

Leslie Hogben

Associate Dean for Graduate Studies and Faculty Development, College of Liberal Arts and Sciences
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BACKGROUND

Degrees held:

Ph.D. Yale University 1978 (Advisor: Nathan Jacobson; NSF Graduate Fellow)
B.A. Swarthmore College 1974 (summa cum laude, Phi Beta Kappa)

Professional Experience:

Iowa State University College of Liberal Arts and Sciences
Associate Dean for Graduate Studies and Faculty Development, 2019-
Iowa State University Department of Mathematics
Dio Lewis Holl Chair in Applied Mathematics, 2012-2020
Professor, 2006-
(sabbatical: Fall 2014-Spring 2015, Fall 2008-Spring 2009)
Director of Diversity, 2009-2018.
Associate Professor, 1983-2006
(sabbatical, Fall 2003; half-time: 1987-1991; leave without pay: 1985-1987)
Assistant Professor, 1980-1983
Instructor (tenure-track), 1978-1980
Iowa State University Department of Electrical and Computer Engineering
Professor (courtesy appointment), 2013-
American Institute of Mathematics,
Associate Director for Diversity (part-time), 2007-
Institute for Mathematics and its Applications,
General member, Sept-Nov 2014

HONORS

2024 Fellow of the American Mathematical Society
2020 Fellow of the American Association for the Advancement of Science (AAAS)
2020 Fellow of the Association for Women in Mathematics (AWM)
2019 Postdoctoral Mentoring Award, Iowa State University
2018 Margaret Ellen White Award, Iowa State University (for graduate mentoring)
2018 College of Liberal Arts and Sciences Excellence in Graduate Mentoring Award
2015 College of Liberal Arts and Sciences Diversity Award
2012 Dio Lewis Holl Chair in Applied Mathematics
2012 Vinograd Graduate Advising Award, Mathematics Department
2012 Iowa Women of Innovation finalist (Academic Innovation and Leadership)
2008 *Choice* magazine Outstanding Academic Title: *Handbook of Linear Algebra*

MEMBERSHIPS

AAAS, AMS, AWM, ILAS, NAACP, NAM, Phi Beta Kappa, SACNAS, Sigma Xi, SIAM

RESEARCH PUBLICATIONS

Papers cited 1498 times by at least 547 papers (includes 191 citations to [33] and 27 citations to [44] not reported in a name search), h-index = 19. In addition, *Handbook of Linear Algebra* 2nd ed. cited 337 times and *Handbook of Linear Algebra* cited 49 times. Data from MathSciNet 10/15/23.

Books

- (VI) L. Hogben, J.C.-H. Lin, B.L. Shader. *Inverse Problems and Zero Forcing for Graphs*. Mathematical Surveys and Monographs **270**, American Mathematical Society, Providence, RI, 2022.

Books Edited

- (V) D. Ferrero, L. Hogben, S. Kingan, G. Mathews, editors. *Research Trends in Graph Theory and Applications*. Association for Women in Mathematics Series **25**, Springer, New York, NY, 2021.
- (IV) F. Chung, R. Graham, F. Hoffman, L. Hogben, R.C. Mullin, D.B. West, editors. *50 Years of Combinatorics, Graph Theory, and Computing*. CRC Press, Boca Raton, FL, 2020.
- (III) A. Beveridge, J. Griggs, L. Hogben, G. Musiker, P. Tetali, editors. *Recent Trends in Combinatorics*, IMA Volumes in Mathematics and its Applications **159**, Springer, New York, NY, 2016.
- (II) L. Hogben, editor. R.A. Brualdi and G.W. Stewart, Associate editors. *Handbook of Linear Algebra*, 2nd edition, CRC Press, Boca Raton, 2014.
- (I) L. Hogben, editor. R.A. Brualdi, A. Greenbaum, and R. Mathias, Associate editors. *Handbook of Linear Algebra*, Chapman Hall/CRC Press, Boca Raton, 2007.

Book Chapters

- (f) S.E. Anderson, K.L. Collins, D. Ferrero, L. Hogben, C. Mayer, A.N. Trenk, S. Walker. Product throttling. In *Research Trends in Graph Theory and Applications*, pp. 11–50, Springer, 2021.
- (e) L. Hogben, J.C.-H. Lin, B.L. Shader. The Inverse Eigenvalue Problem of a Graph. In *50 Years of Combinatorics, Graph Theory, and Computing*, CRC Press, 2020.
- (d) L. Hogben. Nordhaus-Gaddum Problems for Colin de Verdière Type Parameters, Variants of Tree-width, and Related Parameters. In *Recent Trends in Combinatorics*, pp. 275–294, Springer, 2016.
- (c) S. Fallat, L. Hogben. Minimum Rank, Maximum Nullity, and Zero Forcing Number of Graphs. In *Handbook of Linear Algebra*, 2nd ed., pp. 46-1–46-36, CRC Press, Boca Raton, FL, 2014.
- (b') L. DeAlba, L. Hogben, and A. Wangsness Wehe. Matrix Completion Problems (update of (b)). In *Handbook of Linear Algebra*, 2nd ed., pp. 49-1–49-30, CRC Press, Boca Raton, FL, 2014.
- (b) L. Hogben and A. Wangsness. Matrix Completion Problems. In *Handbook of Linear Algebra*, pp. 35-1–35-21, Chapman Hall/CRC Press, Boca Raton, FL, 2007.
- (a) L. Hogben. Identities of Nonassociative Algebras Studied by Computer. In *Algebraists' homage: papers in ring theory and related topics (New Haven, Conn., 1981)*, pp. 321–324, *Contemp. Math.*, 13, Amer. Math. Soc., Providence, RI, 1982.

Papers (Refereed research journals, appeared or accepted)

- [108] Z. Brennan, C. Cox, B.A. Curtis, E. Gomez-Leos, K.P. Hadaway, L. Hogben, C. Thompson. Orthogonal realizations of random sign patterns and other applications of the SIPP. *Electron. J. Linear Algebra* **39** (2023), 434–459.
- [107] N.H. Bong, J. Carlson, B. Curtis, R. Haas, L. Hogben. Isomorphisms and properties of TAR reconfiguration graphs for zero forcing and other X -set parameters. *Graphs Combin.* **39** (2023), Paper No. 86, 23 pp.
- [106] A. Abiad, L. de Lima, D.N. Desai, K. Guo, L. Hogben, and J. Madrid. Positive and Negative Square Energies of Graphs. *Electron. J. Linear Algebra* **39** (2023), 307–326.

