Grétar Tryggvason

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Education

Ph.D.	Brown University, Division of Engineering, Providence, RI	1985
Sc.M.	Brown University, Division of Engineering, Providence, RI	1982
B.S.	University of Iceland, Mechanical Engineering	1980
High School: Menntashólinn við Hamrahlíð, Reykjavik, Iceland		1975

Professional Experience

2017 -	Charles A. Miller, Jr. Distinguished Professor and Head, Department of Mechanical Engineering, Johns Hopkins University, Baltimore, MD. From 7/1/2017.
2011 - 2017	Chair, Department of Aerospace and Mechanical Engineering, University of Notre Dame, IN (Interim, 3/23/2011-12/31/2011).
2010 - 2017	Viola D. Hank Professor of Aerospace and Mechanical Engineering, University of Notre Dame, IN
2016	Visiting Professor, University of Paris VI, France, 6/13-7/9
2000 – 2010	Professor and Head, Department of Mechanical Engineering. Worcester Polytechnic Institute, MA
1999	Visiting Scientist, University of Paris VI, France, 4/19-5/8
1998	Visiting Professor, Institut Universitaire des Systèmes Thermiques Industriels (IUSTI), University of Aix-Marseille, France, 4/15-5/15
1994	Visiting Research Associate, Caltech, 1/1-5/31 (Sabbatical)
1993 - 1997	Associate Chairman, Department of Mechanical Engineering and Applied Mechanics. University of Michigan, Ann Arbor
1991 - 1996	Visiting Research Position, Institute for Computational Mechanics in Propulsion, NASA Lewis Research Center, every summer.
1985 - 2000	Professor of Mechanical Engineering and Applied Mechanics. University of Michigan, Ann Arbor. (Assistant Professor, 1985-1991; Associate Professor, 1991-1997; Professor, 1997-2000)
1984 - 1985	Associate Research Scientist, Courant Institute of Mathematical Sciences, New York University.

Honors and Awards

Outstanding Paper Award. Journal of Chemical Engineering of Japan, 2014
Elected Fellow of the American Association for the Advancement of Science, 2013
ASME Fluids Engineering Award, 2012
WPI Sigma Xi Outstanding Senior Faculty Research Award, 2006

The 2005 Computational Mechanics Award from the Computational Mechanics Division of the Japan Society of Mechanical Engineers (JSME)
Elected Fellow of the American Society of Mechanical Engineers, 2005
Elected Fellow of the American Physical Society (Division of Fluid Dynamics), 2000
College Award for Service, University of Michigan, 2000
Best Paper Award. ASEE Annual meeting (with D. Tilbury and S.L. Ceccio), 1997
Departmental Award for Service, University of Michigan, 1996
Departmental Award for Research, University of Michigan, 1991
Predoctoral Geophysical Fluid Dynamics Fellow, Woods Hole Oceanographic Institution, 1983
Brown University Fellowships, 1980, 1981, and 1983
Thor Thors Special Contribution Award (The American-Scandinavian Foundation), 1980
Fulbright travel grant, 1980

PROFESSIONAL ACTIVITIES

Journal Editorships

2011 - now Editorial Advisory Board, International Journal of Multiphase Flow
2009 - now Editorial Board: Scientia Iranica, Transaction B: Mechanical Engineering
2008 - now Editorial Board: Multiphase Science and Technology
2006 - now Associate Editor, Journal of Applied Fluid Mechanics
2002 - 2015 Editor-in-chief, Journal of Computational Physics
2002 - 2009 Associate Editor, International Journal of Multiphase Flow
1992 - 2002 Associate Editor, Journal of Computational Physics

Major Committee Assignments at the University of Michigan

University:

Member of a "Peer Evaluation of Teaching" team 1994-1995.
Rackham Divisional Board, member, 1991-1993

Engineering College:

FIPSI Math Group, 1998-2000
ABET Working Group, 1997-1999.
Curriculum 2000 Task force, 1995-1996
Member of a group visiting the Technical University of Delft and the Technical University of Warsaw, spring 1996.
Undergraduate Curriculum Review committee (appointed member), 1995-1996
Member of six tenure committees, 1992, 1994, 1995, 1996/7, 1998, 1999. Chaired five of those.
College Rule Committee (elected member). The committee never met and I resigned after a year when I went on a sabbatical leave.
Review Committee for CAEN (Computer Aided Engineering Network), appointed member, winter 1991.
Review Committee for LaSC (Laboratory for Scientific Computing), appointed member, summer and fall 1990.

Mechanical Engineering Department:
Advisory Committee, elected member, 1992-1993 (stepped down when appointed associate chairman). Elected again 1998.
Planning Committee, member, 1992-1998
Committee on instruction, member, Spring 1990.
Ad Hoc departmental review committee, member, Spring 1990

I also served on the graduate committee for the Applied Mechanics Program and the admission and financial aid committee for the Mechanical Engineering Program, ran the seminar program in the thermal-fluid division, gave the preliminary examination regularly, and supervised the construction of a long range teaching plan for the fluids group.

Administrative Duties at the University of Michigan

Associate Chairman, MEAM, 1993-1997
ME Director of Undergraduate Studies, 1992-1993
Leader of ABET preparation teams, 1993 and 1999

Lead undergraduate curriculum reforms in ME 1993-1998 and in that capacity served on various temporary curriculum review committees and chaired the Departmental Curriculum committee.

Major Committee Assignments at Worcester Polytechnic Institute

Presidential Commission on Efficiency and Effectiveness. Chaired a Subgroup on Enhancements and Strategic Opportunities. Spring 2009. Appointed
University Council, 2008-2010. Elected
Academic Space Planning Committee, 2008-2010. Appointed
Ad-hoc group developing a proposal for a Robotics Engineering Degree at WPI, 2006. Associate Director, Program in Robotics Engineering, 2007-2010
Co-chair of a committee on general education and the first year experience 2006 - 2008. Appointed
Ad-hoc group developing a proposal for granting B.A. Degrees at WPI. Fall 2005.
Commission to examine the role of the Fine and Liberal Arts at WPI, 2004/05. Appointed member
Enrollment team to examine admission policies, 2004/2005. Appointed.
President Search Committee, 2003/2004. Appointed.
Search Committee for a new Head for the Physics Department, 2003/2004. Appointed.
Undergraduate Outcomes Assessment Committee (UOAC), 2003-05. Elected.
Student Outcomes Assessment Steering Committee (SOASC). 2001-2003. Appointed.
Campus Master Plan Working Committee 2002/2003. Appointed.
Space Committee, 2002/2003. Appointed.

Society Memberships and Activities

Member: Association of Chartered Engineers in Iceland, 1987-1992; American Physical Society, since 1982 (Division of Fluid Dynamics, Fellow since 2000); Society for Industrial and Applied Mathematics; Sigma Xi, since 1982; American Association for the Advancement of Sciences, since 1988 (Fellow since 2013); American Society of Mechanical Engineers, since 1991 (Fellow since 2005);

American Society of Engineering Education, since 1998; American Nuclear Society, since 2013.

- Appointed member of the Stanley Corrsin Award Selection Committee. Division of Fluid Dynamics of the APS, 2012-2013. Chair for 2013.
- Member of a planning committee for a "5XME" curriculum workshop at the ASME Annual Meeting 2009.
- Conference Chair. 2008 International Mechanical Engineering Education Conference (ASME). Galveston, Texas. April 4 - 8, 2008.
- Member of the ASME Fluids Engineering Honors and Awards Committee, 2006-2008
- Presentation on "Service and Outreach" at a Mini-Symposium for New and Prospective Faculty Members at the 2006 ASME IMECE in Chicago, IL, November 7, 2006.
- Appointed member of the Program Committee of the Division of Computational Physics of the American Physical Society 2004/05
- Elected member-at-large, APS-Division of Fluid Dynamics Executive Committee, 2003-2006
- Member of the ASME Multiphase Flow Technical Committee, Vice Chair 2000-02; Chair 02-04.
- Lead organizer of a symposium on "Numerical Methods for Multiphase Flows" at the ASME Fluid Dynamics Division Summer meeting 2000, 2002, 2004, and 2006.
- Co-organized an "Open Forum for Multiphase flow" at the ASME Fluid Dynamics Division Summer meeting for 1996, 1997, and 1998.
- Co-organized a forum on "Advances in Numerical Modeling of Free Surface and Interface Fluid Dynamics" at the ASME Fluid Dynamics Division Summer meeting since 1995.
- Co-organized a symposium on "Bubbles and Vortices near a Free Surface" at the ASME Fluid Dynamics Division Summer meeting for 1993
- I regularly chair sessions at meetings such as those of the Division of Fluid Dynamics of the APS, SIAM, and ASME.

