The XXIXth Ohio State - Denison Mathematics Conference

ABSTRACTS

The Ohio State University, Columbus, Ohio
May 16-18, 2008

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The XXIXth Ohio State - Denison Mathematics Conference

ABSTRACTS

ORGANIZERS

Conference Organizer & Group Theory	Ákos SERESS, The Ohio State University, Columbus, Ohio
Group Theory	Luise-Charlotte KAPPE, Binghamton University, Binghamton, New York
Combinatorics	K. T. ARASU, Wright State University, Dayton, Ohio Niranjan BALACHANDRAN, The Ohio State University, Columbus, Ohio
Theory of Rings and Modules	S. K. JAIN, Ohio University, Athens, Ohio S. Tariq RIZVI, The Ohio State University, Lima, Ohio

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Program

Friday, May 16, 2008; Afternoon Session

12:00-1:00 PM	**Registration**
	Math Tower -MW- 7^{th} floor
	GROUP THEORY SESSION
	(Psychology Building -PS- 002)
1:00-1:20 PM	Francis C. Y. Tang (University of Waterloo)
	Separability properties of certain 1-relator groups
1:30-1:50 PM	Fernando Guzman (Binghamton University)
	Associativity of the Commutator Operation in Groups
2:00-2:20 PM	Ilir Snopce (Binghamton University)
	Normal zeta functions of some pro-p groups
2:30-2:50 PM	Tuval Foguel (Auburn Montgomery)
	Bol-Loops of Odd Prime Exponent
2:50-3:30 PM	BREAK
3:30-3:50 PM	Stephen M Gagola III (The University of Arizona)
	Sylow's Theorem for finite Moufang loops
4:00-4:20 PM	Joseph Patrick Smith (AUM)
	Groups in which Every Subgroup of the Norm is Normal
4:30-4:50 PM	Charles S. Holmes (Miami University)
	The Degree of a Minimal Polynomial

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Saturday, May 17, 2008; Morning Session

8:00-9:00 AM	**Coffee and Pastries; Registration**

COMBINATORICS SESSION
(Math Tower -MW- 154)

8:30-8:50 AM	Niranjan Balachandran (The Ohio State University) **A λ-Large Type Theorem for Candelabra Systems**
9:00-9:20 AM	Suhkjin Hur (The Ohio State University) **The Kuratowski covering conjecture for graphs of order < 10**
9:30-9:50 AM	Dursun Bulutoglu (Air Force Institute of Technology) **Classification of Orthogonal Arrays by Integer Programming**
10:00-10:30 AM	BREAK
10:30-10:50 AM	Yuqing Chen (Wright State University) **Relative difference sets from additive Hadamard cocycles**
11:00-11:20 AM	Xiaoyu Liu (Wright State University) **An equivalence of Ward's bound and its application to nonlinear divisible codes**
11:30-11:50 AM	Xiangqian Zhou (Wright State University) **On k-splitting families**

GROUP THEORY SESSION I
(Journalism Building -JR- 371)

8:30-8:50 AM	Harald Eric Ellers (Allegheny College) **Branching Rules for Specht Modules**
9:00-9:20 AM	Kenneth Walter Johnson (Penn State Abington) **Fusions between character tables of groups**
9:30-9:50 AM	Mark L. Lewis (Kent State University) **Generalizing Camina groups and their character tables**
9:50-10:30 AM	BREAK
10:30-10:50 AM	Alexandre Turull (University of Florida) **The Brauer-Clifford group and modular representations**
11:00-11:20 AM	Ahmad Alghamdi (Umm AlQura University Makkah) **On Current Conjectures in Block Theory**
11:30-11:50 AM	Adam Salminen (University of Evansville) **Defect zero blocks acted on by p-groups for $p \geq 5$**

GROUP THEORY SESSION II

(Scott Laboratory -SO- 0040)

8:30-8:50 AM	Julia Chifman (University of Kentucky) **Toric ideals of phylogenetic invariants for the general group-based model on claw trees $K_{1,n}$**
9:00-9:20 AM	Thomas Michael Keller (Texas State University) **A lower bound for the number of conjugacy classes of finite groups**
9:30-9:50 AM	Jeffrey Riedl (University of Akron) **Conjugacy Classes of Subgroups of p-Groups**
9:50-10:30 AM	BREAK
10:30-10:50 AM	Jack B.A. Schmidt (University of Kentucky) **Just-non-PT groups**
11:00-11:20 AM	Keyan Yang (Ohio State University) **Orbit Equivalent Permutation Groups**
11:30-11:50 AM	Clifton Edgar Ealy (Western Michigan University) **Symmetric designs over ternary rings**

THEORY OF RINGS AND MODULES SESSION

(Math Building -MA- 240)

9:00-9:20 AM	Dinh Van Huynh (Ohio University, Athens) **Characterizations of some rings with chain conditions**
9:30-9:50 AM	Thuyet Van Le (Hue University, Vietnam) **Some characterizations of QF-rings via injectivity and small injectivity**
10:00-10:20 AM	Zak Mesyan (USC, Los Angeles) **Minimal extensions of rings**
10:30-10:50 AM	Brian Blackwood (Ohio University, Athens) **On parallel sums and invariance of harmonic mean**
11:00-11:20 AM	Pramod Kanwar (Ohio University, Zanesville) **Lie Regular Units**
11:30-12:10 AM	Jae Keol Park (Busan National University, South Korea) **Factor Rings of Quasi-Baer Rings by Prime Radicals**

12:30-2:00 PM **LUNCH BREAK**

Saturday, May 17, 2008; Afternoon Session

COMBINATORICS SESSION
(Math Tower -MW- 154)

2:00-2:40 PM	Bruce Carl Berndt (University of Illinois) **Cranks - Really the Final Problem**
2:50-3:10 PM	Jon Derek Stadler, Capital University **Juggling sequences with restricted heights**
3:15-3:50 PM	BREAK
3:50-4:30 PM	Stephen Carl Milne (The Ohio State University) **Sums of squares and the Leech lattice**
4:40-5:10 PM	Verne E. Leininger (Bridgewater College) **Quadratic q-series**

GROUP THEORY SESSION
(Psychology Building -PS- 002)

