NONCOMMUTATIVE AND NON-ASSOCIATIVE STRUCTURES, BRACES AND APPLICATIONS

MARCH 12–15, 2018

Abstracts

(By order of appearance)

Vladimir Bavula (Sheffield U, UK)

Localizable and weakly left localizable rings

Abstract: Two new classes of rings are introduced – the class of left localizable and the class of weakly left localizable rings. Characterizations of them are given.

Eric Jespers (Vrije U, Brussel)

Groups, Rings, Braces and Set-theoretic Solutions of the Yang-Baxter Equation

Abstract: Drinfeld in 1992 proposed to study the set-theoretical solutions of the Yang-Baxter equation. Recall that a set-theoretical solution is a pair (X, r), where X is a set and $r : X \times X \to X \times X$ is a bijective map such that $(r \times \mathrm{id})(\mathrm{id} \times r)(r \times \mathrm{id}) = (\mathrm{id} \times r)(r \times \mathrm{id})(\mathrm{id} \times r)$. For every $x, y \in X$, write $r(x, y) = (\sigma_x(y), \gamma_y(x))$ where σ_x and γ_y are maps $X \to X$.
In order to describe all set-theoretic non-degenerate (i.e. each σ_x and σ_y is bijective) involutive (i.e. $r^2 = \mathrm{id}$) solutions, Rump introduced a new algebraic structure called a brace. The aim of this talk is to survey some of the recent results on this topic and show that there are deep connections with several structures in group and non-commutative ring theory.

Jan Okniński (U Warsaw, Poland)

Hecke-Kiselman algebras: combinatorics and structure

Abstract: To every finite simple oriented graph Γ a finitely presented monoid S_Γ, called the Hecke-Kiselman monoid of Γ, was associated by Ganyushkin and Mazorchuk in 2011. This is a common generalization of the so called 0-Hecke monoid, arising in representation theory, and on the other hand of the Kiselman monoid, arising in combinatorics. Several combinatorial properties (Gelfand-Kirillov dimension, automaton property) and structural properties of the algebra $K[S_\Gamma]$ over a field K will be discussed in this talk. This is based on various results obtained independently with A. Mecel, L. Kubat, and M. Wiertel.

Michal Ziembowski (Warsaw U Tech, Poland)

Lie solvability in matrix algebras

Abstract: If an algebra A satisfies the polynomial identity

$$[x_1, y_1][x_2, y_2] \cdots [x_{2^m}, y_{2^m}] = 0,$$

(for short, $\mathcal{A}$ is D_{2^m}), then $\mathcal{A}$ is trivially Lie solvable of index $m+1$ (for short, $\mathcal{A}$ is Ls_{m+1}). We will show that the converse holds for subalgebras of the upper triangular matrix algebra $U_n(R)$, R any commutative ring, and $n \geq 1$.
We will also consider two related questions, namely whether, for a field F, an Ls_2 subalgebra of $M_n(F)$, for some n, with (F-)dimension larger than the maximum dimension $2 + \left\lfloor \frac{3n^2}{8} \right\rfloor$ of a D_2 subalgebra of $M_n(F)$, exists, and whether a D_2 subalgebra of $U_n(F)$ with (the mentioned) maximum dimension, other than the typical D_2 subalgebras of $U_n(F)$ with maximum dimension, which were exhibited in [1] and refined in [2], exists. Partial results with regard to these two questions are obtained.

