# Book of Abstracts
# XXV Brazilian Algebra Meeting

State University Campinas, December 3 - 7, 2018

## Session: Associative and non-associative algebras

Auditorium IMECC

| | **December 3rd** | **December 4th** | **December 5th** | | **December 7th** |
|---|---|---|---|---|---|
| 14h00 - 14h40: | Vieira | Kotchetov | Shestakov | | Dokuchaev |
| 14h50 - 15h10: | Diniz | Kharchenko | Sant'Ana | | Muniz |
| 15h15 - 15h35: | La Mattina | Petrogradsky | Guzzo | | França |
| 15h40 - 16h00: | Gonçalves | Sánchez | Kornev | | Cortes |
| 16h00 - 16h30: | Coffee Break | Coffee Break | Coffee Break | | Coffee Break |
| 16h30 - 17h10: | Di Vincenzo | Krassilnikov | Pozhidaev | 16h30 - 16h50: | Ferreira |
| 17h20 - 17h40: | De Mello | Schützer | Fideles | 16h55 - 17h15: | Souza |
| 17h45 - 18h05: | Ribeiro | Santulo | Rasskazova | 17h20 - 17h40: | Juriaans |
| 18h10 - 18h30: | Kuzmin | Tsurkov | Hernández | | |
| 18h35 - 18h55: | Bezerra | Fehlberg | Gutierrez | | |

### Subalgebra depth and double crossed products

*Alberto Hernández Alvarado (Universidad de Costa Rica - Costa Rica)*

**Abstract:**
TBA

### On partial representations of Hopf algebras

*Marcelo Muniz Silva Alves (Universidade Federal do Paraná - Brazil)*

**Abstract:**
In this talk we will present a overview of partial representations of a Hopf k-algebra, k a field. These representations appear naturally in the study of the category of left modules over a partial smash product (introduced by Caenepeel and Janssen in 2008), and the category of partial representations of a Hopf k-algebra H is isomorphic to the category of left modules over a Hopf algebroid. On the other hand, this category is also equivalent to a category of pairs consisting of a left H-module and a distinguished k-subspace of this module. We will also discuss results on partial representations of Majid's double crossed product. This is a work in collaboration with Eliezer Batista, Joost Vercruysse and Tiago Luiz Ferrazza.

## Embeddings in the Jordan algebra of a bilinear form

*Claudemir Fideles Bezerra Júnior (Federal University of Campina Grande - Brazil)*

**Abstract:**
There are a number of important theorems on the subject of matrix embeddings. When does a given ring have an embedding into $n \times n$ matrices over some commutative ring? An obvious necessary condition is that the ring must satisfy the polynomial identities of $n \times n$ matrices. That this condition is not sufficient for $n > 2$ is well known. Procesi proved that an algebra $R$ with trace can be embedded into $n \times n$ matrices over some commutative ring if and only if it satisfies the Cayley-Hamilton identity of degree $n$. It is natural to try to study the embedding problem in other varieties of algebras. Berele showed a similar result to the algebra $n \times n$ matrices with (symplectic or transpose) involution, thus generalizing Procesi's theorem. Moreover the results obtained by Procesi and Berele were determined over the ground field is of characteristic zero. In this poster, over a field $K$ of characteristic zero, we show that a Jordan algebra $J$ with formal trace can be realized as Jordan algebra of a bilinear form if and only if it satisfies all trace identities of the Jordan algebra of a bilinear form. As a consequence of these results we also prove that the ideal of all trace identities of the Jordan algebra of a non-degenerate symmetric bilinear form over $K$ satisfies the Specht property.

