

Devesh Ranjan
Associate Professor
George W. Woodruff School of Mechanical Engineering
CV Table of Contents

Section	Description	Page
I.	Earned Degrees	1
II.	Employment History	1
III.	Honors and Awards	1
IV.	Research, Scholarship, and Creative Activities	2
V.	Teaching	16
VI.	Service	20

DEVESH RANJAN
ASSOCIATE PROFESSOR
J. ERSKINE LOVE JR. FACULTY FELLOW
GEORGE W. WOODRUFF SCHOOL OF MECHANICAL ENGINEERING

I. EARNED DEGREES

University of Wisconsin-Madison	Mechanical Engineering	Ph.D., 2007
University of Wisconsin-Madison	Mechanical Engineering	M.S., 2005
National Institute of Technology-Trichy	Mechanical Engineering	B. E., 2003

II. EMPLOYMENT HISTORY

J. Erskine Love Jr. Faculty Fellow	Georgia Institute of Technology, GA	1/1/2016-Present
Associate Professor	Georgia Institute of Technology, GA	7/1/2014-Present
Morris E. Foster Faculty Fellow	Texas A&M University, TX	9/1/2013 – 6/30/2014
Assistant Professor	Texas A&M University, TX	1/7/2009 – 6/30/2014
Director's Research Fellow	Los Alamos National Laboratory, NM	08/2008 - 1/6/2009
Postdoctoral Research Associate	Los Alamos National Laboratory, NM	01/2008 - 07/2008
Instructor	University of Wisconsin-Madison, WI	06/2007 -08/2007
Graduate Research Assistant	University of Wisconsin-Madison, WI	06/2003 -12/2007
Research Fellow	JNCASR-Bangalore, India	01/2003 - 04/2003
Summer Intern	JNCASR-Bangalore, India	06/2002 - 08/2002
Summer Intern	National Chem. Lab. Pune, India	05/2001 - 06/2001

III. HONORS AND AWARDS

A. International or National Awards

- Invited participant to National Academy of Engineering's 2016 US Frontiers of Engineering Symposium
- US Air Force Office of Scientific Research (**AFOSR**) **Young Investigator Award**, 2013
- National Science Foundation (**NSF**) **CAREER Award**, 2013
- Alexander von Humboldt Fellowship for Postdoctoral Research, August 2007
- Director's Research Fellow, Los Alamos National Laboratory, 2008
- Article selected as cover page in Journal of Fluid Mechanics-Vol. 594
- Best Poster (co-authored by Dr. Om Prakash Singh), International Conference on Advances in Fluid Mechanics, Bangalore, India, July 2003.
- Best Student Contribution (co-authored by John Niederhaus), 16th American Nuclear Society Topical Meeting on the Technology of Fusion Energy, September, 2004.

B. Institute or School Awards

- **J. Erskine Love Jr. Faculty Fellow, 2015**
- Georgia Tech nominee to attend 2016 NAE-Frontiers in Engineering Education

May 24th, 2016

- Texas A&M University Nominee for 2014 Blavatnik Awards for Young Scientists (Category-Physical Sciences and Engineering)
- Morris E. Foster Faculty Fellow in Mechanical Engineering (Awarded by College of Engineering), 2013
- 2013 Texas A&M ASME Professor Mentorship Award
- Caterpillar Teaching Excellence Award 2012-2013 (Awarded by College of Engineering)
- TEES Select Young Faculty Award, 2012-2013
- Departmental Nominee for the 2012-2013 Montague Center for Teaching Excellence Scholar Award (University Level Award)
- Morris E. Foster Faculty Fellowship, Department of Mechanical Engineering, TAMU, 2010
- TAMU Student Led Award for Teaching Excellence (SLATE), 2009
- Rajiv Gandhi Research Scholar for year 2002 (Awarded to top 3 summer interns under JNCASR summer research program by Dept. of Science and Technology).
- Summer Research Fellowship by JNCASR (2002 and 2003).

IV. RESEARCH, SCHOLARSHIP, AND CREATIVE ACTIVITIES

Indicate with an asterisk those that resulted from work done at Georgia Tech and put the names of student co-authors in boldface.

A. PUBLISHED BOOKS, BOOK CHAPTERS, AND EDITED VOLUMES

A1. Books

- "No Data"

A2. Refereed Book Chapters

BC3: **Thanapal, S., Eseltine, D.,** Annamalai, K., and Ranjan, D., "Biomass Fuel Quality Enhancement and Respiratory Quotient (RQ) for Ranking Fossil and Biomass Fuels Based on CO₂ Emissions," *Novel Combustion Concepts for Sustainable Energy Development*, Springer India, 2014 pp 45-73

BC2: Ranjan, D., Niederhaus, J.H.J., Oakley, J.G., Anderson, M.H., and Bonazza, R., "Experimental investigation of shock-induced distortion of a light spherical gas inhomogeneity," *Shock Waves*, Part XV111- Richtmyer-Meshkov, Springer Berlin Heidelberg, 2009. (DOI - 10.1007/978-3-540-85181-3_61)

BC1: Niederhaus, J.H.J., Ranjan, D., Oakley, J.G., Anderson, M.H., ., Greenough, J. A., and Bonazza, R., "Computations in 3D for shock-induced distortion of a light spherical gas inhomogeneity," *Shock Waves Part XV111- Richtmyer-Meshkov*, Springer Berlin Heidelberg, 2009. (DOI - 10.1007/978-3-540-85181-3_60)

A3. Edited Volumes

Bonazza, R. and Ranjan D., "29th International Symposium on Shock Waves Vol. I and II" Springer International Publishing Switzerland, (2015) [DOI: Vol I- 10.1007/978-3-319-16835-7 and Vol II--10.1007/978-3-319-16838-78]

B. REFEREED PUBLICATIONS AND SUBMITTED ARTICLES

B1. Published and Accepted Journal Articles

- J38:** (*) **Akula, B.**, and Ranjan, D., "Dynamics of buoyancy driven flows at moderately high Atwood numbers", *Journal of Fluid Mechanics*, Vol. 795, pp. 313-355 (2016)
- J37:** **Sekhran, A.**, Morrison, G., and Ranjan, D., "An enquiry of the friction factor 'jump' phenomenon in hole-pattern seals," *Journal of Fluids Engineering*, vol. 138, Issue 8, pp. 081102 (2016)
- J36:** (*) **Reilly, D.**, **McFarland, J. A.**, **Mohaghar, M.**, and Ranjan, D., "The effect of initial conditions and circulation deposition on the inclined-interface reshocked Richtmyer-Meshkov instability," *Experiments in Fluids*, 56 (8), 1-16, (2015)
- J35:** (*) **McFarland, J. A.**, **Reilly, D.**, Black, W., Greenough, J. A., and Ranjan, D., "Modal interactions between a large-wavelength inclined interface and small wave-length multimode perturbations in a Richtmyer-Meshkov Instability," *Physical Review E*, Vol. 92, 013023 (2015)
- J34:** (*) **Pidaparti, S. R.**, **McFarland, J. A.**, **Mikhaeil, M. M.**, Anderson, M.H., and Ranjan, D., "Investigation of buoyancy effects on heat transfer characteristics of Supercritical Carbon Dioxide in Heating Mode," *ASME Journal of Nuclear Engineering Radiation Science*, 1(3): 031001-031001-10. (2015) doi:10.1115/1.4029592
- J33:** (*) **Pidaparti, S. R.**, Moiseyev, A., Sienicki, J. J., and Ranjan, D., "Counter flow induced draft cooling tower option for Supercritical Carbon Dioxide Brayton Cycle," *Nuclear Engineering and Design*, Volume 295, Pages 549–558, (2015)
- J32:** **Martin, M. A.**, Chen, C., Mukherjee, P. P., Pannala, S., Dietiker, J-F., Turner, J. A., and Ranjan, D., "Morphological Influence in Lithium-Ion Battery 3-D Electrode Architectures," *Journal of the Electrochemical Society*, 2015, volume 162, issue 6, A991-A1002
- J31:** **Thanapal, S.**, Annamalai, K., Ansley, J. and Ranjan, D., "Cofiring Carbon Dioxide torrefied woody biomass with coal on emission characteristics," *Biomass Conversion and Biorefinery*, March 2016, Volume 6, Issue 1, pp 91-104
- J30:** **Tang, Y.**, Guo, B., and Ranjan, D., "Numerical simulation of aerosol deposition from turbulent flows using three-dimensional RANS and LES turbulence models," *Engineering Applications of Computational Fluid Mechanics*, Online First-Feb 25th, 2015 <http://dx.doi.org/10.1080/19942060.2015.1004818>
- J29:** **McFarland, J. A.**, **Reilly, D.**, **Creel, S.**, **McDonald, C.**, **Finn, T.**, and Ranjan, D., "Experimental Investigation of Inclined Interface Richtmyer-Meshkov Instability Before and After Reshock," *Experiments in Fluids*, Vol. 55, Issue 1, pp 1640 (2014)
- J28:** Siwatch, V., Lawrence, B., **Kuchibhatla, S.**, Annamalai, K., and Ranjan, D., "Excess air, Schmidt number and NOx formation in laminar jet flames," *Combustion Science and Technology*, 186 (12), 1936-1953 (2014)
- J27:** **McFarland, J. A.**, Greenough, J. A., and Ranjan, D., "Simulations and Analysis of the Reshocked Inclined Interface Richtmyer-Meshkov Instability for Linear and Non-linear Interface Perturbations," *Journal of Fluids Engineering*, Vol. 136 (7), 071203, (2014).

