Atlantic Association for Research in Mathematical Sciences
Memorial University of Newfoundland

Atlantic Algebra Centre

Groups, Rings, Lie and Hopf Algebras III

International Workshop

August 13 - 17, 2011

Memorial University
Bonne Bay Marine Station
Norris Point, NL

Schedule

Abstracts of Talks

Monday, August 13, 2012

9:00	-	9:30	**Registration**
9:30	-	10:30	**Amitai Regev** *Weizmann Institute of Science, Israel* Estimates on Kronecker products of S_n characters
10:30	-	11:00	**Coffee**
11:00	-	12:00	**Georgia Benkart** *University of Wisconsin - Madison, USA* The McKay Correspondence Revisited
12:00	-	14:00	**Lunch**
14:00	-	15:00	**Eric Jespers** *Vrije Universiteit Brussel, Belgium* Groups, Group rings and the Yang-Baxter equation
15:10	-	16:00	**David Riley** *University of Western Ontario, Canada* Extending the duality between actions and group-gradings
16:00	-	16:30	**Coffee**
16:30	-	17:00	**Michał Eckstein** *Jagiellonian University, Poland* Quantum Spheres
17:00	-	17:30	**Gabriel Pretel** *University of Wisconsin - Madison, USA* Compatible elements for a tridiagonal pair

Tuesday, August 14, 2012

9:30	-	10:30	**Alberto Elduque** *University of Zaragoza, Spain* Gradings on the octonions, the Albert algebra, and exceptional simple Lie algebras
10:30	-	11:00	**Coffee**
11:00	-	12:00	**Dmitri Nikshych** *University of New Hampshire, USA* The Witt group of braided fusion categories
12:00	-	14:00	**Lunch**
14:00	-	15:00	**Mitja Mastnak** *Saint Mary's University, Canada* Hopf algebras in combinatorics
15:10	-	16:00	**Eduardo Martinez-Pedroza** *Memorial University of Newfoundland, Canada* Relatively Hyperbolic Groups
16:00	-	16:30	**Coffee**
16:30	-	17:00	**Jonny Lomond** *Memorial University of Newfoundland, Canada* Growth of acts of infinitely generated free monoids and groups

Thursday, August 16, 2012

9:30 - 10:30	**Said Sidki** *University of Brasilia, Brazil* Groups Acting on Trees, Automata and Associated Recursive Algebras
10:30 - 11:00	**Coffee**
11:00 - 12:00	**Dmitri Nikshych** *University of New Hampshire, USA* The Witt group of braided fusion categories
12:00 - 14:00	**Lunch**
14:00 - 15:00	**Alberto Elduque** *University of Zaragoza, Spain* Gradings on the octonions, the Albert algebra, and exceptional simple Lie algebras
15:10 - 16:00	**Hamid Usefi** *Memorial University of Newfoundland, Canada* Non-matrix polynomial identities on enveloping algebras
16:00 - 16:30	**Coffee**
16:30 - 17:00	**Sergey Malev** *Bar Ilan University, Israel* Evaluation of non-commutative polynomials on matrix algebras

Friday, August 17, 2012

9:30	-	10:30	**Georgia Benkart** *University of Wisconsin - Madison, USA* A Talk on the Weyl Side
10:30	-	11:00	**Coffee**
11:00	-	12:00	**Leandro Vendramin** *University of Buenos Aires, Argentina* About the classification of pointed Hopf Algebras over non-abelian groups
12:00	-	14:00	**Lunch**
14:00	-	14:30	**Yinhuo Zhang** *University of Hasselt, Belgium* The Green rings of the generalized Taft algebras
14:30	-	15:00	**Irina Sviridova** *University of Brasilia, Brazil* Identities of algebras and super-algebras with involution
15:00	-	15:30	**Coffee**
15:30	-	16:20	**Alexey Gordienko** *Memorial University of Newfoundland, Canada* Invariant decompositions of H-(co)module algebras and their applications to polynomial identities

Georgia Benkart

University of Wisconsin - Madison, USA

The McKay Correspondence Revisited

The McKay correspondence establishes deep connections between finite subgroups of $SU(2)$ and affine simply-laced Lie algebras. This talk will focus on joint work with Halverson relating those objects to certain associative algebras, their combinatorics and representations, and to walks on Dynkin diagrams.

