

# ABRIDGED CURRICULUM VITAE OF AARON LAUVE

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## PROFESSIONAL EMPLOYMENT

2016–present *Associate Professor*, Loyola University Chicago (LUC)  
2010–2016 *Assistant Professor*, Loyola University Chicago (LUC)  
2007–2010 *Visiting Assistant Professor*, Texas A & M University (TAMU)  
2005–2007 *Postdoctoral Fellow*, Université du Québec à Montréal (UQÀM)

## EDUCATION

**Rutgers, The State University of New Jersey** *New Brunswick, NJ*

Ph.D. *A quasideterminantal approach to quantized flag varieties*, May 2005

Directed by Vladimir Retakh and Robert L. Wilson

**The University of Oklahoma** *Norman, OK*

B.S. Mathematics, summa cum laude, May 1999

B.S. Physics, with distinction, May 1999

## RESEARCH INTERESTS

Exploiting combinatorial structures in algebra, and vice versa. Specific interests in this direction include: quasideterminants, Hopf algebras (of quantum, pointed, and combinatorial varieties), word combinatorics, noncommutative ring theory, and representation theory.

## GRANTS, HONORS & AWARDS

### Research

LUC – Research Leave, Fall 2018

LUC – Research Stipend, Summers 2013 & 2014

LUC – CAS Special Project: *Sage Days 65 Workshop*, Summer 2015

National Security Agency – **Principal Investigator**, Young Investigators Grant: *Word combinatorics and combinatorial Hopf algebras*, @TAMU: 2009–2010, @LUC: 2011–2013

BIRS – Collaborator (in group of six), Focused Research Group: *Supercharacters & Hopf Monoids in Species*, awarded a week at Banff, Alberta, Fall 2012

AIM – Participant, Workshop: *Supercharacters & Combin. Hopf Algebras*, Palo Alto, Summer 2010

Rutgers University – Louis Bevier Dissertation Fellowship, 2004–2005

**Teaching / Service**

LUC – (nominee) Sujack Teaching Award, Spring 2017, Spring 2018

LUC – (nominee) St. Ignatius of Loyola Award, Spring 2015

MAA – Project NExT Fellow, 2007–2008

**PUBLICATIONS****Refereed Journal Articles**

- [1] (w/ S. Doty, G.H. Seelinger) *Canonical idempotents of multiplicity-free families of algebras*, l'Enseignement Mathématique, to appear.
- [2] (w/ M. Aguiar) *The characteristic polynomial of the Adams operators on graded connected Hopf algebras*. Alg. Number Theory, 9 (2015), no. 3, 547–583.
- [3] (w/ T. Hangelbroek) *The polyharmonic Dirichlet problem and path counting*. J. Math. Pures Appl. (9), 102 (2014), no. 3, 449–481.
- [4] (w/ M. Konvalinka) *Skew Pieri rules for Hall–Littlewood functions*. Alg. Comb., 17 (2013), no. 3, 499–518.
- [5] (w/ S. Forcey, F. Sottile) *Cofree compositions of coalgebras*, Ann. Comb., Special Issue: 10 years of BAD Math, 17 (2013), no. 1, 105–130.
- [6] (w/ M. Aguiar) *Lagrange’s theorem for Hopf monoids in species*, Canad. J. Math., 65 (2013), no. 2, 241–265.
- [7] (w/ 27 coauthors<sup>1</sup>) *Supercharacters, symmetric functions in noncommuting variables, and related Hopf algebra*, Adv. Math., 229 (2012), no. 4, 2310–2337.
- [8] (w/ S. Mason)  *$QSym_n$  over  $Sym_n$  has an  $n$ -stable basis*, J. Combin. Theory Ser. A, 118 (2011), 1661–1673.
- [9] (w/ M. Mastnak) *The primitives and antipode in the Hopf algebra of symmetric functions in noncommuting variables*, Adv. Appl. Math., 47 (2011), no. 3, 536–544.
- [10] (w/ T. Lam, F. Sottile) *Skew Littlewood–Richardson rules from Hopf algebras*, Int. Math. Res. Not. 2011, no. 6, 1205–1219.
- [11] (w/ S. Forcey, F. Sottile) *Hopf structures on the multiplihedra*, SIAM J. Discrete Math., 24 (2010), no. 4, 1250–1271.
- [12] (w/ F. Bergeron) *Invariant and coinvariant spaces for the algebra of symmetric polynomials in noncommuting variables*, Electron. J. Combin., 17 (2010), no. 1, article R166.
- [13] *Quasideterminants and  $q$ -commuting minors*, Glasg. Math. J. 52 (2010), no. 3, 663–675.
- [14] (w/ C. Cibils, S. Witherspoon) *Hopf quivers and Nichols algebras in positive characteristic*, Proc. Amer. Math. Soc. 137 (2009), no. 12, 4029–4041.
- [15] (w/ A. Glen, F. V. Saliola) *A note on the Markoff condition and central words*, Inform. Proc. Letters, 105 (2008), no. 6, 241–244.
- [16] (w/ E. J. Taft) *A class of left quantum groups modeled after  $SL_q(n)$* , J. Pure and Appl. Algebra, 208 (2007), no. 3, 797–803.
- [17] *Quantum- and quasi-Plücker coordinates*, J. Algebra, 296 (2006), no. 2, 440–461.