- J26: Thanapal, S.,** Chen, W., Annamalai, K., Carlin, N., Ansley, J. and Ranjan, D., "Carbon Dioxide torrefaction of woody biomass," *Energy and Fuels*, 28 (2), 1147-1157 (2014)
- J25: Matsuo, B.,** Anderson, M., and Ranjan, D., "Numerical Study of Compact Heat Exchanger design for GEN-IV Supercritical Carbon Dioxide Power Conversion Cycles," *Nuclear Science and Engineering*, Vol 176, Issue 2, pp 138-153, (2014)
- J24:** Akula, B., Andrews, M. J., and Ranjan, D., "Effect of shear on Rayleigh-Taylor mixing at low Atwood number", *Physical Review E*, Vol. 87, 033013 (2013)
- J23:** Stanic, M., **McFarland, J.**, Stellingwerf, R.F., Cassibry, J. T., Ranjan, D., Bonazza, R., Greenough, J. A., and, Abarzhi, S. I., "Non-uniform structures in Richtmyer-Meshkov Flows," *Physics of Fluids*, 25, 106107 (2013)
- J22: Kuchibhatla, S.** and Ranjan, D., "Effect of initial conditions on Rayleigh-Taylor mixing: Modal interaction", *Physica Scripta*, T155, 014057 (2013)
- J21: McFarland, J. A.,** Greenough, J. A., and Ranjan, D., "Investigation of the Initial Perturbation Amplitude for the Inclined Interface Richtmyer-Meshkov Instability," *Physica Scripta*, T155, 014014 (2013)
- J20: Eseltine, D., Thanapal, S.,** Annamalai, K., and Ranjan, D., "Torrefaction of Woody Biomass (Juniper and Mesquite) using inert and non-inert gases," *Fuel*, Vol. 113, pp 379-388, 2013.
- J19: Haehn, N,** Ranjan, D., Weber, C., Oakley, J., Rothamer, D., and Bonazza, R., "Reacting Shock Bubble Interaction," *Combustion and Flame*, Vol. 153, Issue 3, pp1339-1350 (2012).
- J18: Bailie, C., McFarland, J. A.,** Greenough, J. A., and Ranjan, D., "Effect of incident shock wave strength on the decay of Richtmyer-Meshkov instability-introduced perturbations in the refracted shock wave," *Shock Waves*, Vol. 22, Issue 6, pp 511-519, 2012
- J17: Amini, N., Sekaran, A., Schwaenen, M., Vijaykumar, A.,** and Ranjan, D., "An experimental investigation of the free jet flow from a radially lobed nozzle using hot wire anemometry," *International Journal of Mechanical Engineering Education*, Vol. 40, Number 4, October 2012.
- J16: McFarland, J. A.,** Greenough, J. A., and Ranjan, D., "Computational parametric study of a Richtmyer-Meshkov instability for an inclined interface," *Physical Review E*, Vol. 84, 026303 (2011)
- J15:** Ranjan, D., Oakley, J., and Bonazza, R., "Shock-Bubble Interactions," *Annual Rev. Fluid Mech.*, 43, pp117-140 (2011) [Invited Article]
- J14:** Tillman, S. T., **Kuchibhatla, S.,** Annamalai, K., Caton, J., and Ranjan, D., "Interactive Combustion in a Linear Array of 2D Laminar Isolated & Triple Burner Jets," *Journal of Combustion*, Article ID 716050, 2012, DOI:10.1155/2012/716050
- J13:** Kurizenga, A., Anderson, M., **Fatima, R.,** Corradini, M., Towne, A., and Ranjan, D., "Heat Transfer of supercritical carbon-dioxide in printed circuit heat exchanger geometries," *Journal of Thermal Science and Engineering Application*, Vol.3, September 2011.
- J12: Haehn, N.,** Weber, C., Oakley, J., Anderson, M., Ranjan, D., and Bonazza, R., "Experimental investigation of of twice-shocked spherical inhomogeneity with Particle Image Velocimetry," *Shock Waves*, Vol. 21, No. 3 (2011)

- J11:** Singh, O. P., Ranjan, D., Srinivasan, J., and Sreenivas, K. R., "A study of basalt fingers using experiments and numerical simulations in double-diffusive systems," *Journal of Geography and Geology*, 3, 1 (2011)
- J10:** Haehn, N., Weber, C., Oakley, J., Anderson, M., Ranjan, D., and Bonazza, R., "Experimental study of shock-bubble interaction with reshock," *Shock Waves*, Vol. 22, No. 1 (2011)
- J9:** Haehn, N., Ranjan, D., Weber, C., Oakley, J. G., Anderson, M. H., and Bonazza, R., "Experimental investigation of twice-shocked spherical inhomogeneity," *Physica Scripta*, T142 (2010).
- J8:** Motl, B., Oakley, J.G., Ranjan, D., Weber, C., Anderson, M.H., and Bonazza, R., "Experimental validation of a Richtmyer-Meshkov scaling law over large density ratio and shock strength ranges," *Physics of Fluids*, 21, 126102 (2009).
- J7:** Ranjan, D., Niederhaus, J. H. J., Oakley, J., Anderson, M., Greenough, J. A, and Bonazza, R., "Experimental and numerical investigation of shock-induced distortion of a spherical gas inhomogeneity," *Physica Scripta*, T132 (2008).
- J6:** Ranjan, D., Niederhaus, J., Oakley, J., Anderson, M., Bonazza, R., and Greenough, J., "Shock-bubble interactions: features of divergent refraction geometry observed in experiments and simulations," *Physics of Fluids*, 20, 036101 (2008).
- J5:** Niederhaus, J. H. J., Greenough, J. A, Oakley, J., Ranjan, D., Anderson, M., and Bonazza, R., "A computational parameter study for the three-dimensional shock-bubble interaction," *Journal of Fluid Mechanics*, 594, 85 (2008).
- J4:** Motl, B., Niederhaus, J., Ranjan, D., Oakley, J., Anderson, M., and Bonazza, R., "Experimental Study for ICF-Related Richtmyer-Meshkov Instabilities," *Fusion Science and Technology*, 52, 4 (2007).
- J3:** Ranjan, D., Niederhaus, J., Motl, B., Anderson, M., Oakley, J., and Bonazza, R., "Experimental investigation of primary and secondary features in high Mach number shock-bubble interaction," *Physical Review Letters*, 98, 024502 (2007).
- J2:** Niederhaus, J., Ranjan, D., Oakley, J., Anderson, M., and Bonazza, R., "Inertial-Fusion-Related Hydrodynamic Instabilities in a Spherical Gas Bubble Accelerated by a Planar Shock Wave," *Fusion Science and Technology*, 47, 4 (2005), pp. 1160-1164.
- J1:** Ranjan, D., Anderson, M., Oakley, J., and Bonazza, R., "Experimental Investigation of a Strongly Shocked Gas bubble," *Physical Review Letters*, 94, 184507 (2005).

B2. Conference Presentation with Proceedings (Refereed)

- C35: (*) Jarrahbashi, D., Pidaparti, S., Kang, T., and Ranjan, D., "Nucleation of Supercritical CO₂ Flow in a Converging-Diverging Nozzle," *Proceedings of The 5th International Symposium- Supercritical CO₂ Power Cycles*, March 28-31, 2016 San Antonio, Texas [won the best poster presentation award at the conference]**
- C34: (*) Pidaparti, S., Hruska, P., Moisseytsev, A., Sienicki, J., and Ranjan, D., "Technical and economic feasibility of dry air cooling for the supercritical CO₂ Brayton Cycle using existing technology," *Proceedings of The 5th International Symposium- Supercritical CO₂ Power Cycles*, March 28-31, 2016 San Antonio, Texas**