References

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Alexei Belov (Bar Ilan U, Israel)

Automorphisms of Weyl Algebra and a Conjecture of Kontsevich

Abstract: My talk concerns recent progress made in the positive resolution of Kontsevich's conjecture, which states that, in characteristic zero, deformation quantization of affine space preserves the group of symplectic polynomial automorphisms, i.e. the group of polynomial symplectomorphisms in dimension $2n$ is canonically isomorphic to the group of automorphisms of the corresponding n-th Weyl algebra. The conjecture is positive for $n = 1$ and open for $n > 1$.
In the talk, the plan of attack on Kontsevich conjecture called lifting of symplectomorphisms is presented. Starting with a polynomial symplectomorphism, one can lift it to an automorphism of the power series completion of the Weyl algebra (with commutation relations preserved), after which one can successfully eliminate the relevant terms in the power series (given by the images of Weyl algebra generators under the lifted automorphism) to make them into polynomials. Thus one obtains a candidate for the Kontsevich isomorphism.
The procedure utilizes the following essential features. First, the Weyl algebra over an algebraically closed field of characteristic zero may be identified with a subalgebra in a certain reduced direct product (reduction modulo infinite prime) of Weyl algebras in positive characteristic – a fact that allows one to use the theory of Azumaya algebras and is particularly helpful when eliminating the infinite series. Second, the lifting is performed

via a direct homomorphism $\mathrm{Aut}W_n \to \mathrm{Aut}P_n$ which is an isomorphism of the tame subgroups (that such an isomorphism exists is known due to our prior work with Kontsevich) and effectively provides an inverse to it. Finally, the lifted automorphism is the limit (in formal power series topology) of a sequence of lifted tame symplectomorphisms; the fact that any polynomial symplectomorphism has a sequence of tame symplectomorphisms converging to it is our development of the work of D. Anick on approximation and is very recent.
(This is joint work with A. Elishev and J.-T. Yu)

Marco Castelli (U Salento, Italy)

Indecomposable left cycle sets

Abstract: As suggested by Etingov, Schedler and Soloviev [1], a classification of the involutive set-theoretic solutions of the Yang-Baxter equation can be obtained studying their decomposability. They showed that every involutive non-degenerate indecomposable retractable set-theoretic solution can be obtained as a particular extension of its retraction. In that regard [2] it is possible to study all the finite involutive non-degenerate indecomposable set-theoretic solutions, including the irretractable ones, using an approach based on the dynamical extensions of left cycle sets [3].
In this talk we provide a characterization of a large family of indecomposable finite left cycle sets written in terms of dynamical extensions [2,4].

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Giuseppina Pinto (U Salento, Italy)

Indecomposable simple left cycle sets

Abstract: In order to classify the finite involutive indecomposable set-theoretic solutions of the Yang-Baxter equation, a possible approach consist in studying the dynamical extension of a simple left cycle set [1,2]. In this talk we provide a characterization of indecomposable finite simple left cycle sets and we show some examples [3].

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Michael Wemyss (Glasgow, Scotland)

Contraction Algebras and their Properties

Abstract: In 3-fold algebraic geometry, it is possible to associate to a "flop", which is a certain geometric object, a finite dimensional noncommutative algebra. This is called the contraction algebra, and it encodes lots of the geometry into a single object. As such, they have many remarkable properties, which from a strictly algebraic perspective seem quite strange. I will outline some of these properties, focusing on the baby case, which is a factor of the free algebra in two variables. Contraction algebras are conjectured to in fact give a full classification of flops, and if this is true, it gives predictions for purely algebraic behaviour. I won't assume any familiarity with the geometry during the talk, I will focus entirely on the algebraic properties, and the predictions.

Tatiana Gateva-Ivanova (Amer U, Bulgraria)

Extensions of Braided Groups

Abstract: Set-theoretic solutions of the Yang–Baxter equation form a meeting-ground of mathematical physics, algebra and combinatorics. Such a solution (X, r) consists of a set X and a bijective map $r : X \times X \to X \times X$ which satisfies the braid relations. *Braided groups* and *symmetric groups* (*involutive braided groups*) are group analogues of braided sets and symmetric sets. These interesting objects with rich structures are important for the theory of set-theoretic solutions of the Yang-Baxter equation.
We introduce *a regular extension* of braided (respectively, of symmetric) groups S, T as a braided (resp: symmetric) group (U, r) such that $U = S \bowtie T$ is the double cross product of S and T, where (S, T) is a strong matched pair and the actions of (U, U) extend the actions of S and T. We study how the properties of the extension $U = S \bowtie T$ depend on the properties of S and T.