2:00-2:20 PM	Derek Scott Robinson (University of Illinois at Urbana-Champaign) **Groups in which every subgroup is closed in the profinite topology**
2:30-2:50 PM	Dandrielle Cherie Lewis (Binghamton University) **Characterization of Abnormal Subgroups in a Finite Central Product**
3:00-3:20 PM	Matthew Faran Ragland (Auburn University Montgomery) **Strong Sylow Systems and Mutually Permutable Products**
3:20-4:00 PM	BREAK
4:00-4:20 PM	Joseph Petrillo (Alfred University) **An Introduction to Transitive and Persistent Subgroups**
4:30-4:50 PM	Khaled Al-Sharo (Al al-Bayt University, Jordan) **Groups in which the maximal subgroups of the Sylow subgroups are S-semipermutable**
5:00-5:20 PM	Jason Walter Elliot (University of Illinois at Urbana-Champaign) **Central Extensions of Divisible Groups by Abelian Groups**

THEORY OF RINGS AND MODULES SESSION
(Math Building -MA- 240)

2:00-2:20 PM	Sergio R. Lopez-Permouth (Ohio University, Athens) **Connections between various generalizations of the concept of cyclicity of codes**
2:30-2:50 PM	Nguyen Viet Dung (Ohio University, Zanesville) **Rings characterized by finendo modules**
3:00-3:20 PM	Mercedes Siles Molina (Universidad de Malaga, Spain) **Finiteness conditions on Leavitt path algebras**
3:30-3:50 PM	Hans Schoutens (City University of New York, New York) **Weighted Grothendieck groups**
4:00-4:20 PM	Philipp S. Rothmaler (CUNY, New York) **Definable subcategories of modules**
4:30-5:10 PM	Toma Albu (S. Stoilow Institute of Mathematics, Romania) **Locally finitely generated Grothndieck Categories and Simple Objects**

CONFERENCE BANQUET

(Holiday Inn on the Lane)

6:00 PM	**Cash Bar**
6:30 PM	**Buffet Dinner**

Sunday, MAY 18, 2008; Morning Session

8:00-9:00 AM	**COFFEE AND PASTRIES**

COMBINATORICS SESSION
(Math Tower -MW- 154)

9:30-9:50 AM	K.T. Arasu (Wright State University) **On Two-Circulant Weighing Matrices**
10:00-10:20 AM	Nishali Mehta (The Ohio State University) **Graph games with restricted degrees**
10:20-11:00 AM	BREAK
11:00-11:20 AM	Nuh Aydin (Kenyon College) **Search for Good Linear Codes**
11:30-11:50 AM	Christopher Matthew McClain (The Ohio State University) **The Clique Chromatic Index of Line Graphs**

GROUP THEORY SESSION
(Psychology Building -PS- 002)

8:30-8:50 AM	Arturo Magidin (University of Louisiana at Lafayette) **Capability of semiextraspecial groups. Preliminary Report.**
9:00-9:20 AM	Viji Thomas (Binghamton University) **The Nonabelian Tensor Product of** **Finite Groups is Finite: A Homology Free Proof**
9:30-9:50 AM	Nor Muhainiah Mohd Ali (Universiti Teknologi Malaysia) **Using GAP to Compute Homological Invariants of** **2-Generator Non-Torsion Groups of Nilpotency Class Two**
9:50-10:30 AM	BREAK
10:30-10:50 AM	Elizabeth Wilcox (Binghamton University) **Certain Normal Subgroups of Complete Groups**
11:00-11:20 AM	Arnold D. Feldman (Franklin & Marshall College) **Lattice Properties, Normality, and Subnormality in Finite Groups**
11:30-11:50 AM	Luise-Charlotte Kappe (Binghamton University) **On n-Scorza groups**

THEORY OF RINGS AND MODULES SESSION
(Math Building -MA- 240)

9:30-9:50 AM	Hai Q. Dinh (Kent State University, Warren) **Constacyclic codes of length p^s over $\mathbb{F}_{p^m} + u\mathbb{F}_{p^m}$**
10:00-10:20 AM	Benigno R. Parra (Ohio University, Athens) **Rational Power Series and Periodicity of Sequences**
10:30-10:50 AM	Gangyong Lee (The Ohio State University, Columbus) **Rickart modules**
11:00-11:20 AM	Dinh Hai Hoang (Mahidol University, Thailand) **A weaker form of p-injectivity**

Combinatorics Abstracts

On Two-Circulant Weighing Matrices

K.T. Arasu, Wright State University

We employ theoretical and computational techniques to construct new weighing matri- ces constructed from two circulants. In particular, we construct W(148; 144), W(152; 144), W(156; 144) which are listed as open in the second edition of the Handbook of Combinatorial Designs. In addition, we obtain infinite families of weighing matrices constructed from two circulants, such as W(68 + 2k; 52) and W(108 + 2k; 64) for all $k > 0$, based on ternary complementary pairs. We also fill a missing entry in Strassler's table with answer "YES", by constructing a circulant weighing matrix of order 142 with weight 100. This is joint work with Ilias S. Kotsireas, Christos Koukouvinos and Jennifer Seberry.

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Search for Good Linear Codes

Nuh Aydin, Kenyon College

This talk gives an overview of some of the recent search methods that have been successful in finding new linear codes. It also presents a recent search algorithm and the new codes obtained by that algorithm.

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A λ-Large Type Theorem for Candelabra Systems

Niranjan Balachandran, The Ohio State University

Candelabra systems are combinatorial objects that are closely related to Steiner designs. In this talk, we look at an appropriate incidence matrix that would define a Candelabra system as integers solutions to a certain matrix equation. We prove that the matrix in consideration has full rank. This has interesting consequences regarding some constructions for Steiner 3-designs.

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Cranks - Really the Final Problem

Bruce Carl Berndt, University of Illinois

The existence of the crank, a partition statistic to explain Ramanujan's famous congruence for the partition function modulo 11, was conjectured by Freeman Dyson in 1944. It was discovered by George Andrews and Frank Garvan on June 6, 1988. It was then noticed that the crank can be found in Ramanujan's lost notebook. We have not yet learned the meaning of various entries in the lost notebook pertaining to cranks. A survey of Ramanujan's work on cranks in his lost notebook will be given. We give evidence that Ramanujan was concentrating on cranks when he died, that is to say, the final problem on which Ramanujan worked was cranks – not mock theta functions.

