hat{x}, \hat{y}; \hbar)$ which annihilates the partition function of all-genus covers of the sphere. I will explain that there are at least two natural ways of doing this, with different corrections to the cycles, and different interpretations of the original spectral curve.

This is based on joint works with Gaëtan Borot, Vincent Bouchard, Petr Dunin-Barkowski, Danilo Lewański, Alexandr Popolitov, Sergey Shadrin, and Quinten Weller.

BRADY ALI MEDINA, University of Waterloo
Co-Higgs Bundles and Poisson Structures

A co-Higgs bundle on a complex manifold X is defined as a pair (V, Φ), where V represents a holomorphic vector bundle on X, and the co-Higgs field satisfies the integrability condition $\Phi \wedge \Phi = 0$. Co-Higgs bundles induce a Poisson structure on the projectivization $\mathbb{P}(V)$ of the vector bundle. In this talk, we are going to explore the connection between co-Higgs bundles and holomorphic Poisson structures.

EVAN SUNDBO, University of Toronto
Cohomology of Hypertoric Hitchin Systems

Hypertoric Hitchin systems are combinatorial cousins of moduli spaces of Higgs bundles whose cohomological structure is governed by unions of toric varieties glued to each other along toric subvarieties. We study these 'broken' toric varieties, proving a Deligne-type decomposition theorem and reducing the calculation of the Betti numbers of hypertoric Hitchin systems to understanding a certain family of examples.

AIDEN SUTER, University of Waterloo & Perimeter Institute
Associated variety for $L_1(\mathfrak{psl}_{N|N})$ and 3d A-model Higgs Branch

3d mirror symmetry is a research program concerning the equivalence of two topological twists of 3d supersymmetric QFT known as the 3d A-model and 3d B-model. In particular 3d mirror symemtry posits a duality of symplectic varieties known as the "Higgs" and "Coulomb" branches of the moduli space of vacua for the original 3d theory. In this talk, I will describe how these symplectic varieties can be accessed via vertex operator algebras (VOAs) constructed from boundary conditions for these theories. In particular, it is conjectured that the associated variety of the boundary VOA for the 3d A-model is isomorphic to the Higgs branch of the original theory. I will outline recent work of mine on proving this conjecture in the case of $U(1)$ gauge theories which involves identifying the associated variety of the $L_1(\mathfrak{psl}_{N|N})$ VOA.