Leon S. Lasdon

ADDRESS:

Title**:** Professor Emeritus, IROM department, McCombs School of Business, University of Texas at Austin

Mailing address (home):
7134 Valburn Drive
Austin, TX, 78731

Telephone: 512-585-1922
Email: lasdon@utexas.edu

EDUCATION:

1960 - B.S., Electrical Engineering, Syracuse University
1962 - M.S., Electrical Engineering, Case Institute of Technology
1964 - Ph.D., Systems Engineering, Case Institute of Technology

EXPERIENCE:

Professor, Department of Information,
Risk, and Operations Management at the
McCombs School of Business
The University of Texas at Austin
September, 1977-September 2015

Operations Research Department
Case Western Reserve University
Cleveland, Ohio
Professor, 1970-77
Associate Professor, 1967-70
Assistant Professor, 1964-67

Visiting Professor, Department of
Operations Research
Stanford University
September, 1975 - June, 1976 (Sabbatical Leave)

UNESCO Technical Expert in Computer Science
Department of Industrial and Management Engineering
Technion, Haifa, Israel
September, 1968 - June, 1969 (on leave)

Last updated: January 4, 2011

HONORS:

Sigma Xi (Research)
Eta Kappa Nu (Electrical Engineering)
Tau Beta Pi (Engineering)
Awarded Honorable Mention for Lanchester Prize, awarded for the year's best publication in Operations Research, 1971
Named Case Centennial Scholar by Case Institute of Technology, November, 1980
Named Ed and Molly Smith Centennial Professor in Business, April, 1982, by University of Texas
Received first CBA Foundation Advisory Council Award for Research Excellence (awarded by College of Business Administration, University of Texas at Austin), 1983
Appointed Sam Barshop Centennial Fellow by the IC^2 Institute, University of Texas at Austin, Sept. 1983
Received College of Business Administration Foundation Advisory Council Award for Outstanding Research Contributions April, 1985
Received the University of Texas Award for Outstanding Graduate Teaching, May 1985
Appointed to the David Bruton, Jr. Centennial Chair in Business Decision Support Systems, June, 1985
Received a Dean's Fellowship from the College of Business Administration for the Spring 2000 semester
Presented an invited tutorial on Applied Nonlinear Optimization at the Montreal INFORMS Conference on OR/MS Practice, May 2002
Received a Big 12 Fellowship Research award to spend 2 weeks at University of Colorado Boulder, Aug 1-13, 2004
Named a Fellow of the Institute of Operations Research and the Management Sciences (INFORMS), November 14, 2005.
Member of a 5 person team awarded the INFORMS Impact prize, for work having major impact on the field of Operations Research, November 7, 2010. The award was given for development of the Microsoft Excel Solver, embedded in Microsoft Excel since 1991.

PROFESSIONAL SOCIETIES:

INFORMS
Mathematical Optimization Society
American Association for the Advancement of Science
American Association of University Professors

PROFESSIONAL POSITIONS AND ACTIVITIES:

Member of editorial board, Journal of Computational Optimization and Applications, 1993-2015
Associate Editor-Management Science, 1972-1985
Associate Editor-Operations Research, 1971-80
Referee for research proposals from the National Science foundation and the Office of Naval Research.
Referee for numerous technical journals
Council member, Mathematical Programming Society, 1977-1979
Member, National Research Council Committee, Advisory to Army Research Office, 1980-1983
Program Chairman for ORSA/TIMS joint national meeting, Houston, Texas, October 11-14, 1981. Over 900 papers were presented at this meeting.

Member of Organizing Committee of NATO Advanced Research Institute on "Nonlinear Optimization," Cambridge, England, July 13-24, 1981

Chairman of 1983 Lanchester Prize Committee (an ORSA committee to choose the year's best publications in Operations Research)

Member of INFORMS Task Force on Business School Education, 1995-1997

Member, INFORMS Education Committee, 1995-2005

Chair of the INFORMS Optimization Section, 1995-1997. This subdivision of INFORMS has about 500 members, a web page, organizes optimization sessions at INFORMS conferences, and holds meetings at these conferences.

Elected to a national INFORMS office, Division C Director, for a three year period starting Fall 99. This Division includes the INFORMS Computing Society, the Optimization section, and four other special interest subdivisions. Duties include representing all the subdivisions at INFORMS board meetings.

Invited by Pavilion Technologies, Inc. to be a member of their technical advisory board, 1998. Pavilion is Austin-based and a leader in optimal control in the process industries worldwide.

Invited by Trajecta, Inc. to be a member of their technical advisory board, from 1999 to 2004. Trajecta was Austin-based, specializing in modeling and optimization in that area of marketing called "Customer Relationship Management," focusing on credit card issuers.

Member of the organizing committee of the International Federation of Operations Research, IFORS 16th Triennial Conference hosted by the Operational Research Society to be held in Edinburgh, Scotland, July 2002. IFORS is the main international organization for OR/MS.

Member of the INFORMS Fellow Selection Committee, 2007-2010. Selection as an INFORMS fellow is awarded for distinguished lifetime achievement in Operations Research and outstanding service to INFORMS

RESEARCH INTERESTS:

Optimization Software, Modeling, and Applications, Applications of Operations Research, Modeling and optimization of secondary oil recovery.

PUBLICATIONS:

A. Technical Papers

1. With Shawn Shirzadi and Eric Ziegel, "CRM Models for Enhanced Oil Recovery", submitted to Optimization and Engineering, Oct 2014.

2. *(refereed conference proceedings) With Anh Nguyen, Larry Lake, and Thomas Edgar, "Capacitance Resistive Model Application to Optimize Waterflood in a West Texas Field", Proceedings of the Society of Petroleum Engineers (SPE) annual technical conference and exhibition ,paper SPE 146984, Denver CO, 30 October-2 November 2011. Submitted to the SPE Journal on Reservoir Evaluation and Engineering

3. With Fred Glover, John Plummer, et. al., "Pseudo-Cut Strategies for Global Optimization", International Journal of Applied Metaheuristic Computing, Vol 2, Issue 4, 2011, pp.1-12.

4. With Abraham Duarte, Fred Glover, Manuel Laguna and Rafael Marti, "Adaptive memory programming for constrained global optimization," Computers & Operations Research 37, 2010, pp. 1500-1509.

5. With D. Weber, T.F. Edgar, L.W. Lake, S. Kawas, M. Sayarpour, "Improvements in Capacitance-Resistive Modeling and Optimization of Large Scale Reservoir Systems", Paper SPE121299, in proceedings of the 2009 SPE Western Regional Meeting held in San Jose, California, USA, 24–26 March 2009

6. With Jim Dyer and John Butler, "Long-Range Planning for a West Texas Catholic Diocese." Interfaces, Volume 39, April 2009, pp. 133-144.

7. With Lawrence Fulton, and Reuben R. McDaniel, Jr. and Barbara Wojcik, "Two-stage stochastic optimization for the allocation of medical assets in steady state combat operations," Proceedings of the INFORMS Military Applications Society, 7-8 April 2009, Huntsville, AL, 2009. To appear in the Journal of Defense Modeling and Simulation.

8. With Zsolt Ugray, John C. Plummer, and Michael Bussieck, "Dynamic filters and Randomized Drivers for the Multi-start Global Optimization Algorithm MSNLP," Optimization Methods and Software, Vol. 24, No. 4/5, August 2009, pp. 635-656.

9. With Lawrence Fulton, and Reuben R. McDaniel, Jr., "Multi-period integer optimization of a patient evacuation network with stochastic components," Proceedings of the 76th Military Operations Research Society Symposium, New London, CT, 2008.

10. With Lawrence Fulton, and Reuben R. McDaniel, Jr., & Nicholas Coppola, "Including quality, access, and efficiency in healthcare cost models," Hospital Topics, Vol. 84, No. 4, Fall 2008, pp. 3-16.

11. With John Plummer, "Multistart Algorithms for Seeking Feasibility," Computers and Operations Research, Vol. 35, No. 5, May 2008, pp. 1379-1393.

12. With Zsolt Ugray, John Plummer, Fred Glover, James Kelly and Rafael Martí, "Scatter Search and Local NLP Solvers: A Multistart Framework for Global Optimization," INFORMS Journal on Computing, Vol. 19, No. 3, Summer 2007, pp. 328-340.

13. With L.C. Faya, Larry Lake, Jim Dyer, and Wei Chen, "Constructing Oil Exploration and Development Project Portfolios Using Several Risk Measures-A Realistic Example," SPE Paper 107708-MS, Proceedings of the Hydrocarbon Economics and Evaluation Symposium (HEES) 2007, sponsored by the Society of Petroleum Engineers, held at Dallas, Texas, April 1-3, 2007.

14. With Lawrence Fulton, and Reuben R. McDaniel, Jr., "Cost Drivers and Resource Allocation in Military Health Care Systems," Military Medicine, Vol. 172, No. 3, March 2007, pp. 244-249.

15. With Betsy S. Greenberg, "Using Global Optimization to Estimate Population Class Sizes," Journal of Global Optimization, Vol. 36, June 2006, pp. 319-338.

16. With David Kracman, Daene C. McKinney, and David W. Watkins, "Stochastic Optimization of the Highland Lakes System in Texas," Journal of Water Resources Planning and Management, March/April 2006, pp. 62-70.

17. With Rafael Marti and Abdellah El-Fallahi, "Path Relinking and GRG for Artificial Neural Networks," European Journal of Operations Research, Vol. 169, Issue 2, 2006, pp. 508-519.

18. With Patrick L. Brockett, William W. Cooper and Barnett R. Parker, "A Note Extending Grosskopft, Hayes, Taylor and Weber, 'Anticipating the Consequences of School Reform: A New Use of DEA,'"Socio-Economic Planning Sciences, Vol. 39, Issue 4, December 2005, pp. 351-359.

19. With Zsolt Ugray, John Plummer, Fred Glover, Jim Kelly and Rafael Marti, "A Multistart Scatter Search Heuristic for Smooth NLP and MINLP Problems," in Part 1 of "Metaheuristic Optimization Via Memory and Evolution: Tabu Search and Scatter Search," Cesar Rego and Bahram Alidaee Eds., Operations Research/Computer Science Interface Series, Kluwer Academic Publishers, pp. 1-24, 2005.

