Leslie Hogben
Professor
Department of Mathematics
488 Carver Hall
Iowa State University, Ames, IA 50011
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http://www.public.iastate.edu/%7Elhogben/homepage.html

Degrees held:

Ph. D. Yale University 1978 (Advisor: Nathan Jacobson; NSF Graduate Fellow)
B. A. Swarthmore College 1974 (suma cum laude)

Professional Experience:

Iowa State University,
Professor, 2006-
Mathematics Dept. Diversity Coordinator, 2008-
Sabbatical, 2008-2009
Associate Professor, 1983-2006
Sabbatical, Fall 2003
Part-time, 1987-1991
Leave without pay, 1985-1987
Assistant Professor, 1980-198
Instructor (Tenure-track), 1978-1980
American Institute of Mathematics, Associate Director for Program Diversity, 2007-
Part-time

HONORS & AWARDS

Choice magazine 2008 Outstanding Academic Title: *Handbook of Linear Algebra*

RESEARCH PUBLICATIONS

Books Edited

1. Editor, *Handbook of Linear Algebra*, Chapman Hall/CRC Press, Boca Raton, 2007.

Chapters in Books

1. Matrix Completion Problems (with Amy Wangsness), in *Handbook of Linear Algebra*, Chapman Hall/CRC Press, 2007.
2. Identities of Nonassociative Algebras Studied by Computer, *Contemporary Mathematics*, **13** (1982), AMS.

Papers (refereed, appeared or accepted)

1. L. Hogben. Radicals and Semi-Prime Ideals of Jordan Triple Systems. *Comm. in Algebra* **7** (1979), 1313-1328.
2. I. R. Hentzel, L. Hogben, H. F. Smith. Flexible Derivation Alternator Rings. *Comm. in Algebra* **8** (1980), 1997-2014.
3. L. Hogben. Radicals and Homotopes of Jordan Algebras. *Comm. in Algebra* **9** (1981), 179-

194.
4. L. Hogben, K. McCrimmon. Maximal Modular Inner Ideas and the Jacobson Radical of a Jordan Algebra. *J. Algebra* **68** (1981), 155-169.
5. I. R. Hentzel, L. Hogben. Exhaustive Checking of Sparse Algebras. *J. Algorithms* **2** (1981), 44-49.
6. L. Hogben, V. Kac. The Correct Multiplication Table for the Exceptional Jordan Superalgebra F. *Comm. in Algebra* **11** (1983), 1155-1156.
7. L. Hogben, C. Bergman. Deductive Varieties of Modules and Universal Algebras, *Trans. AMS*, **289** (1985), No. 1, 303-320.
8. B. Cain, L. M. DeAlba, L. Hogben, C. R. Johnson. Multiplicative Perturbations of Stable and Convergent Operators. *Linear Algebra Appl.*, **268** (1998) 151-169.
9. L. Hogben. Completions of Inverse M-Matrix Patterns. *Linear Algebra Appl.*, **282** (1998), 145-160.
10. L. Hogben. Completions of M-Matrix Patterns. *Linear Algebra Appl.*, **285** (1998), 143-152.
11. L. Hogben. Inverse M-Matrix Completions of Patterns Omitting Some Diagonal Positions. *Linear Algebra Appl.*, **313** (2000), 173-192
12. L. M. DeAlba, L. Hogben. Completions of P-Matrix Patterns. *Linear Algebra Appl.*. **319** (2000), 83-102.
13. L. Hogben. Graph Theoretic Methods for Matrix Completion Problems. *Linear Algebra Appl.* **328** (2001), 161-202.
14. J.-Y. Choi, L. M. DeAlba, L. Hogben, M. Maxwell, A. Wangsness. The P_o - Matrix Completion Problem. *Electron. J. Linear Algebra*, **9** (2002), 1-20.
15. L. Hogben. The Symmetric M-Matrix and Symmetric Inverse M-Matrix Completion Problems. *Linear Algebra Appl.*. **353** (2002) 159-168.
16. J.-Y. Choi, L. M. DeAlba, L. Hogben, B. Kivunge, S. Nordstrom, M. Shedenhelm. The Nonnegative P_o -Matrix Completion. *Electron. J. Linear Algebra*, **10** (2003), 46-59
17. L. Hogben. Matrix Completion Problems for Pairs of Related Classes of Matrices. *Linear Algebra Appl.,* **373** (2003), 13-29.
18. L. M. DeAlba, T. Hardy, L. Hogben, A. Wangsness. The (Weakly) Sign-Symmetric P-Matrix Completion Problems. *Electron. J. Linear Algebra*, **10** (2003), 257-271
19. F. Barioli, S. Fallat, L. Hogben. Computation of Path Cover Number and Minimal Rank for Graphs. *Linear Algebra Appl.* **392** (2004), 289-303.
20. L. Hogben. Spectral Graph Theory and the Inverse Eigenvalue Problem of a Graph. *Electron. J. Linear Algebra*, **14** (2005), 12-31.
21. L. Hogben, C. R. Johnson and R. Reams. The Copositive Matrix Completion Problem. *Linear Algebra Appl.,* **408** (2005) 207-211.
22. F. Barioli, S. Fallat, L. Hogben. On the Difference between the Maximum Multiplicity and Path Cover Number for Tree-like Graphs, *Linear Algebra Appl.,* **409** (2005) 13-31.
23. F. Barioli, S. Fallat, L. Hogben. A variant on the graph parameters of Colin de Verdière: Implications to the minimum rank of graphs. *Electron. J. Linear Algebra* **13** (2005), 387-404.
24. J. Bowers, J. Evers, L. Hogben, S. Shaner, K. Snider, A. Wangsness. On completion problems for various classes of *P*-matrices. *Linear Algebra Appl.,* **413**/2-3 (2006) 342-354.
25. L. M. DeAlba, T. Hardy, I. R. Hentzel, L. Hogben, A. Wangsness. Minimum Rank and Maximum Eigenvalue Multiplicity of Symmetric Tree Sign Patterns. *Linear Algebra Appl.,* **418**/2-3 (2006) 389-415.

