

# Keller VandeBogert

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## Employment

Notre Dame, **Kenna Visiting Professor**, *Mathematics Department*, University of Notre Dame.  
IN

## Education

Statesboro, **Georgia Southern University**, *Bachelor's, Mathematics*, 2012 – 2016.  
GA

Statesboro, **Georgia Southern University**, *Master's, Mathematics*, Spring 2017-Summer 2017.  
GA Advisor: Saeed Nasseh

Columbia, **University of South Carolina**, *Ph.D, Mathematics*, 2021.  
SC Advisors: Andy Kustin and Matt Ballard

## Research Interests

My research interest is in the field of Commutative Algebra. More precisely, I am interested in homological techniques including the construction of free resolutions and their applications to the study of finer invariants of certain modules and ideals, especially those arising in the context of Geometry, Combinatorics, and Representation Theory.

## Publications/Preprints

17. **Polarizations and Hook Partitions (with A. Almousa)**, *Submitted*, <https://arxiv.org/abs/2107.07535>.
16. **Products of Ideals and Golod Rings**, *Submitted*, <https://arxiv.org/abs/2107.00040>.
15. **On Restricted Powers of Complete Intersections**, *Submitted*, <https://arxiv.org/abs/2106.15651>.
14. **On Constructions Related to the Generalized Taylor Complex**, *Submitted*, <https://arxiv.org/abs/2106.14920>.
13. **Iterated Mapping Cones for Strongly Koszul Algebras**, *Submitted*, <https://arxiv.org/abs/2104.00037>.
12. **Linear Strands Supported on Regular CW Complexes**, *Submitted*, <https://arxiv.org/abs/2102.01114>.
11. **Linear Strands of Initial Ideals of Determinantal Facet Ideals (with A. Almousa)**, *Submitted*, <https://arxiv.org/abs/2101.07279>.
10. **DG Structure on Length 3 Trimming Complexes and Applications to Tor Algebras**, *Submitted*, <https://arxiv.org/abs/2011.12324>.
9. **Vanishing of Avramov Obstructions for Products of Sequentially Transverse Ideals**, *Submitted*, <https://arxiv.org/abs/2011.11665>.
8. **The DG Products of Peeva and Srinivasan Coincide**, *Submitted*, <https://arxiv.org/abs/2007.03110>.
7. **Minimal Free Resolutions of Certain Equigenerated Monomial Ideals**, *Submitted*, <https://arxiv.org/abs/2007.02373>.

6. **Determinantal Facet Ideals for Smaller Minors (with A. Almousa)**, *Submitted*, <https://arxiv.org/abs/2006.14434>.
5. **DG Structure on the Length 4 Big From Small Construction**, *Journal of Algebra and Its Applications*, <https://arxiv.org/abs/2004.06794>.
4. **Resolution and Tor Algebra Structures of Grade 3 Ideals Defining Compressed Rings**, *Journal of Algebra* <https://arxiv.org/abs/2004.06691>.
3. **Trimming Complexes and Applications to Resolutions of Determinantal Facet Ideals**, *Communications in Algebra*, <https://arxiv.org/abs/2004.06016>.
2. **Structure Theory for a Class of Grade 3 Homogeneous Ideals Defining Type 2 Compressed Rings**, *To appear, Journal of Commutative Algebra*, <https://arxiv.org/abs/1912.06949>.
1. **Applications and Homological Properties of Local Rings with Decomposable Maximal Ideals (with S. Nasseh, S. Sather-Wagstaff, and R. Takahashi)**, *Journal of Pure and Applied Algebra.*, March 2019, pp. 1272-1287.

## Distinctions/Awards

- USC SPARC Grant: The SPARC Graduate Research Grant is a merit-based award designed to ignite research and creative excellence across all disciplines at USC.
- Outstanding First Year Award: Internal Departmental Award at USC, Student must be nominated by a professor in order to be considered and is then chosen from all nominees
- President's List: 5 semesters with 4.0 GPA
- Dean's List: 5 semesters with > 3.5 GPA
- Georgia Southern Mathematics Award: Student must be nominated by a professor in order to be considered and is then chosen from all nominees
- Outstanding Scholar Award (x4 years in a row)
- Winner of Georgia Southern Undergraduate Problem Solving Contest (x2)

## Invited Talks and Posters

**Title TBA**, *AMS Special Session on Commutative Ring Theory*, (Virtual) University of New Mexico, October 2021.

**Title TBA**, *AMS Special Session on Homological Methods in Commutative Algebra*, Creighton University, October 2021.

**Linear Strands of (initial ideals of) Determinantal Facet Ideals**, *AMS Special Session on Commutative Algebra*, (Virtual) Brown University, March 2021.