20. With Ximing Cai and Ari Michelson, "Group Decision Making in Water Resources Planning Using Multiple Objective Analysis," Journal of Water Resources Planning and Management, Vol. 130, Issue 1, January/February 2004, pp. 4-14.

21. With Ximing Cai and Daene C. McKinney, "An Integrated hydrologic-agronomic-economic model for river basin management," Journal of Water Resources Planning and Management, Vol. 129, No. 1, January/February 2003, pp. 4-17.

22. With Ximing Cai and Daene C. McKinney, "A Framework for Sustainability Analysis in Water Resources Management and Application to the Syr Darya Basin," Water Resources Research, Vol. 38, No. 6, June 2002, pp. 21-1/21-14.

23. "Nonlinear and Geometric Programming - Current Status," Annals of Operations Research, Vol. 105, 2001, pp. 99-107.

24. With Ximing Cai and Daene C. McKinney, "A Piece-by-Piece Approach to Solving Large Nonlinear Water Resources Management Models," Journal of Water Resources Planning and Management (ASCE), Vol. 127, No. 6, Nov.-Dec. 2001, pp. 363-368.

25. With Ximing Cai and Daene C. McKinney, "Solving Nonlinear Water Management Models Using a Combined Genetic Algorithm and Linear Programming Approach," Advances in Water Resources, Vol. 24, No. 6, June 2001, pp. 667-676.

26. With Ximing Cai, Daene C. McKinney and David W. Watkins Jr., "Solving Large Nonconvex Water Resources Management Models Using Generalized Benders Decomposition," Operations Research, Vol. 49, No. 2, March-April 2001, pp. 235-245.

27. With Ravindra S. Gajulapalli, "Computational Experience with a Safeguarded Barrier Algorithm for Sparse Nonlinear Programming," Computational Optimization and Applications, Vol. 19, No. 1, April 2001, pp. 107-120.

28. With David W. Watkins, Daene W. McKinney, Soren Nielsen and Quentin W. Martin, "A scenario-based stochastic programming model for water supplies from the Highland Lakes," International Transactions in Operational Research (ITORS), 7, Issue 3, May 2000, pp 211-230.

29. With Chien-Mien Pang and Ilene J. Busch-Vishniac, "Optical Sensor Design Using Nonlinear Programming," Engineering Optimization, Vol. 32, No. 4., 2000, pp. 523-548.

30. "The State of the Art of Nonlinear Optimization," to appear in the Proceedings of the "Optimization in Industry 2" Conference, held in June 1999 in Banff, Canada, published by the United Engineering Foundation.

31. With M. Cetin, C. Kapoor and D. Tesar, "Evaluation of the Optimality in Two Classes of Local Redundancy Resolution Problems," Proceedings of the 10th World Congress on the Theory of Machine and Mechanisms, Finland, June 1999.

32. With K.J. Ziegler, J. Chlistunoff and Keith P. Johnston, "Optimization models for determining nitric acid equilibria in supercritical water," Computers & Chemistry, Vol. 23, No. 5, Sept. 1, 1999, pp. 421-434.

33. With Daniel Fylstra, John Watson and Allan Waren, "Design and Use of the Microsoft Excel Solver," INTERFACES, Vol. 28, No. 5, September-October 1998, pp. 29-55.

34. With Judith S. Liebman, "The Teachers' Forum: Teaching Nonlinear Programming using Cooperative Active Learning," INTERFACES, Vol. 28, No. 4, July-August 1998, pp. 119-132.

35. With James Dyer and Timothy Ruefli, "The Techno-MBA: The Key to the Success of Management Science in Business Schools," OR/MS Today, Vol. 25, No. 1, Feb. 1998, pp. 32-36. Reprinted in Selections, The Magazine of the Graduate Management Admission Council, Autumn 1998, pp. 7-14.

36. With T. Willemain, E. Jordan, Melanie Lenard, Jeffrey Moore and Stephen Powell, "Report of the Operating Subcommittee of the INFORMS Business School Education Task Force," OR/MS Today, Feb. 1997, pp. 36-41.

37. With A. Drud, "Nonlinear Programming," Chapter 10 of "Advances in Sensitivity Analysis and Parametric Programming," Thomas Gal and Harvey J. Greenberg Eds., Kluwer Academic Publishers, Boston, MA, 1997, pp. 10-1/10-46.

38. With John Plummer and Allan D. Waren, "Nonlinear Programming," Chapter 6 of Mathematical Programming for Industrial Engineers, Mordecay Avriel and Boaz Golany, Eds., Marcel Dekker, Inc., Publ., 1996, pp.385-487.

39. With Billy Rigby and Allan D. Waren, "The Evolution of Texaco's Blending Systems: From OMEGA to StarBlend," INTERFACES, Vol. 25, No. 5, Sept.-Oct. 1995, pp. 64-83.

40. With John Plummer and Gang Yu, "Primal-Dual and Primal Interior Point Algorithms for General Nonlinear Programs," ORSA Journal on Computing, Vol. 7, No. 3, Summer 1995, pp. 321-332.

41. With Songjun Luo, "Computational Experiments with a System Optimal Dynamic Traffic Assignment Model," Transportation Research-Part C: Emerging Technologies, Vol. 2, No. 2, June 1994, pp. 109-127.

42. With John Plummer, "Efficient Finite Difference Derivatives for Algebraic Modeling Systems," Annals of Operations Research, Vol. 38, No. 1-4, Fall 1992, pp. 485-499.

43. With M.J. Liebman and T.F. Edgar, "Efficient Data Reconciliation and Estimation for Dynamic Processes Using Nonlinear Programming Techniques," Computers and Chemical Engineering, Vol. 16, No. 10/11, Oct-Nov. 1992, pp. 963-986.

44. With Stuart Smith, "Solving Large Sparse Nonlinear Programs Using GRG," ORSA Journal on Computing, Vol. 4, No. 1, Winter 1992, pp. 2-15.

45. With B. Joffe, "The Relationship between Distributive Recursion and Successive Linear Programming in Refinery Production Planning Problems," Proceedings of the NPRA Computer Conference, Oct. 29-31, 1990, Seattle, WA.

46. With C.D. Kolstad, "Derivative Evaluation and Computational Experience with Large Bi-Level Mathematical Programs," Journal of Optimization Theory and Applications, Vol. 65, No. 3, June 1990, pp. 485-499.

47. With Allan Waren and M. Pechura, "The GRG2 Model Builder," Impacts of Recent Computer Advances on Operations Research, Sharda et al., Eds. North-Holland, Pub., June 1989, pp. 497-507.

48. With A. Roy and D. Plane, "End-User Optimization with Spreadsheet Models," European Journal of Operational Research, Vol. 39, No. 2, March 1989, pp. 131-137.

49. With C. DeWitt, A.D. Waren, D.A. Brenner and S.A. Melhem "OMEGA - An Improved Gasoline Blending System for Texaco,2" Interfaces, Vol. 19, No. 1, Jan-Feb, 1989, pp. 85-101. This paper was one of 6 finalists in the 1988 Edelman prize competition for the year's best OR/MS application.

50. With A. Waren and S. Sarkar, "Interfacing Optimizers with Planning Languages and Process Simulators," in Mathematical Models for Decision Support, Gautam Mitra, Ed., Springer-Verlag, Berlin, Germany, Series F, 1988, pp. 239-262.

51. With Y. Fan and S. Sarkar, "Experiments With Successive Quadratic Programming Algorithms," Journal of Optimization Theory and Applications, Vol. 56, No. 3, March 1988, pp. 359-383.

52. With J. Plummer and M. Ahmed, "Solving a Large Nonlinear Programming Problem on a Vector Processing Computer," Annals of Operations Research: Parallel Optimization on Novel Computer Architectures, No. 14, 1988, pp. 291-304.

53. With J. Plummer, B. Buehler and A.D. Waren, "Optimal Design of Efficient Acoustic Antenna Arrays," Mathematical Programming, Vol. 39, 1987, pp. 131-155.

54. With A. Waren and M. Hung, "The Status of Nonlinear Programming Software: An Update," Operations Research, Vol. 35, No. 4, July-Aug. 1987, pp. 489-503.

55. With Thomas E. Baker, "The Integration of Planning, Scheduling, and Process Control," Proceedings of the Third International Conference on Chemical Process Control, 1986, pp. 579-620.

56. With Nisai Wanakule and Larry W. Mays, "Optimal Management of Large Scale Aquifers: Methodology and Applications," Water Resources Research, Vol. 22, No. 4, April 1986, pp. 447-465.

57. With A. Roy and J. Lordeman, "Extending Planning Languages to Include Optimization Capabilities," Management Science, Vol. 32, No. 3, March 1986, pp. 360-378.

58. With P.E. Coffman, R. MacDonald, J.W. McFarland and K. Sepehrnoori, "Optimal Hydrocarbon Reservoir Production Policies," Operations Research, Vol. 34, No. 1, Jan-Feb 1986, pp. 40-55.

59. With R. Rouhani, W. Lebow and A.D. Waren, "A Generalized Benders Decomposition Approach to Reactive Source Planning in Power Systems," Mathematical Programming Study, No. 25, October 1985, pp. 62-75.

60. With A. Roy, "Structural Analysis of Optimization Problems Formulated in Planning Languages," Journal of Optimization Theory and Applications, Vol. 47, No. 3, Nov. 1985, p.337-347.

61. "Nonlinear Programming Algorithms - Applications, Software, Comparisons," in "Numerical Optimization 1984," P.T. Boggs et al., Eds., Society of Industrial and Applied Mathematics (SIAM). Philadelphia, 1985, pp. 41-70.

62. With J. Zhang and N. Kim, "An Improved Successive Linear Programming Algorithm," Management Science, Vol. 31, No. 10, October 1985, pp. 1312-1331.

63. With Thomas E. Baker, "Successive Linear Programming at Exxon," Management Science, Vol. 31, No. 3, March 1985, pp. 264-274.

