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FORMAL EDUCATION:

- Ph.D. Mathematics, Courant Institute of Mathematical Sciences, NYU, 1976
- M.S. Computer Science/Mathematics, Courant Institute, NYU, 1974
- B.S. Physics, Tulane University, 1972 (cum laude with Honors)
- B.S. Mathematics, Tulane University, 1972 (cum laude with Honors)

THESIS: “The Method of Lines Solution of Partial Differential Equations,” written under the guidance of Prof. Peter D. Lax.

RESEARCH INTERESTS: The development and analysis of numerical methods and software for the solution of partial differential equations.

EMPLOYMENT HISTORY:

- 1998–Present Los Alamos DOE Program Manager in Applied Mathematics (MICS)
- 1985–Present Group Leader, LANL Mathematical Modeling and Analysis Group T-7.
- 1988–Present Adjunct Professor of Mathematics, University of Arizona.
- 1986–1988 Administrative Manager, LANL Advanced Computing Facility.
- 1982–Present Executive Council, Center for Nonlinear Studies, LANL.
- 1982–1983 Associate Chair, Center for Nonlinear Studies, LANL.
- 1980–1985 Deputy Group Leader, LANL Mathematical Modeling and Analysis.
- 1976–Present Research Staff, LANL, Mathematical Modeling and Analysis.
- 1972–1976 Research Assistant, Courant Institute of Mathematical Sciences, NYU.
- 1975–Summer Los Alamos Scientific Laboratory, digital image enhancement.
- 1974–Summer Los Alamos Scientific Laboratory, mathematical immunology.
- 1972–Summer Lawrence Livermore Laboratory, atmospheric pollution.

PROFESSIONAL ACTIVITIES:

- 2006–Present Member Tulane School of Engineering Advisory Board
- 2005–Present Chair of the NSF Institute for Pure and Applied Mathematics (IPAM)
Board of Trustees
- 2004–Present Chair SIAM Science Policy Committee
- 2006–Present Editor-in-Chief SIAM Frontier Book Series
- 1993–Present Editor of the International J. of Computers and Mathematics
- 1990–Present Editor of the SIAM J. on Scientific Computing
- 1989–Present Editor for International Journal of High-Speed Computing

2005–2006 Past President, Society for Industrial and Applied Mathematics (SIAM)
 2002–2006 Member of the Council of Scientific Society Presidents
 1998–2005 Member of the SIAM Council
 1998–2005 Member of the SIAM Systems Oversight committee
 1998–Present SIAM Committee on Science Policy
 2003–2004 President, Society for Industrial and Applied Mathematics (SIAM)
 2003–2005 Chair of the SIAM Council
 1999–2005 Editor of the SIAM J. Multiscale Modeling and Simulation
 2001 Co-Chair of the IMA Special Year on Mathematics in the Geosciences
 1998–2002 Vice President of the Society for Industrial and Applied Mathematics (SIAM) for Publications
 1996–2000 Member of the Scientific Program Advisory Committee for the NSF Institute for Mathematics and its Applications
 1998–2002 Chair of the SIAM Board of Editors-in-Chief
 2001 Co-Chair of the SIAM 2001 Annual Meeting
 2000 Co-organizer with Misha Shashkov, Joel Dendy, Len Margolin, Blair Swartz for the Conference on Systems of Conservation Laws and Related Topics
 1999 Co-organizer with James Cavendish for the NSF/IMA Conference on Decision Making under Uncertainty: Assessment of the Reliability of Mathematical Models
 1999 Co-organizer with David Sharp, Shiyi Chen, Sallie Keller-McNulty, Len Margolin, and Timothy Trucano for the DOE Workshop on Predictability of Complex Phenomena
 1999 Co-organizer for the II PanAmerican Workshop: Applied and Computational Mathematics
 1999 Co-organizer with Shiyi Chen and Weinan E for the CNLS Workshop on Incompressible Fluid Flows: Numerical Methods and Applications
 1998–Present SIAM Vice President for Publications
 1998–2000 Member of the SIAM Community Lecture Series Committee
 1998–Present Member of the SIAM Systems Oversight Committee
 1997 Organizer/Chair CNLS Conference on Nonlinear Waves and Solitons in Physical Systems
 1997–1999 Member of the SIAM Compensation Committee of the Board
 1995–1998 Member of the Council of the AMS
 1995–1996 Member of the Committee on Education of the AMS
 1995–1996 AMS Committee on Publications
 1996–1998 AMS Committee on Meetings and Conferences
 1995 Member of NSF Committee on Visitor Review Panel for the New Technologies Program
 1995 Co-organizer with Misha Shashkov on CNLS Workshop using Knowledge Engineering and Computer Algebra to Write Complex Computer Programs
 1995 Co-organizer with P. Deift, P. Holmes, D. Levermore, D. McLaughlin and E. Wayne for the Annual AMS-SIAM Summer Program: Dynamical Systems and Probabilistic Methods for Nonlinear Waves

- 1993 Co-Organizer/Chair with D. Holm and W. Newman of the CNLS Annual Conference on Modeling the Forces of Nature
- 1993–1999 Member of the Board of Trustees for SIAM
- 1992–1999 Editor-in-Chief of the SIAM J. on Scientific Computing
- 1992–1994 Chair of the Joint AMS-SIAM Committee on Applied Mathematics
- 1992–1994 Member of the AMS Task Force on Education, Industry, & Government Interactions
- 1992–1995 Member of the Board of Governors for the NSF Institute for Mathematics and its Applications
- 1992 Organizer/Chair of the SIAM, Annual Conference 1992
- 1991 Organizer/Chair of CNLS Annual Conference on Experimental Mathematics: Computational Issues in Nonlinear Science
- 1990 Co-Organizer/Chair with D. Campbell and R. Ecke of the CNLS Annual Conference on Nonlinear Science: The Next Decade
- 1989 Co-organizer with J. R. Buchler of the NATO Advanced Research Workshop on the Modeling of Nonlinear Stellar Pulsations
- 1988–1992 National Academy of Sciences NRC/NIST Panel for Computing and Applied Mathematics
- 1988–1991 Vice-chair of Society of Industrial and Applied Mathematics Special Interest Group in Supercomputing
- 1988–1992 SIAM Committee on Committees and Appointments
- 1988–1991 Treasurer of SIAM Special Interest Group on Dynamical Systems
- 1987–1995 Editor for International Journal of Supercomputer Applications
- 1987–1991 Mathematical Association of America State of the OSTP Workshop to develop recommendations for a National Scientific Effort on AIDS Modeling and Epidemiology
- 1987 Co-chair with Ann Stanley for CNLS Conference on Nonlinear Systems of Parabolic PDEs
- 1986 Ten-hour lecture series on “Blending Analysis and Numerics for Solving PDEs,” University of California Summer School on “ Experimental Mathematics: Computation and Discovery in Nonlinear Science ”
- 1982–1985 National Academy of Sciences Committee on Applications of Mathematics. Co-authored the Committee’s report Computational Modeling and Mathematics Applied to the Physical Sciences
- 1984 Co-chair, AMS-SIAM two-week Summer Seminar on Systems of Non-linear Partial Differential Equations
- 1983 Co-chair, CNLS Conference on Implicit Methods for PDEs
- 1982 Co-chair with R. Kirkpatrick and B. Sitt, CEA/Los Alamos meeting on Hydrodynamic Shock Waves and Instabilities
- 1981 Chair, CNLS Adaptive Mesh Methods Conference, Los Alamos
 Referee for professional journals and granting agencies: J. Comp. Phys., SIAM J. Sci. and Stat. Comp., SIAM J. Num. Anal., AIAA, Phys. of Fluids, Phys. Lett. A., NSF, DOE-BES/AMS, ARO, AFOSR, and NIH.

