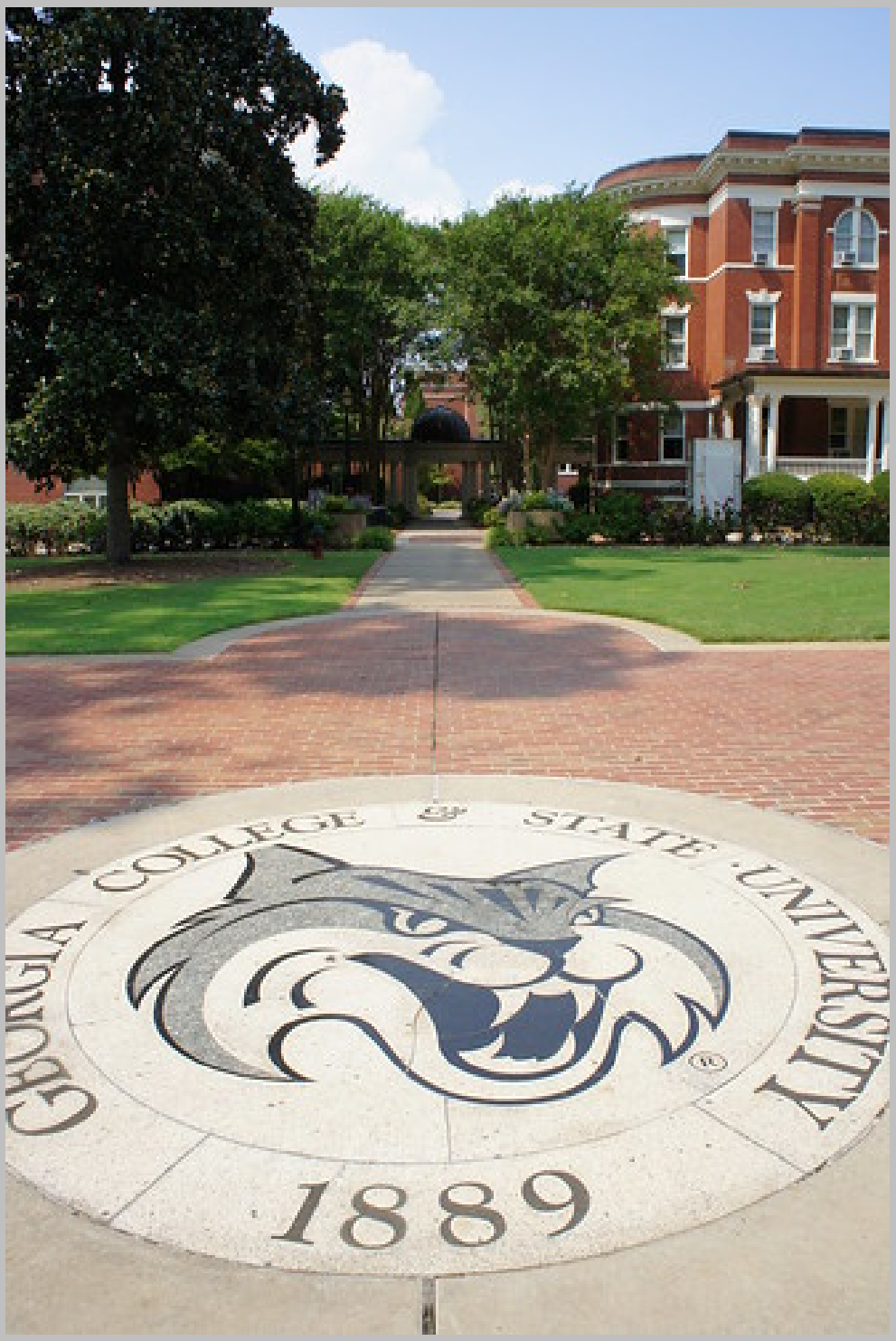
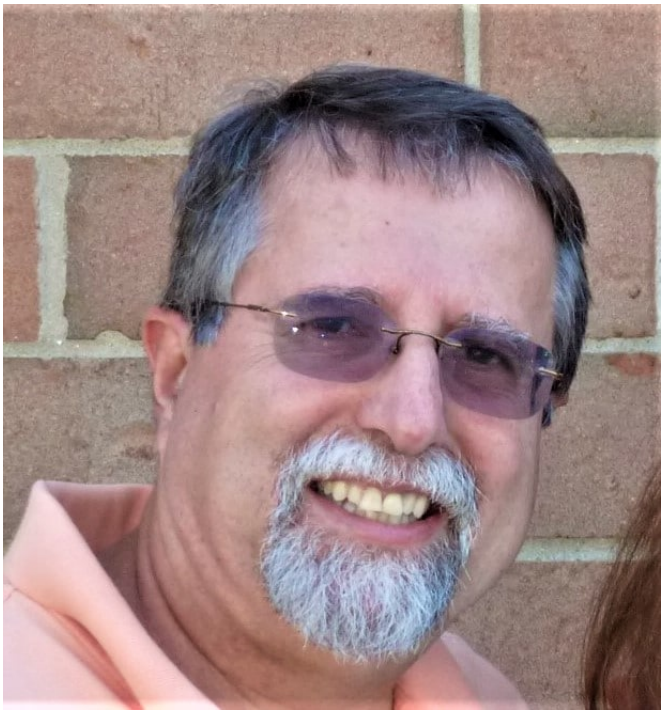
# PROGRAM

**Southern Regional Algebra Conference (SRAC 2022)**
Milledgeville, Georgia, USA
March 18 - 20, 2022



Dedicated to the Memory of **Professor Anthony Giovannitti** who passed away on January 29, 2022.

