

# VITA

## Warren E. Shreve

### ADDRESS

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3401 Evergreen Road N  
Fargo, North Dakota 58102

### EDUCATION

1963–1967	Ph.D., Mathematics University of Nebraska
1962–1963	M.A., Mathematics Bowling Green State University
1956–1960	B.A., Mathematics University of Northern Iowa

### POSITIONS

2000–	Professor North Dakota State University
2001–2007	Chair North Dakota State University
1973–2000	Associate Professor North Dakota State University
1989	Visiting Professor Memphis State University
1983–84	Acting Chair North Dakota State University
1980–83	Associate Chair North Dakota State University
1970–73	Assistant Professor North Dakota State University

1967–70	Assistant Professor University of Connecticut
1963–67	Instructor University of Nebraska
1961–62	Teacher West Branch Community High School West Branch, Iowa
1960–61	Teacher Clarke County Community High School Osceola, Iowa

## INVITED PUBLICATION

### In Print

**1980**

- [1]. *Oscillation in first order matrix differential equations with lag*, **Differential and Integral Equations, Proceedings of the Seventh Midwest Conference, November 3-4, 1978**, University of Missouri-Rolla, 1980.

## REFEREED PUBLICATIONS

### In Print

**1963**

- [2]. *Teaching inductive proofs indirectly*, **The Mathematics Teacher**, Tips for Beginners 61(1963), 643-644.

**1969**

- [3]. *Boundary value problems for  $y'' = f(t, y, \lambda)$* , **SIAM Journal on Appl. Math.**, 17(1969), 84-97.

**1970**

- [4]. *Terminal value problems for second order nonlinear differential equations*, **SIAM Journal on Appl. Math.**, 18(1970) 783-791.

**1971**

- [5]. *Asymptotic behavior in a second order linear matrix differential equation*, **Journal of Differential Equations**, 9(1971), 13-24.

**1973**

- [6]. *A converse problem in matrix differential equations*, **Canad. Math. Bulletin**, 16(1973), 501-404.
- [7]. *Oscillation in first order nonlinear retarded argument differential equations*, **Proc. Amer. Math. Soc.**, 41(1973), 565-568.

**1981**

- [8]. *Boundary value problems for second order nonlinear matrix differential equations*, **Proc. Amer. Math. Soc.**, 83(1981), 63-68.

**1985**

- [9]. *Implementation techniques for the vehicle routing problem*, **Comput. & Ops. Res.**, 12(1985), 273-283, with J. Griffin, M. Nelson, and K. Nygard.

**1987**

- [10]. *An eigenvalue algorithm for symmetric bordered diagonal matrices*, **Current Trends in Matrix Theory**, Proceedings of the Third Auburn Matrix Theory Conference, March 19-22, 1986, Auburn University, Auburn, Alabama, USA, 339-346. Editors F. Uhlig, R. Grone, North Holland, 1987, with M. Stabnow.

**1990**

- [11]. *A quadratic form characterization of complete  $n$ -partite graphs*, **Linear and Multilinear Algebra**, 28(1990), 71-73.
- [12]. *The domination number of the products of graphs*, **Congressus Numerantium**, 79 (1990), 29-33, with R. Faudree, and R. Schelp.

**1992**

- [13]. *On  $k$ -girth graphs*, **Congressus Numerantium**, 89 (1992), 193-207, with G. Chen, and R. Schelp.

**1993**

- [14]. *On cycles of length  $2 \pmod k$* , **Congressus Numerantium**, 93 (1993), 177-182, with G. Chen, and N. Dean.

**1994**

- [15]. *The generalized degree of a graph*, **Congressus Numerantium**, 99 (1994), 43-48, with R. Faudree, T. Lindquester, and R. Schelp.

**1995**

- [16]. *Degree sequences with single repetitions*, **Congressus Numerantium**, 106 (1995), 27-32 with G. Chen, and W. Piotrowski.

**1996**

- [17]. *A partition approach to Vizing's conjecture*, **Journal of Graph Theory**, 21 (1) (1996), 103-111, with G. Chen, and Wiktor Piotrowski.

- [18]. *On the construction of maximally tough  $\frac{k}{2}$ -tough  $k$ -trees*, **Congressus Numerantium**, 120 (1996), 201-210, with W. Wang, and B. Wei.

