

# Robert Muth

## CURRICULUM VITAE

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### Education

- 2011–2016 **University of Oregon**, Eugene, OR.  
Ph.D. in Mathematics, June 2016  
Advisor: Alexander Kleshchev  
Thesis: “Representations of KLR algebras of affine Lie type”
- 2007–2011 **University of Arizona**, Tucson, AZ.  
B.S. in Mathematics, May 2011
- 2001–2004 **University of Arizona**, Tucson, AZ.  
B.F.A. in Visual Arts, May 2004

### Academic Positions

- 2018–present **Washington & Jefferson College**, Washington, PA. Assistant Professor.
- Spring 2018 **Mathematical Sciences Research Institute**, Berkeley, CA. Uhlenbeck Fellow.  
*Program: Group Representation Theory and Applications*
- 2016–2018 **Tarleton State University**, Stephenville, TX. Assistant Professor.
- 2011–2016 **University of Oregon**, Eugene, OR. Graduate Teaching Fellow.
- 2009–2010 **University of Arizona**, Tucson, AZ. Undergraduate Teaching Assistant.

### Research Interests

My research interests include representation theory and combinatorics, with a focus on the following topics:

- Representation theory of symmetric groups and Lie algebras.
- Tableau combinatorics and canonical bases for quantum groups.
- Representation theory of Khovanov-Lauda-Rouquier algebras.

### Publications, Preprints, and Papers in Preparation

- [1] Imaginary Schur-Weyl duality (joint with A. Kleshchev), *Memoirs of the American Mathematical Society* **245** (2017), no. 1157, xvii, 83 pp, [arXiv:1312.6104](https://arxiv.org/abs/1312.6104)
- [2] Stratifying KLR algebras of affine ADE types (joint with A. Kleshchev), *Journal of Algebra* **475** (2017), 37 pp., [arXiv:1511.05511](https://arxiv.org/abs/1511.05511)
- [3] Affine zigzag algebras and imaginary strata for KLR algebras (joint with A. Kleshchev), *Transactions of the American Mathematical Society* (to appear), 44 pp., [arXiv:1511.05905](https://arxiv.org/abs/1511.05905)
- [4] Graded skew Specht modules and cuspidal modules for Khovanov-Lauda-Rouquier algebras of affine type A, *Algebras and Representation Theory*, <https://doi.org/10.1007/s10468-018-9808-2> 32 pp., [arXiv:1412.7514](https://arxiv.org/abs/1412.7514)
- [5] Super RSK correspondence with symmetry, 26 pp. (submitted), [arXiv:1711.00420](https://arxiv.org/abs/1711.00420)
- [6] Based quasi-hereditary algebras (joint with A. Kleshchev), 15 pp. (submitted), [arXiv:1810.02844](https://arxiv.org/abs/1810.02844)

- [7] Generalized Schur algebras (joint with A. Kleshchev), 40 pp. (submitted), [arXiv:1810.02846](#)
- [8] Schurifying quasi-hereditary algebras (joint with A. Kleshchev), 48 pp. (submitted), [arXiv:1810.02849](#)

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## Talks

- Oct. 2018 University of Oklahoma, Algebra Seminar.
- May 2018 Mathematical Sciences Research Institute, Group Representation Theory and Applications Seminar.
- May 2018 University of Oregon, Algebra Seminar.
- Feb. 2018 University of Virginia, Algebra Seminar.
- Dec. 2017 Representation Theory of Symmetric Groups and Related Algebras Workshop, Institute of Mathematical Sciences, Singapore.
- Nov. 2017 Loyola University Chicago, Algebra and Combinatorics Seminar.
- Aug. 2017 Combinatorics of Group Actions and its Applications Workshop, Memorial University of Newfoundland.
- Mar. 2017 97th Meeting of the Texas Section of the MAA, Texas A&M University, Commerce.
- Nov. 2016 University of Oklahoma, Karcher Colloquium – series of two talks.
- Feb. 2016 University of Oregon, Representation Theory Seminar – series of three talks.
- Jan. 2016 AMS Special Session: Geometric and Categorical Methods in Representation Theory, Joint Mathematics Meetings, Seattle.
- Nov. 2015 Loyola University Chicago, Algebra and Combinatorics Seminar.
- Oct. 2015 8th Southeastern Lie Theory Workshop on Algebraic and Combinatorial Representation Theory, North Carolina State University.
- Apr. 2015 University of Southern California, Algebra/Categorification Seminar.
- Apr. 2015 University of Oregon, Algebra Seminar.

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## Conferences, Workshops and Visits

- Oct. 2018 Co-organizer, Special Session on Combinatorial and Categorical Aspects of Representation Theory, AMS Fall Western Sectional Meeting 2018, San Francisco State University.
- Spring 2018 Mathematical Sciences Research Institute, Berkeley, CA, Uhlenbeck Fellowship, Group Representation Theory and Applications Program.
- Dec. 2017 Representation Theory of Symmetric Groups and Related Algebras Workshop, Institute of Mathematical Sciences, Singapore.
- Aug. 2017 Combinatorics of Group Actions and its Applications Workshop, Memorial University of Newfoundland.
- May. 2016 US-Mexico Conference on Representation Theory, Categorification, and Noncommutative Algebra, University of Southern California.
- Nov. 2015 Max Planck Institute for Mathematics, Bonn, Germany.
- Nov. 2015 Finite Simple Groups: Thirty Years of the Atlas and Beyond, Princeton University.
- Oct. 2015 8th Southeastern Lie Theory Workshop on Algebraic and Combinatorial Representation Theory, North Carolina State University.
- Jul. 2015 Simple groups, representations, and related topics, University of Cambridge.
- May 2015 Representation Theory and Related Topics, University of Connecticut.

