

Resume of

Michael Neumann

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Head, Department of Mathematics
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Revised 7/20/08 **Date of Appointment:** 1985
Birthdate and place of birth : November 23, 1946; Jerusalem, Israel
Status: Married with 2 children
Residency: Permanent Resident

Fields of interest Numerical Linear Algebra, Matrix Theory and Linear Algebra, Numerical Analysis.

Education:

B.Sc. Tel Aviv-University, 1970

Ph.D. London University, 1972. Title of thesis: “*The Numerical Solution to Hammerstein’s Integral Equations.*”

Professional Experience:

7/1/2003 – Department Head, Department of Mathematics, University of Connecticut

1985 – Professor, University of Connecticut

1980–1986 Associate Professor, Professor, University of South Carolina

1/1983–6/1983 Visiting Assoc. Professor, University of California, Riverside

1975–1980 Lecturer, University of Nottingham, UK

1973–1975 Lecturer, Technion-Israel Institute of Technology

1972–1973 Temporary Lecturer, University of Reading, UK

Short-term Experiences:

February 2006: Visiting Scholar, Hamilton Reserach Institute, National University of Ireland, Maynooth, Ireland.

August–December, 2001: Interim Head, Department of Mathematics, University of Connecticut.

July–October, 1990: Visiting Professor at the Sonderforschungsbereich 343 “*Diskrete Strukturen in der Mathematik*”, the University of Bielefeld, Bielefeld, Germany.

July–August, 1987: Visiting Professor, Operations Research Unit, Institute of Econometrics and Operations Research, University of Bonn, Germany.

8/1983 Consulting, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

4/79 Visiting Prof., University of Bielefeld, Germany.

10/78–12/78: Visiting Research Mathematician, Univ. of California, Riverside, California.

10/69–2/71 Statistical Programming, University of London.

Other Professional experience:

Editorial Work:

- (i) Senior Editor, Linear Algebra and its Applications: 2007–2010.
- (ii) Associate Editor, Linear Algebra and Its Applications: 1985 – 2005.
- (iii) Associate Editor, J. Elec. Linear Algebra (ELA), 11/2001 – present.
- (iv) Associate Editor of special issue of the journal of Numerical Algorithms in honor of conference on Linear Algebra and Applications in honor of Richard S Varga’s 75th birthday.
- (v) Editorial Board, Journal of Operators and Matrices, 2006–.

- (vi) Editor for the Special Issue of Linear Algebra and its Applications (Vols.114/115, 1989) dedicated to the “Valencia International Conference on Linear Algebra and its Applications.”
- (vii) Editor for the Special Issue of Linear Algebra and its Applications (Vols. 154–156, 1991) on “Iterations in Linear Algebra and its Applications” dedicated to G. H. Golub, R. S. Varga, and D. M. Young.
- (viii) Editor for the Special Issue of Linear Algebra and its Application (Vol.398, 2005) dedicated to Matrix Theory in Mathematical Biology.

Mentor for the University of Connecticut Mentor Connection to a very bright high school student, but with an Asperger’s Syndrome.

External Ph.D. Examiner for the Indian Statistical Institute, Bombay, India.

Hall Tutor: Wortley Hall, The Univ. of Nottingham, Nottingham, England: Oct. 1976 – August 1980. (Hall Tutor is an undertaking of some social responsibility for a group of students living on campus).

Organizer of:

- i) The University of South Carolina Mini-conference on Linear Algebra and Matrix Theory, 1981.
- ii) “The Valencia International Conference on Linear Algebra and its Applications”, Valencia, Spain, September, 1987, (member of Scientific Organizing Committee).
- iii) The Sixth International Linear Algebra Society Conference, Chemnitz, Germany, 1996.
- iv) Co-organizer of the Special Session on Linear Algebra at the American Mathematical Society Meeting 995, in Athens, Ohio, March 26–27, 2004.
- v) Co-organizer of the Minisymposium on “Nonnegative matrices and Matrices with a Perron–Frobenius property”, at the 14th

International Linear Algebra Conference, Shanghai, People's Republic of China, July 16–20, 2007.

vi) Co-organizer of the “The Intimate Conference in Honor of Hans Schneider 80th Birthday”, UConn, Storrs, October 31 – November, 2008.

Refereeing and reviewing for:

American Institute of Aeronautics and Astronautics J. on Guidance, Control, and Dynamics; American Mathematical Monthly; Assoc. Compt. Mach. Trans. Math. Software (ACM TOMS); Birkhauser Publishing Company, Basel; BIT (Scandinavian J. on Numerical Analysis); Canadian Math. Bull.; Computers & Mathematics with Applications; Cornell National Supercomputing Center Proposal; Discrete Mathematics; Discrete Applied Math.; Ecology; J. Computational & Appl. Mathematics; ELA (Electronic Journal of Linear Algebra); ETNA (Electronic Trans. in Numer. Anal.); IMA J. of Numerical Anal.; Int'l. J. of Math. & Engineering; Linear & Multilinear Algebra; Linear Algebra & its Appl.; N.S.F. and AFOSR Proposals; NSERC; Optimization; Proc. Amer. Math. Soc.; Proc. Royal Soc. Edingburgh; SIAM J. on Appl. Math.; SIAM J. on Alg. & Discrete Methods; SIAM J. on Numer. Anal; SIAM Review; The Mathematical Assn. (of Great Britain); Univ. of Connecticut Science Foundation; Grant Agency of the Academy of Science of the Czech Republic; Science Foundation of Ireland.

