

# Curriculum Vita

## Name

Bryan L. Shader

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## Education

1990 PhD, University of Wisconsin–Madison  
1987 MS, University of Wisconsin–Madison  
1984 BS, University of Wyoming

## Academic Positions

2000- Professor of Mathematics, University of Wyoming  
1995-2000 Associate Professor of Mathematics, University of Wyoming  
1990-1995 Assistant Professor of Mathematics, University of Wyoming  
1991-1992 Post-doctoral member, Institute of Mathematics and its Applications

## Students Supervised

Matt Haigler, *The Wyoming Lasso*, High School Science Fair Project, 2004

Jason Chiu, *Results on Fibonacci Numbers*, High School Science Fair Project, 1999  
Won 4th Place in Mathematics Division of Intel's International Science and Engineering Fair

Matt Ong, *Difference Sets*, High School Science Fair Project, 1998  
Won Best of Mathematics Division in Intel's International Science and Engineering Fair

Brenda Christensen, *Electronic voting and cryptography*, NASA Space Grant Undergraduate research project, on-going

Kim Creaser, *Coin weighing problems*, EPSCoR Undergraduate Research Project, 2005

Brenda Christensen, *Shared security systems based on groups*, EPSCoR Undergraduate Research Project, 2004

Andy Curtis, *External memory algorithms for graphs*, Wyoming NASA Space Grant Undergraduate summer research project, 2004

Andy Curtis, *Attacks on Small World Networks*, EPSCoR Undergraduate Research Project, 2003

Brian Gilbert, *The Collatz Sequence*, McNair Scholar Project, 1999

Beau Grande, *Cards, Combinations, Probability, and the Fibonacci Numbers*, Honors Project, 1994

Christer Karlsson, *2D Dynamical Systems*, A&S Summer Independent Research project, 2006.

Phil Meister, *Breaking CAPTCHA's*, EPSCoR Undergraduate Research Project, 2006

Dan Dobbs, *Min-plus algebra and Internet routing*, MS, 2005

Maik Kohlbus, *Spectral Techniques and Applications*, MS, 2003

Maria Anderson, *Max-Plus Algebra and Applications*, MS, 2002

Joel Hayano, *Linear Algebra in High School*, MST, 2000

Cynthia Struckman, *Using Journals to Enhance Communication in the Math Class*, MST, 1996

Linda Galafaro, *Mathematics and Our Environment: Teaching Environmental Education through the Context of Mathematics*, MST, 1996

Susan Heyborne, *An Introduction to the Theory of the Singular Value Decomposition*, MS, 1995

Jochen Nottenbaum, *Costas Arrays*, MS, 1994

Saib Suwilo, *The Road Coloring Conjecture for Cayley Digraphs*, MS, 1994

Brent Deschamp, *Permanents of Hessenberg permutation matrices*, PhD, current student

In-Jae Kim, *Spectral properties of combinatorial classes of matrices*, PhD, 2005

Justin Christian, *Three Problems in Combinatorial Matrix Theory*, PhD, 2005

Saib Suwilo, *Exponents of 2-Digraphs*, PhD, 2001

Jeff Poet, *Score Certificates of Upset Tournaments*, PhD, 1998

Lisa Lister, *Graph Decompositions*, PhD, 1997

Michael Adams, *Generalized Orthogonal Arrays and Related Structures*, PhD, 1997

Liz Boyer, *Biclique Decompositions of Graphs*, PhD, 1995

Si-Ju Kim, Postdoctoral student, 1999-2000

Gwang-Yeon Lee, Postdoctoral student, 1997-1998

Gi-Sang-Cheon, Postdoctoral student, 1996-1997

### Honors & Awards

2006 A & S Top Prof Award

2005 Burton W. Jones Distinguished Teaching Award Recipient  
Given by the Rocky Mountain section of MAA.

2005 A & S Top Prof Award

2004 Top Prof Award, UW Mortar Board

2002 Warming up the Chill Award, Ellbogen Center for Teaching Excellence

1997 Ellbogen Award, a university-wide award for Outstanding Teaching, UW

- 1996 Top Prof Award, UW Mortar Board
- 1996 Meritorious Award for Research, UW A&S College
- 1992 Young Scholar Award at International Graph Theory Conference in Kalamazoo, Michigan
- 1991 Meritorious Award for Research, UW A&S College
- 1989 Outstanding Teaching Assistant Award, University of Wisconsin-Madison

