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Current Position: Professor of Electrical and Computer Engineering
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Citizenship: U.S.

Education: **Ph.D. - 1980 – Carnegie Mellon University** – Applied Mathematics
Advisor - Professor Richard C. MacCamy
M.S. - 1979 – Carnegie Mellon University - Mathematics
M.Sc. - 1978 - University of Salford, England - Computational Methods & Fluid Mechanics
B.Sc. - 1975 - University of Sri Lanka - Mathematics

Editorial Board: SIAM Journal on Applied Mathematics – Associate Editor (1997–2006)
Journal of Engineering Mathematics - Board of Associate Referees
Electronic Journal of Mathematical and Physical Sciences
International Journal of Applied Mathematical Sciences

Work Experience: **Professor of Electrical & Computer Engineering** - 08/1990 - present
Professor of Applied Mathematics - 08/90 - present
The University of Akron

Associate Dean of Graduate Studies and Research
College of Engineering
The University of Akron
Akron, OH 44325-3901 - 07/1999 – 07/2007

Program Director of **Applied Mathematics -** 9/1995 - 8/1997
Division of Mathematical Sciences
National Science Foundation
4201, Wilson Blvd., Room 1025,
Arlington, VA 22230

Associate Professor of Mathematical Sciences - 08/1985 -08/1990
The University of Akron

Assistant Professor 8/1983 - 8/1985
University of Tennessee Space Institute
Tullahoma, Tennessee**.**

Staff Scientist 8/80 - 8/83
Institute for Computer Applications in Science and Engineering
NASA Langley Research Center
Hampton, Virginia.

Other Experience: 9/1998 - 12/1998 - Visiting Associate, Caltech (Sabbatical)

7/1995 - 8/1995 - Visiting Professor, University of Notre Dame

1/1978 - 8/1980 - Teaching Fellow – Department of Mathematics , Carnegie Mellon University.

10/76 - 9/77 - Tutor - Department of Mathematics, University of Salford, UK.

4/1975 - 9/1976 - Assistant Lecturer - Department of Engineering Mathematics, University of Sri Lanka, Peradeniya, Sri Lanka.

Consulting: ICOMP, NASA Lewis Research Center, 9/1988 -08/1995
ICASE, NASA Langley Research Center, 9/1983 - 9/1989
Battelle, Research Triangle Park, 3/1986 - 9/1986

Fields of Interest: Applied Mathematics and Scientific Computation
Electromagnetics, Computational Acoustics,
Modeling in Materials Science: Solidification, Chemical Vapor Deposition, Filtration and Nanoscale Modeling.

Journal Publications

1. **S. I. Hariharan**, "On the Normal Stress Effects of Incompressible Non-Newtonian Fluids," *Journal of Franklin Institute*, Vol. 312, No. 2, 1981, pp. 109-119.

2. **S. I. Hariharan** and R. C. MacCamy,"Integral Equation Procedures for Eddy Current Problems," *Journal of Computational Physics*, Vol. 45, No. 1, 1982, pp. 80-99.

3. **S. I. Hariharan**,"Inverse Scattering for a Two-Dimensional Exterior Dirichlet Problem *Quarterly of Applied Mathematics*, Oct. 1982, pp. 273-286.

4. **S. I. Hariharan** and E. Stephan, "A Boundary Element Method for a Two-Dimensional Interface Problem in Electromagnetics," *Numerische Mathematik*, Vol. 42, 1983, pp. 311-322.

5. **S. I. Hariharan** and H. C. Lester, "A Finite Difference Solution for the Propagation of Sound in Near Sonic Flows," *Journal of Acoustic Society of America*, Vol. 75, 1984, pp. 1052-1062.

6. M. H. Dunn and **S. I. Hariharan**, "Numerical Solutions of One Dimensional Inverse Scattering Problems," *Journal of Computational Physics*, Vol. 55, No. 1, 1984, pp. 157-165.

7. **S. I. Hariharan** and H. C. Lester, "Acoustic Shocks in a Variable Area Duct Containing Near Sonic Flows," *Journal of Computational Physics*, Vol. 58, No. 1, 1985, pp. 134-145.

8. **S. I. Hariharan** and A. Bayliss, "Computation of Radiation of Sound from Unflanged Cylindrical Ducts," *SIAM Journal on Scientific and Statistical Computing*, Vol. 6, No. 2, 1985, pp. 285-296.

9. C. Canuto, **S. I. Hariharan**, and L. Lustman, "Spectral Methods for Exterior Elliptic Problems," *Numerische Mathematik*, Vol. 46, 1985, pp. 505-520.

10. **S. I. Hariharan** and R. C. MacCamy, "Low Frequency Acoustic and Electromagnetic Scattering," *Applied Numerical Mathematics*, Vol. 2, 1986, pp. 29-35.

11. **S. I. Hariharan**, "Nonlinear Acoustic Wave Propagation in Atmosphere," *Quarterly of Applied Mathematics*, Vol. XLV, No. 4, 1987, pp. 735-748.

12. **S. I. Hariharan** and S. I. Sudharsanan, "Wave Envelope Technique for Multimode Wave Guide Problems," *Journal of Scientific Computing*, Vol. 2, No. 4, 1987, pp. 371-387.

13. T. Hagstrom and **S. I. Hariharan**, "Accurate Boundary Conditions for Exterior Problems in Gas Dynamics", *Mathematics of Computation*, Vol. 51, No. 184, (1988), pp. 581-597.

