

# Curriculum Vitae

**Name:** Jim E. Morel

**Work Address:**

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**Education:**

Ph.D.: Nuclear Engineering, University of New Mexico, 1979.  
M.S.: Nuclear Engineering, Louisiana State University, 1974.  
B.S.: Mathematics, Louisiana State University, 1972.

**Professional Experience:**

**2007-Present:** *Director,*

*Center for Large Scale Scientific Simulations,  
Texas A&M University, College Station, TX.*

The Center for Large Scale Scientific Simulations (CLASS) facilitates and promotes multidisciplinary multiphysics computational research collaborations among Texas A&M faculty across a broad range of departments. CLASS also promotes multi-institutional collaborative research among Texas A&M University, other universities, and national laboratories. The CLASS research portfolio currently consists of three major projects, two of which are in collaboration with other universities, and one of which is in collaboration with a national laboratory. CLASS currently has four employees consisting of a program manager and three research scientists.

**2005-Present:** *Professor,*

*Texas A&M University, College Station, TX.*

Tenured faculty member in the Department of Nuclear Engineering.

Teaching undergraduate and graduate nuclear engineering courses. Directing student thesis and dissertation research, and performing collaborative research with colleagues from universities and national laboratories. Pursuing research opportunities in the general areas of computational transport methods, computational radiation-hydrodynamics methods, and computational multiphysics methods. Developing new educational programs relating to multiphysics/multiscale computation and multiphysics software development.

**2002-2005:** *Science Advisor/Senior Staff member*

*Los Alamos National Laboratory, Los Alamos, NM.*

Participated in and provided direction for numerical research efforts in neutron transport, charged-particle transport, thermal radiation transport, and radiation-hydrodynamics.

**1997-2001:** *Group Leader,*

*Los Alamos National Laboratory, Los Alamos, NM.*

Manager/supervisor for a group of approximately 25 staff members tasked with developing computational methods for neutral and charged-particle transport calculations together with transport software packages for implementation in large multiphysics codes. Software engineering was a critical task that received as much attention as numerical analysis. Provided technical leadership for the group, and remained heavily involved in numerical methods research.

**1994-1997:** *Team Leader,*

*Los Alamos National Laboratory, Los Alamos, NM.*

Lead a seven-person team that developed computational methods for neutral and charged-particle transport. Most effort related to parallel 3-D unstructured-mesh neutral-particle and charged-particle transport codes.

**1984-1993:** *Staff Member,*

*Los Alamos National Laboratory, Los Alamos, NM.*

Extensive experience building thermal radiation transport modules for sophisticated radiation-hydrodynamics codes. Extensive experience developing convergence acceleration schemes for the discrete-ordinates equations with advanced spatial discretizations. Developed cell-centered diffusion discretization schemes for 2-D and 3-D non-orthogonal meshes

and associated multigrid solution schemes. Developed multigrid solution techniques for the discrete-ordinates equations with both isotropic and highly anisotropic scattering. Developed codes and algorithms for discrete-ordinates and spherical-harmonics transport calculations on both structured and unstructured 3-D meshes using massively parallel computers.

**1976-1984:** *Member of the Technical Staff,*

*Sandia National Laboratories, Albuquerque, NM.*

Developed computational methods (primarily Monte Carlo and discrete ordinates methods) for both neutral and charged-particle transport. Performed neutral and charged-particle transport analysis for a wide variety of applications including Bremsstrahlung converter design, fast reactor safety, radiation effects on cables and electronics, Electromagnetic pulse effects, magnetic-confinement fusion, and inertial confinement fusion. Extensive experience with all Sandia coupled electron-photon Monte Carlo codes (TIGER, CYLTRAN, ACCEPT, etc.), and with the Los Alamos discrete ordinates codes, ONETRAN, and ONEDANT.

