CONTEMPORARY MATHEMATICS

585

Hopf Algebras and Tensor Categories

International Conference
July 4–8, 2011
University of Almería
Almería, Spain

Nicolás Andruskiewitsch
Juan Cuadra
Blas Torrecillas
Editors

American Mathematical Society

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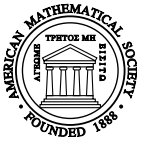

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Preface

The international conference *Hopf Algebras and Tensor Categories* was held at the University of Almería (Spain) from July 4 to July 8, 2011. It was attended by 80 researchers coming from 23 different countries. Around a quarter of them were young researchers. There were 24 invited talks and 28 contributed talks. The list of participants and conference program is included later. In the web page of the meeting `http://www.ual.es/Congresos/hopf2010/` one can find the abstract of all talks and the slides presentation of many of them. The organizing committee consisted of Juan Cuadra and Blas Torrecillas (University of Almería). The members of the scientific committee were Nicolás Andruskiewitsch (National University of Córdoba, Argentina), Susan Montgomery (University of Southern California, USA), Hans-Jürgen Schneider (University of Munich, Germany) and Freddy Van Oystaeyen (University of Antwerp, Belgium). We would like to thank all participants and speakers in the conference, who made possible such a successful and fruitful event.

The conference was financed through various sources of the Spanish funding for Education and Science. It had financial support from the Ministry of Science and Innovation, the Andalusian Ministry of Economy, Science and Innovation, the University of Almería and its Faculty of Sciences, and the Algebra research group. Several other institutions gave their support in some other ways: the department of Algebra and Mathematical Analysis, the saving bank Cajamar, the city halls of Almería and Níjar and the county council of Almería. The organizers are deeply grateful to all of them.

The theory of Hopf algebras has widely evolved in many directions in the last decade and new connections with other areas have come to surface. The talks in the conference covered a large range of topics: classification of finite dimensional Hopf algebras, with emphasis in the families of pointed and semisimple Hopf algebras; Nichols algebras and Weyl groupoids; representations of Hopf algebras, especially of semisimple ones; representations of algebraic quantum groups; Hopf-Galois theory; Hopf algebras in Combinatorics, homological properties of Hopf algebras, Hopf algebra-like structures (quasi-Hopf algebras, weak Hopf algebras, etc.); tensor categories, in particular fusion categories, and algebraic structures in them. The contributions in these proceedings are a good sample of the topics discussed in the conference. We briefly describe them. There is a survey by Dmitri Nikshych covering aspects on the classification of fusion categories through methods using Morita equivalences. A long, self-contained, and comprehensive introduction to Hopf algebras in the category of species is given by Aguiar and Mahajan. The paper by Cohen and Westreich contains an original approach to semisimple Hopf algebras

through the notions of normalized class sum and generalized character table. Beattie and García summarize the status to date of the classification of Hopf algebras of dimensions up to 100. The article by Fantino and Vendramin is one step in the classification program of finite dimensional pointed Hopf algebras through the analysis of Nichols algebras associated to simple racks. The paper by Carnovale proposes a conjecture strongly related to that of De Concini, Kac, and Procesi on representations of quantum groups at roots of unity. Bruguières and Virelizier approach the Drinfeld double of a braided Hopf algebra by means of Hopf monads. Li and Zhang investigate the Green ring of a family of generalized Taft Hopf algebras and determine all nilpotent elements of such a ring. Elhamdadi and Makhlouf give an overview of Hom-Hopf algebras and study the concepts of gauge transformation and Drinfeld twist for Hom-quasi-bialgebras. Finally, the crossed product construction is discussed in different settings: Agore and Militaru deals with it in connection with extensions of Hopf algebras, Böhm and Gómez-Torrecillas study it for weak bialgebras, and Fernández-Vilaboa, González Rodríguez and Rodríguez Raposo present a unified categorical approach to this kind of constructions.

Last but not least, we are very grateful to the American Mathematical Society for the enthusiastic reception of our proposal and Christine Thivierge for her help in the edition. This volume would have not been possible without the contributions of the authors and the anonymous referees, who did an excellent work despite the very tight deadlines they were given. Our deepest gratitude to all of them.

Conference program

Monday, July 4

09:00-10:30	Registration
10:30-11:00	Opening
11:30-12:00	Dmitri Nikshych *The Picard crossed module of a braided tensor category*
12:10-12:40	Sonia Natale *On fusion categories with few irreducible degrees*
12:50-13:20	Ehud Meir *On module categories over graded fusion categories*
15:10-15:40	Stefaan Caenepeel *Monoidal structures on the category of relative Hopf modules*
15:50-16:20	Joost Vercruysse *On the duality of generalized Hopf and Lie algebras*
16:30-17:00	Isar Goyvaerts *On the duality of generalized Hopf and Lie algebras*
17:30-18:00	Sergei Silvestrov *Hom-Hopf algebras and tensor categories*
18:10-18:40	Abdenacer Makhlouf *Generalized Hopf algebras by deforming identities*
18:50-19:20	Eli Aljadeff *Polynomial identities and graded algebras*