Tony was a longtime participant and a former organizer of this conference



Tony received his BA degree from Gannon University and his Ph.D. in Mathematics from New Mexico State University. In 2018, Tony retired from Clayton State University (CSU) where he had worked for 14 years as Professor of Mathematics, Chair/Department Head of Mathematics, and Interim Dean of the College of Information and Mathematical Sciences. Prior to working at CSU, Tony taught at the University of West Georgia, the University of Southern Mississippi, Cal State – Long Beach, and New Mexico State University. He loved teaching mathematics, even as his career took him into administration.

Below is the webpage address for Professor Anthony Giovannitti Obituary.

https://georgiacremation.com/obituary/anthony$_g$*iovannitti*/

**Organizing Committee**

Prof. Robert Blumenthal (Dept. Chair)
Dr. Guy R. Biyogmam
Dr. Simplice Tchamna
Fran Sanford (Admin. Asst.)

Georgia College Department of Mathematics website
https://www.gcsu.edu/artsandsciences/math

University website
https://www.gcsu.edu/

University physical address
231 West Hancock Street, Milledgeville, GA 31061

**List of Participants**

1. Mehsin Jabel Atteya* (College of Education, Al-Mustansiriyah University).
2. Ayman Badawi* (American University of Sharjah).
3. Irfan Bagci* (University of North Georgia).
4. Gary F Birkenmeier* (University of Louisiana at Lafayette)
5. Guy Roger Biyogmam* (Georgia College & State University)
6. Mahir Bilen Can* (Tulane University).
7. Marcela Chiorescu (Georgia College).
8. William Cocke* (Augusta University).
9. Michael DiPasquale* (University of South Alabama).
10. Henry Chimal-Dzul* (Institute of Mathematics, University of Zurich).
11. Ihechukwu Chinyere* (University of Essex).
12. Shitu Fawaz Jimoh*(New Mexico State University)
13. Jorg Feldvoss* (University of South Alabama).
14. Franklin Fondjo Fotou (Langston University)
15. Vicky Fondjo (Langston University)
16. Olivier Heubo-Kwegna* (Saginaw Valley State University).
17. Garrett Johnson* (North Carolina Central University).
18. Drew Lewis* (University of South Alabama).
19. Justin Lynd* (University of Louisiana at Lafayette).
20. Shiji Lyu* (Princeton University).
21. Dipendranath Mahato (Tulane University ).
22. Sam McCrosson* (Montana State University).
23. Nestor Diaz Morera (Tulane University ).
24. Kent Neuerburg* (Southeastern Louisiana University).
25. Jean B Nganou* (University of Houston-Downtown)
26. Bach Nguyen* (Xavier University of Louisiana).
27. Jared Painter* (University of North Alabama).
28. Lokendra Paudel* (University of South Carolina - Salkehatchie).

29. Cornelis Pillen* (University of South Alabama).
30. Hesam Safa* (University of Bojnord, Iran)
31. Naufil Sakran (Tulane University).
32. Sunandini Sen (Texas State University).
33. Fouzia Shaheen* (United Arab Emirates University, UAE).
34. Tin-Yau Tam (University of Nevada, Reno)
35. Simplice Tchamna* (Georgia College & State University)
36. Luis Gabriel Rodríguez Valdés* (National Autonomous University of Mexico).
37. Jose A. Velez-Marulanda* (Valdosta State University).
38. Eunkyung You (Abraham Baldwin Agricultural College).
39. Arik Wilbert* (University of South Alabama).

Presenter*

**SCHEDULE OF PRESENTATIONS**
**Time Zone: Eastern Standard Time (EST)**

**Friday, March 18 2022**

Afternoon

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**Arts & Sciences Building: Room 272**

| | |
|---|---|
| 12:30 pm -1:10 pm | Registration |
| 1:15 pm - 1:25 pm | Opening remarks |
| 1:30 pm - 1:55 pm | Shiji Lyu: *Permanence properties of splinters via ultraproduct* |
| 2:00 pm - 2:25 pm | William Cocke: *Group Theoretic Model Repair* |
| 2:30 pm - 2:55 pm | Lokendra Paudel: *On Maximal non-Manis Extensions* |
| | **Coffee Break** |
| 3:05 pm - 3:35 pm | Simplice Tchamna: *Some properties of star operations on ring extensions* |
| 3:40 pm - 4:15 pm | Olivier Heubo-Kwegna: *Kronecker Function Rings and Generalizations* |
| 4:20 pm - 4:45 pm | Jean Bernard Nganou: *Radically principal MV-algebras* |
| 6:00 pm - | Dinner: Maxwell Student Union (University Banquet Room) |