**1974-1976:** *Nuclear Research Officer,*

*Air Force Weapons Laboratory, Albuquerque, NM.*

Performed radiation transport analyses relating to satellite electronics vulnerability to natural and nuclear space radiation. Developed computational methods for such analyses. Worked extensively with the coupled electron-photon Monte Carlo transport code, TIGER, both in using the code and in implementing new methods and options in the code.

**Awards:**

LANL Distinguished Performance Award, 1992.

DOE Weapons Program Award of Excellence, 1994.

**Professional Service:**

Member, LANL X-Division Science Council (2004).

Member, LANL ADWP Predictive Science Advisory Council(2004).

Member, George W. Woodruff School of Mechanical Engineering Advisory Board (2001-2004), Georgia Institute of Technology.

Member, Editorial Board of *Transport Theory and Statistical Physics*.  
Member, DOE ASC Review Panel for Sandia National Laboratories.

**Professional Memberships:**

Member of the Society for Industrial and Applied Mathematics.  
Member of the American Nuclear Society.

**Academic Activities (prior to 2005):**

Named a National Laboratory Professor in 2004 in the Department of Chemical and Nuclear Engineering at the University of New Mexico while employed at Los Alamos National Laboratory. Held the academic title of full professor. Was able to serve as the chairman of graduate student thesis and dissertation committees. Was able to seek funding for students as a UNM professor, and had faculty voting rights within the department. Was allowed by LANL to spend up to twenty percent time on UNM matters.

Served as an adjunct professor at several universities. The particular name given to this position varies among the institutions, but it implies that one has officially served on the committees of graduate students, and in some cases, directed their research. In particular, the thesis/dissertation research of the following graduate students was directed:

Daniel Sloan	UNM	Ph.D.	Nuc. Eng.	1981.
Maximo Lazo	UNM	M.S.	Nuc. Eng.	1982.
	UNM	Ph.D.	Nuc. Eng.	1984.
B. Todd Adams	UNM	Ph.D.	Nuc. Eng.	1994.
Mark Landesmann	LSU	M.S.	Nuc. Eng.	1986.
Allan Barnett	RPI	Ph.D.	Nucl. Eng.	1988.
John Josef	PSU	Ph.D.	Physics	1998.

Also served on graduate student committees in the Department of Nuclear Engineering at Texas A&M University and in the Applied Mathematics Department at the University of Colorado-Denver.

Periodically taught a graduate course over the last 20 years in the Department of Chemical and Nuclear Engineering at UNM on numerical methods for radiation transport. After the move to LANL from Sandia in 1984, the course was taught at LANL and telecast to both UNM

and Sandia in Albuquerque. Most recently, the course was taught at LANL and telecast over the web to UNM and Sandia in Albuquerque and Sandia in Livermore via the new Access Grid technology.

**Research Interests:**

Discretization techniques and associated multi-level solution techniques for neutral-particle and charged-particle diffusion and transport on unstructured meshes and structured meshes with adaptive refinement. Monte Carlo methods and hybrid deterministic/Monte Carlo methods. Discretization and solution techniques for multiphysics/multiscale calculations. Krylov solution techniques with an emphasis on the development of multilevel preconditioners.

### Invited Plenary Presentations:

1. J. E. Morel, "Deterministic Transport Methods and Codes at Los Alamos," International Conference on Mathematics and Computation, Reactor Physics and Environmental Analyses in Nuclear Applications, Madrid, Spain, September 27-30, 1999.
2. E. W. Larsen and J. E. Morel, "Deterministic Methods for the 1'st-Order Transport Equation," M&C2003: Nuclear Mathematical and Computational Sciences: A Century in Review, A Century Anew, Gatlinburg, Tennessee, April 6-11, 2003.
3. Jim E. Morel, "Basic Krylov Methods with Application to Transport," M&C2005: International Meeting on Mathematics and Computation, Supercomputing, Reactor Physics and Nuclear and Biological Applications, Avignon, France, September 12-15, 2005.

