## Articles in ISI journals

**1.** I. Crivei, **S. Crivei**, I. Purdea, *Change of ring and torsion-theoretic injectivity*, Bull. Austral. Math. Soc. 75 (2007), 127–133.

Let $\tau$ be a hereditary torsion theory in $R$-Mod. Then every ring homomorphism $\gamma : R \to S$ induces in $S$-Mod a torsion theory $\sigma$ given by the condition that a left $S$-module is $\sigma$-torsion if and only if it is $\tau$-torsion as a left $R$-module. We show that if $\gamma : R \to S$ is a ring epimorphism and $A$ is a $\tau$-injective left $R$-module, then the annihilator $\mathrm{Ann}_A\mathrm{Ker}(\gamma)$ is $\sigma$-injective as a left $S$-module. As a consequence, we relate $\tau$-injectivity and $\sigma$-injectivity, and we give some applications.

**2.** S. Caenepeel, **S. Crivei**, A. Marcus, M. Takeuchi, *Morita equivalences induced by bimodules over Hopf-Galois extensions*, J. Algebra 314 (2007), 267–302.

Let $H$ be a Hopf algebra, and $A, B$ be $H$-Galois extensions. We investigate the category ${}_A\mathcal{M}_B^H$ of relative Hopf bimodules, and the Morita equivalences between $A$ and $B$ induced by them. We introduce the notion of $H$-Morita context, and we show that if two right faithfully flat $H$-Galois extensions are connected by a (strict) $H$-Morita context, then the algebras of coinvariants are also connected by a (strict) Morita context. Our main result is the following converse result: if the algebras of coinvariants are Morita equivalent, in such a way that the bimodule structure on one of the connecting modules can be extended to a left-action by the cotensor product $A\Box_H B^{\mathrm{op}}$, then $A$ and $B$ are $H$-Morita equivalent. If two right $H$-comodule algebras are $H$-Morita equivalent, then the induced equivalence between their categories of relative Hopf modules is $H$-colinear. Conversely, we show that every $H$-colinear equivalence comes from a strict $H$-Morita context if the Hopf algebra $H$ is projective, and the $H$-comodule algebras $A$ and $B$ are $H$-Galois extensions of their subalgebras of coinvariants.

**3.** **S. Breaz**, J. Zemlicka, *When every self-small module is finitely generated*, J. Algebra 315 (2007), 885–893.

The aim of this paper is to give necessary and sufficient conditions for rings for which every right self-small module is finitely generated. It is proved that: semi-simple rings, commutative perfect rings and right nonsingular $\Sigma$-extending rings have this property; a right nonsingular semi-prime ring has the property if and only if it is semi-simple; a commutative noetherian ring has the property if and only if it is artinian.

**4.** U. Albrecht, **S. Breaz**, W. Wickless, *Purity and self-small groups*, Comm. Algebra 35 (2007), 3789–3807.

We study pure subgroups of $A$-solvable groups, for $A$ a self-small (abelian) group of finite torsionfree rank and, in particular, for the groups in the class $\mathcal{G}$ of self-small groups $A$ with the torsionfree part $A/tA \cong \mathbb{Q}^n$ for $n < \omega$.

We obtain new characterizations for the class $\mathcal{G}$, using properties of pure subgroups of $A$-solvable groups and characterizations of groups that are mixed, completely decomposable and homogeneous in the category Walk. Also, we point out new differences between the category $\mathcal{G}$ and the category of finite torsionfree rank.

**5. G. Olteanu**, A. del Rio, *Group algebras of Kleinian type and groups of units*, J. Algebra (2007), doi:10.1016/j.jalgebra.2007.03.026.

The study of Kleinian groups goes back to the works of Poincaré and Bianchi, and afterwards it has been strongly related to the Geometrization Program of Thurston for the classification of 3-manifolds. The algebras of Kleinian type are finite dimensional semisimple rational algebras $A$ such that the group of units of an order in $A$ is commensurable with a direct product of Kleinian groups. We classify the Schur algebras of Kleinian type and the group algebras of Kleinian type. As an application, we characterize the group rings $RG$, with $R$ an order in a number field and $G$ a finite group, such that the group of units of $RG$ is virtually a direct product of free-by-free groups.

**6. S. Crivei**, *$\Sigma$-extending modules, $\Sigma$-lifting modules, and proper classes*, Comm. Algebra 36 (2008), accepted for publication, editor: J.L. Gómez Pardo.

We introduce generalizations of extending and lifting modules relative to proper classes $\mathbb{E}$ of short exact sequences of modules. We use such a context to establish some properties of relative $\Sigma$-extending modules, which generalize those of $\Sigma$-extending modules, and properties of relative $\Sigma$-lifting modules, which give new results when specialized to $\Sigma$-lifting modules. We give several characterizations of $\Sigma$-$\mathbb{E}$-extending modules and $\Sigma$-$\mathbb{E}$-lifting modules. For a $\Sigma$-$\mathbb{E}$-extending module $M$, we study the behaviour of the modules in the class $\mathrm{Add}(M)$ of direct summands of direct sums of copies of $M$ under essential monomorphisms. Also, the dual of this property for $\Sigma$-$\mathbb{E}$-lifting modules is discussed.