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**Saturday, March 19 2022**

Morning

| **Concurrent session** | **Arts and Sciences Building: Room 272** |
|---|---|
| 8:00 am - 8:25 am | Irfan Bagci: *On map algebras of Lie superalgebras* |
| 8:30 am - 8:55 am | Guy Roger Biyogmam: *A study of prime Ideals in Leibniz algebras* |
| 9:00 am - 9:25 am | Jorg Feldvoss: *Tensor Products of Leibniz Bimodules* |
| | **Coffee Break** |
| 10:00 am - 10:25 am | Garret Johnson: *On automorphisms of quantum Schubert cell algebras* |
| 10:30 am - 10:55 am | Kent Neuerburg: *Exponent-Preserving Groups* |
| 11:00 am - 11:25 am | Justin Lynd: *Finite groups as internal automorphism groups* |

| **Concurrent session** | **Arts and Sciences Building: Room 275** |
|---|---|
| 8:00 am - 8:25 am | Fouzia Shaheen: *On the projections and unitary groups of $C^*$-algebras* |
| 8:30 am - 8:55 am | Bach Nguyen: *Root of Unity Quantum Cluster Algebra, Poisson Order and Representation Theory* |
| 9:00 am - 9:25 am | Jose A. Velez-Marulanda: *Singular equivalences of Morita type with level, Gorenstein algebras, and universal deformation rings* |
| | **Coffee Break** |
| 10:00 am - 10:25 am | Mahir Bilen: *The nilpotent variety of an asymptotic semigroup* |
| 10:30 am - 10:55 am | Cornelis Pillen: Counterexamples to the tilting module conjecture and Weyl modules without p-Weyl filtrations |
| 11:00 am - 11:25 am | Gary F. Birkenmeier: *Primitive rings with s.Baer, s.Rickart, or related modules* |

**Saturday, March 19 2022**

Afternoon
**Zoom Session**

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**Arts and Sciences building: Room 275**

| | |
|---|---|
| 1:00 pm - 1:25 pm | Meshin Jabel Atteya: *Multiplicative (Generalized)-Derivations of Associative Rings* |
| 1:30 pm - 1:55 pm | Ayman Badawi: *On n-zerodivisor graph of a commutative semigroup* |
| 2:00 pm - 2:25 pm | Henry Chimal-Dzul: *Commutative polynomial rings which are principal ideal rings* |
| | **Coffee Break** |
| 3:00 pm - 3:25 pm | Luis Gabriel Rodríguez: *Homological theory of k-idempotent ideals in dualizing varieties* |
| 3:30 pm - 3:55 pm | Ihechukwu Chinyere: *Perfect Prischepov groups* |
| 4:00 pm - 4:25 pm | Hesam Safa: *Upper bounds on the dimension of multipliers of Lie superalgebras* |
| 6:00 pm - | Dinner: Maxwell Student Union (University Banquet Room) |

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**Sunday, March 20 2022**

Morning

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| | |
|---|---|
| | **Arts and Sciences Building: Room 272** |
| 8:00 am - 8:25 am | Michael DiPasquale: *Parallel drawings and the Jacobian of a line arrangement* |
| 8:30 am - 8:55 am | Drew Lewis: *A unified approach to embeddings of $C$ in $C^3$* |
| 9:00 am - 9:25 am | Sam McCrosson: *Sheaves on Quotients of Manifolds* |
| | **Coffee Break** |
| 10:00 am - 10:25 am | Jared Painter: *Realizability of $H(p,q)$ for Trivariate Monomial Ideals* |
| 10:30 am - 10:55 am | Arik Wilbert: *Real Springer fibers and odd arc algebras* |
| 11:00 am - 11:25 am | Shitu Fawaz Jimoh: *Leibniz Cohomology with Adjoint Coefficients* |
| 11:30 am - 11:45 am | Closing Remark and choice of the next hosting institution |

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## ABSTRACTS

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*Zoom presentation Room 272*
*March 19: 1:00 pm - 1:25 pm*

### Multiplicative (Generalized)-Derivations of Associative Rings

Mehsin Jabel Atteya
Department of Mathematics, College of Education, Al-Mustansiriyah University

Through the last two decades, the commutativity of associative rings with derivations have become one of the focus points of several authors and significant work has been done in this direction. Ring theory is a show-piece of mathematical unification, bringing together several branches of the subject and creating a powerful machine for the study of problems of considerable historical and mathematical importance. The study of derivation was initiated during the 1950s and 1960s. A map $d : RR$ is called a derivation if $d(x + y) = d(x) + d(y)$ and $d(xy) = d(x)y + xd(y)$ for all $x, y \in R$. An additive mapping $D : R \to R$ is called a generalized derivation if there exists a derivation d of $R$ such that $D(xy) = D(x)y + xd(y)$ holds for all $x, y \in R$. Accordingly, a mapping $F : R \to R$ (not necessarily additive) is called multiplicative (generalized)-derivation associated with a map $d : R \to R$ (not necessarily additive nor a derivation) if $D(xy) = D(x)y + xd(y)$ for all $x, y \in R$. The idea of such mappings was introduced by Daif [1] inspired by the work of Martindale [2]. For a positive integer $n(x) > 1$ such that $d^{n(x)}(x) = 0$ for all $x \in R$, the mapping $d : R \to R$ is called a zero-power valued on $R$. The main purpose of this paper is to study multiplicative (generalized)-derivations with zero-power valued on prime and semiprime rings. Precisely, we prove the commutativity of a ring $R$ which satisfied certain conditions These results are in the sprite of the well-known theorem of the commutativity of prime and semiprime rings with derivations satisfying certain polynomial constraints.

