

# Axel Iván Sáenz Rodríguez

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CONTACT INFORMATION	Department of Mathematics University of Virginia 141 Cabell Drive, Kerchof Hall P.O. Box 400137 Charlottesville, VA 22904 USA	Mobile: +1-918-760-3408 E-mail: ais6a@virginia.edu Website: faculty.virginia.edu/saenz/
RESEARCH INTERESTS	I research interacting particle systems via methods of integrability. I consider integrability from two perspectives, probabilistically and geometrically, and the connections between the two points of view. More specifically, I am interested in problems in the areas of the KPZ universality and the Eynard-Orantin topological recursion. Currently, I am working on integral formulas for the periodic ASEP model and asymptotic analysis for Schur Processes.	
ACADEMIC APPOINTMENTS	<b>Postdoctoral Researcher</b> Department of Mathematics, University of Virginia • Mary Ann Pitts Postdoctoral Fellow	August 2016 to present
EDUCATION	<b>University of California, Davis</b> , Davis, CA  Ph.D., Mathematics, June 2016 • Thesis Title: <i>Integrability and <math>\tau</math>-functions on Random Walkers &amp; Isomonodromy Deformation Systems</i> • Advisor: Professor Motohico Mulsae • Area of Study: Integrable Systems, Mathematical Physics, Algebraic Geometry  <b>Columbia University</b> , New York, NY B.A., Applied Mathematics, May 2011  <b>Budapest Semesters in Mathematics</b> , Budapest, Hungary Study Abroad, Spring Semester 2010	
PUBLICATIONS	[1] Iwaki, K., and Saenz, A. “Quantum curve and the first Painlevé equation”. <i>SIGMA</i> <b>12</b> (2016), 011, 24 pages.  [2] Iwaki, K., Marchal, O., and Saenz, A. “Painlevé equations, topological type property and reconstruction by the topological recursion”. <i>Journal of Geometry and Physics</i> <b>124</b> (2018), 16–54.  [3] Brattain, E., Do, N., and Saenz, A. “The completeness of the Bethe ansatz for the ASEP model with periodic boundary conditions”. arXiv:1511.03762v1 (2015) ( <i>submitted</i> ).	
AWARDS	• Kavli Institute for Theoretical Physics Graduate Fellow, January - July 2016 • Dissertation Year Fellowship, 2015 -2016 • Graduate Research Mentorship Fellowship, 2014 -2015 • Graduate Assistance in Areas of National Need (GAANN) Fellowship, 2012 -2013	
TALKS AND PRESENTATIONS	• <b>Geometric/Bernoulli Growth Process from Schur-Processes.</b> “Probability Seminar” February 21, 2018 at the University of Virginia. • <b>An Introduction to Interacting Particle Systems.</b> “Undergraduate Math Club” February 13, 2018 at the University of Virginia. • <b>Transition Probabilities for TASEP on the Ring.</b> “Applied and Computational Mathematics Seminar” November 3, 2017 at Tulane University.	

- **Relaxation Time Scale vs. Cut-Off for TASEP on the Ring.**  
“Integrable Probability Seminar” October 17, 2017 at MIT.
- **Transition Probabilities for ASEP on a Ring.**  
“Dyson-Schwinger Equations, Topological Expansions, and Random Matrices” August 30, 2017 at Columbia University.
- **KPZ Universality and Contour Integral Formulas.**  
“Department Seminar” January 27, 2017 at SUNY New Paltz.
- **Integrability and Contour Formulas for the ASEP Model on a Ring.**  
“Topological Recursion and Modularity” December 21, 2016 at MATRIX Institute in Creswick, Australia.
- **An Overview of the ASEP Model.**  
“VCU Analysis, Logic and Physics Seminar” September 30, 2016 at Virginia Commonwealth University.
- **Geometry and Topology on the Bethe Ansatz for the Periodic ASEP Model.**  
“XXXV Workshop on Geometric Methods in Physics” June 26 -July 2 2016 at University of Biaystok, Poland.
- **On the Completeness of the Bethe Ansatz for the Periodic ASEP Model.**  
“New approaches to non-equilibrium and random systems: KPZ integrability, universality, applications and experiments” January 11 -March 11 2016 at Kavli Institute of Theoretical Physics, UC Santa Barbara.
- **On the Completeness of the Bethe Ansatz for the Periodic ASEP Model.**  
“34th Annual Western States Mathematical Physics Meeting” February 15 -16 2016 at California Institute of Technology.
- **On the Completeness of the Bethe Ansatz for the Periodic ASEP Model.**  
“Davis-Warwick Probability Workshop” December 14 -16, 2015 at UC Davis.

#### SERVICE

Organizer of University of Virginia Probability Seminar, 2016 - present.