Panel and Panel Review Activities

- Presentation at a Midterm Assessment of Implementation of the Decadal Survey on Life and Physical Sciences Research at NASA, Washington, D.C., April 19, 2017
- Member of a Middle States Commission on Higher Education accreditation team for Polytechnic Institute of New York University, March 10-13, 2013
- Chaired an External Academic Review Committee for the Department of Precision Instruments and Mechanology, Tsinghua University, Beijing, China, Sept. 18 & 19, 2012.
- Chaired a panel reviewing departmental productivity for the University of Reykjavik, in Iceland Fall 2009 and 2010.
- Chair of a DOE INCITE proposal review panel, Sept. 22, 2009, Sept. 21, 2010, Sept. 21, 2011 and Sept. 26, 2012.
- Member of a Middle States Commission on Higher Education accreditation team for Clarkson University, Spring 2009

- Member of an NSF review panel (Thermal Transport Processes Convection and Fluids) on 4/27/09
- Chaired a panel reviewing departmental productivity for the University of Reykjavik, in Iceland on December 5 and 6, 2008
- NSF Review Panel, CBET Fluid Dynamics. June 20, 2008
- Member of an IGERT Advisory Group at LSU, Dec. 1, 2006 & Jan. 31, 2008
- Member of a review team for the Illinois DOE ASCI center, Oct. 20 & 21, 2005
- NASA Multiphase Flow and Heat Transfer proposal review pane, Jan. 10-11, 2005
- Member of a review team for the Illinois DOE ASCI center, Oct. 26 & 27, 2004
- Member of a review team for Centre de Mathématics et Leurs Applications at the Ecole Normale Superieure de Cachan, September 29, 2004.
- Member of a review team for the Illinois DOE ASCI center, Oct. 14 & 15, 2003
- Testified before a subcommittee of the US Department of Energy Basic Energy Science Advisory Committee (BESAC), on April 1, 2004 in Chicago.
- DOE—NERI review panel, March 18-19, 1999 and March 8-9, 2001
- NSF Career Review Panel, November 17-18, 2000
- DOE Computational Science Initiative Panel on January 23-24, 1998
- NSF CAREER award review panel, January 16-17, 1997
- DARPA/NSF workshop on "OPAL" on June 2-3, 1997
- NSF proposal review panel, February 8-9, 1996.
- DOE Review panel, chair, spring 1993

Review manuscripts for the Journal of Fluid Mechanics, the Physics of Fluids, Chemical Engineering Science, International Journal of Multiphase Flows, the Journal of Computational Physics and many others; book proposals for various publishers; proposals for the National Science Foundation, the Petroleum Research Fund, the Department of Energy and others.

Other Service (external)

- Member of a promotion committee, Department of Mechanical and Manufacturing Engineering, University of Cyprus, 2/14/2017
- Co-Chair. Japan-US Seminar on Two-Phase Flow Dynamics, Hokkaido University, Sapporo, Hokkaido, Japan, June 22-24, 2017
- Member of Scientific Committee ICNMMF-III (3rd International Conference on Numerical Methods in Multiphase Flows), Tokyo, Japan, June 26-29th, 2017.
- Member of a Ph.D. Dissertation Committee (Jun Fang), Department of Nuclear Engineering, North Carolina State University Defense 6/9/2016.
- Member of Scientific Committee, Dynamics of Evolving Fluid Interfaces - DEFI Gathering physico-chemical and flow properties, IFPEN/Solaize, Feance - 12-13 October 2016
- Member of International Scientific Committee, 9th International Conference of Multiphase Flow (ICMF), Firenza, Italy, May 22-27, 2016.
- Member of Scientific Committee, IUTAM Symposium on Bubbly Flows, Oaxaca, Mexico, March 9-14, 2015.
- Member of International Scientific Committee, 9th International Conference on Boiling and Condensation Heat Transfer. Boulder, CO, April 26-30, 2015,
- Member of a Ph.D. Dissertation Committee (Olivier Marfaing). University Paris VI/

CEA Saclay, France. Defense 11/3/2014.

- Member of a Ph.D. Dissertation Committee (Dustin Langewisch), MIT Nuclear Science and Engineering, 2014.
- Member of International Scientific Committee, International Conference on Numerical Methods in Multiphase Flow (ICNMMF). June 30 – July 2, 2014, Darmstadt, Germany.
- Member of International Scientific Committee, 8th International Conference of Multiphase Flow (ICMF), Jeju, Korea, May 26-31, 2013.
- Member of a Habilitation examination committee, University of Paris VI, 2012, for S. Popinet (submitted evaluation but did not attend the examination).
- Co-chairman, International Organizing Committee, 7th International Symposium on Multiphase Flow, Heat Mass Transfer and Energy Conversion (ISMF2012), October 26-30, 2012, Xi'an, China
- Member of Executive Organizing Committee, International Conference on Numerical Methods in Multiphase Flow, The Pennsylvania State University, June 12-14, 2012
- Member of a Ph.D. Dissertation Committee (G. Boëdec). Université Paul Cézanne, Marseille, 2011
- Member of International Advisory Board: International Conference on Applied Mechanics, Materials, and Manufacturing (ICAMMM 2010). Muscat, Sultanate of Oman, December 13-15, 2010
- Member of Scientific Advisory Committee: The 6th International Symposium on Gas Transfer at Water Surfaces, May 17-21, 2010, Kyoto, Japan
- Member of the Technical Program Committee. IEEE International Conference on Technologies for Practical Robot Applications (TePRA), Woburn, Massachusetts, USA, November 9-10, 2009. http://www.tepra2009.wpi.edu/
- Member of a Ph.D. Dissertation Committee (J. Rodriguez). RPI. Defense 7/6/2009
- Served on a hiring committee in the thermal-fluid sciences. University of Iceland. Fall 2008
- Member of the International Steering Committee for the 20th International Symposium on Transport Phenomena (ISTP-20) to be held in Victoria, British Columbia, Canada, July 7-10, 2009
- Chair. Governing Board of the International Conference of Multiphase Flow, 2007-2010.
- Vice Chair, International Scientific Committee (ISC) of the International Conference on Multiphase Flows (ICMF) 2007.
- Ph.D. Examiner. Brown University, 2005.
- Ph.D. Examiner. Ecole Normale Superieure de Cachan, France, 2004.
- Elected member of the Governing Board of the International Conference of Multiphase Flow, 2004-2007. Elected vice-chair of the Board.
- Ph.D. Dissertation Reader. University of Twente, 2004. Due to conflict with another commitment I could not attend the defense but provided written questions
- Member of the International Scientific Committee (ISC) for the International Conference on Multiphase Flows (ICMF-2004). May 31-June 3, Yokohama, Japan.
- Ph.D. Examiner. University of Alberta, 2003.
- International Scientific Advisory Member. International Conference on Scientific &

Engineering Computation (IC-SEC) 2002, 3-5 December, Singapore.

- Member of an HDR (Habilitation à Diriger des Recherches) examination committee, University of Marseilles, 2001.
- Member of the International Scientific Committee (ISC) of the International Conference on Multiphase Flows (ICMF-2001), New Orleans in May 2001.
- Member of the International Scientific Advisory Committee for MULTIPHASE FLOW 2001. Orlando, FL, 14-16 March 2001
- Ph.D. Examiner. University of Marseille, 1997.
- Ph.D. Dissertation Reader. Princeton University, 1997.
- Member of a large number of Ph.D. Dissertation committees at the University of Michigan (1985-2000), WPI (2000-2010) and University of Notre Dame.

Every year I write a large number of evaluation letters for tenure and promotion at various universities in the US and abroad. I have also nominated and supported the nomination of a number of people for the status of Fellow of APS, ASME and ASEE, as well as for various awards and prizes.

Consulting

Fluid Sciences Inc., Summer 1986 and 1987.
Expert witness in the U.S. Federal Court in Ann Arbor. Fall 1989.
Institute for Computational Mechanics in Propulsion, NASA Lewis, 1991-97
Ford Motor Company, 1992-95
Gas Research Institute, 1994-99
Detroit Edison, 1996 & 97
NBG Technologies Inc. A small company that I co-owned with W.D.A. Dahm. The company was build around software developed under Gas Research Institute funding and provided service to gas utilities. For about two years (1998-2000) the company had an office with two full time employees.
Other minor advising, such as evaluating patents, business plans, feasibility of ideas, etc.

TEACHING

Ph. D. Committees Chaired

1. Dequan Yu: *Numerical Simulations of Vortex Interactions with a Free Surface*. Department of Mechanical Engineering, University of Michigan 1990.

2. Salih Ozen Unverdi: *Numerical Simulations of Multi-Fluid Flows*. Department of Mechanical Engineering, University of Michigan 1990.

