

Rinat Kedem

*Curriculum Vitae*¹

Department of Mathematics MC-382, University of Illinois, Urbana, IL 61801 USA
e-mail: rinat@illinois.edu, Tel: +1-217-244-1350

ACADEMIC AREAS OF INTEREST: Combinatorial representation theory and mathematical physics: Infinite-dimensional Lie algebras, quantum affine algebras, cluster algebras, character identities and q -series, exactly solvable lattice models in statistical mechanics, conformal field theory.

ACADEMIC POSITIONS HELD:

2006–present **Associate Professor**
Department of Mathematics, University of Illinois Urbana-Champaign
2001–2006 **Assistant Professor**
Department of Mathematics, University of Illinois Urbana-Champaign
1997–2001 **Assistant Professor**
Department of Mathematics, University of Massachusetts, Amherst
1996–1997 **Postdoctoral Research Associate & Lecturer**
Department of Mathematics, University of California, Berkeley
1995–1996 **Postdoctoral Research Fellow**
Department of Mathematics, University of Melbourne, Australia
1993–1995 **JSPS Postdoctoral Research Fellow**
Research Institute for Mathematical Sciences, Kyoto University

EDUCATION

May 1993 **Ph.D. Physics**, State University of New York at Stony Brook
Dissertation: “Thermodynamics of the Potts model” (Supervisor: Barry McCoy)
May 1988 **B.A. Physics**, Macalester College, St. Paul, Minnesota
Honors: Phi Beta Kappa, Pi Mu Epsilon, Physics faculty award.

GRANTS, AWARDS AND FELLOWSHIPS

- (1) **6/2008–5/2011**: NSF Research Grant DMS 0802511
- (2) **5/09–12/10**: UIUC Campus Research Board grant
- (3) **4/08**: UIUC Scholars’ travel fund
- (4) **11/2007**: University of Illinois Research Board Grant
- (5) **5/2005–4/2008** National Science Foundation Research Grant DMS 0500759
- (6) **3/2005**: University of Illinois Scholars’ Travel grant
- (7) **1/2005**: University of Illinois Scholars’ Travel grant
- (8) **1/2005**: University of Illinois Research Board Grant
- (9) **5/2004**: American Women in Mathematics Travel Grant
- (10) **10/2001**: University of Illinois Research Board Grant
- (11) **5/2000**: American Women in Mathematics Travel Grant
- (12) **6/1998–5/2000**: National Science Foundation Research Grant DMS 9870550
- (13) **7/1997**: National Science Foundation/ICMP travel grant
- (14) **7/1994**: National Science Foundation/ICMP travel grant
- (15) **9/1993–8/1995**: National Science Foundation/JSPS Postdoctoral Fellowship.

¹last updated September 14, 2010

(16) **9/1988–8/1992:** National Science Foundation Patricia Harris Graduate Fellowship.

RECENT VISITING POSITIONS

- (1) Member, Mathematical Sciences Research Institute program on “Random Matrix Theory, Interacting Particle Systems and Integrable Systems,” Fall 2010.
- (2) Participant, Clay Mathematics Institute 2010 Summer School “Probability and Statistical Physics in Two and more Dimensions”, July 2010, Buzios, Brazil.
- (3) Visiting researcher, CEA-Saclay Institut de Physique Théorique, Gif sur Yvette, France, May and June 2010.
- (4) Visiting scholar, Institut Henri Poincaré, Paris, France, program on Statistical physics, combinatorics and probability, September-October, 2009.
- (5) Mathematisches Forschungsinstitut Oberwolfach Research in Pairs program, August-Sept, 2009.
- (6) Visiting professor, CEA-Saclay Institut de Physique Théorique, Gif sur Yvette, France, May-August, 2009.
- (7) Visiting researcher, NORDITA Stockholm, June 2008.
- (8) Fellow, Institut des Hautes Études Scientifiques, France June 1–July 31 2008.
- (9) Member, Erwin Schrödinger Institute, Vienna, Program on combinatorial statistical mechanics May 18-June 2, 2008.
- (10) Member, MSRI program on Combinatorial Representation Theory, January-May 2008.
- (11) Visiting scholar, CEA-Saclay IPhT, Gif sur Yvette, France Summer/Fall 2007
- (12) Heriot-Watt University, Edinburgh and University of Glasgow, Scotland, July 2007.
- (13) CTQM, University of Aarhus, Denmark June 2007
- (14) Institut des Hautes Études Scientifiques, France , November-December 2006.
- (15) Research Institute for Mathematical Sciences, Kyoto University, October 2006.
- (16) Visiting Researcher, Mathematics Department, University of California Berkeley, Fall 2006.
- (17) Erwin Schrödinger Institute, Vienna, Program on Tensor Categories and Mathematical Physics, June 2004.
- (18) Mathematical Sciences Research Institute, Berkeley, June–July 2002.
- (19) Research Institute for Mathematical Sciences, Kyoto University, May 2002.
- (20) Mathematical Sciences Research Institute, Berkeley, Program on infinite dimensional Lie algebras and mathematical physics, Spring 2002.
- (21) UCLA Institute for Pure and Applied Mathematics, Program on Conformal Field Theories, Fall 2001.
- (22) Visiting Researcher, Department of Mathematics, University of California, Berkeley, 2000–2001.
- (23) Mathematical Sciences Research Institute, Berkeley, Program on Noncommutative Algebra, May–July 2000.
- (24) Research Institute for Mathematical Sciences, Kyoto University, August 1999.
- (25) Mathematical Sciences Research Institute program on Random Matrix Models and Their Applications, January–July 1999.