14. **S. I. Hariharan** and P. K. Dutt, "Acoustic Gravity Waves: A Computational Approach," *Applied Numerical Mathematics*, Vol. 4, 1988, pp. 491-506.

15. **S. I. Hariharan** and Yu Ping, "Linear and Nonlinear Acoustic Wave Propagation in the Atmosphere," *Journal on Scientific and Statistical Computing*, Vol. 10, No. 3 (1989), pp. 448-514.

16. M. E. Lee, **S. I. Hariharan**, and N. Ida "Transient Calculations of Two-Dimensional Eddy Current Problems," *IEEE Transaction on Magnetics,"* Vol. 25, No. 4 (1989), pp. 3140-3144.

17. M. E. Lee, **S. I. Hariharan**, and N. Ida, "Solving General Time-Dependent Two-Dimensional Eddy Current Problem," *Journal of Computational Physics*, Vol. 89, (1990), pp. 319-348.

18. **S. I. Hariharan**, Yu Ping and J. R. Scott, "Time Domain Numerical Calculations of Unsteady Vortical Flows about a Flat Plate Airfoil," *Journal of Computational Physics* Vol. 101, No. 2, 1992, pp. 419-430.

19. G. W. Young, **S. I. Hariharan** and R. Carnahan,"Flow Effects in a Vertical CVD Reactor", SIAM Journal on Applied Mathematics, Vol. 52, No. 6, 1992, pp. 1509-1532.

20. T. Hagstrom, **S. I. Hariharan** and R. C. MacCamy"On the Accurate Long-Time Solution of the Wave Equation in Exterior Domains: Asymptotic Expansions and Corrected Boundary Conditions," *Mathematics of Computation*, Vol. 63, No. 208, pp. 507-539 (1994). Also a supplement to this article, pp. s7-s10.

21. **S. I. Hariharan**, and D. K. Johnson, "A Framework for Evaluating Boundary Conditions," *Journal of Computational Acoustics*, Vol. 3, No. 3, 1995, pp. 241-259.

22. **S. I. Hariharan**, and D. K. Johnson,"Transmission of Light Waves through Normal Shocks," *Journal of Applied Optics*, Vol. 34, No. 33, 1995, pp. 7752-7758.

23. S. P. Grace, **S. I. Hariharan**, and H. Atassi," Direct Computations of Unsteady Vortical Flows about Thin Airfoils," *Journal of Computational Acoustics*, Vol. 6, No. 3, (1998), pp. 337-355.

24. T. Hagstrom and **S. I. Hariharan**, "A Formulation of Asymptotic and Exact Boundary Conditions using Local Operators," *Applied Numerical Mathematics*, 27, 1998, pp. 403-416.

25. **S. I. Hariharan**, K. Kreider and J. R. Scott, "A Potential Theoretic Method for Far Field Sound Calculations," *Journal of Computational Physics*, 164, pp. 143-164 (2000).

26. C. B. Clemons, **S. I. Hariharan** and D. D. Quinn,"Amplitude Equations for Time-dependent Solutions of the McKendrick Equations," *SIAM Journal on Applied Mathematics*, Vol. 62, No. 2, pp. 684-705 (2001).

27. D. Golovaty, L. K. Gross, **S. I. Hariharan** and E. C. Gartland, "On the stability of Uniform bend Fr'eedericksz configuration in nematic liquid crystals," *Journal of Mathematical Analysis and its Applications*, 255, (2001), pp. 391-403.

28. **S. I. Hariharan** and G. W. Young, "Comparison of Asymptotic Solutions of a Phase-field Model to a Sharp-interface Model," *SIAM Journal on Applied Mathematics*, Vol. 62, No. 1, (2001), pp. 244-263.

29. H. R. Patel, **S. I. Hariharan** and G. G. Chase, "Evaluation of Steady Flow Through a Six-Lobe Sand Cartridge Filter by the Method of Boundary Perturbation Method," *Journal of Porous Media*, 5(1), 49-56 (2002).

30. C. B. Clemons, **S. I. Hariharan**, and G. W. Young, "Asymptotic Solutions of a Phase-Field Model for Alloy Solidification," *SIAM Journal on Applied Mathematics*, Vol. 62, No. 6, (2002), pp. 1952-1979.

31. R. Evans, A. Salifu, G. Zhang, E. Evans, **S. I. Hariharan** and G. W. Young, "Development of Experimental Techniques and an Analytical Model for Aluminum Nitriding," *Surface and Coating Technology*, Vol. 157, (2002), pp. 59-65.

32. **S. I. Hariharan**, S. Sawyer, and D. D. Quinn, "A Laplace Transform/Potential Theoretic - Method for Acoustic Wave Propagation in Subsonic Flows," *Journal of Computational Physics*,185, (2003), 252- 270.

33. T. Hagstrom, **S. I. Hariharan**, and D. Thompson, "High-Order Radiation Boundary Conditions for the Convective Wave Equation in Exterior Domains," *SIAM Journal on Scientific Computing*, Vol. 25, No. 3, (2003), pp. 1088-1101.

34. W. Hannon, M. J. Braun, and **S. I. Hariharan**, "Generalized Universal Reynolds Equation for Variable Properties Fluid-Film Lubrication and Variable Geometry Self-Acting Bearings", *Tribology Transactions,* 47: 171-181, 2004.

35. **S. I. Hariharan** and S. Sawyer, "A Transform/Potential Theoretic Methods for Acoustic Radiation from Structures", *Journal of Aerospace Engineering*, Vol. 18, No. 1, pp. 60 – 67, (2005).

