LAYACHI HADJI
Department of Mathematics
Box 870350
The University of Alabama

RESEARCH INTERESTS:

Convection
Solidification
Modeling and analysis of natural and industrial processes.

EDUCATION:

Ph.D Theoretical and Applied Mechanics,
The University of Illinois, Urbana, **1989**.
Dissertation: Analytical Investigations of Convection Effects on the Solid-Liquid Interface
M.S. Applied Mathematics,
The University of Toledo, Ohio, **1983**.
B.S. Petroleum Engineering,
The University of Tulsa, Oklahoma, **1980**.
B.S. Applied Mathematics,
The University of Tulsa, Oklahoma, **1980**.

PROFESSIONAL EXPERIENCE:

1990-present Assistant/Associate Professor/Professor of Mathematics, The Univ. of Alabama.

1989-1990 Research Associate, Ctr. for Non-equilibrium Structures, SMU, Dallas, TX.

1985-1988 Research/Teaching Assistant, Theoretical and Applied Mechanics, Univ. of Illinois.

1983-1985 Teaching Assistant, Mathematics Department, Univ. of Illinois.

1981-1983 Teaching Assistant, Mathematics Department, Univ. of Toledo,

ACTIVITIES:

Membership in professional societies:

Member of the American Physical Society 1988-present
Member of the American Academy of Mechanics 1994–1998
Member of the Society of Engineering Science 1996–1998
Member of the Materials Research Society 1998–1999
Member of the Three Metals Society (TMS) 1999-2001
member of ILASS-Americas 2005-2006

Reviewing & Editorial Activities:

Frequent Technical Reviewer for the following journals:
Advances & Applications in Fluid Mechanics (member of the Editorial Board)
Physics of Fluids
International Journal of Heat and Mass Transfer
Physics Letters A
I M A Journal of Applied Mathematics
Mathematical and Computational Modeling
ASME Journal of Fluid Engineering
Journal of Porous Media
Metallurgical and Materials Transactions A
Applied Mathematics Letters
International Journal of Cast Metal Research
Transport in Porous Media
Journal of Colloid and Interface Science
Journal of Materials Science
Journal of Nonlinear Analysis
Journal of Theoretical Biology
International Journal of Thermal Sciences
Multi-disciplinary Modeling in Materials and Structures.
SIAM Journal of Applied Mathematics
International Journal of Hydrogen Energy.
International Journal of Multiphase Flows.
Journal of Engineering Mathematics
Mathematical Methods in the Applied Sciences

REFEREED JOURNAL PAPERS:

1. **L. Hadji** and M. Schell, Transition to Soret-driven convection in a system with nearly impermeable boundaries, *Phys. Fluids A* **1**, 1467 (1989).

2. **L. Hadji**, M. Schell and D. N. Riahi, Interfacial pattern Formation in the Presence of Solidification and Thermal Convection,*phys. Rev. A* **41**, 863 (1990).

3. **L. Hadji** and M. Schell, Soret-driven Convection Coupled to the Morphology of a Solid-Liquid Interface, *Phys. Fluids A* **2**, 1597 (1990).

4. **L. Hadji**, J. Safar and M. Schell, Analytical Results on the Coupled Bénard-Marangoni Problem Cosistent with experiment, *J. Non-Equilib. Thermodyn.* **16**, 343-356 (1991)

5. **L. Hadji**, Cellular Interfacial Patterns in the Rayleigh- Bénard Problem with Phase Change, Int. J. Engng. Sci **30**, 717-728 (1992).

6. **L. Hadji**, Long-wavelength analysis of the coupling between solidification and Soret-driven convection at positive separation ratio *Phys. Rev. E* **47**, 1078-1086 (1993).

7. **L. Hadji**, Subcritical instability resulting from the low thermal conductivity of the boundaries, *Europhys. Lett.* **23**,245-248 (1993).

8. X. Jin and **L. Hadji**, Interfacial finger cells in a system coupling steady Soret-driven convection and solidification,*phys. Rev. E* **50**, 2361 (1994).