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*Zoom presentation Room 272*
*March 19: 1:30 pm - 1:55 pm*

### On n-zerodivisor graph of a commutative semigroup

Ayman Badawi
American University of Sharjah

Joint work with David F. Anderson

Let $S$ be a (multiplicative) commutative semigroup with 0, $Z(S)$ the set of zero-divisors of $S$, and $n$ a positive integer. The *zero-divisor graph* of $S$ is the (simple) graph $\Gamma(S)$ with vertices $Z(S)^* = Z(S) \setminus \{0\}$, and distinct vertices $x$ and $y$ are adjacent if and only if $xy = 0$. In this paper, we introduce and study the *n-zero-divisor graph* of $S$ as the (simple) graph $\Gamma_n(S)$ with vertices $Z_n(S)^* = \{x^n \mid x \in Z(S)\} \setminus \{0\}$, and distinct vertices $x$ and $y$ are adjacent if and only if $xy = 0$. Thus each $\Gamma_n(S)$ is an induced subgraph of $\Gamma(S) = \Gamma_1(S)$. We pay particular attention to $diam(\Gamma_n(S))$, $gr(\Gamma_n(S))$, and the case

when $S$ is a commutative ring with $1 \neq 0$. We also consider several other types of "n-zero-divisor" graphs and commutative rings such that some power of every element (or zero-divisor) is idempotent.

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*Room 272*
*March 19: 8:00 am - 8:25 am*

**On map algebras of Lie superalgebras**

Irfan Bagci
University of North Georgia

Given a Lie superalgebra $\mathfrak{g}$ over $\mathbb{C}$ and an associative, commutative $\mathbb{C}$-algebra $A$ with unit, a Lie superalgebra of the form $\mathfrak{g} \otimes_{\mathbb{C}} A$ is known as a map superalgebra. Map superalgebras generalize important classes of Lie superalgebras, such as, loop superalgebras (where $A = \mathbb{C}[t^{\pm 1}]$), and current superalgebras (where $A = \mathbb{C}[t]$). Recently I have improved some of my earlier results on simple modules of map algebras of Cartan type Lie superalgebras. In this talk i will give a brief summary of these improvements.

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*Room 275*
*March 19: 11:00 am - 11:25 am*

**Primitive rings with s.Baer, s.Rickart, or related modules**

Gary F Birkenmeier
University of Louisiana at Lafayette

In this talk, we will characterize various types of right primitive rings in terms of modules satisfying the following conditions: Let $M$ be a unital right $R$-module over and associative ring R with unity.
1. $M$ is called "s.Baer (s.Rickart" if for each nonempty subset $X$ (resp., singleton subset $x$) of $M$, there exists $e = e^2$ in $R$ such that $r_R(X)$ (resp., $r_R(x)) = eR$, where $r_R(-)$ is the right annihilator of $-$ in $R$.
2. $M$ is called "quasi-s.Baer (resp., $p.q.$-s.Baer)" if for each submodule $X$ (resp., cyclic submodule $xR$) of $M$, there exists $e = e^2$ in $R$ such that $r_R(X)$ (resp., $r_R(xR)) = eR$.

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*Room 272*
*March 19: 8:30 am - 8:55 am*

**A study of prime Ideals in Leibniz algebras**

Guy Roger Biyogmam
Georgia College & State University

Leibniz algebras are non commutative Lie algebras. In this talk, We will discuss the notions of prime and semi-prime ideals in Leibniz algebras and the interrelation of these notions with maximal ideals, irreducible ideals and solvable radicals. We will also present necessary and sufficient conditions for a maximal ideal of a Leibniz algebra to be a prime ideal. Other classical results related to prime ideals of some structures such as rings will also be discussed.

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*Room 275*
*March 19: 10:00 am - 10:25 am*

**The Nilpotent Variety of an Asymptotic Semigroup**

Mahir Bilen Can
Tulane University

In this talk, we will show that the top dimensional homology of the nilpotent variety of an asymptotic semigroup affords a permutation representation of the Weyl group.

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*Zoom presentation Room 272*
*March 19: 2:00 pm - 2:25 pm*

**Commutative polynomial rings which are principal ideal rings**

Henry Chimal-Dzul
Institute of Mathematics, University of Zurich

A first exposure to the theory of rings almost certainly involves a study of various examples of principal ideal rings (PIRs). Often, the integers $\mathbb{Z}$, the polynomial ring $K[x]$, and more generally, any Euclidean domain, are the most common examples. However, $K[x]$ is the only example that we would have come across of a commutative polynomial ring that is a PIR. This remark brings the discussion of when a commutative polynomial ring is a PIR. In this work, we present –among other results– a complete answer to this topic.

