

# Dennis Eichhorn

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## Education

- 1993 – 1999 **Ph.D., Mathematics**, University of Illinois at Urbana-Champaign.  
Research Areas: Analytic Number Theory, Enumerative Combinatorics, and Graph Theory.  
Thesis Title: *Some results on the congruential and gap-theoretic study of partition functions.*  
Advisor: Professor Bruce C. Berndt.
- 1992 – 1993 Mathematics, The Pennsylvania State University.
- 1988 – 1992 **B.A., Mathematics** with a minor in Computer Science, West Chester University, Summa Cum Laude.

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## Employment

- 2007 – present **Associate Specialist**, University of California at Irvine.
- 2006 – 2007 **Visiting Scholar**, University of Connecticut.
- 2004 – 2006 **Adjunct Professor**, California State University, East Bay.
- 2002 – 2004 **Visiting Assistant Professor**, University of Arizona.
- 1999 – 2002 **VIGRE Post-Doc**, University of Arizona.

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## Publications

- Hybrid proofs of the  $q$ -binomial theorem and other identities, with J. McLaughlin and A. Sills, *Electron. J. Combin.* 18 (2011), no. 1, Paper 60, 21 pp.
- A new lower bound on the number of odd values of the ordinary partition function, *Ann. Comb.* 13 (2009), no. 3, 297–303.
- Sums and differences of the coordinates of points on modular hyperbolas, with M. R. Khan, A. H. Stein, and C. L. Yankov, *Combinatorial number theory*, 17–39, Walter de Gruyter, Berlin, 2009.
- Reciprocals of binary power series, with J. N. Cooper and K. O’Byrant, *Int. J. Number Theory* 2 (2006), no. 4, 499–522.
- Computational proofs of congruences for 2-colored Frobenius partitions, with J. A. Sellers, *Internat. J. Math. Math. Sci.* 29 (2002), no. 6, 333–340.
- Gap unification theory: a note on the treatment of partitions via their gaps, *J. Number Theory* 90 (2001), no. 1, 62–73.
- Edge-coloring cliques with many colors on subcliques, with D. Mubayi, *Combinatorica* 20 (2000), no. 3, 441–444.
- Edge-bandwidth of theta graphs, with D. Mubayi, K. O’Byrant, and D. B. West, *J. Graph Theory* 35 (2000), no. 2, 89–98.
- A combinatorial approach to partitions with parts in the gaps, *Acta Arith.* 85 (1998), no. 2, 119–133.
- Congruences for partition functions, with K. Ono, *Analytic Number Theory*, Vol. 1 (Allerton Park, IL, 1995), 309–321, *Progr. Math.*, vol. 138, (Birkhäuser, Boston), (1996).

## Invited Talks, Special Lectures, and other Selected Presentations

- “The Party Problem, the Four-Color Question, the Seven Bridges of Konigsberg, and Beyond: an Introduction to Solved and Unsolved Problems in Graph Theory,” December 2011, Math Department Colloquium, (Whittier College).
- “Ramsey Theory and the Party Problem,” February 2011, Honored Lecturer, MATH-COUNTS Orange County Competition (UCI).
- “A Completely Accessible and Historically Motivated Introduction to The Theory of Partitions and its Connections to Number Theory, Combinatorics, Group Theory, Continued Fractions, Statistical Mechanics, Complex Analysis, Patience, Chess, and Ping-Pong,” January 2010, Undergraduate Colloquium (UCI).
- “A Completely Accessible and Historically Motivated Introduction to The Theory of Partitions and its Connections to Number Theory, Combinatorics, Representation Theory, Complex Analysis, Group Theory, Modular Forms, Continued Fractions, Patience, Chess, Particle Physics, and Ping-Pong,” May 2009, Math Department Colloquium (Cal State Long Beach).
- “Odd Counts of Partitions,” May 2008, Number Theory Seminar (UCI).
- “The Distribution of the Points  $(x, x^{-1})$  modulo  $n$ ,” October 2007, Integers Conference 2007, (University of West Georgia).
- “The Odd Values of  $p(n)$ ,” May 2006, Combinatorial and Additive Number Theory Conference 2006, (CUNY Graduate Center, New York).
- “The Odd Values of  $p(n)$ ,” October 2005, Integers Conference 2005, (University of West Georgia).
- “Does the Number of  $t$ -cores Rise as  $t$  Increases in Size?,” May 2005, Combinatorial and Additive Number Theory Conference 2005, (CUNY Graduate Center, New York).
- “Partition Functions Do Not Concentrate Too Heavily Modulo  $M$ ,” November 2004, Conference on Additive Number Theory, (University of Florida).
- “A Classical Treatment of the Divisibility Properties of Partition Functions,” October 2003, Integers Conference 2003, (University of West Georgia).
- “A Classical Treatment of the Divisibility Properties of  $p(n)$ ,” May 2003, AMS Western Section Meeting (San Francisco State).
- “Combinatorial Proofs for Colorful Partition Congruences,” May 2002, Illinois Number Theory Conference (University of Illinois).
- “On the Divisibility of  $r_k(n)$ , the Number of Representations of  $n$  as a Sum of  $k$  Squares,” November 1999, Conference On Symbolic Computation, Number Theory, Special Functions, Physics and Combinatorics (University of Florida).
- “Proving Congruences for Arithmetic Functions,” July 1999, NSF-REU in Number Theory (Rose-Hulman).
- “Gap Unification Theory: Comments on the Treatment of Partitions Via Their Gaps,” March 1999, AMS Midwest Section Meeting (University of Illinois).
- “A Completely Accessible and Historically Motivated Introduction to the Theory of Partitions and its Connections to  $q$ -series, Modular Forms, Combinatorics, Group Theory, Particle Physics, Rook Theory, Representation Theory, Patience, and Ping-Pong,” December 1998, Graduate Student Seminar (Ohio State).
- “Proving Congruences of Partition Functions,” October 1998, AMS Eastern Section Meeting (Penn State).