∞ ∞ ∞ ∞ ∞ ∞ ∞ ∞ ∞ ∞

Georgia Benkart

University of Wisconsin - Madison, USA

A Talk on the Weyl Side

The Weyl algebra arises in many different settings in mathematics and physics. It is a noncommutative left and right Noetherian domain, which can be viewed as the ring of differential operators over polynomials in one variable. It acts as down and up operators on differential posets such as the poset of all partitions of integers.

In a joint project with Lopes and Ondrus, we have studied certain generalizations of the Weyl algebra, their derivations, automorphisms, representations and combinatorics. This talk will survey some of this work.

∞ ∞ ∞ ∞ ∞ ∞ ∞ ∞ ∞ ∞

Michał Eckstein

Jagiellonian University, Poland

Quantum Spheres

I will present a brief review on quantum spheres, which are homogeneous spaces of the $SU_q(2)$ quantum group. It will include the basic notions as well as my own results on algebraic structure of those noncommutative spaces.

Alberto Elduque

University of Zaragoza, Spain

Gradings on the octonions, the Albert algebra, and exceptional simple Lie algebras

Given a grading $\Gamma : A = \oplus_{g\in G} A_g$ on a nonassociative algebra A by an abelian group G, we have two subgroups of the group of automorphisms of A: the automorphisms that stabilize each homogeneous component A_g (as a subspace) and the automorphisms that permute the components. By the Weyl group of Γ we mean the quotient of the latter subgroup by the former. In the case of a Cartan decomposition of a semisimple complex Lie algebra, this is the automorphism group of the root system, i.e., the so-called extended Weyl group. A grading is called fine if it cannot be refined.

The fine gradings on the octonions and the Albert algebra over an algebraically closed field (of characteristic different from 2 in the case of the Albert algebra) will be described, as well as the corresponding Weyl groups.

The octonions and the Albert algebra can be used as building blocks of the exceptional simple Lie algebras. The fine gradings above will be shown to induce the fine gradings on the exceptional simple Lie algebras of types G_2 and F_4, and a wealth of interesting gradings in the remaining exceptional simple Lie algebras.

$\infty\ \infty\ \infty\ \infty\ \infty\ \infty\ \infty\ \infty\ \infty\ \infty$

Alexey Gordienko

Memorial University of Newfoundland, Canada

Invariant decompositions of H-(co)module algebras and their applications to polynomial identities

The applications of Lie and associative algebras with an additional structure, e.g. graded, H-(co)module, or G-algebras, gave rise to the studies of the objects and decompositions that have nice properties with respect to these structures. One of the applications of invariant decompositions is in the combinatorial theory of graded, G- and H-polynomial identities [1,2,3,4,5,7].

The Levi theorem is one of the main results of the structure Lie theory, as well as the Wedderburn — Mal'cev theorem is one of the central results in the structure ring theory.

The H-(co)invariant Wedderburn — Mal'cev theorem for finite dimensional H-(co)module associative algebras was proved by D. Ştefan and F. Van Oystaeyen [10] in 1999, in particular, for a finite dimensional (co)semisimple Hopf algebra H over a field of characteristic 0. We prove [6] the H-(co)invariant Levi theorem and obtain other important H-(co)invariant decompositions of Lie algebras. The stability of the solvable and nilpotent radicals in L is studied as well. (See also [8,9].)

We discuss how these results can be applied in order to prove the analog of Amitsur's conjecture on asymptotic behavior for codimensions of graded, G- and H-polynomial identities for finite dimensional associative and Lie algebras over a field of characteristic 0.

References

[1] Aljadeff, E., Giambruno, A. Multialternating graded polynomials and growth of polynomial identities. *Proc. Amer. Math. Soc.* (to appear).

[2] Aljadeff, E., Giambruno, A., La Mattina, D. Graded polynomial identities and exponential growth. *J. reine angew. Math.*, **650** (2011), 83–100.

[3] Giambruno, A., La Mattina, D. Graded polynomial identities and codimensions: computing the exponential growth. *Adv. Math.*, **225** (2010), 859–881.

[4] Gordienko, A. S. Graded polynomial identities, group actions, and exponential growth of Lie algebras. *J. Algebra*, **367** (2012), 26–53.