### 1997

- [19]. *A new game chromatic number*, **European Journal of Combinatorics**, 18 (1997), 1-9, with G. Chen and R. Schelp.
- [20]. *Can one load the dice so that the sum is uniformly distributed?*, **Mathematics Magazine**, 70 (3) (1997), 204-206, with G. Chen and M. Rao.
- [21]. *A Special  $k$ -coloring for a connected  $k$ -chromatic graph*, **Discrete Mathematics**, 170 (1997), 231-236, with G. Chen, and R. Schelp.

### 1998

- [22]. *Note on Whitney's theorem for  $k$ -connected graphs*, **Ars Combinatoria**, 49 (1998), 33-40, with G. Chen, and R. Faudree.
- [23]. *Note on graphs without repeated cycle lengths*, **Journal of Graph Theory**, 29 (1) (1998), 11-15, with G. Chen, M. Jacobson, and J. Lehel.
- [24]. *On the number of graphical partitions with a single repetition*, **Proceedings of the Eighth Quadrennial International Conference on Graph Theory, Combinatorics, Algorithms and Applications, II** (1998) 779-785, with W. Wang, and B. Wei.
- [25]. *Ramsey numbers for irregular graphs*, **Congressus Numerantium**, 135 (1998) 139-145, with G. Chen, and P. Erdős.
- [26]. *(1 mod 3) cycles*, **Congressus Numerantium**, 135 (1998) 179-185, with X. Cai.

### 2001

- [27]. *Weak clique-covering cycles and paths*, **Ars Combinatoria**, 58 (2001) 67-83 with G. Chen, and R. Faudree.
- [28]. *Degree sequences with repeated values*, **Ars Combinatoria**, 59 (2001) 33-44 with G. Chen, J. Hutchinson, W. Piotrowski, and B. Wei.
- [29]. *(2 mod 4) cycles*, **Ars Combinatoria**, 60 (2001) 97-129 with X. Cai.
- [30]. *Pancyclicity Mod  $k$  of claw-free graphs and  $K_{1,4}$ -free graphs*, **Discrete Mathematics**, 230 (2001) 113-118 with X. Cai.

### 2006

- [31]. *Hamiltonian Graphs Involving Neighborhood Unions* **Journal of Graph Theory**, 53 (2006) no. 2, 88-100, with G. Chen, Nhi Vuong, and B. Wei.

### Ongoing Projects

- [32]. *Upper domination Ramsey numbers*. Some questions, including monotonicity, have arisen concerning these numbers.
- [33]. *Repetition sequence algorithms*. Improvement of a result in [28] above as well as the study of the number of degree sequences having a given repetition sequence is being studied.

- [34]. *Equality in Vizing's conjecture.* Vizing's conjecture (problem) concerns an inequality between the domination number of the product of two graphs and each of the two domination numbers. An approach to this problem of considering the case where equality occurs is under consideration.
- [35]. *The Grone-Merris conjecture.* An inequality concerning the degree sequence of a graph and the eigenvalues of its Laplacian matrix is under consideration.
- [36]. *The square of an adjacency matrix.* The the  $i^j$  element of the square  $S$  of an adjacency matrix of a graph is the number of walks from vertex  $i$  to vertex  $j$ . The problem under consideration is to determine properties of  $S$  and to determine which matrices can be the square of an adjacency matrix.

### INVITED PRESENTATIONS:

- 1978      Lecture: *Oscillation in first order matrix differential equations with lag*, Midwest Conference on Differential and Integral Equations, University of Missouri-Rolla, 3-4 November.
- 1981      Series of 5 lectures: *Dynamic programming*, Mathematical Association of America, North Central Section, Summer Seminar in Operations Research, Winona State University, Winona, Minnesota, 22-26 June.
- 1989      Lecture: *A review of Vizing's conjecture*, Memphis State University, Memphis, Tennessee, 31 October.
- 1993      Paper: *Generalized degree*, Cumberland Combinatorics Conference VI, Rhodes College, Memphis, Tennessee, 17-19 May.
- 1996      Paper: *On the number of graphical partitions with a single repetition*, Seventh Quadrennial International Conference on the Theory and Applications of Graphs, Kalamazoo, Michigan, June 2-6.
- 1998      Paper: *Degree sequences with repeated values*, Cumberland Combinatorics Conference XI, Johnson City, Tennessee, May 14-16.
- 2000      Paper: *to be selected*, Eighth Quadrennial International Conference on the Theory and Applications of Graphs, Kalamazoo, Michigan, June