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<sup>1</sup>A paper resulting from a successful 2010 AIM Workshop with roughly the same name. [Supercharacters and combinatorial Hopf algebras](#)

**Books**

- [14] (w/ J. Berstel, C. Reutenauer, F. V. Saliola) *Combinatorics on Words: Christoffel Words and Repeating Words in Words*. CRM Monograph Series, 27. American Mathematical Society, Providence, RI, 2009. xii+147 pp. ISBN: 978-0-8218-4480-9

**Refereed Collections & Proceedings (Selected)**

- [15] (w/ M. Mastnak) *Bialgebra coverings and transfer of structure*, In: Tensor categories and Hopf algebras. Edited by Nicolás Andruskeiwitch and Dmitri Nikshych. Contemporary Mathematics, ###. American Mathematical Society, Providence, RI, to appear.
- [16] (w/ C. Reutenauer) *Rational series in the free group and the Connes operator*. In: Noncommutative Birational Geometry, Representations and Combinatorics, pp. 177–197. Edited by Arkady Berenstein and Vladimir Retakh. Contemporary Mathematics, 592. American Mathematical Society, Providence, RI, 2013.
- [17] (w/ M. Aguiar) *Antipode and convolution powers of the identity in graded connected Hopf algebras*. 25<sup>th</sup> International Conference on Formal Power Series and Algebraic Combinatorics (FPSAC), Paris, France, 2013, DMTCS Proceedings.
- [18] (w/ M. Konvalinka) *Skew Pieri rules for Hall–Littlewood functions*. 24<sup>th</sup> FPSAC Conference (Nagoya, Japan, 2012), DMTCS Proceedings.
- [19] (w/ M. Aguiar) *Lagrange’s theorem for Hopf monoids in species*. 23<sup>rd</sup> FPSAC Conference (Reykjavik, Iceland, 2011), DMTCS Proceedings.
- [20] (w/ T. Lam, F. Sottile) *Skew Littlewood–Richardson rules from Hopf algebras*. 22<sup>nd</sup> FPSAC Conference (San Francisco, 2010), DMTCS Proceedings.
- [21] (w/ S. Forcey, F. Sottile) *New Hopf structures on binary trees*. 21<sup>st</sup> FPSAC Conference (Hagenberg, Austria, 2009), DMTCS Proceedings.
- [22] (w/ F. Bergeron) *Invariant and coinvariant spaces for the algebra of symmetric polynomials in non-commuting variables*. 20<sup>th</sup> FPSAC Conference (Valparaiso, Chile, 2008), DMTCS Proceedings.

**SageMath Development**

- [26] (v.8.4, 09/2018) New feature: added `OrderedMultisetPartitionsIntoSets` module.
- [27] (v.8.3, 08/2018) Improved feature: added new basis to `PartitionAlgebra` module and additional coercions for `BrauerAlgebra` modules.
- [28] (v.7.2, 05/2016) Improved feature: simplified multi-color plotting and shading for `Plot` module.
- [29] (v.6.10, 12/2015) New feature: added `.adams_operator()` and `.convolution_power()` to `Bialgebras_with_bases` module.