# I. Publications

## A. Refereed Journal Articles

1. J. E. Morel and J. C. Courtney, "Subcadmium Fluxes in Water Near Californium Sources," *Health Physics*, **35**, 398-401 (1978).
2. J. E. Morel, "On the Validity of the Extended Transport Correction for Low Energy Electron Transport," *Nuclear Science and Engineering*, **71**, 64-71 (1979).
3. J. A. Halbleib and J. E. Morel, "Adjoint Monte Carlo Electron Transport in the Continuous-Slowing-Down Approximation," *Journal of Computational Physics*, **34**, 211-230 (1980).
4. S. A. Dupree and J. E. Morel, "One-Dimensional Discrete-Ordinates Adjoint Calculations of Cylindrical Target Responses to Plane-Incident Sources," *Nuclear Science and Engineering*, **78**, 284-293 (1981).
5. J. E. Morel, "Fokker-Planck Calculations Using Standard Discrete Ordinates Codes," *Nuclear Science and Engineering*, **79**, 340-356 (1981).
6. J. E. Morel, "A Synthetic Acceleration Method for Discrete Ordinates Calculations with Highly Anisotropic Scattering," *Nuclear Science and Engineering*, **82**, 34-46 (1982).
7. Charles N. Vittitoe, J. E. Morel, and Thomas P. Wright, "Relativistic Electron Beam Transport in Curved Channels," *Journal of Applied Physics*, **53**, 8489-8496 (1982).
8. J. E. Morel and G. R. Montry, "Analysis and Elimination of the Discrete Ordinates Flux Dip," *Transport Theory and Statistical Physics*, **13** 615-633 (1984).
9. B. R. Wienke, J. E. Morel, T. E. Cayton, and R. B. Howell, "HPLAS: Multigroup Cross Section and Reaction Rate Processor for Coupled H, H<sup>+</sup>, and H<sup>-</sup> Transport Applications in Plasmas," *Computer Physics Communications*, **34** 87-99 (1984).

10. J. E. Morel, "An Improved Fokker-Planck Angular Differencing Scheme," *Nuclear Science and Engineering*, **89**, 131-136 (1985).
11. Arian Pregoner and J. E. Morel, "A Simplified Monte Carlo Electron Transport Algorithm for Advanced Bremsstrahlung Converter Design," *Journal of Applied Physics*, **57**, 4849-4855 (1985).
12. J. E. Morel, E. W. Larsen, and M. K. Matzen, "A Synthetic Acceleration Scheme for Radiative Diffusion Calculations," *Journal of Quantitative Spectroscopy and Radiative Transfer*, **34**, 243-261 (1985).
13. J. E. Morel, "Multigroup Legendre Coefficients for the Diamond Difference Continuous Slowing Down Operator," *Nuclear Science and Engineering*, **91**, 324-331 (1985).
14. Maximo S. Lazo and J. E. Morel, "A Linear-Discontinuous Galerkin Approximation for the Continuous-Slowing-Down Operator," *Nuclear Science and Engineering*, **92**, 98-109 (1986).
15. Edward W. Larsen, J. E. Morel, Warren F. Miller, Jr., "Asymptotic Solutions of Numerical Transport Problems in Optically Thick, Diffusive Regimes," *Journal of Computational Physics*, **69**, 283-324 (1987).
16. J. E. Morel, "A Hybrid Collocation-Galerkin- $S_n$  Method for Solving the Boltzmann Transport Equation," *Nuclear Science and Engineering*, **101**, 72-87 (1989).
17. L. J. Lorence, Jr., J. E. Morel, and E. W. Larsen, "An  $S_2$ -Synthetic Acceleration Scheme for the One-Dimensional  $S_n$  Equations with Linear-Discontinuous Spatial Differencing," *Nuclear Science and Engineering*, **101**, 341-351 (1989).
18. Allan Barnett, J. E. Morel, and D. R. Harris, "A Multigrid Acceleration Method for the 1-D  $S_n$  Equations with Anisotropic Scattering," *Nuclear Science and Engineering*, **102**, 1-21 (1989).
19. E. W. Larsen and J. E. Morel, "Asymptotic Solutions of Numerical Transport Problems in Optically Thick Diffusive Regimes II," *Journal of Computational Physics*, **83**, 212-236 (1989).