Colloquia and Seminar talks:

Univ. of California at Riverside (1978); Univ of Wisconsin at Madison (1978, 1990, 1997); Kent State Univ. (1978); Univ. of Calgary, Canada (1987); N. Carolina State Univ. (1978); Univ. of Tennessee at Knoxville (1978); George Washington Univ. (D.C.); Univ. of Denver (1980); Inst. of Practical Math., Karlsruhe, Germany (1978, 1989); Univ. of Bielefeld, Germany (1978, 1990, 1994, 1995); Univ. of Bradford, England (1980); Univ. of Bath, England (1980); Free Univ. of Brussels, Belgium (1978); Center for Super Computing Research and Development at University of Illinois, Urbana-Champaign (1989); Institute for Mathematics and its Applications, University

of Minnesota, (1991); Technion – Israel Institute of Technology, Israel, (1992); Queen’s University, Kingston, Canada, (1993); University of Regina, Regina, Canada, (1994, 1995, 1999); Temple University, Philadelphia (1994), University of Massachusetts at Dartmouth, (1999, 2004); Hebrew University, Jerusalem, Israel (1999).

Conference lectures:

“SIAM National Conferences on Applied Linear Algebra”, Raleigh, North Carolina, 1983 and 1985; “Dundee Conference on Numerical Analysis”; “Auburn Matrix Theory Meeting”; “Oberwolfach Meeting on Matrix Theory & Numer. Algebra”, Oberwolfach, February 1983; “The Gatlinburg IX Conference on Numerical Linear Algebra”, University Waterloo, Canada, August 1984; The AMS–SIM–SIAM Joint Summer Research Conference on the “Role of Linear Algebra in Systems Theory”, Bowdoin College, Maine, July 1984; “International Conference on Linear Algebra and its Applications”, Coimbra, Portugal, October 1984; “MTNS ’85” (Mathematical Theory of Networks and Systems) Stockholm, Sweden, June 1985; “Haifa Third Matrix Theory Conference”, Haifa, Israel, January 1987; “The Gatlinburg X Conference on Numerical Linear Algebra”, Fairfield, Tennessee, October 1987; “The Valencia International Conference on Linear Algebra and its Applications”, Valencia, Spain, September 1987; “Special Session on Modern Trends in Matrix Theory and its Applications”, AMS Annual Meeting, January, 1988; “Oberwolfach Meeting on Numerical Algebra and Parallel Computations”, Oberwolfach, February 1988; “Workshop on Iterative Solutions to Singular Systems”, Univ. of Karlsruhe, Karlsruhe, Germany, March 1988; “SIAM 3rd Conference on Applied Linear Algebra”, Madison, May 1988; “International Symposium on Computational Applied Math.”, Leuven, Belgium, July 1988; “NATO Advanced Study Institute on Numerical Linear Algebra, Digital Signal Processing and Parallel Algorithms”, Leuven, Belgium, August 1988; “Conference on Iterative Methods for Large Linear Systems” (dedicated to David M. Young), University of Texas, Austin, October 1988; “A Conference on Approximation Theory and Numerical Linear Algebra” (dedicated to R. S. Varga), Kent State University, Kent, Ohio, March 1989; Northern Illinois University Conference on “Linear Algebra, Numerical Linear Algebra and Applications”, DeKalb, Illinois, April 1989; “The Householder Symposium XI

on Numerical Linear Algebra”, Tylösand, Sweden, June 1990; Meeting on “Numerical Linear Algebra”, Oberwolfach, Germany, April 1991; “Haifa Seventh Matrix Theory Conference”, Haifa, Israel, June 1991; Minisymposium on Spectral and Combinatorial Methods in Matrix Theory at the SIAM 4th Conference in Applied Linear Algebra, Minneapolis, September 1991; Special Session on “Numerical Linear Algebra”, 868th Meeting of the AMS, Philadelphia, October, 1991; “IV IMPA Summer Workshop on Iterative Methods for Inverse Problems”, Rio de Janeiro, Brazil, January, 1992; ILAS (International Linear Algebra Society) II International Conference, Lisbon, Portugal, August, 1992. “International Workshop on Generalized Inverses: Computational Techniques and Applications”, New Delhi, India, December 1992; ILAS III International Conference, Pensacola, Florida, March 1993; “Workshop on Nonnegative Matrices, Applications and Generalizations”, Haifa, Israel, June 1993; “Haifa Eighth Matrix Theory Conference”, Haifa, June 1993; Meeting on “Numerical Linear Algebra and Applications”, Oberwolfach, Germany, April 1994; ILAS IV International Conference, Rotterdam, Holland, August 1994; “Least Squares Methods: Theory, Algorithms and Applications”, Linköping University, Sweden, January, 1995; ILAS IV International Conference, Atlanta, Georgia, August 1995; Western Canada Linear Algebra Meeting, Kananaskis, Canada, June, 1996; ILAS VI International Conference, Chemnitz, Germany, August 1996; Oberwolfach Meeting on Numerical Linear Algebra, Oberwolfach, Germany, April, 1997; “Haifa Tenth Matrix Theory Conference”, Haifa, Israel, January, 1988; ILAS VII International Conference, Madison, Wisconsin, June, 1988; Linear Algebra: Theory, Applications, and Computations (a conference in honor of Prof. Robert J. Plemmons), Wake Forest Univ., Winston-Salem, North Carolina, Jan., 1999; Workshop on Applied Linear Algebra in honor of Prof. Ludwig Elsner, Bielefeld, Germany, January, 1999; “International Conference on Algebra and Applications”, Ohio University, Athens, Ohio, March, 1999; “Haifa Eleventh Matrix Theory Conference”, Haifa, Israel, June, 1999; DIMACS Workshop on Diagonal matrix matrix and its generalizations and their applications in mathematical programming and theoretical computer science”, Rutgers Univ., New Jersey, August, 1999; Rocky Mountain Mathematics Consortium Summer Conference on “Probabilistic Combinatorics”, Univ. of Wyoming, Laramie, Wyoming, June, 2000; Oberwolfach Meeting on Nonnegative Matrices, M-matrices, and Applications, Oberwolfach, Germany, November, 2000; ILAS IX International Conference, Haifa,