36. G. Vasudevan, **S. I. Hariharan**, and G.G. Chase, "Modeling the Loading Stage Coalescence Process in Fibrous Media", *Journal of Porous Media* 8(3), 299-310 (2005).

37. L. Nelson, J.A. Heminger, C.B. Clemons, G.W. Young, and **S.I. Hariharan**, "Simulation of a One-Dimensional Phase-Field Model for Solidification", *International Journal of Applied Mathematical Sciences*, Vol. 2, No.1 (2005).

38. A. Buldum, I. Busuladzic, C. B. Clemons, L. H. Dill, K. L. Kreider, G. W. Young, E. A. Evans, G. Zhang, **S. I. Hariharan**, and W. Keifer, "Multi-scale Modeling, Simulations and Experiments of Coating Growth on Nanofibers: Part I – Sputtering", *Journal of Applied Physics, 98, 044303* (2005).

39. A. Buldum, C. B. Clemons, L. H. Dill, K. L. Kreider, G. W. Young, X. Zheng, E. A. Evans, G. Zhang, and **S. I. Hariharan**, "Multi-scale Modeling, Simulations and Experiments of Coating Growth on Nanofibers: Part II – Deposition, *Journal of Applied Physics* ,98, 044304 (2005).

40. T. Marinov, A. Buldum, C. B. Clemons, K. L. Kreider, G. W. Young, and **S. I. Hariharan**, "Field Emission from Coated Nanofibers", *Journal of Applied Physics, 98, 044314* (2005).

41. S. Andan, **S. I. Hariharan**, and G. G. Chase, "Continuum Model & Evaluation of the Effect of Saturation on Coalescence Filtration", *Separation science and Technology*, Vol. 13, Issue 8, 1955-1973 (2008).

42. T. Marinov and **S. I. Hariharan**, "Modeling of Field Emission from Nanowires ", *Journal of Applied Physics,105,* Issue: **6** Article Number: 064308 **(**2009**).**

43. N. P. Reddy, G. Mathur, and **S. I. Hariharan**, "Toward a Fuzzy Logic Control of the Infant Incubator", *Annals of Biomedical Engineering*, 0090-6964 (Print) 1573-9686 (Online) (2009).

Refereed Conference Proceedings and Book Chapters

1. **S. I. Hariharan** and R. C. MacCamy, "Numerical Solutions of Low Frequency Electromagnetic and Acoustic Scattering," Numerical Solutions of Singular Integral Equations, Eds. A. Gerasoulis and R. Vichnevetsky, IMACS, 1984.

2. **S. I. Hariharan**, "Numerical Solutions of Acoustic Wave Propagation Problems Using Euler Computations," *American Institute of Aeronautics and Astronautics*, paper No. 84-2290 (1984).

3. **S. I. Hariharan**, "Absorbing Boundary Conditions for Elliptic and Hyperbolic Problems," Chapter 6, Numerical Methods for Partial Differential Equations, Pitman/Longmans, 1986.

4. **S. I. Hariharan**, "A Model Problem for Acoustic Wave Propagation in the Atmosphere", Proceedings of the First IMACS Symposium on Computational Acoustics, North Holland, Eds. D. Lee, R. L. Sternberg and M. Schultz (1988) pp. 65-82.

5. J. S. Wang, N. Ida and **S. I. Hariharan**, "Numerical Modeling of Transient Wave Propagation for High Frequency NDT," Review of Progress in Quantitative Non-destructive Evaluation, D. O. Thompson and D. E. Chimenti, Eds., Plenum Press, (1989), Vol. 8A, pp. 259-266.

6. N. Ida, **S. I. Hariharan**, J. S. Wang and M. E. Lee, "Computation of High Frequency Electromagnetic Fields," in Electromagnetic Fields in Electrical Engineering, D. Shunnian, Ed., International Academic Publishers, Oxford, Proceedings of the

Beijing International Symposium on Electromagnetic Fields in Electrical Engineering, Beijing, China, October19-21, (1989), pp. 600-603.

7. **S. I. Hariharan** and T. Hagstrom, "Far Field Expansion for Anisotropic Wave Equations," Proceedings of the Second IMACS Symposium on Computational Acoustics, North Holland, Eds. D. Lee, A. Cakmak and R. Vichnevetsky, (1990), pp. 283-294.

8. **S. I. Hariharan**, "Long Time Behavior of Unsteady Flow Computations," Unsteady Aerodynamics, Aeroacoustics, and Aeroelasticity of Turbomachines and Propellers, Springer Verlag, Ed. H. M. Atassi, 1993), pp. 73-90.

9. J. N. Scott, R. R. Mankbadi, **S. I. Hariharan** and M. E. Hayder, "Outflow Boundary Conditions for the Computational Analysis of Jet Noise", American Institute of Aeronautics and Astronautics, paper No. 93-4366.

10. **S. I. Hariharan**, D. K. Johnson and G. Adamovsky, "A Theory and Experiments for Detecting Shock Locations," with SPIE's Laser Applications and Combustion and Combustion Diagnostics Proceedings, Vol. 2122, 1994, pp. 195-205.

11. J. N. Scott, **S. I. Hariharan** and R. Mankbadi "Evaluation of Numerical Schemes for the Analysis of Sound Generation by Blade-Gust Interaction," ICASE/LaRC Workshop on Benchmark Problems Computational Aeroacoustics (CAA) Eds. J. Hardin, J. R. Ristorcelli and C. K. W. Tam, NASA Conference Publication 3300, 1995.