- C33: Pidaparti, S., McFarland, J., Umrigar, E.,** Ranjan, D. and Anderson, M., "Effect of buoyancy on heat transfer characteristics of Supercritical Carbon Dioxide in the Heating Mode," *11th AIAA/ASME joint Thermophysics and Heat Transfer Conference*, AIAA 2014-3359.
- C32:(*) Reilly, D., McFarland, J., Carter, J.,** and Ranjan, D., "Shock-Driven Variable-Density Turbulence: New Insight," *14th International Workshop on the Physics of Compressible Turbulent Mixing*, San Francisco, CA, September 3, 2014.
- C31:** Chen, W., **Thanapal, S.,** Annamalai, K., Ranjan, D., B. Lawrence, and Ansley., J. "Kinetics of Pyrolysis of Mesquite Fuel-Comparison of Different Methods," *Proceeding of ASME Turbo Expo 2014: Turbine Technical Conference and Exposition*, paper no. GT2014-27349, doi:10.1115/GT2014-27349.
- C30: McFarland, J. A., Creel, S., Finn, T., McDonald, C.,** Greenough, J. and Ranjan, D., "Simulations and Experimental Work on the Inclined Interface Richtmyer-Meshkov Instability," *Proceedings of 29th International Symposium on Shock Waves, Madison, Wisconsin*, July 14th-19th, 2013.
- C29: McFarland, J. A., Creel, S., Finn, T., McDonald, C.,** Greenough, J. and Ranjan, D., "Inclined Interface Richtmyer-Meshkov Instability: Reshock Study," *Proceedings of 29th International Symposium on Shock Waves, Madison, Wisconsin*, July 14th-19th, 2013.
- C28: Kuchibhatla, S,** and Ranjan, D., "Rayleigh-Taylor Experiments," Paper # IMECE 2012-93087, *Proceedings of 2012 IMECE meeting*, Houston, Texas, Nov 2012.
- C27: McFarland, J. A.,** Greenough, J. A., and Ranjan, D., "An investigation of the inclined interface Richtmyer-Meshkov instability: simulations and progress on students," *Proceedings of 13th International Workshop on Physics of Compressible and Turbulent Mixing*, July 2012.
- C26: Akula, B.** and Ranjan, D., "A study of combined KH and RT instabilities at low Atwood numbers," *Proceedings of 13th International Workshop on Physics of Compressible and Turbulent Mixing*, July 2012.
- C25: McFarland, J. A.,** Greenough, J. A., and Ranjan, D., "Simulations and analysis of shock accelerated inhomogenous flows with and without reshock," *Proceedings of 2012 ASME Fluids Engineering Division Summer Meeting*, Puerto Rico, July 8th-12th, 2012.
- C24: Matsuo, B.,** Anderson, M., and Ranjan, D. and "Numerical investigation of the geometric effects on the performance of printed circuit heat exchangers," *Proceedings of 2012 ASME Heat Transfer Summer Conference, Puerto Rico*, July 8th-12th, 2012.
- C23: Akula, B., McFarland, J., Kuchibhatla, S.,** and Ranjan, D., "Effect of shear on RT mixing at low Atwood numbers," *Proceedings of Turbulent Mixing and Beyond: 3rd International Conference*, Trieste, Italy, August 21st -28th 2011.
- C22: McFarland, J. A.,** Greenough, J. A., and Ranjan, D., "A computational parametric study of a Richtmyer-Meshkov instability for an inclined interface," *Proceedings of Turbulent Mixing and Beyond: 3rd International Conference*, Trieste, Italy, August 21st -28th 2011.
- C21: Kuchibhatla, S, McFarland, J. A., Akula, B,** and Ranjan, D., "Effect of initial conditions on Rayleigh-Taylor mixing: wavelength interaction," *Proceedings of Turbulent Mixing and Beyond: 3rd International Conference*, Trieste, Italy, August 21st -28th 2011.

- C20: Fatima, R.,** Kurizenga, A., Anderson, M., and Ranjan, D., “Numerical Investigation of Thermal Hydraulic behavior of Supercritical Carbon-dioxide in Compact Heat exchanges,” *Proceedings of 2011 Supercritical CO2 Power Cycle Symposium*, 2011
- C19: Kuchibhatla, S., Koppenberger, P., Akula, B., McFarland, J.,** and Ranjan, D., “Rayleigh-Taylor experiments for low Atwood numbers with multimodal initial conditions,” *Proceedings of 12th International Workshop on Physics of Compressible and Turbulent Mixing*, July 2010.
- C18: Akula, B.,** Andrews, M., and Ranjan, D., “Rayleigh-Taylor experiments for low Atwood numbers with multimodal initial conditions,” *Proceedings of 12th International Workshop on Physics of Compressible and Turbulent Mixing*, July 2010.
- C17:** Mukherjee, P. P., Ranjan, D., Mukundan, R., and Borup, R. L., “Heat and water transport in a polymer electrolyte fuel cell electrode,” *14th International Heat Transfer Conference*, Paper-22703, August 2010
- C16:** Ranjan, D., Prestridge, K. P., Andrews, M., Gore, R., Marr-Lyon, M., and Merrill, F., “ICF related Richtmyer-Meshkov instability: Mach 10 experiments,” *Proceedings of 2nd International Conference and Advanced School “Turbulent Mixing and Beyond”*, July-August 2009.
- C15:** Ranjan, D., Balakumar, B. J., Orlicz, G., Prestridge, K. P., and Tomkins, C. D., “Richtmyer-Meshkov Instability: Reshock Study,” *27th International Symposium on Shock Waves*, Paper 30519, July 2009.
- C14:** Ranjan, D., Prestridge, K. P., Andrews, M., Gore, R., Marr-Lyon, M., and Merrill, F., “Richtmyer-Meshkov Instability at a gas interface accelerated by a Mach 10 Shock wave,” *27th International Symposium on Shock Waves*, Paper 30604, July 2009.
- C13:** Balakumar, B. J., Zoldi-Sood, C., Orlicz, G., Ranjan, D., Tomkins, C. D., and Prestridge, K. P., “Experimental and computational investigation of Richtmyer-Meshkov turbulence in fluid layers after reshock,” *27th International Symposium on Shock Waves*, Paper 30672, July 2009.
- C12:** Ranjan, D., Balakumar, B. J., Orlicz, G., Tomkins, C. D., and Prestridge, K. P., “Experimental analysis of the physics of the reshock in the case of a shock-accelerated thin fluid layer,” *11th International Workshop on the Physics of Compressible Turbulent Mixing*, Santa Fe, NM, July 14-18, 2008.
- C11:** Balakumar, B. J., Orlicz, G., Ranjan, D., Tomkins, C. D., and Prestridge, K. P., “Richtmyer-Meshkov instability induced by a Mach 1.2 shock in a varicose curtain,” *11th International Workshop on the Physics of Compressible Turbulent Mixing*, Santa Fe, NM, July 14-18, 2008.
- C10:** Orlicz, G., Balakumar, B. J., Ranjan, D., Tomkins, C. D., and Prestridge, K. P., “Shock driven instabilities in a varicose, heavy-gas curtain: Mach number effects,” *11th International Workshop on the Physics of Compressible Turbulent Mixing*, Santa Fe, NM, July 14-18, 2008.
- C9:** Ranjan, D., Niederhaus, J., Oakley, J., Anderson, M., and Bonazza, R., “Experimental investigation of shock-induced distortion of a light spherical gas inhomogeneity,” *26th International Symposium on Shock Waves*, Paper 2960, Gottingen, Germany, July 15-20, 2007.

- C8:** Niederhaus, J., Ranjan, D., Oakley, J., Anderson, M., Greenough, J., and Bonazza, R., "Computations in 3D for shock-induced distortion of a light spherical gas inhomogeneity," *26th International Symposium on Shock Waves*, Paper 2961, Gottingen, Germany, July 15-20, 2007.
- C7:** Ranjan, D., Niederhaus, J., Anderson, M., Motl, B., Oakley, J., Bonazza, R., and Greenough, J., "Experimental Study of the Interaction of a Planar Shock with a Free-Rising Bubble," *10th International Workshop on the Physics of Compressible Turbulent Mixing*, Paris, France, July 17-21, 2006.
- C6:** Niederhaus, J., Greenough, J., Oakley, J., Ranjan, D., Anderson, M., and Bonazza, R., "A Computational Parameter Study for the Shock-Bubble Interaction in 3D, with and without Modeled Soap Film," *10th International Workshop on the Physics of Compressible Turbulent Mixing*, Paris, France, July 17-21, 2006.
- C5:** Motl, B., Niederhaus, J., Oakley, J., Ranjan, D., Anderson, M., Bonazza, R., and Greenough, J., "Shock Accelerated Two-Dimensional Interface," *10th International Workshop on the Physics of Compressible Turbulent Mixing*, Paris, France, July 17-21, 2006.
- C4:** Ranjan, D., Niederhaus, J., Anderson, M., Oakley, J., and Bonazza, R., "Shock-induced instabilities on a spherical gas bubble," *25th International Symposium on Shock Waves*, Paper 1197-2, Bangalore, India, July 17-22, 2005.
- C3:** Ranjan, D., Sreenivas, R. K., Singh, P. O., and Srinivasan, J., "Laboratory Study of Scale Transitions in Oceanic Double- α Diffusive Finger," *International Conference on Environmental Fluid Mechanics*, pp. 178-182, Guwahati, India, 2005.
- C2:** Ranjan, D., Niederhaus, J., Anderson, M., Oakley, J., and Bonazza, R., "Measurements of mixing induced at a gas interface by the Richtmyer-Meshkov Instability," Paper 2691, Z.L. Jiang (Ed.), *Shock Waves, Proceeding, 24th International Symposium on Shock Waves Beijing, China, July 2004*.
- C1:** Ranjan, D., Niederhaus, J., Bauer, T., Oakley, J., Anderson, M., Smith, L., Greenough, J., and Bonazza, R., "Experimental and Computational Investigations of Shock-Accelerated Gas Bubbles," *9th International Workshop on the Physics of Compressible Turbulent Mixing*, Cambridge, UK, July 19-23, 2004.

B3. Other refereed material

- 40 (*)**Reilly, D., Mohaghar, M., Carter, J., McFarland, J.,** and Ranjan, D., "Progress on simultaneous PLIF/PIV Measurements for a Turbulent Complex Fluid Interface". 68th Annual Meeting of the American Physical Society Division of Fluid Dynamics, Boston, MA, November 22-24, 2015.
- 39 (*)**Mohaghar, M., Reilly, D., Carter, J., McFarland, J.,** and Ranjan, D., "simultaneous PLIF/PIV Measurements for a single-mode inclined interface". 68th Annual Meeting of the American Physical Society Division of Fluid Dynamics, Boston, MA, November 22-24, 2015.
- 38 (*)**Mikhaeil, M.,** Dennissen, N., and Ranjan, D., "Understanding the Rayleigh-Taylor instability through 1D and 3D simulations". 68th Annual Meeting of the American Physical Society Division of Fluid Dynamics, Boston, MA, November 22-24, 2015.