**SELECTED PRESENTATIONS****Conferences & Workshops**

*Generalized Jucys–Murphy elements and canonical idempotents in Brauer algebras.*

**(fully funded)**, SageDays@ICERM, Providence, 07/18

**(partially funded)**, 3<sup>rd</sup> Congress of the Pacific Rim Math. Assoc., Oaxaca, Mexico, 08/17

*Rational series over free groups and the word problem.*

**(partially funded)**, Retakh Fest, Angers, France, 06/18

*Convolution powers of the identity in combinatorial Hopf algebras.*

**(fully funded)**, Midwest Combinatorics Conference, Minnesota, 05/15;  
AMS Sectional Meeting, 03/15;  
(poster), 25<sup>th</sup> FPSAC Conference, Paris, 06/13;  
CMS Summer Meeting, Halifax, 06/13

*Measurements in graded connected Hopf algebras.*

*Hopf Algebras*, Meeting of the Atlantic Category Group, 10/14;

*Hopf algebra structure of the ring of  $k$ -Schur functions.*

**(partially funded)**, XX Coloquio Latinoamericano de Álgebra, Lima, Peru, 12/14;  
AMS Sectional Meeting, 09/14

*Permutation modules for Brauer algebras.* AMS Sectional Meeting, 04/13

*Spectra of principal elements in Frobenius seaweed Lie algebras.* AMS Sectional Meeting, 03/12

*Lagrange's theorem for Hopf monoids in species.* AMS Sectional Meeting, 09/11;

(poster) 23<sup>rd</sup> FPSAC Conference, Reykjavik, Iceland, 06/11;  
SIAM Conference on Discrete Mathematics, Austin, 06/10

*QSym over Sym has a stable basis.* LaCIM 2010: celebrating LaCIM's 10<sup>th</sup> anniversary (Graciously delivered by Christophe Reutenauer in my absence), Montreal, 08/10;

AMS Sectional Meeting, 03/10

*Skew Littlewood–Richardson rules from Hopf algebras.* 22<sup>nd</sup> FPSAC Conference, San Francisco, 08/10

*New Hopf structures on binary trees.* (poster), Joint Meetings, 01/10;

21<sup>st</sup> FPSAC Conference, Hagenberg, Austria, 07/09;  
AMS Sectional Meeting, 04/09;  
CMS Winter Meeting, Ottawa, 12/08

*Nichols algebras in positive characteristic.* Groups and Hopf Algebras Workshop, St. John's, Newfoundland, 06/09

*The Markoff condition and central words.* (poster), Joint Meetings, 01/09

*Commutative and noncommutative invariants of the symmetric group.*

20<sup>th</sup> FPSAC Conference, Valparaiso, Chile, 09/07;  
CMS Winter Meeting, Toronto, 12/06;  
AMS Sectional Meeting, 11/06

*Noncommutative flag varieties and Yangians.*

**(partially funded)** Advanced Course on Quasideterminants, CRM, Barcelona, 02/07;  
AMS Sectional Meeting, 11/05

*Generalized Grassmannians constructed via quasideterminants.* Joint Meetings, 01/05

*Quantum and quasi-Plücker coordinates.* AMS Sectional Meeting, 10/04

## Research Seminars

*Transfer of structure for Hopf algebras.*

Algebra & Combinatorics Seminar, York University, 03/18  
Algebra & Combinatorics Seminar, LUC, 02/18

*Generalized Jucys–Murphy elements and canonical idempotents in Brauer algebras.*

Algebra & Combinatorics Seminar, LUC, 11/16

*Matrix madness.*

Algebra & Combinatorics Seminar, LUC, 11/15;  
Algebra & Combinatorics Seminar, York University, 11/15

*Convolution powers of the identity in combinatorial Hopf algebras.*

Algebra & Combinatorics Seminar, Cornell University, 02/14;  
Algebra Seminar, DePaul University, 03/13;  
Algebra and Representation Theory Seminar, Oklahoma University, 02/13

*Primitive and antipode formulas in the Hopf algebra of symmetric functions in noncommuting variables.*

Algebra and Combinatorics Seminar (ACS), TAMU, 01/11;  
Algebra Seminar, DePaul University, 09/10