20. Mark Landesman and J. E. Morel, "Angular Fokker-Planck Decomposition and Representation Techniques," *Nuclear Science and Engineering*, **103**, 1-11 (1989).
21. J. J. Honrubia and J. E. Morel, "A Synthetically-Accelerated Weighted-Diamond Scheme for Charged-Particle Transport Calculations," *Nuclear Science and Engineering*, **104**, 91-111 (1990).
22. J. E. Morel and E. W. Larsen, "A Multiple Balance Approach for Differencing the  $S_n$  Equations," *Nuclear Science and Engineering*, **105**, 1-15 (1990).
23. B. R. Wienke and J. E. Morel, "Alpha Particle Transport and Thermonuclear Burn in Mixtures," *Nuclear Science and Engineering*, **105**, 79-87 (1990).
24. J. E. Morel and T. A. Manteuffel, "An Angular Multigrid Acceleration Technique for the  $S_n$  Equations With Highly Forward-Peaked Scattering," *Nuclear Science and Engineering*, **107**, 330-342 (1991).
25. L. W. Brasure, A. K. Prinja, M. S. Lazo, and J. E. Morel, "Ion Implantation Profiles In The Straight-Ahead Approximation With Realistic Potentials," *Nuclear Instruments and Methods*, **B53**, 134-143 (1991).
26. J. E. Morel, J. E. Dendy, Jr., Michael L. Hall, and Stephen W. White, "A Cell-Centered Lagrangian-Mesh Diffusion Differencing Scheme," *Journal of Computational Physics*, **103**, 286-299 (1992).
27. T. A. Manteuffel, S. McCormick, J. Morel, S. Oliveira, and G. Yang, "A Parallel Version of a Multigrid Algorithm for Isotropic Transport Equations," *SIAM Journal on Scientific Computing*, **15**, 474-493 (1992).
28. B. T. Adams and J. E. Morel, "A Two-Grid Acceleration Scheme for the Multigroup  $S_n$  Equations with Neutron Upscattering," *Nuclear Science and Engineering*, **115**, 253-264 (1993).
29. J. E. Morel, J. E. Dendy, Jr., and T. A. Wareing, "Diffusion-Accelerated Solution of the 2-D  $S_n$  Equations with Bi-Linear-Discontinuous Differencing," *Nuclear Science and Engineering*, **115**, 304-319 (1993).

