Hopf Algebras and Actions
Seattle Workshop 2014

November 15-16, 2014

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Susan Montgomery, University of Southern California, USA
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Organizers of the Lie Theory Workshop series

This workshop is one of the Lie Theory Workshops organized by Geoff Mason (University of California, Santa Cruz), Susan Montgomery (University of Southern California) and Joseph Wolf (University of California at Berkeley).

ABSTRACT

Enveloping algebras and cohomology of Leibniz pairs

Yan-Hong Bao

Anhui University, China

In this talk, we introduce the enveloping algebra for a Leibniz pair, and show that the category of modules over a Leibniz pair is isomorphic to the category of left modules over its enveloping algebra. Consequently, we show that the cohomology theory for a Leibniz pair introduced by Flato, Gerstenhaber and Voronov can be interpreted by Ext-groups of modules over the enveloping algebra. This is joint work with Yu Ye.

Quivers supporting graded Calabi-Yau algebras

Jason Gaddis

Wake Forest University, USA

A graded Calabi-Yau (CY) algebra of global dimension 3 is necessarily the path algebra of a quiver modulo relations determined by a superpotential on the quiver. In this talk, I will discuss work in progress on classifying quivers which support 3-CY algebras of finite GK dimension. Attention will be paid to examples hinting that the incidence matrix of such a quiver must be normal. This is joint work with Dan Rogalski.

Noetherian Hopf algebras of low Gelfand-Kirillov dimension

Ken Goodearl

University of California, Santa Barbara, USA

We will survey the present state of knowledge concerning noetherian (infinite dimensional) Hopf algebras, concentrating on classification results for noetherian Hopf algebras which are domains (or just prime rings) with GK-dimension at most 4.

Reflection Hopf Algebras

Ellen Kirkman

Wake Forest University, USA

The famous Shephard-Todd-Chevalley Theorem states that when a finite group G acts linearly on a commutative polynomial ring $A = k[x_1, \ldots, x_n]$ over a field k of characteristic zero, the invariant subring A^G is a commutative polynomial ring if and only if G is generated by reflections. More generally, let H be a finite dimensional semi-simple Hopf algebra that acts on an Artin-Schelter regular algebra A so that A is an H-module algebra, the grading on A is preserved, and the action of H on A is inner faithful. When A^H is Artin-Schelter regular we call H a reflection Hopf algebra for A. We present some examples of such pairs (A, H). This is joint work with James Kuzmanovich and James Zhang.

Modularity of generalized twisted quantum doubles

Richard Ng

Louisiana State University, USA

The representation category of a twisted quantum double of a finite group is a modular tensor category. However, this remarkable property does not share by its quotients in general. In this talk, we will introduce a generalized twisted double of a finite group, together with a central subgroup, via the quotients of cleft extensions of quasi-Hopf algebras. A characterization of the modularity of these generalized twisted doubles will be discussed. This is joint work with Geoffrey Mason.

Bismash Products and Exact Factorizations of Sn

Joe Timmer

Louisiana State University, USA

With an exact factorization of a finite group $L = FG$, one may construct the bismash product Hopf algebra $H = k^G \# k_F$. If one were to factor the symmetric group $S_n = FG$, the resulting Hopf algebras have some interesting properties; mostly concerning the indicator values of irreducible modules. In this talk, we present some new results concerning bismash products in general and for those that arise from exact factorizations of S_n.

Frobenius-Schur indicators for near group fusion categories

Henry Tucker

University of Southern California, USA

Fusion categories are $\mathbb{C}$-linear, rigid, semisimple tensor categories. They appear in a diverse range of mathematics, including representation theory of quantum groups, subfactor theory, and conformal field theory. A near group is a fusion category with exactly one non-invertible simple object; the Tambara-Yamagami (TY) categories are the simplest (and most well-studied) family of such fusion categories, and it is known that they are completely determined to tensor equivalence by the (abelian) group structure of their invertible objects, a bicharacter on that group, and a sign parameter. Evans-Gannon showed that near groups are completely determined by the same information as in the TY case along with some additional complex parameters. The classical Frobenius-Schur indicator for finite groups was extended to pivotal categories and shown to be an invariant under tensor equivalence by Ng-Schauenburg. These indicators have been used successfully in finding quasi-Hopf algebra realizations of integral TY categories and in classification of low-rank fusion categories, among other applications. Shimizu gave explicit formulae for the indicators of the non-invertible object in TY categories in terms of the bicharacter and the sign parameter. In this talk we will report on progress toward giving formulae for the indicators of the non-invertible object in a general near group category in terms of the Evans-Gannon data.

Taft algebra actions on path algebras of quivers

Chelsea Walton

MIT, USA

We classify Hopf actions of Taft algebras on path algebras of quivers, in the setting where the quiver is loopless, finite, and Schurian. This is joint work with Ryan Kinser.

On braided linear Gr-categories over finite abelian groups

Yu Ye

University of Science and Technology of China, China

In this talk, we will show explicit and unified formulae for the normalized 3-cocycles on arbitrary finite abelian groups. As an application, we compute all the braided monoidal structures on linear Gr-categories over finite abelian groups. This is joint work with H. Huang and G. Liu.

Hopf algebras of finite Gelfand-Kirillov dimension

Guangbin Zhuang

University of Southern California, USA

During the last few years, a lot of effort has been devoted to the classication of Hopf algebras of finite Gelfand-Kirillov dimension. For example, in a very recent preprint, Wu, Liu and Ding complete the classication of prime regular Hopf algebras of GK-dimension one, which was initiated by Lu-Wu-Zhang and Brown-Zhang. Also, some interesting examples has been discovered in the classication of connected Hopf algebras of low GK-dimension. In this talk, I am going to mention some methods of constructing Hopf algebras (for example, coassociative Lie algebras and Hopf Ore extensions). I will also talk about how cohomology of coalgebras help in the classication problems.