64. With James W. McFarland and Verne Loose, "Development Planning and Management of Petroleum Reservoirs Using Tank Models and Nonlinear Programming," Operations Research, Vol. 32, No. 2, March-April 1984, pp. 270-289.

65. With A. Roy, "On Detection of Linear and Nonlinear Optimization Problems," Operations Research Letters, Vol. 2, No. 4, November 1983, pp. 149-154.

66. With F. Norman and J.K. Hsin, "A Comparison of Methods for Solving and Optimizing a Large Nonlinear Econometric Model," Journal of Economic Dynamics and Control, Vol. 6, 1983, pp. 3-24.

67. With A.D. Waren, "Large Scale Nonlinear Programming," Computers and Chemical Engineering, Vol. 7, No. 5, 1983, pp. 595-604.

68. With P. Beck and M. Engquist, "A Reduced Gradient Algorithm for Nonlinear Network Problems," ACM Transactions in Mathematical Software, Vol. 9, No. 1, March 1983, pp. 57-70.

69. With A. Roy and E. DeFalomir, "An Optimization Based Decision Support System for a Product Mix Problems," Interfaces, Vol. 12, No. 2, April 1982, pp. 26-33.

70. "Reduced Gradient Methods," in Nonlinear Optimization, 1981, M.J.D. Powell, Ed., Academic Press, London, England, 1982, pp. 243-250.

71. "Large Scale Nonlinear Programming," in Large Scale Systems, Y. Haimes, Ed., North-Holland, 1982, pp. 31-65.

72. With F. Palacios-Gomez and M. Engquist, "Nonlinear Optimization by Successive Linear Programming," Management Science, Vol. 28, No. 10, Oct. 1982, pp. 1106-1120.

73. With P. Beck, "Scaling Nonlinear Programs," Operations Research Letters, Vol. 1, No. 1, Oct. 1981, pp. 6-9.

74. A Survey of Nonlinear Programming Algorithms and Software," in Foundations of Computer-Ordered Chemical Process Design, Vol. 2, Engineering Foundation publication, 1981, pp. 185-219.

75. With A.D. Waren, "A Survey of Nonlinear Programming Applications," Operations Research, Vol. 28, No. 5, Sept. - Oct. 1980, pp. 1029-1073 (double length feature article).

76. With M.A. Hanscom, L. Lafond and G. Pronovost, "Modeling and Resolution of the Medium Term Energy Generation Planning Problem for a Large Hydro-Electric System," Management Science, Vol. 26, No. 7, July 1980, pp. 659-668.

77. "Operations Research in China," Interfaces, Vol. 9, No. 1, Feb. 1980, pp. 23-27.

78. With A. Meeraus, "Solving Nonlinear Economic Planning Models Using GRG Algorithms", Proceedings of the International Conference on Systems Analysis and Optimization, Versailles, France, Dec. 11-13, Springer-Verlag, 1978.

79. With A.D. Waren, S. Sarkar, F. Palacios, "Solving the Pooling Problem Using Generalized Reduced Gradient and Successive Linear Programming Methods," SIGMAP Bulletin, July-Aug., 1979, pp. 9-16.

80. With A.D. Waren, "The Status of Nonlinear Programming Software, "Operations Research, Vol. 27, No. 3, May-June 1979, pp. 431-456.

81. With A.D. Waren, "Generalized Reduced Gradient Software for Linearly and Nonlinearly Constrained Problems," in Design and Implementation of Optimization Software, H. Greenberg, Ed., Sijthoff and Noordhoff, Pubs., Alpen aan den Rign, The Netherlands, 1978, pp. 363-397.

82. "Large Scale Mathematical Programming," Handbook of Operations Research, Joseph J. Moder and Salah E. Elmaghraby, Eds., Van Nostrand Reinhold CO, Pub., New York, NY, 1978, pp. 266-294.

83. With J. Mantell, "A GRG Algorithm for Econometric Control Problems," Annals of Economic and Social Management, Vol. 6, No. 5, 1978, pp. 581-597.

84. With M. Ratner and A. Jain, "Solving Geometric Programs Using GRG-Results and Comparisons," Journal of Optimization Theory and Applications, Vol. 25, No. 1, 1978, pp. 581-597.

85. With A.D. Waren, A. Jain, M. Ratner, "Design and Testing of a Generalized Reduced Gradient Code for Nonlinear Programming," ACM Transactions on Mathematical Software, Vol. 4, No. 1, March 1978, pp. 34-50.

86. With A.D. Waren, L.B. Stotts, D.C. McCall, "Recent Developments in Nonlinear Optimization and Their Use in Engineering Design," in Large Engineering Systems, A Wexler, Ed., Pergamon Press, 1977, pp. 184-198.

87. "Operations Research in the Far East," Interfaces, Vol. 8, No. 1, Nov. 1977, pp. 56-63.

88. With A.D. Waren, "A Survey of Nonlinear Programming Software," Proceedings of the Association for Computing Machinery Annual Conference, Seattle, Oct. 17-19, 1977.

89. "Partitions, Decomposition Sparsity," Networks, Vol. 5, 1975, pp. 93-96.

90. With R. Fox, A. Tamir, M. Ratner, "An Efficient One Dimensional Search Procedure," Management Science, Vol. 22, No. 1, Sept. 1975, pp. 42-50.

91. With A.D. Waren and D.F. Suchman, "Optimal Design of Accoustic Sonar Transducer Arrays," Proceedings of IEEE International Conference on Engineering in the Ocean Environment, Vol.II, Aug. 1974, pp. 3-9.

92. With R. Fox and M. Ratner "Nonlinear Optimization Using the Generalized Reduced Gradient Method," Revue Francaise d'Automatique, d'Informatique, et de Recherche Operationnelle (R.A.I.R.O.), V-3, Nov. 1974, pp. 73-104.

93. With A. Waren and S. Madson, "Juror Management in a Metropolitan Trial Court," Judicature, Vol. 57, No. 9, April 1974, pp. 402-410.

94. "Generalized Upper Bounding Methods in Production Scheduling and Distribution" in Optimization Methods for Resource Allocation, Richard Cottle and Jacob Krarup, Eds., The English Universities Press, London, England, 1974, pp. 25-41.

95. With R. Fox and M. Ratner, "An Efficient One Dimensional Search Procedure for Barrier Functions," Mathematical Programming, Vol. 4, No. 3, 1973, pp. 279-296.

96. "Decomposition of a Ship Routing Problem" in Decomposition of Large Scale Problems, D. Himmelblau, Ed., North Holland, Amsterdam, The Netherlands, 1973, pp. 235-241.

97. "Decomposition in Resource Allocation," in Decomposition of Large Scale Problems, D. Himmelblau, Ed., North Holland, Amsterdam, The Netherlands, 1973, pp. 207-234.

98. With E.A. Ernst and L.E. Ostrander and S.S. Divell, "Anesthesiologist Scheduling Using a Set Partioning Algorithm," Computers and Biomedical Research, Vol. 6, 1973, pp. 561-569.

99. "Penalty and Barrier Function Design of Electrical Networks and Sonar Transducer Arrays," in Optimization and Design, Avriel, Rijckaert and Wilde, Eds., Prentice-Hall, Inc., Englewood Cliffs, NJ, 1973, pp. 144-194.

100. With J. Hartman, "A Generalized Upper Bounding Algorithm for Multi-Commodity Flow Problems in Networks," Networks, Vol. 1, No. 4, June 1972, pp. 333-354.

101. "An Efficient Algorithm for Minimizing Barrier and Penalty Functions," Mathematical Programming, Vol. 2, No. 1, Feb. 1972, pp. 65-106.

102. With Y.Y. Haimes and D.A. Wismer, "On a Bicriterion Formulation of the Problems of Integrated System Identification and System Optimization," IEEE Transactions on Systems, Man, and Cybernetics, Vol. SMC-1, No. 3, July 1971, pp. 296-297.

103. With R. Terjung, "An Efficient Algorithm for Multi-Item Scheduling," Operations Research, Vol. 19, No. 4, July-August 1971, pp. 946-969.

104. With J. Hartman, "A Generalized Upper Bounding Method for Doubly Coupled Linear Programs," Naval Research Logistics Quarterly, Vol. 17, No. 4, December, 1970, pp. 411-429.

105. "Conjugate Direction Methods for Optimal Control," IEEE Transactions on Automatic Control, Vol. AC-15, No. 2, April, 1970, pp. 267-268.

106. With A.D. Waren, D. Tabak, and G. Porcelli, "Applying Mathematical Programming," Electro-Technology, Vol. 81, No. 3, March 1968, pp. 48-53.

107. With A.D. Waren, "Mathematical Programming and Engineering Design," Electro-Technology, Vol. 80, No. 5, Nov., 1967, pp. 53-70.

108. "Duality and Decomposition in Mathematical Programming," IEEE Transactions on Systems Science and Cybernetics, Vol. SSC-4, No. 2, July 1968, pp. 86-100.

109. With Allan D. Waren and Daniel F. Suchman, "Optimization in Engineering Design," Proceedings of the IEEE, Vol. 55, No. 11, Nov. 1967, pp. 1885-1897.

110. With A.D. Waren and R.K. Rice, "An Interior Penalty Method for Inequality Constrained Optimal Control Problems," IEEE Transactions on Automatic Control, Vol. AC-12, No. 4, August 1967, pp. 388-395.

111. With S.K. Mitter and A.D. Waren, "The Method of Conjugate Gradients for Optimal Control Problems," IEEE Transactions of Automatic Control, Vol. AC-12, No. 2, April 1967, pp. 132-139.

112. With A.D. Waren and R.K. Rice, "A Penalty Method for Optimal Control," Proceedings of the IEEE, Vol. 55, No. 1, January 1967, pp. 115-116.

113. With D. Suchman and A.D. Waren, "Nonlinear Programming Applied to Linear-Array Design," Journal of the Acoustical Society of America, Vol. 40, No. 5, Nov. 1966, pp. 1197-1200.