PUBLICATIONS AND SELECTED REPORTS:

Books Edited:

1. **An Introduction to Forward and Backward Sensitivity Analysis**, with L. Arriola, Los Alamos book preprint (2006).
2. **Method of Lines**, editor with T. Taha, L. Petzold, and W. Schiesser, Elsevier Science B (2001). Published as a special issue of *Mathematics and Computers in Simulation* 56 (2001).
3. **Nonlinear Waves and Solitons in Physical Systems**, editor with R. Camassa and B. Luce, North-Holland, North-Holland (1998). Also published as a special issue of *Physica D* **123** (1998).
4. **Modeling the Forces of Nature**, editor with R. Camassa and W. Newman, North-Holland, 1994. Also published as a special issue of *Physica D* **77** (1994).
5. **Experimental Mathematics: Computational Issues**, in *Nonlinear Science*, North-Holland (1992). Also published as a special issue of *Physica D* (1992).
6. **Nonlinear Science: The Next Decade**, with D. Campbell and R. Ecke, North-Holland (1991). Also published as a special issue of *Physica D* (1991).
7. **Nonlinear Systems of Partial Differential Equations in Applied Mathematics Part 2**, with D. D. Holm and B. Nicolaenko, *Lectures in Applied Mathematics*, Vol. **23**, Vol. **I**, American Mathematical Society, Providence, RI (1986).
8. **Nonlinear Systems of Partial Differential Equations in Applied Mathematics Part 1**, with D. D. Holm and B. Nicolaenko, *Lectures in Applied Mathematics*, Vol. **23**, Vol. **II**, American Mathematical Society, Providence, RI (1986).

Research Publications:

(Recent papers available at <http://math.lanl.gov/~mac/papers>)

1. "Principles of Mimetic Discretizations of Differential Operators," with Pavel B. Bochev, IMA Volume 142, Springer Verlag, eds. D. Arnold, P. Bochev, R. Lehoucq, R. Nicolaides and M. Shashkov, 2006, pp. 89-120
2. "Being Sensitive to Uncertainty," with L. M. Arriola; to appear in *Computing in Science and Engineering* (2006)
3. "Infection-Age Structured Epidemic Models with Behavior Change or Treatment," with J. Li; in review (2006)
4. "Stability of Logarithmic Functions Over p-adic Fields," with W. A. Beyer and L. M. Arriola; in review (2006)

5. "Determining important parameters in the spread of malaria through the sensitivity analysis of a mathematical model," with Nakul Chitnis and J. M. Cushing; in review (2006)
6. "Non-Adjoint Sensitivity Analysis of Initial Value Problems," with L. Arriola, In review (2006)
7. "Bifurcation Analysis of a Mathematical Model for Malaria Transmission," with N. Chitnis and J. M. Cushing; to appear SIAM J. Appl. Math (2006)
8. "Sensitivity Analysis of the Linear and Quadratic Programming Problem," with L. M. Arriola and B. Harris; in review (2006)
9. "Identifying Gaps in the Spectrum of Self-Adjoint Operators," with J. Restrepo and M. Hasson; to appear in Computers and Mathematics with Appl. (2006).
10. "Estimation of the Reproductive number of the Spanish Flu Epidemic in Geneva, Switzerland)," with G. Chowell, C. E. Ammon, and N. W. Hengartner; to appear in the Proceedings of the Second European Influenza Conference (St-Julians, Malta, September, 2006)
11. "Mathematical applications associated the deliberate release of infectious agents," with G. Chowell, A. Cintron-Arias, S. Del Valle, F. Sanchez, B. Song, H. W. Hethcote, and C. Castillo-Chavez; to appear in Modeling The Dynamics of Human Diseases: Emerging Paradigms and Challenges. AMS Cotemporary Mathematics Series (to appear) Gumel A., Castillo-Chavez, C., Clemence, D.P. and R.E. Mickens (2006)
12. "Transmission dynamics of the great influenza pandemic of 1918 in Geneva, Switzerland: Assessing the effects of hypothetical interventions," with G. Chowell, C. E. Ammon, and N. W. Hengartner; J. Theor. Biol. 241(2), 193-204 (2006)
13. "On Multi-dimensional Compactons ," with Philip Rosenau, and Martin Staley; in review (2006)
14. "Human-mediated Foot-and-mouth Disease Epidemic Dispersal: Disease and Vector Clusters," with A. L. Rivas, B. Kunsberg, G. Chowell, S. D. Smith, and S. J. Schwager; J. Vet. Med. B52, 1-10, 2006
15. "Age-Structured Epidemic Models," with Heterogeneous Mixing," with S. Del Valle, H.W. Hethcote, N. Chitnis, and J. Smith, in review (2006)
16. "Mixing Patterns Between Age Groups Using Social Networks," with S. Del Valle, H.W. Hethcote, and S. G. Eubank, in review (2006)
17. "The Role of Spatial Mixing in the Spread of Foot-and-Mouth Disease," with G. Chowell, A.L. Rivas, N.W. Henartner, and C. Castillo-Chavez; Prev. Vet. Med. 73, 297-314 (2006)