12. T. Hagstrom and **S. I. Hariharan**, "Progressive Wave Expansions and Open Boundary Problems," IMA Volumes in Mathematics and its Applications - Computational Wave Propagation, Vol. 86, 1997, Eds. B. Engquist and G. A. Kriegsmann, Springer Verlag, pp. 23-43.

13. **S. I. Hariharan** and T. Hagstrom, "A Systematic Approach for Constructing Asymptotic Boundary Conditions for Wave-like Equations," Computational Methods for Unbounded Domains, Thomas L Geers (Ed.), Kluwer, (1998), pp. 197-206.

14. T. Hagstrom, B. Alpert, L. Greengard and **S. I. Hariharan**, "Accurate Boundary Treatments for Maxwell's Equations and their Computational Complexity," 13th Annual Review in Computational Electromagnetics, II, (1998), pp. 600-606.

15. D. Golovaty, L. K. Gross, **S. I. Hariharan** and E. C. Gartland"On the stability of a uniform bend Freedericksz configuration in nematic liquid crystals," in the Proceedings of the Second International Conference on Nonlinear Problems in Aviation and Aerospace, Embry-Riddle Aeronautical University (1998).

16. **Hariharan, S.I.**, Sawyer, S.; Quinn, D.D.: *A Laplace Transform / Potential-Theoretic Method for Acoustic Propagation in Subsonic Flows*, *Fifth World Congress on Computational Mechanics (WCCM V)*, July 7-12, 2002, Vienna, Austria.

17. **S. I. Hariharan** and S. Sawyer, "A Transform/Potential Theoretic Methods for Acoustic Radiation from Structures", AIAA Paper 2003-1917, April 2003.

Books

Numerical Solution of Partial Differential Equations, **S. I. Hariharan** and T. H. Moulden, Eds. Pitman/Longmans, 1986.

Funded Research Projects

1. "Acoustic Wave Propagation in the Atmosphere," 1984-85, NAG 1-527, NASA Langley Research Center, ($35,000).

2. "Nonlinear Acoustic Wave Propagation in the Atmosphere," 1985-86, NAG 1-624, NASA Langley Research Center, ($16,000)

3. "Nonlinear Acoustic Wave Propagation in the Atmosphere," 1986-87, NAG 1-624, NASA Langley Research Center, ($20,000).

4. NSF Equipment Grant No. DMS-8604047 - 1986-88 ($33,000 plus $30,000 matching funds) (principal investigator - project director D. C. Buchthal)

5. "Analytical Investigation of Transient Electromagnetic Wave Propagation," U.S. Army Missile Command Grant No. DAAH01-87-P4581 - 1987-88, ($25,000).

6. "Short Time Behavior of Transient Electromagnetic Wave Propagation," U.S. Army Missile Command Grant No. DAAH01-88-P5242 - 1988-89, ($20,000).

7. "A Cooperative Agreement of the Support of MMSL Software and Hardware," 1987-88, Grant No. NCC-3-104, NASA Lewis Research Center, ($123,000), with G. W. Young.

8. "A Cooperative Agreement for the Support of MMSL Software and Hardware," 1988-89, Grant No. NCC-3-104, NASA Lewis Research Center, ($140,000), with G. W. Young.

9. Academic Challenge Grant, 1989-90, State of Ohio (with seven other faculty members) ($53,000)

10. "A Cooperative Agreement for the Support of MMSL Software and Hardware," 1989-90, Grant No. NCC-3-104, NASA Lewis Research Center, ($60,000), with G. W. Young.

11. “Computational Analysis for Time Dependent Wave Propagation Problems in Exterior Domains,” Division of Mathematical Sciences, NSF Mathematical Sciences Division, Grant No. DMS-8921189, 1990-92 ($43,000)

12. 1990-91, NASA Lewis Research Center, Grant No. NCC-3-104, ($184,000), with G. W. Young.

13. Academic Challenge Grant (rounds 1,2,3 and 4), 1990-93, OBR, State of Ohio (with seven other faculty members) ($200,000)

14. “A Cooperative Agreement for the Support of MMSL Software and Hardware,” 1991-92, Grant No. NCC-3-104, NASA Lewis Research Center, ($257,000), with G. W. Young.

15. “Computational Analysis for Time Dependent Wave Propagation Problems in Exterior Domains,” Division of Mathematical Sciences, NSF Mathematical Sciences Division, Grant No. DMS-8921189, 1992 – REU Supplement ($2,500).

16. “A Cooperative Agreement for the Support of MMSL Software and Hardware,” 1992-93, Grant No. NCC-3-104, NASA Lewis Research Center, ($247,000), with G. W. Young.

17. “Shock Position Sensoring: Theory, Experiment and Design", 1993-95, Grant No. NCC-3-283, NASA Lewis Research Center, ($167,000).

18. “A Cooperative Agreement for the Support of MMSL Software and Hardware,” 1993-94, Grant No. NCC-3-104, NASA Lewis Research Center, ($187,000), with G. W. Young.

19. “Applied Mathematics: Research Challenge Faculty Research Award –Ohio Board of Regents", 1994-95, ($9,300).

20. “A Cooperative Agreement for the Support of MMSL Software and Hardware,” 1994-95, Grant No. NCC-3-104, NASA Lewis Research Center, ($148,000), with G. W. Young.

21. “Program Director for Applied Mathematics", National Science Foundation, 1995-97, Grant No. DMS-9528105, ($156,761).