114. With S.K. Mitter, "The Conjugate Gradient Method in Function Space," Proceedings of the Fourth Allerton Conference on Circuit and Systems Theory, 1966.

115. With A.D. Waren, "Optimal Design of Filters with Bounded, Lossy Elements," IEEE Transactions on Circuit Theory, Vol. CT-15, No. 2, June 1966, pp. 175-188.

116. With J.D. Schoeffler, "Decentralized Plant Control," Transactions of the Instrument Society of America, Vol. 5, No. 4, April 1966, pp. 175-184.

117. With C.B. Brosilow, "A Two Level Optimization Technique for Recycle Processes," Proceedings of the AI. CH. E. Joint Meeting, London, 1965, Vol. 4, pp. 75-84.

118. "Solving Multi-Item Scheduling Problems by Decomposition," Proceedings of the 20th Annual Instrument Society of American Conference and Exhibit, October 4-7, Los Angeles, California, 1965, Vol. 20, Part III.

119. With A.D. Waren, "A Note on the Automatic Design of Filters," Proceedings of the IEEE, Vol. 53, No. 9, September 1965, pp. 1261-1262.

120. "Multi-Level Optimization of Large Scale Systems," Proceedings of the Second Systems Engineering Conference, Chicago, September 1965.

121. With S.K. Mitter and A.D. Waren, "The Method of Conjugate Gradients for Optimal Control Problems," Proceedings of the IEEE, Vol. 54, No. 6, June 1965, p. 904.

122. With A.D. Waren, "Practical Filter Design Using Mathematical Optimization," Proceedings of the Third Allerton Conference on Circuit and Systems Theory, (1965), pp. 677-690.

123. With C.B. Brosilow and J.D. Pearson, "Feasible Optimization Methods for Interconnected Systems," Proceedings of the 1965 Joint Automatic Control Conference, Troy, New York, pp. 79-85.

124. With R. Durbeck, "Control Model Simplification Using a Two-Level Decomposition Technique," Proceedings of the 1965 Joint Automatic Control Conference, Troy, New York, pp. 185-194.

125. "A Multi-Level Technique for Optimization," Proceedings of the 1965 Joint Automatic Control Conference, Troy, New York, pp. 85-93.

126. With J.D. Schoeffler, "Decentralized Plant Control," Proceedings of the 19th Annual Instrument Society of America Conference and Exhibit, New York, October 12-15, 1964, Vol. 19, Part III.

C. Books

1. Optimization Theory for Large Systems, Macmillan Company, New York, NY, July, 1971. The text contains 523 pages, and is at a graduate level. This book was awarded honorable mention in the 1970 Lanchester Prize competition for the year's best publication in Operations Research. A Japanese Edition appeared in early 1973, and Russian and Romanian translations appeared in 1976. A reprint by Dover Publications Inc., Mineola, N.Y., appeared in 2002.

2. With Thomas F. Edgar and David M. Himmelblau, Optimization of Chemical Processes, second edition, McGraw Hill, January 2001. First edition was published in 1986.

3. With J. Liebman, L. Schrage, A. Waren, Applications of Modeling and Optimization with GINO, The Scientific Press, Palo Alto. CA, 1986. This book is based on an interactive program that solves nonlinear optimization problems on personal computers. It describes the algorithm (GRG2), and many applications.

PRESENTATIONS AT TECHNICAL MEETINGS:

1. Gave an invited presentation on "Capacitance-Resistive Modeling and Optimization of Hydrocarbon Reservoirs" at the 2010 INFORMS annual meeting held in Austin, TX, Nov 7-10, 2010

2. Gave an invited tutorial on "Applied Nonlinear Optimization" at the 2009 INFORMS annual meeting, held in San Diego, CA, Oct 11-14, 2009

3. Gave an invited presentation on "Optimal Waterflooding of Large Oil Reservoirs" at the Canadian Operations Research Society - Institute for Operations Research and the Management Sciences (CORS-INFORMS) International 2009 Meeting in Toronto, Canada, June 14, 2009.

4. Gave an invited opening talk on "A Survey of Optimization in Business" at the First Annual Exxon Mobil Optimization Conference held in Fairfax, Virginia, on May 7, 2009.

5. Gave an invited talk on "Optimizing Oil Recovery from established Oil Fields by Waterflooding" to faculty and students from the Math Department, at the United States Military Academy at West Point, N.Y., April 22, 2009.

6. Gave an invited talk on "Optimization in Action" as the distinguished speaker for the Guest Lecture Series, Spring 2009, in the Army-Baylor Graduate Program in Business and Health Administration, at Fort Sam Houston, in San Antonio, TX, on April 3, 2009.

7. Gave a talk on "Improvements in Capacitance-Resistive Modeling and Optimization of Large Scale Reservoir Systems", at the 2009 Society of Petroleum Engineers Western Regional Meeting held in San Jose, California, on March 24-26, 2009.

8. Gave an invited seminar to students and faculty on "Optimization in Action" at the United States Military Academy at West Point, NY, November 25, 2008.

9. Presented a paper titled "Optimal Multiperiod Portfolios of Hydrocarbon Exploration and Production Projects Under Uncertainty" at the Institute for Operations Research and the Management Sciences (INFORMS) 2008 Annual Meeting, held in Washington D.C., October 15, 2008.

10. Gave a talk on "Optimal Multiperiod Portfolios of Hydrocarbon Exploration and Production Projects Under Uncertainty" at the Department of Statistics and Operations Research (Departamento de Estadistica y Investigacion Operativa), at the University of Valencia, in Spain, June 13, 2008.

11. Gave a talk on "Optimal Multiperiod Portfolios of Hydrocarbon Exploration and Production Projects Under Uncertainty" at the University of Granada, in Spain, June 6, 2008.

12. Gave a talk on "Optimal Multiperiod Portfolios of Hydrocarbon Exploration and Production Projects Under Uncertainty" at the Department of Systems & Industrial Engineering (SIE) 2008 Seminar Series, at the University of Arizona, Tucson, February 7, 2008.

13. Gave a tutorial titled "Computational Global Optimization" at the 2007 INFORMS Annual Meeting held in Seattle, WA, Nov. 4-7, 2007.
14. Gave a talk titled "Operations Research" as part of the Faculty Research Presentation Series lecture sponsored by the Undergraduate Business Council of the McCombs School of Business, The University of Texas at Austin, October 16, 2007.
15. Presented a paper titled "Call Allocation and Agent Scheduling in a Call Center Network" at the INFORMS International Meeting held in San Juan, Puerto Rico, July 8-11, 2007.
16. Presented a paper titled "Constructing Oil Exploration and Development Project Portfolios Using Several Risk Measures – A Realistic Example" at the Hydrocarbon Economics and Evaluation Symposium (HEES) 2007 held in Dallas, Texas, April 1-3, 2007.
17. Gave an invited talk titled "Optimal Multiperiod Portofolios of Hydrocarbon Exploration and Production Project under Uncertainty" at the 10th INFORMS Computing Society Conference Meeting held in Coral Gables, Florida, January 3-5, 2007.
18. Gave a talk titled "Assigning Priests to Parishes in West Texas" at the 2006 INFORMS Annual Meeting held in Pittsburgh, Pennsylvania, November 5-8, 2006.
19. Participated in the panel session titled "Nonlinear Systems Modeling and Optimization: State-of-the-Art and Perspectives" at the 21st European Conference on Operations Research (EURO XXI), held in Reykjavik, Iceland, July 2-5, 2006.
20. Gave a talk on "Constructing and Optimizing Oil Field Exploration and Development Project" at the INFORMS Conference Applying Science to the Art of Business, held in Miami, Florida, April 30-May 2, 2006.
21. Gave a talk on "Optimization Models for Allocating Calls to Call Centers" at the Case Western University, Cleveland, Ohio on April 20, 2006.
22. Gave a talk titled "Hit-and-Run for MSNLP: A New Global Driver" at the INFORMS Annual Meeting, held in San Francisco, CA, November 14, 2005.
23. Gave an invited talk titled "The State-of-the-art in nonlinear optimization" at the Sixth Conference on Operations Research (VI Congreso Chileno de Investigaciones Operativas), held in Valdivia, Chile, October 25-25, 2005.
24. Gave a talk titled "Multistart Algorithms for Seeking Feasibility" and chaired a session titled "Optimization/Global Optimization" at the INFORMS Annual Meeting, held in Denver, CO, October 24-27, 2004.
25. Gave a talk on "OQNLP/GAMS: A Multi-start Approach to Global Optimization" and chaired a session on "Global Optimization Software in GAMS: Performance and Applications" at the OR/MS INFORMS Annual Meeting held in Atlanta, GA, October 20, 2003.
26. Gave a workshop on Global Optimization at GAMS Development Corporation, Washington DC, September 18, 2003.
27. Gave a talk on "OQNLP Algorithm for Global Optimization" at the 3rd Annual McMaster Optimization Conference: Theory and Applications (MOPTA 03), held at McMaster University in Hamilton, Ontario, Canada, July 30-August 1, 2003.
28. Gave a talk titled "OPTQUEST NLP: A Multi-start Heuristic for MINLP and Global NLP, and its GAMS and Callable Implementations" at the 8th INFORMS Computing Society Conference on Optimization and Information Technology in the Network era held in Phoenix, AZ, January 8-10, 2003.

29. Gave a talk and chaired a session on "New initiatives in Global Optimization" at the INFORMS Annual Meeting in San Jose, CA, November 17-20, 2002.

30. Gave a tutorial on Applied Nonlinear Programming at the 36th Triennial Conference of the International Federation of Operational Research Societies—IFORS 2002, at the University of Edinburgh, Scotland, July 8-12, 2002.

31. Gave a talk titled "A Multistart Scatter Search Heuristic for Smooth NLP and MINLP Problems" at the 8th International Conference of the Society for Computational Economics, Computing in Economics and Finance, held at Aix-en-Provence, France, June 27-29, 2002.

32. Gave a tutorial on Applied Nonlinear Optimization at the INFORMS Conference on OR/MS Practice: Analyzing and Enhancing the Extended Enterprise, held in Montreal, Canada, May 19-21, 2002.