- 37 (*)**Carter, J.**, Gore, R., and Ranjan, D., "Evaluation of a two-length scale turbulence model with experiments on shock-driven turbulent mixing". 68th Annual Meeting of the American Physical Society Division of Fluid Dynamics, Boston, MA, November 22-24, 2015.
- 36 (*)**Johnston, S.**, Fonda, E., Sreenivasan, K. R., and Ranjan, D., "Rayleigh-Benard convection at high Prandtl numbers in circular and square geometry". 68th Annual Meeting of the American Physical Society Division of Fluid Dynamics, Boston, MA, November 22-24, 2015.
- 35 (*)Fonda, E., **Johnston, S.**, Ranjan, D., and Sreenivasan, K. R., "Photochromic flow visualization in silicone oil for demonstrations and experiments". 68th Annual Meeting of the American Physical Society Division of Fluid Dynamics, Boston, MA, November 22-24, 2015.
- 34 (*)**Jarrahbashi, D.**, **Pidaparti, S.**, and Ranjan, D., "Nucleation of super-critical carbon Dioxide in a venturi Nozzle". 68th Annual Meeting of the American Physical Society Division of Fluid Dynamics, Boston, MA, November 22-24, 2015.
- 33 (*)**Reilly, D.**, **Carter, J.**, **Mohaghar, M.**, **Jarrahbashi, D.**, **McFarland, J.**, and Ranjan, D., "Observations of Variable-Density Turbulence From a Complex Fluid Interface" APS Topical Conference on the Shock Compression of Matter, Tampa, FL, June 14-19, 2015.
- 32 (*) **Kuchibhatla, S.** and Ranjan, D., "Nonlinear Evolution of Rayleigh-Taylor Mixing" ASME IMECE Meeting, Houston, TX, 2015 [Paper ID-IMECE 2015-50995]
- 31 (*) **Pidaparti, S.**, **Jarrahbashi, D.**, Anderson, M., and Ranjan, D., "Unusual heat transfer characteristics of supercritical carbon dioxide" ASME IMECE Meeting, Houston, TX, 2015 [Paper ID-IMECE 2015-51225]
- 30 (*)**Reilly, D.**, **Carter, J.**, **McFarland, J.**, and Ranjan, D., "Shock-Driven Variable-Density Turbulence: New Insights". 67th Annual Meeting of the American Physical Society Division of Fluid Dynamics, San Francisco, CA, November 24, 2014.
- 29 (*) **McFarland, J.**, **Reilly, D.**, Greenough, J., and Ranjan, D., "Computational study of the Richtmyer-Meshkov instability with a Complex initial condition". 67th Annual Meeting of the American Physical Society Division of Fluid Dynamics, San Francisco, CA, November 24, 2014.
- 28 (*) **Mikhaeil, M.**, **Akula, B.**, **Finn, T.**, and Ranjan, D., "Dynamics of Rayleigh-Taylor driven flows at high Atwood numbers". 67th Annual Meeting of the American Physical Society Division of Fluid Dynamics, San Francisco, CA, November 23, 2014.
- 27 **McDonald, C.**, **McFarland, J.**, **Reiley, D.**, **Reid, B.**, and Ranjan, D., "Experimental investigation of Richtmyer-Meshkov instability on inclined interface," 65th Annual Meeting of the American Physical Society Division of Fluid Dynamics, San Diego, CA, Nov. 2012
- 26 **Akula, B.**, and Ranjan, D., "Progress on experimental investigation of RT instability at high Atwood numbers," 65th Annual Meeting of the American Physical Society Division of Fluid Dynamics, San Diego, CA, Nov. 2012
- 25 **Kuchibhatla, S.**, and Ranjan, D., "Understanding the impact of initial conditions on low Atwood number Rayleigh-Taylor driven flows," 65th Annual Meeting of the American Physical Society Division of Fluid Dynamics, San Diego, CA, Nov. 2012

- 24 **McFarland, J., McDonald, C., Reiley, D.**, Greenough, J., and Ranjan, D., "Progress with incline-interface Richtmyer-Meshkov experiments," 65th Annual Meeting of the American Physical Society Division of Fluid Dynamics, San Diego, CA, Nov. 2012
- 23 Cassibry, J. T., Stanic, M., Stellingverf, R. F., **McFarland, J.**, Ranjan, D., Bonazza, R., and Abarzhi, S. I., "Integrated study of non-uniform structures in Richtmyer-Meshkov unstable flows by means of theoretical analysis, Lagrangian and Eulerian numerical simulations, and experiments," 65th Annual Meeting of the American Physical Society Division of Fluid Dynamics, San Diego, CA, Nov. 2012
- 22 **Akula, B.**, and Ranjan, D., "Effect of shear on R-T mixing at low and medium Atwood numbers," 64th Annual Meeting of the American Physical Society Division of Fluid Dynamics, Baltimore, MD, Nov. 2011
- 21 **Kuchibhatla, S.**, and Ranjan, D., "Experiments on Rayleigh-Taylor instability with Multi-modal initial conditions at low Atwood numbers," 64th Annual Meeting of the American Physical Society Division of Fluid Dynamics, Baltimore, MD, Nov. 2011
- 20 Tanimizu, K., Sadr, R., and Ranjan, D., "Thermal-hydraulic behavior of Sc-CO₂ in a horizontal circular straight tube," 64th Annual Meeting of the American Physical Society Division of Fluid Dynamics, Baltimore, MD, Nov. 2011
- 19 **Haehn, N.**, Weber, C., Oakley, J., Rothamer, D., Ranjan, D., and Bonazza, R., "Shock-initiated combustion with new insights into the nature of the shock-focusing phenomenon," 64th Annual Meeting of the American Physical Society Division of Fluid Dynamics, Baltimore, MD, Nov. 2011
- 18 **Placette, B., Akula, B.**, Andrews, M., and Ranjan, D., "On Buoyancy and Shear Mixing," 64th Annual Meeting of the American Physical Society Division of Fluid Dynamics, Baltimore, MD, Nov. 2011
- 17 **McFarland, J. A.**, Greenough, J. A., and Ranjan, D., "A Computational study of a Richtmyer-Meshkov instability for an inclined interface," 64th Annual Meeting of the American Physical Society Division of Fluid Dynamics, Baltimore, MD, Nov. 2011
- 16 **Tang, Y.**, Guo, B., and Ranjan, D., "Computational Fluid Dynamics Simulation of Aerosol Deposition from Turbulent Flow in a Vertical Straight Pipe," AAAR 30th Annual Conference, Orlando, FL, Oct. 2011.
- 15 **Haehn, N.**, Oakley, J., Rothamer, D., Anderson, M., Ranjan, D., and Bonazza, R., "Shock-initiated combustion of a spherical density inhomogeneity," 63rd Annual Meeting of the American Physical Society Division of Fluid Dynamics, Long Beach, CA, Nov. 2010
- 14 **Fatima, R.**, Kurizenga, A., Anderson, M., and Ranjan, D., "Experimental and Numerical Investigation of Supercritical Carbon-dioxide Compact Heat exchangers," 62nd Annual Meeting of the American Physical Society Division of Fluid Dynamics, Minneapolis, MN, Nov. 2009
- 13 Ranjan, D., Balakumar, B. J., Orlicz, G., Tomkins, C. D., and Prestridge, K. P., "Experimental analysis of re-shocked gas curtain", 61st Annual Meeting of the American Physical Society Division of Fluid Dynamics, San Antonio, TX, November 23-25, 2008
- 12 Balakumar, B. J., Orlicz, G., Ranjan, D., Tomkins, C. D., and Prestridge, K. P., "Turbulence Statistics in a Richtmyer-Meshkov Unstable Thin Fluid Layer after Reshock," 61st Annual

Meeting of the American Physical Society Division of Fluid Dynamics, San Antonio, TX, November 23-25, 2008

