Workshop on Quantum symmetries - October 16-18, 20, 2019

Titles and abstracts - Speakers

Nicolás Andruskiewitsch (Universidad Nacional de Cordoba, Argentina)
Finite Gelfand-Kirillov dimensional Pre-Nichols algebras of diagonal type
Abstract: Towards the classification of finite GK-dimensional pointed Hopf algebras, a necessary step is the classification of the pre-Nichols algebras as in the title. I will report on work in progress with Guillermo Sanmarco on this question.

Dirceu Bagio (Universidade Federal de Santa Maria)
On Simple Modules Over a Lestrygonian Nichols Algebra
Abstract: In this talk we will present the classification of the simple finite-dimensional modules of the Lestrygonian Nichols algebra. Some results on point modules will also be discussed.

Yuly Billig (Carleton University, Canada)
Representations of Lie algebras of vector fields on algebraic varieties
Abstract: We study a category of representations of the Lie algebras of vector fields on affine algebraic variety X that admit a compatible action of the algebra of polynomial functions on X. We investigate two classes of simple modules in this category: gauge modules and Rudakov modules, and establish a covariant pairing between modules of these two types.
We state a conjecture that gauge modules exhaust modules in this category that are finitely generated over the algebra of functions. We give a proof of this conjecture when X is the affine space.
This is a joint work with Slava Futorny, Jonathan Nilsson, Andre Zaidan, Colin Ingalls and Amir Nasr.

John Dixon (University of Calgary)
BRST Cohomology, the Master Equation and Supergravity
Abstract: A major problem for supersymmetry is the spontaneous breaking of supersymmetry. To be consistent with experiment, this requires something implausible, like an invisible sector and many parameters, as in the Minimal Supersymmetric Standard Model (MSSM). Supersymmetry largely disappears in this context. The Master Equation and the BRST cohomology, that work so well for the Standard Model and for Grand Unified Theories, like SU(5) and SO(10), (GUTs), cannot be used, because the MSSM is an `effective theory'. I will discuss possibilities that may allow us to get a better model from Supersymmetry, in the context of the GUT models coupled to supergravity with a Master Equation.

Gabriel Brandão de Gracia (Institute of Theoretical Physics - Unesp)
B-field formalism and distribution theory for QFT
Abstract: We present the perturbative version of the Heisenberg description of QFT in terms of the Nakanishi B-field formalism and distribution theory. We focus on a specific interacting quantum field Lagrangian.

Stephen Griffeth (Universidad de Talca, Chile)
Structure and character formulas for unitary representations of Cherednik algebras
Abstract: (Partly based on joint work with Susanna Fishel and Elizabeth Manosalva)
I will discuss very recent progress on the study of the irreducible unitary representations of Cherednik algebras: first, a survey of known structural results and the state of the classification problem, and second, for the case of cyclotomic Cherednik algebras, a non-negative formula for their Kazhdan-Lusztig characters, expressing them in terms of Littlewood-Richardson numbers.

Vesselin Gueorguiev (Ronin Institute for Independent Scholarship)

q-analog of A_{m-1} ⊕A_ {n-1} ⊂ A_{mn-1}

Abstract: A natural embedding A_{m-1} ⊕A_ {n-1} ⊂ A_{mn-1} for the corresponding quantum algebras is constructed through the appropriate co-multiplication on the generators of each of the A_{m−1} and A_{n−1} algebras. The above embedding is proved in their q-boson realization by means of the isomorphism between the A_{q}^{−}(mn) ∼ ⊗^n A_{q}^{−}(m) ∼ ⊗^m A_{q}^{−}(n) algebras.

Reimundo Heluani (IMPA, Brazil)

Vertex algebras and arc spaces

Abstract: To any conformal vertex algebra one can attach two vertex Poisson algebras canonically. The associated graded to the Li filtration and the arc space of the C_2 algebra. The former is a quotient of the latter. It is an open problem when these two are isomorphic. We present some examples and applications of such an isomorphism.