Be'eri Greenfeld (Bar Ilan U, Israel)

Growth, relations and prime spectra of monomial algebras

Abstract: We provide a machinery for constructing affine prime monomial algebras with control on their growth and satisfied relations.
We apply this to construct affine monomial algebras growing arbitrarily close to quadraticly, having arbitrarily long chains of prime ideals; this answers a question of Bergman. Previous known counterexamples to Bergman's question, due to Bell, are not constructive so there is much less control on their growth and structure; in particular, our examples are the first graded counterexamples to Bergman's question. On the other hand, graded algebras of quadratic growth have bounded chains of primes, thus our result is close to optimal.
As another application of our construction, we are able to show that monomial algebras defined by sparse enough subexponentially (resp. polynomially) many relations of each degree can be mapped onto prime monomial algebras of intermediate growth (resp. finite GK-dimension). This provides a strengthened analogy for the case of monomial algebras

of Smoktunowicz's answer to questions of Zelmanov and Drensky in the case of sparsely related Golod-Shafarevich algebras.

Agata Pilitowska (Warsaw U of Tech, Poland)

Medial solutions to QYBE-1

ABSTRACT: (For this lecture and the lecture by Zamojska-Dzienio). This is a joint work with P. Jedlička and D. Stanovský [2, 3]. A binary algebra $(Q, *)$ is called a *quandle* if the following conditions hold, for every $x, y, z \in Q$:

(1) $x * (y * z) = (x * y) * (x * z)$ (we say Q is *left distributive*),
(2) the equation $x * u = y$ has a unique solution $u \in Q$ (we say Q is a *left quasigroup*),
(3) $x * x = x$ (we say Q is *idempotent*).

As a consequence of the axioms $(1)-(2)$, each left translation $L_a : Q \to Q$, $x \mapsto a*x$, is an automorphism of Q, for each $a \in Q$. The algebras which satisfy these two axioms are called *racks*. It is known [1] that racks and quandles are closely related to nondegenerate set-theoretical solutions of the quantum Yang-Baxter equation (QYBE): a rack and derived solution are exactly the same, while any injective derived solution is a quandle.
A quandle Q is called *medial* if, for every $x, y, u, v \in Q$,

$$(x * y) * (u * v) = (x * u) * (y * v).$$

We are interested in medial (involutive) solutions to QYBE. It turns out that the main role here play medial quandles in which for every $x, y \in Q$ holds $(x * y) * y = y$ (they are called 2-reductive). Our talk consists of two parts. In the first one we present general structure of medial quandles, and in the second we focus on medial solutions and reductive quandles.

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Anna Zamojska (Warsaw U of Tech, Poland)

Medial solutions to QYBE-2

ABSTRACT: (see abstract to Pilitowska's lecture).

Fabienne Chouraqui (Oranim, Haifa, Israel)

Finite quotients of quantum Yang-Baxter groups

ABSTRACT: In a previous work, we showed that the structure group of a non-degenerate and symmetric set-theoretical solution of the quantum Yang-Baxter equation is a Garside group that satisfies many interesting properties. In this joint work with Eddy Godelle, we associate to the structure group a finite quotient group that plays the role that Coxeter

groups play for Artin groups of finite-type and the symmetric groups play for the braid groups.
This is a joint work with Eddy Godelle – Universite de Caen, France

André Leroy (U d'Artois, Lens, France)

Multivariate polynomial maps and pseudo linear transformations

ABSTRACT: We will first recall a few features of the polynomial maps in the setting of an Ore extension $A[t;\sigma,\delta]$, stressing in particular the important role played by pseudo-linear transformations. We will then explain the problems we are faced when considering iterated skew polynomials. A recent new construction has been proposed by Umberto Martinez-Peñas and Frank R. Kschischang. We will present this construction and the polynomial maps attached to these. An extended version of pseudo-linear maps is then available and we will show that these gives back the nice features encountered in the one variable case.