- 11 Tomkins, C. D., Balakumar, B. J., Orlicz, G., Ranjan, D., and Prestridge, K. P., "Memory of Initial Conditions in Shocked and Re-shocked Heavy-Gas Curtains," 61st Annual Meeting of the American Physical Society Division of Fluid Dynamics, San Antonio, TX, November 23-25, 2008
- 10 Zoldi-Sood, C. A., Gore, R. A., Balakumar, B. J., Orlicz, G., Ranjan, D., Tomkins, C. D., and Prestridge, K. P., "Simulations of a Reshocked Varicose Gas Curtain," 61st Annual Meeting of the American Physical Society Division of Fluid Dynamics, San Antonio, TX, November 23-25, 2008
- 9 Orlicz, G., Balakumar, B. J., Ranjan, D., Tomkins, C. D., and Prestridge, K. P., "Richtmyer-Meshkov Instability in Thin Fluid Layers: Turbulent Mixing, Mach Number and Reshock Effects," 61st Annual Meeting of the American Physical Society Division of Fluid Dynamics, San Antonio, TX, November 23-25, 2008
- 8 Motl, B., Ranjan, D., Oakley, J., Anderson, M., Bonazza, R., "Experimental Study of Richtmyer-Meshkov Instability for a He-SF₆ Interface," 60th Annual Meeting of the American Physical Society Division of Fluid Dynamics, Salt Lake City, UT, November 18-20, 2007.
- 7 Ranjan, D., Motl, B., Niederhaus, J., Oakley, J., Anderson, M., Bonazza, R., "Experimental Study of Shock-Induced Compression and Vortex Generation in the Shock-Bubble Interaction," 59th Annual Meeting of the American Physical Society Division of Fluid Dynamics, Tampa Bay, FL, November 19-21, 2006.
- 6 Niederhaus, J., Ranjan, D., Motl, B., Oakley, J., Anderson, M., Bonazza, R., and Greenough, J., "Computational Analysis for Secondary Vorticity and Non-Axisymmetric Features in the Shock-Bubble Interaction," 59th Annual Meeting of the American Physical Society Division of Fluid Dynamics, Tampa Bay, FL, November 19-21, 2006.
- 5 Ranjan, D., Niederhaus, J., Oakley, J., Anderson, M., Bonazza, R., and Greenough, J., "Interaction of a Planar Shock with a Spherical Gas Inhomogeneity – Part I: Experiments," 58th Annual Meeting of the American Physical Society Division of Fluid Dynamics, Chicago, IL, November 20-22, 2005.
- 4 Niederhaus, J., Ranjan, D., Oakley, J., Anderson, M., Bonazza, R., and Greenough, J., "Interaction of a Planar Shock with a Spherical Gas Inhomogeneity– Part II: Calculations," 58th Annual Meeting of the American Physical Society Division of Fluid Dynamics, Chicago, IL, November 20-22, 2005.
- 3 Ranjan, D., Niederhaus, J., Oakley, J., Anderson, M., and Bonazza, R., "Experimental Study of a Strongly Shocked Gas Bubble," 57th Annual Meeting of the American Physical Society Division of Fluid Dynamics, Seattle, WA, November 21-23, 2005.
- 2 Niederhaus, J., Ranjan, D., Oakley, J., Anderson, M., Bonazza, R., and Greenough, J., "Numerical Simulation of a Strongly Shocked Gas Bubble" (poster), 46th Annual Meeting of the American Physical Society Division of Plasma Physics, Savannah, GA, November 15-19, 2004.
- 1 Ranjan, D., Niederhaus, J., Anderson, M., Oakley, J., Bonazza, R., and Greenough, J., "IFE-Related Instabilities in a Spherical Gas Bubble Accelerated by a Planar Shock Wave," 16th

American Nuclear Society Topical Meeting on the Technology of Fusion Energy, Madison, WI, September 14-16, 2004

B4. Submitted Journal Articles (with date of submission)

1. (*) **Jarrahbashi, D., Pidaparti, S., Kang, T.,** and Ranjan, D., “Nucleation of Supercritical Carbon-dioxide in a Venturi Nozzle,” Submission Date-May 2016.
2. (*) **Kuchibhatla, S.,** Andrews, M., and Ranjan, D., “Experimental Measurements of the effect of initial condition on Rayleigh-Taylor mixing in a mode-coupling regime,” Submission Date-May 2016

C. OTHER PUBLICATIONS AND CREATIVE PRODUCTS

-“No Data”

D. PRESENTATIONS

D1. Keynote Addresses and Plenary Lectures

1. **Plenary Speaker** at 14th International Workshop on Physics of Compressible Turbulent Mixing (IWPCTM) Meeting at San Francisco, 2014, titled “Progress with Experiments on Understanding the Rayleigh-Taylor and Richtmyer-Meshkov Driven Flows for Complex Environments”
2. **Plenary Speaker** “Mechanical Engineering Perspective on Energy Research: from Turbulence Mixing to Nuclear Fusion” at SYNERGY 2013, Mechanical Engineering Department, National Institute of Technology-Trichy, March 17th, 2013.

D2. Invited Conference and Workshop Presentations

3. **Invited Talk** “Fluid Instabilities and Mixing in Variable Density Flows at Extreme Conditions,” at Fluids Days 2013, IISc Bangalore, India, July 19th 2013. (*Special Conference in honor of 80th birthday of Prof. Roddam Narasimha*)

D3. Conference and Workshop Presentations

4. **Invited Talk** “Experimental measurements of velocity and density statistics in turbulent Rayleigh-Taylor mixing layers with and without shear”, at 17th USNCTAM Meeting, June 18th, 2014.
5. **Invited Seminar** “Velocity, density and mixing growth measurements in turbulent Rayleigh-Taylor mixing layers with and without shear” at Stewardship Science Academic Alliance (SSAA) Symposium, Albuquerque, June 28th, 2013.

D4. Invited Seminar Presentations

6. **Invited Seminar** “Techno-Economic Development for Supercritical CO₂ Advanced Energy Conversion,” Mechanical Engineering Seminar, Carnegie Mellon University, on Nov. 6th, 2015.
7. **Invited Seminar** “Understanding the dynamics of shock-and buoyancy-driven flows at Extreme Conditions,” Environmental Fluid Mechanics and Water Resources Seminar, Georgia Tech, on Nov. 14th 2014.

8. **Invited Seminar** “Fluid Instabilities and Mixing in Variable Density Flows at Extreme Conditions,” at Center for Environmental and Applied Fluid Mechanics (CEAFM), John Hopkins University, on Oct 25th, 2013.
9. **Invited Seminar** “Fluid Instabilities and Mixing at Extreme Conditions,” at Department of Mechanical Engineering, University of Florida, on Oct 1st, 2013.
10. **Invited Seminar** “Fluid Instabilities and Mixing in Variable Density Flows at Extreme Conditions,” at George W. Woodruff School of Mechanical Engineering, Georgia Institute of Technology, on May 1st, 2013
11. **Invited Seminar** “Fluid Instabilities and Mixing in Variable Density Flows at Extreme Conditions,” Mechanical Engineering Seminar, University of Maryland-College Park, April 17th, 2013
12. **Invited Seminar** “Fluid Instabilities and Mixing in Variable Density Flows at Extreme Conditions,” at College Colloquium, College of Science, Mathematics & Technology, The University of Texas at Brownsville, April 12th, 2013
13. **Invited Seminar** “Fluid instabilities and mixing in Variable Density Flows at Extreme Conditions,” at Graduate Seminar, Department of Aerospace Engineering, Texas A&M Univ., Feb. 21st, 2013.
14. **Invited Seminar** “Putting design into Turbulence,” at REU Site: Energy and Combustion- College Station, June 8th, 2012.
15. **Invited Seminar** “Fluid instabilities and mixing at Extreme Conditions,” at Graduate Seminar, Department of Mechanical Engineering, Texas A&M Univ., April 18th, 2012.
16. **Invited Seminar** “Transition, Turbulence and Mixing in Shock and Buoyancy-Accelerated Variable Density Flows at Extreme Conditions,” at CRASH center, Department of Atmospheric, Oceanic and Space Sciences, University of Michigan, August 29, 2011.
17. **Invited Seminar** “Experimental Investigation of Shock-Induced Interfacial Instability, Mixing, and Turbulence,” at Mechanical Engineering Department, IIT-Bombay, June 19, 2009.
18. **Invited Seminar** “Experimental Investigation of Shock-Induced Distortion of a Spherical Gas Inhomogeneity” at Mechanical Engineering Department, Caltech, May 29, 2007
19. **Invited Seminar** “Experimental Investigation of Richtmyer-Meshkov Instability for a three-dimensional interface” at Los Alamos National Laboratory, May 15, 2007
20. **Invited Seminar** “Richtmyer-Meshkov Instability” at Jawaharlal Nehru Center for Advanced Scientific Research (JNCASR), July, 2004.

E. GRANTS AND CONTRACTS

E1. AS PRINCIPAL INVESTIGATOR

Funded Projects:

Title of Project: Robust, Cost-Effective Heat Exchangers for 800°C Operation with Supercritical CO₂

Agency/Company: DOE-EERE

Total Dollar Amount: **\$1,545,316 (20% cost share)**

May 24th, 2016

Role: **PI**
Collaborators: **Asegun Henry-GT (co-PI)**
Period of Contract: 10/1/2015-9/30/2018
Candidate's Share: 50% (**\$772,658**)

Title of Project: Investigation of Shock-induced turbulent mixing at a Gaseous Interface
Agency/Company: Los Alamos National Laboratory
Total Dollar Amount: **\$270,000**
Role: **PI**
Collaborators: **none**
Period of Contract: 12/1/2015-9/30/2018
Candidate's Share: 100%

Title of Project: Turbulent Rayleigh-Taylor Parametric Study
Agency/Company: Los Alamos National Lab
Total Dollar Amount: **\$285,000**
Role: **PI**
Collaborators: **none**
Period of Contract: 2/1/2016-9/30/2018
Candidate's Share: 100%

Title of Project: Detailed Measurements of Turbulent Rayleigh-Taylor Mixing at Large Atwood Numbers
Agency/Company: DOE-NNSA
Total Dollar Amount: **\$600,000**
Role: **PI**
Collaborators: **none**
Period of Contract: 7/1/2016-6/30/2019 [expected date, Project has still not been set]
Candidate's Share: 100% (**\$600,000**)

Title of Project: Fundamental study of key issues related to advanced S-CO₂ Brayton Cycle: prototypic HX development and Cavitation
Agency/Company: DOE-NEUP
Total Dollar Amount: **\$799,000**
Role: **PI**
Collaborators: **Devesh Ranjan (PI)**, Mark Anderson-UW Madison (co-PI), Michael Corradini-UW Madison (co-PI)
Period of Contract: 10/1/2014-9/30/2017
Candidate's Share: ~50% (**\$400K**)