### Professional Activities

- Editor-in-chief of *IMAGE*, the Bulletin of ILAS, 2003-present
- Associate Editor of *The Electronic Journal of Linear Algebra*, 1999-present
- Associate Editor of *Linear Algebra and its Applications*, 2003-present
- Editor of *Linear Algebra and its Applications* special Coimbra issue, 2004
- Editor of *The Electronic Journal of Linear Algebra* special BIRS issue, 2004
- Editor of *Linear Algebra and its Applications* special Postech issue, 2002
- Editor of *Linear Algebra and its Applications* special Chemnitz issue, 1998
- Grant refereeing for National Science Foundation, 1994, 1996, 1998, 2003
- Manuscript refereeing (average over 10 per year) for

- Ars Combinatoria
- Bulletin of Inst. of Combinatorics and its Applications
- College Math Journal
- Congressus Numerantium
- IEEE Trans. on Systems, Man., and Cybernetics
- Discrete Mathematics
- J. Combinatorial Theory B
- J. Graph Theory
- Korean Math. Society Bulletin
- Linear Algebra and its Applications
- Linear and Multilinear Algebra
- American Math. Monthly
- SIAM J. Matrix Anal. and Appls.
- Transactions of AMS
- Utilitas Mathematica

Member of Mathematics Association of America, Institute of Combinatorics and its Applications, and International Linear Algebra Society

### Plenary Talks

- Hamilton Conference on Nonnegative Matrices, Maynooth, Ireland, 2006
- MAA Regional meeting, Grand Junction, Colorado, 2006

International Linear Algebra Society Meeting, Regina, Canada, 2005  
Haifa Matrix Theory meeting, Haifa, Israel, 2005  
Missouri Sectional MAA meeting, 2005  
SIAM Linear Algebra and Applications Meeting, Williamsburg, VA, 2003  
Kansas Sectional MAA meeting, Hays, KS, 2003  
Combinatorial Matrix Theory, Postech, S. Korea, 2002  
International Linear Algebra Society Meeting, Atlanta, GA, 2002  
Rocky Mountain Mathematics Consortium, Laramie, WY, 2002  
Algebraic Graph Theory, International Centre for Mathematical Sciences, Edinburgh, Scotland, 2001  
Western Canada Linear Algebra Meeting, Winnipeg, Canada, 2000.  
Topology and Geometry Research Center of S. Korea, Kyungpook, 1995

### **Meetings Organized**

Co-organizer, Workshop on Spectral Graph and Combinatorial Matrix Theory, Amer. Institute of Mathematics, October 2006.  
Co-organizer, Special Session on Combinatorial Matrix Theory, AMS Sectional meeting, Lincoln, 2005  
Co-organizer, 2nd SIAM Conference on Combinatorial Scientific Computing, Toulouse, 2005  
Co-organizer, Brualdi-fest, Madison, Wisconsin, 2005  
Co-organizer, BIRS Workshop on Combinatorial Matrix Theory, Banff, Canada, 2004  
Co-organizer, International Linear Algebra Society Conference, Coimbra, Portugal, 2004  
Co-organizer of Rocky Mountain Discrete Math Day, 1996-present  
Organizer of minisymposium at SIAM Discrete math meeting, San Diego, 2002  
Co-organizer of Rocky Mountain Regional MAA meeting, Laramie, WY, 2002  
Co-organizer of minisymposium at ILAS Conference, Barcelona, Spain, 1999  
Co-organizer of minisymposium at Centennial PhD Conference, Madison, WI, 1998

## Pending Projects

2006-2007 Discrete Mathematics Days, PI, National Security Agency, \$11,000

## Past and Current Projects

2006-2008 Rocky Mountain Discrete Mathematics Days, PI, National Science Foundation, \$15,750  
2002-2006 UW-Computer Science, Engineering, and Mathematics Scholarships, Co-PI, NSF, \$379,510  
2004-2005 Scientific research computing environment, Co-PI, NSF, \$46,809.  
2003-2006 Rocky Mountain Discrete Mathematics Conferences, PI, NSF, \$14,600  
2000-2002 Improving Middle-Level Mathematics Teaching and Learning: A Statewide Initiative, Senior faculty member, NSF, \$1,200,000  
1994-1996 Studies in Discrete Mathematics, PI, National Security Agency \$29,980  
1994-1995 Improving Mathematics at UW: What can we learn from S. Korea? International travel grant, PI, UW International Program, \$1,890  
1994-1996 Model Masters Program, NSF, Senior faculty member, \$1,550,330  
1991 Revitalizing Linear Algebra at UW, Center for Teaching Excellence Travel Grant, PI, \$675  
1990 Research in Sign-Solvability, UW Arts and Sciences College Basic Research Grant, PI, \$2,000