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Christian Lomp (U Porto, Portugal)

Finiteness conditions on the injective hull of simple modules.

ABSTRACT: In the late 1950s, Matlis showed that the injective hull of a simple module over a commutative Noetherian ring is Artinian. Shortly afterwards, Vamos showed that a commutative ring has the property that the injective hulls of simple modules are Artinian if and only if any localization of the ring by a maximal ideal is Noetherian.
While the first Weyl algebra $A_1(\mathbb{Z})$ over the integers $\mathbb{Z}$ is an example of a non-commutative Noetherian ring whose injective hulls of simple modules are Artinian, the first Weyl algebra $A_1(\mathbb{Q})$ over the rational numbers satisfies only the weaker property that the injective hulls of its simple modules are locally Artinian, meaning that any of their finitely generated submodules are Artinian.
In this talk I will shortly report on classes of non-commutative Noetherian rings, like enveloping algebras of Lie algebras and some Ore extensions over commutative rings, that satisfy a weak form of Matlis' theorem. Instead of dropping commutativity one might drop also the Noetherian condition in Matlis' theorem and I will finish my talk with some results on commutative, non-Noetherian rings that satisfy a weak form of Matlis' theorem. The later results were obtained jointly with P. Carvalho and P. Smith.

Tomasz Brzezinski (Swansea U, UK)

Trusses

ABSTRACT: A (skew) truss is a set with two operations: an associative binary operation and a ternary heap operation such that the binary operation distributes over the ternary one. Since a heap is equivalent to a group, a truss can be also understood as a set with two binary operations satisfying a generalised distributive which, law as cases particular include the usual ring distributive law and a (skew) brace distributive law. In this talk with discuss basic properties of trusses, focussing in particular on their relation to (skew) braces.

Florin Nichita (Inst Mat Romanian Acad, Romania)

Non-associative structures, QYBE and applications

ABSTRACT: In 2012, we started a series of special issues at the open access journal AXIOMS, MDPI (based in Switzerland): `http://www.mdpi.com/journal/axioms`. We will survey some of those papers, connecting them will the works of some of the participants at the Malta workshop (refering to numerical solutions of the QYBE, cycloid equation, quandles, medial condition, Artin covers of braid groups, etc). Citing Wolfgang Rump's terminology, "this talk is a bird's eye view of the Malta workshop".

Francesco Catino (U of Salento, Italy)

Set-theoretic solutions of the pentagon equation

ABSTRACT: Let M be a set. A *set-theoretic solution of the pentagon equation* on M is a map $s : M \times M \longrightarrow M \times M$ such that

$$s_{23}\, s_{13}\, s_{12} = s_{12}\, s_{23}$$

where the map $s_{ij} : M \times M \times M \longrightarrow M \times M \times M$ acting as s on the (i, j) factor and as the identity on the remaining factor.

These solutions appear for the first time in S. Zakrzewski, *Poisson Lie Groups and Pentagonal Transformations*, Lett. Math. Phys. **24** (1992), 13–19. Later, a quite number of examples and studies of such maps have appeared in other papers.

In the talk I will present the old and the new results about this type of solutions and I will select some open problems.

Ferran Cedó (U Autonoma de Barcelona, Spain)

Garside structures on the structure group of finite solutions of the Yang-Baxter equation.

ABSTRACT: Let (X, r) be a finite non-degenerate involutive set-theoretic solution of the Yang–Baxter equation. In [1] Chouraqui proved that the structure group $G(X, r)$ of (X, r) is a Garside group. In [2] Dehornoy described finite quotients of $G(X, r)$ that play the role that Coxeter groups play for Artin-Tits groups. I will give new proofs of these

results using the natural structure of left brace of $G(X, r)$.

