

# JOURNEES DE THEORIE DES REPRESENTATIONS ET ANALYSE HARMONIQUE <sup>1</sup>

IRMA, 31 MARS - 1ER AVRIL 2016 - Salle de Conférences

## Programme et Résumés

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31 mars 2016

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### 14h15 Marcus Slupinski (Strasbourg)

*Twisted polynomial invariants and moduli of generic two-dimensional commutative algebras*

Let  $V$  be a two-dimensional vector space over a field  $k$  of characteristic not 2 or 3. In this talk we will show there is a canonical surjection  $\nu$  from the set of suitably generic commutative algebra structures on  $V$  modulo the action of  $GL(V)$  to the plane  $k^2$ . The two coordinates defining  $\nu$  are quotients of invariant polynomials which are quartic in the structure constants and take values in tensor powers of  $\Lambda^2(V)$ . It turns out that the image under  $\nu$  of the set of generic algebras having non-trivial automorphisms is the degenerate elliptic curve  $\Gamma$  defined by  $27y^2 + 4x^3 = 0$ , and that  $\nu$  is a bijection over the complement of  $\Gamma$ . On the other hand, over  $P \in \Gamma$  the fibre of  $\nu$  is naturally parametrised by the set of (equivalence classes of) Galois extensions of order at most 2 (if  $P \neq (0,0)$ ) or of order at most 6 (if  $P = (0,0)$ ). Time permitting, we will give a similar description of the space of orbits of the action of  $SL(V)$  on the set of generic commutative algebra structures on  $V$ . This is joint work with Michel Rausch de Traubenberg.

### 15h15 Victor Gayral (Reims)

*From equivariant quantization to locally compact quantum groups*

In this talk I will explain how a  $G$ -equivariant (or  $G$ -quasi-equivariant) and non-formal quantization on a locally compact group  $G$  may (under good circumstances) allow to construct a locally compact quantum group (deforming  $G$ ) in the sense of Kustermans-Vaes. To illustrate this construction, I will give two classes of examples : the Kahlerian Lie groups with negative sectional curvature (Pyatetskii-Shapiro's groups) and quotients groups of certain subgroups of the affine group of a non-Archimedean local field.

### 16h15-16h45 Pause Café

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1. Conférence financée par l'IRMA et le GDR TLAG

**16h45 Yannick Voglaire** (Luxembourg) :*Atiyah classes and dg-Lie algebroids for matched pairs*

The Atiyah classes appeared independently in complex geometry and Lie theory as obstructions to the existence of connections. It is known since Kapranov that these obstructions themselves play the role of Lie brackets and module structures in the corresponding derived categories of representations, and that they take an important part in the construction of Rozansky-Witten invariants.

Various natural generalizations of these classes include the two initial frameworks and many others. Using Fedosov-Dolgushev-type techniques, we propose an explicit link between two of these generalizations in differential geometry : one (Chen-Stiénon-Xu) is associated to Lie pairs, i.e. inclusions of Lie algebroids, and the other (Mehta-Stiénon-Xu) to differential graded Lie algebroids.

We prove that each Lie pair defines a dg-Lie algebroid. Moreover, when the Lie pair comes from a matched pair of Lie algebroids, we build a quasi-isomorphism whose induced morphism in cohomology sends the Atiyah class of the constructed dg-Lie algebroid to the Atiyah class of the Lie pair.

This is joint work with Panagiotis Batakidis (Penn State).

**17h45 Lucas Fresse** (Nancy) :*An exotic Steinberg correspondence for symmetric pairs*

The Steinberg correspondence (1976) is a connection between the Bruhat cells of a complex reductive group and the nilpotent orbits of its Lie algebra. It plays a central role in several constructions of the Springer representations of Weyl groups. Kato (2009) proposed a geometric construction of the representations of the Weyl group of type  $C$ , more direct than Springer's construction, and which relied on the symmetric pair  $(GL(V), Sp(V))$  and on the action of  $Sp(V)$  on some exotic nilpotent cone. Henderson and Trapa (2012) obtained an exotic version of the Steinberg correspondence for the symmetric pair  $(GL(V), Sp(V))$ , which gave another interpretation of Kato's construction. In this talk, we propose an exotic Steinberg correspondence for some other symmetric pairs. The talk is based on a joint work with Kyo Nishiyama.

**19h45 Dîner** *au Renard Prêchant 34, rue de Zurich*

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1er avril 2016

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**9h Gang Liu** (Metz) :

*Domains of holomorphy for irreducible admissible uniformly bounded representations*

Thanks to the works of Gindikin, Krötz, Olafsson, Opdam and Stanton, a complete classification of domains of holomorphy for irreducible unitary representations of simple Lie groups was accomplished around 2008. It turned out that the domains of holomorphy are closely related to the "crown domain" defined by Akhiezer and Gindikin in the 1990s. In this talk, we will address the same classification problem for irreducible admissible uniformly bounded representations. This is joint work with A. Parthasarathy.

**10h-10h30 Pause Café**

**10h30 Wolfgang Bertram** (Nancy) :

*Differential Calculus and Higher Categories*

Ordinary differential calculus, "done right", automatically leads to "higher gadgets" : n-fold groupoids and n-fold categories. Although such concepts have been invented by Charles Ehresmann in the sixties, in relation with his approach to differential geometry, it seems that Ehresmann himself did not realize that his concepts work on an even more fundamental level, since differential calculus logically precedes differential geometry. Indeed, I believe that this insight may give new strength to "Ehresmann's program". There are also natural links with Connes' "tangent groupoid", with the "local loops" of Sabinin, as well as with "synthetic differential geometry" as developed by Kock et al. I will try to give an overview over my ongoing work in this domain, the first two parts of which are available on the arxiv at <http://arxiv.org/abs/1503.04623> and <http://arxiv.org/abs/1510.03234> .

**11h30 Jan Möllers** (Erlangen)

*Knapp-Stein type intertwining operators for symmetric pairs and applications*

For a symmetric pair  $(G, H)$  we construct intertwining operators between principal series of  $G$  and principal series of  $H$ , intertwining for the action of  $H$ . The operators are given in terms of their integral kernels, which resemble the classical Knapp-Stein kernels and generalize kernels that recently appeared in the study of invariant trilinear forms. If time permits we will also comment on some applications to branching problems for unitary representations, restriction problems for automorphic forms, and boundary value problems on nilpotent groups.