Israel, June, 2001; Random Matrices Conference, M.I.T, Boston, August 2001; ILAS X International Conference, Auburn, Alabama, June, 2002; “Computational Linear Algebra with Applications” (MILOVY 2002), Milovy, Czech Republic, August, 2002; ”Matrix Analysis and Applied Linear Algebra” – a conference in honor of Carl Meyer’s 60th birthday, NC State Univ., Raleigh, North Carolina, May, 2003; SIAM Conf. on Applied Linear Algebra, The College of William and Mary, Williamsburg, Virginia, July, 2003; “International conference on Matrix Analysis and Applications”, Nova Southeastern University, Fort Lauderdale, Florida, USA, December 14-16, 2003; “The Amer. Math. Soc. Annual Meeting and the Workshop for Heads of Department”, Phoenix, Arizona, Jan, 2004: “Workshop on Nonnegative Matrices and Their Applications”, The Hamilton Institute, Maynooth, Ireland, July, 11–14, 2004; “International Linear Algebra Society (ILAS) XI International Conference”, University of Coimbra, Portugal, July 19–22, 2004; The ILAS Speaker at the 2005 Haifa Matrix Theory Conference, Haifa, Israel, 2005; “The 16th International Workshop on Operator Theory and Applications (IOWTA)”, Storrs, Connecticut, July 24–27, 2005; The “II Workshop on Nonnegative Matrices and Their Applications”, The Hamilton Institute, Maynooth, Ireland, July, 9–12, 2006; The “International Linear Algebra Society (ILAS) XIII International Conference”, Amsterdam, Holland, July 18–21, 2006; “International Linear Algebra Society XIV International Conference”, Shanghai, China, July 16–20, 2007; “Gene Golub Memorial Conference”, Univ. of Massachusetts at Dartmouth, February 29–March 1, 2008; “International Linear Algebra Society XIV International Conference”, Cancun, Mexico, June 16–20, 2008.

Teaching of Undergraduate and Graduate Courses:

I have taught most of the undergraduate curriculum and many courses in the graduate curriculum in both pure and applied mathematics. Courses which have been taught most frequently have been in Numerical Analysis, Partial Differential Equations, The Theory of Nonnegative Matrices and their Applications, Linear Programming, and Methods of Applied Mathematics.

Ph.D. Students: (1) Dr. Valerie Miller. Her thesis title was: “Successive Overrelaxation Methods for Solving Large Scale Rank Deficient Least Square Problems.”, (1985). (2) Dr. Michael J. Tsatsomeros. His thesis title was: “Reachability of Nonnegative and Symbiotic States for

Linear Differential Systems”, (1990). (3) Dr. Mei Gao. Her thesis title was “A Global Minimum Search Algorithm for Estimating the Distance to Uncontrollability” (1993). (4) Dr. Yonghong Chen. Her thesis title was “Sign Pattern of Generalized Inverses of M–Matrices” (1994), (5) Dr. Lixing Han. His thesis title: “Algorithms in Unconstrained Optimization” (2000). (6) Dr. Jason J. Moliterno. His thesis title “Coefficients of Ergodicity–Type Bounds for the Algebraic Connectivity of Graphs. (7) Dr. Jianhong Xu. His thesis title: “Parallel Computations for Markov Chains via Perron Complementation” (2003). (8) Dr. Minerva Catral. Her thesis title: “Group Inverses and Mean First Passage Matrices in Finite Ergodic Markov Chains” (2005).

Computing Skills:

FORTRAN, BASIC, APL, UNIX, VMS, CMS, MATLAB.

Membership and Service in Professional Societies:

Society for Industrial and Applied Mathematics

The Institute of Mathematics and its Applications (Associate Fellow)

International Linear Algebra Society (ILAS). Board of Directors 3/2002–2/2005.

International Linear Algebra Society (ILAS). Chair of Advisory Committee.

Chair, The ILAS 2005 Hans Scheider Prize in Linear Algebra in Linear Algebra Committee

Grants and Awards:

1981–1982 National Science Foundation Grant for research on “Special Matrices”, (co–P.I.)

1983–1984 National Science Foundation. “Mathematical Sciences Research Equipment” Grant. Co–proposer of “Numerical Linear Algebra” project in the proposal.

1983–86 National Science Foundation “Functions and Applications of Nonnegative and Cone Preserving Maps.”

1986 NSF “Mathematical Research Equipment Grant”, (P.I.).

- 7/1987–6/1988 NSF Research Grant “Computational and Applied Processes in Linear Algebra.”
- 11/1987–6/1991 AFOSR Research Grant “Convergence and Performance of Synchronous and Asynchronous Parallel and Conventional Iterative Methods, ”
- 7/1989–12/1992 NSF Research Grant (for graduate student support) “Linear Algebra and its Computations”,(PI)
- 7/1990–12/1992 NSF Research Grant “Analyses of Structublack Computational Problems and Parallel Iterative Algorithms”, (co–P.I.)
- 7/1993–12/1996 NSF Research Grant “Structublack matrices and kernels, iterative algorithms and applications”, (co–P.I.)
- 8/1999–7/2002 NSF Research Grant “Computations and Applications for Stochastic Matrices, Linear Systems, and Graphs, (PI).
- 7/2002–6/2005 NSF Research Grant “Sensitivity and Elasticity in Population Models, in Markov Chains, and in Graphs”, (PI).
- 2/2007–6/2009, NSA Research Grant “Nonnegative Matrix Factorizations, Applications and the Inverse Eigenvalue Problem for Nonnegative Matrices”.