- [105] S.E. Anderson, K.L. Collins, D. Ferrero, L. Hogben, C. Mayer, A.N. Trenk, S. Walker. Product throttling for power domination. *Australasian J. Combinatorics* **85** (2023), 248–272.
- [104] J. Geneson, R. Haas, L. Hogben. Reconfiguration graphs of zero forcing sets. *Discrete Appl. Math.* **329** (2023), 126–138.
- [103] F.S. Dahlgren, Z. Gershkoff, L. Hogben, S. Motlaghian, and D. Young. Inverse eigenvalue and related problems for hollow matrices described by graphs. *Electron. J. Linear Algebra* **38** (2022), 661–679.
- [102] J. Geneson, L. Hogben. Propagation time for probabilistic zero forcing. *Australasian J. Combinatorics*, **83** (2022), 397–417.
- [101] L. Hogben, M. Hunnell, K. Liu, H. Schuerger, B. Small, Y. Zhang. Upper bounds for positive semidefinite propagation time. *Discrete Math.* **345** (2022), 112967 (11 pp.).
- [100] L. Hogben, C. Reinhart. Spectra of variants of distance matrices of graphs and digraphs: a survey. *La Matematica*, **1** (2022), 186–224.
- [99] A. Bonato, J. Breen, B. Brimkov, J. Carlson, S. English, J. Geneson, L. Hogben, K.E. Perry. Optimizing the trade-off between number of cops and capture time in Cops and Robbers. *J. Comb.* **13** (2022), 79–103.
- [98] M. Catral, L. Ciardo, L. Hogben, C. Reinhart. Spectral theory of products of digraphs. *Electron. J. Linear Algebra*, **36** (2020), 744–763.
- [97] E. Curl, J. Geneson, L. Hogben. Skew throttling. *Australasian J. Combinatorics*, **78** (2020), 117–190.
- [96] B. Brimkov, K. Duna, L. Hogben, K. Lorenzen, C. Reinhart, S.-Y. Song, M. Yarrow. Graphs that are cospectral for the distance Laplacian. *Electron. J. Linear Algebra*, **36** (2020), 334–351.
- [95] Y. Chan, E. Curl, J. Geneson, L. Hogben, K. Liu, I. Odegard, M.S. Ross. Using Markov chains to determine expected propagation time for probabilistic zero forcing. *Electron. J. Linear Algebra*, **36** (2020), 318–333.
- [94] L. Hogben. Zero forcing and maximum nullity for hypergraphs. *Discrete Appl. Math.*, **282** (2020), 122–135.
- [93] W. Barrett, S. Butler, S. Fallat, H.T. Hall, L. Hogben, J.C.-H. Lin, B.L. Shader, M. Young. The inverse eigenvalue problem of a graph: Multiplicities and minors. *J. Comb. Theory Series B*, **142** (2020), 276–306.
- [92] L. Hogben, J.C.-H. Lin, D. D. Olesky, P. van den Driessche. The sepr-sets of sign patterns. *Linear Multilinear Algebra*, **68** (2020), 2044–2068.
- [91] L. Hogben, N. Shaked-Monderer. SPN graphs and rank-1 CP-completable graphs. *Electron. J. Linear Algebra*, **35** (2019), 376–386.
- [90] D. Ferrero, M. Flagg, H.T. Hall, L. Hogben, J.C.-H. Lin, S.A. Meyer, S. Nasserar, B. Shader. Rigid linkages and partial zero forcing. *Electron. J. Combinatorics*, **26** (2019), P2.43 (25 pages).
- [89] C. Bozeman, B. Brimkov, C. Erickson, D. Ferrero, M. Flagg, L. Hogben. Restricted power domination and zero forcing problems. *J. Comb. Optim.*, **37** (2019), 935–956.
- [88] J. Carlson, L. Hogben, J. Kritschgau, K. Lorenzen, M.S. Ross, S. Selken, V. Valle Martinez. Throttling positive semidefinite zero forcing propagation time on graphs. *Discrete Appl. Math.*, **254** (2019), 33–46.
- [87] G. Aalipour, A. Abiad, Z. Berikkyzy, L. Hogben, F.H.J. Kenter, J.C.-H. Lin, M.Tait. Proof of a conjecture of Graham and Lovasz concerning unimodality of coefficients of the distance characteristic polynomial of a tree. *Electron. J. Linear Algebra*, **34** (2018) 373–380.
- [86] K.F. Benson, D. Ferrero, M. Flagg, V. Furst, L. Hogben, V. Vasilevska. Note on Nordhaus-Gaddum problems for power domination. *Discrete Appl. Math.*, **251** (2018), 103–113.
- [85] J. Breen, B. Brimkov, J. Carlson, L. Hogben, K.E. Perry, C. Reinhart. Throttling for the game of Cops and Robbers on graphs. *Discrete Math.*, **341** (2018) 2418–2430.
- [84] J.S. Alameda, E. Curl, A. Grez, L. Hogben, O’N. Kingston, A. Schulte, D. Young, M. Young. Families of graphs with maximum nullity equal to zero-forcing number. *Special Matrices*, **6** (2018), 56–67.

