

## Coloquio de Álgebras y Representaciones - Quantum 22

### Cronograma de Actividades.

| Hora           | Lunes                           | Martes                                            | Miércoles                | Jueves                       | Viernes                 |
|----------------|---------------------------------|---------------------------------------------------|--------------------------|------------------------------|-------------------------|
| 9:30<br>10:30  |                                 | <a href="#">Fantino</a>                           | <a href="#">Fantino</a>  | <a href="#">Fantino</a>      | <a href="#">Fantino</a> |
| 10:30<br>11:00 | Recepción/<br>Bienvenida        | Café                                              | Café                     | Café                         | Café                    |
| 11:00<br>11:50 | <a href="#">Andruskiewitsch</a> | <a href="#">Libedinsky</a>                        | <a href="#">Griffeth</a> | <a href="#">Ronco</a>        | <a href="#">García</a>  |
| 12:00<br>12:30 |                                 | <a href="#">Peña</a><br><a href="#">Pollastri</a> | <a href="#">Sánchez</a>  | <a href="#">Cóppola</a>      | <a href="#">Ferrer</a>  |
| 12:30<br>12:50 |                                 |                                                   |                          |                              |                         |
| 13:00<br>14:30 | Almuerzo                        | Almuerzo                                          | Almuerzo                 | Almuerzo                     | Almuerzo                |
| 14:30<br>15:20 | <a href="#">Rossi Bertone</a>   | <a href="#">Plavnik</a>                           |                          | <a href="#">Van Eckerén</a>  |                         |
| 15:20<br>15:30 | Pausa                           | Pausa                                             |                          | Pausa                        |                         |
| 15:30<br>16:20 | <a href="#">Pogorelsky</a>      | <a href="#">Mombelli</a>                          |                          | <a href="#">Lopez Franco</a> |                         |
| 16:30<br>17:00 | Café                            | Café                                              |                          | Café                         |                         |
| 17:00<br>17:30 | <a href="#">Guzman</a>          | <a href="#">Campagnolo</a>                        |                          | Espacio de<br>discusión      |                         |
| 17:30<br>18:00 |                                 |                                                   |                          |                              |                         |
| 20:30          | Cena                            | Cena                                              | Cena                     | Cena                         |                         |

## **Titles and abstracts**

### **Nicolás Andruskiewitsch:** Pointed Hopf algebras over nilpotent groups

I will report on the ongoing project of classifying pointed Hopf algebras with finite Gelfand-Kirillov dimension.

### **Emiliano Campagnolo:** Pre-Nichols algebras of diagonal type with finite Gelfand-Kirillov dimension

This talk deals with the classification of pre-Nichols algebras of finite Gelfand-Kirillov dimension. Andruskiewitsch and Sanmarco introduced the notion of an eminent pre-Nichols algebra: Finding eminent pre-Nichols algebras of a fixed braided vector space reduces the problem of finding all pre-Nichols algebras of finite Gelfand-Kirillov dimension to finding quotients of such an algebra.

In this talk we show that the eminent pre-Nichols algebra is equal to the respective distinguished pre-Nichols algebra (if the dimension of the Nichols algebra is finite) or equal to the respective Nichols algebra (if the dimension of the Nichols algebra is infinite); except for some exceptional cases. Subsequently, for each exceptional case, we will present a new pre-Nichols algebra of finite Gelfand-Kirillov dimension and prove that it is the corresponding eminent pre-Nichols algebra. At the end we will see the poset of some pre-Nichols algebras with few Cartan roots.

### **Javier C  pola:** Graded braided commutativity in Hochschild cohomology of Nichols algebras

In 2010 (Proc. Lond. Math. Soc.), Mastnak, Pevtsova, Schauenburg and Witherspoon proved a graded braided commutativity theorem for the Hochschild cohomology with trivial coefficients of a braided bialgebra  $A$  in the category of Yetter-Drinfeld modules over a Hopf algebra  $H$ , when  $A$  or  $H$  is finite dimensional. These hypotheses include the case of several Nichols algebras, but they are not verified by the Jordan Plane or the Super Jordan Plane, which are of our interest. In this talk we will see two ways of generalizing this result to more general contexts that apply to these examples. This is a joint work with Andrea Solotar (Universidad de Buenos Aires).

### **Fernando Fantino:** Representaciones de grupos finitos

Curso para estudiantes.

### **Walter Ferrer:** Quasi-compact group schemes and Hopf sheaves

Trabajo en conjunto con P.L. del   ngel y A. Rittatore.

En un trabajo en elaboraci  n los mencionados autores introducimos la noci  n de Haz de Hopf en una variedad abeliana y sus representaciones y probamos la existencia de una equivalencia contravariante entre la categor  a de extensiones de una variedad abeliana y la categor  a de haces de Hopf conmutativos y fieles generalizando la equivalencia cl  sica entre esquemas de grupos afines y   lgebras de Hopf conmutativas.

En la conferencia presentaremos algunos de los puntos desarrollados en dicho trabajo.

**Gastón García:** A unifying approach to formal multiparameter quantum groups

Based on the Kac's idea of realization of a generalized Cartan matrix, I will introduce the notion of formal multiparameter quantum enveloping algebras (FoMpQUEA) as a generalization of the well-known Drinfeld's quantum group.

It turns out that this class of quantum groups is closed under deformations by "toral" twists and deformations by "toral" 2--cocycles: as a consequence, all "multiparameter formal QUEA's" considered so far are recovered. In particular, any FoMpQUEA is isomorphic to a suitable deformation, by twist or by 2--cocycle, of Drinfeld's standard QUEA.