22. “Software and Hardware Development in Computational Materials Science", 1997-98, Grant No. NCC3-494, NASA Lewis Research Center, ($140,676), with G. W. Young.

23. “Theory, Modeling, Software and Hardware Development in Computational Materials Science", 1998-99, Grant No. NCC3-494, NASA Lewis Research Center, ($125,972), with G. W. Young.

24. “Fast Potential Theoretic Methods for Far Field Sound Radiation Problems", 1998-99, Grant No. NAG3 - 2182, NASA Lewis Research Center, ($30,000) - OBR match $7,500.

25. “High Performance Connection to vBNS", 1999-2000, NSF ANI- 9818075, with S. C. Meyers, R. E. Klosterman, P. L. Rinaldi amd D.S. Keller ($317,996).

26. “Modeling, Software and Hardware Development for Analytical and Computational Materials Science", 1999 - 2000, Grant No. NCC3-716, NASA Glenn Research Center, ($139,072), with G. W. Young.

27. “Modeling and Scaling of Material Processing Systems", National Science Foundation, Grant No. DMS-9972185, ($120,000), with G. W. Young.

28. “Accurate Boundary Conditions for Computational Aeroacoustics", 2000, The University of New Mexico/sub-grant of NASA Glenn Research Center - NRA-99-GRC-2, ($24,484).

29. “Conference on Homogenization and Material Science", 2000, National Science Foundation, Grant No. DMS-0072259, ($15,000), with L. Berlyand and G. W. Young.

30. “Theory, Modeling, Software and Hardware Development for Analytical and Computational Materials Science, 2000 - 2003, Grant No. NCC3-716, NASA Glenn Research Center, ($450,000), with G. W. Young.

31. “Engineering Management", 2001, University of Cincinnati/sub-grant of Ohio Learning Network, ($31,500), with J. Divoky.

32. “Modeling and Analysis of an Electrochemical Nanocell”, 2003, National Science Foundation, Grant No. DMS-0305577, ($100,000), with G. W. Young, C. Clemons, D. Golovaty.

33. “Multiscale Analysis and Simulation of Nanofiber Coatings: Growth and Applications”, 2003, National Science Foundation, Grant No. DMS-035580, ($106,000), with G. W. Young, A. Buldum, K. L. Kreider.

34. “NIRT: Nanofiber Manufacturing for Energy Conversion and Utilization”, National Science Foundation, Grant No. DMI – 0403835, ($1.3 million) co-PI with 8 others (PI – Darrell Reneker), 2004-2009.

35. “Plolarimetric Modeling”, Lockheed Martin Maritime Sensors and Systems, $35,000, with R. Veillette, 2007-2009.

Technical Reports

1. “On the Normal Stress Effects of Incompressible Non-Newtonian Fluids,” ICASE Report No. 80-31

2. “Inverse Scattering for an Exterior Dirichlet Problem,” ICASE Report No. 81-17

3. “A Boundary Element Method for a Two-Dimensional Interface Problem in Electromagnetics,” with E. Stephan, ICASE Report No. 81-14

4. “Numerical Computations of One-Dimensional Inverse Scattering Problems,” with M. H. Dunn, ICASE Report No. 83-5

5. “Acoustic Shocks in a Variable Area Duct Containing Near Sonic Flows,” with H. C. Lester, ICASE Report No. 83-64

6. “Computation of Radiation from Unflanged Cylindrical Ducts,” with A. Bayliss, ICASE Report No. 83-32

7. “A Finite Difference Solution for the Propagation of Sound in Near Sonic Flows,” with H. C. Lester, NASA Technical Memorandum 84663, 1983

8. “Spectral Methods for Exterior Elliptic Problems,” with C. Canuto and L. Lustman, ICASE Report No. 84-21

9. “Absorbing Boundary Conditions for Elliptic and Hyperbolic Problems,” ICASE Report No. 85-33

10. “Low Frequency Acoustic and Electromagnetic Scattering,” with R. C. MacCamy, ICASE Report No. 83-43

11. “Numerical Solutions of Acoustic Wave Propagation Problems Using Euler Computations,” ICASE Report No. 84-39

12. “Nonlinear Acoustic Wave Propagation in Atmosphere,” ICASE Report No. 86-10

13. “Wave Envelope Technique for Multimode Wave Guide Problems,” with S. I. Sudharsanan, ICASE Report No. 86-52

14. “Acoustic Gravity Waves: A Computational Approach,” with P. K. Dutt, ICASE Report No. 87-19

15. “Compressible Navier-Stokes Equations: A Study of Leading Edge Effects,” with P. R. Karbhari, ICASE Report No. 87-42

16. “Accurate Boundary Conditions for Exterior Problems in Gas Dynamics,” with T. Hagstrom, ICOMP Report - 88-2, NASA Technical Memorandum 100807, March 1988

17. “Solving Two-Dimensional Time Dependent Eddy Current Problems,” with M. E. Lee and N. Ida, ICOMP Report - 88-10, NASA Technical Memorandum 100875, June 1988

18. “Linear and Nonlinear Acoustic Wave Propagation in the Atmosphere,” with Yu Ping, NASA Contractor Report 4157, June 1988.

19. “Far Field Expansion for Anisotropic Wave Equations,” with T. Hagstrom, ICOMP Report - 89-14, NASA Technical Memorandum 102112, June 1989.

20. “Time Domain Calculations of Unsteady Vortical Flows about Flat Plate Airfoil,” with Yu Ping and J. R. Scott, ICOMP Report - 89-19, NASA Technical Memorandum 102318, September 1989

21. “Long Time Behavior of Unsteady Flow Computations,” ICOMP Report -92-04, NASA Technical Memorandum 105584, March 1992.