### CONTRIBUTED PRESENTATIONS:

- 1970      *Asymptotic behavior in a second order linear matrix differential equation*, Annual Meeting of American Mathematical Society, San Antonio, Texas, January.
- 1971      *Linear matrix differential equations*, Annual Meeting of American Mathematical Society, Atlantic City, New Jersey, January.
- 1976      *A boundary value problem for second order nonlinear matrix differential equations*, Annual Meeting of American Mathematical Society, San Antonio, Texas, 22-25 January.

- 1979 *A converse problem in matrix differential equations*, Spring Meeting, North Central Section, Mathematical Association of America, Winona State University, Winona, Minnesota, 27-28 April.
- 1986 *An eigenvalue algorithm for symmetric bordered diagonal matrices*, Third Auburn Conference on Matrix Theory, Auburn, Alabama, 19-22 March.
- 1988 *Domination in graphs*, Spring Meeting, North Central Section, Mathematical Association of America, College of St. Thomas, St. Paul, Minnesota, April.  
*A combinatorial result in graph theory*, Fall Meeting, North Central Section, Mathematical Association of America, Moorhead State University, October.
- 1989 *A quadratic form characterization of complete  $n$ -partite graphs*, Spring Meeting, North Central Section, Mathematical Association of America, Mankato State University, Mankato Minnesota, April.
- 1992 *On  $k$ -girth graphs*, Southeastern Conference on Combinatorics, Graph Theory and Computing XXIII, Boca Raton, Florida, February 3-7.  
*A partition approach to Vizing's conjecture*, Sixth Quadrennial International Conference on the Theory and Applications of Graphs, Kalamazoo, Michigan, June 1-5.
- 1993 *On cycles of length  $2 \bmod k$* , Southeastern Conference on Combinatorics, Graph Theory and Computing XXIV, Boca Raton, Florida, February 22-26.
- 1994 *Ramsey numbers for irregular graphs*, Southeastern Conference on Combinatorics, Graph Theory and Computing XXV, Boca Raton, Florida, March 7-11.
- 1995 *( $2 \bmod 4$ ) cycles*, Southeastern Conference on Combinatorics, Graph Theory and Computing XXVI, Boca Raton, Florida, March 6-10.
- 1996 *On the construction of maximally 2-tough 4-trees and maximally  $\frac{k}{2}$ -tough  $k$ -trees*, Southeastern Conference on Combinatorics, Graph Theory and Computing XXVII, Baton Rouge, Louisiana, February 19-23.
- 1999 *Clique-dominating cycles*, Southeastern Conference on Combinatorics, Graph Theory and Computing XXIX, Boca Raton, Florida, March 8-12.

### **GRADUATE RECRUITING PRESENTATIONS, undergraduate level:**

- 1987-88 Dickinson State University, Dickinson ND  
 Gustavus Adolphus College, St. Peter MN  
 Macalester College, St. Paul MN  
 South Dakota State University, Brookings SD  
 University of Minnesota, Duluth MN  
 University of Wisconsin, La Crosse WI

- 1988–89 Carleton College, Northfield MN  
Michigan Technological University, Houghton, MI  
University of Northern Iowa, Cedar Falls IA
- 1990–91 Augustana College, Sioux Falls SD  
Luther College, Decorah IA
- 1997–98 Winona State University, Winona MN
- 1998–99 University of Wisconsin, Superior WI

#### **GRADUATE RECRUITING PRESENTATIONS, graduate level:**

- 1987–88 University of Minnesota, Duluth MN
- 1997–98 University of South Dakota, Vermillion SD

#### **EDUCATIONAL GRANTS RECEIVED:**

- 1962 NSF Summer Institute, Bowling Green State University
- 1962–63 NSF Academic Year Institute, Bowling Green State University
- 1967 NSF Differential Equations Symposium, University of Colorado

#### **GRANT FUNDED:**

- 1983 Principal Investigator, North Dakota Department of Public Instruction, \$18,950, *Teacher Retraining Program*, a summer program of intensive courses for teachers.
- 2006 Principal Investigator, National Science Foundation, North Dakota EPSCoR, \$17,000, *New Faculty Startup Funding*.