## Jordan isomorphisms of the finitary incidence ring of a pocategory

*Rosali Brusamarello (Universidade Estadual de Maringá - Brazil)*

**Abstract:**
A *pocategory* is a preadditive small category $\mathcal{C}$ with a partial order $\leq$ on the set $Ob\,\mathcal{C}$ of its objects. Denote by $I(\mathcal{C})$ the set of the formal sums

$$\alpha = \sum_{x \leq y} \alpha_{xy} e_{xy}, \tag{1}$$

where $x, y \in Ob\mathcal{C}$, $\alpha_{xy} \in Mor(x, y)$ and $e_{xy}$ is a symbol. It is an abelian group under the addition coming from the addition of morphisms in $\mathcal{C}$. The sum (1) is called a *finitary series*, whenever for any pair of $x, y \in Ob\,\mathcal{C}$ with $x < y$ there exists only a finite number of $u, v \in Ob\mathcal{C}$, such that $x \leq u < v \leq y$ and $\alpha_{uv} \neq 0_{uv}$. The set of finitary series, denoted by $FI(\mathcal{C})$, is an additive subgroup of $I(\mathcal{C})$, and it is closed under the convolution

$$\alpha\beta = \sum_{x \leq y} \left( \sum_{x \leq z \leq y} \alpha_{xz}\beta_{zy} \right) e_{xy},$$

where $\alpha, \beta \in FI(\mathcal{C})$. Thus, $FI(\mathcal{C})$ is a ring, called the *finitary incidence ring of* $\mathcal{C}$. Let $R$ and $S$ be rings. An additive map $\varphi : R \to S$ is called a *Jordan homomorphism*, if it satisfies

$$\varphi(r^2) = \varphi(r)^2 \quad \text{and} \quad \varphi(rsr) = \varphi(r)\varphi(s)\varphi(r),$$

for all $r, s \in R$. A bijective Jordan homomorphism is called a *Jordan isomorphism*. In this talk we consider a Jordan isomorphism $\varphi : FI(\mathcal{C}) \to A$, where $A$ is an arbitrary ring and study a decomposition of $\varphi$ into a sum (or a near sum) of an isomorphism and an anti-isomorphism. This is a joint work with Mykola Khrypchenko (UFSC) and Érica Zancanella Fornaroli (UEM).

## Isomorphism between skew polynomial rings

*Wagner de Oliveira Cortes (UFRGS - Brazil)*

**Abstract:**
In this work, we consider rings $R$ and $S$, $\alpha$ and $\gamma$ are endomorphisms of $R$ and $S$, respectively. Let $R[x;\alpha]$ and $S[y;\gamma]$ be the associated skew polynomial rings and $\theta : R \to S$ an isomorphism. We study necessary and sufficient conditions to exist an isomorphism $\Psi : R[x;\alpha] \to S[y;\gamma]$ such that $\Psi|_R = \theta$. Moreover, we proceed the same studies for the partial skew polynomial rings.

## Partial generalized crossed products and a seven terms exact sequence

*Mikhailo Dokuchaev (Universidade de São Paulo - Brazil)*

**Abstract:**
In 1965 S.U. Chase, D.K. Harrison and A. Rosenberg gave a seven terms exact sequence related to a Galois extension of commutative rings with finite Galois group $G$, which involves the relative Brauer group, Picard groups and cohomology groups of $G$. In 1973 Y. Miyashita offered a version of the sequence related to a pair, consisting of an arbitrary extension $R \subseteq S$ of non-necessarily commutative unital rings and a representation of a

(finite or infinite) group $G$ by invertible $R$-subbimodules of $S$. Miyahsita's sequence was generalized by L. El Kaoutit, J. Gómez-Torrecillas in 2012 replacing the unital condition on $R$ and $S$ by an essentially weaker one, namely, the existence of local units.

The success of partial actions in the theory of $C^*$-algebras stimulated diverse algebraic developments, including a Galois theory of commutative rings with finite Galois group $G$ and a group cohomology theory, both based on partial actions. A version of the Chase-Harrison-Rosenberg sequence for a partial Galois extension of unital commutative rings with finite $G$ was elaborated recently in a joint prerpint with A. Paques and H. Pinedo, whose exactness was established in another joint preprint with A. Paques, H. Pinedo and I. da Rocha.

In collaboration with Itailma da Rocha we generalize Miyashita's sequence for an extension $R \subseteq S$ of non-necessarily commutative unital rings and a partial representation of an arbitrary group $G$ by partially invertible $R$-subbimodules of $S$. We shall give some details of this work.