Tuesday, July 5

09:10-09:40	Alain Bruguières *Galois-Grothendieck duality, Tannaka duality and Hopf (co)monads*
09:50-10:20	Claudia Menini *On functors which fail to be monadic*
10:30-11:00	Gabriella Böhm *Weak bimonads and weak Hopf monads*
11:30-12:00	José Gómez Torrecillas *Weak factorizations*

12:10-12:40 Ramón González Rodríguez
The Miyashita-Ulbrich action for weak Hopf algebras

12:50-13:20 Ana Belén Rodríguez Raposo
Towards Sweedler's cohomology for weak Hopf algebras

15:10-15:40 Gigel Militaru
Unified products for Hopf algebras

15:50-16:20 Ana Agore
Crossed product of Hopf algebras

16:30-17:00 Jawad Y. Abuhlail
Hopf semialgebras

17:30-18:00 Walter Ferrer Santos
Compact coalgebras, daggers and Tannakian reconstruction

18:10-18:40 Giovanna Carnovale
On sheets of conjugacy classes in reductive algebraic groups

18:50-19:20 Andrzej Tyc
The Grosshans principle for Hopf algebras and the quantum Weitzenböck theorem

Wednesday, July 6

09:10-09:40 Susan Montgomery
Recent results on Frobenius-Schur indicators for Hopf algebras

09:50-10:20 Siu-Hung Ng
Congruence property and Galois symmetry of modular categories

10:30-11:00 Marcelo Aguiar
Hopf algebras and the geometry of real hyperplane arrangements

11:30-12:00 Eric Rowell
Localizing braided fusion categories

12:10-12:40 César Galindo
Clifford theory for graded fusion categories

12:50-13:20 Xiaolan Yu
Calabi-Yau pointed Hopf algebras of finite Cartan type

15:10-15:40 Miriam Cohen
Interrelations between Hopf algebras and their duals - proposed new directions

15:50-16:20 Sara Westreich
Conjugacy classes and class sums for Hopf algebras

16:30-17:00 Yinhuo Zhang
The Green ring of Taft algebras

Thursday, July 7

09:10-09:40 Vladislav K. Kharchenko
Computing of the number of right coideal subalgebras of quantum groups

09:50-10:20 Mayra Lorena Díaz Sosa
Computing of the combinatorial rank of quantum groups

10:30-11:00 István Heckenberger
Nichols algebras with many cubic relations

11:30-12:00 Iván Angiono
A presentation by generators and relations of Nichols algebras of diagonal type

12:10-12:40 Gastón Andrés García
On pointed Hopf algebras over dihedral groups

12:50-13:20 Fernando Fantino
Twisted homogeneous racks of type D

15:10-15:40 Agustín García Iglesias
Representations of the category of modules over pointed Hopf algebras over S_3 and S_4

15:50-16:20 Margaret Beattie
Classifying Hopf algebras of a given dimension

16:30-17:00 Viacheslav A. Artamonov
Semisimple Hopf algebras

17:30-18:00 Jiwei He
Deformations of a class of graded Hopf algebras with quadratic relations

Friday, July 8

09:10-09:40 Miodrag Iovanov
Serial and co-Frobenius coalgebras, infinite abelian groups and a class of quantum groups

09:50-10:20 Marcin Szamotulski
Galois theory for Hopf-Galois extensions

10:30-11:00 Eliezer Batista
Twisted partial Hopf actions

11:30-12:00 Alessandro Ardizzoni
Preantipodes for dual-quasi bialgebras

12:10-12:40 Sara Madariaga
Hopf algebras with triality

12:50-13:20 Sebastian Burciu
Clifford theory for semisimple Hopf algebras

15:10-15:40 Daniel Bulacu
On cross product Hopf algebras

15:50-16:20 Bojana Femić
The Hopf automorphism group and the quantum Brauer group

16:30-17:00 Dmitry Artamonov
The central elements of the universal enveloping algebra of higher orders and the construction of Knizhik-Zamolodchikov type equations for root systems of types A, D, B

17:30-18:00 York Sommerhäuser
Bilinear forms, Eilenberg-MacLane cocycles and the central charge

18:10-18:40 Julien Bichon
Finite quantum groups and quantum permutation groups

18:50-19:20 David Radford
On the Hennings invariant of a finite-dimensional factorizable Hopf algebra

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Hopf Algebras and Tensor Categories • Andruskiewitsch et al., Editors

This volume contains the proceedings of the Conference on Hopf Algebras and Tensor Categories, held July 4–8, 2011, at the University of Almería, Almería, Spain.

The articles in this volume cover a wide variety of topics related to the theory of Hopf algebras and its connections to other areas of mathematics. In particular, this volume contains a survey covering aspects of the classification of fusion categories using Morita equivalence methods, a long, self-contained, and comprehensive introduction to Hopf algebras in the category of species, and a summary of the status to date of the classification of Hopf algebras of dimensions up to 100. Among other articles in this volume are a study of normalized class sum and generalized character table for semisimple Hopf algebras, a contribution to the classification program of finite dimensional pointed Hopf algebras, an analysis of conjugacy classes related to a conjecture of De Concini, Kac, and Procesi on representations of quantum groups at roots of unity, a categorical approach to the Drinfeld double of a braided Hopf algebra via Hopf monads, an overview of Hom-Hopf algebras, and several discussions on the crossed product construction in different settings.

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