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Classification of Orthogonal Arrays by Integer Programming

Dursun Bulutoglu, Air Force Institute of Technology

Factorial designs are used extensively in a wide range of scientific and industrial investigations for extracting as much information as possible at a fixed cost. Statisticians are interested in finding orthogonal arrays, since orthogonal arrays are the most efficient factorial designs for certain statistical models. However, finding an orthogonal array that is universally optimal for a statistical model is a difficult, unsolved problem. In fact, mathematicians have worked on variants of this problem since the time of Euler. Since the statistical properties of orthogonal arrays are preserved under design isomorphism, classifying them up to isomorphism allows the best to be found with respect to the statistical criterion of choice. A new method for finding all non-isomorphic factorial designs in a given set will be compared to those in the literature.

In Bulutoglu and Margot (2007), the problem of classifying all isomorphism classes of orthogonal arrays is shown to be equivalent to finding all isomorphism classes of non-negative integer solutions to a system of linear equations under the symmetry group of those equations. Cases were solved using Margot's (2007) extension of the branch-and-cut algorithm. A new method for solving the same problem based on solving a sequence of ILPs using Margot's (2007) algorithm will be introduced. Pros and cons of the new method will be discussed. I will also provide a summary of other research directions for finding a best factorial design under the well established GMA statistical criterion.

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Relative difference sets from additive Hadamard cocycles

Yuqing Chen, Wright State University

Additive Hadamard cocycle are a natrual generalization of presemifield in finite geomtry. In this talk, we will discuss relative difference sets obtained from additive Hadamard cocycles, including falg transitivity and absolute polarity of the divisible designs developed from these difference sets.

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The Kuratowski covering conjecture for graphs of order < 10

Suhkjin Hur, The Ohio State University

Kuratowski proved that a finite graph embeds in the plane if it does not contain a subdivision of either K_5 or $K_{3,3}$, called Kuratowski subgraphs. A conjectured generalization of this result to all nonorientable surfaces says that a finite graph embeds in the nonorientable surface of genus $\tilde{g}$ if it does not contain $\tilde{g}+1$ Kuratowski subgraphs such that the union of each pair of these fails to embed in the projective plane, the union of each triple of these fails to embed in the Klein bottle if $\tilde{g} \geq 2$, and the union of each triple of these fails to embed in the torus if $\tilde{g} \geq 3$. We prove this conjecture for all graphs of order < 10.

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Quadratic q-series

Verne E. Leininger, Bridgewater College

q-factorials are usually indexed by a linear function. This presetation will discuss work in progress to use a quadratic function to index q-factorials and the goal of finding the number of ways to express an integer as the sum of two cubes.

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An equivalence of Ward's bound and its application to nonlinear divisible codes

Xiaoyu Liu, Wright State University

We prove an equivalent condition of Ward's bound on dimension of divisible codes, and conclude that Ward's bound is a consequence of the fact that the MacWilliams transform of the weight enumerator has integer coefficients. This equivalence generalizes Ward's bound to some nonlinear codes as long as the MacWilliams identities hold.

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The Clique Chromatic Index of Line Graphs

Christopher Matthew McClain, The Ohio State University

The chromatic index of a graph G is most often defined to be the minimum size of a partition of the edge set of G into matchings. An equivalent definition is the minimum size of a cover of the edge set of G by matchings. We consider the analogous problem of covering the edge set of a simple graph G by subgraphs that are vertex-disjoint unions of cliques. We denote by $\chi_E^K(G)$ the minimum size of such a covering set, and investigate the special case $\chi_E^K(L(G))$, where $L(G)$ is the line graph of G.

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Graph games with restricted degrees

Nishali Mehta, The Ohio State University

A. Hajnal proposed the following graph game: Starting with an empty graph, two players alternately draw edges. They are not allowed to complete a triangle and whoever cannot move is the loser. We study a version of the game with the added restriction that the graph created by the players has prescribed maximal valency.

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Sums of squares and the Leech lattice

Stephen Carl Milne, The Ohio State University

Utilizing classical elliptic function invariants, we first sketch our derivation of several useful new formulas for Ramanujan's τ function. This work includes: the main pair of new formulas for the τ function that "separate" the two terms in the classical formula for the modular discriminant, a generating function form for both of these formulas, a Leech lattice form of one of these formulas, and a triangular numbers form. We then present analogous new formulas for several other classical cusp forms that appear in quadratic forms, sphere-packings, lattices and groups. An additional application to the theory of quadratic forms is also given.

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Juggling sequences with restricted heights

Jon Derek Stadler, Capital University

A juggling function is a bijection f on the integers with the property that $f(t) \geq t$ for all t. To each periodic juggling function, we can associate a finite sequence of integers, called heights. We will discuss a general method for enumerating juggling sequences in which restrictions are placed on these heights, thus addressing an open question recently posed by Graham and Chung. In honor of Steve Milne's birthday, there will be a demonstration of juggling 60.

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On k-splitting families

Xiangqian Zhou, Wright State University

A k-splitting family consists of a set E of size $2k+1$ and a collection $\mathcal{F}$ of k-subsets of E such that (1) two distinct subsets in $\mathcal{F}$ meet by at most $k-2$ elements; and for every $e \in E$, there exists a partition (A, B) of $E \backslash e$ with $A, B \in \mathcal{F}$. We came up with this object when we worked on a matroid theory problem. In this talk, I will show some interesting relationship between k-splitting families and k-connected matroids. This is joint work with James Reid and Haidong Wu.

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Group Theory Abstracts

On Current Conjectures in Block Theory

Ahmad Alghamdi, Umm AlQura University Makkah, Saudi Arabia
& UCSC

Nowadays, much of the research in block theory is devoted to prove conjectures which have been introduced in this field by J. Alperin, E. Dade, M. Broue and G. Robinson. The motivation for such work is to satisfy p-local theory for a prime number p. After a brief introduction, we shall discuss some block theory and then show some examples of these conjectures. In the end, we shall explain a result of a p-block with defect group which is an extra-special p-group of order p^3 and exponent p, for an odd prime number p.