9. **L. Hadji** and X. Jin, Penetrative convection induced by the freezing of seawater, *Int. J. Heat Mass Transfer* **39**, 3823-3834 (1996).

10. **L. Hadji**, Nonlinear analysis of the coupling between interface deflection and hexagonal patterns in Rayleigh-Bénard-Marangoni convection, *Phys. Rev. E* **53**, 5982-5992 (1996). Errata *Phys. Rev. E* **55** p. 3793 (1997).

11. **L. Hadji** and A.M.J. Davis, The influence of insoluble spherical particles on the stability of a planar solidifying interface*J. Crystal Growth* **191**, 889-896 (1998).

12. **L. Hadji**, Asymptotic analysis of particle engulfment, *Phys. Rev. E* **60**, 6180-6183 (1999).

13. **L. Hadji** and M.A.R. Sharif, Penetrative convection in a horizontal layer of seawater near its freezing point, *Applied Mathematical Modeling*, **24**, 733-749 (2000).

14. **L. Hadji**, Modelling and Asymptotic Analysis of Particle-Interface Interaction, *Mathematical and Computational Modelling* **36**, 147-156 (2002).

15. **L. Hadji**, Asymptotic analysis of the crystal-melt interface near a foreign particle, *Europhys. Lett.*, **51**, 413-419 (2000).

16. A. Ponta and **L. Hadji**, Rayleigh-Bénard-Marangoni convection in a liquid with a quadratic density profile (invited paper) *Far East Journal of Applied Mathematics*, **5**, 235-247 (2001).

17. **L. Hadji**, Thermal force induced by the presence of a particle near a solidifying interface, *Phys. Rev. E* **64**, 051502-1 (2001).

18. **L. Hadji**, Morphology of an advancing solid-liquid interface near a spherical particle: Disjoining pressure effects, *Phys. Rev. E* **65**, 022201 (2002).

19. **L. Hadji**, Axisymmetric shapes and forces resulting from the interaction of a particle with with a solidifying interface, *Phys. Rev. E*, **66**, 041404 (2003).

20. **L. Hadji**, Particle engulfment in crystal growth: the thermal puzzle, review article in " Current Topics in Crystal Growth Research", Vol. 6, 95-104 (2002).

21. **L. Hadji**, Morphological instability prior to particle engulfment by a solidifying interface, *Scripta Materialia*, **48** 665 (2003).

22. **L. Hadji**, Morphological Instability Induced by the Interaction of a Particle with a Solidifying Interface, *Eur. Phys. J. B* **37**, 85-89 (2004).

23. **L. Hadji**, The Influence of Cylindrical Inclusions on the Stability of a Directionally Solidified Interface, *Metall. Mater. Trans. A* **35A**, pg. 2181-2185 (2004).

24. **L. Hadji**, Coupled Morphological and Melt Film Instabilities Generated by Inclusions in Crystal Growth, *Mecrogravity Science & Technology* **XVII-2**, pg. 9-17 (2005).

25. **L. Hadji** and W.C. Schreiber, On the evolution of two-dimensional patterns in an inviscid liquid sheet, *Appllied Mathematical Modeling* **31**, pg. 2266-2285 (2007).

26. **L. Hadji**, Effect of shrinkage flow on particle engulfment,*Scripta Materialia* **56**, pg. 57-60 (2007).

27. **L. Hadji**, The drag force on a particle approaching a solidifying interface, *Metall. Mater. Trans A* **37 A**, pg. 3677-3683 (2006).

28. **L. Hadji**, Bubble migration in front of a directionally solidified interface, Physical Review E **75**, 042602 (2007).

29. **L. Hadji** and W.C. Schreiber, The stability of an inviscid liquid sheet containing vapor bubbles, *Journal of Physical and Natural Sciences* (Scientific Journals International), Volume **1**, Issue 2, pg. 1-11 (2007) (http://www.scientificjournals.org/journals2007/articles/1304.pdf).