33. Gave an invited talk on Nonlinear Optimization to the Industrial and Systems Engineering Dept. at the US Military Academy, West Point, NY, May 14-15, 2002.

34. Gave an invited lecture on Optimal Reservoir Management at the University of Arizona, Tucson, AZ, March 21, 2002.

35. Gave a talk titled "Solving Nonconvex NLPs and MINLPs using OptQuest/GRG" at the Miami Beach 2001 INFORMS Conference, Florida, November 4, 2001.

36. Gave a presentation on "Predictive Modeling and Robust Optimization in CRM" at the Austin INFORMS Meeting at the McCombs School of Business, The University of Texas at Austin, TX, September 20, 2001.

37. Gave a talk titled "Solving Nonconvex NLPs and MINLPs using OptQuest/GRG" at the INFORMS International, Hawaii 2001 Conference, at Maui, HI, June 18, 2001.

38. Gave a talk tittled "Global Optimization" at the ITESM-Instituto Technico de Ensino Superior de Monterrey (Technical Institute of Higher Education of Monterey), Mexico, May 25, 2001.

39. Invited to present a paper titled "Predictive Modeling and Robust Optimization in CRM" at the INFORMS Conference on Optimizing the Extended Enterprise in the New Economy, San Diego, CA, May 21, 2001.

40. Gave a talk titled "Solving Nonconvex NLPs and MINLPs Using OptQuest/GRG" at a Conference of Tabu and Scatter Search at the University of Mississippi at Oxford, Oxford, MS, March 8-10, 2001.

41. Gave a talk on global optimization at the Optimization Symposium sponsored by the Austin INFORMS Chapter, TX, February 23, 2001.

42. Presented a paper on "OQGRG: a Scatter Search Approach for Solving Constrained Nonlinear Global Optimization Problems," at the TWMCC (Texas-Wisconsin Modeling and Control Consortium) meeting, Austin, TX, February 20, 2001.

43. "OQGRG: A Scatter Search Approach for Solving Constrained Non-Linear Global Optimization Problems," at the INFORMS Annual Meeting, San Antonio, TX, November 5-8, 2000.

44. Presented an invited talk titled "Results from Optimizing Customer Relationship Management," at McGill University, Montreal, Canada, May 18-22, 2000.

45. Presented an invited talk titled "Results from Optimizing Customer Relationship Management in the Credit Card Industry," and chaired a session on Nonlinear Optimization in Marketing at the INFORMS 2000 Conference, Salt Lake City, UT, May 7-10, 2000.

46. Presented a paper titled "OPTQUEST/GRG: Combining Scatter Search and GRG for Global Optimization," and chaired a session on Nonlinear Programming at the INFORMS (Institute for Operations Research and the Management Sciences) Fall'99 Meeting, Philadelphia, PA, November 7-10, 1999.

47. Presented an invited lecture on "Complexity in Optimization" at the University of Virginia, Charlottesville, VA., November 5, 1999.

48. Presented an invited plenary talk on "The State-of-the-Art of Nonlinear Optimization," at the Optimization in Industry Conference, Banff, Canada, June 6-11, 1999, sponsored by the Engineering Foundation.

49. Presented an invited talk at the Anderson Graduate School of Management, UCLA, (as part of their seminar series), on "Optimizing Simulations," February 26, 1999.

50. Presented an invited talk on "Recent Advances in Nonlinear Optimization" at a meeting of the Texas-Wisconsin Modeling and Control Consortium, at The University of Texas at Austin, February 12, 1999. This consortium involves faculty and students from the Chemical Engineering Departments at The University of Texas at Austin and Wisconsin, and from sponsoring companies like Exxon, Mobil, Simulation Sciences, etc. About 50 people attended.

51. Presented an invited plenary talk titled "Solving a Large Nonlinear Optimization Model of River Basin Operations," at the International Conference on Nonlinear Programming and Variational Inequalities, at the City University of Hong Kong, Hong Kong, December 15-18, 1998.

52. Gave an invited talk on Optimization in Spreadsheets, at the Workshop on Teaching Management Science with Spreadsheets, held at the Dartmouth College, Hanover, NH, June 27-30, 1998.

53. Presented a paper titled "Recent Advances in Sensitivity Analysis in Nonlinear Programming," at the Sixth Informs computer Science Technical Section Conference, held in Monterey, CA, January 7-9, 1998.

54. Presented a paper titled "Recent Computational Results Using SLP/GRG," at the INFORMS (Institute for Operations Research and the Management Sciences) Spring meeting, in Montreal, CA, April 26-29, 1998.

55. Presented a paper titled "Recent advances in sensitivity analysis in Nonlinear Programming," at the Sixth INFORMS Computer Science Technical Section Conference in Monterey, CA, January 7, 1998.

56. Presented a paper titled "Computational Experience with a New SLP/GRG Algorithm," at the National INFORMS (Institute for Operations Research and the Management Sciences) meeting in Atlanta, GA, November 3, 1997.

57. Presented a paper titled "Applications of Nonlinear Programming to Some Refinery Planning Problems," at the INFORMS (Institute for Operations Research and the Management Sciences) Fall 1997 Meeting, in Dallas, TX, October 26-29, 1997.

58. Presented a tutorial titled "Nonlinear Programming," at the National INFORMS (Institute for Operations Research and the Management Sciences) meeting, San Diego, CA, May 4, 1997.

59. Gave an invited seminar on "Teaching Nonlinear Programming Using Cooperative Active Learning," at the University of British Columbia, Vancouver, Canada, January 6, 1997.

60. Presented an invited talk on "Computational Experience with a New SLP/GRG Algorithm," and chaired a session on NLP Algorithms and Software at the Fall 1996 INFORMS Conference in Atlanta, GA, November 3-6, 1996.

61. Presented an invited talk on "Computational Experience with a New SLP/GRG Algorithm," and chaired a session on NLP Algorithms and Software at the IFORS meeting, Vancouver, CA, July 8-13, 1996.

62. Chaired a session titled "Computational Results in Nonlinear Programming" and gave a talk on "A Nonlinear Programming Algorithm Using SLP and GRG, "at the INFORMS National Meeting in New Orleans, LA., October 29-November 1, 1995.

63. Presented an invited talk on "Current Advancements in Nonlinear Programming Software," at the IFORS Fourth Specialized Conference: Operations Research and Engineering Design, held in St. Louis, MI, October 24-27, 1995.

64. Presented an invited talk on "Nonlinear Optimization--The State-of-the-Art," at the TIMS/ORSA '95 Joint National Meeting in Los Angeles, CA, April 23-26, 1995.

65. Presented an invited talk on "The New Role of Optimization," at Dupont in Willington, DE, November 18, 1994.

66. Presented an invited talk on "Adoption and Use of Spreadsheet Optimization," at the 15th International Symposium on Mathematical Programming in Ann Arbor, MI, August 15-19, 1994.

67. Presented an invited talk on "Development of the DSP System for Discrete Multi-Criterion Decision Making," at the TIMS XXXII Conference in Anchorage, Alaska, June 12-15, 1994.

68. Presented an invited talk on "Interior Point Algorithms for Nonlinear Programming" in the Distinguished Lecture Series, I.E. Dept., Texas A & M, TX, October 22, 1993.

69. Invited to chair a session and to present three papers as follows: "Solving Large NLPs Using Interior Point Methods," "Discrete Minimax B-Spline Approximation by GRG," and "Recent Enhancements to the Excel Solver" at the ORSA/TIMS Joint National Meeting at Phoenix, AZ, Oct. 31-Nov. 3, 1993.

70. Presented an invited paper titled "Spreadsheet Optimization" at the IMPS Roundtable Discussion #14, in Denver, CO, May 24-25, 1993.

71. Presented an invited paper titled "Solving Large Dynamic Traffic Assignment Problems" at the ORSA/TIMS National Meeting in Chicago, IL. May 16-19, 1993.

72. Presented an invited paper titled "Interior Point Methods for General Nonlinear Programs" at a Conference on Large Scale Optimization in Gainesville, FL, February 14-16, 1993.

73. Chaired a session and presented a paper titled "Recent Developments in Spreadsheet Optimization" at the ORSA/TIMS Joint National Meeting, in San Francisco, CA, November 1-4, 1992.

74. Gave an invited talk on "An Interior Point Algorithm for Nonlinearly Constrained Problems" at the Fourth SIAM Conference on Optimization, Chicago, IL, May 11-13, 1992.

75. Gave an invited talk on "Experience with an Interior Point algorithm for Nonlinear Programming" at the ORSA/TIMS Joint National Meeting, Orlando, FL, April 26-29, 1992.

76. Presented two invited lectures: "GRGSLP: a New NLP Algorithm" and "An Interior Point Algorithm for General Nonlinear Programs" at the ORSA/TIMS Joint National Meeting, Anaheim, CA, November 3-6, 1991.

77. Panelist at discussion on "Model Management and Operations" at the ORSA/TIMS Joint National Meeting, Anaheim, CA, November 3-6, 1991.

78. Chaired a panel discussion on "Spreadsheet Optimization" at the ORSA/TIMS Joint National Meeting, Las Vegas, NV, May 7-9, 1990.

79. Presented a lecture entitled "Experiments with a Large Scale GRG Code" at an ORSA/TIMS Joint National Meeting, Las Vegas, NV, May 7-9, 1990.

80. Presented invited tutorial session (with Allan Waren) at the Las Vegas ORSA/TIMS National Meeting, Las Vegas, NV, May 7-9, 1990. The topic was "Large Scale Nonlinear Programming."

81. Presented an invited lecture entitled "Solving Large Sparse Nonlinear Programs by Successive Linear Programming" at the advanced Decision Support Systems unit of AT and T, Austin, TX, February 2, 1990.

82. Invited participant (with four other Americans) in a Soviet-American Seminar on Large Scale Optimization Problems, held in Moscow, Russia, June 4-8, 1990. An earlier session was held at the University of Maryland, College Park, MD., January 8-12, 1990. My talk was entitled "Large Scale Nonlinear Programming."