**DG Structure on Length 3 Trimming Complexes and Realizability of Tor-Algebras**, *AMS Special Session on Differential Graded Methods in Commutative Algebra*, (Virtual) Georgia Institute of Technology, March 2021.

**Linear Strands Supported on Cell Complexes**, *New Mexico State University Algebra Seminar*, (Virtual) New Mexico State University, February 2021.

**Cellular Resolutions for Monomial Ideals**, *USC Algebra, Geometry, and Number Theory Seminar*, (Virtual) University of South Carolina, February 2021.

**Trimming Complexes and Their Applications**, *Joint Mathematics Meeting Special Session on Commutative Algebra*, (Virtual) Washington, D.C., January 2021.

**Groebner Bases and Linear Strands of Determinantal Facet Ideals**, *Geometry, Algebra, Singularities, and Combinatorics Seminar*, (Virtual) Northeastern University, November 2020.

**Vanishing of Avramov Obstructions for Products of Transverse Ideals**, *A Special Day for Pure Mathematics*, (Virtual) Georgia Southern University, November 2020.

**Algebra Structures on Resolutions and the Problem of Realizability**, *Algebra and Number Theory Seminar*, (Virtual) Texas Tech University, November 2020.

**Trimming Complexes and Their Applications**, *AMS Special Session on Homological Commutative Algebra*, (Virtual) University of Tennessee, Chattanooga, October 2020.

**Linear Strand and Minimal Free Resolutions for some Equigenerated Monomial Ideals**, *AMS Special Session on Free Resolutions, Combinatorics, and Geometry*, (Virtual) University of Texas, El Paso, September 2020.

**Tate-Like Complexes and Their Applications to DG Algebras**, *Commutative and Homological Algebra Market Presentations (CHAMP)*, Virtual Seminar, September 2020.

**(Poster Presentation) Minimal Free Resolutions and Tor Algebra Structures of Certain Compressed Rings**, *Early Commutative Algebra Researchers (eCARs)*.

**Trimming Complexes and Applications to Resolutions of Certain Ideals**, *CA-Zoom Conference*, April 2020.

**Tor Algebra Structures for Compressed Rings**, *Algebra and Discrete Mathematics Seminar*, Clemson University, April 2020.

**Trimming Complexes and Applications**, *USC Algebra, Geometry, and Number Theory Seminar*, University of South Carolina, January 2020.

**More on Compressed  $k$ -algebras**, *Algebraic Geometry Seminar*, University of South Carolina, November 2018.

**Compressed  $k$ -algebras and Some Structure Theory**, *Carolina Math Seminar*, University of South Carolina, November 2018.

**Properties of Local Rings With Decomposable Maximal Ideals**, *Algebraic Geometry Seminar*, University of South Carolina, March 2018.

**Some Structure Theory for a Class of Artinian Compressed Algebras**, *Georgia Southern Mathematics Colloquium*, Georgia Southern University, August 2018.

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## Expository Talks

Columbia, SC **Chain Homotopies and Mapping Cones/Cylinders**, *Homological Algebra Seminar*, September 2017.

**Classification of Elementary Particles via Symplectic Induction**, *Graduate Colloquium*, October 2017.

**Adjoint Functors and Balancing of Ext/Tor**, *Homological Algebra Seminar*, October 2017.

**The Hodge Decomposition**, *Complex Geometry Course Presentation*, November 2017.

**The Category of Correspondences**, *Motives Seminar*, February 2018.

**Schemes as Functors/Yoneda's Lemma**, *Geometric Invariant Theory Seminar*, February 2018.

**Computation of Lie Groups/Algebras in the Scheme-Theoretic Setting**, *Geometric Invariant Theory Seminar*, March 2018.