22. “On the Accurate Long-Time Solution of the Wave Equation in Exterior Domains: Asymptotic Expansion and Corrected Boundary Conditions,” with T. Hagstrom and R. C. MacCamy, ICOMP Report - 93 -4, NASA Technical Memorandum, 106117, 1993.

23. “A Theory and Experiments for Detecting Shock Locations,” with D. K. Johnson and G. Adamovsky, NASA Technical Memorandum, 106634, 1994.

24. “Boundary Conditions for Unsteady Compressible Flows,” with D. K. Johnson, NASA Technical Memorandum, 106737, 1994.

25. “Progressive Wave Expansions and Open Boundary Problems,” with T. Hagstrom, ICOMP Report -95-26, NASA CR, 198432, 1995.

26. “Potential Theoretic Methods for Far Field Sound Radiation Calculations,” with Ed. Stenger and J. R. Scott, ICOMP Report -95 -26, NASA Technical Memorandum 107118, 1995.

27. “A Formulation of Asymptotic and Exact Boundary Conditions Using Local Operators,” with T. Hagstrom, ICOMP Report -98-03, NASA/CR-1998-207935, 1998.

Other Publications

“An Integral Equation Procedure for Eddy Current Problems,” Ph.D. thesis Carnegie-Mellon University, 1980.

“A Review of Numerical Solutions of Integral Equations of the Second Kind,” M.Sc. thesis, University of Salford, 1978.

Papers Presented at Conferences (Abstracts Published)

1. AMS 84th Summer Meeting, Ann Arbor, Michigan, August 18-22, 1980, paper No. 779-45-1 (with R. C. MacCamy) - "An Integral Equation Procedure for Eddy Current Problems."

2. SIAM Fall Meeting, Cincinnati, Ohio, October 26-28, 1982 - Inverse Scattering for an Exterior Dirichlet Problem."

3. ASA (Acoustical Society of America) 104th meeting, Orlando, Florida, Nov. 8-12, 1982, paper No. VVII (with H. C. Lester) - "A Finite Difference Solution for the Propagation of Sound in a Variable Area Duct."

4. SIAM Fall Meeting, Norfolk, Virginia, November 7-9, 1983 – "Acoustic Shocks in a Converging-diverging Nozzle," (with H. C. Lester).

5. AIAA/NASA 9th Aeroacoustics Conference, Williamsburg, Virginia, October 15-17, 1984 - "Numerical Solution of Acoustic Wave Propagation Problems Using Euler Computations."

6. AIAA, Tennessee Section, 3rd Aerospace Sciences Technical Symposium, Tullahoma, Tennessee, January 25, 1985 - Same paper as above.

7. SIAM National Meeting, Boston, Massachusetts, July 20-24, 1986 (with S. I. Sudharsanan) - "Wave Envelope Method for Wave Guide Problems."

8. First IMACS Symposium on Computational Acoustics, Yale University, Connecticut, August 6-8, 1986 - "A Model Problem for Acoustic Wave Propagation in the Atmosphere."

9. Hyperbolic Problems - Second International Conference, RWTH, Achen, West Germany, March 14-18, 1988, - "Accurate Boundary Conditions for Exterior Problems in Gas Dynamics." (with T. Hagstrom).

10. The 4th Joint MMM-Intermag Conference, Vancouver, British Columbia, Canada, July 12-15, 1988 - "Transient Calculations of Two-Dimensional Eddy Current Problems," (with M. E. Lee and N. Ida).

11. The 12th IMACS World Congress on Scientific Computation, Paris, France, July 18-22, 1988 - "Linear and Nonlinear Acoustic Wave Propagation in the Atmosphere."

12. Review of Progress in Quantitative NDE, University of California, San Diego, July 31-August 5, 1988, "Numerical Modeling of Transient Wave Propagation for High Frequency NDT," (with J. S. Wang and N. Ida.)

13. Second IMACS Symposium on Computational Acoustics, March 15-17, 1989, Princeton University, Princeton, NJ - "Far Field Expansion for Anisotropic Wave Equations," (with T. Hagstrom.)

14. SIAM Annual Meeting, July 17-21, 1989, San Diego, "Solutions for Unsteady Vortical Disturbances Around a Flat Plate Airfoil," (with Yu Ping and J. R. Scott).

15. Workshop Field and Integral Equations Methods in Fluid Structure Interactions, (sponsored by ONR), University of Delaware, September 12-15, 1989 - "Modeling Boundary Conditions for Compressible Flows," (invited presentation.)

16. SIAM National Meeting, July 16-20, 1990, Chicago, "Absorbing Boundary Conditions for the Wave Equation - Low Frequency Corrections," with T. Hagstrom and R. C. MacCamy.

17. Sixth International Symposium on Unsteady Aerodynamics, "Long Time Behavior of Unsteady Flow Computations," University of Notre Dame, Sept. 15 - 19,1991.

18. ICASE LaRC Workshop on Computational Aeroacoustics, "Computational Considerations of Two Dimensional Exterior Aeroacoustics Problems," April 6-9, 1992, Hampton, VA.

19. (invited talk) DGLR/AIAA 14th Aeroacoustics Conference, May 11- 14, 1992, "On the Time Accurate Calculations of Computational Fluid Dynamics and Aeroacoustics Problems," Aachen, Germany.