*Skew Littlewood–Richardson rules from Hopf algebras.* Discr. Geom. & Comb. Seminar, Cornell, 10/09;

Combinatorics Seminar, MIT, 10/09;  
Algebra, Geometry & Combinatorics Seminar, UI–Urbana-Champaign, 10/09;

*Another look at Markoff’s work on quadratic forms.* AGANT Seminar, UT-Arlington, 09/09;

Number Theory Seminar, University of Texas, 10/08;  
Discrete Math Seminar, Texas State University, 10/08;

*Nichols algebras in positive characteristic.* Joint Algebra Seminar, University of Ottawa, 12/08

*Rational and irrational series over the free group.* Groups and Dynamics Seminar, TAMU, 11/08;  
Postdoc Lunch Series, TAMU, 10/08

*Poset paths and  $q$ -commuting minors.* Séminaire du LaCIM, UQÀM, 04/06

*Capture the flag: the quantum flag of Taft & Towber revisited.* Algebra Seminar, Rutgers, 04/04

**Colloquia & Broader Audiences**

*The Markoff condition and central words.* Applied Mathematics Colloquium, IIT 10/14;  
(poster) Young Mathematicians Network Poster Session, Joint Meetings, 01/08

*Spectra of Principal Elements in Frobenius Seaweed Lie Algebras.*

Mathematics Colloquium, Wake Forest University 09/12;  
Math. & Computer Science Colloquium, St. Mary’s University (Halifax) 06/12

*A menagerie of “coinvariant” spaces (modern takes on Chevalley–Shephard–Todd).* Mathematics Colloquium,

Northern Illinois University, 12/11;  
Topology Seminar, University of Chicago, 11/11

*Pointed Hopf algebras.* Kempner Colloquium Series, University of Colorado, 11/09

*Middle binomial matrices and Chebyshev polynomials.* Postdoc Lunch Series, TAMU, 10/09

*Up with quasideterminants! (w/ apologies to S. Axler)* Postdoc Lunch Series, TAMU, 10/07

**Outreach**

*Arithmetic with fractional bases.* Brazos Valley Math Teachers’ Circle, 10/09

*Fun with Polynomials,* Rutgers Undergraduate Seminar, 04/02

*Zero-divisor graphs,* Math Club Student Lecture Series, University of Oklahoma, 10/98

*Tangling with topology,* Mu Alpha Theta National Convention, 08/96

(MAΘ is a high school mathematics honor society holding state and national competitions.)

## TEACHING

### University Courses

*Instructor at Loyola University Chicago*

MATH 108 – <i>Real-World Modeling</i> (2)	MATH 215 – <i>Obj.-Orient. Program.</i> (2)
MATH 117 – <i>Precalc., I</i> (1)	MATH 313 – <i>Abs. Algebra, I</i> (2)
MATH 118 – <i>Precalc., II</i> (2)	MATH 314/414 – <i>Abs. Algebra, II</i> (2)
MATH 131 – <i>Appl. Calc., I</i> (3)	MATH 315/488 – <i>Adv. Linear Algebra</i> (2)
MATH 132 – <i>Appl. Calc., II</i> (3)	MATH 318/418 – <i>Combinatorics</i> (2)
MATH 161 – <i>Calc., I</i> (4)	MATH 351 – <i>Real Analysis, I</i> (1)
MATH 162 – <i>Calc., II</i> (2)	MATH 398 – <i>Combin. on Words</i> (1)
MATH 212 – <i>Linear Algebra</i> (2)	

*Instructor (Elsewhere, Selected)*

Mathematics of Contingent Claims. TAMU, Spring 2010

Gentle, proof-based introduction to options pricing models: Black-Scholes, implied volatility trees, binomial trees and the like. Basic probability and differential equations are prerequisites.

Structure of Mathematics I. TAMU, Fall 2009

A “content” and “methods” for pre-service elementary and middle school teachers.

Calculus II. McGill University, Fall 2006

Linear Algebra and its Applications. Rutgers University, Summer 2005

For engineering graduate students. Matrix factorizations, numerical & iterative methods, etc.

*Co-Instructor (Elsewhere)*

(w/ F. Bergeron, F. Saliola) Algebra and Combinatorics. UQÀM, Fall 2006

Second year graduate topics course on quasisymmetric and noncommutative symmetric functions.