18. "Critical response to post-outbreak vaccination against foot-and-mouth disease," with G. Chowell, A.L. Rivas, N.W. Hengartner, and C. Castillo-Chavez; to appear in Modeling The Dynamics of Human Diseases: Emerging Paradigms and Challenges. AMS Cotemporary Math Series, Editors: Gumel A. , Castillo-Chavez, C., Clemence, D.P. and R.E. Mickens. (2006)
19. " Modelling the 2001 Foot-and-Mouth Epidemic in Uruguay using Geo-referenced Data," with G. Chowell, A. L. Rivas, N.W. Hengartner, C. Castillo-Chavez, To appear in Preventive Veterinary Medicine 2006
20. "Modeling the transmission dynamics of Acute Hemorrhagic Conjunctivitis: Application to a 2003 outbreak in Mexico," with G. Chowell , E. Shim, F. Brauer P. Diaz-Duenas, and C. Castillo-Chavez; Stat. Med. 25(11), 1840-1857 (2006)
21. "Differential susceptibility and infectivity epidemic models," with Jia Li; Math Biosciences and Eng, v.3, no.1, p.89-100 (2006)
22. "Identification of case clusters and counties of greater infective connectivity in the 2001 Uruguayan foot-and-mouth disease epidemic," with G. Chowell, A. L. Rivas, and S.D. Smith; Am. J. Vet. Res. 67(1), 102-113 (2006)
23. "Infection-Age Structured Epidemic Models with Behavior Change or Treatment," with J. Li, in review 2006
24. "Differential susceptibility epidemic models," with Jia Li; J. Math. Biol. 50, 626-644 (2005)
25. "Effects of Behavioral Changes in a Smallpox Attack," with S. Del Valle, H. Hethcote, and C. Castillo-Chavez, Mathematical Biosciences 195 (2005) 228-251
26. "Mixing Patterns Between Age Groups Using Social Networks," with S. Del Valle, S. Eubank, and H. Hethcote. (2005) in review.
27. "Bifurcation Analysis of a Mathematical Model for malaria Transmission," with N. Chitnis, J.M. Cushing, Submitted to SIAM J Applied Math (2005)
28. "The reproductive number for an HIV model with differential infectivity and staged progression," with J.Li, Linear Algebra and its Applications, Mar 2005; v.398, p.101-116
29. "Epidemiological models for mutating pathogens," with J. Li, Y.C. Zhou, Z. Ma, SIAM J on Applied Mathematics, 2005, v.65, no.1, p.1-23
30. "Modeling the 2001 Foot-and-Mouth Epidemic in Uruguay using Geo-referenced Data," with G. Chowell, A/L. Rivas, N.W. Hengartner, C. Castillo-Chavez, Submitted to Preventive Veterinary Medicine 2005.
31. "Predicting scorpion sting incidence in an endemic region using climatological variables," with G. Chowell, P. Diaz-Duenas, N. W. Hengartner, International J of Environmental Health Research. 15(6), 425-435 (2005)

32. "The Role of Spatial Mixing in the Spread of Foot-and-Mouth Disease," with G. Chowell, A. L. Rivas, N. W. Hengartner, and C. Castillo-Chavez. (in review 2005).
33. "Patch dynamics for multiscale problems," *Computing in Science and Engineering*; May-June 2005; vol.7, no.3, p.47-53
34. "Applications of Algebraic Topology to Compatible Spatial Discretizations," with P.B. Bochev, to appear in the Five-Laboratory Conference on Computational Mathematics proceedings, Vienna, June 2005, LAUR 05-4619
35. "Achieving Brouwer's law with high-order Stormer multistep methods," with K.R. Grazier, W.I. Newman, David J. Goldstein, Philip W. Sharp, to appear *Australian and New Zealand Industrial and Applied Mathematics J* 46(E) pp.C101–C119, 2005.
36. "Long Simulations of the Solar System: Brouwer's Law and Chaos," with K.R. Grazier, W.I. Newman, and P.W. Sharp. In review *Australian and New Zealand Industrial and Appl. Math. J. ANZIAM J.* 46(E) C1086-C1103
37. "Brouwer's Law: Optimal Multistep Integrators for Celestial Mechanics," with K.R. Grazier, W.I. Newman, D.J. Goldstein, and P.W. Sharp. In review *Australian and New Zealand Industrial and Appl. Math. J.* (2005)
38. "The Reproductive Number of Ebola and the Effects of Public Health Measures: The cases of Congo and Uganda," with G. Chowell, N. W. Hengartner, C. Castillo-Chavez, and P. W. Fenimore, *J. Theor. Biol.* 229(1), 119-126 (2004).
39. "Model Parameters and Outbreak Control for SARS," with G. Chowell, C. Castillo-Chavez, P.W. Fenimore, C. Kribs-Zaleta, and L. Arriola, *Emerg. Inf. Dis.* 10 (7) (2004) p.1258-1263
40. "A numerical study of the exact evolution equations for surface waves in water of finite depth," with Y.A. Li, W.Y. Choi, *Studies in Applied Math*, Oct 2004, v.113, no.3, p.303-324
41. "The convergence of mimetic discretization for rough grids," with S. Steinberg, *Computers and Mathematics with Applications*; 2004; vol.47, no.10-11, p.1565-610
42. "Epidemiological Models with Virus Strains Mutation and Hopf Bifurcation," with J. Li, Y. Zhou, and Z. Ma, *SIAM J. Appl. Math.* Vol. 65, No. 1, pp. 1-23 (2004)
43. "Infection-Age Structured Epidemic Models with Behavior Change or Treatment," with J. Li, in review *J. of Math. Biology*
44. "An Age-Structured Model of HIV infection that allows for the variations in the production rate of viral particulates and the death rate of productively infected cells," with P. W. Nelson, M. A. Gilchrist, D. Coombs, and A. S. Perelson, *Math Biosciences and Engineering*, Vol. 1, No. 2, 267-288 (2004)

45. "Effect of Behavior Changes in a Smallpox Model," with S. Del Valle, H. Hethcote, and C. Castillo-Chavez, in review *Math. Biosciences* (2004)
46. "The geographic spread of an infectious agent between the major cities in the US," with Tara LaForce, *Mathematical Modeling Applications in Homeland Security*, SIAM Pub. p. 215-240 (2003), T. Banks and C. Castillo-Chavez (Eds.)
47. "Modeling the impact of random screening and contact tracing in reducing the spread of HIV," with J. Li and E.A. Stanley, *Mathematical Biosciences*, 2003, v.181, no.1, p.17-54
48. "Computer arithmetic for probability distribution variables," with W.Y. Li, *Reliability Engineering and System Safety*, Jul-Sept 2004, v.85, no.1-3, p.191-209
49. "Non-Adjoint Sensitivity Analysis of Initial Value Problems," with L. Arriola, Submitted for publication *Mathematical Association of America Monthly*. (2004)
50. "Solution adapted mesh refinement and sensitivity analysis for parabolic partial differential equation systems," with S.T. Li and L.R. Petzold, *Lecture Notes in Computational Science and Engineering*, 2003, v.30, p.117-132
51. "Scaling laws for the movement of people between locations in a large city," with G. Chowell, S. Eubank, and C. Castillo-Chavez, *PHYSICAL REVIEW E*, DEC 2003, v.68, no.6, pt.2, p.066102
52. "Modeling the Impact of Random Screening and Contact Tracing in Reducing the Spread of AIDS," with with J. Li and E. A. Stanley, *Mathematical Biosciences*, **181** (1) (2003) pp. 066102-066108.
53. "An Adaptive Moving Mesh Method with Static Rezoning for Partial Differential Equations," with S. Li and L. Petzold, *Comp. Math. with Appl.*, **46**, (2003), pp. 1511-1524.
54. "Scaling laws for the movement of people between locations in a large city," with G. Chowell, S. Eubank and C. Castillo-Chavez, *Phys. Rev. E*, **68** (6) (2003) pp. 17-54.
55. "Differential Susceptibility Epidemic Models," with J. Li, in review, *J. of Math. Biology* (2003).
56. "High-Order Multistep and Runge Kutta Methods for the Numerical Solution of Stochastic PDEs," with M. Cliff, *Los Alamos Report* (2002).
57. "Mimetic finite difference methods for diffusion equations," with J. Morel, M. Shashkov and S. Steinberg, *Computational Geosciences* **6**, (2002), pp. 333-352.
58. "Mimetic Finite Difference Operators for Second-Order Tensors on Unstructured Grids," with J. C. Campbell and M. J. Shashkov, *Computers Math. with Applications*, **44** (2002) 157-173.

