

# Brian Curtin

## Curriculum Vitae

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### Education

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Doctor of Philosophy in Mathematics. University of Wisconsin, Madison, *August 1996*  
Wisconsin. Minor in History of Science.

Thesis advisor: Paul M. Terwilliger.

Bachelor of Arts Degree. Ripon College, Ripon, Wisconsin. Majors in *May 1991*  
Mathematics and Physics, Minor in Computer Science. Graduated  
Summa Cum Laude.

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### Graduate and Postdoctoral Fellowships

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National Science Foundation Postdoctoral Research Fellowship. *1998-2001*

Hosted by Vaughn Jones of the University of California–Berkeley.

Japan Society for the Promotion of Science Postdoctoral Fellowship. *1996–1998*

Hosted by Eiichi Bannai at Kyushu University.

National Science Foundation Graduate Fellowship *1991–1994*

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### Research Grants

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NSA Young Investigators Award *2003-2005*

Research and Creative Scholarship Grant Program, *2002*  
University of South Florida internal grant

USF Faculty Development Grant *2004*

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### Undergraduate Awards

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Ripon College Outstanding Senior Mathematics Major *1991*

Honorable Mention, Mathematical Contest in Modeling *1991*

Meritorious, Mathematical Contest in Modeling *1990*

Meritorious, Mathematical Contest in Modeling *1989*

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### Research

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My area of research is the algebraic combinatorics of Bose-Mesner algebras, Terwilliger algebras, Leonard pairs, spin models, and planar algebras. I am particularly interested in duality, spin models, algebraic characterizations of combinatorial properties, and Leonard pairs and tridiagonal pairs in representation theory. In these areas I often focus on examples related to distance-regular graphs and connection to quantum groups. I have also studied some combinatorial planar algebras and used linear algebra to study Fibonacci numbers.

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**Employment**


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- Associate Professor.** Department of Mathematics, University of South Florida. *2007–Present*
- Assistant Professor.** Department of Mathematics, University of South Florida. *August 2001–2007*
- NSF Postdoctoral Fellow.** Department of Mathematics, University of California, Berkeley. Researched mathematical problems under the auspices of the National Science Foundation. *August 1998– July 2001*
- Adjunct Assistant Professor.** Department of Mathematics, University of California, Berkeley. Taught one upper division undergraduate math course each semester: real and complex analysis, linear algebra (twice). *August 1999–Present*
- JSPS Postdoctoral Fellow.** Department of Mathematics, Kyushu University, Fukuoka, Japan. Researched mathematical problems under the auspices of the Japan Society for the Promotion of Science. *August 1996–August 1998*
- Teaching Assistant.** Department of Mathematics, University of Wisconsin–Madison. Taught 3 sections of trigonometry. Planned and delivered lectures. Responsible for assigning and grading homework. *January–May 1996*
- Teaching Assistant.** Department of Mathematics, University of Wisconsin–Madison. Led discussion sections for 3 semester calculus sequence. Responsible for weekly quizzes and homework. *August 1994–December 1995*
- Coach of Math Modeling Club.** Department of Mathematics and Computer Science, Ripon College, Ripon, Wisconsin. Prepared students to participate in the National Contest in Modeling. Designed talks and exercises to introduce methods of applicable mathematics. *August 1993–March 1994*
- Program Assistant for NSF REU.** Department of Mathematics, University of Dayton, Dayton, Ohio. Aided undergraduate research projects in graph theory at a National Science Foundation Research Experience for Undergraduates. *June–August 1993; June–August 1992*
- Departmental Assistant.** Department of Mathematics and Computer Science, Ripon College, Ripon, Wisconsin. Assisted *Mathematica*-based laboratory sessions and graded homework. *January–May 1991*
- NSF REU participant.** Department of Mathematics, University of Dayton, Dayton, Ohio. Independently examined a problem in algorithmic graph theory, showing the problem to be NP-complete. *June–August 1990*

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## Courses Taught

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### Calculus:

- Engineering Calculus I (Fall 2001, Spring 2007)
- Calculus II (Spring 2002, 2006, 2008)
- Engineering Calculus II (Spring 2005, 2009)
- Engineering Calculus III (Fall 2002)
- Calculus III (Spring 2003, 2004, Fall 2007)

### Upper Division Undergraduate Courses:

- Linear Algebra (Fall 2000, Spring 2001, Spring 2002)
- Elementary Abstract Algebra (Fall 2003, 2004, 2005, 2006)
- Introduction to Real Analysis (Spring 2000)
- Introduction to Complex Analysis (Fall 1999)
- Mathematical Modeling (Fall 2006, 2008)

### Graduate Courses:

- Algebra I (Fall 2002, 2003, 2005, 2007)
- Algebra II (Spring 2003, 2004, 2006, 2008)
- Algebraic Graph Theory (Fall 2001)
- Lie Algebras (Fall 2004)
- Association Schemes (Fall 2008)

### Seminars:

- Organized reading seminar on Leonard pairs (Fall 1999, Spring 2000)
- Ran seminar for undergraduates in preparation for the Mathematical Contest in Modeling (Fall 1993, Spring 1994, Fall 2000, Spring 2001)

Sponsored a team in the Spring 2006, 2007, 2009 Mathematical Contests in Modeling.

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**Graduate Students**


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Hasan Alnajjar, Ph.D., Spring 2004. “Tridiagonal pairs in representation theory”.

Now at Jordan University, Aman, Jordan.

Ena Salter, MA, Summer 2005. “Fibonacci vectors”.

Now at Manatee Community College, Sarasota, Florida.

Ibtisam Daqqa, Ph.D. Spring 2008. “The subconstituent algebra of a Latin square”.

Now at Saudi Arabia.

Jessica Sobkowiak, MA, Summer 2009. “Some combinatorial structures constructed from modular Leonard triples”.

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**Presentations**


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Colloquium: “The Terwilliger algebra of a Latin square” National Chiao Tung University, Hshinchu, Taiwan. *June 9, 2009*

“Leonard pairs associated with  $sl_2$ ” AMS Sectional, Worcester Massachusetts, WPI. *April 25, 2009*

“Spin Leonard pairs” Knotting Mathematics and Art: International conference in low dimensional topology and Mathematical Art, University of South Florida. *November 4, 2007*

Invited: “Leonard Triples” AMS Sectional, Chicago Illinois. *October 6, 2007*

“Isomorphisms and homomorphisms of graphs” Algebraic Combinatorics, An International Conference in Honor of Eiichi Bannai’s 60th Birthday, Sendai, Japan. *June 30, 2006*

Invited (Colloquium): “Bose-Mesner algebras” Kent State University. *February 9, 2006*

Invited: “Duality of Bose-Mesner algebras” AMS Sectional, Lincoln Nebraska. *October 22, 2005*

Invited: “Modular Leonard triples of Bannai-Ito type” AMS Sectional, Bard College, New York. *October 9, 2005*

“Hyper-self-duality of Hamming and Doob graphs” Geometric and Algebraic Combinatorics 3, Oisterwijk, The Netherlands. *August 16, 2005*

“Bose-Mesner algebras, spin models, and planar algebras” Subfactors Seminar, Vanderbilt University. *March 29, 2005*

Invited: “Hyper-dual pairs of Bose-Mesner algebras” Com<sup>2</sup>MaC Conference on Association schemes, Codes, and Designs, Pusan National University, Busan, Korea. *July 24, 2004*

Invited: “Modular Leonard triples” AMS sectional, Chapel Hill, NC. *October 24, 2003*

Invited: “Modular Leonard triples” International workshop on special functions, orthogonal polynomials, quantum groups, and related topics, Bexbach, Germany. *October 19, 2003*