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Wolfgang Rump (U Stuttgart, Germany)

Skew-braces and near-rings meeting in Malta

Abstract: Skew-braces, introduced by Guarnieri and Vendramin, arise from and give birth to set-theoretic solutions to the Yang-Baxter equation. They also arise as the underlying combinatorics of Hopf-Galois extensions, and as triply factorized groups. Near-rings first appeared as near-fields in the coordinization of finite projective planes (Dickson 1905; Veblen and Wedderburn 1907). Being related to sharply 2-transitive affine groups, there is no obvious tie to sharply 1-transitive affine groups (braces). On the other hand, the radical of a near-ring is a skew-brace, and any skew-brace embeds into a near-ring of self-maps. However, none of these connections leads to a characterization of near-rings in terms of skew-braces, or of skew-braces in terms of near-rings.
We show that nevertheless, every skew-brace A is completely described by a near ring, the initial object of a category of near-rings associated to A. The terminal object is the above mentioned near-ring of self-maps. Moreover, it will be shown that near-rings and skew-braces admit a common specialization as well as a common generalization: They live on the same island (the same category) and give birth to a structure that is a near-ring and skew-brace at the same time. Birds of a feather flock together.

Susan Sierra (U Edinburgh)

Algebras birational to Sklyanin algebras

Abstract: A three-dimensional Sklyanin algebra S is quadratic with Hilbert series $(1-t)^{-3}$ and thus obeys a version of the Yang-Baxter equation. In this talk we give a survey on what is known about algebras birational to S: algebras with the same graded quotient ring as a generic Sklyanin algebra. We show that algebras birational to S can be best understood through a "blowing up" construction analogous to that of commutative algebraic geometry. We classify birational subalgebras of S, and we show that S has an extremely strong maximality property: it has almost no noetherian connected graded birational overrings.

Ilaria Colazzo (U Salento, Italy)

The matched product of the solutions of the Yang-Baxter equation

Abstract: The Yang-Baxter equation is one of the fundamental equations in mathematical-physics. The problem of finding and classifying the set theoretical solutions of the Yang-Baxter equation has originally been posed by Drinfeld in [4]. In particular, the class of non-degenerate solutions has received considerable attention [5, 6, 7, 8, 3]. Although interesting and remarkable results on classifying non-degenerate solutions have been presented, there are still many open related problems.
One of these problems is how to construct new families of solutions. Initial contribution to this aspect has been given by Etingof, Schedler, and Soloviev, who present a method to obtain a new solution via retraction. Recently, Vendramin in [9] and Bachiller, Cedó, Jespers, Okniński in [1] provide methods to obtain families of solutions starting from others, which are known.
In this talk we introduce a novel construction technique, called *matched product of solutions* [2], which allows one to obtain new solutions from two generic (not necessarily non-degenerate) solutions. In addition, we prove that the matched product of two left non-degenerate involutive solutions is still left non-degenerate and involutive.

References

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Paola Stefanelli (U Salento, Italy)

The matched product of semi-braces

Abstract: Braces, introduced by Rump in [5], turns out to be a useful tool to construct set-theoretical solutions of the Yang-Baxter equation. Many aspects of this algebraic structure were investigated (see, for instance, [3]) and, recently, Guarnieri and Vendramin introduced in [4] a generalization of braces, skew braces, in order to obtain non-degenerate bijective solutions of the Yang-Baxter equation. In [2], a further generalization of braces, the semi-brace, was introduced to provide new solutions, not necessarily bijective.
In this talk we focus on a new construction of semi-braces, the *matched product*, obtained in [1]. Moreover, we show how this construction allow us to provide a complete description of semi-braces: every semi-brace is the matched product of a skew brace G and a

trivial semi-brace E. Finally, we view in a different light the solution associated to any semi-brace, as matched product of the solutions associated respectively to the skew brace G and the trivial semi-brace E.