20. (invited talk) SIAM 40th Anniversary Meeting, July 20 - 24, 1992, "Boundary Conditions and Time Accurate Simulations of Compressible Flows," Los Angeles, CA.

21. 15th AIAA Aeroacoustics Conference, October 25-27, 1993, Long Beach, CA, " Outflow Boundary conditions for the Computational Analysis of Jet Noise," with J. N. Scott, R. R. Mankbadi and M. E. Hayder (presented by J. N. Scott).

22. SPIE's International Symposium, OE/LASE 94, January 22-29, 1994, Los Angeles, CA, "A Theory and Experiment for Detecting Shock Locations," with D. K. Johnson and G. Adamovsky.

23. Flow Acoustics: A Technology Audit, July 11-13, 1994, Ecole Centrale De Lyon, France, "Computational Aeroacoustics: A Treatment of Boundary Conditions," with T. M. Hagstrom.

24. Workshop on Computational Wave Propagation, September 19-23, 1994, Institute for Mathematics and its Applications, University of Minnesota, Minneapolis, MN, "Far Field Solutions and Open Boundary Problems."

25. ICASE/LaRC workshop on Computational Aeroacoustics, October 24-26, 1994, Hampton, VA, "Evaluation of Numerical Schemes for the Analysis of Sound Generation by Blade-Gust Interaction," with J. N. Scott and R. Mankbadi.

26. Waves and Memory in Continua: A Meeting in Honor of Richard C. MacCamy , Carnegie-Mellon University, Pittsburgh, August 17-19, 1995, "Open Boundary Problems and Progressive Wave Expansions."

27. SIAM Annual Meeting, July 22-26, 1996, Kansas City, Missouri, "Progressive Wave Expansions and Asymptotic Boundary Conditions," (invited mini-symposium talk).

28. "A Systematic Approach for Constructing Asymptotic Boundary Conditions for Wave-like Equations," with T. Hagstrom, University of Colorado at Boulder, July 27-31, 1997.

29. SIAM Meeting on Mathematical and Numerical Aspects of Wave Propagation, June 1-5, 1998, Golden, Colorado, "A Formulation of Asymptotic and Exact Boundary Conditions in Electromagnetics Using Local Operators," with T. Hagstrom (invited mini-symposium talk).

30. "Nonlinear Stability of Age-dependent Population Dynamics," (with C. B. Clemons and D. D. Quinn), SIAM Conference on Applications of Dynamical Systems, Snowbird, Utah, May 23-27, 1999.

31. Third Forum on Numerics and Modeling for Partial Differential Equations,NUMPDES 2000, SIAM Great Lakes section, April 1, 2000, Dearborn, Michigan, "Comparison of Asymptotic Solutions of Phase-Field Models to a Sharp-Interface Model" (invited talk).

32. Third SIAM Conference on Mathematical Aspects of Materials Science, "Comparison of Asymptotic Solutions of Phase-Field Models to a Sharp-Interface Model," May 22-24, 2000, Philadelphia, (with G. W. Young).

33. Ninth International Conference on Hyperbolic Problems: Theory, Numerics and Applications, March 22-29, 2002, Caltech, "On Phase-field Methods".

34. **Hariharan, S.I.**; Sawyer, S.; Quinn, D.D.: *A Laplace Transform / Potential-Theoretic Method for Acoustic Propagation in Subsonic Flows*, Proceedings of the *Fifth World Congress on Computational Mechanics (WCCM V)*, July 7-12, 2002, Vienna, Austria, Editors: Mang, H.A.; Rammerstorfer, F. G.; Eberhardsteiner, J., Publisher: Vienna University of Technology, Austria, ISBN 3-9501554-0-6, http://wccm.tuwien.ac.at

35. S. Andan, **S. I. Hariharan**, G. G. Chase, "Effect of Saturation on Coalescence Filtration" American Filtration Society Conference, Ann Arbor, Oct 2005.

36. S. Andan; **S. I. Hariharan**, and G. G. Chase, "Modeling of Drainage" American Filtration Society Conference, Chicago, May 2006.

37. S. Andan, **S. I. Hariharan**, and G. G. Chase, "Loading Stage in Cylindrical Co-ordinates" American Filtration Society Conference, Pittsburgh, Oct 2006.

38. S. Andan, **S. I. Hariharan**, and G. G. Chase, "Modeling of Drainage in Coalescence Filtration" American Filtration Society Conference, Orlando, March 2007.

39. T. Marinov and **S. I. Hariharan**, "Old Boundary Integral Techniques and New Problems in Nanotechnology", Boundary Elements - Theory and Applications Beta 2007, Hannover, Germany, May 22 - 24, 2007.

Short Course: Instructor (Organized with T. H. Moulden)

Numerical Methods for Partial Differential Equations, March 18-25, 1985, University of Tennessee, Tullahoma, TN 37388.

Conference

Waves and Memory in Continua: A Meeting in Honor of Richard C. MacCamy, Carnegie-Mellon University, Pittsburgh, August 17-19, 1995. Organized with W. Hrusa, G. Hsiao, V. Mizel and M. Gurtin.

Homogenization and Materials Science, The University of Akron, Akron, September 15 – 17, 2000. Organized with L. Berlyand and G. W. Young (funded by the National Science Foundation.