#### **GRANTS WRITTEN:**

- 1981 Principal Investigator, National Science Foundation, \$51,875, equipment grant for VAX 11-750 Computer.
- Principal Investigator, National Science Foundation, \$22,248, *Boundary and multipoint problems in matrix differential equations*.
- Senior associate with David Smith and Robert Gammill, National Science Foundation Undergraduate Research Participation (URP), \$17,265, Kendall E. Nygard, Principal Investigator.

- 1982 Additional Principal Investigator with Mark Gordon and John Griffin, National Science Foundation, \$37,600, *Acquisition of computer systems for research in mathematics and chemistry*, Principal Investigator, Kendall E. Nygard.
- 1983 Additional Principal Investigator with Davis Cope and Peter Greenberg, \$17,900, *Acquisition of a computer system for research in mathematical sciences*, Principal Investigator, Kendall E. Nygard.
- Co-Principal Investigator with Peter Greenberg, Department of Transportation, \$91,451, *Transportation planning, microcomputer technology*, Principal Investigator, Kendall E. Nygard.
- Investigator with Peter Greenberg and Davis Cope, Department of Defense - University Instrumentation Program, \$52,830, *Acquisition of a computer system for research in mathematical sciences*, Project Leader, Kendall E. Nygard.
- 1991 Investigator with Joseph P. Brennan, Davis K. Cope, Yuesheng Xu, Guantao Chen; Principal Investigator, Ronald M. Mathsen; *Mathematical Sciences Computing Research Environments*, \$50,563, partially funded.
- 1999 Principal Investigator, National Science Foundation, \$172,551, *Graphical Degree Sequences and Their Repetition Subsequences*.

## PROFESSIONAL ACTIVITIES

- Referee: Discrete Applied Mathematics  
International Journal of Computer Mathematics  
Journal of Graph Theory  
Journal of Mathematical and Physical Sciences  
Journal of Combinatorial Mathematics and Combinatorial Computing  
Mathematics Magazine
- Organizer: Special Session on Graph Theory, American Mathematical Society Meeting #869, Central Region, Fargo, North Dakota, 25-26 October 1991.
- Co-Organizer: Tenth Midwest Conference on Differential Equations, Fargo, North Dakota, 9-10 October 1981 (with Ronald M. Mathsen).
- Chair: Third Annual Distinguished Teaching Awards Selection Committee, North Central Section, Mathematical Association of America, 1993-1994.
- Owner: GRAPHNET, an electronic distribution list for graph theorists in which graph theory problems, discoveries, and conferences may be communicated to interested parties, currently about 400 subscribers worldwide, 1990–present.

## THESES DIRECTED:

- M.S. *Disconjugacy, singular points and converse problems in homogeneous matrix differential equations*, Jaafar Al-Siwan, Master of Science, October 1977.

- M.S. *An algorithm for finding the eigenvalues of real symmetric bordered diagonal matrices*, Michael Stabnow, Master of Science, May 1985.
- Ph.D. *Combinatorial Optimization: Scheduling, Facility Location, and Domination*, Wiktor Piotrowski, Doctor of Philosophy, February 1992.
- M.S. *The Colorability of Graphs Having a Bounded Number of Triangles and Bounded Genus*, Margaret Sherman, Master of Science, August, 1994.
- Ph.D. *(s mod k)-cycles in Graphs*, Xiaotao Cai, Doctor of Philosophy, August 1997.
- Ph.D. *The Identification of Non-adjacent Vertices in n-critical Graphs*, Margaret Sherman, Doctor of Philosophy, December 1997.
- M.S. *The Number of Graphical Partitions with a Single Repetition*, Wenhui Wang, Master of Science, May 1998.
- M.S. *Graph Pebbling*, Wendy Booth, Master of Science, Master of Science, December 1999.
- Ph.D. *Determining the Biplanar Crossing Number of  $C_k \times C_l \times C_m \times C_n$* , Joshua Lambert, Doctor of Philosophy, May 2009.