Local organizer of the conference Seminar on Stochastic Processes 2017 held at the University of Virginia, March 8-11, 2017

Service to the Galois Group, the UC Davis mathematics graduate student group:

- President, 2015 -2016
- Treasurer, 2014 -2015

Local organizer of the 6<sup>th</sup> annual Davis Math Conference held at UC Davis, 2015.

Representative of Mathematics department to the UC Davis Graduate Student Association (GSA), 2012-2013.

#### CONFERENCES AND WORKSHOPS

- “First (Integrable Probability) FRG Workshop” October 27 - October 29, 2017 at Columbia University.
- “Dyson-Schwinger Equations, Topological Expansions, and Random Matrices” August 28 - September 1, 2017 at Columbia University.
- “The 27th Annual PCMI Summer Session, Random Matrices” June 25 - July 15, 2017 at Park City Mathematics Institute.
- “Workshop on Asymptotic Representation Theory” February 20 - 24, 2017 at the Institut Henri Poincare.
- “Topological Recursion and Modularity” December 19 -23, 2016 at the MATRIX Institute of Australia.
- “Quantum Invariants and Low-Dimensional Topology” December 14 -17, 2016 at the MATRIX Institute of Australia.
- “Quantum Integrable Systems, Conformal Field Theories and Stochastic Processes” September 12 -23, 2016 at Institut d’Etudes Scientifiques de Cargese.
- “Topological Recursion and its Influence in Analysis, Geometry, and Topology” July 4 - 8, 2016 at The University of North Carolina.

- “2016 Summer School on Random Matrices” June 13 - 24, 2016 at The University of Michigan.
- “Random Matrices, Random Growth Processes and Statistical Physics” September 7 - 11, 2015 at The Simons Center for Geometry and Physics.
- “NIMS Summer School on Random Matrix Theory” June 29 - July 10, 2015 at The National Institute for Mathematical Sciences, Daejeon, South Korea.
- Conference: “Geometric Invariants and Spectral Curves ” June 1 and June 5, 2015, at The Leiden Center.
- Conference: “Western Algebraic Geometry Symposium (WAGS), ” February 28 - March 1, 2015 , at the University of California at Davis.
- AIM Workshop: “Quantum curves, Hitchin systems, and new developments in the Eynard-Orantin theory,” September 28 - October 3, 2014, in Palo Alto, California
- Banff International Research Station 5-Day Workshop: “Quantum Curves and Quantum Knot Invariants,” June 15 - June 20, 2014, in Banff, Canada
- Conference: “String-Math,” June 9 -13, 2014, at the University of Alberta, Edmonton, Canada
- Conference: “The Mathematics of Quantum Theory in Honor of the 80th Birthday of Professor Albert Schwarz,” May 23 - 27, 2014, at the University of California in Davis, California
- Conference : “Frontier Probability Days,” May 18 - 20, 2014, at the University of Arizona, Tucson, Arizona
- SISSA Workshop: “Hamiltonian PDEs, Forbenious Manifolds, and Delinge-Mumford Moduli Spaces,” September 16 - 20, 2013, at La Scuola Internazionale Superiore di Studi Avanzati, Trieste, Italy
- Banff International Research Station 5-Day Workshop: “Integrable Systems and Moduli Spaces,” August 25 - August 30, 2013, in Banff, Canada
- Conference: “Geometric topology in New York”, 12 - 16 August 2013, Columbia University.
- QGM Conference: “Topological Recursion and Quantum Algebraic Geometry,” January 21 - February 1, 2013, at the Center for Quantum Geometry of Moduli Spaces, Aarhus Universitet, Denmark

TEACHING  
EXPERIENCE

**University of Virginia**, Charlottesville, VA

*As Associate Instructor*

- MATH 9995: Independent Research (Integrable Probability) Spring, 2018
- MATH 3340: Complex Variables with Applications Spring, 2018
- MATH 9995: Independent Research (Symmetric Functions) Fall, 2017
- MATH 3100: Introduction to Probability Fall, 2017
- MATH 3310: Basic Real Analysis Summer, 2017
- MATH 4110: Introduction to Stochastic Processes Spring, 2017
- MATH 3100: Introduction to Probability Fall, 2016
- MATH 4110: Introduction to Stochastic Processes Fall, 2016

**University of California, Davis**, Davis, CA

*As Associate Instructor (Instructor of Record)*

- Math 16c: Short Calculus III Summer, 2012

*As Teaching Assistant*

- Math 21b: Calculus II Fall, 2011
- Math 21c: Calculus III Winter, 2012
- Math 21d: Calculus IV Spring, 2012
- Math 21a: Calculus I Fall, 2013

**Columbia University**, New York, NY

- Graded homework for numerous physics and mathematics courses. 2009-2010

PROFESSIONAL  
SERVICE

**Referee Service**

- *Annales de l'Institut Henri Poincaré*
- *Symmetry, Integrability and Geometry: Methods and Applications (SIGMA)*