3. Museok Song: *Vortex Ring Interactions with a Free Surface*. Department of Naval Architecture, University of Michigan 1991. (Co-Chair with G. Meadows)

4. Elizabeth A. Ervin: *Full Numerical Simulations of Bubbles and Drops in Shear Flow*. Department of Mechanical Engineering, University of Michigan 1993.

5. Mohammad Reza Heyranni-Nobari: *Numerical Simulations of Drop Collisions and Coalescence*. Department of Mechanical Engineering, University of Michigan 1993.

6. Chester H. H. Chang: *A Local Integral Model of Chemically Reacting Flows, Including Finite Rate Effects*. Department of Aerospace Engineering, University of Michigan 1994. (Co-Chair with W.J.A. Dahm).

7. Yi-Jou Jan: *Computational Studies of Bubble Dynamics*. Department of Mechanical Engineering, University of Michigan 1994. (Co-Chair with S.L. Ceccio)

8. Asghar Esmaeeli: *Numerical Simulations of Bubbly Flows*. Department of Mechanical Engineering, University of Michigan 1995.

9. Selman Nas: *Computational Investigation of Thermocapillary Migration of Bubbles and Drops in Zero Gravity*. Department of Aerospace Engineering, University of Michigan 1995.

10. Saeed Mortazavi: *Computational Investigation of Particulate Two-Phase Flows*. Department of Aerospace Engineering, University of Michigan 1995. (Co-Chair with W.J.A. Dahm).

11. Faical Tounsi: *Numerical Simulations of the Interactions of Vortices with Density Interfaces*. Department of Mechanical Engineering, University of Michigan 1995.

12. Damir Juric: *Computations of Phase Change*. Department of Mechanical Engineering, University of Michigan 1996.

13. Nallan C. Suresh: *Modeling of Natural Gas Flames*. Department of Mechanical Engineering, University of Michigan 1997. (Co-Chair with W.J.A. Dahm).

14. Jaehoon Han: *Numerical Studies of Drop Motion in Axisymmetric Geometry*. Department of Mechanical Engineering, University of Michigan 1998. (Co-Chair with S.L. Ceccio).

15. Judy Hweina Che: *Numerical Simulations of Complex Multiphase Flows: Electrohydrodynamics and Solidification of Droplets*. Department of Mechanical Engineering, University of Michigan 1999 (Co-chair with S.L. Ceccio).

16. Bernard Bunner: *Numerical Simulations of Gas-Liquid Bubbly Flows*. Department of Mechanical Engineering, University of Michigan 2000.

17. Khaled Sbeih: *Vortex Sheet Modeling of High Reynolds Number Shear Layers*. Department of Mechanical Engineering, University of Michigan 2000. (Co-Chair with W.J.A. Dahm).

18. Nabeel Zahran Al-Rawahi: *Numerical Simulations of Dendritic Solidification with Convection*. Department of Mechanical Engineering, University of Michigan 2002.

19. Warren B. Tauber: *Numerical Simulations of Atomization through Nonlinear Behavior of a Sheared Immiscible Fluid Interface*. Department of Mechanical

Engineering, University of Michigan 2002.

20. Mark Joseph Stock: *A Regularized Inviscid Vortex Sheet Method for Three Dimensional Flows With Density Interfaces*. Department of Aerospace Engineering, University of Michigan 2006. (Co-Chair with W.J.A. Dahm).

21. Souvik Biswas: *Direct Numerical Simulation and Two-Fluid Modeling of Multi-Phase Bubbly Flows*. Department of Mechanical Engineering, Worcester Polytechnic Institute 2007.

22. Siju Thomas: *Multiscale Modeling of Thin Films in Direct Numerical Simulations of Multiphase Flows*. Department of Mechanical Engineering, Worcester Polytechnic Institute 2009.

23. Ali Nematbakhsh: A Nonlinear *Computational Model of Floating Wind Turbines*. Worcester Polytechnic Institute 2013. (Co-Chair with Prof. D. Olinger).

24. Bahman Aboulhasanzadeh: *Multiscale Computations of Mass Transfer in Bubbly Flows*. University of Notre Dame, 2014.

25. Ming Ma: *Using Direct Numerical Simulation and Statistical Learning to Model Bubbly Flows in Vertical Channels*. University of Notre Dame, 2017.

Current Ph.D. Student at WPI

Amirmahdi Ghasemi: *Modeling of Underwater Kites for Power Generation*. Co-Chair with Prof. D. Olinger.

Current Ph.D. Students at Notre Dame

Alberto M. Roman Afanador: *Computations of Multiphase Flows*.

Courses Taught at the University of Michigan

Undergraduate Courses: Thermodynamics (taught 3 times, total of 108 students); Fluid Mechanics (taught 5 times, total of 220 students); Fluid Mechanics II (taught once, 16 students); Design & Manufacturing I (co-taught 7 times, total of 1108 students); Design II (taught once, 14 students).

Graduate Courses: Dynamics of Inviscid Fluids (taught 4 times, total of 35 students); Fluid Mechanics; (taught once, 14 students); Computational Fluid Dynamics (taught 13 times, total of 252 students);

Courses Taught at WPI

Undergraduate Course: Heat Transfer (taught once, 70 students); Thermodynamics (taught once, 100 students); Introduction to Thermal Sciences (taught once); Introduction to Innovation and Entrepreneurship (co-taught twice, 53 students)
Graduate Courses: Computational Fluid Dynamics (taught every year with 20-30 students)

Courses Taught at the University of Notre Dame

Undergraduate Course: Fluid Mechanics (Fall 2011, 56 students); Thermodynamics (Spring 2015, 49 students; Spring 2016, 76 students)

Graduate Course: Computational Fluid Dynamics (Spring 2011, 16 students; Spring 3013, 6 students; Spring 2015, 5 students; Spring 2017, 10 students); Numerical Methods (Fall 2016, 17 students); Mathematical Methods I (Fall 2016, 30 students).

Undergraduate Special Projects Directed

University of Michigan

M. Lasken. ONR Sponsored Summer study, 1991
A. Kotlyer. NSF Sponsored High school student, 1993-94. Work Study, 1994-96.
C. Dulin. UROP (Undergraduate Research Opportunity Program), 1994-95
T. Neubecker. UROP, 1994-95
L. Delfin. UROP, 1994-95
R.L. Smiertka. UROP, 1995-96
Joon Kwak. UROP, 1996
Gregory Sabo. UROP, 1998-99
Tina Ong. 1999-2000
All projects involved graphics for Computational Fluid Dynamics

Worcester Polytechnic Institute

Senior Project: *SAE Chassis Design*. Kristian K. Bleasdell, Sarah J. Grenier, Daryl W. Moss, and Francis D. Rzegocki, Spring 2001.

Senior Project: *The 2002 WPI-SAE CAR. Aerodynamics*: Christopher R. Cammack and David M. Lenhardt. *Chassis Design*: Joshua A. Beauvais and Alexander M. Clifford. *Power Train*: John R. Escolas, Michael K. Krager, and Adam D. Strelczuk. Spring 2002

Senior Project: *Heat Exchanger Design for 5KW SOFC APU*. Kelly A. Jaramillo and Christopher G. Greene. Fall 2001

Senior Project: *DES/MFG Fiber optic Drawing Drum*. Curtis L. Britton and Ronald M. Wright. Spring 2002

Junior Project: *Geothermal Energy in Iceland*. Timothy B. Baird, Chun-Shek Chan, and Peter G. C. Kast. Summer and Fall 2002

Junior Project: *Marketing the 2002 WPI Racecar*. Christopher R. Cammack, Chad F.Derosier, Schuyler J. Ortega, Steven W. Tipa, and Neil R. Whitehouse. Spring 2002

Senior Project: *Modeling an MPBR core using FLUENT*. Benjamin T. Parks and James A. Beaudoin. Fall 2002

Senior Project: *EV1-Hybrid Car Design*: Eric Johnson, Justin Wheeler, David Sama, and Joseph Murphy. Two students from ME, two from EE. Co-advised with Prof. A. E. Emanuel. Spring 2003

Senior Project: *Constellation-X SXT Trade Study and Design*. David Belliveau and Conway Chuong. Project done at GSFC. Co-advised with Prof. F. Looft. Fall 2002

Senior Project: *Remotely Operable Micro Environmental Observatory*. Jeffrey R. Blair (ME 04 Provost's MQP Award). Spring 2004.

Senior Project: *Odor Management in Human Waste Receptacles*. Stephen Walasavage. Spring 2005.

Senior Project: *Tutorials for CFD Modeling of Fluid Flow*. Gary B. DeBlois. Spring

2005.

Junior Project: *Anaerobic Digestion for the Treatment of Biomass*. Gregory Cole, Daniel Rapp, and Anthony Vello. Spring 2005.