Memberships in Professional and Honorary Societies

The Institute of Electrical and Electronics Engineers (IEEE)
Society for Industrial and Applied Mathematics (SIAM)

Reviewer

Journal of Computational Physics
Journal of Differential Equations
Electronic Journal of Differential Equations
SIAM Journal on Numerical Analysis
SIAM Journal on Applied Mathematics
Journal of Engineering Mathematics
Journal of Applied Mathematical Modeling
Quarterly of Applied Mathematics
AIAA Journal
NSF Applied Mathematics and Engineering proposals
AFOSR Grant Proposals
ARO Grant Proposals

Computers in Physics
The International Journal of Analytical and Experimental Modal Analysis
Ohio Supercomputer Center - evaluation of proposals for CRAY time

Other Activities (chairing sessions)

SIAM Fall Meeting 1983, Session 1d on Numerical Analysis.
First IMACS Meeting on Computational Acoustics, Yale, 1986, Session on Ocean Acoustics.

ICASE/LaRC workshop on Computational Aeroacoustics, October 24-26, 1994. Hampton, VA.

Third SIAM Conference on Mathematical Aspects of Materials Science, May 22-24, 2000, Philadelphia, session on Models and Methods for Problems of Solidification II.

Ninth International Conference on Hyperbolic Problems: Theory, Numerics and Applications, March 22-29, 2002, Caltech, session on Waves.

Panels

NSF NYI panel 1994.
NSF CAREER panel 1995.
NSF SBIR panel 1998.
NSF IGMS panel 1999.
NSF DMS fluids panel 2000.
NSF ITR panel 2000.
NSF NIRT panel 2001.
NSF IGMS panel 2004

Theses and Dissertations Supervised

1. Roger Pelham - M.S. (1984) - University of Tennessee Space Institute.
2. Voula Sdraka - M.S. (1986) - Department of Mathematical Science, University of Akron - Paper Directed: One-dimensional Atmospheric Acoustic Wave Propagation.
3. Min E. Lee - (Ph.D. - 1989) - Electrical Engineering, (Co-advisor N. Ida), University of Akron. Dissertation title: Potential FD-TD Methods for Electromagnetic Interface Problems.
4. Yu Ping - (M.S. - 1989) - Applied Mathematics, University of Akron. Thesis title: Vortical flows around Thin Airfoils.
5. M. Krishna - (M.S. - 1991) - Applied Mathematics, University of Akron. Thesis Title: Renewed Low Frequency Corrections for the Reduced Wave Equation.

6. R. Carnahan - (M.S. - 1993) Applied Mathematics, University of Akron (jointly with G. Young). Paper Directed: Flow Effects in a Vertical CVD Reactor.

7. D. Maxwell - (M.S. - 1993) - Applied Mathematics, University of Akron. Thesis Title: On-Surface Boundary Conditions at Low and High Frquencies.
8. D. K. Johnson - (M.S. - 1993) Applied Mathematics, University of Akron. Thesis Title: A Study of Computational Boundary Conditions for Fully Unsteady Spherically Symmetric Acoustic Problems.
9. E. J. Stenger - (M.S. - 1995) - Applied Mathematics, University of Akron. Thesis Title: Calculating the Far-field Sound Radiation from Airfoils using Potential Theory.
10. D. K. Johnson - (Ph.D. - 1997) Engineering Applied Mathematics, University of Akron. Dissertation title: Simulations and Experiments for Detecting Flow Inhomogeneities.
11. R. Batalha - (Ph.D. - 2000) Electrical Engineering (Co-advisor N. Ida), University of Akron. Dissertation title: "On the Parabolic Approximation for Transmission of Light through Phase Objects.
12. J. Bonfiglio - (M.S. - 2000) - Applied Mathematics (Co-advisor G. W. Young), University of Akron. Thesis Title: "An asymptotic Model for Two-dimensional Time-dependent Solidification Model".
13. E. J. Flick - (M.S. - 2000) - Applied Mathematics. Thesis Title: "The Prediction of Far-field Acoustic Radiation using Double Layer Potentials".
14. S. Meech – (MS - 2001) - Applied Mathematics (Co-advisor G. W. Young), University of Akron. Paper Directed: Asymptotic Solution of Thermal, Flow, and Mass Transport in a Cylindrical Stagnation Flow CVD Reactor.
15. S. Murphy - MS - 2002 -Applied Mathematics (2002), University of Akron. Thesis Title: Infinite Order Far-field Boundary Conditions for the Wave Equation.
16. T. Marinov – MS -2005- Applied Mathematics, University of Akron. Thesis Title: Field Emissions from Coated Nanofibers.
17. R. Santhanam– MS – 2006- Biomedical Engineering, University of Akron. Thesis Title: Localized Wound Healing: Electromagnetic Induction on Coated Nanofiber Wound Dressings.
18. T. Marinov – PhD –2008 - Engineering Applied Mathematics, University of Akron. Dissertation title: Field Emission and Scattering from Conducting Nanofibers.
19. Q. Khasawneh – PhD –2008- Mechanical Engineering, University of Akron. Dissertation title: On the Analysis of Mechanical Properties of Nanofiber Materials.
20. S. Andan– PhD – Chemical Engineering (Co-advisor G. G. Chase -current).
21. K. Kilburn – PhD – Engineering Applied Mathematics (Co-advisor S. Sawyer – current).
22. N. S. Kucherlapati – MS – Electrical Engineering (current).
23. S. Adhikari -– MS – Electrical Engineering (current).

Community Involvement:

Chairman of Advisory Board- Green YMCA, City of Green, Ohio.

Awards

1. Employee recognition award for teaching, research and services by the University of Akron 1987-88.
2. Outstanding Researcher Award by the University of Akron 1993.
3. Outstanding Researcher Award by the College of Arts and Sciences 1999.