**Results on Connected Solvable Groups and Borel Subgroups**, *Spherical Varieties Seminar*, June 2018.

**Definition of Spherical Varieties and Examples**, *Spherical Varieties Seminar*, July 2018.

**Grothendieck Topologies and Étale Morphisms of Schemes**, *Étale Cohomology Seminar*, September 2018.

**Some Fun with The Basel Problem**, *Graduate Colloquium*, September 2018.

**Spectral Sequences and Examples**, *Étale Cohomology Seminar*, October 2018.

**The Grothendieck Spectral Sequence + Computations**, *Étale Cohomology Seminar*, November 2018.

**Mayer-Vietoris for Étale Cohomology + Applications**, *Étale Cohomology Seminar*, November 2018.

**More Étale Cohomology Computations**, *Étale Cohomology Seminar*, November 2018.

**How It's Made: Schemes**, *Graduate Colloquium*, January 2019.

**Grassmannians, Full Flag Varieties, and the Plücker Embeddings**, *Geometric Technique Seminar*, February 2019.

**Ray Class Groups and Generalizing Dirichlet's Theorem**, *Algebraic Number Theory Seminar*, March 2019.

**The Basic Theorem of the Geometric Technique**, *Geometric Technique Seminar*, March 2019.

**Schur/Weyl Functors and the Language of Partitions**, *Geometric Technique Seminar*, March 2019.

**The Lascoux Resolution + Examples**, *Geometric Technique Seminar*, March 2019.

**Bott's Theorem for Cohomology Computations**, *Geometric Technique Seminar*, April 2019.

**Group/Tate Cohomology and the Herbrand Quotient**, *Algebraic Number Theory Seminar*, April 2019.

**Resolutions: What They Are, and How To Use Them**, *Graduate Colloquium*, September 2019.

**Algebra Structures on Resolutions and Their Applications**, *Graduate Colloquium*, October 2020.

**Determinantal Ideals**, *Graduate Colloquium*, January 2021.

Statesboro, GA **Random Polygon to Ellipse: A Generalization**, *Eagle Undergraduate Math Conference*, February 2016.

**The Goodgrant Challenge**, *Eagle Undergraduate Math Conference*, February 2016.

**$\pi$  and Fourier Series**, *Undergraduate Seminar*, April 2016.

## Conferences/Workshops Attended

San Diego, CA **University of California, San Diego**, *Structure of Length 3 Resolutions Workshop*, August 2019.

Notre Dame, IN **University of Notre Dame**, *Thematic Program on Commutative Algebra and its Interaction with Algebraic Geometry*, June 2019.

Columbia, SC **University of South Carolina, Columbia**, *Carolina Math Seminar*, November 2018.

Boston, MA **Northeastern University**, *Spring Eastern Sectional Meeting*, April 2018.

Savannah, GA **Georgia Southern University**, *A Day of Algebraic Geometry in Savannah*, February 2018.

Chapel Hill, NC **University of North Carolina, Chapel Hill**, *Workshop on Topics in Algebraic Geometry*, November 2017.

Charlottesville, **University of Virginia**, *Virginia Operator Theory and Complex Analysis Meeting*, October 2017.  
VA  
Greensboro, **University of North Carolina Greensboro**, *Computational Number Theory Summer School: Function Fields*, May 2016.  
NC  
Birmingham, **University of Alabama at Birmingham**, *MAA SouthEastern Section Conference*, March 2016.  
AL  
Statesboro, **Georgia Southern University**, *Eagle Undergraduate Math Conference*, February 2016.  
GA  
Washington, **Mathematical Association of America**, *MAA Math Fest*, August 2015.  
DC

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## Teaching

University of **Free Resolutions of Rings and Modules**, *Fall 2021*.  
Notre Dame  
University of **Calculus for Business Administration and Social Sciences**, *Spring 2021*.  
South **Calculus 2 Recitation Leader**, *Fall 2020*.  
Carolina **Calculus for Business Administration and Social Sciences**, *Spring 2020*.  
**Calculus 1 Recitation Leader**, *Fall 2019*.  
**Calculus for Business Administration and Social Sciences**, *Spring 2019*.  
**Precalculus**, *Fall 2018*.  
**Elementary Differential Equations**, *Summer 2018*.  
**Calculus 1 Recitation Leader**, *Spring 2018*.  
**Calculus 1 Recitation Leader**, *Fall 2017*.  
Georgia **Calculus 2 Recitation Leader**, *Summer 2017*.  
Southern **Calculus 1 Recitation Leader**, *Spring 2017*.  
University