[5] Gordienko, A. S. Amitsur's conjecture for associative algebras with a generalized Hopf action. `arXiv:1203.5384v2 [math.RA] 31 Mar 2012`

[6] Gordienko, A. S. Structure of H-(co)module Lie algebras. `arXiv:1205.0778v3 [math.RA] 3 May 2012`

[7] Gordienko, A. S. Amitsur's conjecture for polynomial H-identities of H-module Lie algebras `arXiv:1207.1699v1 [math.RA] 6 Jul 2012`

[8] Linchenko, V. Nilpotent subsets of Hopf module algebras, *Groups, rings, Lie, and Hopf algebras*, Proc. 2001 St. John's Conference, ed. Yu. Bahturin (Kluwer, 2003) 121–127.

[9] Pagon, D., Repovš, D., Zaicev, M. V. Group gradings on finite dimensional Lie algebras, *Alg. Colloq.* (to appear).

[10] Ştefan, D., Van Oystaeyen, F. The Wedderburn — Malcev theorem for comodule algebras. *Comm. in Algebra*, **27**:8, 3569–3581.

Eric Jespers

Vrije Universiteit Brussel, Belgium

Groups, Group rings and the Yang-Baxter equation

Via the theory of braces, which itself proved recently to be an important tool in several areas of algebra, including knot theory and braid groups, there is an intriguing connection between solutions of the Yang-Baxter equation, groups and units of group rings and there are several open problems concerned with the so called structure groups associated to the solutions of the Yang-Baxter equation. We report on new constructions for the classification of solutions. This is joint work with Cedo, Okninski and del Rio.

∞ ∞ ∞ ∞ ∞ ∞ ∞ ∞ ∞ ∞

Jonny Lomond

Memorial University of Newfoundland, Canada

Growth of actions of infinitely generated free monoids and groups

Given a filtration $\{F_i\}_{i\in\mathbb{N}}$ in a free monoid (group) F, such that every set of the filtration is finite, and an F-act S, we may define a non-decreasing function g on the natural numbers which we call the "growth function" of S with respect to a finite generating set. In this talk, we give the properties of growth functions with respect to certain natural filtrations based on the length of generators in free groups and monoids, and provide upper bounds on the number of Schreier generators in an infinitely generated subgroup of a free group.

∞ ∞ ∞ ∞ ∞ ∞ ∞ ∞ ∞ ∞

Sergey Malev

Bar Ilan University, Israel

Evaluation of non-commutative polynomials on matrix algebras.

My talk will address a Kaplansky problem: the only possible images of a multilinear polynomial evaluated on n by n matrices $M_n(K)$ are $\{0\}$, the set of scalar matrices, $sl_n(K)$ or $M_n(K)$. A particular case of this says that any traceless matrix can be written as a commutator of two matrices and was proved half a century ago. We settle the Kaplansky problem (and generalise the result for homogeneous polynomials) for $n = 2$. We also obtain a classification for $n = 3$.

Eduardo Martinez-Pedroza

Memorial University of Newfoundland, Canada

Relatively Hyperbolic Groups

In this talk, I will describe a class of groups called relatively hyperbolic. This class has been at the center of important recent advances in low dimensional topology, in particular the announced solution to the Virtual Haken conjecture by Ian Agol. The talk will include definitions, basic properties, examples and some open questions.

∞ ∞ ∞ ∞ ∞ ∞ ∞ ∞ ∞ ∞

Mitja Mastnak

Saint Mary's University, Canada

Quantum Lie algebras and deformations of Nichols algebras

Lie algebras can be viewed as deformations of symmetric algebras. One of the possible approaches to a theory of quantum Lie algebras is to define them as deformations of Nichols algebras (which are a quantum analogue of symmetric algebras). In the talk I will present some examples and discuss some rigidity results for certain classes of Nichols algebras. The talk is based on join work in progress with M. Kotchetov.

∞ ∞ ∞ ∞ ∞ ∞ ∞ ∞ ∞ ∞

Mitja Mastnak

Saint Mary's University, Canada

Hopf algebras in combinatorics

It was observed by S. Joni and G.K. Rota in the 1970's that many discrete structures give rise to natural Hopf algebras whose comultiplications encode disassembly of those structures. Their ideas were further developed by W.R. Schmidt in 1980's. A flurry of activity in the area exploded in the 1990's and produced an ever growing zoo of interesting Hopf algebras.

This talk is an algebraist's attempt to highlight some common features of these Hopf algebras. We will discuss the general flavor of algebraic structure questions often asked about these objects and describe some of the tools involved in answering such questions. The emphasis will be placed on examples. These include the Hopf algebra of symmetric functions, Gessel's Hopf algebra of quasi symmetric functions, Rota's Hopf algebra of ranked posets, the Malvenuto-Reutenauer Hopf algebra of permutations, the Loday-Ronco Hopf algebra of binary trees, and the Connes-Kreimer Hopf algebra of rooted trees. The seminal work of M. Aguiar, N. Bergeron, and F. Sottile on universality of symmetric and quasi symmetric functions (they are terminal objects in appropriate categories) will also be discussed.