26. A. Chowdhury, L. Hogben, J. Melancon, R. Mikkelson. Rational Realization of Maximum Eigenvalue Multiplicity of Symmetric Tree Sign Patterns. *Linear Algebra Appl.,* **418**/2-3 (2006) 380-393.
27. L. Hogben. The copositive completion problem: unspecified diagonal. *Linear Algebra Appl.,* **420**/1 (2007) 160-162.
28. L. Hogben, H. van der Holst. Forbidden minors for the class of graphs G with $\xi(G) \leq 2$, *Linear Algebra Appl.,* **423**/1 (2007) 42-52.
29. L. M. DeAlba, I. R. Hentzel, L. Hogben, J. J. McDonald, R. Mikkelson, O. Pryporova, B. Shader, K. Vander Meulen. Spectrally Arbitrary Patterns: Reducibility and the 2*n* Conjecture for *n*=5. *Linear Algebra Appl.,* **423**/2-3 (2007) 262-276.
30. N. L. Chenette, S. V. Droms, L. Hogben, R. Mikkelson, O. Pryporova. Minimum Rank of a Tree over an Arbitrary Field. *Electron. J. Linear Algebra* **16** (2007) 183-186.
31. S. Fallat, L. Hogben. The Minimum Rank of Symmetric Matrices Described by a Graph: A Survey, *Linear Algebra Appl.,* **426**/2-3 (2007) 558-582.
32. A. Berman, S. Friedland, L. Hogben, U. G. Rothblum, B. Shader. Minimum rank of matrices described by a graph or pattern over the rational, real and complex numbers. *Electron. J. Combinatorics,* **15**/1 (2008) R 25 (19 pages).
33. Zero forcing sets and the minimum rank of graphs (with 17 co-authors). *Linear Algebra Appl.,* **428**/7 (2008) 1628-1648.
34. L. Hogben. Orthogonal representations, minimum rank, and graph complements. *Linear Algebra Appl.,* **428**/11-12 (2008) pp 2560-2568.
35. A. Berman, S. Friedland, L. Hogben, U. G. Rothblum, B. Shader. An upper bound for minimum rank of a graph. *Linear Algebra Appl.* **429**/7 (2008) 1629-1638.
36. F. Barioli, S. M. Fallat, D. Hershkowitz, H. T. Hall, L. Hogben, H. van der Holst, B. Shader. On the minimum rank of not necessarily symmetric matrices: a preliminary study. *Electron. J. Linear Algebra* **18** (2009) 126-145.
37. L. M. DeAlba, L. Hogben, and B. K. Sarma The *Q*-matrix Completion Problem. . *Electron. J. Linear Algebra* **18** (2009) 176-191.
38. L. Hogben. Minimum rank problems. To appear in *Linear Algebra Appl.*
39. L. DeAlba, J. Grout, L. Hogben, R. Mikkelson, K. Rasmussen Universally optimal matrices and field independence of the minimum rank of a graph. *Electron. J. Linear Algebra* **18** (2009) 403-419.
40. Minimum rank of skew-symmetric matrices described by a graph, with 15 co-authors. To appear in *Linear Algebra Appl.*
41. Generic maximum nullity of a graph, with Bryan Shader. To appear in *Linear Algebra Appl.*