Senior Project: *Adhesive Mounting of Sensitive Optical Components for a Spaceflight Application*. Wesley Culver, Justin Rockwell, Rebecca Ziemba. C-advisor. Project done at the MIT Lincoln Laboratory. Fall 2005.

Senior Project: *Computations of Fire Suppression by Mist*. Carl Nelson, Ashley Poulin, and Jonathan Sikes. Co-advised with Prof. J. Barnett. Fall 2005 and Spring 2006.

Senior Project: *Simulations of Crowd Actions in Response to Emergencies and Dangers (SCARED*). Jason Allukian, Andrew Biery, Nate Birmingham, Kevin Mullins. Co-advised with Prof. J. Barnett. Fall 2005 and Spring 2006.

Junior Project: *Sustainability*. Kaes Sullivan-Keizer, Fall 2006 and Spring 2007

Senior Project: *Hydrophonics*. Kaes Sullivan-Keizer, Fall 2006 and Spring 2007

Senior Project: *Re-engineering the EV1*. Shane Slocum. Fall 2006 and Spring 2007

Senior Project: *Studies of Metal Fires at Sandia National Lab*. R. Accosta and L. Archer Spring 2008.

Senior Project: *Fire Modeling using Fluent*. R Viall and K. Wiegand. Fall 2007 and Spring 2008

Senior Project: *Fire Modeling with FDS*: R. Thomann, J. Moseley and R. LaFalam. Fall 2007 and Spring 2008

Senior Project: *Simulations of Crowds*: B. Dubois and B. Willey. Fall 2007 and Spring 2008

Senior Project: *Aerial Wind Turbine*: K. P. Martinez, A. J. McIsaac and D. R. Thayer. Fall 2008-Spring 2009

Senior Project: *Sweep Ergometer*: Kyla L. Bye-Nagel, Summer 2009

Senior Project: *Computations of Sprays*: James C. Cook, Fall 2009

Senior Project: *Computations of Complex Flows*: Jonathan Zoll. Fall 2009

Short Courses and Workshops Taught

Two lectures given as part of "Short Course on Modeling and Computation of Multiphase Flow, Part IIB: Multiphase flow CFD." March 8-12, 1999; March 20-24, 2000; March 19-23, 2001; March 18-22, 2002; March 24-28, 2003; March 22-26, 2004; March 14-18, 2005; March 20-24, 2006; February 11-15, 2008; February 9-13, 2009; February 15-19, 2010; February 14-18; 2011; February 13-17, 2012; February 11-15, 2013; February 10-14, 2014, February 9-13, 2015, February 15-19, 2016, February 13-17, 2017, ETH, Zurich, Switzerland.

Four lectures as part of "Introduction to Computational Techniques for Multiphase Flows." July 17-19, 2017 I-Hotel, Champaign, IL. Sponsored by American Society of Thermal and Fluids Engineers.

Three lectures given as part of "29th Computational Fluid Dynamics Lectures." February 23-27, 1998. Von Karman Institute for Fluid Dynamics, Belgium.

Co-principal Lecturer. "Suivis d'interfaces," INRIA Rocquencourt, France, May 3-6, 1999. Several lectures.

Lectures given as part of "Experiments, Modeling, and Numerical Calculation for

Dispersed Multiphase Flow," ERCOFTAC Summer school, July 16-19, 2001, Merseburg, Germany.

Lecture given as part of "Ecole d'été sur la modélisation des fronts et interfaces," Ile de Porquerolles, France, June 26-July 2, 2005.

Two lectures given as part of "CFD of Multifluid Flows." May 21-24, 2007. Von Karman Institute for Fluid Dynamics, Belgium.

Several lectures given as part of "Summer School on Numerical Methods for Multiphase Flows," at KTH, Stockholm, Sweden, Sept. 3-7, 2012.

Fundamentals of Multiphase Flows—A DNS Approach. A series of lectures at Xi'an Jiaotong University, China. June 5-19, 2013.

Summer School and International Symposium on Fundamental Issues of Multiphase Flows. HUST Wuhan, China, June 9-14, 2014. Three tutorial lectures and one research talk.

Postdoctoral Advisees and funded visiting research professors

S. Ozen Unverdi
Yumin Yang
Mei Zhuang
Saeed Mortazavi
Asghar Esmaeeli
Shunji Homma
Damir Juric
Arturo Fernandez, 2000-03
Jiacai Lu, 2001-
Sadegh Dabiri, January 2011-June 2014
Huanxiong Xia. January 2016 -

Sponsored Visitors (not funded)

John C. Wells (Ritsumeikan University, Japan) Visiting Associate Professor, 9/2003-3/2004.
Hiroshi Terashima, Visiting Research Scientist, 2007-09.
Guoyi Peng (Nihon University, Japan) Visiting Associate Professor, 4-9/2012.
Ying Zhang (Nanchang University, China) Visiting Associate Professor, 9/2012-9/2014.
Metin Muladouglu (Koc University, Turkey) Visiting Associate Professor, 8/2013-12/2013.
Bao Zhou (Harbin Engineering University). Visiting Graduate Student, 9/1/2013-8/31/2014.
Saul Piedra (Universidad Nacional Autónoma de México). Visiting Graduate Student, 6/15/2014-12/15/2014.
Xin Feng (Chinese Academy of Sciences). Visiting Professor, 2/5/2017-2/4/2018.

RESEARCH

Researcher ID: http://www.researcherid.com/rid/H-4445-201
Google Scholar profile: http://scholar.google.com/citations?user=tUXL6-oAAAAJ&hl=en

Books

A. Prosperetti and G. Tryggvason (editors and main contributors). "*Computational Methods for Multiphase Flow*." Cambridge University Press, 2007. Paperback edition 2009.

Reviewed in: *J. Fluid Mech*. 603 (2008),474-475; *Int'l. J. Multiphase Flow* 34 (2008), 1096-1097.

G. Tryggvason, R. Scardovelli and S. Zaleski. "*Direct Numerical Simulations of Gas-Liquid Multiphase Flows*." Cambridge University Press. 2011.

G. Tryggvason and D. Apelian (editors and contributors). "*Shaping Our World: Engineering Education for the 21st Century.*" John Wiley and Sons, Inc., 2011

Patents

"A Local Integral Method for Computations of Molecular Mixing and Chemical Reactions." With W.J.A. Dahm. Issued Dec. 10, 1996. Patent No. 5,583,789.

"Method and Apparatus for Obtaining Species Concentrations and Reaction Rates in a Turbulent Reacting Flow." With W.J.A. Dahm. Issued June 17, 1997. Patent No. 5,640,331.

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137. T. Reichardt, G. Tryggvason and M. Sommerfeld. "Effect of Velocity Fluctuations on the Rise of Buoyant Bubbles." *Computers and Fluids,* 150 (2017) 8–30.

138. J. Lu, M. Muradoglu and G. Tryggvason. "Effect of Insoluble Surfactant on Turbulent Bubbly Flows in Vertical Channels." *International Journal of Multiphase Flow*. 95 (2017), 135-143.

139. H. Xia, J. Lu, S. Dabiri, and G. Tryggvason. "Fully Resolved Numerical Simulations of Fused Deposition Modeling. Part I—Fluid Flow." *Rapid Prototyping Journal. To Appear.*

140. B. Zhou, B. Aboulhasanzadeh, P. Gao, and G. Tryggvason. "A Numerical Study of the Phase Distribution in Oscillatory Bubbly Flows." *Submitted for Publication.*

141. B. Magolan, E. Baglietto, C. Brown, I.A. Bolotnov, G. Tryggvason, and J. Lu. "Multiphase Turbulence Mechanisms Identification from Consistent Analysis of Direct Numerical Simulation Data." *Submitted for Publication.*

Citations (June 2017): Scientific Citation Index: 6,098 citations and h-index of 38.
Google Scholar: 12,431 citation and h-index of 50.

Chapters in Books

J. Glimm, B. Lindquist, O. McBryan and G. Tryggvason, "Sharp and Diffuse Fronts in Oil Reservoirs: Front Tracking and Capillarity." In *Mathematical and Computational Methods in Seismic Exploration and Reservoir Modeling,* ed. W.E. Fitzgibbon, SIAM, Philadelphia, p. 54-67 (1985).

G. Tryggvason, "Numerical Studies of Large Amplitude Instabilities." In *Advances in Multiphase Flow and Related Problems,* ed. G. Papanicolau, SIAM, Philadelphia, p. 257-272, (1986).

G. Tryggvason, "Vortex Dynamics of Stratified Flows." In *Mathematical Aspect of Vortex Dynamics*, ed. R. Catfish, SIAM, Philadelphia, p. 160-270, (1988).

G. Tryggvason, A. Esmaeeli, D. Juric, S. Nas and M. Saeed, "A Front-Tracking Method for Direct Simulations of Multiphase Flows." In *Boundary Elements* XVII, edited by C.A. Brebbia, S. Kim, T. A. Osswald and H. Power, Comp. Mech. Pub., Southampton, pp. 653-660 (1995).