59. "Mimetic Finite Difference Methods for Maxwell's Equations and the Equations of Magnetic Diffusion," with M. Shashkov, *Prog. in Electromagnetic Research, PIER* **32**, (2001), 89-121.
60. "The Effect of Inner Products for Discrete Vector Fields on the Accuracy of Mimetic Finite Difference Methods," with M. Shashkov, and S. Steinberg, *Computers Math. with Applications*, **42**, No. 12, 1527-1548, (2001).
61. "Compacton Solutions in a Class of Generalized Fifth-Order KdV Equations," with F. Cooper and A. Khare, *Phys. Rev. E*, **6402**, No. 2.2, 6608- (2001).
62. "Mimetic Finite Difference Methods for Maxwell's Equations and the Equations of Magnetic Diffusion," with M. Shashkov, *J. of Electromagn. Waves and Appl.*, Vol. 15, No. 1, 107-108 (2001).
63. "Fourth and Sixth-Order Conservative Finite Difference Approximations of the Divergence and Gradient," with J. Castillo, M. Shashkov, and S. Steinberg, *Appl. Numerical Math.*, **37** (2001), 171-187.
64. "The Initialization and Sensitivity of Multigroup Models for the Transmission of HIV," with J. Li and E. A. Stanley, *J. Theor. Biology* **208**, No. 2, (2001) 227-249
65. "The origin of acquired immune deficiency syndrome: Darwinian or Lamarckian?," with T. Burr, and G. Myers, *Phil. Trans. R. Soc. Lond.* **B** (2001) **356**, 877-887.
66. "Stability, Relaxation, and Oscillation of Bidegradation Fronts," with J. Xin, *SIAM J. Appl. Math.* **61** (2000), no. 2, 472-505
67. "An Algorithm to Align a Quadrilateral Grid with Internal Boundaries," with S. Li, P. Knupp and M. Shashkov, *J. Comp. Physics*, **163**, No. 1, (2000) 133-149
68. "Impacts of Misspecifying the Evolutionary Model in Phylogenetic Tree Estimation," with T. Burr, and G. Myers, and A. Skourikhine, *Proceedings of the International Conference on Mathematics and Engineering Techniques in Medicine and Biological Sciences*, pp. 481-487 (2000)
69. "An Intuitive Formulation for the Reproductive Number for the Spread of Diseases in Heterogeneous Populations," with J. Li, *Math. Biosciences* **167**, No. 1, (2000) 65-86
70. "Sensitivity Studies of the Differential Infectivity and Staged Progression Models for the Transmission of HIV," with J. Li and E. A. Stanley, *Los Alamos Report LA-UR-99-2253* (1999).
71. "Dynamical Evolution of Planetesimals in the Outer Solar System. II. The Saturn/Uranus and Uranus/Neptune Zone," with K. R. Grazier, W. I. Newman, and W. M. Kaula, *ICARUS* **140**, 353-368 (1999).
72. "Dynamical Evolution of Planetesimals in the Outer Solar System. I. The Jupiter/Saturn Zone," with K. R. Grazier, W. I. Newman, and W. M. Kaula, *ICARUS* **140**, 341-352 (1999).

73. "Mimetic Discretizations for Maxwell's Equations," with M. Shashkov, *J. of Comp. Physics.* **151**, No. 2, 881-909 (1999)
74. "An Adaptive Moving Mesh Method with Static Rezoning for Partial Differential Equations," with S. Li and L. R. Petzold, Los Alamos Report LA-UR-98-5465 (1999)
75. "Interactive and Dynamic Control of Adaptive Mesh Refinement," with S. Li, Los Alamos Report LA-UR-98-5462 (1999), in review.
76. "An Adaptive Mesh Refinement Method for Two Dimensional PDEs," with S. Li, Los Alamos Report LA-UR-98-5463 (1998)
77. "An Adaptive Moving Mesh Method with Locally Refined Nested Grids for PDEs," with S. Li, Los Alamos Report LA-UR-98-5460 (1999)
78. "The Differentiated Infectivity and Staged Progression Models for the Transmission of HIV," with J. Li and E. A. Stanley, *Mathematical Biosciences* **155**, no. 2 (1999) 77-109
79. "The Orthogonal Decomposition Theorems for Mimetic Finite Difference Methods," with M. Shashkov, *SIAM J on Numerical Analysis*, **36**, No. 3, (1999) 788-818
80. "Nonlinear Waves and Solitons in Physical Systems," with R. Camassa and B. Luce, *Physica D* **123** no. 1-4, (1998) 1-20
81. "Pulsating Multiplet Solutions of Quintic Wave Equations," with P. Rosenau, *Physica D* **123** (1998) 502-512
82. "Mimetic Discretizations for Maxwell's equations and the equations of magnetic diffusion," with M. Shashkov, *Mathematical and Numerical Aspects of Wave Propagations*, J. A. DeSanto, ed., (SIAM, Philadelphia, 1998), 561-563.
83. "The Approximation of Boundary Conditions for Mimetic Finite Difference Methods," with M. Shashkov, *Computers and Mathematics with Applications*, **36**, no. 5, 79-99, (1998).
84. "The Black Box Multigrid Numerical Homogenization Algorithm," with J. E. Dendy, Jr. and J. D. Moulton, *J. of Comp. Physics*, **142**, 80-108 (1998)
85. "Modeling the Effectiveness of Isolation Strategies in Preventing STD Epidemics," with J. Li, *SIAM Journal of Applied Mathematics*, **58**, no. 3, 912-913 (1998).
86. "The Adjoint Operators for the Natural Discretizations for the Divergence, Gradient, and Curl on Logically Rectangular Grids," with M. Shashkov, *Applied Numerical Math.***25**, 413-442, (1997)
87. "Numerical Simulations and Mimetic Discretizations for Maxwell's equations and the equations of magnetic diffusion, " with M. Shashkov, Los Alamos Report LA-UR-97-5158 (1997).