Title of Project: CAREER: Transition, Turbulence and Mixing in Shock-Accelerated Variable Density Flows at Extreme Conditions
Agency/Company: National Science Foundation (NSF)
Total Dollar Amount: **\$375,628**
Role: **PI**
Collaborators: **none**
Period of Contract: 7/1/2014-4/30/2018

May 24th, 2016

Candidate's Share: 100% (**\$375,628**)

[Note: This project was transferred from Texas A&M to Georgia Tech, Initial Performance Period-05/1/2013-04/30/2018, \$416,352]

Title of Project: YIP Award: "Breaking with Tradition: Turbulence with Memory"

Agency/Company: DOD- US AFOSR

Total Dollar Amount: **\$242,572**

Role: **PI**

Collaborators: **none**

Period of Contract: 9/1/2014-8/31/2016

Candidate's Share: 100% (**\$242,572**)

[Note: This project has been subcontracted from Texas A&M to Georgia Tech, Initial Performance Period-09/1/2013-08/31/2016, \$360,000]

Title of Project: A Parametric study to understand the evolution of density self-correlation in Turbulent Rayleigh-Taylor driven mixing with and without shear

Agency/Company: Los Alamos National Laboratory

Total Dollar Amount: **\$75,000**

Role: **PI**

Collaborators: **none**

Period of Contract: 10/1/2014-10/30/2015

Candidate's Share: 100% (**\$75K**)

Title of Project: Detailed Measurements of Turbulent Rayleigh-Taylor Mixing at Large and Small Atwood Numbers

Agency/Company: DOE-NNSA

Total Dollar Amount: **\$240,663**

Role: **PI**

Collaborators: **none**

Period of Contract: 9/19/2014-9/18/2015 – No cost extension until 9/18/2016

Candidate's Share: 100% (**\$240,663**)

[Note: The original proposal awarded to PI at Texas A&M, Initial Performance Period-09/19/2012-09/18/2015, \$438,000]

Title of Project: Technical Development for S-CO₂ Advanced Energy Conversion

Agency/Company: DOE-NEUP (Subcontract through UW-Madison)

Total Dollar Amount: **\$80,250**

Role: **PI**

Collaborators: **none**

Period of Contract: 12/15/2013-11/10/2014

Candidate's Share: 100% (**\$80,250**)

[Note: This is the year 3 funds transferred from the original proposal awarded to PI at Texas A&M, Initial Performance Period-10/26/2011-09/30/2014, \$213,361.]

May 24th, 2016

Title of Project: Collaborative Research: Turbulent-convection experiments at extreme conditions using cryogenic nitrogen
Agency/Company: National Science Foundation
Total Dollar Amount: **\$332,545**
Role: **PI**
Collaborators: **Devesh Ranjan (PI), K. R. Sreenivasan-NYU (co-PI), Enrico Fonda-NYU (co-PI)**
Period of Contract: 9/1/2016-8/31/2019 [expected date, Project has been recommended for award]
Candidate's Share: 80% (**\$272,145**)

Successful Grants at Texas A&M University (2009-2014) Prior to Joining GT in July 2014 which had either remained or completed at that institution (Served as PI).

Title of Project: Study of Supercritical Fluid Thermal Hydraulics,"
Agency/Company: Qatar National Research Fund
Total Dollar Amount: **\$1,018,324**
Role: **PI**
Collaborators: **Devesh Ranjan (PI), Reza Sadr-TAMUQ (co-PI), Mark Anderson (co-PI)**
Period of Contract: 09/01/2009-06/30/2013
Candidate's Share: 50% (**\$509,162**)

Title of Project: Turbulent Rayleigh-Taylor Parametric Study
Agency/Company: Los Alamos National Laboratory
Total Dollar Amount: **\$240,000**
Role: **PI**
Collaborators: **none**
Period of Contract: 02/10/2011-02/09/2014
Candidate's Share: 100%

Title of Project: Detailed Measurements of Turbulent Rayleigh-Taylor Mixing at Large and Small Atwood Numbers
Agency/Company: DOE-NNSA
Total Dollar Amount: **\$376,981**
Role: **PI**
Collaborators: **none**
Period of Contract: 9/01/2009-8/31/2013
Candidate's Share: 100%

Title of Project: Detailed Measurements of Initial Conditions Effects on Rayleigh-Taylor Mixing Development by Implementing a "Flapper" Type System
Agency/Company: Los Alamos National Laboratory
Total Dollar Amount: **\$90,000**
Role: **PI**
Collaborators: **none**
Period of Contract: 10/01/2010-09/30/2011

May 24th, 2016

Candidate's Share: 100%

Title of Project: Experimental Component of LDRD-DR20090058DR –Turbulence by Design

Agency/Company: Los Alamos National Laboratory

Total Dollar Amount: **\$90,000**

Role: **PI**

Collaborators: **none**

Period of Contract: 10/01/2009-09/30/2010

Candidate's Share: 100%

E2. AS CO-PRINCIPAL INVESTIGATOR

Funded Projects:

Title of Project: Investigation of Autoignition and combustion stability of high pressure supercritical carbon-dioxide oxy-combustion

Agency/Company: DOE-UTSR

Total Dollar Amount: **\$1,007,200 (Direct-\$799,754, Cost-share \$207,446)**

Role: **co- PI**

Collaborators: **Wenting Sun (PI), Timothy Lieuwen (co-PI), Suresh Menon (co-PI)**

Period of Contract: 8/1/2015-7/31/2018

Candidate's Share: 29% (**\$292,503 excluding cost share**)

Successful Grants at Texas A&M University (2009-2014) Prior to Joining GT in July 2014 which had either remained or completed at that institution (Served as Co-PI).

Title of Project: NSF REU Site: Texas Center for Undergraduate Research in Energy and Propulsion

Agency/Company: National Science Foundation

Total Dollar Amount: **\$403,921**

Role: **co- PI**

Collaborators: **Eric Petersen (PI), Devesh Ranjan (co-PI)**

Period of Contract: 04/1/2013-3/31/2016

Candidate's Share: 50% (\$201,960)

Title of Project: Quantitative Assessments of Shock-Driven Variable Density flows (Task A) and Radiation Diffusion Model Error (Task B)

Agency/Company: DOE (Subcontract through Univ. of Michigan Crash Center)

Total Dollar Amount: **\$150,000**

Role: **co- PI**

Collaborators: **Marvin Adams (PI), Devesh Ranjan (co-PI), Ryan McClarren (co-PI)**

Period of Contract: 12/15/11-8/31/13

Candidate's Share: 68% (\$100,133)

Title of Project: TGA/DSC and Torrefaction studies on Agricultural Biomass Fuels

May 24th, 2016

Agency/Company: Agni Corporation
Total Dollar Amount: **\$55,000**
Role: **co- PI**
Collaborators: **Kalyan Annamalai (PI), Devesh Ranjan (co-PI)**
Period of Contract: 05/18/2010-11/30/2010
Candidate's Share: 50% (\$27,500)

Title of Project: Combustion and Ash Fouling Studies on a 100,000 BTU/h Burner Facility for Coal and Coal-Torrefied Biomass Blends
Agency/Company: Agni Corporation
Total Dollar Amount: **\$16,000**
Role: **co- PI**
Collaborators: **Kalyan Annamalai (PI), Devesh Ranjan (co-PI)**
Period of Contract: 04/1/2012-3/31/2013
Candidate's Share: 50% (\$8,000)
Note: The project was negotiated for total amount of \$116,267. However, due to the financial trouble within the company it was discontinued. The amount shown is the total amount received from the company.

E3. AS SENIOR PERSONNEL OR CONTRIBUTOR

Title of Project: Creative Turbulence: Experiments in Art and Physics
Agency/Company: APS-2015 Public Outreach and Informing the Public Grants
Total Dollar Amount: **\$10K**
Role: **Contributor**
Collaborators: **Enrico Fonda-NYU (PI), R. Luke DuBois (NYU), Maurizio Porfiri (NYU), K. R. Sreenivasan (NYU), Devesh Ranjan (GT), Daniel Lathrop (UMD), Daniel Serrano (UMD)**
Period of Contract: 11/1/2015-10/30/2018

E4. PENDING PROPOSALS

Title of Project: Discoveries in blast-wave-driven turbulence of astrophysical relevance
Agency/Company: DOE-Early Career Program
Total Dollar Amount: **\$750,000**
Role: **PI**
Collaborators: **none**
Period of Contract: 09/01/2016-08/31/2021 [Currently under negotiation]
Candidate's Share: 100%

F. OTHER SCHOLARLY AND CREATIVE ACCOMPLISHMENTS

List all other scholarly and creative accomplishments such as invention disclosures, start-up companies, etc. that are not listed elsewhere.