## Articles in Progress

0. G.-S. Cheon, G.-Y. Lee, and B. L. Shader  
Permutation Ladders  
Submitted to *Bulletin of ICA*.
- 1. I.-J. Kim and B. L. Shader  
Spectra of acyclic matrices and Smith Normal Form  
Submitted to *J. Algebraic Combinatorics*.
- 2. I.-J. Kim and B.L. Shader  
On Fiedler- and Parter-vertices of Acyclic Matrices  
Submitted to *Lin. Alg. Appls.*
- 3. I.-J. Kim and B. L. Shader  
Nonsingular Acyclic Matrices  
Submitted to *Lin. Multilinear Alg.*
- 4. S. J. Kirkland and B. L. Shader  
Spectra of distance matrices of trees  
In preparation.
- 5. B. Shader  
Equivalence Relations on colored digraphs  
In preparation.
- 6. S.-G. Hwang, I.-J. Kim, and B. L. Shader  
Permutation packing problems  
In preparation.

- 7. L. Boyer, T.S. Michael and B. L. Shader  
 $p$ -ranks of tournament matrices  
 In preparation.
- 8. J.D. Christian, K. Driessel, C.K. Li and B. L. Shader  
 Spectrally transverse graphs  
 In preparation.

### Published Works

1. R. A. Brualdi and B. L. Shader  
*Matrices of sign-solvable linear systems.*  
 Cambridge Tracts in Mathematics, 116, 1995.
2. R. A. Brualdi and B. L. Shader  
 Graphs and Matrices  
 Chapter 3 in *Topics in Algebraic Graph Theory*, (R. Wilson and L. Beineke, eds), Encyclopedia of Mathematics and its Applications, 102, Cambridge University Press, 2005.
3. M. Cavers, I.-J. Kim, B. L. Shader and K. Vander Meulen  
 On Spectrally Arbitrary Patterns  
 Electronic Journal of Linear Algebra, Vol. 13 (2005), 240-248.
4. D. Olesky, B. L. Shader, and P. vanden Driessche  
 Permanents of Hessenberg  $(0, 1)$ -matrices  
*Elec. J. Combinatorics*, R70(1), 2005, 24 pages.
5. B.L. Shader  
 Bipartite Graphs and Matrices  
 Invited chapter for *The Handbook of Linear Algebra*, CRC Press, to appear 2006.
6. G. S. Choi, S. G. Hwang, I. P. Kim, and B. L. Shader  
 $(\pm 1)$ -invariant sequences and truncated Fibonacci sequences  
*Linear Algebra Appl.*, 395 (2005), 303–312.
7. C. K. Li, T. Milligan, and B. L. Shader  
 Non-existence of  $5 \times 5$  full ray nonsingular matrices  
*Electronic J. Linear Algebra* 11 (2004), 212-240
8. J. D. Christian and B. L. Shader  
 Nonexistence results for Hadamard-like matrices.  
*Electron. J. Combin.* 11 (2004), 9 pp.
9. G.-S. Cheon, S.-G. Hwang, S.-H. Rim, B. L. Shader and S.-Z. Song  
 Sparse orthogonal matrices.  
*Linear Algebra Appl.* 373 (2003), 211–222.
10. G.-S. Cheon, S.-G. Hwang and B. L. Shader  
 Permanents of woven matrices.  
*Linear Algebra Appl.* 364 (2003), 223–233.
11. B. L. Shader and S. Suwilo  
 Exponents of nonnegative matrix pairs.  
*Linear Algebra Appl.* 363 (2003), 275–293.