Papers (under review, available at http://orion.math.iastate.edu/lhogben/research/homepage.html)

1. Techniques for determining the minimum rank of a small graph, with DeLoss, Grout, Mackay, Smith, Tims
2. Sign patterns that require eventual positivity or require eventual nonnegativity, with Ellison and Tsatsomeros.
3. Average minimum rank, with Hall, Martin, Shader
4. Sign patterns that require eventual positivity, with 10 co-authors
5. Minimum rank and maximum nullity of tree sign patterns

Papers (other, appeared)

1. A. Abian, L. Hogben, E. H. Johnston. Laurent Series Obtained by Long Division, *Radovi Matematicki*, **1** (1985), 79-99.
2. Relationships between the Completion problems for Various Classes of Matrices, *Proceedings of the 8th SIAM Conference on Applied Linear Algebr*a, available electronically at http://www.siam.org/meetings/la03/proceedings/
3. L. Hogben, Spectral Graph Theory and the Inverse Eigenvalue Problem of a Graph, *Chamchuri Journal of Mathematics* (Proceedings of International Conference on Algebra and Related Topics 2008).

RESEARCH LECTURES

Plenary Lectures

1. "Minimum rank of matrices described by a graph or digraph," 15th International Linear Algebra Society (ILAS) Conference, Cancun, Mexico, June 16, 2008.
2. "Combinatorial Matrix Theory," International Conference on Algebra and Related Topics (ICART 2008), Bangkok, Thailand, May 28, 2008.

Invited Lectures (last five years)

1. "Average minimum rank of a graph," University of Victoria, March 23, 2009.
2. "Spectra of Matrix Patterns" (special session) Joint Mathematics Meetings, Washington, DC, Jan. 5-8, 2009.
3. "Inverse Eigenvalue of a Graph and Spectral Graph Theory," Rocky Mountain Discrete Mathematics Days, Laramie, WY, September 12-13, 2008.
4. "Matrix Completion Problems for Classes of Nonnegative Matrices," 3rd Hamilton Nonnegative matrix Workshop, Hamilton Institute, Maynooth, Ireland, August 5-7, 2008.
5. "Combinatorial Matrix Theory," School of Applied Mathematics, University of Electronic Science and Technology of China, November 5, 2007.
6. "Minimum rank of symmetric matrices described by a graph," 14th Conference of the International Linear Algebra Society, PR China, July 16-20, 2007.
7. "Minimum rank of symmetric matrices described by a graph," Second International Congress in Algebras and Combinatorics, Beijing, PR China, July 6-11, 2007.
8. "Minimum rank of symmetric matrices described by a graph," 2007 Haifa Matrix Theory Conference, Haifa, Israel, April 16-19, 2007.
9. "Matrix Completion Problems," (special session) AMS Central Section Meeting, Lincoln, NE, Oct. 21-23, 2005.
10. "Minimum Rank and Maximum Eigenvalue Multiplicity of Symmetric Tree Sign Patterns," Rocky Mountain Discrete Math Days, Laramie, WY, August 1-2, 2005.
11. "A variant on the graph parameters of Colin de Verdiere: Implications to the minimum rank of graphs," (mini-symposium) 12th ILAS Conference, Regina, Canada, June 26, 2005.
12. "Spectral Graph Theory and the Inverse Eigenvalue Problem of a Graph," Directions in Combinatorial Matrix Theory Workshop, Banff International Research Station, Banff, Canada, May 6-8, 2004.