In the last part I will try to explain how Hopf algebras can be used to study joint distributions of k-tuples in a noncommutative probability space. In joint work with A. Nica we have constructed a Hopf algebra whose multiplication of characters (i.e., algebra maps from the Hopf algebra to the ground field) corresponds to free multiplicative convolution of joint distributions. Main focus will be the case where $k = 1$ and the combinatorial Hopf algebra in question is the well known Hopf algebra of symmetric functions. In this case several notions in free probability, such as the S-transform, its reciprocal $1/S$, and its logarithm $\log S$, relate in a natural sense to the sequences of complete, elementary and power sum symmetric functions.

∞ ∞ ∞ ∞ ∞ ∞ ∞ ∞ ∞ ∞

Dmitri Nikshych

University of New Hampshire, USA

The Witt group of braided fusion categories

This is a report on joint works with A. Davydov, M. Muger, and V. Ostrik.

I will start with basic definitions and facts about braided fusion categories, emphasizing representations of metric groups and quasitriangular Hopf algebras as fundamental examples. In particular, I will explain that the notion of the Drinfeld center generalizes that of the hyperbolic metric group.

Then I will recall the classical notion of the Witt group of quadratic forms. It is the quotient of the monoid of quadratic forms on finite Abelian groups by the submonoid of hyperbolic quadratic forms.

Similarly, a categorical generalization of the Witt group is the group W defined as the quotient of the monoid of non-degenerate braided fusion categories by the submonoid of Drinfeld centers. Elements of W are in bijection with equivalence classes of braided fusion categories that are completely anisotropic (i.e., do not admit non-nontrivial separable commutative algebras).

I will describe the structure of the categorical Witt group W. Unlike the classical Witt group it has both torsion part and free part. The key fact is a complete reducibility of completely anisotropic braided fusion categories.

I will also discuss relations between the Witt classes of braided fusion categories coming from representations of affine Lie algebras. Conjecturally, these classes generate the subgroup of W consisting of classes of unitary braided fusion categories.

Gabriel Pretel

University of Wisconsin - Madison, USA

Compatible elements for a tridiagonal pair

Let $\mathbb{F}$ denote an algebraically closed field with characteristic 0. Let t denote an indeterminate and recall the $\mathfrak{sl}_2$ loop algebra $\mathfrak{sl}_2 \otimes \mathbb{F}[t, t^{-1}]$ with Lie bracket defined by

$$[u \otimes a, v \otimes b] = [u, v] \otimes ab, \qquad u, v \in \mathfrak{sl}_2, \quad a, b \in \mathbb{F}[t, t^{-1}].$$

We show that $\mathfrak{sl}_2 \otimes \mathbb{F}[t, t^{-1}]$ has a presentation involving generators A, B, H and relations

$$\begin{aligned}
&[H, [A, B]] = 0, & & \\
&[A, [A, H]] = 4H, & &[H, [H, A]] = 4A, \\
&[B, [B, H]] = 4H, & &[H, [H, B]] = 4B, \\
&[A, [A, [A, B]]] = 4[A, B], & &[B, [B, [B, A]]] = 4[B, A].
\end{aligned}$$

The last two equations above are known as the Dolan-Grady relations.

Let V denote a vector space over $\mathbb{F}$ with finite positive dimension. By a *tridiagonal pair* on V we mean an ordered pair $A, B \in \mathrm{End}(V)$ such that (i) each of A, B is diagonalizable; (ii) there exists an ordering $\{V_i\}_{i=0}^{d}$ of the eigenspaces of A such that $BV_i \subseteq V_{i-1} + V_i + V_{i+1}$ for $0 \leq i \leq d$, where $V_{-1} = 0$ and $V_{d+1} = 0$; (iii) there exists an ordering $\{V_i^*\}_{i=0}^{\delta}$ of the eigenspaces of B such that $AV_i^* \subseteq V_{i-1}^* + V_i^* + V_{i+1}^*$ for $0 \leq i \leq \delta$, where $V_{-1}^* = 0$ and $V_{\delta+1}^* = 0$; (iv) there is no subspace W of V such that $AW \subseteq W$, $BW \subseteq W$, $W \neq 0$, $W \neq V$.