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## Teaching Experience

### 1993 – 1999 **Teaching Assistant at the University of Illinois.**

- Taught a wide range of undergraduate courses, including pre-calculus, numeracy, business calculus, and calculus.
- Used different instructional styles, including large lecture, traditional lecture, and small group collaborative learning (Harvard Consortium).
- Developed and taught a new advanced calculus course that uses small group collaborative learning.
- Taught a large lecture business calculus class (200+ students) that involved coordinating teaching assistants running discussion sections.
- Assisted in the Math Department Teaching Assistant Orientation for four years.

### 1999 – 2002 **VIGRE Post-Doc at the University of Arizona.**

- Taught several undergraduate courses, including calculus, math in modern society, and abstract algebra.
- Headed a Research Tutorial Group, “An Introduction to the Theory of Partitions,” in which four first-year graduate students did semester-long research projects in number theory.
- Directed two Masters theses.

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## Graduate Advising

- Greg Houser, University of Arizona, M.S., Spring 2002, “Combinatorial proofs of classical congruences for  $C_h(n)$ , the number of partitions of  $n$  in  $h$  colors.”
- Eric Roberts, University of Arizona, M.A., Fall 2002, “Sets of integers with  $l$  terms in arithmetic progression.”

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## Past and Present Professional Activities

- Referee for The International Journal of Number Theory, The Proceedings of the American Mathematical Society, The Transactions of the American Mathematical Society, The Electronic Journal of Combinatorics, The Turkish Journal of Mathematics, Ars Combinatoria, The Journal of Integer Sequences, INTEGERS: The Electronic Journal of Combinatorial Number Theory, and Discrete Mathematics.
  - Reviewer for Math Reviews and Zentralblatt Math.
  - Collaborating problems and solutions editor for The American Mathematical Monthly.
  - Advisor for the Cal State East Bay Putnam Team and Math Problems Group.
  - Assistant Advisor for the University of Connecticut Putnam Team.
  - Assistant Advisor for the UC Irvine Putnam Team.
  - Informal GRE Math Subject Exam Advisor for UC Irvine undergraduates.
  - Informal Interview Coach for UC Irvine math graduate students and postdocs.
  - Informal reviewer of job application materials for select UC Irvine math graduate students and postdocs.
  - Co-director of the UC Irvine Future Faculty Program for math graduate students.
  - External Reviewer of research proposals for CUNY.
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## Fellowships and Grants

- 1999 – 2002 Partially supported by a VIGRE grant, University of Arizona.
- 1997 – 1999 Research Assistant for two semesters plus one summer term on a grant from the University of Illinois Research Board under Bruce Berndt.
- 1997 – 1998 Partially supported by an NSA grant under Bruce Berndt for two summers.
- 1993 – 1998 G.A.A.N.N. Fellow for five semesters plus four summer terms, University of Illinois.
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## Manuscripts in Preparation

- Ranks and cranks for Ramanujan-like congruences of  $p(n, m)$ , with B. Kronholm, (in preparation).
  - A bijective treatment of gap-frequency partitions, with A. Sills, (in preparation).
  - On the distribution of binomial coefficients among quadratic residues modulo  $p$ , with A. Stein, (in preparation).
  - On relations between  $t$ -core partition functions, (in preparation).
  - A classical treatment of the distribution of partition functions modulo  $M$ , (in preparation).
  - Combinatorially generated weighted partition identities, with Kevin O’Bryant, (in preparation).
  - Finitization proofs of congruences for  $t$ -cores, with J. A. Sellers (preprint, 10 pp.).
  - Divisibility properties of certain arithmetic functions in any arithmetic progression, (in preparation).
  - Combinatorial proofs of classical congruences for  $c_h(n)$ , the number of partitions of  $n$  in  $h$  colors, with G. Houser, (in preparation).
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## Honors, Awards, and Committee Work

- 2011 – present Math 2A/2B Final Exam Review Committees, UC Irvine.
- 2005 Selfridge Prize for Excellence in Mathematics Presentation.
- 1999 Campus Award for Excellence in Undergraduate Teaching (\$3500 plus \$1000 salary increase), University of Illinois.
- 1999 College of Liberal Arts and Sciences Award for Excellence in Undergraduate Teaching for Graduate Teaching Assistants (\$2000), University of Illinois.
- 1998 Math Department Instructional Award, University of Illinois.
- 1997 Appointed to the Graduate College Executive Committee, University of Illinois.
- 1997 Elected Co-Chair of the University of Illinois Graduate Student Advisory Council.
- 1997 Appointed to the University of Illinois Senate.
- 1995, 1996 Elected to Math Department Graduate Affairs Committee, University of Illinois.
- 1994 – 1998 On the University of Illinois *List of Teachers Rated as Excellent by Their Students* for five semesters (out of six possible).
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