12. B. L. Shader  
Set-systems with signed solutions.  
*Linear Algebra Appl.* 361 (2003), 121–132.
13. D. Olesky, B. L. Shader and P. van den Driessche  
Exponents of  $k$ -tuples of matrices.  
*Linear Algebra Appl.* 356 (2002), 123–134.
14. S.-J. Kim and B. L. Shader  
On matrices which have signed null-spaces.  
*Linear Algebra Appl.* 353 (2002), 245–255.
15. J. Stuart, L. Beasley and B. L. Shader  
Irreducible, pattern  $k$ -potent ray pattern matrices.  
*Linear Algebra Appl.* 346 (2002), 261–271.
16. S.-J. Kim and B. L. Shader  
Sign-solvable cone-systems.  
*Linear Multilinear Algebra* 50 (2002), 23–32.
17. S. Kirkland, J. Moliterno, M. Neumann and B. L. Shader  
On graphs with equal algebraic and vertex connectivity.  
*Linear Algebra Appl.* 341 (2002), 45–56.
18. E. Boyer, L. Lister and B. L. Shader  
Sphere-of-influence graphs using the sup-norm.  
*Math. Comput. Modelling* 32 (2000), no. 10, 1071–1082.
19. J. Moliterno, M. Neumann and B. L. Shader  
Tight bounds on the algebraic connectivity of a balanced binary tree.  
*Electronic J. Linear Algebra* 6 (1999/00), 62–71.
20. C. Eschenbach, F. Hall, R. Hemasinha, S. Kirkland, Z. Li, B. Shader, J. Stuart and J. Weaver  
Properties of tournaments among well-matched players.  
*Amer. Math. Monthly* 107 (2000), 881–892.
21. S.-J. Kim and B. L. Shader  
Linear systems with signed solutions.  
*Linear Algebra Appl.* 313 (2000), 21–40.
22. J. Poet and B. L. Shader  
Score certificate numbers of upset tournaments.  
*Discrete Appl. Math.* 103 (2000), 177–189.
23. G.-Y. Lee, J. J. McDonald, B. L. Shader and M. J. Tsatsomeros  
Extremal properties of ray-nonsingular matrices.  
*Discrete Math.* 216 (2000), 221–233.
24. G.-S. Cheon and B. L. Shader  
Sparsity of orthogonal matrices with restrictions.  
*Linear Algebra Appl.* 306 (2000), 33–44.
25. G.-S. Cheon and B. L. Shader  
Sparse orthogonal matrices and the Haar wavelet.  
*Discrete Appl. Math.* 101 (2000), 63–76.

26. C. Eschenbach, F. Hall, R. Hemasinha, S. Kirkland, Z. Li, B. Shader, J. Stuart and J. Weaver  
On almost regular tournament matrices.  
*Linear Algebra Appl.* 306 (2000), 103–121.
27. G.-Y. Lee and B. L. Shader  
Sign-consistency and solvability of constrained linear systems.  
*Electron. J. Linear Algebra* 4 (1998), 1–18.
28. D. Gregory, V. Watts and B. L. Shader  
Biclique decompositions and Hermitian rank.  
*Linear Algebra Appl.* 292 (1999), 267–280.
29. G.-S. Cheon and B. L. Shader  
Constructions for the sparsest orthogonal matrices.  
*Bull. Korean Math. Soc.* 36 (1999), 119–129.
30. G.-S. Cheon and B. L. Shader  
How sparse can a matrix with orthogonal rows be?  
*J. Combin. Theory Ser. A* 85 (1999), 29–40.
31. B. L. Shader  
A simple proof of Fiedler’s conjecture concerning orthogonal matrices.  
*Rocky Mountain J. Math.* 27 (1997), 1239–1243.
32. S. Kirkland, M. Neumann and B. L. Shader  
On a bound on algebraic connectivity: the case of equality.  
*Czechoslovak Math. J.* 48(123) (1998), 65–76.
33. B. L. Shader  
Sign-nonsingular matrices and orthogonal sign-patterns.  
*Ars Combin.* 48 (1998), 289–296.
34. S. Kirkland, M. Neumann, and B. L. Shader  
Bounds on the subdominant eigenvalue involving group inverses with applications to graphs.  
*Czechoslovak Math. J.* 48(123) (1998), 1–20.
35. J. Poet and B. L. Shader  
Short score certificates for upset tournaments.  
*Electron. J. Combin.* 5 (1998), Research paper 24, 18 pp.
36. S. Kirkland, M. Neumann and B. L. Shader  
Applications of Paz’s inequality to perturbation bounds for Markov chains.  
*Linear Algebra Appl.* 268 (1998), 183–196.
37. S. Kirkland, M. Neumann and B. L. Shader  
Distances in weighted trees and group inverse of Laplacian matrices.  
*SIAM J. Matrix Anal. Appl.* 18 (1997), 827–841.
38. M. J. Adams and B. L. Shader  
A construction for  $(t, m, s)$ -nets in base  $q$ .  
*SIAM J. Discrete Math.* 10 (1997), 460–468.
39. B. L. Shader and C. L. Shader  
Scheduling conflict-free parties for a dating service.  
*Amer. Math. Monthly* 104 (1997), 99–106.