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Groups in which the maximal subgroups of the Sylow subgroups are S-semipermutable

Khaled Al-Sharo, Al al-Bayt University, Jordan & AUM

A subgroup H of a group G is said to be S-semipermutable in G if $HS = SH$ for all Sylow subgroups S of G for which $(|H|, |S|) = 1$. A group G is called an S-group if the maximal subgroups of the Sylow subgroups of G are S-semipermutable in G. The class of of T_0-groups is defined to be the class of all groups G in which $G/\Phi(G)$ is a T -group (Where T -groups are groups in which normality is transitive relation). In this talk we introduce some properties of the S-groups. More precisely, we describe the nilpotent residual of S-groups and establsh a relation between S-groups and T_0 -groups.

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Toric ideals of phylogenetic invariants for the general group-based model on claw trees $K_{1,n}$

Julia Chifman, University of Kentucky

We address the problem of studying the toric ideals of phylogenetic invariants for a general group-based model on an arbitrary claw tree. We focus on the group $\mathbb{Z}_2$ and choose a natural recursive approach that extends to other groups. The study of the lattice associated with each phylogenetic ideal produces a list of circuits that generate the corresponding lattice basis ideal. In addition, we describe *explicitly* a quadratic lexicographic Gröbner basis of the toric ideal of invariants for the claw tree on an arbitrary number of leaves. Combined with a result of Sturmfels and Sullivant, this implies that the phylogenetic ideal of *every* tree for the group $\mathbb{Z}_2$ has a quadratic Gröbner basis.

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Symmetric designs over ternary rings

Clifton Edgar Ealy, Western Michigan University

A symmetric or projective design, D, arises naturally as an incidence structure whose point set is the set of one dimensional subspaces of a finite vector space V and whose block set is the set of hyperplanes of V. If the dimension of V is 3, D is a projective plane. If the dimension of V is at least 4, D is a projective design. In this talk, we will discuss a generalization of projective designs over finite fields.

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Branching Rules for Specht Modules
(joint work with John Murray)

Harald Eric Ellers, Allegheny College

Let Σ_n be the symmetric group of degree n and let F be a field. For any partition λ of n, let S^λ be the corresponding Specht module over F. (When F has characteristic 0, the Specht modules are the simple $F[\Sigma_n]$-modules; when F has finite characteristic p, the heads of the Specht modules corresponding to p-regular partitions are the simple $F[\Sigma_n]$-modules.) We determine the structure of $\mathrm{End}_{\Sigma_{n-1}}(S^\lambda \downarrow_{\Sigma_{n-1}})$ when the characteristic of F is distinct from 2.

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Central Extensions of Divisible Groups by Abelian Groups

Jason Walter Elliot, University of Illinois at Urbana-Champaign

Central extensions are easier to understand than general extensions because the kernel becomes a trivial module for the quotient. In particular, the Universal Coefficient Theorem is helpful, and especially so when the kernel is divisible. Moreover, such extensions are "universal" in the sense that they contain copies of all central extensions. We will consider these extensions when the quotient is abelian.

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Lattice Properties, Normality, and Subnormality in Finite Groups

Arnold D. Feldman, Franklin & Marshall College

Cores and closures help reveal structure and relationships in finite groups. For example, if G is a finite group, M is maximal in G, and C is the normal core of M in G, then G/C is a primitive group. And a subgroup H is normally embedded in G if and only if for each prime p, a Sylow p-subgroup P of H is a Sylow p-subgroup of its normal closure P^G in G. These cores and closures, being defined respectively as joins and intersections of subgroups, have properties stemming from those of the lattice of subgroups of G. Hence it is possible to gain insight about them using concepts from lattice theory. We use these concepts to determine some types of subgroups for which the normal core and the subnormal core coincide.

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Bol-Loops of Odd Prime Exponent

Tuval Foguel, Auburn Montgomery

In this talk we look at Bol-loops of odd prime exponent. We give examples of finite centerless Bol-loops of odd prime exponent; we also show that any finite Bol-loops of odd prime exponent are solvable. We end the paper with a proof of the existents of simple finitely generated infinite Bruck-loops of prime exponent for large primes.

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Sylow's Theorem for finite Moufang loops

Stephen M Gagola III, The University of Arizona

A Moufang loop is a binary system that satisfies a particular weak form of the associative law. We prove that if L is a finite Moufang loop and p is a "Sylow prime" for L so that every p-subloop of L is contained in a Sylow p-subloop of L then the number of Sylow p-subloops of L is congruent to one modulo p. Here p is a Sylow prime for L if $p \nmid \frac{q^2+1}{gcd(q+1,2)}$ for all q for which a composition factor of L is isomorphic to the Paige loop $P(q)$.

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Associativity of the Commutator Operation in Groups

Fernando Guzman, Binghamton University

The study of associativity of the commutator operation in groups goes back to some work of Levi in 1942. In the 1960's Richard J. Thompson created a group F whose elements are representatives of the generalized associative law for an arbitrary binary operation. In 2006, Geoghegan and Guzman proved that a group G is solvable iff the commutator operation in G eventually satisfies ALL instances of the associative law, and also showed that many non-solvable groups do not satisfy any instance of the generalized associative law. We will address the question: Is there a non-solvable group which satisfies SOME instance of the generalized associative law? For finite groups, we prove that the answer is no.

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The Degree of a Minimal Polynomial

Charles S. Holmes, Miami University

The following result is well known for an $n \times n$ matrix A with entries from a field F and having $m(x)$ as its minimal polynomial. Result: If d is the degree of $m(x)$, then $d \leq n$.

The proof of this result usually runs through the Cayley-Hamilton theorem in conjunction with the characteristic polynomial and the determinant. The proof here is independent of the usual proofs. New is always questionable with such classical material, but the proof is more elementary. The definitions of determinant and characteristic polynomial appear long after this result in my next edition of Elementary Linear Algebra with early eigenvalues. I think it interesting and helpful to note that Hans Zassenhaus suggested the broad outlines of this approach to linear algebra.