- [83] B. Bjorkman, L. Hogben, S. Ponce, C. Reinhart, T. Tranel. Applications of analysis to the determination of the minimum number of distinct eigenvalues of a graph. *Pure Appl. Funct. Anal.*, **3** (2018), 537–563.
- [82] D. Ferraro, L. Hogben, F.H.J. Kenter, M. Young. The relationship between k -forcing and k -power domination. *Discrete Math.* **341** (2018), 1789–1797.
- [81] K.F. Benson, D. Ferrero, M. Flagg, V. Furst, L. Hogben, V. Vasilevska, B. Wissman. Zero forcing and power domination for graph products. *Australasian J. Combinatorics* **70** (2018), 221–235.
- [80] W. Barrett, S. Fallat, H.T. Hall, L. Hogben, J.C.-H. Lin, B.L. Shader. Generalizations of the Strong Arnold Property and the minimum number of distinct eigenvalues of a graph. *Electron. J. Combinatorics*, **24** (2017) P2.40 (28 pages).
- [79] L. Hogben, K. Palmowski, D.E. Roberson, S. Severini. Orthogonal representations, projective rank, and fractional minimum positive semidefinite rank: connections and new directions. *Electron. J. Linear Algebra* **32** (2017), 98–115.
- [78] S. Butler, M. Catral, H.T. Hall, L. Hogben, X. Martinez-Rivera, B. Shader, P. van den Driessche. The enhanced principal rank characteristic sequence for Hermitian matrices. *Electron. J. Linear Algebra* **32** (2017), 58–75.
- [77] M. Dairyko, L. Hogben, J.C.-H. Lin, J. Lockhart, D. Roberson, S. Severini, M. Young. Note on von Neumann and Rényi entropies of a graph. *Linear Algebra Appl.*, **521** (2017) 240–253.
- [76] A. Berliner, C. Bozeman, S. Butler, M. Catral, L. Hogben, B. Kroschel, J.C.-H. Lin, N. Warnberg, M. Young. Zero forcing propagation time on oriented graphs. *Discrete Appl. Math.* **224** (2017), 45–59.
- [75] D. Ferraro, L. Hogben, F.H.J. Kenter, M. Young. Note on power propagation time and lower bounds for the power domination number. *J. Comb. Optim.*, **34** (2017), 736–641.
- [74] E. Gethner, L. Hogben, B. Lidicky, F. Pfender, A. Ruiz, M. Young. Crossing numbers of complete tripartite and balanced complete multipartite graphs. *J. Graph Theory*, **84** (2017), 552–565.
- [73] L. Hogben, K. Palmowski, D. Roberson, M. Young. Fractional Zero Forcing via Three-color Forcing Games. *Discrete Appl. Math.*, **213** (2016), 114–129.
- [72] S. Butler, C. Erickson, L. Hogben, K. Hogenson, L. Kramer, R.L. Kramer, J.C.-H. Lin, R.R. Martin, D. Stolee, N. Warnberg, M. Young. Rainbow arithmetic progressions. *J. Combinatorics*, **7** (2016), 595–626.
- [71] G. Aalipour, A. Abiad, Z. Berikkyzy, J. Cummings, J. De Silva, W. Gao, K. Heysse, L. Hogben, F.H.J. Kenter, J.C.-H. Lin, M. Tait. On the distance spectra of graphs. *Linear Algebra Appl.*, 497 (2016), 66–87.
- [70] S. Butler, M. Catral, S.M. Fallat, H.T. Hall, L. Hogben, P. van den Driessche, M. Young. The enhanced principal rank characteristic sequence. *Linear Algebra Appl.* **498** (2016), 181–200.
- [69] L. Hogben, B.-S. Tam, U. Wilson. Note on the Jordan form of an irreducible eventually nonnegative matrix. *Electron. J. Linear Algebra*, **30** (2015), 279–285.
- [68] D. Burgarth, V. Giovanetti, L. Hogben, S. Severini, M. Young. Logic circuits from zero forcing. *Natural Computing*, **14** (2015), 485–490.
- [67] C. Bozeman, AV. Ellsworth, L. Hogben, J. C.-H. Lin, G. Maurer, K. Nowak, A. Rodriguez, J. Strickland. Minimum rank of graphs with loops. *Electron. J. Linear Algebra* **27** (2014), 907–934.
- [66] W. Barrett, S. Butler, M. Catral, S. M. Fallat, H. T. Hall, L. Hogben, P. van den Driessche, M. Young. The principal rank characteristic sequence over various fields. *Linear Algebra Appl.* **459** (2014), 222–236.
- [65] C. Grood, J.A. Harmse, L. Hogben, T. Hunter, B. Jacob, A. Klimas, S. McCathern, Minimum rank of zero-diagonal matrices described by a graph. *Electron. J. Linear Algebra*, **27** (2014), 458–477.
- [64] C. Qiu, N. Vaswani, B. Lois, L. Hogben. Recursive Robust PCA or Recursive Sparse Recovery in Large but Structured Noise. *IEEE Trans. Information Theory*, **60** (2014), 5007–5039.