40. S. Kirkland, M. Neumann and B. L. Shader  
Characteristic vertices of weighted trees via Perron values.  
*Linear and Multilinear Algebra* 40 (1996), 311–325.
41. D. Gregory, K. Vander Meulen and B. L. Shader  
Skew rank decompositions.  
*Linear Algebra Appl.* 244 (1996), 123–154.
42. D. Gregory, K. Vander Meulen and B. L. Shader  
Rank decompositions and signed bigraphs.  
*Linear and Multilinear Algebra* 40 (1996), 283–301.
43. R. A. Brualdi and B. L. Shader  
Cutsets in bipartite graphs.  
*Linear and Multilinear Algebra* 34 (1993), 51–54.
44. B. L. Shader  
Some recent results in combinatorial matrix theory  
*Proceedings of the Topology and Geometry Research Center*, 6 (1995) 237–258.
45. D. Gregory, K. Vander Meulen and B. L. Shader  
Skew rank decomposability.  
*Proceedings of the Fifth SIAM Conference on Applied Linear Algebra*, (1994) 523–526.
46. B. L. Shader  
Least squares sign-solvability.  
*SIAM J. Matrix Anal. Appl.* 16 (1995), 1056–1073.
47. L. Beasley, S. Kirkland, and B. L. Shader  
Rank comparisons.  
*Linear Algebra Appl.* 221 (1995), 171–188.
48. S. Kirkland and B. L. Shader  
On multipartite tournament matrices with constant team size.  
*Linear and Multilinear Algebra* 35 (1993), 49–63.
49. E. Boyer and B. L. Shader  
On biclique decompositions of complete  $t$ -partite graphs.  
*Linear Algebra Appl.* 217 (1995), 31–40.
50. R. A. Brualdi, K. L. Chavey and B. L. Shader  
Bipartite graphs and inverse sign patterns of strong sign-nonsingular matrices.  
*J. Combin. Theory Ser. B* 62 (1994), 133–150.
51. R. A. Brualdi and B. L. Shader  
Minimum permanents on special faces of the polytope of doubly stochastic matrices.  
*Linear Algebra Appl.* 201 (1994), 103–111.
52. R. A. Brualdi and B. L. Shader  
Strong Hall matrices.  
*SIAM J. Matrix Anal. Appl.* 15 (1994), 359–365.
53. R. A. Brualdi, K. L. Chavey and B. L. Shader  
Rectangular  $L$ -matrices.  
*Linear Algebra Appl.* 196 (1994), 37–61.

54. S. Kirkland and B. L. Shader  
Tournament matrices with extremal spectral properties.  
*Linear Algebra Appl.* 196 (1994), 1–17.
55. B. L. Shader  
Convertible, nearly decomposable, and nearly reducible matrices.  
*Linear Algebra Appl.* 184 (1993), 37–53.
56. L. Beasley, R. A. Brualdi and B. L. Shader  
Combinatorial orthogonality.  
*IMA Vol. Math. Appl.*, (1993) t50:207–218.
57. B. L. Shader  
On biclique partitions of the complete graph.  
*Discrete Math.* 117 (1993), 197–213.
58. D. A. Gregory, S. J. Kirkland and B. L. Shader  
Pick’s inequality and tournaments.  
*Linear Algebra Appl.* 186 (1993), 15–36.
59. R. A. Brualdi, K. L. Chavey and B. L. Shader  
Conditional sign-solvability.  
*Math. Comput. Modelling* 17 (1993), 141–148.
60. R. A. Brualdi and B. L. Shader  
Matrices of 0’s and 1’s with restricted permanent minors.  
*Discrete Math.* 96 (1991), 161–174.
61. B. L. Shader  
On tournament matrices.  
*Linear Algebra Appl.* 162/164 (1992), 335–368.
62. B. L. Shader  
Maximal convertible matrices.  
*Congr. Numer.* 81 (1991), 161–172.
63. N. Alon, R. A. Brualdi and B. L. Shader  
Multicolored forests in bipartite decompositions of graphs.  
*J. Combin. Theory Ser. B* 53 (1991), 143–148.
64. R. A. Brualdi and B. L. Shader  
On sign-nonsingular matrices and the conversion of the permanent into the determinant.  
*Applied geometry and discrete mathematics*, 117–134, DIMACS Ser. Discrete Math. Theoret. Comput. Sci., 4, Amer. Math. Soc., Providence, RI, 1991.
65. R. A. Brualdi and B. L. Shader  
Matrix factorizations of determinants and permanents.  
*J. Combin. Theory Ser. A* 54 (1990), 132–134.
66. G. S. Katzenberger and B. L. Shader  
Singular tournament matrices.  
*Congr. Numer.* 72 (1990), 71–80.