30. H. Liu, W.C. Schreiber and **L. Hadji**, The influence of thermal modulation on the break-up of a liquid sheet: Linear stability analysis,*advances and Applications in Fluid Mechanics* **3**, pg. 175-196 (2008).

31. H. Liu, W.C. Schreiber and **L. Hadji**, The influence of thermal modulation on the break-up of a liquid sheet: nonLinear analysis, *advances and Applications in Fluid Mechanics* **3**, pg. 197-217 (2008).

32. **L. Hadji**,Modeling convection in colloidal suspensions of tine particles, Journal of non-equilibrium Thermodynamics, **36**, 203-227 (2011)

33. **L. Hadji**, Convection in colloidal suspensions of solid particles: A comparative study of the homogeneous mixture and particulate medium models, Chem. Eng. Comm., **199**, 1394-1411 (2012)

34. **L. Hadji**, Long wavelength analysis of a model for the geographic spread of a disease, Applications & Applied Mathematics, **9 (2)**, 1-10 (2014).

35. **L. Hadji** and M. DarAssi, The influence of sedimentation on the threshold for Soret-driven convection in colloidal suspensions, Phys. Rev. E, **89**, 013014 (2014).

36. R. Shahmurov and **L. Hadji**, Nonlinear steady stable solutions to the Oustroumov problem, International Journal of Heat & Mass Transfer, **82**, 604-612 (2015).

37. M. DarAssi and **L. Hadji**, The effect of slowly sedimenting particles on the onset of Soret convection in a colloidal suspension(in preparation))

38. **L. Hadji**, R. Shahmurov and N. Aljahdally, Thermal convection induced by a an infinitesimally thin and unstably stratified layer, J. Non-Equilib. Thermodyn.(DOI 10.1515/jnet-2015-0071).

39. C. T. Wanstall and **L. Hadji**, A step function density profile model for the convective stability of CO_2 geological sequestration,J. Eng Math (2018) 108:5371 (DOI 10.1007/s10665-017-9907-9, ArXiv:1702.07623 [physics.flu-dyn]).

40. L.A. Vo and **L. Hadji**, Weakly nonlinear convection induced by carbon dioxide sequestration in a a perfectly impervious geological formation, Phys. of Fluids 29, 127101 (2017)(doi 10.1063/1.4998253).

42. N. Aljahdally and **L. Hadji**, Convection-driven analog of the shock tube problem, Journal of non-equilibrium Thermodynamics, **43**, **4** (2018) (ArXiv:1611.06260 [physics.flu-dyn]), (https://doi.org/10.2017-0067)

43. L. Hadji, A Simple Analytical Model for Estimating the Dissolution-Driven Instability in a Porous Medium, Invited paper in
https: www.mdpi.com/journal/fluids/special-issues/CO2storage in geological formations, Fluids (2018), **3(3)**, 60.

44. A. Rohl and L. Hadji, Long wavelength stable three-dimensional Rayleigh-Bénard convection with Dirichlet boundary conditions Submitted February 2020 (J. Eng. Math.).

REFEREED TECHNICAL PUBLICATIONS:

1. **L. Hadji**, Instabilities due to Soret Diffusion Coupled to the Morphology of a Solid-Liquid Interface, Fourth chapter in the book titled **Mathematical modeling and simulation in hydrodynamic stability**, Editor D.N. Riahi, (World Scientific, 1996). (Book chapter)

2. **L. Hadji** and D. N. Riahi, On Nonlinear Thermal Convection with Solidification, *Proceedings of the First National Fluid Dynamics Congress, 24 - 28th July, 1988*, Cincinnati, Ohio. pg. 1914-1921.

3. **L. Hadji** and D. N. Riahi, Nonlinear Pattern Formation in the Coupled Bénard-Marangoni Convection, in Developments in Mechanics, *Proceedings of the Twenty-second Midwestern Mechanics Conference, 6–9th October, 1991, Rolla, Missouri.* pg. 417-419.

