Particle collisions, geometry and representation theory

Cédric Bonnafé (Montpellier), Questions about the geometry of Calogero-Moser spaces attached to complex reflection groups

Joint work with Raphaël Rouquier. The representation theory of finite reductive groups (Deligne-Lusztig theory, Broué's Conjectures, Broué-Malle-Michel's work) suggests that one could attach to any complex reflection groups (not only Weyl groups) some objects ("unipotent representations", "character sheaves",...) whose meaning needs to be understood. A lot of numerical facts (Gordon-Martino's Conjecture, Bellamy's work, theory of Calogero-Moser cells) seem to indicate that the framework of Cherednik algebras could explain these phenomenons. By reasoning by analogy, this leads to numerous problems about the geometry of the Calogero-Moser spaces attached to complex reflection groups: rational smoothness, cohomology, fixed points under a finite group of roots of unity, Lie algebra attached to a cuspidal point. I will try to present in this talk an overview of these questions: I must confess that almost no answer will be given...

Adrien Brochier (Edinburgh), Topological field theories and quantum D-modules

The goal of this talk is to describe a topological construction of a certain quantum version of the category of D-modules on a reductive algebraic group G, and of its equivariant version. The latter is, at least conjecturally, closely related to the category of modules over the double affine Hecke algebra. More precisely, these categories are obtained as the value of a certain (partially defined) 4-dimensional topological field theory (TFT) on the punctured and the closed torus respectively. This TFT is constructed from the braided tensor category of modules over the quantum group of G. More generalluy, our main result is an explicit construction, in the framework of factorization homology, of the 2-dimensional part of a 4-dimensional TFT constructed from any ribbon tensor category. Time permitting I will discuss some applications of this formalism to quantization of character varieties, Witten-Reshetikhin-Turaev theory, and the so-called AJ conjecture relating the coloured Jones polynomial and the A-polynomial of a link. This is a joint work with David Ben-Zvi and David jordan.

Vassily Gorbunov (Aberdeen), Schubert calculus and Quantum integrable systems

We describe a new unexpected connection between Schubert calculus, the topic actively investigated in topology, representation theory and combinatorics and a certain type of lattice integrable systems, mathematically described as a particular commutative subalgebra in a quantum group type associative algebra. We outline how this connection produces new results in both areas.

Iain Gordon (Edinburgh), Robinson-Schensted algorithm and Bethe Algebras

I will discuss a recent conjecture of Bonnafe-Rouquier which proposes a Kazhdan-Lusztig cell theory for all finite complex reflection groups. This conjecture is a puzzle even in the case of the symmetric group. I will explain an approach to confirming the conjecture by using recent work of Mukhin-Tarasov-Varchenko on the Bethe Ansatz for Gaudin Hamiltonians. This is joint work with Adrien Brochier. The talk will not assume any sophisticated background in combinatorics or integrable systems.

Georges Wilson (Oxford), Introduction to adelic Grassmannians

The talk will first review some of the history surrounding my 1998 paper "Collisions of Calogero-Moser particles and an adelic Grassmannian". Then I shall explain how the main result of that paper should have been formulated.