- [63] W. Barrett, S. Butler, M. Catral, S.M. Fallat, H.T. Hall, L. Hogben, M. Young. The maximum nullity of a complete subdivision graph is equal to its zero forcing number. *Electron. J. Linear Algebra*, **27** (2014), 444-457.
- [62] A. Berliner, M. Catral, L. Hogben, M. Huynh, M. Young. Minimum rank, maximum nullity, and zero forcing number for simple digraphs. *Electron. J. Linear Algebra* **26** (2013), 762-780.
- [61] W. Barrett, S. Fallat, H.T. Hall, L. Hogben. Note on Nordhaus-Gaddum problems for Colin de Verdière type parameters. *Electron. J. Combinatorics*, **20** (2013) P56 (9 pages).
- [60] J. Ekstrand, C. Erickson, H.T. Hall, D. Hay, L. Hogben, R. Johnson, N. Kingsley, S. Osborne, T. Peters, J. Roat, A. Ross, D.D. Row, N. Warnberg, M. Young. Positive semidefinite zero forcing. *Linear Algebra Appl.*, **439** (2013), 1862-1874.
- [59] D. Burgarth, D. D'Alessandro, L. Hogben, S. Severini, M. Young. Zero forcing, linear and quantum controllability for systems evolving on networks. *IEEE Trans. Automatic Control*, **58** (2013), 2349–2354.
- [58] F. Barioli, W. Barrett, S. Fallat, H.T. Hall, L. Hogben, B. Shader, P. van den Driessche, H. van der Holst. Parameters related to tree-width, zero forcing, and maximum nullity of a graph. *J. Graph Theory*, **72** (2013), 146-177.
- [57] L. Hogben, U. Wilson. Eventual properties of matrices. *Electron. J. Linear Algebra* **23** (2012), 953-965.
- [56] M. Catral, A. Cepek, L. Hogben, M. Huynh, K. Lazebnik, T. Peters, M. Young. Zero forcing number, maximum nullity, and path cover number of subdivided graphs. *Electron. J. Linear Algebra*, **23** (2012), 906-922.
- [55] L. Hogben, M. Huynh, N. Kingsley, S. Meyer, S. Walker, M. Young. Propagation time for zero forcing on a graph. *Discrete Appl. Math.* **160** (2012), 1994-2005.
- [54] J. Ekstrand, C. Erickson, D. Hay, L. Hogben, J. Roat. Note on positive semidefinite maximum nullity and positive semidefinite zero forcing number of partial 2-trees. *Electron. J. Linear Algebra* **23** (2012), 79-87.
- [53] M. Catral, C. Erickson, L. Hogben, D.D. Olesky, P. van den Driessche. Sign patterns that allow strong eventual nonnegativity. *Electron. J. Linear Algebra* **23** (2012), 1-10.
- [52] F. Barioli, W. Barrett, S. Fallat, H.T. Hall, L. Hogben, H. van der Holst. On the graph complement conjecture for minimum rank. *Linear Algebra Appl.* **436** (2012), 4373-4391.
- [51] C. Edholm, L. Hogben, M. Huynh, J. LaGrange, D. Row. Vertex and edge spread of zero forcing number, maximum nullity, and minimum rank of a graph. *Linear Algebra Appl.* **436** (2012), 4352-4372.
- [50] L. Hogben. A note on minimum rank and maximum nullity of sign patterns. *Electron. J. Linear Algebra* **22** (2011) 203-213.
- [49] L. Hogben. Eventually cyclic matrices and a test for strong eventual nonnegativity. *Electron. J. Linear Algebra* **19** (2010), 129-140.
- [48] L. Hogben, J. McLeod. A linear algebraic view of partition regular matrices. *Linear Algebra Appl.* **433** (2010) 1809-1820.
- [47] F. Barioli, W. Barrett, S.M. Fallat, H.T. Hall, L. Hogben, B. Shader, P. van den Driessche, H. van der Holst. Zero forcing parameters and minimum rank problems. *Linear Algebra Appl.* **433** (2010), 401-411.
- [46] H.T. Hall, L. Hogben, R. Martin, B. Shader. Expected values of parameters associated with the minimum rank of a graph. *Linear Algebra Appl.* **433** (2010), 101-117.
- [45] L. DeLoss, J. Grout, L. Hogben, T. Mackay, J. Smith, G. Tims. Techniques for determining the minimum rank of a small graph. *Linear Algebra Appl.* **432** (2010), 2995-3001.
- [44] IMA-ISU research group on minimum rank (M. Allison, E. Bodine, L.M. DeAlba, J. Debnath, L. DeLoss, C. Garnett, J. Grout, L. Hogben, B. Im, H. Kim, R. Nair, O. Pryporova, K. Savage, B. Shader, A. Wangsness Wehe). Minimum rank of skew-symmetric matrices described by a graph. *Linear Algebra Appl.* **432** (2010), 2457-2472.

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- [40] L. Hogben. Minimum rank problems. *Linear Algebra Appl.* **432** (2010), 1961-1974.
- [39] L. Hogben, B. Shader. Maximum generic nullity of a graph. *Linear Algebra Appl.* **432** (2010), 857-866.
- [38] L.M. 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.
- [37] L.M. DeAlba, L. Hogben, B.K. Sarma. The Q-matrix Completion Problem. *Electron. J. Linear Algebra* **18** (2009) 176-191.
- [36] F. Barioli, S.M. Fallat, H.T. Hall, D. Hershkowitz, 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.
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- [34] L. Hogben. Orthogonal representations, minimum rank, and graph complements. *Linear Algebra Appl.*, **428** (2008), 2560-2568.
- [33] AIM Minimum Rank – Special Graphs Work Group (F. Barioli, W. Barrett, S. Butler, S.M. Cioaba, D. Cvetković, S.M. Fallat, C. Godsil, W. Haemers, L. Hogben, R. Mikkelson, S. Narayan, O. Pryporova, I. Sciriha, W. So, D. Stevanović, H. van der Holst, K. Vander Meulen, and A. Wangsness). Zero forcing sets and the minimum rank of graphs. *Linear Algebra Appl.*, **428** (2008), 1628–1648.
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- [31] S. Fallat, L. Hogben. The Minimum Rank of Symmetric Matrices Described by a Graph: A Survey, *Linear Algebra Appl.*, **426** (2007), 558-582.
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- [27] L. Hogben. The copositive completion problem: unspecified diagonal. *Linear Algebra Appl.*, **420** (2007), 160-162.
- [26] A. Chowdhury, L. Hogben, J. Melancon, R. Mikkelson. Rational realization of maximum eigenvalue multiplicity of symmetric tree sign patterns. *Linear Algebra Appl.*, **418** (2006), 380-393.
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- [7] L. Hogben, C. Bergman. Deductive varieties of modules and universal algebras, *Trans. AMS*, **289** (1985), 303-320.
- [6] L. Hogben, V. Kac. The correct multiplication table for the exceptional Jordan superalgebra F . *Comm. Algebra* **11** (1983), 1155-1156.
- [5] I.R. Hentzel, L. Hogben. Exhaustive checking of sparse algebras. *J. Algorithms* **2** (1981), 44-49.
- [4] L. Hogben, K. McCrimmon. Maximal modular inner ideals and the Jacobson radical of a Jordan algebra. *J. Algebra* **68** (1981), 155-169.
- [3] L. Hogben. Radicals and homotopes of Jordan algebras. *Comm. Algebra* **9** (1981), 179-194.
- [2] I.R. Hentzel, L. Hogben, H.F. Smith. flexible derivation alternator rings. *Comm. Algebra* **8** (1980), 1997-2014.
- [1] L. Hogben. Radicals and semi-prime ideals of Jordan triple systems. *Comm. Algebra* **7** (1979), 1313-1328.

Papers (Expository, proceedings, etc.; appeared or accepted)

- (I) S. Fallat, L. Hogben, J.C.-H. Lin, B. Shader. The Inverse Eigenvalue Problem of a graph, zero forcing, and related parameters. *Notices AMS*, 67(2): 257-261.
- (H) A. Berliner, C. Brown, J. Carlson, N. Cox, L. Hogben, J. Hu, K. Jacobs, K. Manternach, T. Peters, N. Warnberg, M. Young. Path cover number, maximum nullity, and zero forcing number of oriented graphs and other simple digraphs. *Involve* **8** (2015), 147-167.
- (G) C. Qiu, N. Vaswani, L. Hogben. Recursive Robust PCA or Recursive Sparse Recovery in Large but Structured Noise. *ICASSP 2013*, 5954-5958 (abstract of part of [64]).