4. L. Nastac, S. Chang, D. M. Stefanescu and **L. Hadji**, A Model for Microsegregation in Multicomponent Systems Solidifying with Equiaxed Morphology, *Proceedings of a symposium on Microstructural Design by Solidification Processing*, Chicago, Ill. Nov. 1-5, 1992. Pg 57-75.

5. **L. Hadji**, On the instability of a liquid layer beneath a rigid and deformable boundary in Developments in Theoretical and Applied Mechanics, I. C. Jong and F. A. Akl, eds., vol. XVII, 450-456 (1994).

6. **L. Hadji** and D. N. Riahi, Axisymmetric convective patterns in thin spherical shells via long wavelength expansion, in Developments in Theoretical and Applied Mechanics I.C.Jong and F. A. Akl, eds., vol. XVII, 444-449 (1994).

7. **L. Hadji**, X. Jin and W. Schreiber, On solidificaion in the presence of thermo-solutal convection with Soret effect in Developments in Theoretical and Applied Mechanics, I. C. Jong and F. A. akl, eds., vol. XVII, 474-483 (1994).

8. **L. Hadji**, Nonlinear thermal convection in the Bénard-Marangoni problem with a deformable free interface, in *Proceedings of the Symposium on Two-Fluid Flows with or without Phase Change*, edited by A. Narain, D.A. Siginer and K.M. Kelkar, ASME-AMD Vol. 184, pp. 87-94 (1994).

9. **L. Hadji**, Penetrative convection in a layer of seawater, Proceedings of the 32nd. Annual Meeting of the Society of Engineering Science, New-Orleans, pp. 203-204, October 1995.

10. **L. Hadji**, Floating convection induced by the freezing of seawater, Proceedings of the Fifth International Symposium on Thermal Engineering and Science for Cold Regions , Ottawa, Ontario Canada 19-22 May (1996).

11. **L. Hadji** and A.M.J. Davis, The influence of insoluble spherical particles on the stability of a solidifying interface in Mathematics in Heat Transfer, Eds. G.E. Tupholme and A.S. Wood (1998) 147–156.

12. **L. Hadji**, Analysis of the morphology of a directionally solidifying interface near an insoluble spherical particle in "Solidification 1999", Eds. W.H. Hofmeister, J.R. Rogers, N.B. Singh, S.P. Marsh and P.W. Vorhees (1999) p. 263-272.

13. **L. Hadji**, Particle-interface interaction: An asymptotic approach in " State of the art in cast metal matrix composites in the next millenium", edited by P.K. Rohatgi (2000), p.101-114.

14. **L. Hadji**, Morphology and forces induced by the presence of a particle near a solidifying interface, in Developments in Theoretical and Applied Mechanics, A. Kassab Ed., Vol. XXI, (2002), pg. 601-696.

15. **L. Hadji** and W.C. Schreiber, Nonlinear pattern formation in an inviscid liquid sheet, *Proceedings of ILASS-Americas 2005*, pg. 1-11.

16. **L. Hadji**, W.C. Schreiber, P. Puzinauskas, and V. Daramwar, The effect of vapor bubbles on the stability of a liquid sheet, *Proceedings of the ILASS-Americas 2006*, pg. 1-7.

17. L. Hadji, Convection onset in nano fluids, Proceedings of the 16th United States National Congress of Theoretical and Applied Mechanics.

18. M. DarAssi and **L. Hadji**, Analysis of the interplay between sedimentation and thermophoresis in the presence of convection in colloidal suspensions, ASME 2014 4th. Joint US-Euro Fluids Conference, ed. U. Fritsching, Chicago, 2014.

ABSTRACTS:

1. L. Hadji and D. N. Riahi, Thermal Convection Effects on the Solid-Liquid Interface During Solidification of a Single-Component Liquid, Bulletin of the American Physical Society, Division of Fluid Dynamics, Vol. 33 (1988)

2. L. Hadji and M. Schell, Soret-Convection Effects on the Solid-Liquid Interface During Solidification of a Binary Mixture, Bulletin of the American Physical Society, Division of Fluid Dynamics, Vol. 34 (1989).