- Aug. 2014 Algebraic Lie Theory and Representation Theory, University of Glasgow.  
Apr. 2014 Categorification and Geometric Representation Theory, University of Montreal.

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## Awards/Grants

- Jan. 2018 **Uhlenbeck Postdoctoral Fellowship.**  
Mathematical Sciences Research Institute, Berkeley. Support for semester research program, *Group Representation Theory and Applications*.
- Oct. 2017 **Faculty Development Grant.**  
Texas A&M University System. Awarded for support of research-related travel.
- Oct. 2016 **Faculty Development Grant.**  
Texas A&M University System. Awarded for support of research-related travel.
- May 2015 **D.K. Harrison Memorial Award.**  
University of Oregon. Awarded for exceptional achievement in research.
- Mar. 2015 **Johnson Research Award.**  
University of Oregon. Awarded for support of research-related travel.

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## Teaching Experience

Instructor of Record for all courses listed below.

*Washington & Jefferson College*

- MTH 151 **Calculus I**, Fall 2018.  
Limits, continuity, differentiation, optimization, integration and applications.
- MTH 415 **Real Analysis**, Fall 2018.  
Theory of calculus, topology of the reals, convergence of sequences and series, power series.  
*Tarleton State University*
- Math 1316 **Trigonometry**, Fall 2016.  
Trigonometric functions, modeling periodic behavior, vectors, complex numbers.
- Math 2413 **Calculus I**, Spring 2017, Fall 2017.  
Limits, continuity, differentiation, optimization, integration and applications.
- Math 3310 **Discrete Math**, Fall 2016.  
Introduction to proof, set theory, graph theory, recursive definitions, induction, combinatorics.
- Math 4332 **Abstract Algebra**, Spring 2017.  
Group theory, ring theory, computational methods in abstract algebra.
- Math 4309 **Advanced Analysis**, Fall 2017.  
Theory of calculus, topology of the reals, convergence of sequences and series.
- Math 4390 **Math Topics: Game Theory**, Spring 2017.  
Probability and utility theory, games in extensive form and normal form, equilibria, strategy, decision theory, some Python programming.
- Math 5308 **Graduate Abstract Algebra**, Fall 2016.  
Group theory, ring theory, module theory.  
*University of Oregon*
- Math 111 **College Algebra**, Fall 2011, Winter 2012, Spring 2012, Fall 2012.  
Functions, polynomials, exponential functions, logarithms, mathematical modeling.
- Math 112 **Elementary Functions**, Fall 2013.  
Trigonometric functions, periodic functions, vectors, applications in physical sciences.

- Math 242 **Business Calculus II**, Summer 2013.  
Integral calculus, optimization, modeling and applications in business and social sciences.
- Math 246 **Calculus for Biological Sciences**, Winter 2016.  
Differential calculus, dynamical systems, modeling and optimization in life sciences.
- Math 251 **Calculus I**, Winter 2013, Spring 2013, Spring 2014.  
Differential calculus, limits, optimization, modeling.
- Math 252 **Calculus II**, Fall 2014.  
Integral calculus, methods of integration, volume, areas, differential equations, applications.
- Math 307 **Introduction to Proof**, Winter 2015.  
Construction and analysis of formal mathematical proofs, set theory, basic number theory.

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## Service

- 2016–2018 **Research Advisor**, Tarleton State University.  
Advise graduate and undergraduate students in research projects in areas such as combinatorics, representation theory, computational abstract algebra, and applied mathematics. Some recent conference presentations by students include:
- “Quantifying gerrymandering via transit compactness”  
*First Place — Undergraduate research in mathematics*  
14th Annual Texas A&M University System Pathways Research Symposium. Nov. 2017  
Undergraduate researchers: Peter Hayes, Casey Sutton, Maria Tovar, Preston Ward  
Co-advisor: Scott Cook
- “Implementing KLR algebras and related objects in Sage”  
97th Meeting of the Texas Section of the MAA, Texas A&M University, Commerce. April 2017.  
Graduate researcher: Mary Barker
- 2017–2018 **Faculty Advisor**, Tarleton Mathematics Club, Tarleton State University.  
Aid in organization of Mathematics Club activities, including semimonthly meetings, arrangement of undergraduate travel to sectional conferences, Calculus Bowl, and various outreach projects.
- 2017–2018 **Program Committee Member**, MAA Texas Section Conference 2019.  
Organize plenary/research speaker program and short courses for large sectional conference.
- 2017–2018 **Graduate Committee Member/Chair**, Tarleton State University.  
Served on five graduate committees, including once as chair, intended to evaluate graduate student mathematical knowledge and communication skills in final semester oral exams.
- 2015–2016 **Committee Chair**, AWM Undergraduate Mentoring Committee, University of Oregon.  
The Undergraduate Mentoring Committee provides resources for women undergraduates studying mathematics, including providing panel discussions on REUs and post-graduation opportunities for math majors, and organizing the Undergraduate Reading Program.
- 2014–2016 **Undergraduate Mentor**, Undergraduate Reading Program, University of Oregon.  
Mentored undergraduates in reading projects related to group theory, representation theory, and knot theory, as part of a reading program which culminates in a presentation and poster session.
- 2014–2016 **Committee Member**, AWM Distinguished Speaker Series, University of Oregon.  
The Speaker Series Committee invites experts to give talks targeted to graduate students and upper-level undergraduate students in mathematics and its applications in other disciplines. The aim is to spark interest in mathematics, particularly among members of groups who are under-represented in higher level mathematics.
- 2014–2015 **Organizer**, Graduate Notions Seminar, University of Oregon.  
Organized weekly seminar encompassing a range of graduate level mathematical topics.