83. Invited speaker at a symposium on "Supercomputing and Linear Programming" sponsored by convex Computer Corp. in New York City, NY, October 19, 1989. Spoke on "Nonlinear Optimization: Software and Applications in the Oil and Chemical Industry."

84. Presented 2 talks at an ORSA/TIMS Joint National Meeting in New York City, NY, October 16-18, 1989, entitled "The EMS/MINOS Modeling System" and "SQP: A Large Scale Implementation."

85. "The EMS/MINOS Modeling System" and "Design and Testing of a Large Scale GRG Code" at a CORS/TIMS/ORSA Joint National Meeting, Vancouver, Canada, May 8-10, 1989.

86. "Interfacing Optimizers with Process Simulators: methodology and an application" at the Shell Conference on Logistics, Apeldoorn, Netherlands, November 2-4, 1988.

87. "Experimenting with SQP: a Dual SQP approach" at an ORSA/TIMS Joint National Meeting, Denver, CO, October 23-26, 1988.

88. "OMEGA - An Improved Gasoline Blending System of Texaco," in the Edelman Prize Competition at the TIMS/ORSA Joint National Meeting, Washington, DC, April 24-27, 1988.

89. Cluster Chairman for Linear and Large Scale Programming, TIMS/ORSA Joint National Meeting, Washington, DC, April 24-27, 1988.

90. Co-Organized with D. Kendrick the second annual IC_2 Conference on Integrated Modeling Systems, Austin, TX, October 21-24, 1987.

91. "Nonlinear Programming Software and Applications" at the ORSA/TIMS Joint National Meeting, St. Louis, MO, October 1987.

92. "Interfacing Optimizers with Planning Languages and Process Simulators," at NATO-Sponsored Advanced Study Institute on "Mathematical Models for Decision Support," Val D'Isere, France, July 26-August 2, 1987,

93. "Experiments with Successive Quadratic Programming Algorithms," at SIAM Conference on Optimization, Houston, TX, May 18-20, 1987.

94. "Nonlinear Programming for Process Optimization," at ORSA/TIMS Joint National Meeting, New Orleans, LA., May 4-6, 1987.

95. "An Application of Two Level Programming to a Coal Cartel," at ORSA/TIMS Joint National Meeting, FL, Oct. 27-29, 1987.

96. "An SLP Code for Nonlinear Optimization," at ORSA/TIMS Joint National Meeting, Los Angeles, CA, April 14-16, 1986.

97. "The Integration of Planning, Scheduling, and Control," at third International Conference on Chemical Process Control, Asilomar, CA, January 12-17, 1986.

98. "A survey of Nonlinear Programming Software," at ORSA/TIMS Joint National Meeting, Atlanta, GA, Nov. 3-6, 1985.

99. "Optimal Design of Efficient Acoustic Antenna Arrays," and "Experiments with SQP Algorithms," at 12th International Symposium on Mathematical Programming, Boston, MA, Aug. 5-9, 1985.

100. "Solving Sonar Array Problems on a Vector Processing Computer," at ORSA/TIMS Joint National Meeting, Boston, MA, April 29-May 1, 1985.

101. "The Integration of Planning, Scheduling, and Control," Ford Motor CO, Detroit, MI, April 26, 1985.

102. "Experience with a Trust Region SQP Algorithm" and session chairman on "Nonlinear Programming Applications and Software" at ORSA/TIMS Joint National Meeting, Dallas, TX, November 26-28, 1984.

103. "Nonlinear Programming Applications," invited lecture at International Federation of Operations Research Conference, Washington, DC, August 6-10, 1984.

104. "The IFPS/OPTIMUM Interactive Optimization System" and session chairman at the 27th TIMS International Meeting, Copenhagen, Denmark, June 17-21, 1984.

105. Invited plenary session speaker on "Experience with SLP and GRG Algorithms and Applications" at SIAM Conference on Numerical Optimization, Boulder, CO, June 11-14, 1984.

106. "Sonar Array Design Using Mathematical Programming," at ORSA/TIMS Joint National Meeting, San Francisco, CA, May 14-16, 1984.

107. "Hierarchical Systems for Production Planning, Scheduling, and Control," invited lecture at 30th anniversary of Systems Research Center, Case Western Reserve University, Houston, TX, May 3, 1984.

108. "Nonlinear Programming - Algorithms, Software, Applications," invited lecture at Southern Methodist University, Dallas, TX, April 6, 1984.

109. Presented an invited lecture on "Recent Advances in Optimization Software and Modeling Languages" at the Operations Research Department of Case Western Reserve University, Cleveland, OH, April 29, 1983.

110. Gave four lectures at an ORSA/TIMS conference in Chicago, IL, April 25-27, 1983. The topics were "Design of Sonar Arrays Using Mathematical Programming," "GRG3 - An Improved Nonlinear Programming System," "Large Scale Nonlinear Optimization," and "Successive Linear Programming Software for Large Nonlinear Programs." Also chaired a session on "Nonlinear Programming."

111. "Current and Future Developments in Optimization," invited lecture at doctoral colloquium attended by selected graduate students in Management Science on a national basis. Sponsored by ORSA, Chicago, IL, April 21-24, 1983.

112. "Large Scale Nonlinear Programming" at American Institute of Chemical Engineers National Meeting, Los Angeles, CA, November 18-19, 1982.

113. Talk on "Solving Large Sonar Array Design Problems" and chaired session on "Large Scale Systems Optimization" at National ORSA/TIMS meeting, San Diego, CA, October 25-27, 1982.

114. "Nonlinear Optimization Software and its Use in Design Automation" at the ASME Design Automation Conference, Washington, DC, September 12-14, 1982.

115. "Reduced Gradient Methods," given at NATO Advanced Research Institute on Nonlinear Programming, Cambridge, England, July 13-24, 1981.

116. Invited lecture on Nonlinear Programming at the Hydro-Quebec research Institute, Montreal, Canada, May 15, 1981.

117. Invited lecture on Nonlinear Programming Algorithms and Software at "SHARE 56" meeting, Houston, TX, March 8, 1981.

118. "Recent Developments in Nonlinear Programming Software and Applications," invited speaker at "Conference on the Mathematics of Operations Research and Systems Theory," Lunteren, Holland, January 14-16, 1981.

119. "Large Scale Nonlinear Programming: Application to Electric Power Systems" at "Optimization Days," University of Quebec, Montreal, Canada, May 13-14, 1981.

120. Chaired a session and presented a talk on "Nonlinear Network Optimization" at CORS-TIMS-ORSA Joint National Meeting, Toronto, Canada, May 3-6, 1981.

121. Talk on "Large Scale Nonlinear Programming" (invited) at Case Centennial Symposium on Large-Scale Systems, Cleveland, OH, November 13-14, 1980.

122. "Optimal Control of Large Nonlinear Econometric Models" and "An Application of Optimum Control Theory to Petroleum Reservoir Management", at ORSA/TIMS national meeting, Colorado Springs, CO, 11/9-11/12, 1980.

123. Invited speaker in a plenary session at the Tenth International Symposium on Mathematical Programming, Montreal, Canada, August 27-31, 1979. Spoke on "A Survey of Nonlinear Programming Software and Applications."

124. ORSA/TIMS National Meeting, New Orleans, LA., 4/30-5/2, 1979. Chaired session on "Nonlinear Programming Software and Applications" and presented talk on "Experience

with MINOS/GRG in Solving Large Non-Linear Programming Problems in Economic Planning."

125. Lectured for two weeks in the People's Republic of China, Dec. 25-Jan. 8, 1978-1979. Invited by the Chinese Academy of Sciences.

126. Invited speaker at the International Symposium on Systems Optimization and Analysis, Versailles, France, Dec. 11-13, 1978. Spoke on "Solving Nonlinear Economic Planning Problems Using GRG Algorithms."

127. ORSA/TIMS National Meeting, Los Angeles, CA, Nov. 13-15, 1978. Chaired session on Large Scale Systems Optimization and spoke on "The Application of OPTCON, an Optimal Control Program, to the MPS Econometric Model."

128. Invited Speaker at ORSA/TIMS National Meeting, New York, NY, May 1-3, 1978. Spoke on "Unconstrained Minimizers in GRG Algorithms," and was member of panel in discussion on "Need for Research with Respect to Management Science Applications in Developing Countries."

129. Texas Conference on Mathematical Software, The University of Texas, Austin, Austin, TX, March 29-31, 1978. Spoke on "GRG Software for Nonlinear Optimization."

130. ORSA/TIMS National Meeting, Atlanta, GA, Nov. 7-9, 1977. Gave invited talk on "Optimal Control of Large Nonlinear Planning Models," was member of panel in discussion on "Large Scale Mathematical Programming Special Structure--When Is It Useful," chaired session on "Large Scale Systems."

131. Invited Speaker at ASME Design Automation Conference, Chicago, IL, Sept. 26-28, 1977. Spoke on "The Solution of Very Large Nonlinear Programs."

132. Invited Lecturer in the NATO Advanced Study Institute on "The Design and Implementation of Optimization Software, Urbino, Italy, June 20-July 2, 1977.

133. Invited Speaker at conference on "The Disaggregation Problem," Ohio State University, Columbus, OH, , March 9-11, 1977, "An Efficient Algorithm for Multi-Item Scheduling."

134. ORSA/TIMS Joint National Meeting, San Francisco, CA, May 9-11, 1977. Panel member in discussion on "Guidelines for Computational Testing of Mathematical Programming Algorithms and Software," and gave paper on "An Improved GRG Code for Nonlinear Programming."

135. ORSA/TIMS Joint National Meeting, MiaMI, FL, Nov. 3-5, 1976. Gave invited talks on "A Survey of Users of Nonlinear Programming" and "An In-Core Nonlinear Mathematical Programming System for Large Sparse Nonlinear Programs" and chaired a session on "Algorithms for Large Scale Optimization Problems."

136. Lecturer in tour of several Far East countries sponsored by Office of Naval Research, June 1-July 15, 1976. Lectured on numerous topics in management science. Countries visited: Japan, Hong Kong, Taiwan, Philippines, and Singapore.