Concerning the classical picture, I will introduce certain multiparameter Lie bialgebras (MpLbA's), and consider their deformations, by twist and by 2--cocycles. It turns out that the semiclassical limit of every FoMpQUEA is a suitable MpLbA, and conversely each MpLbA can be quantized to a suitable FoMpQUEA. I will also provide several results that give structural properties and relate the classical and quantum objects.

This talk is based on a joint work with Fabio Gavarini, see ArXiv:2203.11023.

**Stephen Griffeth:** Diagonal coinvariant rings for complex reflection groups

Given an irreducible complex reflection group  $W$  in a vector space  $V$ , it is well-known that the ring of polynomial functions modulo the ideal generated by the positive-degree  $W$ -invariant is isomorphic to the regular representation of  $W$ . Replacing  $V$  by its cotangent bundle, which is the vector space direct sum  $V + V^*$ , the analogous diagonal coinvariant ring is much less well-understood, except for the case of the symmetric group  $S_n$ , where a theorem of Haiman implies that it has dimension exactly  $(n+1)^{n-1}$ . We will explain what is now known in general, the connections to representation theory, and outline a program for understanding the resulting phenomena.

**Juan Guzmán:** Vertex ind-schemes

In this talk I will introduce the notion of vertex ind-scheme, which we propose as the analogue of a Lie group in the context of Lie conformal algebras. In order to define this object and understand its connection to its tangent Lie conformal algebra and its universal enveloping vertex algebra we will recall some results of the theory of factorization algebras over smooth curves developed by Beilinson and Drinfeld. This is joint work with C. Boyallian.

**Nicolás Libedinsky:** Counting Bruhat intervals

We will explain what is known about the problem of counting the number of elements of Bruhat intervals in affine Weyl groups and explain some interesting sub-questions of this hard problem.

**Ignacio López:** The Sweedler hom in duoidal categories

The Sweedler hom of two associative algebras  $A, B$  is the universal coalgebra  $P(A, B)$  with the property that coalgebra morphisms  $C \rightarrow P(A, B)$  are in natural bijection with algebra morphisms  $A \rightarrow \text{Hom}(C, B)$ . A particular instance is the so-called finite dual of an algebra. These constructions have been generalized to the context of braided monoidal categories in recent years. In this talk we explain how these notions can be carried over to the more general duoidal categories (which have two compatible monoidal structures) and give some examples of interest. (Joint work with Christina Vasilakopoulou).

**Martín Mombelli:** (Co)Ends relativos a una categoría tensorial

Se presentará una herramienta desarrollada en [1], en el contexto de categorías tensoriales. Esta herramienta generaliza el (co)end para categorías. Se mostrarán algunas aplicaciones.

[1] N. Bortolussi y M. Mombelli, (Co)ends for representations of tensor categories, Theory and Applications of Categories, Vol. 37, No. 6, (2021), 144-188.

**Héctor Peña Pollastri:** Finite dimensional representations of the double of the Jordan plane  
We define a generalized Drinfeld double for the Jordan plane. We show it is a Hopf extension of  $U(sl_2)$ . We compute their center and their simple modules. We also explore some families of indecomposable modules and compute the Ext between simple modules.

**Julia Plavnik:** On odd-dimensional modular categories  
TBA

**Barbara Pogorelski:** On the combinatorial rank of quantum groups  
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 the quantum groups of type  $G_2$  and  $F_4$ .

**María Ofelia Ronco:** A preLie bialgebra model for closes paths on graphs  
We shall describe a generalized bialgebra structure on the vector space spanned by the set of all closed paths on finite graphs. The coalgebra structure is not coassociative, but co-preLie and the algebra structure is Perm. We use the M. Livernet result to describe the projection on the space of simple cycles, and we give an algorithm for reconstructing a closed path from its simple cycles (i.e. generalized primitive elements). This is a joint work with P.-L. Giscard and C. Mammez.

**Fiorela Rossi Bertone:** On infinitesimal deformations of monomial algebras  
Gerstenhaber introduced the algebraic theory of deformations for associative algebras and showed its connection with Hochschild cohomology. In this talk we will focus on the so-called infinitesimal deformations, that is, given an algebra  $A$ , we consider associative algebra structures on  $A[t]/(t^2)$ . In the case of monomial algebras over an algebraically closed field, we will study the presentation by quivers and relations of the infinitesimal deformation of an algebra. We will work with the module categories on the deformations and, under certain hypotheses, we will describe the Yoneda product of the Ext algebra of the deformations in terms of the Yoneda product of the Ext algebra of the original algebra. The talk is based on joint work with M. J. Redondo, L. Román and M. Verdecchia.

**José Ignacio Sánchez:** Cociclos de Hopf asociados a deformaciones punteadas y copunteadas sobre  $S_3$

En esta charla recordamos el concepto de cociclos de Hopf y deformaciones. Seguidamente, proponemos un breve recorrido sobre la estrategia para su cálculo explícito y la posibilidad de aislar aquellos que son puros, esta estrategia aparece en [GS]. Finalmente, presentamos una descripción explícita de los cociclos de Hopf relativos a las deformaciones punteadas y copunteadas sobre  $S_3$ , determinando además los cociclos puros y los exponenciales.

[GS] García Iglesias, A., Sánchez, J., On the computation of Hopf cocycles, with an example of diagonal type, Glasg. Math. J., in press (2022), arXiv:2108.11432v2.

**Jethro van Ekeren:** Modular tensor categories from W-algebras

I will describe results of joint work with Tomoyuki Arakawa, in which we describe the modular tensor categories of representations (or rather, the modular data of these categories) of certain vertex algebras called affine W-algebras. In many cases the modular data matches that of quantum groups at roots of unity, but in other cases, the results are quite mysterious.

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