G. Tryggvason and S.O. Unverdi. "The Shear Breakup of an Immiscible Fluid Interface." In *Fluid Dynamics at Interfaces* (Proceedings of the C.S. Yih memorial symposium). W. Shyy and R. Narayanan, editors. Cambridge University Press, 1999.

S. Guo, W.W. Schultz, and G. Tryggvason. "Numerical studies of contaminated surface deformation by a vortex pair." In *Free surface flow with vorticity*. P. Tyvant, editor. Comp. Mech. Publ., 1998, p. 179-202.

W. J.A. Dahm, G. Tryggvason, R. D. Frederiksen, and M. J. Stock. "Local Integral Moment (LIM) Simulations," Chapter 4 in *Computational Fluid Dynamics in Industrial Combustion* (C.M. Baukal, Ed.), CRC Press, 2000.

G. Tryggvason and B. Bunner. "Direct Numerical Simulations of Multiphase Flows." In *Parallel Computational Fluid Dynamics. Trends and Applications*. Ed. C.B. Jensen et al. pp. 77-84. Elsevier, 2001.

G. Tryggvason, B. Bunner, M.F. Goz, and M. Sommerfeld. "Direct numerical simulations of multiphase flow." In *Direct and Large-Eddy Simulations IV*. Ed. B.J. Geurts, R. Friedrich, and O. Metais. Kluwer Academic Publisher, 2002.

S. Homma, J. Koga, S. Matsumoto, and G. Tryggvason. "Formation of a Jet and its Breakup into Drops in Liquid-Liquid Systems." *Theoretical and Applied Mechanics*, Japan, Volume 51, 2003.

G. Tryggvason. "12.2.1 Bubble and Droplet Motion and Deformation" in *Handbook on Multiphase Flows* (C. Crowe, Editor). CRC Press, 2006.

G. Tryggvason and J. Lu. Direct Numerical Simulations of Multiphase Flows. Chapter 4 in: B. C. Khoo, Z. Li and P. Lin (editors). Interface Problems and Methods in

Biological and Physical Flows (Lecture Notes Series, Institute for Mathematical Sciences, National University of Singapore). World Scientific, 2009

G. Tryggvason, J. Lu, S. Biswas and A. Esmaeeli. Studies of Bubbly Channel Flows by Numerical Simulations. Chapter 5 in: M. Deville, T.-H. Le and P. Sagaut (editors) Turbulence and Interactions: Keynote Lectures of the TI 2006 Conference. Springer 2009.

G. Tryggvason and S. Dabiri. Direct Numerical Simulation of Shock Propagation in Bubbly Liquids. Chapter 6 in *Bubble Dynamics and Shock Waves. Shock Wave Science and Technology Reference Library Vol*. 8. Can F. Delale (editor). p. 117. Springer 2013.

D.J. Olinger, J.S. Goela, and G. Tryggvason. Modeling and Testing of a Kite-Powered Water Pump. Chapter 22 in *Airborne Wind Energy*, U. Ahrens, M. Diehl, and R Schmehl (editors). p 387. Springer 2013.

Book Reviews

Reviewed: *Fluid Dynamics and Transport of Droplets and Sprays* by W. Siringano. ASME Journal of Fluid Engineering. March, 2000.

Conference and Symposium Presentations/Papers

G. Tryggvason and H. Aref, "Numerical Experiments on Statistical Fingering in Stratified Hele Shaw Flows", 35th Meeting of the American Physical Society, Div of Fluid Dynamics, Rutgers University, New Brunswick, NJ. Abstract in Bull. Amer Phys Soc 27: 1172, (1982).

G. Tryggvason and H. Aref, "Interface Dynamics by the Vortex-in-cell Method", XVI'th Intern. Congr. Theor. Appl. Mech., Lyngby, Denmark, (1984).

G. Tryggvason and H. Aref, "Vortex-in-Cell Calculations of Flows with Sharp Interfaces." 37th Meeting of the American Physical Society, Div of Fluid Dynamics, Brown University, Providence RI. Abstract in Bull. Amer. Phys. Soc. 29:1569, (1984).

G. Tryggvason, "Simulations of the Rayleigh-Taylor Instability by Front Tracking Methods." SIAM Spring Meeting, Pittsburgh. (1985).

G. Tryggvason, "Simulations of the Rayleigh-Taylor Instability by a Vortex Method." 38th Meeting of the American Physical Society, Div of Fluid Dynamics, Tucson, Arizona. Abstract in Bull. Amer. Phys. Soc. 30:1742, (1985).

G. Tryggvason, "Numerical Studies of Large Amplitude Instabilities of Fluid Interfaces." Invited Presentation. SIAM Workshop on Multiphase Flow, Leesburg, VA, (June 2-4, 1986).

G. Tryggvason, "Stratified Flow via Vortex Methods", Invited Presentation, Workshop on Computational Fluid Mechanics, Davis, CA, (June 17-18, 1986).

G. Tryggvason, "Numerical Studies of Instabilities of Fluid Interfaces." 10th U.S. National Congress of Applied Mechanics, Austin, TX, (June 16-20, 1986).

G. Tryggvason, "Numerical Simulations of Large Amplitude Rayleigh-Taylor Instability," SIAM National Meeting, Boston, MA (July 21-25, 1986).

G. Tryggvason, "A Vortex Blob Method for Sharply Stratified Flow," 39th Meeting of the American Physical Society, Div of Fluid Dynamics, Abstract in Bull. Amer. Phys. Soc. 31:1700 Columbus, OH, (Nov. 23-25, 1986).

G. Tryggvason, "Free surface/Vortex Interactions," Ship Wake Consortium Workshop, DTNSRDC, Washington, DC, (May 4-5, 1987).

G. Tryggvason, "Free surface/Vortex Interactions", Ship Wake Consortium Workshop, Univ of Michigan, Ann Arbor, (Sept.21-22, 1987).

G. Tryggvason and D. Yu, "Interaction of Vorticity and Density Interfaces", SIAM 35th Anniversary Meeting, Denver, CO, (October 12-15, 1987).

G. Tryggvason, D. Yu and S.W. Hong, "Interaction of Vorticity and Density Interfaces", 40th Meeting of the American Physical Society, Div. of Fluid Dynamics, Abstract in Bull. Amer. Phys. Soc., 32:2073. Eugene, OR, (Nov. 20-21, 1987).

G. Tryggvason, "Vortex Dynamics of Stratified Flows", Invited Presentation, SIAM Workshop on Mathematical Aspect of Vortex Dynamics, Leesburg, VA, (April 25-27, 1988).

G. Tryggvason, "On the Boundary Integral Formulation of Free Surface Problems", SIAM Annual Meeting, Minneapolis, MN, (July 11-15, 1988).

41th Meeting of the American Physical Society, Div of Fluid Dynamics, Abstracts in Bull. Amer.Phys. Soc. 33, Buffalo, N.Y, (Nov. 23-25, 1988). Three talks:

G. Tryggvason, "On Boundary Integral Formulation of Sharply Stratified Flows."

G. Tryggvason, A. Hirsa, W. Willmarth and D. Yu, "Interaction of a Vortex Pair with a Free Surface."

G. Tryggvason, M. Song and D. Yu, "Vortex Interaction with a Free Surface."

G. Tryggvason, "Fluid Mixing by Contour Dynamics." Symposium on Fractal Aspect of Materials Disordered Systems. Fall Meeting of the Material Research Society, Boston, MA. (Nov. 29-Dec. 2, 1988).

G. Tryggvason, "Computations of Vortex/Free Surface Interactions", ONR Workshop on Vortex/Free Surface Interactions, Ann Arbor, (March 9-10, 1989).

G. Tryggvason, "On Boundary Integral Formulation of Sharply Stratified Flows", 21 Midwestern Mechanics Conference, Houghton, MI, (August 13-16, 1989).

42th Meeting of the American Physical Society, Div of Fluid Dynamics, NASA, Abstracts in Bull. Amer.Phys. Soc. 34, Ames, CA, (Nov. 19-21, 1989). Two talks:

G. Tryggvason, M. Song and L. Bernal, "Vortex Interaction with a Free Surface."

G. Tryggvason and S.O. Unverdi, "Viscous Rayleigh-Taylor Instability."

G. Tryggvason, S.O. Unverdi and K. Sbeih, "Simulations of Incompressible Flows Containing Interfaces-using Front Tracking Methods", Regional Meeting of the American Mathematical Society, Manhattan, KA, (March 16-17,-1990).

G. Tryggvason, "Full Simulations of Bubbly Flows", Invited presentation, ONR Workshop on Bubbly Flows, Miami, FL, (May 3-4, 1990).