Assume A, B is a tridiagonal pair on V. It is known that the d and δ above are equal and for $0 \leq i \leq d$ the spaces V_i, V_i^* have the same dimension; we denote this common dimension by ρ_i. It is also known that $\rho_i \leq \binom{d}{i}$ for $0 \leq i \leq d$. Now suppose that $\{d - 2i\}_{i=0}^{d}$ is an eigenvalue sequence for each of A, B and that $\rho_i = \binom{d}{i}$ for $0 \leq i \leq d$. In this case V has dimension 2^d. It is known that A, B satisfy the Dolan-Grady relations. A linear transformation $H \in \mathrm{End}(V)$ is said to be *compatible* with A, B whenever A, B, H satisfy all of the relations listed above in our discussion of $\mathfrak{sl}_2 \otimes \mathbb{F}[t, t^{-1}]$. Let the set $\mathrm{Com}(A, B)$ consist of the elements of $\mathrm{End}(V)$ that are compatible with A, B. In our talk we will describe $\mathrm{Com}(A, B)$. In particular we will see that $\mathrm{Com}(A, B)$ has cardinality 2^d and that the elements of $\mathrm{Com}(A, B)$ mutually commute and are diagonalizable on V; moreover their common eigenspaces all have dimension 1. Let the set X consist of these common eigenspaces, and note that X has cardinality 2^d. We will see that there exists a d-cube structure on X with the following property: for all $x \in X$, Ax and Bx are contained in the sum of those elements of X adjacent to x. For all $x \in X$ there exists $H_x \in \mathrm{Com}(A, B)$ such that for $0 \leq i \leq d$ the sum of the elements in X at distance i from x is an eigenspace for H_x with eigenvalue $d - 2i$.

Amitai Regev

Weizmann Institute of Science, Israel

Estimates on Kronecker products of S_n characters

The problem of decomposing the Kronecker product of S_n characters is one of the last major open problems in the ordinary (i.e. characteristic zero) representation theory of the symmetric group S_n. Here λ and μ are partitions of n, with corresponding irreducible S_n characters χ^λ, χ^μ. Then $\chi^\lambda \otimes \chi^\mu$ is an S_n character, hence $\chi^\lambda \otimes \chi^\mu = \sum_{\rho \vdash n} \kappa(\lambda, \mu, \rho) \cdot \chi^\rho$, and the problem is to calculate the multiplicities $\kappa(\lambda, \mu, \rho)$. This is related to the cocharacters of some PI algebras. For example $\sum_{\lambda \vdash n,\ \ell(\lambda) \leq k} \chi^\lambda \otimes \chi^\lambda$ it the trace cocharacter of the $k \times k$ matrices.

Algorithms for computing $\kappa(\lambda, \mu, \rho)$ are known, but are rather ineffective in the general case. Hence one tries to give some bounds on these coefficients $\{\kappa(\lambda, \mu, \rho) \mid \lambda, \mu, \rho \vdash n\}$. When λ and μ are in a fixed (k, ℓ) hook and n goes to infinity, we prove upper and lower polynomial bounds for the multiplicities $\kappa(\lambda, \mu, \rho)$:

Theorem 1. *Given k and ℓ, there exist $a = a(k, \ell)$, $b = b(k, \ell)$ such that for any partitions $\lambda, \mu \vdash n$ in the (k, ℓ) hook – and any $\rho \vdash n$ – $\kappa(\lambda, \mu, \rho) \leq a \cdot n^b$.*

There exist $g > 0$ such that for $n = 1, 2, \dots$ there are partitions $\lambda, \nu \vdash n$ in the (k, ℓ) hook, satisfying $\kappa(\lambda, \lambda, \nu) > n^g$.

Main tools in the proof are 1. A reduction from Kronecker ("inner") products $\chi^\lambda \otimes \chi^\mu$ to "outer" tensor products $\chi^\nu \hat{\otimes} \chi^\rho$. 2. Polynomial bounds on the Littlewood-Richardson coefficients in the (k, ℓ) hook.

Outside the (k, ℓ) hook these results fail! By applying the maximizing f^λ (Logan and Shepp, Vershik and Kerov), we give an example where $\kappa(\lambda, \lambda, \rho)$ grow as fast as $\sqrt{n!}$. We also give an example where the growth of the L-R multiplicities $r(\lambda, \lambda, \nu)$ is $\geq$ exponential.