RECENT CONFERENCE LECTURES AND SEMINARS

- (1) 6/10: 15th Itzykson meeting “New trends in quantum integrability” IPhT-Saclay, France.
- (2) 5/10: Algebra and Combinatorics day, Purdue.
- (3) 4/10: MIT Combinatorics Seminar.
- (4) 4/10: AMS Central Section meeting, St. Paul session on “combinatorial representation theory”.

- (5) 03/10: Combinatorics Seminar, University of Michigan.
- (6) 01/10: Algebra and Combinatorics seminar, North Carolina State University.
- (7) 12/09: Canadian Mathematical Society Winter Meeting, Winsdor, Ontario, Session on “Lie algebras and representation theory”.
- (8) 10/09: Institut Henri Poincaré workshop on “Two dimensional lattice models”.
- (9) 4/09: Newton Institute Workshop on Geometric Aspects of Discrete and Ultra-discrete Integrable Systems, University of Glasgow.
- (10) 3/09 Session organizer “Algebra, Geometry and Combinatorics” AMS sectional meeting Urbana, IL.
- (11) 3/09 Oberwolfach workshop on Enveloping Algebras and Geometric Representation Theory
- (12) 10/08 499 Inroduction to Graduate Research (University of Illinois).
- (13) 9/08 Conference on “Combinatorics and representation theory”, Nagoya University, Japan.
- (14) 8/08 Workshop on crystals and tropical combinatorics, Kyoto, Japan.
- (15) 5/08: Workshop on “combinatorics and statistical physics”, Erwin Schödinger institute, University of Vienna.
- (16) 3/08: MSRI workshop on Combinatorial Representation Theory.
- (17) 3/08: BIRS workshop on Quantum affine Lie algebras, extended affine Lie algebras, and applications.
- (18) 2/08: Combinatorial representation theory seminar, MSRI.
- (19) 2/08: Lie theory seminar, University of California Riverside.
- (20) 2/07: Colloquium, University of California Riverside.
- (21) 11/07: Mathematical physics seminar: CEA-Saclay/IPhT.
- (22) 10/07: ENIGMA school on quantum integrable systems, la Londe les Maures, France.
- (23) 7/07: Conference: Recent developments in infinite dimensional algebras and their applications to quantum integrable systems, Faro, Portugal.
- (24) 7/07: Algebra seminar, University of Glasgow.
- (25) 7/07: Mathematical physics seminar, Heriot Watt University, Edinburgh
- (26) 12/06: Themes in the interface of Representation Theory and Physics, City University, London.
- (27) 12/06: Algebra and geometry Seminar, University of Versailles, France.
- (28) 12/06: Universal enveloping algebras Seminar, University of Paris VI, France
- (29) 10/06: Workshop on Combinatorial Representation Theory and Related Topics, Kyoto.
- (30) 6/06: Integrable Systems 2006 workshop, Prague.
- (31) 3/06: Representation theory, geometry and combinatorics seminar, Berkeley.
- (32) 7/05: ARCC Workshop on Generalized Kostka Polynomials, American Institute of Mathematics.
- (33) 5/05 Conference on Lie algebras, Vertex Operator algebras and their applications, NCSU.
- (34) 3/05: Representations of Kac-Moody Algebras and Combinatorics, BIRS, Banff, Canada.
- (35) 7/04: Conference on Quantum Groups at the Technion, Haifa.
- (36) 6/04: Tensor Categories in Mathematics and Physics, Erwin Schrödinger Institute, Vienna
- (37) 9/03: Quantum Theory and Symmetries 3, Cincinnati, OH.
- (38) 4/03: Session Organizer, AMS sectional meeting, Bloomington, IN.
- (39) 12/01: Classical and quantum integrable systems, Edinburgh.
- (40) 11/01: Representations of Loop groups, IPAM, UCLA.
- (41) 8/01: XIV Coloquio Latinoamericano de Algebra, Cordoba, Argentina.
- (42) 5/01: Conference on Representation Theory, UCSC.
- (43) 5/00: Conference on Infinite-Dimensional Lie theory and Conformal Field Theory, U. Virginia.
- (44) 5/00: Combinatorics seminar, MIT.
- (45) 4/00: Workshop on Quantum Algebras and Integrability, U. Montreal.
- (46) 3/00: Mathematical Sciences Research Institute Workshop on Quantum Groups, Morelia, Mexico.