30. J. E. Morel and J. M. McGhee, "A Fission-Source Acceleration Technique For Time-Dependent Even-Parity  $S_n$  Calculations," *Nuclear Science and Engineering*, **116**, 73-85 (1994).
31. T. A. Wareing, Wallace F. Walters, and J. E. Morel, "Diffusion-Accelerated Solution of the Two-Dimensional X-Y  $S_n$  Equations with Linear-Bilinear Nodal Differencing," *Nuclear Science and Engineering*, **118**, 122-126 (1994).
32. J. E. Morel and J. M. McGhee, "A Diffusion-Synthetic Acceleration Technique for Solving the Even-Parity  $S_n$  Equations with Anisotropic Scattering," *Nuclear Science and Engineering*, **120**, 147-164 (1995).
33. T. Manteuffel, S. McCormick, J. Morel, S. Oliveira, and G. Yang, "A Fast Multigrid Algorithm for Isotropic Transport Problems I: Pure Scattering," *SIAM Journal on Scientific Computing*, **16**, 601-635 (1995).
34. Taewan Noh, Warren F. Miller, Jr., and Jim E. Morel, "The Even-Parity and Simplified Even-Parity Transport Equations in Two-Dimensional x-y Geometry," *Nuclear Science and Engineering*, **123**, 38-56 (1996).
35. T. Manteuffel, S. McCormick, J. Morel, and G. Yang, "A Fast Multigrid Algorithm for Isotropic Transport Problems II: With Absorption," *SIAM Journal on Scientific Computing*, **17**, 1449-1474 (1996).
36. J. E. Morel, Todd A. Wareing, and Kenneth Smith, "A Linear-Discontinuous Spatial Differencing Scheme for  $S_n$  Radiative Transfer Calculations," *Journal of Computational Physics*, **128** 445-462 (1996).
37. J. E. Morel, Leonard J. Lorence, Jr., Ronald P. Kensek, and John A. Halbleib, "A Hybrid Multigroup/Continuous-Energy Monte Carlo Method for Solving the Boltzmann-Fokker-Planck Equation." *Nuclear Science and Engineering*, **124**, 369-389 (1996).
38. R. P. Datta, S. D. Altekhar, A. K. Ray, and J. E. Morel, "A Computational Model for Coupled Electron-Photon Transport in Two Dimensions," *Physical Review E*, **53**, 6514-6522 (1996).
39. J. E. Morel, J. M. McGhee, and E. W. Larsen, "A 3-D Time-Dependent Unstructured Tetrahedral-Mesh  $SP_n$  Method," *Nuclear Science and Engineering*, **123**, 319-327 (1996).

40. E. W. Larsen, J. E. Morel, and J. M. McGhee, "Asymptotic Derivation of the Multigroup  $P_1$  and Simplified  $P_n$  Equations with Anisotropic Scattering," *Nuclear Science and Engineering*, **123**, 328-342 (1996).
41. T. A. Wareing, W. F. Walters, and J. E. Morel, "A Diffusion-Accelerated Solution Method for the Non-Linear Characteristic Scheme," *Nuclear Science and Engineering*, **124**, 72-81 (1996).
42. J. A. Josef and J. E. Morel, "Simplified Spherical Harmonic Method for Coupled Electron-Photon Transport Calculations," *Physical Review E.*, **57**, 6161-6171 (1998).
43. J. E. Morel, Randy M. Roberts, Mikhail J. Shashkov, "A Local Support-Operators Diffusion Discretization Scheme for Quadrilateral r-z Meshes," *Journal of Computational Physics*, **144**, 17-51 (1998).
44. J. David Moulton, Jim E. Morel, and Uri Ascher, "Approximate Schur Complement Preconditioning of the Lowest-Order Nodal Discretization," *SIAM Journal on Scientific Computing*, **19**, 185-205 (1998).
45. J. E. Morel and J. M. McGhee, "A Self-Adjoint Angular Flux Equation," *Nuclear Science and Engineering*, **132**, 312-325 (1999).
46. R. B. Lowrie, J. E. Morel, and J. A. Hittinger, "The Coupling of Radiation and Hydrodynamics," *The Astrophysical Journal*, **521**, 432-450 (1999).
47. J. E. Morel, "Diffusion-Limit Asymptotics of the Transport Equation, the  $P_{1/3}$  Equations, and Two Flux-Limited Diffusion Theories," *Journal of Quantative Spectroscopy and Radiative Transfer*, **65**, 769-778 (2000).
48. R. B. Lowrie and J. E. Morel, "Issues with High-Resolution Godunov Methods for Radiation Hydrodynamics," *Journal of Quantative Spectroscopy and Radiative Transfer*, **69**, 475-489 (2001).
49. R. B. Lowrie, D. Mihalas, and J. E. Morel, "Comoving-Frame Radiation Transport for Nonrelativistic Fluid Velocities," *Journal of Quantative Spectroscopy and Radiative Transfer*, **69**, 291-304 (2001).
50. T. A. Wareing, J. M. McGhee, J. E. Morel, and S. D. Pautz, "Discontinuous Finite Element  $S_n$  Methods on 3-D Unstructured Grids," *Nuclear Science and Engineering*, **138**, 256-268 (2001).