- (F) M. Archer, M. Catral, C. Erickson, R. Haber, L. Hogben, X. Martinez-Rivera, A. Ochoa, Potentially eventually exponentially positive sign patterns. *Involve* **6** (2013), 261-271.
- (E) M. Archer, M. Catral, C. Erickson, R. Haber, L. Hogben, X. Martinez-Rivera, A. Ochoa. Constructions of potentially eventually positive sign patterns with reducible positive part. *Involve* **4** (2011), 405-410.
- (D) E. Almodovar, L. DeLoss, L. Hogben, K. Hogenson, K. Murphy, T. Peters, C. Ramirez. Minimum rank, maximum nullity and zero forcing number for selected graph families. *Involve* **3** (2010), 371-392.
- (C) 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).
- (B) Relationships between the Completion problems for Various Classes of Matrices. *Proceedings of the 8th SIAM Conference on Applied Linear Algebra*, available electronically at <http://www.siam.org/meetings/la03/proceedings/>
- (A) A. Abian, L. Hogben, E.H. Johnston. Laurent Series Obtained by Long Division, *Radovi Matematicki*, **1** (1985), 79-99.

Papers under review

- (R-i) B.A. Curtis, L. Hogben, A. Roux. Zero forcing irredundant sets. <https://arxiv.org/abs/2403.03921>
- (R-ii) T.R. Cameron, L. Hogben, F.H.J. Kenter, S.A. Mojallal, H. Schuerger. Forts, (fractional) zero forcing, and Cartesian products of graphs. <https://arxiv.org/abs/2310.17904>
- (R-iii) A. Clark, B.A. Curtis, E.K. Gngang, L. Hogben. Apportionable matrices and gracefully labelled graphs. <https://arxiv.org/abs/2307.10548>
- (R-iv) L. Hogben, M. Hunnell, K. Liu, H. Schuerger, B. Small, Y. Zhang. New Structures and their Applications to Variants of Zero Forcing and Propagation Time. <https://arxiv.org/abs/2308.11808>
- (R-v) B. Bjorkman, C. Bozeman, D. Ferrero, M. Flagg, C. Grood, L. Hogben, B. Jacob, C. Reinhart. Power domination reconfiguration. <https://arxiv.org/abs/2201.01798>

GRANTS (current)

More than \$3M in lifetime funding as PI (mostly through ISU) and an additional \$25M as co-PI (mostly through AIM).

- 2023-26 NSF, “Mathematical Sciences Institutes Diversity Initiative”, AIM PI, with 2 AIM co-PI, through AIM in collaboration with IPAM, ICERM, IMSI, and SLMath.
- 2023-25 NSF, “PRIMES PAIR: Partnering with AIM for Inclusive Research”, AIM co-PI, Mary Flagg, PI, award to University of St. Thomas.
- 2019-24 NSF, “RTG: Combinatorics, Computation and Applications at Iowa State,” PI, 4 co-PIs.
- 2020-24 NSF, “Research Experiences for Undergraduate Faculty”, (4 workshops and follow-up), AIM PI, with 1 AIM co-PI, through AIM in collaboration with ICERM.
- 2020-25 NSF, “American Institute of Mathematics Research Conference Center: A Model for Collaboration,” co-PI, J. Brian Conrey PI, 3 other co-PIs, through AIM.

RESEARCH LECTURES

Plenary Lectures

- (1) “Uniform and apportionable matrices,” Western Canada Linear Algebra Conference (WCLAM), Regina, Canada (but my talk was virtual), My 27, 2023.
- (2) “A universal approach to zero forcing and power domination,” International Workshop on Variants of Graph Domination, Bharata Mata College, India (virtual), November 17, 2022.
- (3) “Propagation and throttling for zero forcing, power domination, and Cops & Robbers,” Graph Searching

in Canada (GRASCan) Workshop 2019, Fields Institute, Toronto, August 6, 2019.

- (4) “The inverse eigenvalue problem of a graph and zero forcing,” 22nd International Linear Algebra Society (ILAS) Conference, Rio de Janeiro, Brazil, July 11, 2019.
- (5) “The Inverse Eigenvalue Problem of a Graph,” PIMS - UVic Distinguished Lecture, University of Victoria, March 22, 2018.
- (6) “Distance spectra,” 47th Southeastern International Conference on Combinatorics, Graph Theory & Computing (SEICCGTC), Florida Atlantic University, Boca Raton, FL, March 8, 2016.
- (7) “Minimum rank of matrices described by a graph or digraph,” 15th International Linear Algebra Society (ILAS) Conference, Cancun, Mexico, June 16, 2008.
- (8) “Combinatorial matrix theory,” International Conference on Algebra and Related Topics (ICART 2008), Bangkok, Thailand, May 28, 2008.

Invited Lectures (last five years)

1. “Fractional zero forcing,” Atlantic Graph Theory seminar (virtual), January 17, 2024.
2. “Uniform and apportionable matrices,” 05C50 Online (virtual), January 12, 2024.
3. “Fractional zero forcing,” Discrete Math and Combinatorics Seminar, University of South Carolina (virtual), January 12, 2024.
4. “Uniform and apportionable matrices,” (in special session) Joint Mathematics Meetings, San Francisco, January 5, 2024.
5. “A universal approach to TAR reconfiguration graphs of X -sets,” (in special session) Joint Mathematics Meetings, Boston, MA, January 5, 2023.
6. “Extreme values of parameters related to zero forcing, propagation time, and throttling,” Discrete Math and Combinatorics Seminar, University of South Carolina (virtual), August 26, 2022.
7. “Extreme values of parameters related to zero forcing, propagation time, and throttling,” Algebraic Graph Theory Seminar, University of Waterloo (virtual), March 14, 2022.
8. “Reconfiguration for zero forcing and related parameters,” (in special session), 53rd Southeastern International Conference on Combinatorics, Graph Theory & Computing (SEICCGTC), Florida Atlantic University, Boca Raton, FL, March 8, 2022.
9. “Zero forcing, propagation time, and throttling on a graph,” in the (members-only) kick-off of the (virtual) AIM Research Community *Inverse eigenvalue problems for graphs*, February 17, 2021.
10. “Product throttling for zero forcing, power domination, and Cops and Robbers,” (in special session) AMS Fall Sectional (virtual), October 24-25, 2020.
11. “Zero forcing, propagation time, and throttling on a graph,” New York Combinatorics Seminar (virtual), August 31, 2020.
12. “Maximum nullity and zero forcing on a graph,” (in special session), 51st Southeastern International Conference on Combinatorics, Graph Theory & Computing (SEICCGTC), Florida Atlantic University, Boca Raton, FL, March 9, 2020.
13. “SPN graphs,” (in mini-symposium) 22nd International Linear Algebra Society (ILAS) Conference, Rio de Janeiro, Brazil, July 12, 2019.
14. “Throttling for Cops and Robbers, zero forcing, and power domination,” Women Doing Math Seminar, Texas State University, San Marcos, TX, April 3, 2019.
15. “Extending maximum nullity and zero forcing from graphs to hypergraphs,” Keynote lecture in the Combinatorial Matrix Theory Special Session, 50th Southeastern International Conference on Combinatorics, Graph Theory & Computing (SEICCGTC), Florida Atlantic University, Boca Raton, FL, March 5, 2019.