- “Automorphisms and homomorphisms of graphs.” Combinatorics Seminar, University of Florida. February 18, 2003
- Invited: “Planar algebras generated by graphs.” AMS sectional, Orlando, FL. November 10, 2002
- “1-Homogeneous, pseudo 1-homogeneous, and 1-thin distance-regular graphs.” Geometric and Algebraic Combinatorics 2, Oisterwijk, The Netherlands. August 15, 2002
- “Graph automorphisms and homomorphisms.” Combinatorics Seminar, University of Wisconsin–Madison. October 27, 2001
- “Some planar algebras generated by graphs” Formal Power Series and Algebraic Combinatorics, Tempe, Arizona. May 27, 2001
- Invited (Colloquium): “Bose-Mesner algebras.” University of South Florida. March 2, 2001
- Invited (Colloquium): “Bose-Mesner algebras.” Texas A&M . January 26, 2001
- “A Planar algebra constructed from the Petersen graph.” Algebraic Combinatorics, Monster and Vertex Operator Algebras, University of California, Santa Cruz. July 24, 2000
- Invited: “Planar algebras related to graphs.” Com<sup>2</sup>MaC Conference on Association schemes, Codes, and Designs, Postech, Korea. July 6, 2000
- “Highly structured graphs and their algebraic combinatorics.” Mathematics undergraduate student association lecture, University of California, Berkeley. September 6, 1999
- Poster: “Distance-Regular Graphs Related to the Quantum Universal Enveloping Algebra of  $sl(2)$ .” Formal Power Series and Algebraic Combinatorics, Barcelona, Spain. June 10, 1999
- Poster: “Quantum enveloping algebras and spin models.” Symposium à la Mémoire de François Jaeger, Grenoble France. September 2, 1998
- Invited: “The local structure of a bipartite distance-regular graph.” Workshop on Distance-regular graphs, National Chiao Tung University, Hsinchu, Taiwan. June 4, 1998
- “Quantum enveloping algebras and association schemes.” Group theory and algebraic combinatorics, RIMS, Kyoto. March 11, 1998
- “ $U_q(sl(2))$  and polynomial association schemes.” Workshop on Jacobi polynomials and Gauss sums, RIMS, Kyoto. December 2, 1997
- “Distance-regular graphs with few irreducible  $T$ -modules.” Yamagata, Japan. November 20, 1997
- Invited: “ $U_q(sl(2))$  and some spin models on distance-regular graphs.” 8th Annual Kusatsu Seminar, Kusatsu, Japan. August 2, 1997
- “Spin models on distance-regular graphs.” 14th annual Symposium in Algebraic Combinatorics in Japan, International Christian University, Tokyo, Japan. With K. Nomura. July 15, 1997

- “Distance-regular graphs which support a spin model are thin.” British Combinatorial Conference, London. *July 7, 1997*
- “ $U_q(sl(2))$  and some spin models on distance-regular graphs.” Colloquium, Kanazawa University. *June 11, 1997*
- “2-thin bipartite distance-regular graphs” Combinatorics seminar, Kyushu University. *June, 1997*
- “Distance-regular graphs which support a spin model are thin.” Workshop on Distance-regular graphs, National Chiao Tung University, Taiwan. *May 10, 1997*
- “Spin models on distance-regular graphs.” Workshop on Distance-regular graphs, National Chiao Tung University, Taiwan. *May 9, 1997*
- “The Terwilliger algebra of bipartite spin models.” National Chiao Tung University, Taiwan. *May 6, 1997*
- “Almost 2-homogeneous bipartite distance-regular graphs.” National Chiao Tung University, Taiwan. *May 6, 1997*
- “2-Thin bipartite distance-regular graphs.” Colloquium, National Chiao Tung University, Taiwan. *May 5, 1997*
- “Spin models on distance-regular graphs.” Seminar, Hokkaido University. *March 6, 1997*
- “Distance-regular graphs which support a spin model are thin.” Seminar, Osaka Kyoiku University. *February 28, 1997*
- “Spin models on distance-regular graphs.” Seminar, Osaka Kyoiku University. *February 21, 1997*
- “The combinatorics of the Terwilliger algebra.” Seminar, International Christian University, Tokyo. *February 18, 1997*
- “Distance-regular graphs which support a spin model are thin.” Workshop on Coding theory, modular forms, and algebraic combinatorics, Kyushu University. *February 12, 1997*
- “Almost 2-homogeneous bipartite distance-regular graphs.” Workshop on the Terwilliger algebra of association schemes, RIMS, Kyoto. *December 18, 1996*
- “The Terwilliger algebra of bipartite spin models.” Group theory and algebraic combinatorics, RIMS, Kyoto. *December 13, 1996*
- “2-thin bipartite distance-regular graphs” Combinatorics seminar, University of Wisconsin, Madison. *August 18, 1996*
- Poster: “2-Homogeneous bipartite distance-regular graphs.” Formal Power Series and Algebraic Combinatorics, University of Minnesota. *June 25, 1996*
- “2-homogeneous bipartite distance-regular graphs.” Conference on Modern Algebra and its Applications, Vanderbilt University. *May 17, 1996*
- “2-Thin bipartite distance-regular graphs.” University of Waterloo, Canada. *April 15, 1996*