88. "The Differentiated Infectivity Model for the Transmission of HIV," with J. Li and E. A. Stanley, Los Alamos Report LA-UR-97- (1997).
89. "Natural Discretizations for the Divergence, Gradient, and Curl on Logically Rectangular Grids," with M. Shashkov, Computers Math Applic. **33**, no. 4, 81-104, (1997).
90. "Energy stability bounds on convective heat transport: Numerical study," with C. R. Doering, Phys. Rev. E, **55**, no. 6, 7775-7778, (1997).
91. "Behavior Changes in SIS STD Models with Selective Mixing," with J. Li, SIAM Journal of Applied Mathematics, **57**, No. 4, 1082-1094, (1997).
92. "Disease Transmission Models with Biased Partnership Selection," with J. Li, Applied Numerical Mathematics, **24**, No. 2-3, pp 379-392, (1997).
93. "Problems with Heterogeneous and Non-Isotropic Media or Distorted Grids," with M. Shashkov and S. Steinberg, Finite Volumes for Complex Applications, F. Benkhaldoun and R. Vilsmeier (Eds.), Hermes Press, Paris, pp, 249-260, (1996).
94. "The Numerical Solution of Diffusion Problems in Strongly Heterogenous Non-Isotropic Materials," with M. Shashkov and S. Steinberg. JCP, 132, No. 1, 130-148, (1996).
95. "Biased Preference Models for Partnership Formation," with J. Li, World Congress of Nonlinear Analysts, pp. 3137-3148, (1996).
96. "Heterosexual Spread of HIV with Biased Sexual Partner Selection," with E. A. Stanley. Models for Infectious Human Diseases, V. Isham and G. Medley, eds. Cambridge Press (1996) 274-278.
97. "Multidimensional Methods for Hyperbolic Problems," with M. Shashkov, B. Swartz and B. Wendroff, Los Alamos Report LA-UR-96-1026 (1996).
98. "High-Order Mimetic Finite Difference Methods on Nonuniform Grids," with J. Castillo, M. Shashkov, and S. Steinberg. ICOSHOm.95. Houston J. of Mathematics. A. Ilin and R. Scott (Eds.) (1996) 347-362.
99. "The Sensitivity and Accuracy of Fourth Order Finite-Difference Schemes on Nonuniform Grids in One Dimension," with J. Castillo, M. Shashkov, and S. Steinberg. Computers Math. with Applications, **30**, No. 8, pp. 41-55 (1995).
100. "An Exhaustive Search for Stable Orbits in the Outer Solar System," with K.R. Grazier, W. I. Newman, W. M. Kaula, and F. Varadi, DDA95 - Dynamical Astronomy, Yosemite, CA - B.A.A.S Vol. 24, no. 2, (1995).
101. "Mappings and Integraters on the Edge of Chaos," with K. R. Grazier, W. I. Newman, and W. M. Kaula, 25th DDA meeting, Yosemite, CA - B.A.A.S **21**, no. 2, (1995).
102. "A Risk-based Heterosexual Model for the AIDS Epidemic with Biased Sexual Partner Selection," with E. A. Stanley, in Modeling the AIDS Epidemic, E. Kaplan and M. Brandeau, eds. Raven Press (1994) 331-364.

103. “New Wave mathematics,” with Rosenau P., What’s Happening in the Mathematical Sciences **2**, ed. B. Cipra, **30**, (1994), 14-18.
104. “A New Integrable Shallow Water Equation,” with R. Camassa, and D. Holm, Advances in Applied Mechanics, **30**, (1994), 1-33.
105. “A Divide and Conquer Algorithm for Grid Generation,” with R. Dougherty, Applied Numerical Math., **14** (1994) 125-134.
106. “Threshold Conditions for the Spread of the HIV Infection in Age-Structured Populations of Homosexual Men,” with J. Li and E. A. Stanley, J. Theo. Biology, **166**, (1994) 9-31.
107. “Long Term Integrations of the Solar System: Simplicity beats Complexity,” with R.E. Bell, K.R. Grazier, W. I. Newman, and W. M. Kaula, DDA94 - Dynamical Astronomy, Kingsville TX- B.A.A.S **26**, no. 2, (1994).
108. “The Compacton: a Soliton with Compact Support,” with P. Rosenau, Phys. Rev. Letters **70**, No. 5, (1993) 564-567.
109. “Mathematical Foundations of High-Performance Computing and Communications,” co-author with the panel on the Mathematical Sciences in HPCC, NRC (1992).
110. “Rash Theory,” with Klaus, A. Perelson, and L. Segel, Theoretical and Experimental Insights into Immunology, (1992), A. Perelson, G. Weisbuch and A. Continho, eds. Springer Verlag.
111. “Bounded and Unbounded Patterns of the Benney Equation,” with P. Rosenau and A. Oron, Phys. Fluids **A** (6) (1992) 125-134.
112. “High Order Finite Volume Approximations of Differential Operators on Nonuniform Grids,” with R. J. Knapp and J. C. Scovel, Physica **D** 60 (1992) 112-138.
113. “Calculating Realistic Error Bounds Using Significance Arithmetic with Dependency Tracking,” Los Alamos Report (1992).
114. “Identifying Coherent Structures in Nonlinear Wave Propagation,” with W. I. Newman and D. K. Campbell, Chaos, **1**, No. **1**, 77–94 (1991).
115. “Identification and Determination of Solitary Wave Structures in nonlinear Wave Propagation,” with W. I. Newman and D. K. Campbell, Cohen, G., Halpren, L., and Joly, P. eds., *Mathematical and Numerical Aspects of Wave Propagation phenomena*, (Philadelphia: SIAM), 509-518 (1991).
116. “A Shock Wave Driven by a Phased Implosion,” with R. Menikoff, S. A. Colgate, N. L. Johnson, K. Lackner and G. Miranda, Phys. Fluids **A**, **3** (1), (1991), 201–218.
117. “Local Mimetic Difference Schemes: with J. C. Scovel, Algebraic Topology in Numerical Analysis,” Los Alamos report (1991).

