Department of Applied Mathematics
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EXPERIENCE

Teaching Professor, APPM, University of Colorado at Boulder	2023 – Present
Senior Instructor, APPM, University of Colorado at Boulder	2011 – 2023
Instructor, APPM, University of Colorado at Boulder	9/03 – 9/11
Lecturer, APPM, University of Colorado at Boulder	5/01 – 5/03
Instructor, MCEN, University of Colorado at Boulder	9/96 – 8/98
Assistant professor, adjunct, MCEN, University of Colorado at Boulder	1/94 – 5/03
Part-time instructor, APPM, University of Colorado at Boulder	1/94 – 5/01
Engineering consultant, Kawamura Design, Broomfield, CO	9/93 – 5/94
Lead graduate teacher coordinator, GTP, Univ. of Colorado at Boulder	11/93 – 5/94
Research engineer, The Timken Company, Canton, OH	4/80 – 8/85

EDUCATION

University of Colorado, Ph.D. in Mechanical Engineering, 1993.
Massachusetts Institute of Technology, M.S. in Mechanical Engineering, 1980.
University of Colorado, B.S. in Applied Mathematics (distributed engineering minor), 1977.

COURSES TAUGHT AT CU BOULDER

GEEN 1300	Introduction to Engineering Computing
GEEN 1340	Calculus Ia with Algebra
GEEN 1345	Calculus Ib with Algebra
GEEN 3852	Thermodynamics I for Engineers
APPM 1350	Calculus I for Engineers
APPM 1360	Calculus II for Engineers
APPM 2350	Calculus III for Engineers
APPM 2360	Introduction to Linear Algebra and Differential Equations
APPM 2750	Java II
APPM 3050	Scientific Computation in MATLAB
APPM 3350	Advanced Engineering Calculus
APPM 4350	Fourier Series & BV Problems
APPM 4380	Mathematical Modeling
APPM 4570	Statistical Methods
APPM 4650	Intermediate Numerical Analysis I
APPM 4660	Intermediate Numerical Analysis II
APPM 4950	Special Topics – Modeling Ant Colonies
APPM 4950	Special Topics – Evolution of River Morphology
APPM 4950	Special Topics – Tensors
APPM 5040	Extend Your Limits
APPM 5350	Fourier Series & BV Problems
APPM 5380	Mathematical Modeling
APPM 5570	Statistical Methods

MCEN 3012 Thermodynamics I
MCEN 3022 Heat Transfer
MCEN 4027 Mechanical Engineering Senior Laboratory
MCEN 4030 Computational Methods
MCEN 4122 Thermodynamics II
MCEN 5022 Thermodynamics

CURRENT RESEARCH INTERESTS

Rapid solidification of undercooled pure liquids

This research involves the formulation, and solution, of a mathematical model to describe the effect of finite rate heat release on the macroscopic propagation speed of a solidification front through an undercooled pure liquid. Based on continuum equations, the model describes heat and mass transport in a volumetrically averaged mixture of solid and liquid in the thin phase transformation region. This thin solidification zone is examined on a length scale larger than any microstructural detail, yet smaller than macroscopic thermal conduction length scales in the pure liquid and solid regions. Arrhenius-type source terms are used to represent the volumetrically averaged, finite rate phase transformation process occurring within the solidification zone.

Modeling ant colony behavior

Recent research on red harvester ant colonies shows that a colony acts as a complex system composed of individual ants working towards the benefit of the colony without the aid of any central input or direction. There has been extensive field research to understand the basis behaviors of individual ants and to assess the factors that influence how the colony operates from day to day. We use this existing work as a guideline for creating an agent-based model that simulates a day in the life of an ant colony. In the model, as in life, every ant reacts to its immediate surroundings according to its basis behaviors, with no additional coordinated direction from the nest or the queen. Specifically, each ant knows only what it has experienced for itself and acts on that without regard to the colony's other current activities or needs. Despite the myopic attitude of its inhabitants, the colony is able to grow and prosper as long as food is available.