-No data

G. SOCIETAL AND POLICY IMPACTS

- Dr. Ranjan and his team has collaborated with Guerilla Science, a professional outreach organization based in NYC and London, with which they developed and run a fluid dynamics-inspired competition. The obstacles/demonstrations part of the National Math Festival in Washington DC were covered in a news section by Science, and were then part of the Figment Festival, a participatory art festival with approximately 25,000 participants in Governors Island in NYC, as well as of the NYU Tandon School of Engineering research expo. (<http://guerillascience.org/olympics/>)
- Dr. Ranjan's research featured in the 2016 Stewardship Science Academic Programs Annual produced by the DOE-National Nuclear Security Administration Office of Research (DOE-NA0038) [http://nnsa.energy.gov/sites/default/files/nnsa/inlinefiles/SSAP%20Annual%20Book_Final_Feb%202016_0.pdf] [page#19]
- Dr. Ranjan featured in the 2012 Stewardship Science Academic Alliance Annual as the success story of the program. The annual is widely distributed to the congressman and senators on the hill. [<http://nnsa.energy.gov/sites/default/files/nnsa/01-13-inlinefiles/2012%20SSAA%20Annual.pdf>] [page# 43]

H. Other Professional Activities

V. TEACHING

A. COURSES TAUGHT

Semester, Year	Course Number	Course Title	Number of Students
Spring 2016	ME 3345	Heat Transfer	52
Fall 2015	ME6601-A, Q	Introduction to Fluid Mechanics	52 [38+14]
Fall 2014	ME 3345	Heat Transfer	46

B. INDIVIDUAL STUDENT GUIDANCE

List all Postdoctoral Fellows, Ph.D. students, M.S. Thesis students, and undergraduate students supervised/advised. Explicitly indicate any co-advisement relationships. For Ph.D. and M.S. Thesis students, include date of graduation and title of thesis and, if known, the current position of the graduate students. For graduate students currently supervised, indicate the semester advisement began, their progression through appropriate exams, title of their project/dissertation, and current position if available. Provide any indicators you have of the quality of your mentorship.

B1. Ph.D. Students

Current Graduate Students

1. Student Name: Mr. Mark Mikhaeil (**DOE-NEUP Fellowship recipient, President's Fellowship**)
Major: Mechanical Engineering
Semester Advisement Began: Fall 2014
Current Progress: Passed Qualifying exam, working on two manuscripts currently.
Dissertation/Project Title: "Rayleigh-Taylor Mixing at Extremes"
Expected Graduation: Spring 2018

Note: Mark worked with me during the summer of 2013 as a NSF-USRG Fellow. I worked with Mark in early 2014 on the application process for the DOE-NEUP Fellowship. **Mark was awarded the outstanding poster at the 2015 SSAP symposium. Mark also worked at LANL in summer 2015 and the work was highlighted in the SSAA magazine.**

2. Student Name: Mr. Sandeep Pidaparti
Major: Mechanical Engineering
Semester Advisement Began: Summer 2014 at GT, Fall 2012 at Texas A&M
Current Progress: Passed Qualifying Exam, Proposal defense set for June 2016
Dissertation/Project Title: "Technical Development for S-CO₂ Advanced Energy Conversion"
Expected Graduation: Spring 2017
Note: Sandeep followed me from Texas A&M to GT. Sandeep finished his MS in 2013, under my supervision. **This year Sandeep has published 2 journal papers, 1 in review and is working on another one at the point of submission of this document.**
3. Student Name: Mr. Stephen Johnston (**President's Fellowship**)
Major: Mechanical Engineering
Semester Advisement Began: Fall 2014
Current Progress: Worked on the design of the setup and making excellent progress towards his thesis.
Dissertation/Project Title: "Turbulent Convection at Extremes"
Expected Graduation: Spring 2019
Note: Stephen won the 1st prize for the poster presentation at the 2015 APS-DFD meeting.
4. Student Name: Mr. Benjamin Musci (**DOE-NNSA SSGF Fellowship, President's Fellowship**)
Major: Mechanical Engineering
Semester Advisement Began: Fall 2015
Current Progress: Just Started
Dissertation/Project Title: "blast-wave driven turbulence"
Expected Graduation: Spring 2019
5. Student Name: Mr. Mohammad Mohaghar
Major: Mechanical Engineering
Semester Advisement Began: Fall 2014
Current Progress: Already co-authored one journal publication this year, Passed Qualifying exam, working on one journal publication to be submitted by mid-june.
Dissertation/Project Title: "Shock-Driven Turbulent Mixing"
Expected Graduation: Spring 2018
6. Student Name: Mr. Miad Karimi
Major: Aerospace Engineering
Semester Advisement Began: Fall 2015
Current Progress: Just Started
Dissertation/Project Title: "Oxy-Combustion System"

Expected Graduation: Spring 2019

Note-Co-advised with Dr. Wenting Sun (AE).

7. Student Name: Mr. John Carter
Major: Mechanical Engineering
Semester Advisement Began: Fall 2014
Current Progress: Making excellent progress with thesis. Several conference presentations. Spent summer at LANL in 2015 and invited to spend 10 weeks this summer too at LANL.
Dissertation/Project Title: "Richtmyer-Meshkov Instability"
Expected Graduation: Spring 2019
8. Student Name: Mr. Prasoon Suchandra
Major: Mechanical Engineering
Semester Advisement Began: Fall 2015
Current Progress: Just Started
Dissertation/Project Title: "buoyancy-driven turbulence: transition to turbulence"
Expected Graduation: Spring 2019
9. Student Name: Mr. Taegyu Kang
Major: Mechanical Engineering
Semester Advisement Began: Fall 2015
Current Progress: Just Started
Dissertation/Project Title: "Understanding two-phase flow systems related to supercritical co2 cycle"
Expected Graduation: Spring 2019
Note: Taegyu along with Sandeep and Dorrin won the 1st prize during the poster presentation at the 5th International symposium on Supercritical Power Cycle.
10. Student Name: Mr. Diego Vaca [**Fulbright Scholar**]
Major: Mechanical Engineering
Semester Advisement Began: Fall 2015
Current Progress: Just Started
Dissertation/Project Title: "Solar Energy and role of supercritical co2 systems"
Expected Graduation: Spring 2019
11. Student Name: Mr. Dan Fries
Major: Aerospace Engineering
Semester Advisement Began: Spring 2015
Current Progress: Passed qualifying exam, making excellent progress with thesis, in process of submitting the 1st first authored paper.
Dissertation/Project Title: "Experimental Combustion and turbulence in subsonic and supersonic flows"
Expected Graduation: Spring 2019
Note-Co-advised with Dr. Suresh Menon (AE).

Ph. D Students Graduated at Texas A&M University

12. Student Name: Dr. Bhanesh Akula
Current Position- **Intel Corporation, Portland-Oregon**
Major: Mechanical Engineering
Dissertation/Project Title: Experimental Investigation of Buoyancy Driven Mixing with and without Shear at Different Atwood Numbers
Graduation: **December 2014**

13. Student Name: Dr. Sarat Kuchibhatla
Current Position- **Dow Chemical Company, Midland, MI**
Major: Mechanical Engineering
Dissertation/Project Title: On the Effect of Initial Conditions on Rayleigh-Taylor Mixing
Graduation: **December 2014**

14. Student Name: Dr. Jacob McFarland
Current Position- **Assistant Professor, Mechanical and Aerospace Engineering Department, University of Missouri-Columbia**
Major: Mechanical Engineering
Dissertation/Project Title: Experimental and Computational Study of the Inclined Interface Richtmyer-Meshkov Instability
Graduation: **Summer 2013**

15. Student Name: Dr. Siva Sankar (**co-advised with Prof. Kalyan Annamalai**)
Current Position- **Trinity Consultants**
Major: Mechanical Engineering
Dissertation/Project Title Effect of Co-firing torrefied biomass with sub-bituminous coal in a 30 kWt downfired burner
Graduation: **August 2014**

16. Student Name: Dr. Mona Karimi (**co-advised with Prof. Sharath Girimaji**)
Current Position- **NA**
Major: Mechanical Engineering
Dissertation/Project Title Compressibility Effects on the Kelvin-Helmholtz Instability and Mixing Layer Flows
Graduation: **December 2014**

17. Student Name: Dr. Yingjie Tang (**co-advised with Prof. Bing Guo**)
Current Position- **Post Doc at University of Houston**
Major: Mechanical Engineering
Dissertation/Project Title Computational fluid dynamics study of aerosol transport and deposition mechanisms
Graduation: **Summer 2012**

Ph. D Students Graduated at University of Wisconsin-Madison

18. Student Name: Dr. Nicholas Haehn (co-advised with Prof. Riccardo Bonazza)

Current Position- **Senior Packaging Engineer at Intel Corporation-Arizona**
Major: Mechanical Engineering
Dissertation/Project Title: Reacting Shock-Bubble Interactions
Graduation: Summer 2012

B2. M.S. Students (Indicate thesis option for each student)

Current Graduate Students

None.