118. "Finding Threshold Conditions for Epidemiological Models," with E. A. Stanley and J. Li, Los Alamos National Laboratory report LA-UR-90-1967.
119. "A Mathematical Analysis of Threshold Conditions for Heterogeneous Epidemiological Models," with E. A. Stanley and J. Li, Los Alamos National Laboratory report LA-UR-90-3561.
120. "Design of Gifthorse," with R. Menikoff, K. Lackner, N. Johnson, and S. Colgate, Defense Science (1990).
121. "An Algorithm for Finding Roots of Functions Using Clustering Methods," with D. J. Goldstein and S. N. Kerr, Los Alamos report (1990).
122. "Numerical Methodologies for Solving Partial Differential Equations," The Numerical Modelling of Nonlinear Stellar Pulsations, R. Buchler Ed., Kluwer Acad. Pub. (1990), 215–237.
123. "Numerical Results of the Risk-Based Model," with E. A. Stanley, Los Alamos Science No. **18** (1989) 28–35.
124. "The Seeding Wave," with S. A. Colgate, Los Alamos Science No. **18** (1989) 36–39.
125. "AIDS and a Risk-Based Model," with S. A. Colgate, E. A. Stanley, C. R. Qualls and S. P. Layne, Los Alamos Science No. **18** (1989) 2–33.
126. "Modeling the AIDS Epidemic," with S. A. Colgate and E. A. Stanley. Society of Industrial and Applied Mathematics News **22**, No. **3** (1989) 1, 8–10.
127. "Risk Behavior-Based Model for the Cubic Growth of Acquired Immunodeficiency Syndrome in the United States" with S. A. Colgate, E. A. Stanley, S. P. Layne and C. R. Qualls, Proc. Natl. Acad. Sci. USA, **86** (1989) 4793–4797.
128. "The Effects of Social Mixing Patterns on the Spread of AIDS," with E. A. Stanley, Mathematical Approaches to Problems in Resource Management and Epidemiology, (Ithaca, NY, 1987), 190-219, Lecture notes in Biomath., 81, C. Castillo-Chavez, S. A. Levin, and C. A. Shoemaker (Eds.), Springer, Berlin (1989).
129. "Dynamic Rezone Methods for Partial Differential Equations in One Space Dimension," with B. Larrouturou, Appl. Numerical Math. **5** (1989) 435–450.
130. "Nonnegativity-, Monotonicity-, or Convexity-Preserving Cubic and Quintic Hermite Interpolation," with R. L. Dougherty and A. S. Edelman, Math. Comp. **52**, No. **186** (1989), 471–494.
131. "Building Large-Scale Models to Understand the AIDS Epidemic," with E. A. Stanley, S. A. Colgate, and S. P. Layne, Cray Channels, **10**, No. **3** (1988) 10–12.
132. "Mathematical Research in the Soviet Union with Practical Applications," with W. A. Beyer, D. D. Holm, B. Nichols, and P. R. Stein, Los Alamos National Laboratory report LA-11335-MS (1988).

133. "The Need for National HIV Databases," with S. A. Colgate, S. P. Layne, T. G. Marr and E. A. Stanley, *Nature*, **333** (1988) 511–512.
134. "Static Rezone Methods on Logically Rectangular Grids," with W. D. Henshaw, Los Alamos National Laboratory report LA-UR-88-345 (1988).
135. "Using Mathematical Models to Understand the AIDS Epidemic," with E. A. Stanley, *Math. Biosci.* **90** (1988), 415–473.
136. "Evolution of Solidification Front of a Dilute Binary Alloy: A New Asymptotic Approach," with A. Novick-Cohen and P. Rosenau, *Phys. Rev. B*, **37**, No. **13** (1988), 603–7608.
137. "On the Use of Adaptive Moving Grid Methods in Combustion Problems," with B. Larrouturou, to appear in *Modeling of Chemical Reaction Systems*, Heidelberg, Germany (1988).
138. "Significance Arithmetic with Dependency Tracking," Los Alamos Report (1988).
139. "Moving Mesh methods for Partial Differential Equations," *Mathematics Applied to Science* (New Orleans 1986), 129-153, Academic Press, Boston, MA (1988).
140. "A Behavior Based Model of the Initial Growth of AIDS in the United States," with S. A. Colgate, S. P. Layne and E. A. Stanley, Los Alamos National Laboratory report LA-UR-87-3412, (1987).
141. "On the Quasi-continuous Approximation of the Toda Lattice," with P. Rosenau, *Physics Letters A*, **124** (1987), 287–289.
142. "Piecing Together the AIDS Puzzle," with E. A. Stanley, Los Alamos National Laboratory Research Highlights (1987), 60–61.
143. "Coherence and Chaos in the Kuramoto-Velarde Equation," with B. Nicolaenko, *Directions in Partial Differential Equations*, E. M. Crandall, P. Rabinowitz and R. Turner, Eds., Academic Press (1987), 89–111.
144. "Coherence and Chaos on Unstable Flame Fronts," with B. Nicolaenko, Los Alamos Research and Development 1985, Los Alamos National Laboratory report LA-10600 (1986) 71–74.
145. "Nonlinear Pattern Selection in a Mechanical Model for Morphogenesis," with A. Perelson, P. Maini, J. Murray, and G. Oster, *J. Math. Biol.* (1986) **24**:525–541.
146. "Order and Complexity in the Kuramoto-Sivashinsky Model of Weakly Turbulent Interfaces," with B. Nicolaenko and S. Zaleski, *Physica* **23D** (1986) 265–292.
147. "Analysis of Nonlinear Parabolic Equations Modeling Plasma Diffusion Across a Magnetic Field," with P. Rosenau, *Lectures in Appl. Math.*, **23** (1986), 216–245.

148. “The Kuramoto-Sivashinsky Equation: A Bridge Between PDES and Dynamical Systems,” with B. Nicolaenko, *Physica* **18D** (1986), 113–126.
149. “Plasma Diffusion Across a Magnetic Field,” with P. Rosenau, *Physica* **20D** (1986) 444–446.
150. “Analysis of Nonlinear Mass and Energy Diffusion,” with P. Rosenau, *Physical Review A*, **32**, No. **4** (1985), 2370–2373.
151. “Discrete Approximations to the Divergence and Gradient Operators,” with J. C. Scovel, Los Alamos National Laboratory report (1985).
152. “Adaptive Static Rezoning Methods,” with M. Naughton, *Lectures in Applied Mathematics*, **22**, Part **I** (1985) 321–343.
153. “Static Rezone methods for Tensor-Product Grids, with M. J. Naughton, Large-scale computations in fluid mechanics, Part 1 (La Jolla, Calif., 1983), 321-343, *Lectures in Appl. Math.*, 22-1, American Math Society Providence, RI., (1985).
154. “Significance Arithmetic for Calculations with Uncertainties in the Data,” Los Alamos National Laboratory report (1984).
155. “High-order Incomplete Factorizations of Sparse Matrices,” with T. A. Manteuffel, *Advances in Computer Methods for Partial Differential Equations*, V. R. Vichnevetsky and R. S. Stepleman, Eds., Pub. IMACS - (1984), 551–555.
156. “Moving Mesh Methods for Initial Boundary Value Problems,” Los Alamos National Laboratory report LA-UR-84-61 (1984).
157. “Scientific Computing on Tomorrow’s Supercomputers,” *IEEE Distributed Processing special issue of Distributed Systems Architecture*, **6**, No. SI-1, 84–91 (1984).
158. “Numerical Methods for Tracking Interfaces,” *Physica* **12D** (1984) 396–407.
159. “Dynamic Acceleration of Nonlinear Iterations,” with T. A. Manteuffel, *Elliptic Problem Solvers Conference II*, G. Birkhoff, Ed., Academic Press (1984) 301–313.
160. “Future Directions in Large-Scale Scientific Computations,” *Large Scale Scientific Computation*, S. V. Parter, Ed., Academic Press (1984) 51–84.
161. “Diffusion Patterns of a Confined Plasma,” with P. Rosenau, Los Alamos National Laboratory report LA-9943-MS (1983).
162. “RWMOD: Read/Write Routines for Arrays in FORTRAN Programs,” with R. Y. Hayes, Los Alamos National Laboratory report LA-UR-83-2664 (1983).
163. Interview: “What’s Happening Now . . . in the Kerr Years,” published in *Los Alamos Science*, Winter/Spring (1983), No. **7**, p. 94–109.