Workshop participation (in addition to those where lectured, listed above, or organized, listed below; last ten years)

1. Mentor for the Graph Searching Project at the Workshop for Women in Graph Theory and Applications (WIGA), held at the Institute for Mathematics and its Applications, August 19 - 23, 2019.
2. Oberwolfach Research Institute for Mathematics 5-day workshop, *Copositivity and Complete Positivity*, Oct 29 - Nov 3, 2017.
3. Institute for Mathematics and its Applications 5-day workshop, *Information Theory and Concentration Phenomena*, April 13-17, 2015, Minneapolis, MN.
4. Institute for Mathematics and its Applications 5-day workshop, *Geometric and Enumerative Combinatorics*, Nov 10-14, 2014, Minneapolis, MN.
5. American Institute of Mathematics 5-day workshop, *Positivity, graphical models, and modeling of complex multivariate dependencies*, Oct 13-17, 2014, Palo Alto, CA.
6. Institute for Mathematics and its Applications 5-day workshop, *Additive and Analytic Combinatorics*, Sept 29-Oct 3, 2014, Minneapolis, MN.
7. Institute for Mathematics and its Applications 5-day workshop, *Probabilistic and Extremal Combinatorics*, Sept 8-12, 2014, Minneapolis, MN.
8. American Institute of Mathematics 5-day workshop, *Exact crossing numbers*, April 28-May 2, 2014, Palo Alto, CA.
9. Banff International Research Station Focused Research Group. *Minimum Rank, Maximum Nullity, and Zero Forcing of Graphs*, June 16-23, 2013, Banff, AB.

CONFERENCE/WORKSHOP/SPECIAL SESSION ORGANIZING

Conference/Workshop Organizing

Ongoing programs:

- a) Organizer (with Ulrica Wilson and Brianna Donaldson) of AIM/ICERM Research Experiences for Undergraduate faculty (REUF) workshops, 2009, 2011-2019, 2022-.
- b) Organizing Committee member 2014-2020, Rocky Mountains Great Plains Graduate Research Workshop in Combinatorics (GRWC). GRWC 2015 and GRWC 2018 were held at Iowa State University.

One-time events:

1. Organizer (with S. Fallat, H.T. Hall, B. Shader, M. Young) of the AMS Mathematics Research Community "Finding Needles in Haystacks: Approaches to Inverse Problems Using Combinatorics and Linear Algebra," June 6-12, 2021, virtual.
2. Chair of the Scientific Organizing Committee and Chair of the Local Organizing Committee, *ILAS 2017: Connections*, 21st ILAS Conference, Iowa State University, July 24-28, 2017.
3. Banff International Research Station Focused Research Group, *The Inverse Eigenvalue Problem of a Graph*, BIRS, June 5-12, 2016, organizer with Shaun Fallat and Bryan Shader.
4. Chair of the local organizing committee, AMS Spring 2013 Central Section meeting, Iowa State University, April 27-28, 2013.
5. Banff International Research Station Focused Research Group, *Eventually Nonnegative Matrices and their Sign Patterns*, BIRS, May 15-22, 2011, organizer.
6. NSF-CBMS Regional Conference, *The Mutually Beneficial Relationship of Matrices and Graphs*, Iowa State University, July 12-16, 2010, with Bryan Shader; Richard Brualdi, principal lecturer.
7. Banff International Research Station workshop, *Theory and Applications of Matrices Described by Patterns*, organizer with Richard Brualdi, Pauline van den Driessche, Shaun Fallat, Bryan Shader, BIRS, Jan. 31-Feb 5, 2010.

8. IMA graduate summer program, *Linear Algebra and Applications*, Iowa State University, June 28–July 27, 2008, with organizer Jason Grout, Wolfgang Kliemann, and Y.T. Poon.
9. American Institute of Mathematics Structured Quartet Research Ensemble (SQuaRE), 2 year 8-person research group, *Minimum Rank of Symmetric Matrices described by a Graph*, AIM Feb. 2008, Feb. 2009, organizer.
10. American Institute of Mathematics Research Conference Center (ARCC), five day funded workshop, *Spectra of families of matrices described by graphs, digraphs, or sign patterns*, organizer with with Richard Brualdi and Bryan Shader, at AIM October 23–27, 2006.
11. Chair of the Organizing Committee, *Topics in Linear Algebra Conference*, Iowa State University, September 2002.