GRANTS (last five years)

2009-2010 Research Experiences in the Mathematical Sciences for Undergraduate Faculty (REMS-UF), co-PI, with Roselyn Williams, PI, held at American Institute of Mathematics, July 20-24, 2009.

2009-2010 BIRS half-workshop, "Theory and Applications of Matrices Described by Patterns", with Richard Brualdi, Pauline van den Driesssche, Shaun Fallat, Bryan Shader, to be held at Banff International Research Station Jan. 31-Feb 5, 2010

2008-2010 NSF Alliance grant ISU subcontract, PI, with Mark Kaiser, co-PI

2008-2013 NSF REU site grant, "Mathematics and Computing Research Experiences for Undergraduates at Iowa State University," co-PI, with Justin Peters, PI (3 summers funding in 5 years).

2008-2009 NSF conference grant, supplemental funding for Institute for Mathematics and Its Applications Participating Institution Graduate Summer Program "Linear Algebra and Applications," PI, with Wolfgang Kliemann and Y. T. Poon, co-PIs.

2008 Institute for Mathematics and Its Applications Participating Institution Graduate Summer Program "Linear Algebra and Applications," with Wolfgang Kliemann and Y. T. Poon, held at ISU in July 2008.

2007-2009 American Institute of Mathematics Structured Quartet Research Ensemble (SQuaRE), 8-person research group meeting "Minimum Rank of Symmetric Matrices described by a Graph," Feb. 2008, Feb. 2009.

2005-2006 American Institute of Mathematics Research Conference Center (ARCC), five day workshop "Spectra of families of matrices described by graphs, digraphs, or sign patterns," with Richard Brualdi and Bryan Shader, held October 23-27, 2006.

2004-2008 NSF REU site grant "Mathematics and Computing Research Experiences for Undergraduates at Iowa State University," co-PI, with Justin Peters, PI.

CONFERENCE/WORKSHOP/SPECIAL SESSION ORGANIZING

Conference/Workshop Organizing

1. BIRS half-workshop, "Theory and Applications of Matrices Described by Patterns", with Richard Brualdi, Pauline van den Driesssche, Shaun Fallat, Bryan Shader, to be held at Banff International Research Station Jan. 31-Feb 5, 2010.
2. IMA graduate summer program "Linear Algebra and Applications," held at ISU June 28-July 27, 2008. 60 participants (50 at any one time).
3. American Institute of Mathematics Research Conference Center (ARCC) Structured Quartet Research Ensemble (SQuaRE), 8-person research group "Minimum Rank of Symmetric Matrices described by a Graph," February 2008, February 2009.
4. American Institute of Mathematics Research Conference Center (ARCC) five day workshop (34 participants), "Spectra of families of matrices described by graphs, digraphs, or sign patterns," with Richard Brualdi and Bryan Shader, October 23-27, 2006.
5. Topics in Linear Algebra Conference, ISU, September 2002, with Y. T. Poon, Irvin Hentzel, Bryan Cain, Huaiqing Wu, Luz DeAlba, Mark Mills, Amy Wangsness.

Special Session/Mini-symposium Organizing (last five years)

1. Special Session "Spectra of Matrix Patterns and Applications to Dynamical Systems," with Bryan Shader, Luz DeAlba, In-Jae Kim, at Joint Mathematics Meetings, Washington, DC, January 2009.
2. Mini-symposium "Combinatorial Matrix Theory," with Bryan Shader, at 15th Annual ILAS Conference in Cancun, Mexico, June 2008.
3. Mini-symposium "Matrices and Graphs," with Bryan Shader, in honor of Hans Schneider, 14th Annual ILAS Conference in Shanghai, China, July 2007.
4. Special Session "Combinatorial Matrix Theory," with Bryan Shader, at AMS Sectional meeting, Lincoln, NE Oct. 21-23, 2005, 20 speakers. http://orion.math.iastate.edu/lhogben/research/AMSLincoln.html
5. Mini-symposium on Spectral Properties of Families of Matrices described by Patterns or Graphs, 12th Annual ILAS Conference, University of Regina, June 26-29, 2005. http://orion.math.iastate.edu/lhogben/research/Regina.html

EDITORSHIPS

1. Associate Editor, *Linear Algebra and Its Applications*, 2007-.
2. One of the editors of *Linear Algebra and Its Applications* 421(2-3), 2007 special issue in honor of Miroslav Fiedler. Co-author of preface pp. 173-181 (with P. Butkovic, R. Nabben, Z. Strakos, M. Tuma).