## CURRENT PH.D. STUDENTS

Lindsay Merchant

## RESEARCH INTERESTS

Graph Theory, Combinatorics, Matrix Theory, Differential Equations

## PROFESSIONAL MEMBERSHIPS

American Mathematical Society  
 Institute for Combinatorics and its Applications  
 Mathematical Association of America  
 Society of Industrial and Applied Mathematics

## TEACHING

- Undergraduate Courses: Intermediate Algebra, College Algebra, Trigonometry, FORTRAN, Advanced FORTRAN, Calculus I, II, III, IV, V, Honors Calculus, Differential Equations, Advanced Engineering Mathematics, Advanced Calculus, Linear Algebra, Graph Theory, Real Analysis, Abstract Algebra, Number Theory, Combinatorics
- Graduate Courses: Topology, Calculus of Variations, Complex Analysis, Real Analysis, Graph Theory, Group Theory, Ring Theory, Field Theory

McNair Project: Susan Bornsen, Smallest Nonmeshy Trees, 1996

Mentoring: Nathan Harsen, Rado Numbers, 2007 (paper submitted)

Senior Projects  
Directed: Linda Vik, Probabilistic Method and the Lovász Local Lemma, 1997  
Scott Sherman, Graphs and Electrical Networks, 1998  
Wade Kragtorp, An Algorithm for Determining Domination, 1998  
Robert Breid, The Mathematics of Juggling, 1998  
Jason Huck, Topological Graph Theory: an Examination of Adding Handles to Spheres and the Rotational Embedding Scheme, 2001  
Wyatt Bachman, A Brief Explanation of Snarks and Their Families, 2004  
Laura Christensen, Tic Tac Toe, 2004  
Nicholas Hetland, Random Walks, 2004  
Matthew Chaussee, Analysis of Sudoku, 2005  
Lindsay Merchant, An Introduction to Nim, 2005  
Cheri Morstad Dischinger, Applying Graph Theory to Solve Sudoku, 2007  
Michael Olson, Balanced Graphs, 2008  
Yi Zhang, Design in Blocks, 2009  
Luke Kubat, Four-Color Theorem, 2009.

## UNIVERSITY SERVICE

Department of  
Mathematics: Department Promotion Tenure & Evaluation Committee, Chair, 2007–2010  
Department of Mathematics, Chair, 2001–2007  
(included attending Chair Workshops, San Diego, July 2001;  
Baltimore, June 2002) Graduate Program Director, 1991–2001  
(included updating program, conferring with students,  
codirecting Teaching Assistant and Graduate Student  
Workshop)  
Graduate Recruiting Director, 1986–2001  
(included coordinating recruiting trips, presenting  
seminars, coordinating recruiting mailings)  
Faculty Recruiting Committee, 1998–1999  
Sonya Kovalevsky Day presentation, 1998 Mathematics Department Graduate  
Handbook Editor, 1994, 1996, 1998  
Faculty Recruiting Committee, Summer 1997  
Faculty Recruiting Committee, 1995–1996  
Faculty Recruiting Committee, Chair, 1990–1991  
Departmental Scheduling, 1979–1985  
Faculty Recruiting Committee, 1995–1996  
Department Graduate Committee, Chair, 1972–1976  
Mathematics Department Public Relations Committee, Chair, 1974–76

College of  
Science &  
Mathematics: College Scheduling Committee, 1985–1989  
Promotion Tenure & Evaluation Committee 1985–1987 (Chair in 86-87)  
Student Progress Committee, 1974–1980  
Promotion Tenure & Evaluation Committee 1976–1978  
Promotion Tenure & Evaluation Committee 1974–1976 (Chair in 75-76)  
Graduate Programs and Research Committee, 1973–1974

University: Dean Kevin McCaul Evaluation Committee 2009–2010  
Senate Library Committee, Graduate School representative, 1999–2002  
NDSU Governor’s School presentations, 1998, 1999, 2002  
NDSU Graduate Bulletin, Mathematics Section Editor, 1996  
University Scheduling Committee, 1986–1989  
Tri-College Flying Club Advisor, 1976–1985  
University Salary Recommendation Committee, 1974–1975