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Fusions between character tables of groups

Kenneth Walter Johnson, Penn State Abington

(Joint work with S. Humphries). If the character table of a finite group H satisfies certain "magic rectangle" conditions, then the characters and classes can fuse to the character table of a group G of the same order. The general question addressed is: which groups have character tables which fuse from those of abelian groups? The theory is developed in terms of the S-rings of Schur and Wielandt which appeared first in the discussion of pemutation groups with a regular subgroup but later were used in the theory of circulant graphs. We discuss certain classes of p-groups which fuse from abelian groups and give examples of such groups which do not. We also show that a large class of simple groups do not fuse from abelian groups. Examples show that the groups which fuse from abelian groups do not form a variety. There are many open questions such as whether the class of p-groups which fuse from abelian group can be easily described. Some new techniques for S-rings are developed. It is possible to ask related questions such as: which association schemes have character tables which fuse from those of abelian groups? The Camina Pair condition on a group extension appears, and also an extension to a Camina Triple condition where pairs of normal subgroups appear. Our techniques may be relevant to work on circulant graphs.

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On n-Scorza groups

Luise-Charlotte Kappe, Binghamton University

We say a group is an n-Scorza group if it is the union of n proper subgroups and all of its proper homomorphic images are cyclic. It is well known that there are no 2-Scorza groups. According to a 1926 result by Scorza, a group is a 3-Scorza group if and only if it is isomorphic to the Klein Four group. Greco showed that a group is a 4-Scorza group if and only if it is isomorphic to the elementary abelian 3-group of rank 2 or the symmetric group on 3 letters.

In this talk we will give a characterization of the n-Scorza groups in the class of solvable groups as well as a classification of these groups for $n \leq 20$.

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A lower bound for the number of conjugacy classes of finite groups

Thomas Michael Keller, Texas State University

In 2000, L. Héthelyi and B. Külshammer proved that if p is a prime number dividing the order of a finite solvable group G, then G has at least $2\sqrt{p-1}$ conjugacy classes. We will present a recent extension of this result: If p is large, the result remains true for arbitrary finite groups.

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Characterization of Abnormal Subgroups in a Finite Central Product

Dandrielle Cherie Lewis, Binghamton University

A group G is a central product of subgroups U1 and U2 of G provided that G = U1U2 and [U1,U2] = 1. This denition implies that Ui are normal G for i = 1,2 and that U1 intersect U2 is a subgroup of Z(U1)intersect Z(U2). I am currently working on a characterization of the normal, subnormal, pronormal and abnormal subgroups of a central product. In this talk, I will present a characterization of abnormal subgroups in a finite central product.

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Generalizing Camina groups and their character tables

Mark L. Lewis, Kent State University

We generalize the definition of Camina groups. We will show that these nilpotent generalized Camina groups have many of the same properties as nilpotent Camina groups. In addition, we will come up with an algebraic classification of the character tables of these groups. This classification generalizes the classification of the character tables for p-groups whose derived subgroups have order p that was done by Nenciu.

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Capability of semiextraspecial groups. Preliminary Report.

Arturo Magidin, University of Louisiana at Lafayette

A p-group G is extraspecial if and only if $Z(G) = G' \cong Z/pZ$ and G/G' is elementary abelian. A p-group G is *semiextraspecial* if and only if for every maximal subgroup H of $Z(G)$, G/H is extraspecial. Semiextraspecial groups were introduced by Beisiegel, who proved that the rank of G is always even, equal to $2n$, and the rank of G' is at most n. When the rank of G' is equal to n, the group is said to be *ultraspecial*. Among the ultraspecial groups are the p-Sylow subgroups of $\mathrm{SL}(3, p^n)$ and of $\mathrm{SU}(3, p^{2n})$.

A group G is capable if $G \cong K/Z(K)$ for some group K. It has long been known that the only capable extraspecial group is the nonabelian group of order p^3 and exponent p. Moreto proved that if G is capable and semiextraspecial, then it is ultraspecial. I had previously shown that the ultraspecial groups of order p^6 and exponent p are all capable, and will report further recent results regarding the full converse of Moreto's necessary condition.

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Using GAP to Compute Homological Invariants of 2-Generator Non-Torsion Groups of Nilpotency Class Two

Nor Muhainiah Mohd Ali, Universiti Teknologi Malaysia

Let R be the class of 2-generator non-torsion groups of nilpotency class 2. Using their classification and non-abelian tensor squares, we determine certain homological invariants of groups in R, such as the exterior square, the symmetric square and the Schur multiplier. With the help of GAP, we first compute the invariants for some representative groups, then extrapolate from there to obtain invariants in the general case. This is joint work with Luise-Charlotte Kappe and Nor Haniza Sarmin.

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On fixed point sets and Lefschetz modules for sporadic simple groups

Silvia Elena Onofrei, Kansas State University

The reduced Lefschetz modules associated to complexes of distinguished p-subgroups (those subgroups which contain p-central elements in their centers) are investigated. The case when the underlying group G has parabolic characteristic p is analyzed in detail. We determine the nature of the fixed point sets of subgroups of order p. The p-central elements have contractible fixed point sets. Under certain hypotheses, the noncentral p-elements have fixed points which are equivariantly homotopy equivalent to the corresponding complex for a quotient of the centralizer. For the reduced Lefschetz modules, the vertices of the indecomposable summands and the distribution of these summands into the p-blocks of the group ring are related to the fixed point sets. Applications to the sporadic group geometries are discussed. This is joint work with J. Maginnis.

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An Introduction to Transitive and Persistent Subgroups

Joseph Petrillo, Alfred University

Given subgroup properties α and β, a subgroup U of a group G may or may not possess one or both of the following properties:

$\alpha\beta$-transitivity: Every α-subgroup of U is a β-subgroup of G.

$\alpha\beta$-persistence: Every β-subgroup of G in U is an α-subgroup of U.

We will present some elementary results and discuss examples of $\alpha\beta$-transitive and $\alpha\beta$-persistent subgroups for various α and β.

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Strong Sylow Systems and Mutually Permutable Products

Matthew Faran Ragland, Auburn University Montgomery

Hall's theory on finite solvable groups is well known. Every finite solvable group possesses a set of Sylow subgroups, one for each prime, which are pairwise permutable. The converse holds as well. Such a set of Sylows for a group is called a *Sylow basis*. Two subgroups H and K of a finite group G are said to be *mutually permutable* provided the subgroups of K permute with H and the subgroups of H permute with K. A natural question to ask is what kinds of finite solvable groups possess a Sylow Basis for which the subroups are not just pairwise permutable but pairwise mutually permutable. These groups are precisely the finite solvable PST-groups, the groups in which Sylow permutability is a transitive relation. We call such a Sylow basis a *strong Sylow basis*.