137. Chairman of session on "Large Scale Programming Systems I," ORSA/TIMS National Meeting, Philadelphia, PA, March 31-April 2, 1976. Also appeared as member of panel in discussion on "Is Mathematical Programming Moribund."

138. Invited Speaker, ORSA/TIMS National Meeting, Las Vegas, NV, Nov. 17-19, 1975, "Design of a Large Scale Nonlinear Programming System."

139. Invited Speaker, TIMS International Meeting, Kyoto, Japan, July 24-26, 1975, "Large Scale Nonlinear Programming."

140. Invited Speaker, Symposium on Mathematical Optimization and Engineering Design, Chicago, IL, April 30-May 2, 1975, "Optimal Design of Acoustic Sonar Transducer Arrays."

141. Invited Speaker, ORSA/TIMS National Meeting, Chicago, IL, April 30 - May 2, 1975, "Design and Testing of a Generalized Reduced Gradient Code for Nonlinear Programming." Also chaired session on "Large Scale Optimization."

142. 46th National ORSA/TIMS Meeting, San Juan, Puerto Rico, Oct. 16-18, 1974, "A Generalized Reduced Gradient Method for Nonlinear Programming."

143. Chairman of session on "Large Scale Mathematical Programming," at 46th National ORSA/TIMS Meeting, San Juan, Puerto Rico, Oct. 16-18, 1974.

144. Invited Speaker, ORSA/TIMS Joint National Meeting, Boston, MA, April 22-24, 1974, "Development and Use of a Large Scale Production Planning System."

145. 44th National ORSA Meeting, San Diego, CA, November 12, 1973, "Some OR Applications in the Cuyahoga County Common Pleas Court."

146. Invited Speaker, VIII International Symposium on Mathematical Programming, Stanford University, CA, August 1973, "One Dimensional Search and Penalty Methods -- Some Theoretical and Computational Results."

147. Invited Participant in a small workshop, sponsored by the American Bar Association, on Juror Selection and Management, Washington, DC, June 10-12, 1973.

148. Invited Speaker, 43rd National ORSA Meeting, Milwaukee, MI, May 9-11, 1973, "A Survey of Large Scale Mathematical Programming."

149. National Conference of Metropolitan Courts, San Francisco, CA, Oct. 11-13, 1972. "Effective Utilization of Jurors."

150. Invited Lecturer, NATO Advanced Study Institute on "Decomposition as a Tool for Solving Large Scale Problems," Cambridge, England, July 17-26, 1972. Spoke on "Decomposition of a Ship Routing Problem."

151. Forty-first National ORSA Meeting, New Orleans, LA., April 1972. Chaired the session on "Large Scale Systems," and presented a talk on "An Efficient One Dimensional Search Procedure for Barrier Functions."

152. IEEE Conference on Decision and Control, MiaMI, FL, Dec. 16-18, 1971. Chaired the session on "Large Scale Systems" and spoke on "Specially Structured Algorithms for Penalty Functions."

153. Invited Lecturer at the NATO international summer school on "The Impact of Optimization Theory on Technological Design," Leuven, Belgium, July 26-August 6, 1971. Spoke on Large Scale Systems Optimization and Technological Design.

154. Invited Lecturer at the NATO Conference on Applications of Optimization Methods for Large-Scale Resource-Allocation Problems, Elsinore, Denmark, July 5-9, 1971. Spoke on Generalized Upper Bounding Methods and Production Scheduling.

155. 39th National ORSA Meeting, Dallas, TX, ay 5-7, 1971. Chaired the session on "Large Scale Systems."

156. Econometric Society Meeting, Detroit, IL, December 27-30, 1970. Spoke on "Mathematical Programming and Decentralized Decision Making."

157. 38th National ORSA Meeting, Detroit, IL, October 28-30, 1970. Spoke on "A Special Purpose Algorithm for Minimizing Penalty and Barrier Function."

158. Israel Operations Research Society Meeting, Tel Aviv, Israel, June 1969 spoke on production scheduling and inventory control.

159. TIMS-ORSA meeting, San Francisco, CA, May 1968. Spoke on an efficient algorithm for multi-item scheduling.

160. First annual meeting of the IEEE group on Systems Science and Cybernetics, Boston, MA, October 1967. Spoke on decomposition in mathematical programming.

161. TIMS International Meeting, Mexico City, Mexico, August 1967. Spoke on Duality and Decomposition in Mathematical Programming.

162. Joint Automatic Control Conference, Philadelphia, PA, June 1967. Spoke on an Interior Penalty Method for Optimal Control.

163. Fourth Allerton Conference on System and Circuit Theory, University of Illinois, IL, October 1966. Spoke on the conjugate gradient method for optimal control problems.

164. Second Systems Engineering Conference, McCormick Place, Chicago, IL, Sept. 1965. Spoke on multi-level solution of optimization problems.

165. Third Allerton Conference on System and Circuit Theory, University of Illinois, IL, October 1965. Spoke on Filter Design Using Mathematical Programming.

166. Twentieth Annual I.S.A. Conference, Los Angeles, CA, October 4-7, 1965. Spoke on multi-item scheduling.

167. Nineteenth Annual I.S.A. Conference, New York, NY, October 12-15, 1964. Spoke on Optimal Control of Coupled Systems.

168. TIMS Conference, San Francisco, CA, February 1965. Spoke on decomposition of optimization problems.

169. A.I.Ch.E. Meeting, London, England, June 1965. Spoke on optimization of Chemical Processes.

170. A.I.Ch.E. Annual Meeting, Las Vegas, NV, September 1964. Spoke on decomposition of optimization problems.

INTERNATIONAL SPEAKING TOURS AND CONSULTING:

1. Presented an invited plenary talk titled "Solving a Large Nonlinear Optimization Model of River Basin Operations," at the International Conference on Nonlinear Programming and Variational Inequalities, at the City University of Hong Kong, Hong Kong, December 15-18, 1998.

2. Gave a presentation on "Business Process Reengineering" at the International Seminar "Management Science 2000," at the University of Los Andes, Bogota, Colombia, August 24-26, 1994.

3. Invited plenary session speaker at the Twelfth National Conference of the Australian Society for Operations Research, in Adelaide, Australia, July 7-9, 1993. Spoke on "Primal-Dual and Primal Interior Point Algorithm for Several Nonlinear Programs" and on "Recent Development on Spreadsheet Optimization."

4. Served as consultant to the World Bank on a project in China dealing with the planning of water, air, and solid waste treatment facilities. Location was in Beijing during the period 8/16/92-8/23/92, working and lecturing at the Chinese Institute of Environmental Management.
5. Served as consultant to the UNDP in a 1-month tour of Computer Aided Management Centers in India, Dec 1987 - Jan 1988. Spoke on optimization software and modeling languages, and advised on the conduct of center projects.
6. Lectured for two weeks in China December 25, l979 - January 8, l980 on invitation of the Chinese Academy of Sciences. Spoke in Peking and Shanghai on mathematical programming algorithms, software, and applications (visit described in publication no. 50).
7. Served as UNDP expert in computer science at the Universities Computer Center, Rangoon, Burma, December l976. Lectured and consulted on the theory and applications of various operations research techniques.
8. Served as lecturer in a tour of the Far East sponsored by the Office of Naval Research, June-July l976. Visited Japan, Taiwan, Hong Kong, Philippines, Singapore. Lectured on various aspects of mathematical programming and its applications (visit described in publication no. 38).

SOFTWARE PUBLISHING:

1. Co-author (with Stuart Smith) of LSGRG2, an enhancement of GRG2 for large sparse nonlinear programs.
2. Co-author (with J. Plummer, S. Sarkar, Y. Fan, D. Mahidhara) of SQP. This solves nonlinear programs by Successive Quadratic Programming.
3. Co-author (with J. Plummer, R. Marsten) of SLP, which solves both small and large sparse nonlinear programs by Successive Linear Programming.
4. Co-author (with Execucom Systems Corp.) of IFPS/OPTIMUM, which combines several optimizers (including GRG2) with the widely used planning language IFPS. This system is now marketed by Execucom Systems Corp., and is used by over 200 private sector organizations and 60 universities.
5. Co-author (with A. Waren and L. Schrage) of GINO, an interactive version of GRG2 (see (1) above) for personal computers. A book on the system was published in 1986, and both program and book are marketed by Scientific Press.
6. Co-author (with A. Waren) of a nonlinear optimization computer program called GRG2. Both current and previous versions are now used in over 100 universities and research institutes in 11 countries and in over 20 for-profit organizations. GRG2 was ranked second overall out of over 30 programs in a recent international comparison of such programs.

GRADUATE STUDENT THESES SUPERVISED:

Format: Student, Degree, Date of Graduation, Thesis Title

1. Wei Chen, PhD, IROM dept, July 2011, Multistage Stochastic Programming Models for the Portfolio Optimization of Oil Field Projects