M.S Students Graduated at Georgia Tech (1)

1. Student Name: Mr. David Reilly
Current Position- Pipeline Engineer, Projects& Technolgy-Pipelines, Flowlines & Risers at **Shell International Exploration & Production Inc.**
Major: Mechanical Engineering
Semester Advisement Began: Summer 2014 at GT, Fall 2013 at TAMU
Dissertation/Project Title: "Experimental Study of Shock-Driven, Variable-density Turbulence using a complex interface"
Graduation: Fall 2015
Note: David worked me in summer of 2012 as a NSF REU student and joined the research team in Fall 2013 as a graduate student. David followed me from Texas A&M to GT. **David received the 2016 Sigma Xi Best M.S. Thesis award.**

M.S Students Graduated at Texas A&M University (Total -9)

Ms. Roma Fatima (2010) (Cummins Filtration), Mr. Sarat Kuchibhatla (2010) (PhD at TAMU), Mr. Dustin Eseltine (co-advised) (2011) (PhD at TAMU), Mr. Michael Martin (co-advised)(2012) (Boeing Corp.), Ms. Beth Placette (2012) (Cameron), Mr. Thomas Finn (2014) (ExxonMobil), Mr. Bryce Matsuo (2013), Mr. Skylar Creel (2014), Mr. Sandeep Pidaparti (co-advised) (2013) (PhD Georgia Tech)

B3. Undergraduate Students

1. Student Name: Mr. Nicholar Frye
Major: Mechanical Engineering
Semester-Spring 2016
2. Student Name: Mr. Seiichiro Takeuchi
Major: Mechanical Engineering
Semester-Spring 2016
3. Student Name: Ms. Tasnim Rafiya
Major: Aerospace Engineering
Semester-Spring 2016
4. Student Name: Mr. Won Sup Song [PURA Awardee][**joining Stanford University for graduate study**]
Major: Mechanical Engineering
Semester-Spring 2016
5. Student Name: Ms. Debapriya Bhattacharjee
Major: Mechanical Engineering
Semester-Fall 2015
6. Student Name: Mr. Brandon Conner

- Major: Mechanical Engineering
Semester-Fall 2015, Spring 2016
7. Student Name: Mr. Terrence Sanzo
Major: Mechanical Engineering
Semester-Fall 2015
 8. Student Name: Mr. Alex Dunfee
Major: Mechanical Engineering
Semester-Spring 2015
 9. Student Name: Mr. Ismail Brewish
Major: Mechanical Engineering
Semester-Spring 2015
 10. Student Name: Mr. Himanshu Dedge
Major: Mechanical Engineering
Semester-Spring 2015
 11. Student Name: Mr. Cody Huggins
Major: Mechanical Engineering
Semester-Spring 2015
 12. Student Name: Mr. Karamjit Singh
Major: Mechanical Engineering
Semester-Spring 2015, Fall 2014
 13. Student Name: Mr. Adam R. Jensen
Major: Mechanical Engineering
Semester-Fall 2014

Undergraduate Students advised at Texas A&M University (thesis option) (Total -7)

Mr. Peter Koppenberger (Currently working at Idaho National Lab.), Mr. Colin Bailie (currently pursuing PhD at Stanford University), Mr. Adam Martin (Graduated with MS from TAMU), Mr. Jonathan Paschel, Mr. Sterling Debner, Mr. David Nicholson Jr. (NSF REU supported), Mr. Chris McDonald (undergraduate research scholar program supported).

B4. Service on thesis or dissertation committees

Student Name: Mr. Xingjian Wang (PhD proposal, PhD Dissertation defense)
Major: Mechanical Engineering
Committee: Vigor Yang (co-advisor), Tim Lieuwen (co-advisor), Devesh Ranjan, Suresh Menon, Wenting Sun
Graduation Date: Spring 2016 [Defense Date-March 4th, 2016]
Dissertation/Thesis Title: Swirling Fluid Mixing and Combustion Dynamics at Supercritical Conditions

Student Name: Mr. Benjamin Knox (PhD proposal)
Major: Mechanical Engineering
Thesis Advisor: Caroline Genzale
Graduation Date: Summer 2016 [Proposal defense-April 9th, 2015]
Dissertation/Thesis Title: Injection Rate Shaping for Control of Unburned Hydrocarbon Emissions in Diesel Spray Combustion

May 24th, 2016

Student Name: Mr. Alex Muroyama (PhD proposal)
Major: Mechanical Engineering
Thesis Advisor: Peter Loutzenhiser
Graduation Date: Spring 2017 [Proposal defense-April 2016]
Dissertation/Thesis Title: Design, Modeling, and Testing of a Hybrid Solar/Autothermal Steam Gasification Process

Student Name: Mr. Bradley A. Ochs (PhD proposal)
Major: Aerospace Engineering
Thesis Advisor: Suresh Menon
Graduation Date: Spring 2017 [Proposal defense-March 2016]
Dissertation/Thesis Title: TURBULENT PREMIXED FLAMES IN COMPRESSIBLE FLOWS

Student Name: Mr. Nicholas Magina (Ph.D. Dissertation defense)
Major: Mechanical Engineering
Thesis Advisor: Timothy Lieuwen
Graduation Date: Spring 2016 [Defense date: April 2016]
Dissertation/Thesis Title: Dynamics of Forced Non-premixed Flames

B5. Mentorship of postdoctoral fellows or visiting scholars

Postdoctoral Name: Dr. Dorrin Jarrahbashi
Major: Mechanical Engineering
Project Title: Cavitation in supercritical fluids driven systems
Period Advised—1/2015-Current

Postdoctoral Name: Dr. Vladimer Tsiklashvili
Major: Mechanical Engineering
Project Title: Shock-tube Turbulent Mixing
Period Advised—8/2015-Current

Postdoctoral Fellow mentored at Texas A&M University

Postdoctoral Name: Dr. Jacob McFarland
Current Position- Assistant Professor, University of Missouri-Columbia
Major: Mechanical Engineering
Project Title: "Turbulent Convection at Extreme-Design Analysis"
Period Advised—09/2013-06/2014

C. OTHER TEACHING ACTIVITIES

None at Georgia Tech

Activity at Texas A&M University

C1. Course Development

- No data

C2. Course Improvement

May 24th, 2016

- Transformed the graduate course “Turbulence Measurements and Analysis” to include 4 different experiments to provide students hands-on experience in making these measurements. The article based on this work was published in 2012 [J17 in the journal list]
- Modified the senior elective “Thermal-Fluids Analysis and Design” to include a final project which was a significant part of the course. It is a project based course in the catalog now.

C3. Professional Development/Continuing Education

C4. Other Teaching Activities

VI. SERVICE

A. PROFESSIONAL CONTRIBUTIONS

A1. Editorial Board Memberships

- Editorial Board of Shock Waves (Publisher-Springer & Verlag)
- Invited Co-Editor, Proceedings of the 29th International Symposium on Shock Waves - Madison, Wisconsin, USA, July 14-19, 2013 - Volume I and II, Springer

A2. Society Offices, Activities, and Membership

- Joint-Secretary for the International Shock Wave Institute (ISWI)
- American Society of Mechanical Engineers (ASME), Member, 2007-present
- American Physical Society (APS), Member, 2003-present
- Vice-President, Los Alamos Postdoctoral Association, 2008.

A3. Organization and Chairmanship of Technical Sessions, Workshops and Conferences

- Conference Co-Organizer of 29th International Shock Wave Symposium (ISSW) held at Madison, Wisconsin from July 14th –July 19, 2013.
- Session Chair, Richtmyer-Meshkov Instabilities, 2013 APS-DFD Meeting, Pittsburgh, PA.
- ASME-IMECE 2009, Topic Organizer- Gasification, Fuel Sprays, and Microscale Combustion
- Session Chair, Richtmyer-Meshkov Instabilities, 2008 APS-DFD Meeting, San Antonio, Texas
- Session Chair, Fusion Science, 2004 ANS Student Conference, Madison, Wisconsin

A4. Technical Journal or Conference Referee Activities

- Reviewer for various Archival Journals (PRL, PRE, PoF, JFM, JHT, Shock Waves, Fuel, Combustion and Flame, JFE, etc)

A5. Proposal Panels and Reviews

- NSF Panelist (CBET Program, Combustion, Fire, & Plasma Systems; Fluid Dynamics Panel) 2008, 2010, 2011, 2013
- Invited Panelist-2012 SMART Fellowship Evaluation Panel- Jan. 19th -21st , 2012 Washington DC
- SMART Fellowship Program-Panelist 2009
- Invited Panelist-2012 NDSEG Fellowship Evaluation Panel- Feb 25th , 2012 Washington DC
- Invited Reviewer for proposal submitted to Maryland Industrial Partnership 12/2011

A6. Other Involvement

- Invited Panelist – Workshop: “Research Needs for Material Mixing at Extremes” organized by Los Alamos National Laboratory, 2011
- Invited Panelist – Workshop: “Thermal Energy Storage Workshop” organized by DOE ARPA-E, 2011
- Invited Member- Workshop: “Atmospheric Pressure Weakly Ionized Plasmas for Energy Technologies, Flow Control and Materials Processing” organized by Princeton University on behalf of DARPA, 2011

B. PUBLIC AND COMMUNITY SERVICE

None

C. INSTITUTE CONTRIBUTIONS

- Faculty Advisor- Pi Tau Sigma Chapter, Georgia Tech, Sep 2014-Present
- Member, Faculty Advisory Committee, Aug. 2015-Present
- Member, GWW Undergraduate Committee, Aug. 2014-Aug 2015
- Member, Fluids Qualifying Exam Committee

Department Service at Texas A&M [2009-2014]

- Faculty Advisor- Pi Tau Sigma Chapter, Texas A&M University, Jan. 2013-July 2014
- Member & Chair of Ph.D. Qualifying Examination Committee (Fluid Mechanics)- Fall 2009, Spring 2010, Fall 2010 Member & Chair Ph.D. Qualifying Examination Committee (Thermodynamics) – Fall 2011, Spring 2012, Fall 2012
- Member of Graduate Studies and Research Committee (Elected)
- Member of Honors and Awards Committee (Appointed),
- Member of Scholarship Committee
- Member Faculty Search Committee in the area of “New Energy”-2013