## On the existence of free Lie subalgebras

*Renato Fehlberg Júnior (UFES - Brazil)*

**Abstract:**
Many mathematicians have been studying the existence of free subobjects, such as free subalgebras in a division ring D in terms of Makar-Limanov conjecture. Despite of the efforts, the existence of such structures is not well understood. On the other hand, the question is better understood in the case of noncyclic free subgroups in the multiplicative group $D^x$ (Lichtman Conjecture). In this work, we bring this question in the context of Lie Algebras and we obtained some initial results.

## On the structure of Lotka-Volterra algebras and its derivations

*Juan Carlos Gutierrez Fernandez (Universidade de São Paulo - Brazil)*

**Abstract:**
TBA

## Explicit construction of free symmetric algebras in division rings

*Vitor de Oliveira Ferreira (USP - Brazil)*

**Abstract:**
A general criterium for producing free algebras inside the division ring of fractions of skew polynomial rings is presented, with an explicit description of free generators. This method is then applied to some families of division rings with a natural involution, yielding free subalgebras generated by symmetric elements. Special cases include the division ring of

fractions of the group algebra of a torsion-free nilpotent group and the division ring of fractions of the first Weyl algebra. (Joint with Érica Z. Fornaroli and Jairo Z. Gonçalves.)

## Herstein's problem on multiplicative commutators

*Willian Versolati Franca (Universidade Federal de Juiz de Fora - Brazil)*

**Abstract:**
Let $R$ be a simple unital ring. Under a mild technical restriction on $R$, we will characterize biadditve mappings $G : R^2 \to R$ satisfying $G(u,u)u = uG(u,u)$, and $G(1,r) = G(r,1) = r$ for all unit $u \in R$ and $r \in R$ respectively. As an application we describe bijective linear maps $\theta : R \to R$ satisfying $\theta(xyx^{-1}y^{-1}) = \theta(x)\theta(y)\theta(x)^{-1}\theta(y)^{-1}$ for all invertible $x, y \in R$. This solves an open problem of Herstein on multiplicative commutators. More precisely, we will show that $\theta$ is an isomorphism. Furthermore, we shall see the existence of a unital simple ring $R'$ without nontrivial idempotents, that admits a bijective linear map $f : R' \to R'$, preserving multiplicative commutators, that is not an isomorphism.

## Identities with involution for $2 \times 2$ upper triangular matrices algebra over a finite field

*Dimas José Gonçalves (Universidade Federal de São Carlos - Brazil)*

**Abstract:**
Let $UT_2(F)$ be the $2 \times 2$ upper triangular matrices algebra over a finite field $F$ of characteristic different from 2. For every involution of the first kind of $UT_2(F)$ we describe the set of all $*$-polynomial identities for this algebra.

This is a joint work with Ronald I. Q. Urure.

## Lie Maps on Alternative Rings

*Henrique Guzzo Junior (Universidade de São Paulo - Brazil)*

**Abstract:**
This is a joint work with Bruno Leonardo Macedo Ferreira. Let $\mathfrak{R}$ and $\mathfrak{R}'$ be two rings and $\varphi\colon \mathfrak{R} \to \mathfrak{R}'$ a mapping of $\mathfrak{R}$ in $\mathfrak{R}'$. We call $\varphi$ a *Lie multiplicative mapping* of $\mathfrak{R}$ in $\mathfrak{R}'$ if for all $x, y \in \mathfrak{R}$

$$\varphi\big([x,y]\big) = [\varphi(x), \varphi(y)],$$

and let $D\colon \mathfrak{R} \to \mathfrak{R}$ a mapping of $\mathfrak{R}$ into itself. We call $D$ a *Lie triple derivable multiplicative mapping* of $\mathfrak{R}$ into itself if for all $x, y, z \in \mathfrak{R}$

$$D\big([[x,y],z]\big) = [[D(x),y],z] + [[x,D(y)],z] + [[x,y],D(z)].$$

If $D([x,y]) = [D(x),y]+[x,D(y)]$ for all $x, y \in \mathfrak{R}$ we say that $D\colon \mathfrak{R} \to \mathfrak{R}$ is a *Lie derivable multiplicative mapping.*

In this work we study to alternative rings the almost additivity of the Lie multiplicative and Lie triple derivable maps. We prove that, if $\mathfrak{R}$ and $\mathfrak{R}'$ be alternative rings and under some conditions on $\mathfrak{R}$, then every Lie multiplicative bijection $\varphi$ of $\mathfrak{R}$ onto an arbitrary alternative ring $\mathfrak{R}'$ is almost additive. We also prove that, every Lie triple derivable maps is almost additive.