Member of Organizing Committee/Advisory Board (last 5 years, in addition to those listed above)

1. AIM Research Community (ARC) *Inverse eigenvalue problems for graphs*, organized by J.Breen, M. Flagg, J.C.H. Lin, B. Shader, on-going virtually. <https://aimath.org/programs/researchcommunities/iepg/> (member of the Advisory Board)
2. Southeastern International Conference on Combinatorics, Graph Theory & Computing, Boca Raton, FL, annually in March, 2020-. <http://www.math.fau.edu/combinatorics2021/advisorycom1.php> (member of the Advisory Committee)
3. 22nd ILAS Conference, Rio de Janeiro, Brazil, July 2019. (member of the Scientific Organizing Committee)

Organization of Special Sessions/Mini-symposia/non-ISU Seminars (last five years)

1. Special Session, “Matrices and graphs,” with Bryan Curtis, 54th Southeastern International Conference on Combinatorics, Graph Theory & Computing (SEICCGTC), Florida Atlantic University, Boca Raton, FL, March 6–10, 2023.
2. Special Session, “Graph reconfiguration,” with Bryan Curtis, 53rd Southeastern International Conference on Combinatorics, Graph Theory & Computing (SEICCGTC), Florida Atlantic University, Boca Raton, FL, March 7–11, 2022.
3. Mini-symposium, “Spectral Graph Theory,” with Carolyn Reinhart, SIAM Applied Linear Algebra Conference (and International Linear Algebra Society Conference), Virtual, May 17–21, 2021.
4. Special Session, “The Inverse Eigenvalue Problem of a Graph and Zero Forcing,” with Bryan Shader, 52nd Southeastern International Conference on Combinatorics, Graph Theory & Computing (SEICCGTC), Virtual, March 8–12, 2021.
5. Special Session, “The Inverse eigenvalue problem for graphs, zero forcing, and related topics,” with Bryan Shader, Joint Mathematics Meetings, Virtual, January 7, 2021.
6. Special Session, “Women in Graph Theory and Applications,” 51st Southeastern International Conference on Combinatorics, Graph Theory & Computing (SEICCGTC), Florida Atlantic University, Boca Raton, FL, March 5–9, 2020.
7. Mini-symposium, “Zero Forcing, Propagation, Throttling: Variations and Applications,” with Mary Flagg and Jesse Geneson, 22nd International Linear Algebra Society (ILAS) Conference, Rio de Janeiro, Brazil, July 12, 2019.
8. Special Session, “Combinatorial Matrix Theory,” with David E. Brown, 50th Southeastern International Conference on Combinatorics, Graph Theory & Computing (SEICCGTC), Florida Atlantic University, Boca Raton, FL, March 4–8, 2019.
9. Special Session, “Research from the Rocky Mountains-Great Plains Graduate Research Workshop in Combinatorics,” with Mike Ferrara, Paul Horn, and Tyrell McAllister, Joint Mathematics Meetings, San Diego, January 2018.

EDITORSHIPS (last ten years)*Electronic Journal of Linear Algebra*

Advisory Editor, 2020-

Associate Editor, 2011-2019

Linear Algebra and its Applications

Associate Editor, 2007-2022

Associate Editor for the following Special Issues:

* 21st ILAS Conference Proceedings (Iowa State 2017), 576 (2019).

* 16th ILAS Conference Proceedings (Pisa 2010), 438 (2013).

* 2010 BIRS workshop Theory and applications of matrices described by patterns, 436 (2012).

Minnesota Undergraduate Mathematics Journal, Associate Editor, 2015-.**PROFESSIONAL OFFICES, BOARDS, AND COMMITTEES** (last ten years)

Member At Large of the Section A Steering Committee, American Association for the Advancement of Science (AAAS), 2023-.

Chair, Committee to Select the Winner of the Ruth Lyttle Satter Prize, American Mathematical Society. 2024- (member 2022-).

Member, Diversity Advisory Committee, Society for Industrial and Applied Mathematics. 2021-.

Member At Large, Liaison Committee with the American Association for the Advancement of Science, American Mathematical Society. 2022-2024.

Secretary/Treasurer, International Linear Algebra Society. 2009-2021.

Member, Scientific Review Panel, Atlantic Association for Research in the Mathematical Sciences (AARMS), 2015-2018.

Member, Inaugural Selection Committee for the AWM Dissertation Prizes, Association for Women in Mathematics, 2016-2017.

Member, AWM Mentoring Travel Grant Committee, Association for Women in Mathematics, 2013-2015, chair 2015.

REFEREEING AND REVIEWING (last five years)**Grant Reviewing**

member of NSF virtual panel 2021

member of NSF panel 2019

Refereeing*J. Comb. Theory Series B* (1 in 2023)*Linear Algebra Appl.* (1 in 2022)*Graphs Linear Algebra* (1 in 2019)**ADVISING AND DIRECTION OF POSTDOCTORAL ASSOCIATES, DOCTORAL & MASTER'S STUDENTS****Postdoctoral Sponsor**

Name	Years	Employment
Dr. Bryan Curtis	2021-	current
Dr. Jesse Geneson	2018-2020	Asst. Prof., San Jose State University
Dr. Michael Young	2010-2014	Assoc. Prof. and Assoc. Dean, Carnegie-Mellon University
Dr. Minerva Catral	2009-2010	Assoc. Prof., Xavier University (Ohio)
Dr. Jason Grout	2007-2009	Jupyter Developer, Bloomberg

Ph.D. Supervisor

Name	Major	Year	Employment	Co-supervisor
Zachary Brennan	Math	current		David Herzog
Esther Conrad	Math	2022	Scientist, NASA	K.Y. Rozier
Michael Ross	Math	2022		
Carolyn Reinhart	Math	2021	Vis. Asst. Prof., Swarthmore C	
Beth Bjorkman	Math	2020	Res. Mathematician, AF Research Lab	
Joshua Carlson	Math	2019	Asst. Prof., Drake U in Fall 21	
Derek Young	Math	2019	Asst. Prof., Mt. Holyoke C	
Michael Dairyko	AMath	2018	Director, Ticket Analytics, Milwaukee Bucks	M. Young
Chassidy Bozeman	Math	2018	Asst. Prof., Mt. Holyoke C	
Xavier Martínez-Rivera	AMath	2017	Vis. Asst. Prof., Bates C	
Jephian Chin-Hung Lin	Math	2017	Assoc. Prof., National Sun Yat-Sen U	S. Butler
Kevin Palmowski	AMath	2015	Data Scientist, SRC	
Nicole Kingsley	AMath	2015	Lect., Rochester Institute Technology	
Brian Lois	AMath/EE	2015	Data Scientist, AT&T	N. Vaswani
Nathan Warnberg	Math	2014	Asst. Prof., U Wisconsin-LaCrosse	
Craig Erickson	Math	2014	Vis. Lect., Hamline U	
Steven Osborne	Math	2013	Workiva	S. Butler
Geoff Tims	Math	2013	Nationwide Insurance	
Travis Peters	Math	2012	Asst. Prof., St. Benedict's/St. John's	
Darren Row	Math	2011	Assoc. Prof., St. Mary's U, MN	
Olga Pryporova (Kurth)	Math	2009	was Postdoc, U Connecticut	
Rana Mikkelson	Math	2008	was US Government	
Amy Wangsness (Wehe)	Math	2005	Professor, Fitchburg State U	