Since one can characterize the solvable PST-groups in terms of their Sylow bases and their should be a way to characterize the solvable PST-groups in terms of their system normalizers. Using a recent result of Ballester-Bolinches, Cossey, and Soler-Escriva that says subgroups permuting with all system normalizers of a finite solvable group are necessarily subnormal we can show the following: the finite solvable PST-groups are those finite solvable groups G which can be written as $G = LD$ with L and D Hall subgroups which are mutually permutable, L the nilpotent residual of G, and D a system normalizer of G.

In this talk we discuss these results and others. This is joint work with Jim Beildeman and Hermann Heineken.

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Conjugacy Classes of Subgroups of p-Groups

Jeffrey Riedl, University of Akron

Let p be any prime and let P be a Sylow p-subgroup of the symmetric group of degree p^3.

Thus P is a semidirect product B semi Q where the normal subgroup B is elementary abelian, and where Q is a group of exponent p^2 that is isomorphic to a Sylow p-subgroup of the symmetric group of degree p^3.

Let $\mathcal{H}$ be the set consisting of all subgroups H of P having the property that the group HB/B has exponent p^2.

It is clear that the set $\mathcal{H}$ is a union of conjugacy classes of subgroups of P.

We have made progress in describing some of these conjugacy classes of subgroups and their sizes.

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Groups in which every subgroup is closed in the profinite topology

Derek Scott Robinson, University of Illinois at Urbana-Champaign

A group is called extended residually finite (ERF) if every subgroup is closed in the profinite topology, i.e., is the intersection of subgroups of finite index. We shall describe characterizations of various classes of groups with the ERF property, particularly locally finite groups and FC-groups.

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Defect zero blocks acted on by p-groups for $p \geq 5$

Adam Salminen, University of Evansville

Let p be an odd prime and let k be an algebraically closed field of characteristic p. Suppose that $kGb \cong End_k(V)$ is a defect zero block of kG which is P-stable for some p-group $P \leq Aut(G)$ with $Br_P(b) \neq 0$, then V will be an endo-permutation kP-module. It is conjectured that such a V will always be self-dual. We will show that this conjecture holds for $p \geq 5$.

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Just-non-PT groups

Jack B.A. Schmidt, University of Kentucky

Just-non-PT groups are studied to show that finite PT groups are precisely the finite groups in which subnormal subgroups of defect two are permutable, and are precisely the finite groups in which every normal subgroup is permutable sensitive.

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Groups in which Every Subgroup of the Norm is Normal

Joseph Patrick Smith, AUM

The norm of a group is the intersection of all the normalizer subgroups with in the group. Dedekind groups are groups in which every subgroup is normal. The structure of Dedekind groups are well known. In this talk I seek to to generalize out the idea of Dedekind groups in which every subgroup of the norm is normal.

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Normal zeta functions of some pro-p groups

Ilir Snopce, Binghamton University

Let G be a finitely generated group. Let $a_n(G)$ be the number of subgroups of G of index n and let $a_n^{\triangleleft}(G)$ be the number of normal subgroups of G of index n. The functions

$$\zeta_G(s) = \sum_{n=1}^{\infty} a_n(G) n^{-s},$$

$$\zeta_G^{\triangleleft}(s) = \sum_{n=1}^{\infty} a_n^{\triangleleft}(G) n^{-s}$$

are called the zeta function, respectively the normal zeta function of the group G. In this talk we give an explicit formula for the number of normal subgroups of index p^n in the congruence subgroups of $SL_2(\mathbb{F}_p[[t]])$, and for the normal zeta function associated with the group. Let $\mathcal{Q}^1(s,r)$ be subgroups of the Nottingham group discovered by Ershov. We observe that these groups are isospectral with $SL_2^1(\mathbb{F}_p[[t]])$. This provides us with an infinite family of non-commensurable normally isospectral groups.

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Separability properties of certain 1-relator groups

Francis C. Y. Tang, University of Waterloo

Let S be a subset of a group G. Then G is said to be S-separable if for all x in G§there exists a normal subgroup N of finite index in G such that in G*=G/N, x* is not in S*. !-relator groups form a very interesting class of groups. They include the fundamental groups of orientable and non-orientable surfaces. These groups have very nice separability properties. On the other hand the well-known Baumslag-Solitar groups are quite nasty. They are not even residually finite i.e. 1-separable. In this talk we shall discuss some separability properties of certain 1-relator groups. In particular we show that outer automorphism groups of certain torsion 1-relator groups are residually finite. These results can be generalized to certain 1-relator products of cyclics.

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The Nonabelian Tensor Product of Finite Groups is Finite: A Homology Free Proof

Viji Thomas, Binghamton University

R. Brown and J. L. Loday first introduced the non-abelian tensor product $G \otimes H$ for groups G and H in context with an application in homotopy theory. Let G and H be groups which act on each other via automorphisms and which act on themselves via conjugation. The actions of G and H are said to be compatible, if ${}^{{}^h g}h' = {}^{hgh^{-1}}h'$ and ${}^{{}^g h}g' = {}^{ghg^{-1}}g'$ for all $g, g' \in G$, $h, h' \in H$. The non-abelian tensor product $G \otimes H$ is defined provided G and H act compatibly. In such a case $G \otimes H$ is the group generated by the symbols $g \otimes h$ with relations $gg' \otimes h = ({}^g g' \otimes {}^g h)(g \otimes h)$ and $g \otimes hh' = (g \otimes h)({}^h g \otimes {}^h h')$, where ${}^g g' = gg'g^{-1}$ and ${}^h h' = hh'h^{-1}$. In their 1987 paper, *Some computations of non-abelian tensor products of groups*, Brown, Johnson and Robertson mention eight open problems. The first problem is phrased as follows: Let G and H be finite groups acting compatibly on each other. Then is it true that $G \otimes H$ is finite? In the same year, G. J. Ellis answered the question in the affirmative using homological methods. Brown, Johnson and Robertson add that no purely algebraic proof is known. In this talk I will present a homology free and purely group theoretic proof that the non-abelian tensor product of two finite groups is finite.