### Student Supervision

*Supervisor*

*New bases for  $r$ -quasisymmetric functions.* **LUROP Provost** and **WISER**, Summer 2018

*$(q, t)$ -Catalan Vandermonde determinants and the space of diagonal harmonics of Garsia-Haiman.* Summer 2015; **LUROP Provost**, Summer 2016

*Minimal generating sets for the symmetric group.* **McNair**, Summer 2016

*Horn-type questions about sums and products of matrices.* **WISER**, Summer 2016

*On a geometric three-letter generalization of Christoffel words.* **LUROP Provost**, Summer 2016

*Novel ways to invert a square matrix.* Summer 2015

*When is a matrix invertible?* **REAP Program** (High School Student), Summer 2014

*Co-Supervisor*

(w/ S. Doty) *Specht and permutation modules for Brauer algebras.* **LUROP Provost & LUROP Mulcahy**, Summer 2012–Spring 2015

(w/ A. Giaquinto) *Spectra of Frobenius seaweed Lie algebras.* **LUROP**, Summer 2011–Summer 2012, Summer 2013–Spring 2014

## **SERVICE**

### **Professional**

*Co-organizer, Special Sessions in AMS Sectional Meetings*

*“Hopf algebraic combinatorics,” LUC, October 2015*

*“Symmetric functions and their generalizations,” Wake Forest, September 2011*

*Co-organizer, Sage Days 65, LUC, June 2015*

*Co-organizer, CRM Mini-workshop, “Alg. Comb. meets Inverse Systems,” January 2007*

*External Examiner, PhD Defense Committee, York University, August 2018*

*External Examiner, PhD Defense Committee, UQÀM, May 2015*

*Member, Program Committee, 30<sup>th</sup> International FPSAC Conference, Dartmouth, July 2018*

*Member, Organizing Committee, AMS Central Section Fall Meeting, LUC, October 2015*

*Member, Organizing Committee, 26<sup>th</sup> International FPSAC Conference, DePaul, July 2014*

*Mentor, MAA Project NExT Fellows Program, Fall 2014 to Spring 2016*

*Referee, Journal and Conference Manuscripts (54)*

*Adv. Math. (1),*

*Canad. J. Math. (1),*

*Comm. Algebra (1),*

*DMTCS, Proc./FPSAC (21),*

*Electron. J. Combin. (4),*

*Exp. Math. (1),*

*Internat. J. Alg. Comput. (1),*

*Int. Math. Res. Not. (1),*

*Mem. Amer. Math. Soc. (1),*

*J. Algebra Appl. (1),*

*J. Algebraic Combin. (5),*

*J. Combin. Theory Ser. A (4),*

*J. Discrete Math. (1),*

*J. London Math. Soc. (1),*

*J. Pure and Appl. Alg. (3),*

*Selecta Math. (2),*

*Sém. Lothar. Combin. (2),*

*SIAM J. Discrete Math. (1),*

*SIGMA (1),*

*Trans. Amer. Math. Soc. (1)*

*Reviewer, MathSciNet, Math Reviews (12)*

*Reviewer, Young Investigator Grants Program, NSA, Spring 2015*

### **University**

*Interviewer, Ignatian Scholarship Competition, Spring 2015, Spring 2018*

*Interviewer, Presidential Achievement Competition, Spring 2013*

*Member, Hiring Committee: CSME Assistant Director for Math Programs, Spring 2015*

*Reviewer, Junior Science and Humanities Symposium, Loyola, Spring 2015, Spring 2016*

### **Other**

*Judge, Poster Session, Chicago Area Undergraduate Research Symposium, 2014*

*Judge, MAA “Undergraduate Poster Session,” Joint Meetings, January 2009 & January 2008*

*Participant, Loyola Math Teachers’ Circle, Fall 2015*

*Participant, Brazos Valley Math Teachers’ Circle (College Station, TX), Spring 2009–Spring 2010*

*Panelist, Mathematical Biology REU “Grad School Informational” (TAMU), July 2008*

## **PERSONAL INFORMATION**

**Citizenship:** *United States of America* (Born: Lafayette, Louisiana).

**Languages:** English (native), French (working).