3. L. Hadji, Finite Amplitude Bénard-Marangoni Convection, Presented at the SEAS-SIAM meeting, April 3-4, 1992, Huntsville, Alabama.

4. L. Hadji, The Influence of Soret-Driven Convection on the Morphology of a Solid-Liquid Interface., *Proceedings of the first joint ASCE-ASME-SES Meeting, June 6-9, 1993 at Univ. of Virginia, Charlottesville*

5. C. H. Kuo, W. Schreiber and **L. Hadji**, A numerical simulation of the coupling between solidification and Bénard convection at high Rayleigh numbers, *Proceedings of the first joint ASCE-ASME-SES Meeting, June 6-9, 1993 at Univ. of Virginia, Charlottesville.*

6. L. Hadji and X. Jin, A numerical study of the coupling between steady Soret-driven convection and solidification, in Proceedings of the 14th World Congress on Computational and Applied Mathematics (IMACS), Atlanta Ga., 207-210 (1994).

7. L. Hadji and A.M.J. Davis On the interaction of insoluble spherical particles with a solidifying interface in the presence of morphological instabilities in the Proceedings of the Symposium on Computational and Mathematical Models of Microstrutural Evolution, Spring meeting of the Material Research Society (MRS), San-Francisco April 14–16, 1998.

8. L. Hadji, On the morphology of a directionally solidified front near an insoluble spherical particle, Bulletin of the American Physical Society, Division of Fluid Dynamics, Vol. 43 (1998).

9. L. Hadji, Asymptotic analysis of particle engulfment, Computational Materials Science at the Microstructural Scale, 1999 TMS Fall Meeting, Cincinnati, OH. (1999).

10. **L. Hadji**, Asymptotic Analysis of particle–interface interaction, Bulletin of the American Physical Society, Division of Fluid Dynamics, Vol. 44 (1999).

11. **L. Hadji**, Thermal force induced by the presence of a particle near a solid-liquid interface, Bulletin of the American Physical Society, Division of Fluid Dynamics, Vol.46 (2001).

12. **L. Hadji**, Instabilities generated by inclusions in crystal growth in the Tenth Annual International Conference on Composites/Nano Engineering, edited by David Hui, pp. 223-224 (2003).

13. **L. Hadji**, Instabilities generated by inclusions in crystal growth, Bulletin of the American Physical Society, Division of Fluid Dynamics, Vol. 48 (2003).

14. **L. Hadji**, Directional Solidification of a binary alloy in the presence of a foreign particle, 2009 Joint ASCE-ASME-SES Conference on Mechanics and Materials, Virginia Tech University, Blacksburgh, VA, June 24-27 (2009).

15. **L. Hadji**, Bénard convection in the presence of micro particles, Bulletin of the American Physical Society of Fluid Dynamics, Vol. 54, Number 19, Minneapolis, MN.

16. Hadji, Layachi, Convection onset in colloidal suspensions of particles, Bulletin of the American Physical Society , 55(16) 301 (2010).

17. **L. Hadji**, The onset of particle-dominated convection regime in colloidal suspensions, Bulletin of the American Physical Society , 57(17) 294 (2012).

18. **L. Hadji**, Convection in vertically unbounded regions, PACAM XV Congress, May 16-22 2015, Urbana-Champaign.

19. **L. Hadji**, Nonlinear convection in unbounded regions, South-Eastern Meeting of the American Mathematical Society, Huntsville, Alabama, March 27-20, 2015.

20. R. Shahmurov and **L. Hadji**, Nonlinear convection in unbounded vertical channels,Bulletin of the American Physical Society , 60(21) 124 (2015).

21. C.T. Wanstall and L. Hadji Modeling the convective stability of CO_2 sequestration by a discontinuous and unstably stratified density profile, Bulleting of teh American Physical Society, 61 (20) 516 (2016)

22. C.T. Wanstall, L. Vo and L. Hadji, A new model for the convective stability of carbon sequestration, Joint Mathematics Meetings, Atlanta, GA (2017).