G. Tryggvason, J. Abdollahi-Alibeik, M. Song and S.O. Unverdi, "Interaction of Vortices with a Free Surface and a Density Interface," Invited presentation at the AMS-SIAM Summer Seminar on Vortex Dynamics and Vortex Methods, Seattle, WA, (June 18-29, 1990).

G. Tryggvason, S.O. Unverdi and K. Sbeih, "Numerical Studies of Unsteady Vortex Layers," ASME Symp on Non-steady Fluid Mechanics, Toronto, Canada, (June 4-6, 1990).

G. Tryggvason, "Computation of Vortex Sheet Roll-Up," Invited presentation in a Mini-symposium, SIAM Annual Meeting, Chicago, IL, (July 16-20, 1990).

G. Tryggvason and S.O. Unverdi, "A Front Tracking Method for Incompressible Flows", SIAM Annual Meeting, Chicago, IL, (July 16-20, 1990).

A. Hirsa, G. Tryggvason, J. Abdollahi-Alibeik and W. W. Willmarth, "Measurement and Computations of Vortex Pair Interaction with a Clean or Contaminated Free Surface," 18th Symp on Naval Hydrodynamics, National Academy Press, Washington, DC, (1990).

M. Song, N. Nachman, J.T. Kwon, L.P. Bernal and G. Tryggvason, "Vortex Ring Interaction with a Free Surface," 18th Symp on Naval Hydrodynamics, National Academy Press, Washington, DC (1990).

G. Tryggvason, C.H.H. Chang and W.J.A. Dahm. "A Lagrangian Model for Simulating Combustion, Including Finite Rate Chemistry, in Complex Flows." Twenty-third Int'l Symposium on Combustion, Poster Paper P229, Combustion Institute, Pittsburg, PA, (1990).

ASME Applied Mechanics Conference. Columbus OH, June 16-19, 1991. Two talks:

Y.-J. Jan and G. Tryggvason, "Computational Studies of Contaminated Bubbles," Symp on Dynamics of Bubbles and Vortices Near a Free Surface," AMD Vol. 119 (Ed. Sahin and Tryggvason), pp. 46-59, ASME (1991).

T. Faical, M. Song, S.O. Unverdi and G. Tryggvason, "Collision of Viscous Vortices with a Free Surface and Density Interfaces," Symp on Dynamics of Bubbles and Vortices Near a Free Surface," AMD Vol. 119 (Ed. Sahin and G.Tryggvason), p. 31-37, ASME (1991).

G. Tryggvason and S.O. Unverdi, "Full Numerical Simulations of Multi-Fluid Flows, Invited presentation. IUTAM Symposium on the Fluid Dynamics of Mixing and Stirring, La Jolla, CA, (Aug. 20-24, 1990).

G. Tryggvason, C.H.H. Chang and W.J.A. Dahm, "Lagrangian Model Simulations of Molecular Mixing, Including Finite Rate Chemical Reactions, in a Temporally Developing

Shear Layer," invited poster presentation, IUTAM Symposium on the Fluid Dynamics of Mixing and Stirring, La Jolla, CA, (Aug. 20-24, 1990).

G. Tryggvason and S.O. Unverdi, "Numerical Studies of Multi-Fluid Flows," American Institute of Chemical Engineers, Annual Meeting, Chicago IL, (Nov. 11-16, 1990).

43th Meeting of the American Physical Society, Div of Fluid Dynamics, Cornell University, Abstracts in Bull. Amer. Phys. Soc. 35, Ithaca, NY, (Nov. 19-21, 1990). Four talks:

G. Tryggvason and S.O. Unverdi, "Numerical Simulations of Bubble Interactions."
G. Tryggvason and M. Song, "Free Surface Waves due to the Opening-Up of a Vortex Ring,"
G. Tryggvason, K. Sbeih and W.J.A. Dahm, "Numerical Simulations of Viscous and Inviscid Kelvin-Helmholtz Instability."
G. Tryggvason, C.H.H. Chang and W.J.A. Dahm, "Lagrangian Model Simulations of Molecular Mixing, Finite Rate Chemical Reactions, and Extinction in a Temporally Developing Shear Layer,"

G. Tryggvason, "Vortex Ring Interaction with a Free Surface," Invited presentation at an ONR 1991 Free Surface Vorticity Workshop in San Diego, (Feb. 25 - 26, 1991).

G. Tryggvason, "Computations of Multi-Fluid Flows," Invited presentation at the Center for Nonlinear Studies Annual Meeting at Los Alamos National Laboratory. May 20-24, 1991.

G. Tryggvason and S.O. Unverdi, "Mixing by Interfacial Instabilities," Invited presentation in a minisymposium on chaotic mixing at the ICIAM meeting in Washington, DC, (July 8-12, 1992).

G. Tryggvason, "Full Numerical Simulations of Multi-Bubble Flows," Invited talk in a Mini-Colloquium on Dispersed Two-Phase Flow at the First European Fluid Mechanics Conference, Cambridge, England, (Sept. 16-20, 1991).

44th Meeting of the American Physical Society, Div of Fluid Dynamics, Abstracts in Bull. Amer. Phys. Soc. 36, Scottsdale, AZ, (Nov. 24-26, 1991). Three talks:

G. Tryggvason and Y.-J. Jan, "Computations of a Rising Bubble with Insoluable Surfactan."
G. Tryggvason and T. Faical, "Numerical Simulations of Vortex Ring and Density Interface Interaction."
G. Tryggvason, C.H.H. Chang and W.J.A. Dahm, "Local Integral Model Simulations of Chemically Reacting Flows."

G. Tryggvason, "Studies of Bubbly Flows," Invited talk at an ONR Workshop on Bubbly Flows in Santa Barbara, (Oct. 17-18, 1992).

G. Tryggvason, "Numerical Simulations of Contaminated Fluid Interfaces," Invited presentation at the Conference on Nonlinead Analysis and Computation at the University of New York, Stony Brook, (Nov. 21-22, 1991).

G. Tryggvason, "Numerical Studies of Drop Collision and Coalescence," Invited presentation

at the NASA first Technology Interface Meeting for the Modular Containerless Processing Facility Project in Pasadena, CA, (January 13-15, 1992).

M. Song and G. Tryggvason, "Numerical Investigation of an Oblique Collision of a Vortex Ring with a Clean Free Surface," 19th Symp on Naval Hydrodynamics, National Academy Press, Washington, DC, (1992).

G. Tryggvason, Y.-J. Jan, A. Esmaeeli and S.O. Unverdi, "Full Simulations of Multi-Bubble Flows." In *Proceedings of Second International Symposium on Propeller and Cavitation,* Hangzhou, China, Sept. 1-4, 1992.

45th Meeting of the American Physical Society, Div of Fluid Dynamics, Abstracts in Bull. Amer. Phys. Soc. 37, Tallahassee, Florida, Nov 22-24, 1992. Five talks:

G. Tryggvason and E. Ervin, "Bubbles rising in a Vertical Shear."
G. Tryggvason and A. Esmaeeli, "Computations of a Rising Bubble Cloud."
G. Tryggvason, and S. Nas, "Computational Investigation on Thermal Migration of Bubbles and Drops."
G. Tryggvason and M.R. Nobari, "Head-on Collision of Drops."
G. Tryggvason and Y.-J. Jan, "Computational Studies of Surfactant Effect on the Interaction Between Several Bubbles."

G. Tryggvason "Studies of Bubbly Flows," ONR Workshop on Dynamics of Bubbly Flows, RPI, Troy, NY, July 19-20, 1993.

G. Tryggvason, Presentation at a NASA Workshop, Lewis Research Center, Cleveland, OH, June 15, 1993.

A. Esmaeeli, E.A. Ervin and G. Tryggvason, "Numerical Simulations of Rising Bubbles." In *Proceedings of the IUTAM Conference on Bubble Dynamics and Interfacial Phenomens* . Proceedings of an IUTAM Symposium held in Birmingham, U.K., 6-9 Sept. 1993. Ed.: J.R. Blake, J.M. Boulton-Stone and N.H. Thomas. pp. 247-255.

S. Nas and G. Tryggvason, "Computational Investigation of the Thermal Migration of Bubbles and Drops." In *AMD 174/FED 175 Fluid Mechanics Phenomena in Microgravity,* Ed. Siginer, Thompson and Trefethen. pp. 71-83. ASME (1993). Presented at the ASME 1993 Winter Annual Meeting.

46th Meeting of the American Physical Society, Div of Fluid Dynamics, Abstracts in Bull. Amer. Phys. Soc. 38, Albuquerque, NM, Nov. 21-23, 1993. Three talks:

G. Tryggvason and S. Nas "Computational Investigation on Thermal Migration of Bubbles and Drops."
A. Esmaeeli and G. Tryggvason "Numerical Simulation of Bubbly Flows."
M.R. Nobari and G. Tryggvason "Coalescence of Initially Stationary Drops."