164. "Adaptive Moving Mesh Methods for Partial Differential Equations," *Advances in Reactor Computations*, American Nuclear Society Press, La Grange Park, IL (1983) 24–43.
165. "Computational Modeling and Mathematics Applications of Mathematics, co-author with W. C. Rheinboldt, J. G. Glimm, R. J. Kee, Jr., J. A. Krumhansl, J. E. Osborn, M. H. Schultz, I. Stakgold, National Academy Press (1983).
166. "On Davydov's alpha-Helix Solitons," with D. W. McLaughlin and A. C. Scott, *Long-Time Prediction in Dynamics*, edited by C. W. Horton, Jr., et al, John Wiley & Sons (1983), 367–394.
167. "Self-Adjusting Grid for One-Dimensional Hyperbolic Conservation Laws," with A. Harten, *J. Comp. Phys.* **50**, No. **2**, (May 1983), 235–269.
168. "Accurate Monotonicity Preserving Cubic Interpolation," *Society of Industrial and Applied Mathematics Journal of Scientific and Statistical Computing*, **4**, No. **4**, (December 1983) 645–654.
169. "The Propagation of Errors in Calculations Due to Uncertainties in Data," Los Alamos National Laboratory report LA-UR-82-368 (1982).
170. "FORSIG: A Extension of FORTRAN with Significance Arithmetic," Los Alamos report LA-9448-MS (1982).
171. "The Numerical Differentiation of Discrete Functions Using Polynomial Interpolation Methods," with B. Larrouturou, *Appl. Math and Comp.*, Vols. **10–11**; reprinted in *Numerical Grid Generation*, J. F. Thompson, Ed., Elsevier North-Holland, New York (1982), 487–506.
172. "Dynamic Rezoning Methods," *Proceedings of the CEA/Los Alamos Meeting on Hydrodynamic Shock Waves and Instabilities*, **II**, R. C. Kirkpatrick and B. Sitt, Eds., (1982) 24.1–24.19.
173. "Numerical Methods for Nonlinear Differential Equations," *Nonlinear Problems: Present and Future*, A. R. Bishop, D. K. Campbell, B. Nicolaenko, Eds., North-Holland Publishing Co. (1982), 91–107.
174. "A Note on Time Step Changes Using Implicit ODE Methods," Los Alamos report No. LA-UR-81-2361 (1981).
175. "DERMOD: A Subroutine Package for the Numerical Differentiation of Discrete Functions I. Polynomial Interpolation Methods," with B. Larrouturou, Los Alamos National Laboratory report LA-9122 (1981). Also published in French by Ecole Nationale des Points et Chaussées (1981).
176. "Multigrid and ICCG for Problems with Interfaces," with J. E. Dendy, *Elliptic Problem Solvers*, Martin Schultz, Ed., Academic Press, Inc., New York, NY (1981), 247–254.

177. "Vectorizable Factorizations of Sparse Matrices," Los Alamos report No. LA-UR-81-891 (1981).
178. "Davydov's Alpha-Helix Solitons," with D. W. McLaughlin and A. C. Scott, *Physica* **3D** (1981) 1–2, 23–44.
179. "The Numerical Solution of Time Dependent PDE's on an Adaptive Mesh," Los Alamos report No. LA-UR-80-3702 (1980).
180. "EOSMOD: A Subroutine Package for Calculating Equations of State and Opacities," with M. M. Klein, Los Alamos Publication No. LA-8502-M (1980).
181. "Accurate Cubic Piecewise Monotone Interpolation," Los Alamos report No. LA-UR-80-3700 (1980).
182. "The Method of Lines Solution of the Two-Phase Flow Equations," First CSNI Numerical Benchmark Problem, W. Werner, Ed., (1980).
183. "A Method of Lines Approach to the Numerical Solution of Conservation Laws," *Advances in Computer Methods for Partial Differential Equations, III* (Proc. Third IMACS Internat. Sympos., Lehigh Univ., Bethlehem, Pa., 1979, pp. 313-321, IMACS, New Brunswick, N.J., (1979).
184. "Impact Fusion from a High Velocity Cylindrical Implosion," with S. A. Colgate and R. S. Menikoff, *Conference Proceedings of the Impact Fusion Workshop*, Los Alamos Scientific Laboratory (1979).
185. "PDELIB: A Library for the Numerical Solution of Partial Differential Equations," with D. Durack, *Advances in Computer Methods for Partial Differential Equations*, **3** (1979) 43.
186. "The Method of Lines: A Simplified Approach to Solving Partial Differential Equations," Los Alamos report No. LA-UR-79-740 (1979).
187. "Explicit A-Stable Iterative Methods for the Solution of Partial Differential Equations," Los Alamos report No. LA-UR-79-29 (1979).
188. "On the Structure of Computer Codes for Solving Partial Differential Equations," *Conference Proceedings CUBE-1978 Symposium Proceedings*, Los Alamos report No. LA-7417-C and LA-UR-78-2445 (1978).
189. "MOLID: A General Purpose Subroutine Package for the Numerical Solution of Partial Differential Equations," Los Alamos Scientific Laboratory manual, LA-7595-M (1978).
190. "Time Evolution of Almost Periodic Solutions of the KdV Equation," *Rocky Mountain Mathematics Journal*, **8**, Nos. **1–2**, 95–104 (1978).
191. "Digital Removal of Random Media Image Degradations by Solving the Diffusion Equations Backwards in Time," with A. Carasso and J. Sanderson, *SIAM J. on Num. Anal.*, **15**, No. **2**, 344–367 (April 1978).

