REVISTA DE LA
UNIÓN MATEMÁTICA ARGENTINA
Volumen 51, Número 1, 2010, Páginas 1–5

PREFACE

The Humboldt Kolleg *Colloquium on Hopf Algebras, Quantum Groups and Tensor Categories* was held at *Hotel del Lago*, in La Falda, Córdoba, from August 31st to September 4th 2009. This event was followed by a Conference in Honor of Professor Hans-Jürgen Schneider, organized on the occasion of his 65th birthday, which took place on September 5th 2009, in the *Academia Nacional de Ciencias de Córdoba*. The events counted with the participation of researchers from twenty countries, including five countries of Latin America. The Colloquium received support from the Alexander von Humboldt Foundation (Germany), the International Center for Theoretical Physics (Italy), the *Consejo Nacional de Investigaciones Científicas y Técnicas*, the Ministry of Science and Technology of Córdoba, the *Agencia Nacional de Promoción Científica y Tecnológica*, the *Academia Nacional de Ciencias de Córdoba*, that hosted the events of Saturday, September 5, and the project *Álgebra no conmutativa y teoría de representaciones* supported by the Regional Program of Scientific Cooperation MATHAMSUD, that covered the participation of most of the participants from France.

The Colloquium brought together many distinguished experts in its fields of interest. Conferences covered the main topics of research in the areas of quantum groups, classification of Hopf algebras and related objects, tensor categories and its applications to physics and topology. The programme consisted of fifty talks, divided into twenty-four forty-minutes talks and twenty-six twenty-minutes talks. Young researchers had the opportunity to present their results to a wide audience. This generated a very vital atmosphere, originating discussions among young and more experienced researchers that we hope will give rise to future fruitful collaboration among them.

We greatly appreciate the excellent disposition of many young participants to collaborate with the organization of the events.

The programme of the Conference in Honor of Professor Schneider consisted of five forty-minutes invited talks, addressed by collaborators of Professor Schneider, who surveyed their joint work with him, then presenting new results and outlining perspectives of future research in these topics. Each talk was followed by some comments or remarks by Professor Schneider himself.

Hans-Jürgen Schneider is a distinguished mathematician, very much recognized for his research in Hopf algebras. His initial interests were on algebraic groups and with the advent of quantum groups, he evolved to the study of structural aspects of Hopf algebras. He enjoys collaborating with other colleagues, and has a very strong sense of responsibility towards the mathematical community: he was the adviser of a large number of Diploma (Master) and PhD thesis, and acted for sixteen years as editor of Communications in Algebra. During the last sixteen years, he had a fruitful and influential exchange with Argentinean mathematicians. Besides his long-term collaboration with Nicolás Andruskiewitsch, he gave two fundamental courses on Hopf algebras at the University of Córdoba; hosted Alexander von Humboldt and DAAD fellows at the University of Munich; visited Córdoba almost every year since 1994 and received visitors from the Universities of Córdoba and Buenos Aires regularly; co-directed one PhD thesis in Córdoba and was member of the jury of another one in Montevideo; participated in many conferences and was part of the Academic committee of some of

them. In 2001 he was elected Correspondent Member of the *Academia Nacional de Ciencias de Córdoba*. His interests on Argentina and Latin America exceeded the purely mathematical themes: together with his wife Heidi, he traveled extensively through the country and knows almost every corner of Argentina and many places in Chile, Uruguay, Ecuador and Brazil.

The contributions to the two issues of the present volume of the *Revista de la Unión Matemática Argentina* cover a wide spectrum of topics related to the conference main subjects. The classification of different sorts of Hopf algebras is a theme of current interest. Several papers touch different aspects of this question. There are three papers devoted to pointed Hopf algebras: the paper by Andruskiewitsch, Fantino, García and Vendramin considers when simple racks in some class are of type D, a notion very useful in the classification of finite-dimensional Nichols algebras. García Iglesias studies the representation theory of finite-dimensional pointed Hopf algebras with group $\mathbb{S}_3$; Heckenberger and Yamane compute the Shapovalov determinant of a class of pointed Hopf algebras, relying on their previous work on the Weyl groupoid and Lusztig-type isomorphisms. Passing to semisimple Hopf algebras, the article by Artamonov explores when such a Hopf algebra has certain specific representation degrees.

Another class of Hopf algebras introduced by Bichon and Banica, the inner linear ones, is discussed in the paper by Andruskiewitsch and Bichon. Wakui specializes to triangular Hopf algebras his recent results on quasi-triangular ones. Kassel and Masuoka elaborate on certain generic Hopf-Galois extensions considered in previous work by the first of them and Aljadeff. Sommerhäuser re-visits quasi-triangular and ribbon quasi-Hopf algebras from a new perspective. There is also a paper by Dascalescu, Nastasescu and Velicu on incidence coalgebras.

Several of the applications of Hopf algebras to other areas in mathematics and theoretical physics are implemented through their categories of representations, that are examples of tensor categories. The study of tensor categories and particular classes of them are by their own an active area of research. The paper by Müger presents an up-to-date account of tensor categories, focusing on essential ideas and with an extensive bibliography. Fusion categories are semisimple tensor categories with a number of finiteness properties. Prominent examples are certain categories arising from quantum groups at roots of one, but not realizable as categories of representations of Hopf algebras. The search of understanding these categories was one of the main motivations of the introduction of weak Hopf algebras. Three papers deal with these fusion categories: Trinchero defines a structure of weak Hopf algebra in the path algebra, in a novel approach; Coquereaux determines the global dimensions of these fusion categories and of a class of module categories over them; finally, Rowell studies the representations of the braid groups arising in this setting associated to exceptional Dynkin diagrams. The paper by Femic deals with several issues concerning algebras in braided monoidal categories. An overview of some aspects of Conformal Field Theory related to finite tensor categories and general (not necessarily semisimple) modular categories, is presented in the article by Fuchs and Schweigert.

Nicolás Andruskiewitsch and Sonia Natale

Córdoba, Argentina, July 5th. 2010.

Hans–Jürgen Schneider

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Algebras de Hopf, grupos cuánticos y categorías tensoriales
La Falda - 2009