## Algebras whose orders do not contain $\mathbb{Z}^2$

*Stanley Orlando Juriaans (Universidade de São Paulo - Brazil)*

**Abstract:**
Algebras $A$ having the following property are studied If $\Gamma$ is an order in $A$, then $U(\Gamma)$ does not contain a copy of the free abelian group on two generators.

## Structural constants for quantum Lie algebras

*Vladislav Kharchenko (UNAM - Mexico)*

**Abstract:**
The numerous attempts to define a quantum Lie algebra as an elegant algebraic object with binary (quantum) Lie bracket are not crowned with evident and commonly accepted success. Although in general there does not exists a bilinear bracket as an operation, there is a binary bracket which is an extremely important and effective tool for the investigation. A space spanned by PBW generators may be considered as a "quantum Lie algebra", whereas the Groebner–Shirshov relations in the PBW generators represent the "table of multiplication" in that basis. The developed in this way bracket technique is an important tool for calculations that allows one to keep the intuition of the Lie algebra machinery. In the talk, we develop this approach in more details for Drinfel'd-Jimbo quantizations.

## TBA

*Alexandr Kornev (UFABC - Brazil)*

**Abstract:**
TBA

## Group gradings on algebras over the field of real numbers

*Mikhail Kotchetov (Memorial University - Canada)*

**Abstract:**
TBA

## On strongly Lie nilpotent associative algebras

*Alexei Krassilnikov (Universidade de Brasilia - Brazil)*

**Abstract:**
TBA

## On algebras of skew polynomials with the identities of the full matrix algebra

*Alexey Kuzmin (UFRN - Brazil)*

**Abstract:**
Let $F$ be a field of characteristics 0 and $M_n$ be the algebra of all $n \times n$ matrices over $F$. One of the difficult open problems in the theory of PI-algebras is to find a basis for identities of $M_n$. Certain bases are known only for the case $n = 2$.

Consider an algebra $P_n = F[1, a_1, \ldots, a_n]$ $(n \geq 2)$ of associative and commutative polynomials on variables $a_1, \ldots, a_n$ over $F$ with the unity $1 \in P_n$. We endow $P_n$ with an automorphism $\varphi : P_n \mapsto P_n$ of order $n$ induced by the following cyclic mapping

$$\varphi(a_i) = a_{i+1} \text{ for } i = 1, \ldots, n-1 \text{ and } \varphi(a_n) = a_1.$$

Let $P_n' = P_n[x, \varphi]$ be an algebra of so-called *skew polynomials* on one variable $x$ over $P_n$ such that $P_n'$ has an associative but not commutative multiplication defined by the conditions $x^n = 1$ and $xa = \varphi(a)x$ for all $a \in P_n$.

In this talk we present the result that the full matrix algebra $M_n$ is an homomorphic image of the algebra $P_n'$ and it satisfies only the identities that hold in $P_n'$.

## On commutative non associative algebras satisfying $(xx)(xx) - t((xx)x)x = 0$, $t \neq 0, 1$

*Alicia Labra (Universidad de Chile - Chile)*

**Abstract:**
TBA

## Codimensions of Algebras with involution

*Daniela La Mattina (University of Palermo - Italy)*

**Abstract:**
Let $A$ be an associative algebra with involution over a field $F$ of characteristic zero and let $\mathrm{Id}^*(A)$ be the $\mathrm{T}^*$-ideal of $*$-polynomial identities of $A$.

One associates to $A$, in a natural way, a numerical sequence $c_n^*(A)$, $n = 1, 2, \ldots$, called the sequence of $*$-codimensions of $A$ which is the main tool for the quantitative investigation of the polynomial identities of the algebra $A$. Such a sequence, in case $A$ satisfies a nontrivial identity, is exponentially bounded.