192. “A Local Method for Digitally Restoring Motion-Blurred Pictures,” with J. Sanderson, *IEEE Transactions on Acoustics, Speech, and Signal Processing*, **20**, No. **3**, 256–263 (June 1978).
 193. “Jet Formation,” with S. A. Colgate and D. Durack, Los Alamos Scientific Laboratory Report, (1977).
 194. “Mesh Refinement and Local Inversion of Elliptic Partial Differential Equations,” *J. of Comp. Physics*, **23**, No. **2**, 124–134 (1977).
 195. “Periodic Solutions to a Logistic Difference Equation,” with F. Hoppensteadt, *Society of Industrial and Applied Mathematics Journal of Applied Mathematics*, **32**, No. **1**, 73–81 (1977).
 196. “Shock Exponentiation in Axial Jets,” with S. A. Colgate and D. Durack, Los Alamos Scientific Laboratory Report, (1977).
 197. “The Method of Lines Solution of Partial Differential Equations,” Courant Institute of Mathematical Sciences, Vol. C00-3077–139 (October 1976).
 198. “Finite Difference Approximations and Entropy Conditions for Shocks,” with P. Lax and A. Harten, *Comm. on Pure and Appl. Math.* **29**, 297–322 (1976).
 199. “Almost Periodic Solutions of the KdV Equation” appendix, with P. Lax. *SIAM Review* **18**, No. **3**, 351–375 (1975).
 200. “Periodic Solutions of the KdV Equation” appendix, with P. Lax, *Comm. on Pure and Appl. Math.* **28**, 141–188 (1975).
 201. “Global Transport and Kinetics Model of SST Pollution in the Stratosphere,” with J. Chang, A. Hindmarsh, N. Madsen, and W. Duewer. LLL Report UCRL-51336, and DOT-CIAP report, pp. B1–B36 (1973).
 202. “A Finite Difference Study of Hyperbolic Partial Differential Equations,” Physics Honors Thesis, Tulane University (1972).
- Publications nearing completion:**
203. “Limitations of Bond-Percolation as a Model of Epidemics on Networks,” with J. C. Miller, A. Hagberg, and P. Swart (2006)
 204. “Exotic Traveling Wave Solutions of Nonlinear Evolution Equations,” with R. Camassa and J. Lin (2006)
 205. “Local Time Step versus Locked Time Step methods for Adaptive Mesh Refinement,” with S. Li (2006)
 206. “Modeling the Influence of Polls on Elections ,” with J. M. Restrepo (2006)
 207. “The Importance of Contact Patterns in Modeling the Spread of Infectious Diseases,” with S. Del Valle, H. Hethcote, N. hitnis, and J. Smith (2006)

208. "Estimating the Incidence of HIV Infection in the United States," with G. Chowell (2006)
209. "Continuum Epidemic Models of Disease Spreading," Aceves, AB; Dohnal, T; Gabitov, I; and Hyman JM.
210. "Targeted Vaccination in a Social Network Epidemic Model," J. Miller, J. M. Hyman
211. "Theory and Implementation of PDV Significance Arithmetic in Uncertainty Computation," W. Li
212. "Level Set, Finite Volume Approximation of Shoaling Water Waves," Barber, J; Restrepo, JM, Hyman, JM; and Camassa, R.
213. "Continuum Epidemic Models of Disease Spreading," with A.B. Aceves, T. Dohnal, I. Gabitov; in preparation (2005).
214. "Targeted Vaccination in a Social Network Epidemic Model," with J. Miller, in preparation (2005).

OTHER REPORTS:

Co-authored 43 Los Alamos Classified reports on analytical and numerical methods analyzing shock waves in non-weapons inertial fusion systems. Most are joint with S. A. Colgate.

Equations," SELECTED COMPUTER CODES:

MOL1D (1976) General purpose method of lines subroutine package for the solution of systems of initial boundary value partial differential equations in one space dimension; FORTRAN - 4,200 lines.

PDE1D (1978) Fully vectorized general purpose explicit PDE package for solving hyperbolic systems of initial value problems. These routines are much faster than MOL1D and require one-third the memory; FORTRAN - 1,200 lines.

PDE2D (1979) 2-D version of PDE1D; FORTRAN - 2,200 lines.

PLT1T (1979) High-level interactive graphics plotting package for the Tektronix series 40XX terminals; FORTRAN - 1,800 lines.

PDE1A (1980) Revision of PDE1D that accommodates adaptive meshes and highly interactive graphics; FORTRAN - 3,800 lines.

EOSMOD (1981) with M. Klein, High-level interface for interpolating the SESAME equations-of-state and opacity tables; FORTRAN - 3,500 lines.

DERMOD (1981) Vectorized subroutine package for the numerical differentiation of functions defined on a discrete mesh in 1, 2, and 3 dimensions using finite differences (with B. Larrouturou); Fourier and Chebyshev pseudospectral methods (with R. Dougherty); and finite volume methods (with C. Scovel); FORTRAN - 12,000 lines.

FORSIG (1981) A preprocessor and arithmetic library for an extension of FORTRAN that can account for the creation and propagation of errors in a computer program due to uncertainties in the data; SNOBOL - 700 lines; FORTRAN - 1,100 lines.

RWMOD (1983) (with R. Hayes) A portable input/output package to read or write 1, 2, and 3-dimensional arrays in a formatted or unformatted style; FORTRAN - 1,300 lines.

PLTN (1983) (with R. Dougherty) An interactive color plotting package to display multiple lines, contours, surfaces, grids, streamlines, and velocity vectors using the NCAR plotting routines; FORTRAN - 9,000 lines.

1 1/2-D Code (1977–1988) A sophisticated interactive computer program to approximate multimaterial fluid flows in a variable area cylindrical pipe system. The code is Lagrangian in r and Eulerian in z and makes extensive use of the EOSMOD, DERMOD, PDE1A, RWMOD, PLT1T, and PLTN packages; FORTRAN - 3,000 lines (31,000 lines when assembled).

ODEUM (1984) Automatic implementation of new temporal integration of numerical methods into a variable time step/variable order integration package for solving PDE's. The ODESA subpackage(written with L. MacNeil) provides sophisticated stability and accuracy analysis of the multistep multicycle integration methods that can be implemented in ODEUM; ALTRAN - 1,700 lines, FORTRAN - 3,800 lines.

SSMD (1985) High-level Multitasking routines to assist in converting FORTRAN programs to run on multiprocessing computers (with R. Dougherty); FORTRAN - 600 lines.

AIDS (1987) Simulation of the spread of the AIDS virus in a risk-based biased-mixing model of the U.S. homosexual population; FORTRAN - 4,000 lines.

DEMODO (1991) Automated solution of evolutionary partial differential equations in two and three space dimensions. FORTRAN - 13,000 lines.