Honors:

- (i) University of Connecticut Provost’s Research Excellence Award for 2004/05.
- (ii) University of Connecticut Board of Trustees Distinguished Professor. (Awarded: January 30, 2007.)
- (iii) Elected Member of the Connecticut Academy of Arts and Sciences. (April 2007.)

Publications:

a) **Published:**

- 1) “Subproper splitting for rectangular matrices,” Lin. Alg. Appl., 14:41–51, 1976.
- 2) (with A. Berman) “Proper splittings of rectangular matrices,” SIAM J. Appl. Math., 31:307–312, 1976.
- 3) (with A. Berman) “Consistency and splittings,” SIAM J. Numer. Anal., 13:877–888, 1976.

- 4) (with S. P. Gudder) "Splittings and iterative methods for approximate solutions to singular operator equations in Hilbert spaces," *J. Math. Anal. Appl.*, 62:272–297, 1978.
- 5) "Some applications of partial orderings to iterative methods for rectangular linear systems," *Lin. Alg. Appl.*, 19:95–116, 1978.
- 6) "3-part splittings for singular and rectangular linear systems," *J. Math. Anal. Appl.*, 64:297–318, 1978.
- 7) (with R. J. Plemmons) "Convergent nonnegative matrices and iterative methods for consistent linear systems," *Numer. Math.*, 31:265–279, 1978.
- 8) (with R. J. Plemmons) "Generalized inverse-positivity and splittings of M-matrices," *Lin. Alg. Appl.*, 23:21–36, 1979.
- 9) "Weak stability for matrices," *Lin. Multilin. Alg.*, 7:257–263, 1979.
- 10) "A note on generalizations of strict diagonal dominance for real matrices," *Lin. Alg. Appl.*, 26:3–14, 1979.
- 11) (with D. W. Masser) "On the square roots of quasi-accretive matrices," *Lin. Alg. Appl.*, 28:135–140, 1979.
- 12) (with C. R. Johnson) "Square roots with positive definite hermitian part," *Lin. Multilin. Alg.*, 8:353–355, 1980.
- 13) (with M. Lewin) "The inverse M-matrix problem for $(0, 1)$ -matrices," *Lin. Alg. Appl.*, 30:41–50, 1980.
- 14) (with R. J. Plemmons) "M-matrix characterizations II: General M-matrices," *Lin. Multilin. Alg.*, 9:211–225, 1980.
- 15) (with R. S. Varga) "On the sharpness of some upper bounds for the spectral radii of S.O.R. iteration matrices," *Numer. Math.*, 35:69–79, 1980.
- 16) "A combined direct-iterative approach for solving large scale singular and rectangular consistent systems of linear equations," *Lin. Alg. Appl.* 34:85–101, 1980. (Also appeablack in: *Large Scale Matrix Problems*, A. Björck, R. J. Plemmons and H. Schneider, editors, Elsevier N. Holland, N.Y. 1980.)
- 17) (with J. de Pillis) "A noncommutative spectral theorem for operator entried companion matrices," *Lin. Multilin. Alg.*, 10:45–51, 1981.
- 18) "On the Schur complement and the LU-factorization of a matrix," *Lin. Multilin. Alg.*, 9:241–254, 1981.

- 19) (with J. de Pillis) "Iterative methods with k -part splittings," IMA J. Numer. Anal., 1:65–79, 1981.
- 20) "The Kahan S.O.R. convergence bound for nonsingular and irreducible M -matrices," Lin. Alg. Appl., 39:205–222, 1981.
- 21) (with L. Elsner and C. R. Johnson) "The effect of the perturbation of a nonnegative matrix on its Perron eigenvector," Czech. Math. J., 32:99–109, 1982.
- 22) (with J. Buoni and R. S. Varga) "Theorems of Stein–Rosenberg type III: The singular case," Lin. Alg. Appl., 42:183–198, 1982.
- 23) (with G. Poole and H. Werner) "More on the generalizations of matrix monotonicity," Lin. Alg. Appl., 48:413–435, 1982.
- 24) (with R. E. Funderlic and R. J. Plemmons) "LU decompositions of generalized diagonally dominant matrices," Numer. Math., 40:57–69, 1982.
- 25) (with M. Fiedler and T. L. Markham) "Classes of products of M -matrices and inverse M -matrices," Lin. Alg. Appl., 52–53:265–287, 1983.
- 26) "On bounds for the convergence of the SSOR method for H -matrices," Lin. Multilin. Alg., 15:13–21, 1984.
- 27) (with S. R. Mohan and K. G. Ramamurthy) "Nonnegativity of principal minors of generalized inverses of M -matrices," Lin. Alg. Appl., 58:247–259, 1984.
- 28) (with E. Deutsch) "Derivatives of the Perron root at an essentially nonnegative matrix and the group inverse of an M -matrix," J. Math. Anal. Appl., 102:1–29, 1984.
- 29) (with R. J. Plemmons) "Backward error analysis for linear systems associated with inverses of H -matrices," BIT, 24:102–112, 1984.
- 30) (with J. de Pillis) "The effect of the perturbation of hermitian matrices on their eigenvectors," SIAM J. Alg. Discrete Methods, 6:201–209, 1985.
- 31) (with R. J. Stern) "Boundary results for positively invariant cones and their reachability cones," Lin. Multilin. Alg., 17:143–154, 1985.
- 32) (with T. L. Markham and R. J. Plemmons) "Convergence of a direct-iterative method for large-scale least squares problems." Lin. Alg. Appl., 69:155–167, 1985.