23. **L. Hadji**, Modeling the dissolution-driven convection as a Rayleigh-Benard problem, InterPore2018 (MS 3.11, session A), New-Orleans, May-14-17, 2018.

24. A. Rohl and **L. Hadji**, Stable long wavelength three-dimensional convection with Dirichlet thermal boundary conditions, Division of Fluid Dynamics 2019 Meeting, Nov. 18-21 (Seattle, WA).

RESEARCH GRANTS:

1. *A Mathematical and numerical study of thermosolutal convection with Soret effect coupled to the morphology of a solid-liquid interface*, PI in SOMED GRANT 4/15/93 - 4/15/94 $ 19,800

2. *NIGEC, Mathematical Modeling of the Coupled Katabatic, Ocean and Ice System for the Antarctic,* Co-Investigator in joint UAH-UA project, 10/1/92 to 6/30/95. UA funding $ 158,800.

3. Principal Investigator in a grant titled *Numerical Study of Penetrative Convection in Seawater*, from Cray Research Inc., Department of Mathematics, 1/31/95 - 1/31/96, $ 15,000.

4. Principal Investigator in an DMS-NSF grant titled *A strongly coupled analytical study of the interaction of foreign particles with a solid-liquid interface in the presence of morphological and fluid instabilities*, Department of Mathematics, 06/01/97-05/31/2001, $ 111,000.

5. Principal Investigator in a joint project with Oak-Ridge under the direction of Peter Angelo titled "Modeling for casting Solidification, Particle Transport, Visualization", 04/01/2020-03/31/2022, (UA share $ 220,000)

SOLO PRESENTATIONS:

1988 *Cellular Solidification in a layer with nearly insulating boundaries*, Department of Theoretical and Applied Mechanics, Oct.1988

1988 *On nonlinear thermal convection with solidification*, at the First National Fluid Dynamics Congress, 24-28th. of July in Cincinnati Ohio.

1989 *The influence of the Soret effect during the solidification of a binary mixture*, Southern Methodist University, Dallas Texas.

1991 *Nonlinear Pattern formation in the coupled Bénard Marangoni convection* at the Twenty second Midwestern Mechanics Conference, 6-9th. October, the University of Missouri at Rolla.

1991 *Benard convection coupled to the morphology of a solid/liquid interface* Department of Matallurgical and Materials Engineering, Feb. 1991.

1992 *Finite amplitude Bénard Marangoni convection* at the Southeastern section of SIAM, April 3-4 in Huntsville Alabama.

1993 *The influence of Soret-driven convection on the morphology of a solid-liquid interface* at the First Joint Meeting of the American Society of Civil Engineers, the American Society of Mechanical Engineers and the Society of Engineering Sciences (ASCE-ASME-SES) at the University of Virginia, Charlottesville, Virginia.

1994 *On the instability of a liquid layer beneath a rigid and deformable boundary* at the Seventeenth Southeastern Conference on Theoretical and Applied Mechanics at Hot Springs Arkansas.

1994 *Axisymmetric convective patterns in thin spherical shells via long wavelength expansion* at the Seventeenth Southeastern Conference on Theoretical and Applied Mechanics at Hot Springs Arkansas.

1994 *On solidification in the presence of thermosolutal convection with Soret effect* at the Seventeenth Southeastern Conference on Theoretical and Applied Mechanics at Hot Springs Arkansas.

1994 *A numerical study of the coupling between steady Soret-driven convection and solidification* at the fourteenth World Congress on Computational and Applied Mathematics (IMACS), July 11 - 15 in Atlanta Georgia.

1994 *Nonlinear thermal convection in the Bénard Marangoni problem with a deformable free interface* at the Symposium on Two-Fluid Flows with or without Phase Change, ASME Winter Annual Meeting, November 6-13 in Chicago Illinois.

1995 *Penetrative convection in a layer of seawater* at the 32nd Annual Meeting of the Society of Engineering Science, October 29 - November 1, New-Oeleans, LA.

1996 *Floating convection induced by the freezing of seawater* at the Fifth International Symposium on Thermal Engineering and Science for Cold Regions, Ottawa, Ontario, Canada 19-22 May (1996).