**7. G. Olteanu**, A. del Rio, *An algorithm to compute the Wedderburn decomposition of semisimple group algebras implemented in the GAP package wedderga*, J. Symbolic Comput. (2008) (special issue devoted to Computer Algebra and Its Applications), accepted for publication, editors: F.J. Castro-Jimenez, L. Gonzalez-Vega.

The Brauer-Witt Theorem states that the Wedderburn components of the (semisimple) group algebra $FG$, where $F$ is a field of characteristic zero and $G$ is a finite group, are Brauer equivalent to cyclotomic algebras. We present an algorithm to compute the Wedderburn decomposition of semisimple group algebras based on a computational approach of the Brauer-Witt theorem. The algorithm was implemented in the GAP package `wedderga`.

## Submitted articles

**8. S. Crivei**, *Relatively extending modules.*

We consider and study a generalization of extending modules relative to a class $\mathcal{A}$ of modules and a proper class $\mathbb{E}$ of short exact sequences of modules. These modules will be called $\mathbb{E}$-$\mathcal{A}$-extending. We introduce and employ suitable closures for modules, and we show their connection with the theory of natural and conatural classes of modules and that of approximation of modules. We establish various characterizations of modules with the property that every direct sum of copies of them is a $\mathbb{E}$-$\mathcal{A}$-extending module.

**9. S. Breaz**, *The number of Remak decompositions of a finite Abelian group.*

The fundamental (decomposition) theorem of finite abelian groups states that every such a group has a direct sum decomposition of indecomposable cyclic (primary) groups, and this decomposition is unique up to an isomorphism, up to the order of terms. However, such decompositions are not unique if one replaces the isomorphism relation with the equality. In this paper we give a formula for the computation of the number of such decompositions (i.e. the number of Remak decompositions of a finite abelian group).

**10. C. Modoi**, *Functors inducing an abelian localization.*

We find necessary and sufficient conditions for an arbitrary functor defined on a ring with several objects (i.e. a small preadditive category) with values in a Grothendieck category, to induce an abelian localization between the category of modules over the ring representing the domain of the functor and the Grothendieck category which is its codomain. In view of these, we characterize the morphisms for which the composition between the corresponding restriction functor and the inclusion of the subcategory consisting of closed objects relative to the corresponding torsion class is a full faithful functor. Using also a known characterization of flatness of a functor defined on a ring with several objects and with values in a Grothendieck category, we obtain the desired characterizations.

**11. C. Modoi**, *Brown representability theorem: a functorial version.*

We state and prove a new version of the Brown representability theorem in triangulated categories with arbitrary coproducts. This new version generalizes the existent ones, for instance that in the case of triangulated categories that are well generated in the sense of Neeman. The difference with respect to the previous versions also consists of the functorial approach, having as starting point the well known fact that every contravariant Ab-valuated functor defined on a locally presentable category and which transforms colimits into limits is representable.

**12.** A. Herman, **G. Olteanu**, A. del Rio, *Ring isomorphism of cyclic cyclotomic algebras*.

It is shown that ring isomorphism between cyclic cyclotomic algebras over cyclotomic number fields is essentially determined by the list of local Schur indices at all rational primes. As a consequence, ring isomorphism between simple components of the rational group algebras of finite metacyclic groups is determined by the center, the dimension over $\mathbb{Q}$, and the list of local Schur indices at rational primes. An example is given to show that this does not hold for finite groups in general.

## Computer packages

**13.** O. Broche Cristo, A. Konovalov, A. Olivieri, **G. Olteanu**, A. del Rio, *Wedderga - Wedderburn Decomposition of Group Algebras, Version 4.2*; 2007 (http://www.gap-system.org/Packages/wedderga.html, http://www.um.es/adelrio/wedderga.htm).

The name Wedderga stands for **Wedder**burn decomposition of **g**roup **a**lgebras. This is a GAP package to compute the simple components of the Wedderburn decomposition of semisimple group algebras of finite groups over abelian number fields and over finite fields. It also contains functions that compute the primitive central idempotents of the same kind of group algebras, and to construct crossed products over a group with coefficients in an associative ring with identity and the multiplication determined by a given action and twisting. The new version completes and extends the previous ones from strongly monomial groups to any finite group, and from the semisimple group algebra $\mathbb{Q}G$ to $KG$ for fields $K$ of the above types.

**14.** **S. Crivei, G. Olteanu**, Ş. Şuteu-Szöllősi, *ELISA - A collection of GAP algorithms related to extending and lifting abelian groups, Version 1.1*; 2007 (http://www.gap-system.org/Packages/undep.html, http://math.ubbcluj.ro/ crivei/GAP_project).

The name `ELISA` stands for: **E**xtending and **li**fting **s**ubgroup **a**lgorithms. This is a collection of GAP algorithms for determining special subgroups of finite abelian groups related to the extending and lifting properties. We give functions, on one hand to check the properties of being direct summand, essential, superfluous, coessential, complement (closed), supplement (coclosed) subgroup, and on the other hand to determine all subgroups with the mentioned properties as well as closures (coclosures) of a subgroup of a finite abelian group. The new version also contains algorithms which are able, for instance, to determine type subgroups of a group or to determine groups with the TS property.