- 33) (with R. J. Stern) “Cone reachability for linear differential systems,” *Applicable Analysis*, 20:57–71, 1985.
- 34) (with M. Fiedler, C. R. Johnson, and T. L. Markham) “A trace inequality for M–matrices and symmetrizability of a real matrix by a positive diagonal matrix,” *Lin. Alg. Appl.*, 71:81–94, 1985.
- 35) (with E. Deutsch) “On the first and second derivatives of the Perron vector,” *Lin. Alg. Appl.*, 71:57–76, 1985.
- 36) (with V. Miller) “A note on comparison theorems for nonnegative iteration matrices,” *Numer. Math.*, 47:427–434, 1985.
- 37) (with A. Berman and R. J. Stern) “Cone reachability for nondiagonal linear differential systems,” *Lin. Alg. Appl.*, 81:263–280, 1986.
- 38) “Neighborhoods of dominant convergence for the SSOR method,” *SIAM J. Alg. Discrete Methods*, 7:551–559, 1987.
- 39) (with V. Miller) “Successive overrelaxation methods for solving the rank deficient linear least squares problem,” *Lin. Alg. Appl.*, 88–89:533–557, 1987.
- 40) (with R. J. Plemmons) “Convergence of parallel multisplitting iterative methods for M–matrices,” *Lin. Alg. Appl.*, 88–89:559–573, 1987.
- 41) (with E. Deutsch) “On the derivative of the Perron vector whose infinity norm is fixed,” *Lin. Multilin. Alg.*, 21:75–85, 1987.
- 42) (with S. Nelson) “Generalizations of the projection method with applications to SOR theory for hermitian positive semidefinite systems,” *Numer. Math.*, 51:123–141, 1987.
- 43) (with R. Bru and L. Elsner) “Models of parallel chaotic iteration methods,” *Lin. Alg. Appl.*, 103:175–192, 1988.
- 44) (with R. Bru) “Nonnegative Jordan Basis,” *Lin. Multilin. Alg.*, 23:95–109, 1988.
- 45) (with A. Hadjidimos) “A note on the SSOR convergence domain due to Neumaier and Varga,” *Lin. Alg. Appl.*, 107: pp.207–217, 1988.
- 46) (with G. Avdelas, J. de Pillis, and A. Hadjidimos) “A guide to the acceleration of iterative methods whose iteration matrix is nonnegative and convergent,” *SIAM J. Matrix Analysis Appl.*, 9:329–342, 1988.

- 47) (with P. J. Kavanagh) “Consistency and convergence of the parallel multisplitting method for singular M -matrices,” *SIAM J. Matrix Analysis Appl.*, 10:210–218, 1989.
- 48) (with R. J. Stern) “Discrete approximations to reachability cones of linear differential equations,” *Lin. Alg. Appl.*, 120:65–79, 1989.
- 49) (with A. Hadjidimos) “Precise domains of convergence for the block SSOR method associated with p -cyclic matrices,” *BIT*, 29:311–320, 1989.
- 50) (with M. Hanke) “Preconditioning and splittings for rectangular systems”, *Numer. Math.*, 57:85–95, 1990.
- 51) (with L. Elsner and I. Koltracht) “On the convergence of asynchronous paracontractions with application to tomographic reconstruction from incomplete data,” *Lin. Alg. Appl.*, 130:65–82, 1990.
- 52) (with R. E. Hartwig and N. J. Rose) “An algebraic–analytic approach to nonnegative basis,” *Lin. Alg. Appl.*, 133:77–88, 1990.
- 53) (with A. Hadjidimos) “Convergence domains of the SSOR method for generalized consistently orderblack matrices”, *J. Comp. Appl. Math.*, 33:35–52, 1990.
- 54) (with R. J. Stern and M. Tsatsomeros) “The reachability cones of essentially nonnegative matrices”, *Lin. Multilin. Alg.*, 28:213–224, 1991.
- 55) (with I. Koltracht) “On the inverse M -matrix problem for real symmetric positive definite Toeplitz matrices”, *SIAM J. Matrix Anal. Appl.*, 12:310–320, 1991.
- 56) (with H. J. Werner) “Nonnegative group inverses”, *Lin. Alg. Appl.*, 151:85–96, 1991.
- 57) (with E. Elsner and B. Vemmer) “The effect of the number of processors on the convergence of the parallel block Jacobi method”, *Lin. Alg. Appl.*, 154–156:311–330, 1991.
- 58) (with M. Hanke and W. Niethammer) “On the SOR method for symmetric positive definite systems”, *Lin. Alg. Appl.*, 154–156:457–472, 1991.
- 59) (with M. Tsatsomeros) “Symbiosis points for linear differential systems”, *Lin. Multilin. Alg.*, 30:49–59, 1991.