The purpose of this talk is to survey some recent results on the growth of the $*$-codimensions. Based on the existence of the $*$-exponent of a PI-algebra

$$\exp^*(A) = \lim_{n\to\infty} \sqrt[n]{c_n^*(A)}$$

we shall answer some questions such as: can one characterize the varieties of $*$-algebras of polynomial growth, of almost polynomial growth, etc?

## Variations in the Lvov–Kaplansky Multilinear Conjecture

*Thiago Castilho de Mello (Universidade Federal de São Paulo - Brazil)*

**Abstract:**
TBA

## Self-similar nil Poisson superalgebras

*Victor Petrogradsky (University of Brasilia - Brazil)*

**Abstract:**
The Grigorchuk and Gupta-Sidki groups play fundamental role in modern group theory. They are natural examples of self-similar finitely generated periodic groups. The author constructed their analogue in case of restricted Lie algebras of characteristic 2, Shestakov and Zelmanov extended this construction to arbitrary positive characteristic. Thus, there are examples of (self-similar) finitely generated restricted Lie algebras with a nil $p$-mapping. In characteristic zero, similar examples of Lie algebras do not exist by a result of Martinez and Zelmanov. The author also constructed respective analogues in the world of Lie superalgebras of arbitrary characteristic. Recently, we observed that these examples lead to fractal Poisson superalgebras and Jordan superalgebras. Now, we discuss nillity of these Poisson superalgebras. In particular, we discuss nillity of the restricted Poisson algebras related to the original example of the Fibonacci restricted Lie algebra.

## On the Cayley–Dickson process for Dialgebras

*Alexandre Pozhidaev (Novosibirsk State University - Russia)*

**Abstract:**
In 2014, R.Felipe-Sosa, R.Felipe, J.Sanchez-Ortega, M.R.Bremner and M.K.Kinyon introduced the Cayley-Dickson process for dialgebras. We continue this work proving that all dialgebras obtained by the Cayley-Dickson process from the 2-dimensional commutative associative dialgebra D with involution are disimple noncommutative Jordan dialgebras. Furthermore, we study in detail the structure of the obtained quaternion and octonion dialgebras.

## Non-Moufang Variety satisfying Moufang Theorem

*Marina Rasskazova (Omsk Service Institute - Russia)*

**Abstract:**
The famouse Moufang theorem affirms that a subloop generated by three elements $x, y, z$ of some Moufang loop is a group if and only if $(xy)z = x(yz)$. A.Rajah (Malasia) asked of existens of non-Moufang variety of diassociative loops where we have Moufang theorem for all loops from this variety. We construct such variety as subvariety of variety Steiner loops.

## On inner actions of weak Hopf algebras

*Alveri Alves Sant'Ana (UFRGS - Brazil)*

**Abstract:**
Let $H$ be a weak Hopf algebra and $A$ a unitary and associative algebra. In this work we investigate under what conditions $A$ admits an inner action of $H$. Also, if $A$ is a left $H$-module algebra then we show that $H$ acts innerly on $A$ if and only if $H$ is a quantum commutative weak Hopf algebra. This is a joint work with D. Bagio and D. Flôres (UFSM).

## Identities with graded involution of $M_{1,1}(F)$

*Rafael Bezerra dos Santos (Universidade Federal de Minas Gerais - Brazil)*

**Abstract:**
Let $F$ be a field of characteristic zero. We denote by $M_{1,1}(F)$ the matrix algebra $M_2(F)$ endowed with a nontrivial grading. It is well known that the transpose and symplectic involutions are graded involutions on $M_{1,1}(F)$, that is, these involutions preserve the homogeneous components of $M_{1,1}(F)$. In this talk, we explicit the generators of the $T_2^*$-ideals of identities with graded involutions of $M_{1,1}(F)$ when we consider the transpose and symplectic involutions. Also, we exhibit the decompositions of the $S_{\langle n \rangle}$-cocharacter

of $M_{1,1}(F)$ in each case.