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

Name	Degree	Year	Co-Supervisor
Elizabeth Todd	MSM	2018	E. Stines
Michael Ross	Math	2018	
Adam Retzlaff	MSM	2017	E. Stines
AnnaVictoria Ellsworth	Math	2015	
Xavier Martínez-Rivera	Math	2014	
Nicole Kingsley	AMath	2014	
Arianne Ross	Math	2011	
Laura DeLoss (Hogrefe)	Math	2009 (thesis)	
Dan Sarasio Meyer	MSM	2008	
Olga Ruff	Math	2007	
Joyce Eveland	MSM	2006	H. Thompson
Jennifer Parker	MSM	2006	
Becky Atherton	MSM	2005	
Lesley Lamphier	MSM	2004	
Michele Funke	MSM	2002	
Sandra Nordstrom	Math	2002	
George Peters	Math	1995	R. Alexander
Daniel Carberry	Math	1995	
Rachel Lamp	Math	1990	
Joyati Chakraborty	Math	1985	

REU/Undergraduate Research Mentor: more than 40 students supervised

TEACHING

Not currently teaching except Math 699 Ph.D. thesis research

Taught the following courses during last 10 years of classroom teaching:

Math 166 Calculus II

Math 201 Introduction to Proofs

Math 207 Matrices and Linear Algebra

Math 507/407 Applied Linear Algebra

Math 510 Linear Algebra

Math 610 Early Graduate Research (<https://aimath.org/hogben/EGR.html>)

Math 680F Advanced Topics: Linear Algebra

EDUCATIONAL PUBLICATIONS

Textbooks

(E-I) *Elementary Linear Algebra*, West Publishing Co., 1987.

Chapters in Books

(E-a) Canonical Forms, in *Handbook of Linear Algebra*, CRC Press, 2007. Updated in the 2nd edition, CRC Press, 2014.

Articles

(E-1) L. Hogben, M. Hunacek. Review of *Linear algebra done right*, 3rd ed. *American Mathematical Monthly*, 123, 621–624, 2016.

(E-2) L. Hogben, W. Kliemann. Review of *Applied Linear Algebra* by Olver and Shakiban. *American Mathematical Monthly*, 115(4): 373–378, 2008.

Workbooks

(E-A) 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.

(E-B) L. Hogben, K. Heimes. *Applications of Ordinary Differential Equations and Linear Algebra* (notes), 1991.

Computer Programs

(P-1) R.K. Alexander, L. Hogben, R. Tondra *Phase Plane for Ordinary Differential Equations* (computer program), 1986.

(P-2) I.R. Hentzel, L. Hogben, *Matrix Calculator* (computer program), CONDUIT, 1986.

EDUCATIONAL LECTURES

Plenary Lectures

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

OUTREACH PUBLICATIONS

Chapters in Books

- (O-a) Personal reflections: An evolving perspective on women in mathematics. *Association for Women in Mathematics: The First Fifty Years*, Springer, 2021.

Articles

- (O-5) L. Hogben, T.C. Stephens. Joining a mathematical research community. *Notices of the AMS* 66(7): 1101–1107, 2019.
- (O-4) L. Hogben, U. Wilson. AIM’s Research Experiences for Undergraduate Faculty (REUF) program. *Involve* 7:343–353, 2014 (Proceedings of the Trends in Undergraduate Research on the mathematical Sciences Conference 2012).
- (O-3) L. Hogben. ISU REU: diverse, research-intense, team-based. *Involve* 7(3), 335–342 (Proceedings of the Trends in Undergraduate Research on the mathematical Sciences Conference 2012).
- (O-2) L. Hogben. The REU Experience at Iowa State University. *Proceedings of AMS NSA Conference Promoting Undergraduate Research in Mathematics*, American Mathematical Society, 2007.
- (O-1) J. Grout, L. Hogben. Your NSF Mathematical Sciences Institutes. *IMAGE* (Bulletin of ILAS) 39, 17–19, 2007.

ADMINISTRATION

Associate Dean for Graduate Studies and faculty development, College of Liberal Arts and Sciences, 2019–

- Lead LAS efforts to support graduate students and postdoctoral associates.
- Oversee college awards process.
- Participate in college leadership including promotion and tenure/advancement decisions and other decision making.

ISU Mathematics Department Director of Diversity 2009–2018 listed under Diversity, Equity, and Inclusion (the next section).

DIVERSITY EFFORTS

- Associate Director for Diversity, American Institute of Mathematics (AIM), 2007–.
 - Work with the Deputy Director to broaden participation in AIM workshops.
 - Chair the AIM Human Resources Board and convey their input to the IM Scientific Board.
 - Helped create and continue to organize the Research Experiences for Undergraduate Faculty (REUF) workshops <http://reuf.aimath.org/> (see Research Conferences and Workshops Organized).
 - Co-organizer, Spring Opportunities Conference, AIMS, April 15–17, 2019.
 - Co-chair the NSF Mathematical Sciences Institutes Diversity Committee.
- Member, Diversity Advisory Committee, Society for Industrial and Applied Mathematics. 2021–.
- ISU Mathematics Department Director of Diversity 2009–2018.
 - Led a team of departmental faculty working to recruit and retain a diverse group of graduate students and post-doctoral associates.
 - Built faculty collaborations with minority-serving schools.
 - Worked with other leaders of diversity efforts at ISU and nationally to enhance the diversity of the STEM workforce.

- The ISU Mathematics Department won the 2015 AMS Award for an Exemplary Program or Achievement in a Mathematics Department, partly based on diversity success.
- Advisor to ISU student chapter of AWM, 2017-2018.
- Leader of EDGE@ISU mentoring cluster for women graduate students, post-doctoral associates and junior faculty, 2010-2017.
- Co-lead (with Prof. Mahamadi Warma) partnership between Departments of Mathematics at ISU and University of Puerto Rico, Rio Piedras Campus, 2009-2014.