- 60) (with H. Schneider) “Principal components of minus M -matrices”, *Lin. Multilin. Alg.*, 32:131–148, 1992.
- 61) (with L. Elsner and I. Koltracht) “Convergence of sequential and asynchronous nonlinear paracontractions”, *Numer. Math.*, 62:305–319, 1992.
- 62) (with L. Elsner) “Monotonic sequences and rates of convergence of asynchronized iterative methods”, *Lin. Alg. Appl.*, 180:17–33, 1993.
- 63) (with R. E. Hartwig) “Bounds on the exponent of primitivity which depend on the spectrum and the minimal polynomial”, *Lin. Alg. Appl.*, 184:103–122, 1993.
- 64) (with L. Elsner, I. Koltracht, and D. Xiao) “On accurate computations of the root”, *SIAM J. Matrix Anal. Appl.*, 14:457–467, 1993.
- 65) (with A. Hadjidimos) “On domains of superior convergence of the SSOR method over the SOR method”, *Lin. Alg. Appl.*, 187:67–85, 1993.
- 66) (with M. Gao) “A global minimum search algorithm for estimating the distance to uncontrollability”, *Lin. Alg. Appl.*, 189:305–350, 1993.
- 67) (with M. Hanke) “The geometry of the set of scaled projections”, *Lin. Alg. Appl.*, 190: 137–148, 1993.
- 68) (with I. Koltracht and D. Xiao) “On a question of Boyle and Handelman concerning eigenvalues of nonnegative matrices”, *Lin. Multilin. Alg.*, 36:125–140, 1993.
- 69) (with J. J. McDonald and H. Schneider) “Resolvents of minus M -matrices and splittings of M -matrices”, *Lin. Alg. Appl.*, 195: 17–33, 1993.
- 70) (with H. Schneider) “Algorithms for computing bases for the Perron eigenspace with prescribed nonnegativity and combinatorial properties”, *SIAM J. Matrix Anal. Appl.*, 15:578–591, 1994.
- 71) (with S. J. Kirkland) “Convexity and concavity of the Perron root and vector of Leslie matrices with applications to a population model”, *SIAM J. Matrix Anal. Appl.*, 15:1092–1107, 1994.
- 72) (with R. Bru and L. Elsner) “Convergence of infinite products of matrices and inner–outer iterations schemes”, *ETNA (Electronic Trans. in Numer. Anal.)*, 2:183–193, 1994.

- 73) (with R. Bru and J. J. Climent) “On the index of block upper triangular matrices”, *SIAM J. Matrix Anal.*, 16:436–447, 1995
- 74) (with S. J. Kirkland) “Group inverses of M -matrices associated with nonnegative matrices having few eigenvalues”, *Lin. Alg. Appl.*, 220:181–213, 1995.
- 75) (with J. J. McDonald, H. Schneider, and M. J. Tsatsomeros) “Inverse M -matrix inequalities and generalized ultrametric matrices”, *Lin. Alg. Appl.*, 220:321–341, 1995.
- 76) (with Y. Chen and S. J. Kirkland) “Group generalized inverses of M -matrices associated with periodic and nonperiodic Jacobi matrices”, *Lin. Multilin. Alg.*, 39:325–340, 1995.
- 77) (with A. Hadjidimos) “Superior convergence domains for the p -cyclic SSOR majorizer”, *J. Comp. Math. Appl.*, 62 :27-40, 1995.
- 78) (with Y. Chen and S. J. Kirkland) “Nonnegative alternating circulants leading to M -matrix group inverses”, *Lin. Alg. Appl.*, 233:81–97, 1996.
- 79) (with C. R. Johnson and M. J. Tsatsomeros) “Conditions for the positivity of determinants”, *Lin. Multilin. Alg.*, 40:241–248, 1996.
- 80) (with S. J. Kirkland and B. L. Shader), “Characteristic vertices of weighted trees via Perron values”, *Lin. Multilin. Alg.*, 40:311–325, 1996.
- 81) (with D. Hershkowitz, W. Huang, and H. Schneider), “Minimization of norms and the spectral radius of a sum of nonnegative matrices under diagonal equivalence), *Lin. Alg. Appl.*, 241–243:431–453, 1996.
- 82) (with J. J. McDonald, H. Schneider, and M. Tsatsomeros) “Inverses of unipathic M -matrices”, *SIAM J. Matrix Anal. Appl.*, 17:1025–1036, 1966.
- 83) (with Y. Chen) “ M -matrix generalized inverses of M -matrices”, *Lin. Alg. Appl.*, 256:263–285, 1997.
- 84) (with R. A. Gonzales, J. Eisert, I. Koltracht, and G. Rawitscher) “Integral equations methods for the continuous spectrum radial Schrödinger equation”, *J. Comp. Phys.*, 134:134-149, 1997.
- 85) (with S. J. Kirkland and B. L. Shader) “Distances in weighted trees and group inverses of Laplacian matrices”, *SIAM J. Matrix Anal.*, 18:827–841, 1997.

- 86) (with S. J. Kirkland) “Algebraic connectivity of weighted trees under perturbation”, *Lin. Multilin. Alg.*, 42:187-203, 1997.
- 87) (with J. Climent and A. Sidi) “A semi-iterative method for real spectrum singular linear systems with an arbitrary index”, *J. Comp. Applied Math.*, 87:21–38, 1997.
- 88) (with S. J. Kirkland and B. L. Shader) “Applications of Paz’s inequality to perturbation bounds for Markov chains”, *Lin. Alg. Appl.*, 268:183–196, 1998.
- 89) (with L. Elsner and R. Nabben) “Orthogonal bases which lead to symmetric nonnegative bases”, *Lin. Alg. Appl.*, 271:323–343, 1998.
- 90) (with A. Hadjidimos) “On the minimization of the ℓ_2 -norms of the SOR and MSOR operators”, *SIAM J. Matrix Anal.*, 19:191–204, 1998.
- 91) (with S. J. Kirkland) “The M-matrix group generalized inverse problem for weighted trees”, *SIAM J. Matrix Analysis.*, 19: 226–234, 1998.
- 92) (with M. T. Chien) “Positive definiteness of tridiagonal matrices via the numerical range”, *ELA (Electronic Journal of Linear Algebra)*, 3:93–102, 1998.
- 93) (with S. J. Kirkland and B. L. Shader) “Bounds on the subdominant eigenvalue involving group inverses with applications to graphs”, *Czech. Math. J.*, 48:1–20, 1998.
- 94) (with S. J. Kirkland and B. L. Shader), “On a bound on algebraic connectivity: The case of equality”, *Czech. Math. J.*, 48:65–76, 1998.
- 95) (with L. Elsner, L. Han, and M. Zippin) “On a polygon equality problem”, *J. Math. Anal. Appl.*, 224:67–75, 1998.
- 96) “A conjecture concerning the Hadamard product of inverses of M-matrices”, *Lin. Alg. Appl.*, 285:277–290, 1998.
- 97) (with J. J. McDonald, R. Nabben, H. Schneider, and M. J. Tsatsomeros) “Inverse tridiagonal Z-matrices”, *Lin. Multilin. Alg.*, 45:75–97, 1988.
- 98) (with H. Schneider) “Partial norms and the convergence of general products of matrices”, *Lin. Alg. Appl.*, 287:307–314, 1999.