The 32th AIAA Aerospace Sciences Meeting, Reno, NV, Jan. 10-13, 1994. Three papers:

L.P. Bernal, P. Maksimovic, F. Tounsi and G. Tryggvason, "An Experimental and Numerical Investigation of Drop Formation by Vortical Flows in Microgravity," AIAA 94-0244.

N.C. Suresh, W.J.A. Dahm and G. Tryggvason, "LIM Modeling of Chemical Reactions in Spatially and Temporally Developing Shear Flows," AIAA 94-0870.
M.R.H. Nobari and G. Tryggvason, "Numerical Simulations of Drop Collisions," AIAA 94-0835.

G. Tryggvason, "Full Simulations of Multiphase Flows," ASME Summer Meeting, Lake Tahoe, NV, June 19-23, 1994.

G. Tryggvason, "A Front Tracking Method for Viscous, Incompressible, Multi-Fluid Flows," SIAM Annual Meeting, San Diego, CA, July 25-29, 1994

P. Yu, A. Esmaeeli, S. L. Ceccio, and G. Tryggvason. "Direct Simulations of Bubbly Flows." 20th Symposium on Naval Hydrodynamics, Santa Barbara, August 1994. Proceedings, pp. 209-221. National Academy Press, Washington, DC, (1994).

47th Meeting of the American Physical Society, Div of Fluid Dynamics, Abstracts in Bull. Amer. Phys. Soc. 39, Atlanta, GA, Nov. 20-22, 1994. Four talks:
B. Dooley, A. Warncke, M. Gharib, and G. Tryggvason "Vortex Ring Generation due to the Coalescence of a Water Drop at a Free Surface."
N.C. Suresh, W.J.A. Dahm, and G. Tryggvason "Local Integral Momentum Simulations of Mixing and Nonequilibrium Chemisrty in Complex Shear Flows."
S. Mortazavi and G. Tryggvason "The Fluidization of Drops in a Shear Flow."
A. Esmaeeli and G. Tryggvason "Numerical Simulation of Bubbly Flows."

D. Juric and G. Tryggvason, "Full Simulations of Flows with Phase Change," AIAA 95-0700. 33rd AIAA Aerospace Sciences Meeting, NV, Jan. 9-12, 1995.

G. Tryggvason. "Direct numerical simulations of multiphase flows using a front tracking/finite difference method." Invited mini-symposium presentation. 3rd. National Congress on Computational Mechanics, Dallas, TX, June 12-14, 1995.

S.O. Unverdi, Y. Yang, and G. Tryggvason "Energy Dissipation for Finite Amplitude Surface Waves," 48th Meeting of the American Physical Society, Div of Fluid Dynamics, Abstracts in Bull. Amer. Phys. Soc. 40: 1928, Irvine, CA, Nov. 19-21, 1995.

G. Tryggvason "Computations of Underhood Flows. "The Best of German/American Automotive Technology, Faunhofer USA," Conference. Troy, MI, July 27-28, 1995.

ASME Winter Annual Meeting, San Francisco, CA, Nov. 12-17, 1995. Three talks:
D. Juric and G. Tryggvason, "A Front-Tracking Method for Liquid-Vapor Phase Change," in *Advances in Numerical Modeling of Free Surface and Interface Fluid Dynamics*, edit by Raad, Huang, and Tryggvason. FED-Vol. 234, ASME, pp. 141-148 (1995).
M. Taeibi-Rahni, E. Loth, and G. Tryggvason, "Unsteady Forces on Large Spherical and Ellipsoidal Bubbles," in *Gas Liquid Flows*, edited by Rohatgi, O'Hern, Shoukri, and Fukano. FED-Vol. 225, ASME, pp. 9-16 (1995).

D. Juric and G. Tryggvason, "Direct Numerical Simulations of Flows with Phase Change,"

AIAA 96-0857, 34th AIAA Aerospace Sciences Meeting, Reno, NV, Jan. 15-18, 1996.

A. Esmaeeli and G. Tryggvason. "Direct Simulations of Multiphase Flows" in Proceeding of the 8th Workshop on Two-Phase Flow Predictions, M. Sommerfeld, Editor, 1996. Invited lecture, Merseburg, Germany, March 26-29, 1996.

A. Esmaeeli, G. Tryggvason, and V. Arpaci. "Thermal Migration of Bubbles Toward a Fluid Interface." AIChE Symposium Series of the 31st National Heat Transfer Conference, Editor M. El-Genk, Vol. 92, pp. 100-109. AICHE, 1996.

G. Tryggvason and D. Juric, "Boiling and Solidification by a Front Tracking/Finite Difference Method." Invited mini-symposium resentation. SIAM Annual meeting, Kansas City, Missori, July 22-26, 1996.

D. Juric and G. Tryggvason, "Computations of Film Boiling," in *Advances in Numerical Modeling of Free Surface and Interface Fluid Dynamics*, Editors by P. E. Raad, T. T. Huang, and G. Tryggvason, FED-Vol. 238, pp 341-347. ASME, 1996.

A. Esmaeeli and G. Tryggvason. "Dynamics of Polydispers Bubbly Flows in Periodic Domains." in *Advances in Numerical Modeling of Free Surface and Interface Fluid Dynamics*, Editors by P. E. Raad, T. T. Huang, and G. Tryggvason, FED-Vol. 238, pp 375-383. ASME, 1996.

G. Tryggvason, D. Juric, J. Han, and S.L. Ceccio. "Direct Numerical Simulations in Material Processing," in *Space Processing of Materials*, Narayanan Ramachandran, Editor, Proc. SPIE 2809, 178-184 (1996). Invited participation in a mini-symposium. SPIE meeting Denver Colorado, August 4-9, 1996.

G. Tryggvason, "Direct Simulations of Multiphase Flows: Invited presentation in a symposium on Free Surface/Interface problems at the 19th International Congress of Theoretical and Applied Mechanics. Kyoto, Japan, 25-31 August, 1996.

G. Tryggvason, "Drop deformation and Coalescence in Shear Flows." Invited lecture, EUROMECH Colloquium on Interfacial Instabilities, Paris, France, September 11-13, 1996.

G. Tryggvason, "Restructuring the Mechanical Engineering Curriculum—The Michigan Program." Workshop on the ME curriculum for the next twenty five years, Boston, MA Oct. 7-8, 1996.

The 1996 International Mechanical Engineering Congress & Exposition, Atlanta, Georgia, November 17-22, 1996. Two papers

D. Juric and G. Tryggvason, "Numerical Simulations of Phase Change in Microgravity,"

A. Esmaeeli, G. Tryggvason, and V. Arpaci. "Thermal Migration of Bubbles in Zero Gravity."

49th Meeting of the American Physical Society, Div of Fluid Dynamics, Abstracts in Bull. Amer. Phys. Soc. 41, Syracuse, NY, Nov. 24-26, 1996. Six talks:

M. Saeed and G. Tryggvason. “Numerical Simulations of Finite Reynolds Number

Suspensions."
J. Han and G. Tryggvason. "A Numerical Study of the Secondary Breakup of Liquid Drops.
B. Bunner and G. Tryggvason. "Large Direct Simulations of Multiphase Flows."
A. Esmaeeli and G. Tryggvason. "Deformation Induced Migration of Bubbles in Shear Flows."
J. Che, J. Han, G. Tryggvason, and S.L. Ceccio. "Liquid Metal Drop Impingment
S.O. Unverdi and G. Tryggvason. "Vortex Generation and Mass Transport by Gravity-Capillary Wave."

G. Tryggvason. "Direct Numerical Simulations of Multiphase Flows." Institute for Multiphase Flow Science and Technology. Feb 28-March 1, 1997.

ASME Fluids Engineering Division Summer Meeting, Vancouver, Canada, June 22-26, 1997. Four talks:

B. Bunner and G. Tryggvason. "Simulations of Large Bubble Systems."
J. Che, J. Han, G. Tryggvason, and S.L. Ceccio. "Impingment and Solidification of Liquid Metal Drops."
E. Steinthorsson, K. Ajmani, G. Tryggvason, M. Benjamin. "Numerical Simulations of Multi-Fluid Flow in Fuel Atomizers."
A. Esmaeeli, G, Tryggvason, and V. Arpaci. Thermocapillary migration of bubbles in shear flows

D. M. Tilbury, S. L. Ceccio, and G. Tryggvason. "Restructuring the Undergraduate Curriculum of the Mechanical Engineering and Applied Mechanics Department at The University of Michigan." ASEE Annual meeting, 1997.