PROFESSIONAL OFFICES

Secretary/Treasurer, International Linear Algebra Society. 2009 -
Assistant Secretary/Treasurer, International Linear Algebra Society. 2006 – 2009.
Member, International Linear Algebra Society Nominating Committee, 2007.
Member, Hans Schneider Prize Committee, International Linear Algebra Society. 2007.
Member, Alice T. Schafer Prize Committee, Association for Women in Mathematics, 2008-2010

ADVISING AND DIRECTION OF POST- DOCTORAL, DOCTORAL & MASTER'S STUDENTS

Post-doctoral sponsor

Minnie Catral	2009-	
Jason Grout	2007-2009	Asst. Prof. Drake University

Ph.D. Thesis Supervisor

Darren Row	Math	current	
Olga Pryporova	Math	2009	Postdoc, U Connecticut
Rana Mikkelson	Math	2008	US Govenment
Amy Wangsness	Math	2005	Asst. Prof., Fitchburg State College

Master's Supervisor (thesis where indicated, otherwise creative component)

Laura DeLoss	Math	2009	(thesis)
Dan Sarasio Meyer	MSM	2008	
Olga Ruff	Math	2007	
Jennifer Parker	MSM	2006	
Becky Atherton	MSM	2005	
Lesley Lamphier	MSM	2004	
Michele Funke	MSM	2002	
Sandra Nordstrom	Math	2002	
Daniel Carberry	Math	1995	
Rachel Lamp	Math	1990	
Joyati Chakraborty	Math	1985	

Master's Creative Component Co-Supervisor

Joyce Eveland	MSM	2006
George Peters	Math	1995

RESEARCH MENTORING (graduate and undergraduate students)

2006- ISU Honors project mentor

2009 (summer REU) 1 faculty, 4 graduate students, 6 undergraduate students, paper being written

2008 (summer IMA program research group) 6 faculty, 10 graduate students, paper recommended for publication

Spring 2008 Math 610 Early Graduate Research Seminar, 2 faculty, 1 post-doc, 5 graduate students, 1 undergraduate, 2 papers submitted

2006 (summer REU) 1 faculty, 2 graduate students, 2 undergraduate students, paper published

2005-2006 3 faculty, 2 graduate students, paper published

2005 (summer REU) 1 faculty, 1 graduate student, 2 undergraduate students, paper published

2004-5 (research group) 4 faculty, 1 graduate student, paper published

2004 (summer REU) 1 faculty, 1 graduate student, 2 undergraduate students (REU), paper published

2003 (summer REU) 1 faculty, 2 undergraduate students (REU), paper with summer 2004 group.

2002-3 (research group) 3 faculty, 1 graduate student, paper published

2001-2 (research group) 2 faculty, 3 graduate students, 1 special student, paper published

2000-1 (research group) 2 faculty, 3 graduate students, paper published

EDUCATIONAL PUBLICATIONS

Textbooks

1. Editor, *Mathematics for Elementary School Teachers: Explorations for Iowa State*

University, Houghton Mifflin, 1999, based on *Mathematics for Elementary School Teachers: Explorations* by Bassarear. Wrote about 80 pages of new material.

2. *Elementary Linear Algebra* (text), West Publishing Co., 1987.

Chapters in Books

1. Canonical Forms, in *Handbook of Linear Algebra*, CRC Press, 2007.

Papers (invited)

1. Review of *Applied Linear Algebra* by Olver and Shakiban, *American Mathematical Monthly,* 115(4): 373-378, 2008.
2. The REU Experience at Iowa State University, Proceedings of AMS NSA *Conference Promoting Undergraduate Research in Mathematics,* American Mathematical Society, 2007.

Workbooks

1. *Applications of Ordinary Differential Equations and Linear Algebra* (notes), with K. Heimes, 1991.

Computer Programs

1. *Phase Plane for Ordinary Differential Equations* (computer program), with R. K. Alexander and R. Tondra, 1986.
2. *Matrix Calculator* (computer program), with I. R. Hentzel, CONDUIT, 1986.