- 99) (with S. J. Kirkland) “Cutpoint decoupling and first passage times for random walks on graphs”, *SIAM J. Matrix Anal.*, 20:860–870, 1999.
- 100) (with D. Hershkowitz and H. Schneider) “Hermitian positive semidefinite matrices whose entries are 0 or 1 in modulus”, *Lin. Multilin. Alg.*, 46:259–264, 1999.
- 101) (with S. J. Kirkland) “On group inverses of M–matrices with uniform diagonal entries”, *Lin. Alg. Appl.*, 296:153–170, 1999.
- 102) (with L. Han and M. J. Tsatsomeros) “Spectral radii of fixed Frobenius norm perturbations of nonnegative matrices”, *SIAM J. Matrix Anal. Appl.*, 21:79–92, 1999.
- 103) (with J. L. Moliterno and B. Shader) “Tight bounds on the algebraic connectivity of a balanced binary tree”, *ELA (Electronic Linear Algebra journal)*, 6:62–71, 2000.
- 104) “Inverses of Perron complements of inverse M–matrices”, *Lin. Alg. Appl.*, 313:163–171, 2000.
- 105) (with S. J. Kirkland) “Regular Markov chains for which the transition matrix has large exponent”, *Lin. Alg. Appl.*, 316:45–65, 2000.
- 106) (with G. Goldberg, P. Okunev, and H. Schneider) “Distribution of subdominant eigenvalues of random matrices”, *Methodology and Computing in Applied Probability*, 2:137–151, 2000.
- 107) (with J. J. McDonald) “The Soules approach to the inverse eigenvalue problem for nonnegative symmetric matrices of order $n \leq 5$ ”, *Amer. Math Soc. Contemporary Math. Series*, 259:387–407, 2000.
- 108) (with S. J. Kirkland) “Extremal first passage times for trees”, *Lin. Multilin. Alg.*, 48:21–33, 2000.
- 109) (with J. J. Moliterno) “The algebraic connectivity of two trees connected by an edge of infinite weight”, *ELA (Electronic Lin. Alg. J.)*, 8:1-13, 2001.
- 110) (with S. Fallat) “On Perron complements of totally nonnegative matrices”, *Lin. Alg. Appl.*, 327:85–94, 2001.
- 111) (with S. J. Kirkland and J. Xu) “A divide and conquer approach to computing the mean first passage matrix for markov chains via Perron complement blackuctions”, *J. Numer. Lin. Alg. Appl.*, 8:287–295, 2001.

- 112)** (with S. J. Kirkland and J. L. Molitierno) “The sharpness of a lower bound on the algebraic connectivity for maximal graphs”, *Lin. Multilin. Alg.*, 48:237–246, 2001.
- 113)** (with S. J. Kirkland, J. J. Molitierno, and B. L. Shader) “On graphs with equal algebraic and vertex connectivity”, *Lin. Alg. Appl.*, 341:45–56, 2002.
- 114)** (with A. Goldberger) “The Hadamard product of circulant matrices on three symbols which are inverses of M-matrices”, *Lin. Multilin. Alg.*, 50:143–149, 2002.
- 115)** (with A. Goldberger) “On a strong form of a conjecture of Boyle and Handelman”, *ELA (Elec. J. of Lin. Alg.)*, 9:138–149, 2002.
- 116)** (with S. J. Kirkland, N. Ormes, and J. Xu) “On the elasticity of the Perron root of a nonnegative matrix”, *SIAM J. Matrix Anal.*, 24:454–464, 2002.
- 117)** (with G. Goldberg) ”Distribution of subdominant eigenvalues of matrices with random rows”, *SIAM J. Matrix Anal.*, 24:747–761, 2003.
- 118)** (with L. Han and J. Xu) “On the roots of certain polynomials arising from the analysis of the Nelder–Mead simplex method”, *Lin. Alg. Appl.*, 363:109–124, 2003.
- 119)** (with J. L. Molitierno) “”On trees with perfect matchings”, *Lin. Alg. Appl.*, 362:75–85, 2003.
- 120)** (with N. Ormes) “Bounds for graph expansions via elasticity”, to *ELA (Electronic J. Lin. Alg.)*, 10:163–178, 2003.
- 121)** (with A. Goldberger) “Multilinear functional inequalities involving permanents, determinants”, *Lin. Alg. Appl.*, 369:295–310, 2003.
- 122)** (with S. J. Kirkland) “On algebraic connectivity as a function of an edge weight”, *Lin. Multilin. Alg.*, 52:17–33, 2004.
- 123)** (with J. Molitierno) “On operations in which graphs are appended to trees”, *Lin. Multilin. Alg.*, 52:145–156, 2004.
- 124)** (with J. Xu) ”On the stability of the computation of the stationary distribution probabilities of Markov chains” using Perron complements”, *J. Numer. Lin. Alg. Appl.*, 10:603–618, 2003.
- 125)** (with R. Bapat) “Inequalities for permanents involving Perron complements”, *Lin. Alg. Appl.*, 385:95–104, 2004.