1997 *On the freezing of seawater* at the Rheology Group Meeting, Tuscaloosa Alabama

1997 *Thermosolutal Convection in the Presence of Solidification* at the Aerospace Engineering and Mechanics Department Seminar, Tuscaloosa, Alabama.

1998 *On the morphology of a directionally solidifying interface near an insoluble spherical particle*, 51st Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, Philadelphia, PA NOv. 1998.

1999 *Asymptotic analysis of particle engulfment*, Symposium on Computational Materials Science at the Microstructural Scale, The 1999 Fall Meeting of the TMS, Cincinnati, OH Nov. 3 1999.

1999 *Asymptotic analysis of particle-interface interaction*, 52nd annual Meeting of the Fluid Dynamics Division of the American Physical Society, New-Orleans, LA. Nov. 21-23 1999.

2000 *Particle-interface interaction: An asymptotic approach*, Symposium titled "State of the art in cast metal matrix composites in the next millenium" held in conjunction with the 2000 Fall Meting of the TMS in St. Louis, Missouri.

2001 *Thermal force induced by the presence of a particle near a solidifying interface*, 54th. Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, San Diego, CA., Nov. 18-21, 2001.

2003 *Instabilities generated by inclusions in crystal growth*, Tenth Annual International Conference on Composites/Nano Engineering, July 20-26, New Orleans, LA

2003 *Instabilities generated by inclusions in crystal growth*, 56th. Annual Meeting of the Division of Fluid Dynamics of the American Physical Society, New-Jersey, Nov. 20-22.

2005 *Nonlinear pattern formation in an inviscid liquid sheet*, ILASS-Americas 2005 meeting, University of California, Irvine, California, May 23-25, 2005.

2009 Directional solidification of a binary alloy in the presence of foreign particles, Virginia Tech University, Blacksburg, VA, June 24-27.

2009 Bénard convection in the presence of micro particles, 62nd Meeting of the Division of Fluid Dynamics, Nov. 22-24, Minneapolis, MN.

2010 Convection onset in colloidal suspensions of particles 63rd. Annual meeting of the APS Division of Fluid Dynamics, Nov. 21-23 Long-Beach, CA.

2010 Rayleigh-Benard Convection in Nanofluids 16th. U.S. National Congress of Theoretical and Applied Mechanics. Penn State U., State College, Pennsylvania, 06/27/10 - 07/02/10.

2012 , The onset of particle-dominated convection regime in colloidal suspensions, 65th. Annual meeting of the APS Division of Fluid Dynamics, Nov. 18-20, San Diego, CA.

2014 Analysis of the interplay between sedimentation and thermophoresis in the presence of convection in colloidal suspensions, ASME 2014 4th. Joint US-Euro Fluids Conference, ed. U. Fritsching, Chicago, 2014.

2015 Nonlinear convection in unbounded regions, South-Eastern Meeting of the American Mathematical Society, Huntsville, Alabama, March 27-20, 2015.(Invited talk in the special session New development in the theory of ordinary differential equations).

2015 Nonlinear convection in vertically unbounded regions, Pan-American Congress of Applied Mechanics, XV, Urbana-Champaign, May 18-May 21, 2015.

2015 Nonlinear convection in unbounded vertical channels, Meeting of the American Physical Society, Division of Fluid Dynamics, Boston, MA, Nov. 22-24, 2105.

2017 A new model for the convective stability of carbon sequestration, Joint Mathematics Meetings, Atlanta, GA (2017).

2018. Modeling the dissolution-driven convection as a Rayleigh-Benard problem, InterPore2018 (MS 3.11, session A), New-Orleans, May-14-17, 2018.