51. J. E. Morel, Michael L. Hall, and Mikhail J. Shashkov, "A Local Support-Operators Diffusion Discretization Scheme for Hexahedral Meshes," *Journal of Computational Physics*, **170**, 338-372 (2001).
52. R. B. Lowrie and J. E. Morel, "Methods for Hyperbolic Systems with Stiff Relaxation," *International Journal for Numerical Methods in Fluids*, **40**, 413-423 (2002).
53. J. L. Liscum-Powell, A. K. Prinja, J. E. Morel, and L. J. Lorence, Jr., "Finite-Element Solution of the Self-Adjoint Angular Flux Equation for Coupled Electron-Photon Transport," *Nuclear Science and Engineering*, **142**, 270-291 (2002).
54. J. Hyman, J. Morel, M. Shashkov, and S. Steinberg, "Mimetic Finite Difference Methods for Diffusion Equations," *Computational Geosciences*, **6**, 333-352 (2002).
55. J. S. Warsa, T. A. Wareing, and J. E. Morel, "Fully-Consistent Diffusion-Synthetic Acceleration of Linear Discontinuous  $S_n$  Transport Discretizations on Unstructured Tetrahedral Meshes," *Nuclear Science and Engineering*, **141**, 235-251 (2002).
56. J. E. Morel, T. A. Wareing, R. B. Lowrie, and D. K. Parsons, "Analysis of Ray-Effect Mitigation Techniques," *Nuclear Science and Engineering*, **144**, 1-22 (2003).
57. J. S. Warsa, T. A. Wareing, J. E. Morel, "Solution of the Discontinuous P1 Equations in Two-Dimensional Cartesian Geometry with Multi-Level Preconditioning," *SIAM Journal on Scientific Computing*, **24**, 2093-2124 (2003).
58. T. M. Evans, Todd J. Urbatsch, Henry Lichtenstein, J. E. Morel, "A Residual Monte Carlo Method for Radiative Diffusion," *Journal of Computational Physics*, **189**, 539-556 (2003).
59. J. S. Warsa, T. A. Wareing, J. E. Morel, J. M. McGhee, and R. B. Lehoucq, "Krylov Subspace Iterations for Deterministic k-Eigenvalue Calculations," *Nuclear Science and Engineering*, **147**, 26-42 (2004).

60. J. E. Morel and K. D. Lathrop, "Singular Solutions, Integral Transport Theory, and the  $S_n$  Method," *Nuclear Science and Engineering*, **147**, 158-166 (2004).
61. J. S. Warsa, T. A. Wareing, and J. E. Morel, "Krylov Iterative Methods and the Degraded Effectiveness of Diffusion Synthetic Acceleration for Multidimensional  $S_n$  Calculations in Problems with Material Discontinuities," *Nuclear Science and Engineering*, **147**, 218-248 (2004).
62. Konstantin Lipnikov, Jim Morel, and Mikhail Shashkov, "Mimetic Finite Difference Methods for Diffusion Equations on Non-Orthogonal Non-Conformal Meshes," *Journal of Computational Physics*, **199**, 589-597 (2004).
63. Jim E. Morel and Jeffery Densmore, "A Two-Component Equilibrium Diffusion Limit," *Annals of Nuclear Energy*, **31**, 2049-2057 (2004).
64. J. S. Warsa, M. Benzi, T. A. Wareing and J. E. Morel, "Preconditioning a Mixed Discontinuous Finite Element Method for Radiation Diffusion," *Numerical Linear Algebra with Applications*, **11**, 795-811 (2004).
65. Jim E. Morel and James S. Warsa, "An  $S_n$  Spatial Discretization Scheme for Tetrahedral Meshes," *Nuclear Science and Engineering*, **151**, 157-166 (2005).
66. Robert C. Ward, Randal S. Baker, Jim E. Morel, "A Diffusion Synthetic Acceleration Method For Block Adaptive Mesh Refinement," *Nuclear Science and Engineering*, **152**, 164-179 (2005).
67. Jim E. Morel, B. Todd Adams, Taewan Noh, John M. McGhee, Thomas M. Evans, and Todd J. Urbatsch, "Spatial Discretizations for Self-Adjoint Forms of the Radiative Transfer Equations," *Journal of Computational Physics*, **214**, 12-40 (2006).
68. Gordon L. Olson, David S. Miller, Edward W. Larsen, Jim E. Morel, "Chord Length Distributions in Binary Stochastic Media in Two and Three Dimensions," *Journal of Quantitative Spectroscopy and Radiative Transfer*, **101**, 269-283 (2006).