- 126)** (with J. Xu) “Improved bounds for a condition number for Markov chains”, *Lin. Alg. Appl.*, 386:225–241 2004.
- 127)** (with A. Goldberger) “An improvement of an inequality of Fiedler leading to a new conjecture on nonnegative matrices”, *Czech. Math. J.*, 54:773–780, 2004.
- 128)** (with S. J. Kirkland and J. Xu) “Convexity and elasticity of the growth rate in stage-based population models”, *SIAM J. Matrix Anal.*, 26:170–185, 2004.
- 129)** (with M. Catral, L. Han, and R. J. Plemmons) “On blackcued rank nonnegative matrix factorization for symmetric nonnegative matrices”, *Lin. Alg. Appl.*, 393:107–126, 2004.
- 130)** (with A. Goldberger) “Perron–Frobenius theory: a topological approach”, *Lin. Alg. Appl.*, 399:245–284, 2005.
- 131)** (with J. Xu) “A parallel algorithm for computing the group inverse via Perron complementation”, *J. Elec. Lin. Alg.*, 13:131–145, 2005.
- 132)** (with R. Bapat and S. J. Kirkland) “On distance matrices and Laplacians”, by R. Bapat, S. J. Kirkland, *Lin. Alg. Appl.*, 401:193–209, 2005.
- 133)** (with M. Catral and J. Xu) “Proximity in group inverses of M -matrices and inverses of diagonally dominant M -matrices”, *Lin. Alg. Appl.*, 409:32–50, 2005.
- 134)** (with M. Catral and J. Xu) “Matrix analysis of a Markov chain small-world model”, *Lin. Alg. Appl.*, 409:126–146, 2005.
- 135)** (with R. Bapat and M. Catral) “On functions that preserve M -matrices and inverse M -matrices”, *Lin. Multilin. Alg.*, 53:193–201, 2005.
- 136)** (with L. Han) “Effect of Dimensionality on the Nelder–Mead Simplex Method”, *Optimization Methods and Software*, 21:1–16, 2006.
- 137)** (with S. Fallat, S. J. Kirkland, and J. J. Molitierno) “On graphs whose Laplacian matrices have distinct integer eigenvalues”, *J. of Graph Theory*, 50:162–174, 2005.
- 138)** (with M. Chen and L. Han) “On single and double Soules matrices”, *Lin. Alg. Appl.*, 416 88–110, 2006.

- 139) (with J. Xu) “On Newton and Newton-like inequalities for M-matrices and for Drazin inverses of M-Matrices”, ELA (journal of Elec. Lin. Alg.)15:314–328, 2006.
- 140) (with M. Chen and N. Shaked-Monderer) “Double Soules pairs and matching Soules bases”, Lin. Alg. Appl., 421:315–327; 2007.
- 141) (with S. J. Kirkland and J. Xu) “Transition matrices for well-conditioned Markov chains”, Lin. Alg. Appl., 424:118–131, 2007.
- 142) (with S. Barik and S. Pati) “On nonsingular trees and a reciprocal eigenvalue property”, Lin. Multi. Alg., 54:453–465, 2006.
- 143) (with N. Sze) “Optimization of the spectral radius of nonnegative matrices”, journal of Operators and Matrices, 1:593–601, 2007.
- 144) (with N. Sze) “A note on the perturbation of positive matrices by normal and unitary matrices”, Lin. Alg. Appl., 428:224–229, 2008.

b) Accepted for publication:

- 145) (with M. Chen and N. Shaked-Monderer) “Basic Soules matrices and their applications”, Lin. Alg. Appl., to appear.
- 146) (with J. Axtell, L. Han, D. Hershkowitz, and Nung-Sing Sze) “Optimization of the spectral radius of a product for nonnegative matrices”, Lin. Alg. Appl., to appear.
- 147) (with S. Pati) “The Laplacian spectrum of graphs with a tree structure”, Lin. Multi. Alg., to appear.
- 148) (with N. Sze) “On optimal condition numbers for Markov chains”, Numer. Math., to appear.
- 149) (with J. Han, L. Han, and U. Prasad) “On the convergence of the Image Space Reconstruction Algorithm”, Operators and Matrices, to appear.
- 150) (with A. Goldberger) “An upper bound on the characteristic polynomial of a nonnegative matrix leading to a proof of the Boyle-Handleman conjecture”, Proc. AMS, to appear.

c) Submitted for publication:

- 151) (with S. J. Kirkland) “The case of equality in the Dobrushin–Deutsch–Zenger bound”, submitted to *Lin. Alg. Appl.*

Books:

(with A. Berman and R. J. Stern) “Nonnegative Matrices in Dynamic Systems”, Series in Pure and Applied Mathematics, Wiley Interscience, New York, 1989.

Additional Material

- 1) (with A. Berman) “Monotone submatrices,” a problem in *SIAM Rev.*, 18(1976), p.490.
- 2) (with M. Newborn and A. Ziv) “An analysis of the Alpha–Beta algorithm for trees of depth two,” Technical report No. 58, Computer Science Department, Technion, Haifa, Israel, 1976.
- 3) “The University of South Carolina mini–conference on linear algebra and matrix theory,” *Letters in Linear Algebra, Lin. Alg. Appl.*, 43(1982), pp.273–284.
- 4) (with L. Han) “Combining quasi–newton and Cauchy directions”, *International J. Appl. Math.*, 12(2):167–191, 2003.
- 5) (with L. Han) “Inner Product Spaces, Orthogonal Projection, Least Squares and Singular Value Decomposition”, a chapter in the Chapman & Hall/CRC Press Handbook of Linear Algebra, pp: 5–1 to 5–16, New York, 2006.