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*Zoom presentation Room 272*
*March 19: 3:30 pm - 3:55 pm*

**Perfect Prischepov groups**

Ihechukwu Chinyere
University of Essex

In an article published with Journal of Group Theory
(see https://www.degruyter.com/document/doi/10.1515/jgth-2018-0032/html)
Williams conjectured that a certain cyclically presented group denoted by $H(r, n, s)$ has trivial abelianisation if and only if $r$ or $s$ is divisible by $n$. This conjecture is stated as a group-theoretic problem, but it is in fact not so. In linear algebra it is a question about when a certain family of circulant matrices have determinant $\pm 1$, and in ring theory it is a question about when a certain family of elements in the quotient ring $Z[t]/(t^n - 1)$ are invertible. In a joint work with Dr Bainson, we gave a proof of this conjecture. In my talk I will describe the ideas that go into our proof and mention a more general version of the conjecture which is still open. Our paper has been published by Journal of Algebra (see ttps://doi.org/10.1016/j.jalgebra.2021.09.005) .

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*Room 272*
*March 20: 2:00 pm - 2:25 pm*

**Group Theoretic Model Repair**

William Cocke
Augusta University

Joint work with Paul Attie

Model checking is the formal verification that a system (or program) satisfies certain properties. Model repair of a given model and formula is the identification of a submodel that satisfies the formula. In many cases the symmetry of the model can be used to computational reduce the cost of model checking and model repair. We will demonstrate some of the benefits of group theoretic model repair. We will also compare group theoretic model repair with repair by abstraction.

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*Room 272*
*March 20: 8:00 am - 8:25 am*

**Parallel drawings and the Jacobian of a line arrangement**

Michael DiPasquale
University of South Alabama

This is joint work with Jessica Sidman and Will Traves

This talk is about ongoing work connected to Terao's conjecture for line arrangements, which hypothesizes a tight connection between the combinatorics of a line arrangement in the projective plane and the structure of its Jacobian ideal (which describes the singular locus of the line arrangement). We show that the vector space of *parallel drawings* of a line arrangement is isomorphic to a vector space of certain syzygies of maximal degree of the Jacobian. In the theory of rigid planar frameworks the set of 'special positions' where the space of parallel drawings jumps up higher than expected is well-studied. From this we obtain a large body of examples, generalizing an example of Ziegler, where the structure of the minimal free resolution of the Jacobian ideal changes even though the combinatorics of the line arrangement stays fixed. There will be many examples.

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*Room 272*
*March 20: 11:00 am - 11:25 am*

**Leibniz Cohomology with Adjoint Coefficients**

Shitu Fawaz Jimoh
New Mexico State University

With the Poincaré group $\mathbf{R}^{3,\,1} \rtimes O(3,\,1)$ as the model of departure, we focus, for $n = p+q$, $p + q \geq 4$, on the affine indefinite orthogonal group $\mathbf{R}^{p,q} \rtimes SO(p,\,q)$. Denote by $\mathfrak{h}_{p,\,q}$ the Lie algebra of the affine indefinite orthogonal group. We compute the Leibniz cohomology of $\mathfrak{h}_{p,\,q}$ with adjoint coefficients, written $HL^*(\mathfrak{h}_{p,\,q};\,\mathfrak{h}_{p,\,q})$. We calculate several indefinite orthogonal invariants, and $\mathfrak{h}_{p,\,q}$-invariants and provide the Leibniz cohomology in terms of these invariants.

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*Room 272*
*March 19: 9:00 am - 9:25 am*

**Tensor Products of Leibniz Bimodules**

Jorg Feldvoss
University of South Alabama

Joint work with Friedrich Wagemann.

Leibniz algebras were introduced by Bloh and Loday as non-commutative analogues of Lie algebras. Many results for modules over Lie algebras have been proven to hold for bimodules over Leibniz algebras, but there are also several results that are not true in this more general context.

Let $\mathfrak{L}$ be a (left) Leibniz algebra. In general, the tensor product $M \otimes N$ of two $\mathfrak{L}$-bimodules $M$ and $N$ is not an $\mathfrak{L}$-bimodule, but by dividing out a certain subspace of $M \otimes N$ that is invariant under the left and right $\mathfrak{L}$-actions one obtains again an $\mathfrak{L}$-bimodule (which we call the truncated tensor product of $M$ and $N$). In many cases, but not always, such a truncated tensor product is non-zero. In my talk I will report on some structural properties of truncated tensor products of Leibniz bimodules.

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*Zoom Room 275*
*March 18: 3:40 pm - 4:15 pm*

**Kronecker Function Rings and Generalizations**

Olivier Heubo-Kwegna

Saginaw Valley State University

The generalization of the notion of a Kronecker function ring started with Krull in 1936 with the introduction of e.a.b. (*endlich arithmetisch brauchbar*) star operations. Recently in 2001, two generalizations of the concept of Kronecker function rings were proposed: one by F. Halter-Koch, and the other by M. Fontana and K.A. Loper. Halter-Koch's construction starts from an axiomatization of two properties of the classical Kronecker function ring, whilst the Fontana-Loper approach uses semistar operations.
In 2012, A. Fabbri and O.A. Heubo-Kwegna introduced the notion of projective star operations on polynomial rings and showed that the projective Kronecker function ring built from the projective star operations is an example of Halter-Koch's generalization of Kronecker function ring. An open problem is to generalize this notion of projective star operations on polynomial rings to the more general context of graded rings.