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Arne Van Antwerpen (Vrije U, Brussel)

Left semi-braces and solutions to the Yang-Baxter equation

Abstract: In this talk, we introduce a left semi-brace. A left semi-brace is a semi-group $(A, \cdot)$ with an additional group structure $(A, \circ)$ such that $a\circ(b\cdot c) = (a\circ b)\cdot(a\circ(\overline{a}\cdot c))$, for any $a, b, c \in A$, and where $\overline{a}$ denotes the inverse of a in $(A, \circ)$. This new structure is a generalization of a skew left brace, as introduced by Guarnieri and Vendramin, and the structure of Catino, Colazzo and Stefanelli, which we will refer to as a left cancellative left semi-brace. We give some general structure theoretical results. Among others, we prove that finite left semi-braces come from completely simple semi-groups. Further, we discuss a sufficient condition for a left semi-brace to give set-theoretical solutions and present several structure theoretical results on left semi-braces, which turn out to be equivalent to this sufficient condition. Lastly, if time permits, some results on the structure algebra of certain finite left semi-braces will be presented.

Kayvan Nejabati Zenouz (Univeristy of Exeter, UK)

Hopf-Galois structures and skew braces

Abstract: For L/K a finite Galois extension of fields with Galois group G, a Hopf-Galois structure on L/K is K-Hopf algebra with an action on L satisfying a certain property. For example, the group algebra $K[G]$ endows L/K with a Hopf-Galois structure, however in general there can be more than one Hopf-Galois structure on L/K. Hopf-Galois theory for separable extensions of fields was studied by C. Greither and B. Pareigis. They showed finding Hopf-Galois structures can be though of as a problem in group theory. Later, major advances on classification of Hopf-Galois structures were made by N. Byott, S. Carnahan, L. Childs, and T. Kohl. Recently, a fruitful discovery revealed a connection between Hopf-Galois structures and skew braces, and hence to the set-theoretic solutions of the QYBE. The classification of skew braces (or of Hopf-Galois structures) of a given order and understanding their automorphism groups remain among the important topics of research. In this talk, I will first discuss the explicit connection between Hopf-Galois structures and skew braces. Then I will review some recent results on Hopf-Galois

structures and skew braces of order p^3; I will point to the patterns observed and how they can be explained. Finally, I will show some examples of automorphism groups of skew braces.

Jerzy Matczuk (Warsaw University, Poland)

On Some Questions Related to Köthe's Problem

ABSTRACT: The aim of the talk is to discuss the following questions:

(1) Is the matrix ring over a nil clean ring nil clean?
(2) When does the set of clean elements of a polynomial ring $R[x]$ form a subring?
(3) When is the polynomial ring $R[x]$ an UJ-ring (i.e. every unit is of the form $1+s$, for some $s \in J$- the Jacobson radical of $R[x]$)

In particular it will be shown that the above questions are strongly related to the Köthe's problem and some of their restricted versions are in fact equivalent to it. The talk is based on results obtained in [1, 2, 3].

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Olav Arnfinn Laudal (U Oslo, Norway)

Noncommutative deformations of thick points

ABSTRACT: Any commutative k-algebra, k a field, is of course also an associative k-algebra, and we may therefore deform it as an associative algebra. In particular this is of interest in singularity theory. It turns out that the versal base space of the non-commutative deformation functor of a thick point, in an a affine space, may have properties that are rather astonishing. In this talk I shall describe the computation of the local "moduli suite", see [2], of the singularity consisting of an isolated point with a 3-dimensional tangent space. The versal base space contains a maximal subspace, $\underline{H}$ over which the family of 4-dimensional associative k-algebras are all isomorphic. $\underline{H}$ is, moreover, isomorphic to the Hilbert scheme of two points in 3-space, and is provided with a bundle of 6-dimensional Lie algebras, $\mathfrak{g}$, together with an action of $\mathfrak{g}$ on the tangent bundle of $\underline{H}$. The interest of this is that, $\underline{H}$ with the action of $\mathfrak{g}$, are interesting candidates for a generalised space time, $\underline{H}$ and (local) gauge group, $\mathfrak{g}$, fitting well with General Relativity and the Quantum Theory of the Standard Model, see [1].