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The Brauer-Clifford group and modular representations

Alexandre Turull, University of Florida

Clifford Theory provides well behaved character correspondences between different groups which have isomorphic quotients. Given one such quotient group, and a field F, we define the Brauer-Clifford group. In the case of a field F of characteristic zero, each irreducible character of the original groups gives rise to a specific element of the Brauer-Clifford group. When two characters of different groups yield the same element of the Brauer-Clifford group, we obtain a very well behaved character correspondence between the characters of the different groups, which preserves not only induction, restriction, multiplicities, but also fields of values for the corresponding characters, and Schur indices. In this talk, we explore the modular case, i.e. the case when F has characteristic p for some prime p. We see that irreducible modules over K yield specific elements of an appropriate Brauer-Clifford group, and that equality of the elements of the Brauer-Clifford group for different groups yields an isomorphism of certain categories of modules over K. This generalizes the result for characters described above.

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Certain Normal Subgroups of Complete Groups

Elizabeth Wilcox, Binghamton University

A complete group G is a group with trivial center all of whose automorphisms are inner – thus G is isomorphic to $\mathrm{Aut}(G)$. It is known that any finite group can be embedded subnormally in a finite complete group but none of the current proofs give an estimate on the subnormal length of this embedding. We will discuss a sufficient and necessary condition for a finite group G to be normal in a complete group when $\mathrm{Z}(G) = 1$ and $|G|$ is relatively prime to its index in $\mathrm{Aut}(G)$.

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Orbit Equivalent Permutation Groups

Keyan Yang, Ohio State University

H and G are two finite permutation groups on Ω. If H and G have the same orbits on the power set of Ω, we say H and G are orbit equivalent, $H \equiv G$ on Ω. In this talk, we will look at a special class of 2-step imprimitive permutation groups and determine the orbit equivalent permutation groups pairs in this class.

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Theory of Rings and Modules Abstracts

Locally Finitely Generated Grothendieck Categories and Simple Objects

Toma Albu,
S. Stoilow Institute of Mathematics of the Romanian Academy

A Grothendieck category $\mathcal{C}$ is said to be *locally finitely generated* if the subobject lattice of every object in $\mathcal{C}$ is compactly generated, or equivalently, if $\mathcal{C}$ possesses a family of finitely generated generators. Every nonzero locally finitely generated Grothendieck category possesses simple objects. We shall call a Grothendieck category $\mathcal{C}$ *indecomposable* if $\mathcal{C}$ is not equivalent to a product of nonzero Grothendieck categories $\mathcal{C}_1 \times \mathcal{C}_2$. In this talk an example of an indecomposable non-locally finitely generated Grothendieck category possessing simple objects is presented, answering in the negative a sharper form of a question posed by Albu, Iosif, and Teply in [*J. Algebra*, **284** (2005), 52-79].

The results which will be presented have been obtained jointly with *John van den Berg*.

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Search for Good Linear Codes

Nuh Aydin, Kenyon College

This talk gives an overview of some of the recent search methods that have been successful in finding new linear codes. It also presents a recent search algorithm and the new codes obtained by that algorithm.

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On Parallel Sums and Invariance of Harmonic Mean. Preliminary Report.

Brian Blackwood, Ohio University

The question on the invariance of harmonic mean of two elements in a von Neumann regular ring will be discussed.

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QI modules (joint work with Yiqiang Zhou)

John Dauns, Tulane University

For a right R-module M, let $\sigma[M]$ be the subcategory of Mod-R subgenerated by M. R.Wisbauer defines M to be a **QI-module**, if every quasi-injective module in $\sigma[M]$ is M-injective. The quasi-injective modules in $\sigma[M]$ are identified. The structure of a single QI-module, and the class $\mathcal{K}_q$ of all QI-modules are investigated. Clearly, a semisimple module is QI. It is shown that $\mathcal{K}_q$ is precisely the class of all semisimple R-modules for the following rings : (1) R is right semiartinian; (2) R is a principal ideal domain; (3) R has finitely many maximal right ideals (in particular, if R is local). Those QI-modules N_R are examined which do not contain any nonzero free modules. Some classes of rings R are determined such that every QI-module N does not contain any nonzero free submodules, i.e. if N is QI, then $\nexists\ \ 0 \neq F \leq N$, where F is free. All of the above is joint work with Yiqiang Zhou.

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Constacyclic codes of length p^s over $\mathbb{F}_{p^m} + u\mathbb{F}_{p^m}$

Hai Q. Dinh, Kent State University

All constacyclic codes of length p^s over the finite chain ring $R = \mathbb{F}_{p^m} + u\mathbb{F}_{p^m}$ are studied. The units of the ring R are of the forms γ, and $\alpha + u\beta$, where α, β, γ are nonzero elements of the Galois field $\mathbb{F}_{p^m}$, which provide $p^m(p^m 1)$ such constacyclic codes. First, the structure and Hamming distances of all constacyclic codes of length p^s over the finite field $\mathbb{F}_{p^m}$ are obtained, and used as a tool to establish the structure and Hamming distances of all $(\alpha + u\beta)$-constacyclic codes of length p^s over R. We then classify all γ-constacyclic codes of length p^s over R by categorizing them into 4 types: trivial ideals, principal ideals with nonmonic polynomial generators, principal ideals with monic polynomial generators, and nonprincipal ideals; and we give a detailed structure of ideals in each type. Among other results, we are also able to obtain the number of codewords in each constacyclic code.

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Rings characterized by finendo modules

Nguyen Viet Dung, Ohio University - Zanesville

Following C. Faith, a module M over an associative ring R (with identity) is called *finendo* if M is finitely generated over its endomorphism ring. In this talk, we discuss rings satisfying the property that every right R-module is finendo, and show that if such a ring R is hereditary, then R is of finite representation type. We also show that if R is an arbitrary ring with all right R-modules finendo, then R is a left pure semisimple ring with a right Morita duality and the quotient ring $R/(J(R))^2$ is of finite representation type. (This is joint work with José Luis García).