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*Room 272*
*March 19: 10:00 am - 10:25 am*

**On automorphisms of quantum Schubert cell algebras**

Garrett Johnson
North Carolina Central University

Joint work with Hayk Melikyan

We study the automorphism groups of quantum Schubert cell algebras, with a focus on quantized nilradicals of parabolic subalgebras of complex simple Lie algebras

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*Room 272*
*March 19: 10:30 am - 10:55 am*

**Exponent-Preserving Groups**

Kent Neuerburg

Southeastern Louisiana University

Joint work with
G. Alan Cannon and Gary Walls

The concept of an exponent-preserving (EP) group, G, is defined and is used to study the simplicity of $M_E(G)$ where $E = G$ in the case that $G$ has a cyclic Sylow $p$-subgroup.

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*Room 272*
*March 20: 8:30 am - 8:55 am*

**A unified approach to embeddings of $C$ in $C^3$**

Drew Lewis

University of South Alabama

An important open question in affine algebraic geometry is whether every embedding of $\mathbb{C}$ in $\mathbb{C}^3$ can be rectified. Several partial results for special cases have been proven over the years using various techniques. We present a general technique for showing embeddings are rectifiable, which we use to recover all known partial results, as well as generalize some of them.

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*Room 272*
*March 19: 11:00 am - 11:25 am*

**Finite groups as internal automorphism groups**

Justin Lynd

University of Louisiana at Lafayette

Joint work with Sylvia Bayard

Not every finite group is realizable as the group of automorphisms of a finite group. On the other hand, if $A$ is a finite group, then it is easy to realize it as an *internal* automorphism group $\mathrm{Aut}_G(U) = N_G(U)/C_G(U)$ of a subgroup $U$ of a finite group $G$: just represent $A$ faithfully on an elementary abelian $p$-group $U$ and then let $G$ be the semidirect product of $U$ by $A$. In this case, $U$ is normal in $G$. By contrast, we show how it is possible to realize $A$ as an internal automorphism group even when $U$ is very far from being normal in $G$. Our construction relies on methods from fusion systems on arbitrary finite groups and brings up further natural questions

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*Room 272*
*March 18: 1:30 pm - 1:55 pm*

**Permanence properties of splinters via ultraproduct**

Shiji Lyu

Princeton University

A Noetherian ring is called a splinter if it is a direct summand of every finite cover. We show that for a regular map $A \to B$ of Noetherian rings where $A$ is a G-ring and contains a field, if $A$ is a splinter then so is $B$. In mixed characteristics we show that for a regular local map $A \to B$ of Noetherian local rings where $A$ is a G-ring and $\dim A = \dim B$, if $A$ is a splinter then so is $B$. We also study the splinter property of non-Noetherian rings to the extent necessary for our main results.

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*Room 272*
*March 20: 9:00 am - 9:25 am*

**Sheaves on Quotients of Manifolds**

Sam McCrosson
Montana State University

Joint work with David Ayala

It is a well known fact that, for a connected manifold $X$ with basepoint $x_0$, the category of $\pi_1(X, x_0)$-sets is equivalent to the category of locally constant sheaves on $X$. This result has already been generalized by MacPherson (1986) and Truemann (2007), but in all new work between advisor David Ayala and student Sam McCrosson, we are given a new and exciting treatment of a variation of the problem using the novel categorical construction of subdivisions. Techniques from algebra, topology, and category theory come together in this thrilling exploration of the structure and topology of manifolds equipped with an action from a finite group.

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*Room 272*
*March 18: 4:20 pm - 4:45 pm*

**Radically principal MV-algebras**

Jean B Nganou
University of Houston-Downtown

Joint work with Olivier Heubo-Kwegna

An MV-algebra $A$ is radically principal if every prime ideal $P$ of $A$ is radically principal, i.e., there exists a principal ideal $I$ of $A$ such that Rad($P$)=Rad($I$). We investigate radically principal MV-algebras and provide some characterizations as well as some classes of examples. We prove a Cohen-like theorem, precisely, an MV-algebra is radically principal if and only if every maximal ideal is radically principal. It is also shown that the radically principal hyperarchemedian MV-algebras are the weakly finite ones and the radically principal Boolean algebras are the finite ones. Radically principal MV-algebras are also studied from the perspective of lattice-ordered groups.

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*Room 275*
*March 19: 8:30 am - 8:55 am*

**Root of Unity Quantum Cluster Algebra, Poisson Order and Representation Theory**

Bach Nguyen
Xavier University of Louisiana

joint work with Kurt Trampel and Milen Yakimov.

The theory of (quantum) cluster algebra has major influences in many areas of mathematics such as algebraic geometry, Lie theory, representation theory of algebras, combinatorics, and mathematical physics. Recently, the notion of root of unity quantum cluster algebras was introduced and it provides new approaches for studying problems in classical cluster theory and also bridging independent research areas together. In this talk, we will give a quick introduction to (quantum) cluster algebra and root of unity quantum cluster algebra and survey some recent results on root of unity quantum cluster algebras. We will also show that root of unity quantum cluster algebras have canonical structures of Poisson orders which play a fundamental role in the representation theory of quantum groups at roots of unity.