Evolution of river meanders

On appropriate time and length scales, rivers are living entities. Their spatial and temporal evolution depends on their current shape, volume flow, and local topography. We have been developing code in Matlab to model the evolution of river morphology, and comparing it with river data taken from Google Earth images.

Modeling thermo–mechanical and thermo–acoustic responses in gasses

The deposition of localized energy on time scales that are short or long compared to the mechanical response time of the surrounding medium leads to a myriad of possibilities. This work has applications in liquid propellant rocket engines, lightning strikes and thunder, and supernovae phenomena.

PUBLICATIONS

D.R. Kassoy and J.A. Norris, "Thermo–mechanical Modeling of Reaction Initiation and Detonation Formation." International Colloquium on the Dynamics of Explosions and Reactive Systems, Boston MA, August 2021.

Norris, J.A. and Kassoy, D.R., "The Effect of Finite Rate Heat Release on the Solidification of an Undercooled Pure Liquid." *Proceedings of the Royal Society of London*, Series A, v. 454, pp. 2347–2370, 1998.

Norris, J.A. and Kassoy, D.R., "Effects of Finite Rate Phase Transformation Kinetics on the Steady-State Solidification Front Propagation Speed in Undercooled Pure Liquids." In *Phase Transformations and Systems Driven Far From Equilibrium*, (eds. E. Ma, P. Bellon, M. Atzmon, and R. Trivedi), v. 481, Materials Research Society Proceedings, Boston, MA, 1997.

Hetzner, D.W. and Norris, J.A., "Effect of Austenitizing Temperature on the Carbide Distributions in M42 Tool Steel." *Microstructural Science*, v. 17, pp. 91–101, 1989.

Weidman, P.D. and Norris, J.A., "Capillary Gravity Waves With Fixed Contact Lines: An Approximate Analysis." *PHC PhysicoChemical Hydrodynamics*, v. 9, no. 1/2, pp. 393–402, 1987.

PRESENTATIONS

"Reformulation of the Piston Problem." D.R. Kassoy and J.A. Norris, APS Division of Fluid Dynamics annual meeting, November 2023.

"Thermo–mechanics Modeling and Physics." D.R. Kassoy and J.A. Norris, APS Division of Fluid Dynamics annual meeting, November 2019.

"Spontaneous Reaction Zone Propagation in a 1–D Finite Hot Spot of Reactive Gas." D.R. Kassoy and J.A. Norris, APS Division of Fluid Dynamics annual meeting, November 2018.

"The Physics of Thermo–Mechanics." International Colloquium on the Dynamics of Explosions and Reactive Systems, D.R. Kassoy and J.A. Norris, APS Division of Fluid Dynamics annual meeting, November 2017.

"The Origin and Evolution of Mechanical and Thermodynamic Disturbances Caused by Localized Energy Deposition in Gaseous Volumes." International Colloquium on the Dynamics of Explosions and Reactive Systems, D.R. Kassoy and J.A. Norris, Boston MA, August 2017.

"Phase Transformation Kinetics and Solidification Front Propagation in Undercooled Pure Liquids." Materials Research Society, 1997 Fall meeting, Boston MA, December 1997.

"Solidification of Undercooled Pure Liquids." Metallurgy Department, Colorado School of Mines, Golden, CO. January 27, 1994.

"Effects of Finite Rate Phase Transformation on the Solidification of Undercooled Pure Liquids." The American Physical Society, 46th annual meeting of the Fluid Dynamics Division. Albuquerque, NM. November 23, 1993.

"Rapid Solidification of Highly Undercooled Melts." Department of Mechanical Engineering, University of Colorado, Boulder, CO. March 2, 1992.

"An Approximate Analysis for Capillary-Gravity Waves with Fixed Contact Lines." The American Physical Society, 39th annual meeting of the Fluid Dynamics Division. The Ohio State University, Columbus, OH. November 24, 1986.