69. Jim E. Morel, James S. Warsa, and Alejandro Gonzalez-Aller, “A Lumped Linear-Discontinuous Spatial Discretization Scheme for  $S_n$  Calculations in  $R - Z$  Geometry,” *Nuclear Science and Engineering*, **155**, 168–178 (2007).
70. Jim E. Morel, Anil Prinja, John McGhee, Todd Wareing, and Brian C. Franke, “A Discretization Scheme for the 3-D Angular Fokker-Planck Operator,” *Nuclear Science and Engineering*, **156**, 154–163 (2007).
71. Jim E. Morel and James S. Warsa, “Spatial Finite-Element Lumping Techniques for the Quadrilateral Mesh  $S_n$  Equations in  $X - Y$  Geometry,” *Nuclear Science and Engineering*, **156**, 325–342 (2007).
72. D. A. Knoll, R. B. Lowrie, and J. E. Morel, “Numerical Analysis of Time Integration Errors for Nonequilibrium Radiation Diffusion,” *Journal of Computational Physics*, **226**, 1332–1347 (2007).
73. Jim E. Morel, T.-Y. Brian Yang, and James S. Warsa, “Linear Multifrequency-Grey Acceleration Recast for Preconditioned Krylov Iterations,” *Journal of Computational Physics*, **227**, 244–263 (2007).

## B. Refereed Proceedings - Full papers

1. J. E. Morel and G. R. Montry, "Analysis and Elimination of the Discrete Ordinates Flux Dip," *Proceedings of a Topical Meeting on Advances in Reactor Computations*, Vol. 2, pp.796-811, Salt Lake City, March 28-31, 1983.
2. M. S. Lazo and J. E. Morel, "A Linear-Discontinuous Galerkin Approximation for the Continuous-Slowing-Down Operator," *Proceedings of the International Meeting on Advances in Nuclear Engineering Computational Methods*, Vol. 2, pp.770-787, Knoxville, Tennessee, April 9-11, 1985.
3. J. M. Mack, J. E. Morel, and H. G. Hughes, "Monte-Carlo Electron-Photon Transport," *Lecture Notes in Physics*, **240**, 272-290 (1985).
4. Leonard J. Lorence, Jr., W. E. Nelson, and J. E. Morel, "Coupled Electron-Photon Transport Calculations by the Method of Discrete Ordinates," *IEEE Transactions on Nuclear Science*, **NS-32**, 4416-4420 December (1985).
5. J. J. Honrubia and J. E. Morel, "Comparison of Step-Like, Weighted-Diamond and Linear-Discontinuous Schemes for Charged-Particle Transport Calculations," *Transactions of the International Topical Meeting on Advances in Reactor Physics, Mathematics and Computation*, April 27-30, 1987, Hotel Meridien Montparnasse, Paris, France, Vol. 1, pp. 377-388, (1987).
6. J. E. Morel and E. W. Larsen, "A New Class of  $S_n$  Spatial Differencing Schemes," *American Nuclear Society Proceedings of a Topical Meeting on Advances in Nuclear Computation and Radiation Shielding*, Sante Fe, NM, April 9-13, 1:1-1:13 (1989).
7. B. R. Wienke and J. E. Morel, "Alpha Particle Transport and Thermonuclear Burn in Mixtures," *American Nuclear Society Proceedings of a Topical Meeting on Advances in Nuclear Computation and Radiation Shielding*, Sante Fe, NM, April 9-13, 49:1-49:9 (1989).
8. J. E. Morel, L. A. Olvey, J. M. McGhee, G. W. Claborn, and J. A. Josef, "Diffusion-Accelerated Solution of the Even-Parity  $S_n$  Equations With