- “A class of bipartite distance-regular graphs.” Workshop on distance-regular graphs and incidence geometries, RIMS, Kyoto, Japan. *March 9, 1995*
- “2-Thin bipartite distance-regular graphs.” Algebraic Combinatorics conference, RIMS, Kyoto, Japan. *March 15, 1995*
- “Variations on graph packings.” Colloquium, Ripon College. *April 1, 1993*
- “Minimal spanning trees for a communications network.” Wisconsin MAA Sectional Meeting, UW–Oshkosh. With Robert Klein and Craig Erdmann. *April 25, 1991*
- “Snow Trek: a snow removal model.” Wisconsin MAA Sectional Meeting, UWC–Richland Center. With Lieke Daley and Philip Alper. *April 20, 1990*
- “An NP-complete problem in graph theory.” MAA Joint Mathematics Meeting, Columbus, Ohio. *August 1990*
- “Student solutions to the Mathematical Contest in Modeling.” Wisconsin MAA Sectional Meeting, UW–Parkside. With Paul Cassidy. *April 21, 1989*

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**Seminar Presentations**


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I present regular in the discrete mathematics seminar at the University of South Florida.

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|---|--|---------------------------|
| “A bilinear form for tridiagonal pairs of $q$ -Serre type”      | USF.   | <i>September 17, 2007</i> |
| “Leonard Triples”   | USF.   | <i>September 10, 2007</i> |
| ”Isomorphisms and Homomorphisms of graphs II”                   | USF.   | <i>October 2, 2006</i>    |
| ”Isomorphisms and Homomorphisms of graphs I”                    | USF.   | <i>September 25, 2006</i> |
| “Hyper-duality in Bose-Mesner algebras”                         | USF.   | <i>September 16, 2005</i> |
| “Imprimitivity in distance-regular graphs”                      | USF.   | <i>October 12, 2004</i>   |
| “Dual aspects of imprimitivity in Bose-Mesner algebras”         | USF.   | <i>October 19, 2004</i>   |
| “Duality in Bose-Mesner algebras I”                             | USF.   | <i>April 16, 2004</i>     |
| “Duality in Bose-Mesner algebras II”                            | USF.   | <i>April 23, 2004</i>     |
| “Modular Leonard triples as $q$ -analogs of the Pauli matrices” | USF.   | <i>November 7, 2003</i>   |
| “Modular Leonard triples”                                       | USF.   | <i>April 7, 2003</i>      |
| “Algebraic characterizations of graph regularity conditions”    | USF.   | <i>October 14, 2002</i>   |
| “A Gentle Introduction to Distance-regular Graphs, I”           | USF.   | <i>March 4, 2002</i>      |
| “A Gentle Introduction to Distance-regular Graphs, II”          | USF.   | <i>March 18, 2002</i>     |
| “Homomorphisms and automorphisms of graphs, I”                  | USF.   | <i>October 25, 2001</i>   |
| “Homomorphisms and automorphisms of graphs, II”                 | USF.   | <i>November 14, 2001</i>  |
| “Homomorphisms and automorphisms of graphs.”                    | Combinatorics seminar, University of California, Berkeley.                                 | <i>January 29, 2001</i>   |
| “Some planar algebras associated with a graph.”                 | Subfactors seminar, University of California, Berkeley.                                    | <i>May 12, 2001</i>       |
| “A Planar algebra constructed from the Petersen graph.”         | Subfactors seminar, University of California, Berkeley.                                    | <i>January 28, 2000</i>   |
| “Highly structured graphs and their algebraic combinatorics.”   | Mathematics undergraduate student association lecture, University of California, Berkeley. | <i>September, 6 1999</i>  |
| “Introduction to distance-regular graphs.”                      | Combinatorics seminar, University of California, Berkeley .                                | <i>October 11, 1999</i>   |
| “2-thin bipartite distance-regular graphs.”                     | Combinatorics seminar, Kyushu University.  | <i>June, 1997</i>         |