LIST OF PUBLICATIONS

- [1] P. Di Francesco and R. Kedem, Non-commutative integrability, paths and quasi-determinants. Preprint June 2010, Submitted.
- [2] R. Kedem, A pentagon of identities, fusion products and the Kirillov-Reshetikhin conjecture. Preprint April 2010, Accepted for publication.
- [3] P. Di Francesco and R. Kedem, Discrete non-commutative integrability: Proof of a conjecture by M. Kontsevich, *International Mathematics Research Notices* (2010) doi:10.1093/imrn/rnq024 (22 pages).
- [4] P. Di Francesco and R. Kedem, Positivity of the T-system cluster algebra. *Elec. J. Combinatorics* (2009) **16**(1). (39 pages).
- [5] P. Di Francesco and R. Kedem, Q-system Cluster Algebras, Paths and Total Positivity. *SIGMA* **6** (2010), 014, 36 pages.
- [6] P. Di Francesco and R. Kedem, Q-systems, Heaps, Paths and Cluster Positivity. *Comm. Math. Phys.* **293** (2010) 727–802. DOI 10.1007/s00220-009-0947-5 (2009).
- [7] Ph. Di Francesco and R. Kedem, Q-systems as cluster algebras II: Cartan matrix of finite type and the polynomial property. *Lett. Math. Phys.* (2009) **89**:183–216.
- [8] R. Kedem, Q-systems as cluster algebras. *J. Phys. A: Math. Theor.* **41** (2008) 194011, 14 pages.
- [9] P. Di Francesco, R. Kedem, Proof of the combinatorial Kirillov-Reshetikhin conjecture. *Int. Math. Res. Notices* **2008** (2008): rnm006-57 (57 pages).
- [10] E. Ardonne, R. Kedem, Fusion products of graded Kirillov-Reshetikhin modules and fermionic multiplicity formulas. *J. Algebra* **308** (2007) 270–294.
- [11] E. Ardonne, R. Kedem, M. Stone, Fermionic characters and arbitrary highest-weight integrable affine sl_{r+1} modules, *Comm. Math. Phys.* **264** (2006) 427–464.
- [12] E. Ardonne, R. Kedem, M. Stone, Fusion products, Kostka polynomials, and fermionic characters of $su(r+1)_k$, *J. Phys. A: Math. Gen.* **38** (2005) 9183–9205.
- [13] E. Ardonne, R. Kedem, M. Stone, Filling the Bose sea: symmetric quantum Hall edge states and affine characters. *J. Phys. A: Math. Gen.* **38** (2005) 617–636,.
- [14] R. Kedem, Fusion products of sl_N symmetric power representations and Kostka polynomials. *Quantum Theory and Symmetries: Proceedings of the 3rd International Symposium Cincinnati, USA 10 - 14 September 2003* (World Scientific) 88–93.
- [15] R. Kedem, Fusion products, cohomology of $GL(N)$ flag manifolds, and Kostka polynomials, *IMRN* 2004:25 (2004) 1273-1298.
- [16] B. Feigin, M. Jimbo, R. Kedem, S. Loktev, T. Miwa, Spaces of coinvariants and fusion product II. Affine sl_2 character formulas in terms of Kostka polynomials. (math.QA/0208156) *J. Algebra* **279** (2004) 147–179.
- [17] B. Feigin, M. Jimbo, R. Kedem, S. Loktev, T. Miwa, Spaces of coinvariants and fusion product I. From equivalence theorem to Kostka polynomials. *Duke Math. J.* volume 125, no. 3 (2004).
- [18] B. Feigin, R. Kedem, S. Loktev, T. Miwa, E. Mukhin, Combinatorics of the \hat{sl}_2 Spaces of Coinvariants–Dual functional realization and recursion. *Compositio Mathematica Compositio Math.* **134** (2002), no. 2, 193–241.
- [19] B. Feigin, R. Kedem, S. Loktev, T. Miwa, E. Mukhin, Combinatorics of the \hat{sl}_2 Spaces of Coinvariants Loop Heisenberg modules and recursion. *Selecta Math.* **8** (2002), no. 3, 419–474.
- [20] B. Feigin, R. Kedem, S. Loktev, T. Miwa, E. Mukhin, Combinatorics of the \hat{sl}_2 spaces of coinvariants. *Transform. Groups* 6 (2001), no. 1, 25–52.
- [21] R. Kedem, Singular R -matrices and Drinfeld’s comultiplication, *Lett. Math. Phys.* **41** (1997) 149–160.
- [22] M. Jimbo, R. Kedem, H. Konno, T. Miwa and J. Petersen, Level-0 structure of level-1 $U_q(\hat{sl}_2)$ modules and Macdonald Polynomials. *Phys. Lett. A* **28** 5589–5606 (1995).
- [23] M. Jimbo, R. Kedem, H. Konno, T. Miwa and J. Petersen, New level-0 action of $U_q(\hat{sl}_2)$ on level-1 modules. *Proceedings of the 1994 statistical mechanics and quantum field theory workshop, Univ. Southern California.* World Scientific, Singapore (1995).
- [24] M. Jimbo, R. Kedem, H. Konno, T. Miwa, and R.A. Weston, Difference equations in spin chains with a boundary. *Nucl. Phys. B.* **B448** 429–456 (1995).
- [25] M. Jimbo, R. Kedem, T. Kojima, H. Konno and T. Miwa, XXZ chain with a boundary. *Nucl. Phys.* **B441** 437–470 (1995).
- [26] R. Kedem and B. M. McCoy, Quasi-particles in the chiral Potts model. *Intl. J. Mod. Phys.* **B8** 3601–3621 (1994).
- [27] O. Foda, K. Iohara, M. Jimbo, R. Kedem, T. Miwa and H. Yan, Notes on highest weight modules of the elliptic algebra $\mathcal{A}_{q,p}(\hat{sl}_2)$, *Prog. Theor. Phys. Suppl.* **118** 1–34 (1995).
- [28] O. Foda, K. Iohara, M. Jimbo, R. Kedem, T. Miwa and H. Yan, An elliptic quantum algebra for \hat{sl}_2 . *Lett. Math. Phys.* **32** 259–268 (1994).
- [29] S. Dasmahapatra, R. Kedem, B. M. McCoy and E. Melzer, Virasoro characters from Bethe equations for the critical ferromagnetic three-state Potts model. *J. Stat. Phys.* **74** 239 (1994).