- Anisotropic Scattering,” *Proceedings of the International Topical Meeting on Advances in Mathematics, Computation, and Reactor Physics*, April 28 - May 2, 1991, Greentree Marriot, Pittsburgh, PA, pp. 11.2 3-1 to 11.2 3-10.
9. J. E. Morel, J. M. McGhee, L. A. Olvey, and G. W. Claborn, “Solution of the 3-D Even-Parity  $S_n$  Equations on the Connection Machine,” *Proceedings of the International Topical Meeting on Advances in Mathematics, Computation, and Reactor Physics*, April 28 - May 2, 1991, Greentree Marriot, Pittsburgh, PA, pp. 1.1 2-1 to 1.1 2-11.
  10. W. F. Walters and J. E. Morel, “Investigation of Linear-Discontinuous Angular Differencing for the 1-D Spherical Geometry  $S_n$  Equations,” *Proceedings of the International Topical Meeting on Advances in Mathematics, Computation, and Reactor Physics*, April 28 - May 2, 1991, Greentree Marriot, Pittsburgh, PA, pp. 13.2 3-1 to 13.2 3-8.
  11. W. L. Filippone, J. E. Morel, and W. F. Walters, “An Extended First-Collision Source Method For Electron Beam Source Problems,” *Proceedings of the International Topical Meeting on Advances in Mathematics, Computation, and Reactor Physics*, April 28 - May 2, 1991, Greentree Marriot, Pittsburgh, PA, pp. 7.2 2-1 to 7.2 2-12.
  12. W. L. Filipone, R. C. Little, J. E. Morel, R. E. MacFarlane, and P. G. Young, “Coupled Proton/Neutron Transport Calculations Using The  $S_N$  and Monte Carlo Methods,” *Proceedings of the International Topical Meeting on Advances in Mathematics, Computation, and Reactor Physics*, April 28 - May 2, 1991, Greentree Marriot, Pittsburgh, PA, pp. 2.1 1-1 to 2.1 1-8.
  13. Edward W. Larsen, J. E. Morel, and John M. McGhee, “Asymptotic Derivation of the Simplified  $P_n$  Equations,” *Proceedings of the Joint International Conference on Mathematical Methods and Supercomputing in Nuclear Applications*, Karlsruhe, Germany, April 19-23, 1993, Vol. 1, pp. 718-729.
  14. B. T. Adams and J. E. Morel, “An Upscatter Acceleration Scheme for the Multigroup  $S_n$  Equations,” *Proceedings of the Joint International Conference on Mathematical Methods and Supercomputing in Nuclear*

- Applications*, Karlsruhe, Germany, April 19-23, 1993, Vol. 2, pp. 445-456.
15. J. E. Morel, J. E. Dendy, Jr., and T. A. Wareing, "Diffusion-Accelerated Solution of the 2-D  $S_n$  Equations with Bi-Linear-Discontinuous Differencing," *Proceedings of the Joint International Conference on Mathematical Methods and Supercomputing in Nuclear Applications*, Karlsruhe, Germany, April 19-23, 1993, Vol. 2, pp. 488-499.
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## II. Refereed Articles Accepted for Publication

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