David Riley

University of Western Ontario, Canada

Extending the duality between actions and group-gradings

Let A be an algebra over an algebraically closed field F of characteristic $p \geq 0$, and let G be a finite abelian group. When $p = 0$ or $p > 0$ and G has no p-torsion, G is isomorphic to its dual group, $\hat{G}$, and G-actions by automorphisms on A are known to be dual to $\hat{G}$-gradings of A; similarly, when $p > 0$ and $\mathfrak{g}$ is the n-dimensional restricted Lie algebra torus, $\mathfrak{g}$-actions by derivations on A are known to be dual to G-gradings of A, where G is the elementary abelian p-group of rank n. In the case when A is either an associative or Lie algebra, we describe how to extend these dualities to include actions by antiautomorphisms and antiderivations by expanding the notion of a G-grading. We then apply these extended dualities to identities. This is joint work with my PhD student, Chris Plyley.

∞ ∞ ∞ ∞ ∞ ∞ ∞ ∞ ∞ ∞

Said Sidki

University of Brasilia, Brazil

Groups Acting on Trees, Automata and Associated Recursive Algebras

During the early years of computer science it was suggested that it may be possible to generate groups by finite input-output automata. The first such construction appeared in the early 1970's by S. Aleshin. They were examples of finitely generated infinite (residually finite) groups where every element has order power of a fixed prime number p; that is, Burnside p-groups. Other constructions followed sporadically, by Suschanski, R. Grigorchuk and by N. D. Gupta and the author, all using formulations different from yet equivalent to automata. The definition of these groups was of such simplicity that it gave access to some of their deep properties and new phenomena related to groups, algebras and other areas of mathematics were disovered. Since then constructions and applications have grown to the point that multiple theories have been formulated around them. Our intent in our lecture will be to introduce algebraic topics in this subject illustrating them with examples and to formulate some problems.

Irina Sviridova

University of Brasilia, Brazil

Identities of algebras and super-algebras with involution

We will discuss identities with involution and graded identities with involution of associative algebras and super-algebras with involution over a field of zero characteristic.

We will consider the connection between identities of finitely generated and finite dimensional algebras, and the finite basis question for identities with involution.

∞ ∞ ∞ ∞ ∞ ∞ ∞ ∞ ∞ ∞

Hamid Usefi

Memorial University of Newfoundland, Canada

Non-matrix polynomial identities on enveloping algebras

A polynomial identity is called non-matrix if it is not satisfied by the algebra of 2×2 matrices over $\mathbb{F}$. Let L be a Lie superlagebra. In this talk we give necessary and sufficient conditions on L so that its enveloping algebra satisfy a non-matrix PI. Among non-matrix identities we consider some Lie identities, including Lie solvability and nilpotency. We shall talk about restricted Lie algebras in characteristic 2 and give a characterization of them when their restricted enveloping algebras are Lie solvable. The latter complements earlier results of Riley and Shalev from 1993. Parts of this talk is a joint work with J. Bergen, D. Riley and S. Siciliano.

∞ ∞ ∞ ∞ ∞ ∞ ∞ ∞ ∞ ∞

Leandro Vendramin

University of Buenos Aires, Argentina

About the classification of pointed Hopf Algebras over non-abelian groups

This talk is an instance of the problem of finding non-trivial finite dimensional pointed Hopf algebras over non-abelian groups. This problem is not well understood, and very few examples are known. One of the approaches to solve it consists on exploring (families of) groups, their conjugacy classes and representations of centralizers. So far, we possess certain very powerful techniques which allow to rule out some pairs (conjugacy class, rep. of centralizer) giving rise to infinite-dimensional algebras. For example, with this approach it is possible to classify finite-dimensional pointed Hopf algebras over certain families of simple groups.

Yinhuo Zhang

University of Hasselt, Belgium

The Green rings of the generalized Taft algebras

We investigate the Green rings of the generalized Taft Hopf algebras $H_{n,d}$, extending the recent results of Chen, Van Oystaeyan and Zhang. We shall determine all nilpotent elements in the Green ring $r(H_{n,d})$. It turns out that each nilpotent element in $r(H_n(q))$ can be written as a sum of indecomposable projective representations. The Jacobson radical $J(r(H_{n,d}))$ of $r(H_{n,d})$ is of rank $n - n/d$ and is generated by one element. Moreover, we will compute all finite dimensional indecomposable representations over the Green ring $R(H_{n,d})$ of $H_{n,d}$ over the complex field