TEACHING ACTIVITIES:

Upper division courses taught:

MATH 441 Boundary Value Problems

MATH 442 Integral Asymptotics Methods and Fourier Transforms

MATH 445 Singular Perturbation Methods

MATH 600 Studies in Convection and Solidification

MATH 300 Numerical methods

MATH 343 Differential Equations II

MATH 504 Modeling with MATLAB

MATH 558 Complex Variables

MATH 537 Topics in nonlinear partial differential equations (enrollment of 12 students in 2014)

MATH 498 Introduction to Fluid Mechanics

MATH 698 Non dissertation research

MATH 644 Singular perturbation theory

Ph.D. Dissertations directed

1. Mahmoud DarAssi, **Asymptotic analysis of mass-dominated convection in nanofluids**(2014)

2. Rishad Shahmurov, **Rayleigh-Bénard Convection in the absence of horizontal boundaries**(2014).

3. Noufe Aljahdaly, **Development, analysis and simulation of laboratory scale models of some problems in astrophysical convection** (2017).

Masters thesis/projects directed

1. Xian-Xi Jin, **A numerical study of planar interface morphological stability in solidification processes**(project)
2. Stanley Carl McCaa, **Buoyancy-driven convection due to thermal instability of freezing seawater**(project)
3. Aurora Ponta, **Rayleigh-Bénard-Marangoni convection in water**
4. Brandon Morgan, **Analysis of the Equation of the Joukowski Airfoil using Conformal Mapping**(project)
5. Liet Vo, **Weakly nonlinear analysis of convection induced by the sequestration of CO_2 in a geological formation that is perfectly impervious** (thesis, 2017)
6. Alexandra Doyle, **SOlution methods for some nonlinear PDEs** [2018]
7. Alaric Rohl, **Rayleigh-Bénard instability to a long-wavelength mode rectangular tube with stress-free boundary conditions** [2019]

Membership in Masters thesis committees

1. L. Nastac, Materials Engineering (Metallurgical Eng.) (MTE)(1991)
2. R. Phalinikar, MTE (1993)
3. A. Catalina, MTE (1997)
4. R.S. Bhamidipati, MTE (1996)
5. J.F.L. Torres, MTE (1999)
6. O. Damrah, MATH (2008)
6. Leighton Wilson, MATH (2015)

Membership in PhD Dissertation defense committees

1. C.H. Kuo, Mech. Eng. (ME) (1994)
2. L. Nastac, MTE (1995)
3. X. Jin, ME (1997)
4. A. Catalina, MTE (1999)
5. L. Beltran, MTE (2003)
6. H. Fayoumi, MATH (2008)
7. P. Taylor, MATH (2009)
8. Yuanyuan Song, MATH (2014)

9. Daojie Zhang, MTE (2015)

10. Duc Nugen, MATH (2015)

11. Huy D. Vo, MATH 2017

11. Keisha Cook, MATH [2019]

12. Siwen Wang, MATH [2020]

Membership in PhD supervisory committees

1. C.H. Kuo, ME (1996)

2. L. Nastac, MTE (1994)

3. X. Jin, ME (1996)

4. K. Ping, APMA (1999)

5. H. Liu, ME (2007)

6. S. Kansakar, MATH (UAH) (2008).

7. R. Shahmurov, MATH (2011) (Chairman)

8. M. Dar-Assi, MATH (2011) (Chairman)

9. Noufe Aljahdaly (2014) (Chairman)

9. Daojie Zhang, MTE (2015)

10. Siwen Wang, MATH (20190

SERVICE

Departmental Committees 1. Library representative (91-92)

2. Textbook selection committee (94-95) (Chairman) and (00-01)

3. Graduate Committee (97-2000) and 2010-2011 and 2012

4. Instructors Hiring committee (99-01) and 2003-2005.

5. Faculty Hiring Committee 02-03, 04-05, 05-06, 07-08, 2010-11 (Chair), 2012-13 (chair),2014-15(Chair)

6. Chair , Committee in charge of revising applied math courses (2014-15)(Chair)

7. Undergraduate advisor, Classical track and member of Applied Math Tracks merger committee

8. Undergraduate Studies Committee

College level 1. College of Arts and Sciences Graduate Committee.

Campus wide 1. International Education Committee (2001-02)

2. University Libraries Committee (2005-2006)

3. Research Grants Committee (2011-2014)