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**Refereed Articles Published**


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B. Curtin and I. Daqqa

The subconstituent algebra of strongly regular graphs associated with a Latin square.  
*Designs, Codes, and Cryptography* **52** (2009), 263–274.

B. Curtin and I. Daqqa

The subconstituent algebra of a Latin square.  
*European Journal of Combinatorics* **30** (2009), 447–457.

B. Curtin

Hyper-duality of Type II Bose-Mesner algebras.  
*Journal of Applied Algebra and Discrete Structures* **6** (2008), 1–11.

H. Alnajjar and B. Curtin

A bilinear form for tridiagonal pairs of  $q$ -Serre type.  
*Linear Algebra and its Applications* **428** (2008), 2688–2690.

B. Curtin

Inheritance of hyper-duality in imprimitive Bose-Mesner algebras.  
*Discrete Mathematics* **308** (2008), 3003–3017.

B. Curtin, E. Salter and D. Stone

Some Formulae for the Fibonacci numbers.  
*Fibonacci Quarterly* **45** (2007), 171–180.

B. Curtin

Modular Leonard triples.  
*J. Linear Alg. App.* **424** (2007), 510–539.

B. Curtin

Spin Leonard pairs.  
*Ramanujan J.* **13** (2006), 319–332.

H. Alnajjar and B. Curtin

A family of tridiagonal pairs related to the quantum affine algebra  $U_q(\widehat{sl(2)})$ .  
*Electronic J. Linear Alg.* **9** (2005), 1–9.

B. Curtin

Algebraic characterizations of graph regularity conditions.  
*Designs, Codes and Cryptography* **34** (2005), 241–248.

B. Curtin and K. Nomura

1-Homogeneous, pseudo 1-homogeneous, and 1-thin distance-regular graphs.  
*J. Combin. Theory Ser. B* **93** (2005), 279–302.

H. Alnajjar and B. Curtin

A family of tridiagonal pairs.  
*J. Linear Alg. App.* **390** (2004), 369–384.