## Good and elementary gradings and cohomology

*Ednei Aparecido Santulo Junior (Universidade Estadual de Maringá - Brazil)*

**Abstract:**
Let $A$ be an associative algebra with a multiplicative basis $B$ containing a set $I$ of orthogonal idempotents such that, for any $b \in B$ there exist unique $u_b$ and $v_b$ in $I$ satisfying $b = u_b b v_b$. In this case, we generalize the concepts of good gradings and elementary gradings from the context of matrix algebras. A natural question that arises is: "is every good grading an elementary grading?" and, if the answer is "no", we can also ask how large is the set of elementary gradings in the set of good gradings. In order to answer those questions, we define a cohomology for $(A, B)$.

This is joint work with Laerte Bemm and Érica Z. Fornaroli.

## On the T-ideal generated by the standard polynomial of degree $n$

*Waldeck Schützer (Universidade Federal de São Carlos - Brazil)*

**Abstract:**
TBA

## Free symmetric pairs in the field of fractions of residually torsion-free nilpotent group algebras

*Javier Sánchez Serdà (Universidade de São Paulo - Brazil)*

**Abstract:**
Let $k$ be a field of characteristic different from 2, let $G$ be a nonabelian residually torsion-free nilpotent group, let $k[G]$ be the group algebra of $G$ over $k$ and let $k(G)$ be its Malcev-Neumann division ring of fractions. It is known that any involution on the group ring $k[G]$ induced by an involution of $G$ can be extended to $k(G)$. We show that if $*$ is an involution on $k(G)$ induced by an involution on $G$, then $k(G)$ contains pairs of symmetric elements with respect to $*$ which generate a free group inside the multiplicative group of $k(G) \setminus \{0\}$.

## Identities and Isomorphisms of Upper Block Triangular Matrix Algebras

*Diogo Diniz Pereira da Silva e Silva (UFCG - Brazil)*

**Abstract:**
Let $(d_1, \ldots, d_n)$ be an $n$-tuple of positive integers and $F$ a field. The corresponding algebra $UT(d_1, \ldots, d_n)$ of upper block triangular matrices is the subalgebra of $M_m(F)$, where $m = d_1 + \cdots + d_n$, consisting of the matrices

$$\begin{pmatrix} A_{11} & A_{12} & \cdots & A_{1n} \\ 0 & A_{22} & \cdots & A_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & A_{nn} \end{pmatrix},$$

where $A_{ij}$ is a block of size $d_i \times d_j$. These algebras play an important role in the classification of minimal varieties of a given exponent (see [A. Giambruno, M. Zaicev, *Minimal varieties of algebras of exponential growth*, Advances in Mathematics **174** (2003) 310–323]).

The gradings, by a finite abelian group, on upper block triangular matrix algebras algebras (over an algebraically closed field of characteristic zero) were classified by A. Valenti, M.V. Zaicev in [*Abelian gradings on upper block triangular matrices* Canadian Mathematical Bulletin **55** (2012) 208–213]. In this talk we describe the (graded) isomorphism classes of these algebras, this is the main result of [A.R. Borges, C. Fidelis, D. Diniz, *Graded isomorphisms on upper block triangular matrix algebras*, Linear Algebra and its Applications, In Press]. We then consider the question of whether graded identities of an upper block-triangular matrix algebra determine this algebra up to graded isomorphism. This is joint work with Alex Ramos Borges and Claudemir Fidelis.

This research was supported by CNPq, projects 303822/2016-3 and 406401/2016-0.

## Graded identities of tensor products by the Grassmann algebra

*Viviane Ribeiro Tomaz da Silva (Universidade Federal de Minas Gerais - Brazil)*

**Abstract:**
Let $E$ be the unitary Grassmann algebra of an infinite dimensional $F$-vector space $L$. As a consequence of the results of Di Vincenzo and Nardozza (2003) we have that the generators of the $T_G$-ideal of $G$-graded identities of a $G$-graded algebra in characteristic zero and the generators of the $T_{G\times\mathbb{Z}_2}$-ideal of $(G \times \mathbb{Z}_2)$-graded identities of its tensor product by $E$ endowed with the canonical grading have pairly the same degree.