- [30] R. Kedem, B. M. McCoy and E. Melzer, The sums of Rogers, Schur and Ramanujan and the Bose-Fermi correspondence in 1+1-dimensional quantum field theory. *Proceedings of the 1994 statistical mechanics and quantum field theory workshop, Univ. Southern California*. World Scientific, Singapore (1995).
- [31] S. Dasmahapatra, R. Kedem, T. R. Klassen, B. M. McCoy and E. Melzer, Quasi-particles, conformal field theory and q -Series. *Int. J. Mod. Phys. B* **7** 3617 (1993).
- [32] R. Kedem, T. R. Klassen, B. M. McCoy and E. Melzer, Fermionic sum representations for conformal field theory characters. *Phys. Lett. B* **307** 68 (1993).
- [33] R. Kedem, T. R. Klassen, B. M. McCoy and E. Melzer, Fermionic quasi-particle representations for characters of $\frac{(G^{(1)})_1 \times (G^{(1)})_1}{(G^{(1)})_2}$. *Phys. Lett. B.* **304** 263 (1993).
- [34] R. Kedem and B. M. McCoy, Construction of modular branching functions from Bethe's equations in the 3-State potts chain. *J. Stat. Phys.* **71** 875 (1993).
- [35] R. Kedem, Thermodynamics of the 3-state Potts spin chain, *J. Stat. Phys.* **71** 903 (1993).
- [36] S. Dasmahapatra, R. Kedem and B. M. McCoy, Spectrum and completeness of the 3-State superintegrable chiral Potts model, *Nucl. Phys.* **B396** 506 (1993).