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A weaker form of p-injectivity

Dinh Hai Hoang, Mahidol University

Let R be a ring. A right R-module N is called an M-p-injective module if any homomorphism from an M-cyclic submodule of M can be extended to M. In this paper, we introduce and investigate the class of M-rp-injective modules and M-lp-injective modules, and prove that for a finitely generated Kasch module M, if M is quasi-rp-injective, then there is a bijection between the class of maximal submodules of M and the class of minimal left right ideals of its endomorphism ring S. As an application, if the ring R is right Kasch, right self rp-injective, then there is a bijection between the class of maximal right ideals and the class of minimal left ideals.

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Characterizations of some rings with chain conditions

Dinh Van Huynh, Ohio University

A module M is called a CS-module if every submodule of M is essential in a direct summand. We will use this condition and its generalizations to characterize noetherian rings and QF-rings.

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Lie Regular Units - Preliminary Report

Pramod Kanwar, Ohio University

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Some characterizations of QF-rings via injectivity and small injectivity

Thuyet Van Le, Hue University & Ohio University

A ring R is QF if R is a right or left self-injective ring satisfying ACC on right annihilators. A right R-module M_R is called *small injective* if every homomorphism from a small right ideal to M_R can be extended to a R-homomorphism from R_R to M_R and a ring R is called right small injective, if R_R is small injective. Some characterizations of QF-rings were obtained, e.g., a ring R is QF iff R is right small injective and has a finitely generated essential right socle. We also prove that if every simple right (resp., left) R-module is small injective, then R is semiprimitive. We also have: The Jacobson radical J of a ring R is noetherian as a right R-module iff $E^{(\mathbb{N})}$ is small injective for every small injective module E_R.

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Rickart Modules (Preliminary Report)

Gangyong Lee, The Ohio State University

A module M_R is called a *Rickart module* if the right annihilator in M of a principal left ideal of S is generated by an idempotent in S. This concept provides a generalization of a right PP ring to the general module theoretic setting. It is clear that every Baer module (and ring) is Rickart module while the converse is not true. For example, $\mathbb{Z}^{(\mathbb{N})}$ is Rickart but not Baer as a $\mathbb{Z}$-module. We will obtain characterizations of Rickart modules and discuss various properties. In particular connections between a Rickart module and its endomorphism ring will be presented. For example, M is a Rickart module iff S is a right Rickart ring and M is principal-retractable.

(This is joint work with S. Tariq Rizvi and Cosmin Roman.)

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Connections between various generalizations of the concept of cyclicity of codes

Sergio Roberto Lopez-Permouth, Ohio University

Cyclic codes play a central role in Coding Theory. Some of the most important codes, such as Reed-Solomon and BCH codes for example, are cyclic. For this reason, generalizations of the concept of cyclicity have surfaced frequently in the literature. One such a generalization, the concept of a consta-cyclic code extends further in a natural way to the concept of a polynomial code. Recently, our group has considered a different type of generalization, the so-called sequential codes. In this talk we explore some surprising connections between these various generalizations. (This talk is based on an ongoing collaboration with Benigno Parra-Avila and Steve Szabo.)

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Minimal extensions of rings

Zak Mesyan, USC

A ring S is said to be a minimal extension of a ring R if R is a subring of S and there are no subrings strictly between R and S. I will discuss minimal extensions of an arbitrary ring R, with particular focus on those possessing a nonzero ideal that intersects R trivially. I will also give a classification of all minimal extensions of prime rings. This is joint work with Tom Dorsey, and it generalizes results of Dobbs, Dobbs-Shapiro, and Ferrand-Olivier for commutative rings.

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Quasi-Baer Ring Hulls and Factor Rings of Quasi-Baer Rings by Prime Radicals

Jae Keol Park, Busan National University, South Korea

We discuss quasi-Baer and FI-extending ring hulls. When a ring R is semiprime, we show that the existence of the quasi-Baer ring hull and the FI-extending ring hull. Also we establish their structures for a certain semiprime ring. Further, FI-extending module hulls are discussed for finitely generated projective modules over semiprime rings. Applications to C^*-algebras are considered.

The quasi-Baer condition of $R/P(R)$ is provided when R is a quasi-Baer ring, where $P(R)$ is the prime radical of R. We give an example of a quasi-Baer ring R such that $R/P(R)$ is not quasi-Baer. When $P(R)$ is nilpotent, we prove that if R is a quasi-Baer (resp., Baer) ring, then $R/P(R)$ is quasi-Baer (resp., Baer).

Examples which illustrate and delimit results are also discussed. (These are joint works with Gary F. Birkenmeier, Jin Yong Kim, and S. Tariq Rizvi).

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Rational Power Series and Periodicity of Sequences

Benigno R Parra, Ohio University

It is quite familiar that the real numbers whose decimal expansion is periodic are precisely the rational numbers. If we assume that R is a commutative ring, it is also straightforward to see that a power series f in $R[[x]]$ with periodic coefficients is rational. Now an immediate question is when the converse holds. In this talk we show that periodicity and rationality are equivalent if and only if R is an integral extension of Z_m.. If F is a field, then we also prove the equivalence between two versions of rationality in $F[[x_1, \ldots, x_n]]$. Finally we extend Kronecker's criterion for rationality in $F[[x]]$ to $F[[x_1, \ldots, x_n]]$.

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Definable subcategories of modules

Philipp S Rothmaler, CUNY

Full subcategories of the category of all (say, left) modules over an arbitrary ring whose object classes are closed under direct limit, direct product and pure substructure were called definable by Crawley-Boevey. I will report on some joint results with Ivo Herzog on such subcategories.

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Weighted Grothendieck groups

Hans Schoutens, City University of New York

Grothendieck groups and rings may come in many guises: as the K_0-theory of projective modules, as the Grothendieck ring of varieties over a field, as the Euler characteristic in Euclidean topology, etc. In most cases, however, they are insensitive to the finer structure (like torsion, nilpotents, etc.). By introducing a weighted version, I will show that in the module case, we can counteract unwanted cancellation, leading to interesting new invariants of a ring or a scheme.

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Finiteness conditions on Leavitt path algebra

Mercedes Siles Molina, Universidad de Malaga

Leavitt path algebras of row-finite graphs have being introduced very recently. They are the algebraic relatives of graph C*-algebras and provide us with examples of rings whose algebraic structure is determined by highly visual properties of the underlying graph. In this talk we will introduce Leavitt path algebras and will give classification theorems for those which satisfy certain finiteness conditions (such as being finite or left artinian).

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