REFERENCES

[1] E. Eriksen, O.A. Laudal, A. Siqveland, "Noncommutative Deformation Theory", Chapman and Hall, (2017)

[2] O.A. Laudal and G. Pster, "Local moduli and singularities" Lecture Notes in Mathematics **1310**, Springer Verlag, (1988).

Ivan Shestakov (U Sao Paulo, Brazil)

Speciality problem for Malcev algebras.

ABSTRACT: A Malcev algebra is an algebra that satisfies the identities $x^2 = 0$ and $J(xy, z, x) = J(x, y, z)x$, where $J(x, y, z) = (xy)z + (yz)x + (zx)y$. Clearly, any Lie algebra is a Malcev algebra.
If A is an alternative algebra then it forms a Malcev algebra A^- with respect to the commutator multiplication $[a, b] = ab - ba$. The most known examples of non-Lie Malcev algebras is the algebra O^- for an octonion algebra O and its subalgebra $sl(O)$ consisting of octonions with zero trace. Every simple non-Lie Malcev algebra is isomorphic to $sl(O)$. The problem of speciality, formulated by A.I.Malcev in 1955, asks whether any Malcev algebra is isomorphic to a subalgebra of A^- for certain alternative algebra A. In other words, it asks whether an analogue of the celebrated Poincare-Bikhoff-Witt theorem is true for Malcev algebras. We show that the answer to this problem is negative, by constructing a Malcev algebra which is not embeddable into an algebra A^- for any alternative algebra A. This is a joint work with A. Buchnev, V. Filippov, and S. Sverchkov.

Agata Smoktunowicz (U Edinburgh)

On interactions between noncommutative rings, braces and geometry

ABSTRACT: In this talk we will mention some applications of noncommutative ring theory in other research areas such as geometry, braces, skew braces and theory of set-theoretic solutions of the quantum Yang-Baxter equation.

Natalja Iyudu (U Edinburgh)

Sklyanin algebras via Groebner basis

ABSTRACT: I will discuss some results on Sklyanin algebras obtained using Groebner bases techniques, and explain how Sklyanin algebras appeared in the study of Yang-Baxter equations. It will be stressed how potentiality plays an important role in establishing Koszulity and finding a Hilbert series of Sklyanin algebras.

Petr Vojtechovsky (U Denver CO, USA)

Simply connected latin quandles

ABSTRACT: A quandle is connected if its left translations generate a group that acts transitively on the underlying set. In 2014, Eisermann introduced the concept of quandle coverings, corresponding to constant quandle cocycles of Andruskiewitsch and Graña. A connected quandle is simply connected if it has no nontrivial coverings, or, equivalently, if all its second constant cohomology sets with coefficients in the symmetric groups are trivial. We develop a combinatorial approach to constant cohomology and use it to find two infinite families of simply connected quandles. (This is joint work with Marco Bonatto)

David Stanovsky (Charles U, Prague, Czech Rep)

Abelian, nilpotent and solvable quandles

Abstract: Based on the general Gumm-Smith commutator theory of universal algebra, I will present how to specialize the general notions of abelianness, solvability and nilpotence for the class of racks and quandles. It turns out that the general ideas, coming from module representations (in a particular sense), can be expressed naturally in terms of properties of the multiplication and displacement groups of quandles.

Bernhard Amberg (U Mainz, Germany)

Factorized groups and solubility

Abstract: A group G is factorized if it can be written as the product $G = AB$ of two of its subgroups A and B. In the study of such groups so-called triply factorized groups of the form $G = AB = AM = BM$ with a normal subgroup M of G play an important role. There is a strong connection of such groups with radical rings etc. This can be used to prove some results on the structure of soluble factorized groups, and also to construct special interesting examples and counterexamples. Finally some criteria for the solubility of factorized groups are presented.