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*Room 272*
*March 20: 10:00 am - 10:25 am*

**Realizability of $H(p, q)$ for Trivariate Monomial Ideals**

Jared Painter
University of North Alabama

Joint work with Diego Garzon Alvarado

We will explore the existence of specific Koszul structures for $R = S/I$, where $S = \Bbbk[x, y, z]$ and $I$ is a monomial ideal. Christensen, Veliche, and Weyman determined strong restrictions for the values $p$ and $q$ could take on in the most diverse of the Koszul classes, $\mathbf{H}(p, q)$. These bounds depend on the rank of the first and last free modules in the minimal free resolution of the given ring. We have further restricted these bounds for trivariate monomial ideals, when $R$ is perfect, in terms of only the number of minimal generators of $I$. The construction of these bounds is combinatorial in nature and relies on properties of the planar graph that corresponds to the minimal free resolution of $R$. In this talk we will show that all values for $p$ and $q$ within certain bounds can be achieved from trivariate monomial ideals.

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*Room 272*
*March 18: 3:05 pm - 3:35 pm*

**On Maximal non-Manis Extensions**

Lokendra Paudel
University of South Carolina - Salkehatchie

Joint work with Simplice Tchamna

Let $R$ be a commutative ring with unity. A ring extension $R \subseteq S$ is said to be maximal non-Manis if $R$ is not a Manis subring of $S$ and each proper $S$-overring of $R$ is a Manis subring of $S$. In this talk, we will discuss some properties and examples of maximal non-Manis extensions.

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*Room 275*
*March 19: 10:30 am - 10:55 am*

**Counterexamples to the tilting module conjecture and Weyl modules without p-Weyl filtrations**

Cornelis Pillen
University of South Alabama)

Joint work with Chris Bendel, Dan Nakano and Paul Sobaje

Recently the authors found a projective indecomposable module for the Frobenius kernel of the simple algebraic group of type $G_2$ in characteristic 2 that is not the restriction of an indecomposable tilting module. This yields a counterexample to Donkin's longstanding Tilting Module Conjecture (TMC). In this talk we discuss techniques that give rise to infinite families of counterexamples to the TMC. Such counterexamples can be found for all groups other than those with root systems of type $A_n$ or $B_2$. For the same groups, we produce families of Weyl module that do not afford Weyl $p$-filtrations, thereby providing a negative answer to a question raised by Jantzen in 1980.

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*Room 275*
*March 19: 8:00 am - 8:25 am*

**On the projections and unitary groups of $C^*$-algebras**

Fouzia Shaheen
United Arab Emirates University, UAE

Joint work with
Ahmed Al-Rawashdeh

The classification of operator algebras is an important topic in the field, and $K$-Theory is an essential tool that has been used for this task. The unitary groups play a significant role in the classifications of unital $C^*$-algebras. In 1954 Dye proved that the discrete unitary group in a factor determines the algebraic type of the factor. In 2012 Al-Rawashdeh, Booth, and Giordano proved that if the unitary groups of two simple unital AH-algebras

of real rank zero are isomorphic as abstract groups, then their $K_0$-groups are isomorphic as scaled ordered groups and we proved that such $C^*$-Algebras are isomorphic if and only if their unitary groups are isomorphic as topological groups. Also, for simple unital purely infinite $C^*$-algebras, we showed that two unital Kirchberg algebras are $*$-isomorphic if and only if their unitary groups are isomorphic, as abstract groups. An isomorphism between unitary groups induces a bijection between the projections. For many $C^*$-algebras, this induced mapping preserves orthogonality of projections (orthoisomorphism), but in a certain type of UHF-algebras, the induced mapping need not be an orthoisomorphism. If $\varphi$ is a continuous isomorphism, then $\varphi$ is implemented by a linear or conjugate linear $*$-automorphism. In this project, we aim to extend the results of Al-Rawashdeh to a larger class of simple unital $C^*$-algebras, by investigating properties of invertible elements and symmetries and orthoisomorphism of idempotents for large class of unital $C^*$-algebra. Moreover, in a different approach, we will investigate the IUG-P (Invariant Unitary Group-Property) for many fundamental properties of $C^*$-algebras, indeed we aim to discuss which property is invariant if the unitary groups of $C^*$-algebras are isomorphic.

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*Zoom presentation Room 272*
*March 19: 4:00 pm - 4:25 pm*

**Upper bounds on the dimension of multipliers of Lie superalgebras**

Hesam Safa
University of Bojnord, Iran

We study the notion of the Schur multiplier $\mathcal{M}(L)$ of a finite-dimensional $n$-Lie superalgebra $L = L_0 \oplus L_1$ and prove that

$$\dim \mathcal{M}(L) \leq \sum_{i=0}^{n} \binom{m}{i} \mathcal{L}(n-i,k),$$

where $\dim L_0 = m$, $\dim L_1 = k$, $\mathcal{L}(0,k) = 1$ and $\mathcal{L}(t,k) = \sum_{j=1}^{t} \binom{t-1}{j-1}\binom{k}{j}$, for $1 \leq t \leq n$. It is also shown that if $L$ is a nilpotent $n$-Lie superalgebra with $\dim L^2 = (1|0)$, then