2. Lawrence Van Fulton, Ph.D.-MSIS, 3/05, Performance of Army Medical Department Health Delivery Components, 2001-2003: A Multi-model Approach.
3. Abhijit Chatterjee, Ph.D.-MSIS, 7/03, Data Mining and Optimization: Applications in Customer Portfolio Management in the Credit Card Industry.
4. Zsolt Gyula Ugray, Ph.D.-MSIS, 9/01, OQGRG: A Multi-Start Algorithm for Global Solution for Nonlinear and Mixed Integer Programs.
5. Ravindra S. Gajulapalli, Ph.D.-MSIS, 7/95, INTOPT: An Interior Point Algorithm for Large Scale Nonlinear Optimization.
6. Songjun Luo, Ph.D.-MSIS, Sum/94, Airline Schedule Perturbation Management.
7. Sambit Mukherjee, Ph.D.-MSIS, 8/92, Optimization and Implementation Procedures for the Media Planning Problem.
8. Jose Carlos M. Maia, Ph.D.-MSIS, 8/92, Modeling and Solution Strategies for Large Nonlinear Production Planning Model.
9. Stuart Smith, Ph.D.-MSIS, 8/90, Design and Testing of a Large Scale GRG Algorithm and Grasp Approaches for Independent Set and Graph Coloring.
10. Deepa Mahidhara, Ph.D.-MSIS, 8/89, The Theory and Implementation of a Large Scale Successive Quadratic Programming Algorithm.
11. Ramayya Krishnan, Ph.D.-MSIS, 12/87, Knowledge Based Aids for Production Planning.
12. John Plummer, Ph.D.-Business, 9/86, An Application of Lagrangian Relaxation to a Large-Scale Constrained Nonlinear Minimax Problem.
13. Yuan-An Fan, Ph.D.-Business, 7/85, Experiments with Successive Quadratic Programming Algorithms.
14. Patrick Henaff, Ph.D.-Business, 6/85, A Newton's Algorithm for Solving Multicountry Econometric Models.
15. Swapan Sarkar, Ph.D.-Business, 6/84, Analysis, Implementation and Testing of Successive Quadratic Programming Algorithms.
16. Nae-Heon Kim, Ph.D.-Mech., 6/83, A New Variant of Engineering Successive Linear Programming.
17. Joseph Melton, Ph.D.-Mech., 9/82, An Investment Planning Engineering Model for an Oil Shale Industry in the Piceance Basin.
18. Eugene Coffman, Ph.D.-Business, 9/82, Optimal Production from Gas and Oil Reservoirs.
19. Ranavir Bose, Ph.D.-Business, 6/82, An Optimization Approach to Electric Utility Corporate Models.
20. Phillip Beck, Ph.D.-Business, 5/81, Nonlinear Networks.
21. Victor Hsin, Ph.D.-Business, 7/80, Optimal Control of Econo-Business metric Models.
22. Fernando Palacios, Ph.D.-Business, 12/79, The Solution of Nonlinear Optimization Problems Using Successive Linear Programming.
23. Asim Roy, Ph.D.-Business, 12/79, Optimization and Financial Planning.
24. Joseph Mantell, Ph.D.-OR, 6/77, Optimal Control.
25. Arvind Jain, Ph.D.-OR, 6/76, Nonlinear Optimization Using GRG.

26. Cornelis DeKluyver, Ph.D.-OR, 1/75, Innovation and Industrial Product Life Cycles: A Heuristic Classification System.
27. Joseph Svetska, Ph.D.-OR, 8/74, Application of Operations Research to a Check Processing System.
28. Donald Kylin, Ph.D.-OR, 9/72, An Automated Strip Steel Inspection System.
29. Jack Mathis, Ph.D.-OR, 9/72, Synthesis of a Crude Oil Supply System.
30. Andrew Daughety, Ph.D.-OR, 9/72, Operations Research Applications in Housing Inspection Code Enforcement.
31. Vaughn Huckfeldt, M.S.-OR, 6/71, Nonlinear Optimization with Upper and Lower Bounds.
32. Robert Fricks, Ph.D.-OR, 10/70, Nonconvex Optimization.
33. James Hartman, Ph.D.-OR, 8/70, Large Scale Linear Programs.
34. Benjamin Lev, Ph.D.-OR, 9/70, Specially Structured Transportation Problems.
35. Gary Silverman, Ph.D.-OR, 9/68, Primal Decomposition of Mathematical Programs by Resource Allocation.
36. Josef Schengili, M.S.-Business, 6/68, Production and Distribution Problems with Some Discrete Decision Variables.
37. T.S. Chidambaram, Ph.D.-OR, 6/67, Coordination Problems in Competitive Situations.
38. Emilio Nunez, M.S.-Eng., 6/67, Application of Dual-Feasible Decomposition to the Optimization of an Airlift Thermo for Catalytic Cracker.
39. Lawrence Munini, M.S.-Eng., 6/66, Optimization of Coupled Systems by Decomposition.

CONSULTING EXPERIENCE:

1. *Consultant, British petroleum, 2009-present.* Work involves helping BP develop a GAMS model which fits and optimizes a family of CRM models (Capacitive-Resistive Models) for predicted the effects of water or gas injection into producing oil and gas fields.
2. *Consultant, Dell Computer Co., June 2004-2006.* Work involves developing optimization models to plan the allocation of calls for technical support from Dell customers to multiple call centers worldwide.
3. *Consultant, National Oil Well, June 2003-2004.* Work involves models to estimate savings from reducing and centralizing inventory levels.
4. *Consultant, Shell Chemical Co. and Shell Global Services, 2001-2003.* Work involves nonlinear gasoline blending models.
5. *Consultant, CSCI Inc., July 2000-2002*. Work involves developing models for ballistic missile defense.
6. *Consultant, Trajecta, Inc., 1999-2002*. Work involved developing and implementing decision support models for marketing applications.
7. *Consultant, Internal Revenue Service, 1995-1996.* Work involved location of offices for information systems hardware and software, and planning expansion of the IRS telecommunications network.
8. *Consultant, Basil Joffe and Associates, 1994-1996.* Work involved enhancements to the widely used refinery modeling systems, PIMS.

9. *Consultant, EXXON Chemicals, 1987-1989.* Work involved process unit optimization and optimization modeling systems.

10. *Consultant, ARCO Exploration and Development CO, 1984.* Work involved the use of nonlinear optimization methods to estimate the parameters of a model used to predict hydrocarbon flows using enhanced recovery techniques.

11. *Consultant, Naval Undersea Systems Center, New London, Conn., 1982-1984.* Work involved the use of optimization to aid in the design of advanced sonar systems.

12. *Consultant, Shell Oil CO, 1983-1985.* Work involved a long range plan for the integration of planning, scheduling, and control systems throughout Shell.

13. *Consultant, Electric Power Research Institute (EPRI), 1981-1984.* Work involved optimal allocation of reactive power sources in a large power network.

14. *Consultant, Texas Energy and Natural Resource Council (TENRAC), Spring 1981.* Work involved review of proposals and contractors' work on energy models for Texas.

15. *Consultant, IBM, 1980-1982.* Work involved determining optimal energy use in office buildings.

16. *Consultant, U.S. Department of Energy, December 1979-1981.* Work involved design and use of LP refinery models.

17. *Consultant, Los Alamos Scientific Laboratories, 1979-1983.* Work involved optimal operation of oil and gas reservoirs.

18. *Consultant, Shell and Exxon Oil Companies, 1979-80.* Work involved various applications of mathematical programming.

19. *Consultant to the U.S. Air Force*, on the use of mathematical methods in manpower planning, 1978.

20. *Consultant to the World Bank*, on the use of nonlinear optimization models in economic planning for developing countries, 1977-1980.

21. *Consultant to U.S. Dept. of Energy*, on the use of nonlinear optimization models in national energy planning, 1977-78.

22. *Consultant to Systems Control, Inc., Palo Alto, CA*, on design of models of the U.S. Agricultural system, 1977-78.

23. *Consultant, Western Interstate Commission on Higher Education, Jan. 1975-1976.* The work involved aiding in the design of an algorithm for solving dynamic optimization (optimal control) problems. This algorithm is embedded within a larger interactive system of computer programs which permit construction of dynamic models used in educational planning.

24. *Consultant, City of Cleveland Police Department, August 1973-June 1974.* This work included systems analysis and software design to aid in the following areas of police operations: patrol division (allocation, dispatching, and response time of patrol vehicles), traffic division (geographic distribution of accidents, automation of required reports), and services division (analysis of information flow and requirements). Many of the programs developed are currently being used by the department.

25. *Consultant, Gould Corporation, Ocean Systems Division, Jan. 1973-April 1973.* Work involved design of sonar acoustic arrays using nonlinear programming. Tasks include array analysis, formulation as a nonlinear program, synthesis of an appropriate nonlinear programming code, and solution of a number of array design problems.

26. *Consultant, Cleveland Court Management Project, Sept. 1972-June 1973.* Work involved the design of an interactive information system to aid in the scheduling of civil and criminal cases.

Tasks include systems analysis, data base design, detailed design of the computerized system, and coding of some programs in COBOL and IMS.

27. *Consultant, Cuyahoga County Common Pleas Court, June 1972-Sept. 1973.* Work involved continuation and extensions of the project described in (8) above.

28. *Consultant, Cleveland Court Management Project, Sept. 1971-June 1972.* Work involved design of a computer-based information system to promote more efficient utilization of jurors. Results have been implemented by the court, with significant resultant savings.

29. *Consultant for the Chi Corporation, 1968-70.* Work involved formulation of problems as linear programs, solution, and interpretation of results. Other work involved design of large product distribution systems.

30. *Consultant to the "Joint Panel for Development of a Coordinated Management System for Ammunitions Production," U.S. Army, Navy, Air Force; June 1971-1972.* Work involved aiding in the construction of a decision model for planning procurement, production, and work force in joint munitions production of the armed services.

31. *Consultant for Babcock and Wilcox, Inc., Dec. 1969-Dec. 1970.* Work involved selection of optimal lengths and optimal cutting patterns for drawn steel tubing.

32. *Consultant for the Veterans Hospital, Cleveland, Ohio, 1966-68.* The problem was to estimate the parameters of a 3 to 5 pool mathematical model of the kidney from numerical data (rhenograms). The model was a set of simultaneous linear differential equations, with model parameters appearing in the coefficient matrix. A computer program to perform the estimation, using the method of least squares, was written and used.

33. *Consultant for the Quaker Oats Company, Chicago, Illinois, 1966-67.* Work involved long-run production planning and short-term production and distribution problems. Efforts centered on formulating these problems as mathematical programs and developing algorithms for solution.

34. *Consultant for Clevite Corporation, Cleveland, Ohio 1965-67.* Work included development of a method for computer design of piezoelectric filter networks, reported in publications 5, 8, 10. The technique was extended to the automatic design of linear arrays of transducers (publication 14), and to the design of planar arrays of hydro-acoustic transducers (publication 18) to meet specifications on many patterns in many planes.

35. *Consultant for Goodyear Tire and Rubber Company, Akron, Ohio 1964-71.* Work focused on the development of a decomposition algorithm for multi-item production scheduling. This now forms the core of an integrated computerized, production scheduling and inventory control system, which was used to schedule the production of hundreds of items in 4 major plants. This work won the Lanchester prize (for the year's best OR/MS application) in 1981.