In a joint work with Centrone published in 2016 we have dealt with the $(\mathbb{Z}_2 \times \mathbb{Z}_2)$-graded identities of $E_{k^*} \otimes E$ over an infinite field of characteristic $p > 2$, where $E_{k^*}$ is one of the three up to isomorphism kinds ($E_{k^*}$, $E_\infty$, $E_k$) of homogeneous $\mathbb{Z}_2$-gradings of $E$. We have found identities of degree $p + 1$ and $p + 2$ while the maximal degree of a generator of the $\mathbb{Z}_2$-graded identities of $E_{k^*}$ is $p$ if $p > k$.

Continuing our studies, in another joint work with Centrone, we have recently found the graded ideal of identities of $E_{gr} \otimes E^{\otimes n}$ over an infinite field of characteristic different from two, where $E_{gr}$ is an arbitrary $\mathbb{Z}_2$-grading on $E$ such that the subspace $L$ is homogeneous.

In this talk we shall present all of these results. This research is partially supported by CNPq-Brazil.

## On commutators and associators in alternative algebras

*Ivan Shestakov (Universidade de São Paulo - Brazil)*

**Abstract:**
It is proved that in a unital alternative algebra $A$ over an associative commutative ring $\Phi$ with $\frac{1}{2} \in \Phi$ for any elements $a, b, c, d \in A$ the associator $(a, b, c)$ and the Kleinfeld function $f(a, b, c, d)$ never could be equal to the identity element 1. Moreover, if $A$ is not associative then no commutator $[a, b]$ could be equal to 1.

The restriction on characteristic is essential since in the Cayley-Dickson algebra over a field of characteristic 2 there are commutators, associators, and Kleinfeld functions equal to 1.

## Embedding free abelian groups of rank two in the unit group of integral group ring

*Antonio Calixto de Souza Filho (USP - Brazil)*

**Abstract:**
Let $G$ be an infinite group such that $n$ is the greater integer for which there there exists in $G$ a subgroup $A$ isomorphic to $\mathbf{Z}^n$, the free Abelian group of rank $n$. We define $n \doteq r_{abel}(G)$ the Abelian free rank of $G$. Clearly, if $G$ is finite, then $r_{abel}(G) = 0$. Denote by $U(\mathbf{Z}G)$ the group of units of the group ring $\mathbf{Z}G$. Earlier, it was classified the groups $G$ with $r_{abel}(U(\mathbf{Z}G)) = 0$ as well as it was classified the finite groups $G$ with $r_{abel}(U(\mathbf{Z}G)) = 1$. Here we classify the finite groups $G$ with $r_{abel}(U(\mathbf{Z}G)) = 2$.

## Automorphisms of the category of the finitely generated free groups of the some subvariety of the variety of all groups

*Arkady Tsurkov (UFRN - Brazil)*

**Abstract:**
TBA

## Algebras with graded involution and codimension growth

*Ana Cristina Vieira (UFMG - Brazil)*

**Abstract:**
An involution $*$ on a superalgebra $A = A^{(0)} \oplus A^{(1)}$ that preserves the homogeneous

components is called *graded involution* and in this case, $A$ is a $*$-superalgebra $A$. The sequence of $(\mathbf{Z}_2, *)$-*codimensions* of $A$ controls the growth of the identities satisfied by $A$. In this talk, we will present some results about the behavior of this sequence for particular varieties of $*$-superalgebras.

## Minimal varieties of $*$-superalgebras

*Onofrio Mario Di Vincenzo (Università della Basilicata - Italy)*

**Abstract:**
In this talk, I present a characterization of the varieties of superalgebras with involution, over a field of characteristic zero, which are minimal with respect to the value of their $*$-superexponent. The $*$-superalgebras generating these minimal varieties will be exhibited. These $*$-superalgebras will be realized as appropriate subalgebras of upper block triangular matrix algebras, with an elementary $\mathbf{Z}_2$-grading and the graded involution given by the flip with respect to the secondary diagonal. It is a joint work with Ernesto Spinelli and Viviane Ribeiro Tomaz da Silva.