Andrey Yuryevich Mikhaylov (IFT UNESP)

Deformations, renormgroup, symmetries, AdS/CFT

Abstract: We consider the deformations of a supersymmetric quantum field theory by adding spacetime-dependent terms to the action. We propose to describe the renorm group flow of such deformations as a solution of some Maurer-Cartan equation. In particular, we consider the strongly coupled limit of N = 4 supersymmetric Yang-Mills theory. The AdS/CFT correspondence relates the computation of the renorm group flow to a computation in the classical supergravity, which we describe. There is a leg amputation procedure, which constructs a solution of the Maurer-Cartan equation from tree diagramms of SUGRA. We consider a particular example of the beta-deformation. It is known that the leading term of the beta-function is cubic in the parameter of the beta-deformation. We give a cohomological interpretation of this leading term. We conjecture that it is actually encoded in some simpler cohomology class, which is quadratic in the parameter of the beta-deformation.

Julia Pevtsova (University of Washington, USA)

Cohomology of finite dimensional Hopf algebras

Abstract: This is a report on the ongoing project with Nicolás Andruskiewitsch, Iván Angiono, and Sarah Witherspoon in which we aim to prove that cohomology of a finite dimensional Nichols algebras of diagonal type is a finitely generated algebra. I will give an overview of the history of the problem of finite generation of cohomology for Hopf algebras and outline some of the current progress.

Bárbara Pogorelski (Universidade Federal do Rio Grande do Sul, Brazil)

On the combinatorial rank of quantum groups

Abstract: In this talk we introduce the definition of the combinatorial rank of a Hopf algebra. Then we present the results which are already known, for quantum groups of type A_n, B_n, C_n and D_n. These results have been obtained by V. Kharchenko, M.L. Díaz Sosa and A. Álvarez. Finally we approach this problem for quantum groups of type G_2.

Luis Enrique Ramirez (Universidade Federal do ABC)

Gelfand-Tsetlin modules for arbitrary characters

Abstract: By a theorem due to Ovsienko, for any Gelfand-Tsetlin character there exist at least one irreducible extension (i.e. irreducible Gelfand-Tsetlin module with such character in its support). In this talk we describe an explicit construction of a "universal" module associated with an arbitrary Gelfand-Tsetlin character which contains an irreducible extension of the character as a subquotient.

João Fernando Schwarz (Instituto de Matemática e Estatística)

Noncommutative Birational Equivalence and Applications

Abstract: It is a classical question in algebraic geometry to study the birational equivalence of algebraic varieties. An important particular case is the famous Noether's Problem. Gelfand and Kirillov introduced the study of the birational equivalence of the enveloping algebra of an algebraic Lie algebra - the Gelfand-Kirllov Conjecture - and laid ground for much fundamental work in this area. We study a noncommutative version of Noether's Problem for the Weyl algebra, where beautiful results are obtained. As applications we obtain new proofs of important results on the structure of rational Cherednik algebras, finite W-algebras, and Kleinian singualirities.

Dmitry Vasilevich (Universidade Federal do ABC, Brazil)

Index Theorems, Anomalies, and all that

In the first part of this lecture we shall review the relations between fundamental notions of Mathematics and Quantum Field Theory: the Index of an elliptic operator and quantum anomalies. We shall aslo describe powerful computational methods based on the heat kernel expansion. In the second part, we shall specialize to the Atiyah-Patodi-Singer Index theorem, which interrelates quantum anomalies in d and d+1 dimensions, and show how this theorem can be extended to the domain wall geometries.

Cristian Vay (Universidad Nacional de Cordoba, Argentina)

Symmetries on modules over Drinfeld doubles

Abstract: Let *B* be a Nichols algebra over a Hopf algebra *H* and let *D* be the Drinfeld double of the bosonization *B#H*. In this talk, we will exhibit various symmetries appearing in the representations of *D*. These symmetries are mainly consequences of properties of the algebra structure of *D* (namely, *D* is Frobenius and admits a triangular decomposition), hence also hold for other families of algebras (e.g. restricted enveloping algebras, small quantum groups and restricted rational Cherednik algebras). However, to obtain some of these symmetries we need to make use of the Hopf algebra structure of *D*.

Titles and abstracts - Poster Session

Davi Bastos Costa (IF-USP)

General solution to the U(1) anomaly equations

Abstract: The anomaly cancellation equations for the U(1) gauge group can be written as a cubic equation in n−1 integer variables, where n is the number of Weyl fermions carrying the U(1) charge. We solve this Diophantine cubic equation by providing a parametrization of the charges in terms of n−2 integers, and prove that this is the most general solution.

Marzia Petrucci (IF-USP)

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