DEPARTMENT AND COLLEGE SERVICE

Undergraduate committee, Dept. of Applied Mathematics, 2005 – present.
Student advisor (one of five to ten students), Dept. of Applied Mathematics, 2004 – 2020.
Special needs APPM exam coordinator, 2003 – 2017.
Hiring coordinator for extra APPM exam–graders, 2003 – 2017.
APPM annual representative for College of Eng. High School Honors Institute, 2003 – 2010.
APPM annual representative for College of Engineering Open House, Admitted Students Day, College of Engineering Orientation, Engineering Sampler Day, etc., 2003 – 2021.
Chair, reappointment committee for APPM Instructor Robert Benim, 2024.
Chair, reappointment committee for APPM Instructor Anne Dougherty, 2023.
Chair, reappointment committee for APPM Instructor Sujeet Bhat, 2017.
Hiring committee for multiple APPM Instructors, 2013 and 2016.

Undergraduate committee, Dept. of Mecanical Engineering, 1996 – 1998 academic years.
Faculty advisor, The American Society of Mechanical Engineers, 1996–1998 academic years.
Faculty advisor, Theta Tau (Engineering fraternity), 2005 – present.

UNIVERSITY SERVICE

Non-tenured At-Large Boulder Faculty Assembly (BFA) representative, 2006 – present.
BFA CU Intercollegiate Athletics Committee, 2006 – 2008.
BFA Academic Technologies & Services Committee, 2024 – present.
BFA Administrative Services & Technology Committee, 2008 – 2012.
BFA Instructor Track Faculty Affairs Committee, Chair 2011, Co–Chair 2012 – 2014, and member till present.
BFA Nominations and Elections Committee, Chair 2014 – 2016, and 2018 – present.
BFA Bylaws Committee, Spring 2015 – present. Chair 2016 – 2018.
BFA Excellence Awards Committee, 2008, 2014 – present.
BFA Ad–Hoc committee on CU Boulder's Office of Discrimination and Harassment, 2014.
BFA Secretary, 2014, 2015, and 2018 – 2022 academic years.
BFA Vice Chair, 2016, 2017 academic years.
BFA At-Large Representative to the BFA Executive Committee, 2022 – present.

APPM representative to the CU Honor Council, 2008 – 2022.
APPM department representative to the Arts & Sciences Council (ASC), Fall 2010 – Spring 2011.
Member of the ASC Grievance Committee, Fall 2010 – 2014.
Member of the A&S Instructor Task Force, Fall 2018 – present.
Member of the Focus on Excellence Committee, 2017 academic year.
Member of the First–year Interest Group Committee, Spring 2017.
Member of the First Year Seminar Design and Selection Committees, 2017 academic year.

Professional Rights and Responsibilities Working Committee, 2021 – 2023.
Dean's Advisory Committee on Instructor Track Faculty, 2019 – 2021.
Dean's Implemtation Committee on Instructor Track Faculty issues, 2021 – present.
Hiring Committee for the CU Boulder Dean of Division Natural Sciences, 2024.
Hiring Committee for the CU Boulder Chief of Police, 2013.
Vice Chancellor's Parking Rate Committee, 2011 – 2013.
Chancellor's Program Accessibility Committee, 2007 – 2009.

ASSOCIATIONS

Materials Research Society.
Tau Beta Pi (Engineering honorary fraternity).
The American Physical Society.

CERTIFICATIONS

Sun certified Java programmer.
Sun certified Java academic instructor.

TEACHING HONORS

CU-LEAD Faculty Award, CU-LEAD Alliance scholars, 2005.
Marinus Smith Teaching Award, CU Parents Association, 2004, 2006.
Multicultural Engineering Program, Faculty Appreciation Award, 2002.
National Residence Hall Honorary Association, IACURH Regional Faculty Award, 2011.
Peebles Innovation in Education Award, College of Engineering and Applied Science, 2007.
Residence Life Academic Teaching Award, 2002, 2004, 2006.

SERVICE HONORS

Boulder Faculty Assembly, Faculty Recognition Award, 2015.