- B. Curtin and K. Nomura  
Homogeneity of a distance-regular graph which support a spin model.  
*J. Alg. Combin.* **19** (2004), 257–272.
- B. Curtin  
Some planar algebras related to graphs.  
*Pacific Journal of Mathematics* **209** (2003), 231–248.
- B. Curtin and K. Nomura  
Spin models and hyper-self-dual Bose-Mesner algebras.  
*J. Alg. Combin.* **13** (2001), 173–186.
- B. Curtin  
The Terwilliger algebra of a 2-homogeneous bipartite distance-regular graph.  
*J. Combin. Theory Ser. B.* **81** (2001), 125–141.
- B. Curtin  
Almost 2-homogeneous bipartite distance-regular graphs.  
*European J. Combin.* **21** (2000), 865–876.
- B. Curtin and K. Nomura  
Distance-regular graphs related to the quantum enveloping algebra of  $sl(2)$ .  
*J. Alg. Combin.* **12** (2000), 25–36.
- B. Curtin  
Distance-regular graphs which support a spin model are thin.  
*Discr. Math.* **197–198** (1999), 205–216.
- B. Curtin and K. Nomura  
Some formulas for spin models on distance-regular graphs.  
*J. Combin. Theory Ser. B* **75** (1999), 206–236.
- B. Curtin  
The local structure of a bipartite distance-regular graph.  
*European J. Combin.* **20** (1999), 739–758.
- B. Curtin  
Bipartite distance-regular graphs, part I.  
*Graphs Combin.* **15** (1999), 143–158.
- B. Curtin  
Bipartite distance-regular graphs, part II.  
*Graphs Combin.* **15** (1999), 377–391.
- B. Curtin  
2-Homogeneous bipartite distance-regular graphs.  
*Discr. Math.* **187** (1998), 39–70.

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B. Curtin and I. Daqqa

The subconstituent algebra of some strongly regular graphs associated with a Latin square.  
*Designs, Codes, and Cryptography*

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**Refereed Articles Submitted for Review**


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B. Curtin

The subconstituent algebra of a Bol loop.

*Contributions to Discrete Mathematics*


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**Non-refereed Articles**


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B. Curtin

Homomorphisms and Isomorphisms of Graphs.

*Submitted to Proc. of Algebraic Combinatorics, An International Conference in Honor of Eiichi Bannai's 60th Birthday* Sendai Japan, (2006)

B. Curtin and K. Nomura

Association schemes related to the quantum group  $U_q(\mathfrak{sl}(2))$ .*Sūrikaisekikenkyūsho Kōkyūroku* No. 1063 (1998), 129–139.

B. Curtin

The Terwilliger algebra of certain spin models.

*Sūrikaisekikenkyūsho Kōkyūroku* No. 991 (1997), 93–100.

B. Curtin and V.F.R. Jones

Some planar algebras related to graphs.

*Proc. of 13th Conference of Formal Power Series and Algebraic Combinatorics (FPSAC 01)* Tempe, Arizona, (2001)

B. Curtin and K. Nomura

Distance-Regular Graphs Related to the Quantum Universal Enveloping Algebra of  $sl(2)$ .*Proc. of 11th Conference of Formal Power Series and Algebraic Combinatorics (FPSAC 99)* Barcelona, Spain, (1999)

B. Curtin

2-Homogeneous bipartite distance-regular graphs.

*Proc. of 8th Conference of Formal Power Series and Algebraic Combinatorics (FPSAC 96)*, pp. 113–114. University of Minnesota, (1996)

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**Professional Membership and service**


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American Mathematical Society, since 1991

Mathematical Association of America, since 1989

Program Committee, Com2MaC conference 2004

Session Chair, Com2Mac Workshop on DRGs 2004

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**University and Department Service**


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Reviewer for USF Research Council Internal Awards grant program, Fall 2004, 2005

Spring 2005, 2006, Fall 2007

Mathematics Department Advisory Committee, 2008–2009  
Mathematics Department Graduate Admissions Committee, 2008–2009  
Mathematics Department Graduate Committee, 2007–2008  
Mathematics Department Publicity Committee, 2005–2006  
Mathematics Department Computer Committee, 2003–2005  
Mathematics Department Library Committee, 2002–2003, 2005–2006, 2006–2007  
College of Arts and Sciences FAST faculty input committee, Fall 2002  
Algebra Qualifying Exam Committee, Fall 2003, Winter 2003, Spring 2004, Fall 2004,  
Winter 2005, Spring 2005, Fall 2005, Winter 2006, Spring 2006, Fall 2006  
Winter 2007, Spring 2007, Fall 2007, Spring 2008, Winter 2009