$$\begin{aligned} \dim \mathcal{M}(L) &\leq \sum_{i=0}^{n} \left[ \binom{p-1}{i} \mathcal{L}(n-i,q) + \binom{m-p+1}{i} \mathcal{L}(n-i,k-q) \right] \\ &+ \sum_{i=1}^{n-1} \left[ \sum_{j=0}^{i} \binom{p-1}{j} q^{i-j} \sum_{j=0}^{n-i} \binom{m-p}{j} (k-q)^{n-i-j} \right] - 1, \end{aligned}$$

where $\dim L_0 = m$, $\dim L_1 = k$, $\dim Z(L) = (p|q)$ and $\mathcal{L}(t,k)$ is the function defined above. These two upper bounds simultaneously generalize the previous bounds on Lie algebras, $n$-Lie algebras and Lie superalgebras. We also discuss some inequalities on the dimension of $\mathcal{M}(L)$ as well as a result on the converse of Schur's theorem in $n$-Lie superalgebras.

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*Room 272*
*March 18: 2:30 pm - 2:55 pm*

**Some properties of star operations on ring extensions**

Simplice Tchamna
Georgia College & State University

Joint work with
Lokendra Paudel

In this talk, we will present some of the results published in the article [International Electronic Journal of Algebra, Vol. 30 (2021)] Volume 30 (2021) 99-115] Let $\star$ be a star operation on a ring extension $R \subseteq S$. A ring extension $R \subseteq S$ is called Prüfer *star*-multiplication extension (P$\star$ME) if $(R_{[]},_{[]})$ is a Manis pair in $S$ for every $\star$-maximal ideal of $R$ [**?**, Definition 3.1]. We establish some results on star operations, and we study P$\star$ME in pullback diagrams of type $\square$. We show that, for a maximal ideal of $R$, the extension $R_{[]} \subseteq S$ is Manis if and only if $R[X]_{[R[X]]} \subseteq S[X]$ is a Manis extension.

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*Zoom presentation Room 272*
*March 20: 3:00 pm - 3:25 pm*

**Homological theory of k-idempotent ideals in dualizing varieties**

Luis Gabriel Rodríguez Valdés
National Autonomous University of Mexico

Joint work with Valente Santiago Vargas and Martha Lizbeth Shaid Sandoval Miranda

In this talk, we develop the theory of $k$-idempotent ideals in the setting of dualizing varieties. Several results given previously by M. Auslander, M. I. Platzeck, and G. Todorov are extended to this context. Given an ideal $I$ (which is the trace of a projective module), we construct a canonical recollement which is analogous to a well-known recollement in categories of modules over artin algebras. Moreover, we study the homological properties of the categories involved in such a recollement. Consequently, we find conditions on the ideal $I$ to obtain quasi-hereditary algebras in such a recollement. Applications to bounded derived categories are also given.

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*Room 275*
*9:00 am - 9:25 am*

**Singular equivalences of Morita type with level, Gorenstein algebras, and universal deformation rings**

Jose A. Velez-Marulanda
Valdosta State University

Let $\mathbf{k}$ be a field of arbitrary characteristic, let $\Lambda$ be a Gorenstein $\mathbf{k}$-algebra, and let $V$ be an indecomposable finitely generated non-projective Gorenstein-projective left $\Lambda$-module whose stable endomorphism ring is isomorphic to $\mathbf{k}$. In this article, we prove that the

universal deformation rings $R(\Lambda, V)$ and $R(\Lambda, \Omega_\Lambda V)$ are isomorphic, where $\Omega_\Lambda V$ denotes the first syzygy of $V$ as a left $\Lambda$-module. We also prove the following result. Assume that $\Gamma$ is another Gorenstein $\mathbf{k}$-algebra such that there exists $\ell \geq 0$ and a pair of bimodules $({}_\Gamma X_\Lambda, {}_\Lambda Y_\Gamma)$ that induces a singular equivalence of Morita type with level $\ell$ (as introduced by Z. Wang) between $\Lambda$ and $\Gamma$. Then the left $\Gamma$-module $X \otimes_\Lambda V$ is also Gorenstein-projective and the universal deformation rings $R(\Gamma, X \otimes_\Lambda V)$ and $R(\Lambda, V)$ are isomorphic..

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*Room 272*
*March 20: 10:30 am - 10:55 am*

**Real Springer fibers and odd arc algebras**

Arik Wilbert
University of South Alabama

Joint work with Jens Niklas Eberhardt and Grégoire Naisse

Arc algebras were introduced by Khovanov in a successful attempt to lift the quantum $\mathfrak{sl}_2$ Reshetikhin–Turaev invariant for tangles to a homological invariant. When restricted to knots and links, Khovanov's homology theory categorifies the Jones polynomial. Osvath–Rasmussen–Szabo discovered a different categorification of the Jones polynomial called odd Khovanov homology. Recently, Naisse–Putyra were able to extend odd Khovanov homology to tangles using so-called odd arc algebras which were originally constructed by Naisse–Vaz. The goal of this talk is to discuss a geometric approach to understanding odd arc algebras and odd Khovanov homology using Springer fibers over the real numbers.

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