EDUCATIONAL LECTURES

Plenary Lectures

1. "Teaching Linear Algebra: Technology and Resources," 3rd University Mathematics Courses Forum, Chengdu, China, November 2, 2007.

Invited Lectures and Presentations (last five years)

1. "Matrices, Digraphs, Markov Chains & Their Use by Google," Bay Area Mathematical Adventures, February 27, 2008.
2. "Research motivates students," Joint Mathematics Meetings, San Diego, January 7, 2008.
3. "Markov Chains and Their Use by Google," University of Northern Iowa, Nov. 29, 2006.
4. "Applying to Graduate Schools and REUs" Pi Mu Epsilon Talk, ISU, Oct 8, 2006.
5. "Markov Chains and Their Use by Google," Pi Mu Epsilon Talk, ISU, Dec. 4, 2005.
6. "Using graphs to decode RNA chains," University of Wisconsin-Lacrosse, April 1, 2005.
7. "Using graphs to decode RNA chains," Maharishi University, Nov. 10, 2004

TEACHING (since 2000)

Math 150 Discrete mathematics, taught on-line through WebCT (requires log-in)
Math 165 Calculus 1, http://orion.math.iastate.edu/lhogben/classes/math165.html
Math 165H Honors calculus I, http://orion.math.iastate.edu/lhogben/classes/math165h.html
Math 166H Honors calculus II, http://orion.math.iastate.edu/lhogben/classes/math166h.html
Math 267, Differential Equations http://orion.math.iastate.edu/lhogben/classes/math267.html
Math 297 Math for El Ed 3, http://orion.math.iastate.edu/lhogben/classes/math297.html
Math 301 Abstract Algebra, http://www.public.iastate.edu/%7Elhogben/math301.html
Math 307 Linear Algebra, http://www.public.iastate.edu/%7Elhogben/math307.html
Math 317 Theory of Linear Algebra, http://www.public.iastate.edu/%7Elhogben/math317.html
Math 489 History of mathematics, http://www.public.iastate.edu/%7Elhogben/math489.html
Math 490 Independent study course: Markov chains, minimum rank honors (3 student-years)
Math 504-505 Abstract Algebra I & II http://orion.math.iastate.edu/lhogben/classes/math504.html
Math 510 Linear Algebra, http://www.public.iastate.edu/%7Elhogben/math510.html
Math 590 Independent study courses: Combinatorial Matrix Theory, Algebraic Graph Theory, Linear Algebra (510 for students in other departments), (9 student-years)
Math 599 Masters creative component (8 students)
Math 610 Seminar: Early Graduate Research (minimum rank problems)
Math 690/610 Combinatorial matrix theory research group (13 student-years)
Math 690E Topics in Linear Algebra, http://www.public.iastate.edu/%7Elhogben/math690E.html
Math 699 Ph.D. thesis research (4 students) M.S. thesis research (1 student)

DIVERSITY EFFORTS

1. Mathematics Department Diversity Coordinator: Lead a team of departmental faculty working to recruit and retain a diverse group of graduate students, build faculty collaborations with minority-serving schools, work with other leaders of diversity efforts at ISU and nationally to enhance the diversity of the STEM workforce.
2. Lead organizer for the 2nd annual Iowa Mathematical Field of Dreams Conference held at ISU Nov. 8-8, 2008 to encourage under-represented students to enroll in graduate school http://www.math.iastate.edu/Alliance/Alliance.html.
3. Associate Director for Program Diversity, American Institute of Mathematics (AIM). Assisted organizers and co-lead AIM 2008 workshop Research Experiences in Linear Algebra and Number Theory for Undergraduate Faculty (see http://aimath.org/pastworkshops/relant.html); 75% of participants were from Historically Black Colleges and Universities. Also AIM 2009 workshop Research Experiences for Undergraduate Faculty (see http://aimath.org/pastworkshops/relant2.html)
4. Co-leader of Women in Mathematical Sciences group at ISU (female faculty in Mathematics, Statistics, Computer Science) that informally mentors untenured faculty and graduate students and has received ISU funding for a Distinguished Lecture series, http://www.public.iastate.edu/%7Elhogben/IWIMS.html.
5. Major professor for 12 female graduate students, including 3 Ph. D. students, and Mentor to 3 minority undergraduate students.