G. Tryggvason. "Numerical Studies of the Behavior of Drops in Microgravity." Invited talk. Gordon Research Conference, Henniker, NH, June 29-July 4, 1997.

B. Bunner and G. Tryggvason. "Direct Simulations of Multi-Phase Flow," Proceedings of ISAC' 97 High Performance Computing on Multiphase Flow. Invited talk. Symposium held as a part of the JSME Centennial Grand Congress. Tokyo, Japan, July 17-19, 1997.

50th Meeting of the American Physical Society, Div of Fluid Dynamics, Abstracts in Bull. Amer. Phys. Soc. Nov, 1997. Five talks:

J. Han and G. Tryggvason.
B. Bunner and G. Tryggvason.
J. Che and G. Tryggvason.
M. Saeed and G. Tryggvason.
S. Homma and G. Tryggvason.

G. Tryggvason, B. Bunner, S. Mortazavi, & A. Esmaeeli "Direct Numerical Simulations of Dispersed Multiphase Flows," Proceedings of the 11 Japanese Symposium on CFD. Tokyo, Japan. December, 1997. Invited Opening Lecture.

G, Tryggvason. Direct Numerical Simulations of Multiphase Flows. Plenary lecture at the 13-USNC. Gainesville, FL June 21-26, 1998

Proceedings of the 1998 ASME Fluids Engineering Division Summer Meeting, Washington, D.C., June 21-25, 1998. Five papers:

J. Che, S.L. Ceccio, and G. Tryggvason. "Computations of the Impingement and Solidification of Molten Metal Drops," FEDSM98-5215.

W. Tauber, S.O. Unverdi, and G. Tryggvason. Formation of Drops by Interfacial Shear. FEDSM98-5217.

B. Bunner and G. Tryggvason. "Direct Numerical Simulation of Large Three-Dimensional Bubble Systems." FEDSM98-5214

S. Homma, G. Tryggvason, J. Koga, and S. Matsumoto. "Formation of a Jet in Liquid-Liquid System and Its Breakup into Drops." FEDSM98-5216.

S. Mortazavi and G. Tryggvason. "Numerical Simulations of Drops in Channels." FEDSM98-5218.

G. Tryggvason. Simulation of Boiling. Poster presentation. NASA microgravity conference. August 12-14, 1998, Cleveland, OH.

Dutta, D., Geister, D., Tryggvason, G., "Introducing Hands-On Experiences in Design/Manufacturing Education" Proc of the SME Manufacturing Education for the 21st Century, San Digo, Oct 14-16, 1998, Vol 5, pp. 219-222

51th Meeting of the American Physical Society, Div of Fluid Dynamics, Abstracts in Bull. Amer. Phys. Soc. 43: 2030, Philadelphia, PA, Nov. 22-24, 1998. Five talks:

W. Tauber, S.O. Unverdi, and G. Tryggvason. The Shear Breakup of an immiscible fluid interface.

B. Bunner and G. Tryggvason. "Numerical Simulation of Three-Dimensional Bubbly Flows.

S. Mortazavi, G. Tryggvason and W.J.A. Dahm. A Vortex Method for Simulations of Three-Dimensional Jets.

J. Han and G. Tryggvason. Secondary Breaqkup of Liquid Drops in Axisymmetric Geometry.

S. Homma, G. Tryggvason, J. Koga, and S. Matsumoto. Breakup of Laminar Jet into Drops in Immiscible Liquid-Liquid Systems.

J. Che, S.L. Ceccio, and G. Tryggvason. "Computations of Structures Formed by the Solidification of Impinging Molten Metal Drops," Proc. of the 1999 TMS Annual Meeting, San Diego, California, Feb. 1999.

Tryggvason. Direct Numerical Simulations of Multiphase Flow. American Physical Society Centennial Meeting, Atlanta, GA. March 20-26, 1999. Invited talk in a special session organized by the computational physics division of APS at the APS Centennial meeting in Atlanta

B. Bunner and G. Tryggvason, "A Parallel Front-Tracking Method for the Simulation of Dispersed Multiphase Flows." Proceedings of the Ninth SIAM Conference on Parallel Processing for Scientific Computing, San Antonio, March 1999.

G. Tryggvason. "Direct Numerical Simulations of Dispersed Flow." 9th Workshop on

Two-Phase Flow Predictions, Merseburg , Germany, April 13-16, 1999.

Tryggvason. Invited presentation on Direct Numerical Simulations of Atomization. 12th Annual Conference on Liquid Atomization and Spray Systems, Indianapolis, IN, May 16-19, 1999.

Tryggvason, G. and Bunner, B. (1999). "Direct Numerical Simulation of Many Bubbles." Presented at the 4th International Congress on Industrial and Applied Mathematics, Edinburgh, Scotland, July 1999.

The 3rd ASME/JSME Joint Fluids Engineering Conference, San Francisco, July 18-22, 1999. Four papers

W. Tauber and G. Tryggvason. "FEDSM99-7115: The Shear Breakup of Immiscible Round Jets."

J. Han and G. Tryggvason "FEDSM99-7116: Numerical studies of the secondary breakup of drops."

Iyer, C. O., Bunner, B., Ceccio S. L., and Tryggvason G. "FEDSM99-7295: Capture of a Bubble by a Concentrated Vortex."

S.Homma, J. Koga, S. Matsumotoand G. Tryggvason. "FEDSM99-7114: Solutal-Capillary Motion of a Liquid Jet and Its Breakup Into Drops"

G. Tryggvason. Direct simulations of multiphase flows. Invited talk. Interfaces for the 21 century. Monterey, CA. August 16-18, 1999.

W. Tauber and G. Tryggvason. "Computations of Atomization." Invited presentation at the 8th International Symposium on CFD (ISCFD), September 5-10, 1999, Bremen, Germany. W. Tauber gave the talk and received the best student talk prize.

Chen, S.J., Dahm, W.J.A. & Tryggvason. "Experimental Results on the Coupling Between Fluid Dynamics and Combustion in a Laminar Vortex Ring", AIAA Paper No. 2000-4333, 38th AIAA Aerospace Sciences Meeting, January 10 - 13, 2000, Reno, NV.

G. Tryggvason. Direct Numerical Simulations of Multiphase Flow. 2000 IMuST Annual Meeting. March 12-14, 2000, Santa Barbara, CA.

Göz, M. F., Sommerfeld, M., Bunner, B., and Tryggvason, G. (2000), "Direct numerical simulation of gas bubbles in a liquid — Effects of deformability and bidispersity." Proceedings of the Japanese-German Symposium on Multiphase Flow, Dresden, Germany.

G. Tryggvason & B. Bunner. Direct Numerical Simulations of Multiphase Flow. 11th International Conference on Finite Elements in Flow Problems. May 3, 2000. Austin, Texas

G. Tryggvason and B. Bunner. Direct Numerical Simulations of Multiphase Flows. Plenary lecture Parallel CFD 2000, May 22-25, 2000 in Trondheim, Norway. *In Parallel Computational Fluid Dynamics. Trends and Applications*. Ed. C.B. Jensen et al. pp. 77-84. Elsevier, 2001.

G. Tryggvason. Direct Numerical Simulations of Multiphase Flow. US-Japan Seminar, June 5 – 8, 2000, Santa Barbara, CA

ASME Fluids Engineering Division Summer Meeting, meeting June 11-15, 2000. Boston, MA. Five talks:

J. Han and G. Tryggvason. "FEDSM2000-11137: Energy transfer in the secondary breakup of liquid drops."
M. F. Göz, B. Bunner, M. Sommerfeld, and G. Tryggvason. "FEDSM2000-11151: The unsteady dynamics of two-dimensional bubbles in a regular array."
S. Homma, J. Koga, S. Matsumoto and G. Tryggvason. "FEDSM2000-11278: Pinch-off dynamics of jet breakup in liquid-liquid systems."
Al-Rawahi and G. Tryggvason. "FEDSM2000-11279: A numerical method for flow and solidification."
W.B. Tauber and G. Tryggvason. "FEDSM2000-11280: Primary atomization of a jet."

G. Tryggvason. "Direct Numerical Simulations of Multiphase Flow." IUTAM Symposium on Free Surface Flows at Birmingham, UK, July 10, 2000.

S.-J. Chen, W.J.A. Dahm, and G. Tryggvason. Effects of Heat Release in a Reacting Vortex Ring. 28 International Symposium on Combustion. Edinburgh, Scotland, 30 July-4 August 2000.

G. Tryggvason. Direct Numerical Simulations of Multiphase Flow. Invited Talk. Engineering Foundation Conference on Chemical Reaction Engineering VII: Computational Fluid Dynamics. August 6-11, 2000, Quebec City, Canada.

G. Tryggvson. Talk at the Fifth Microgravity Fluid Physics and Transport Phenomena Conference. August 9-11, 2000, Cleveland, Ohio.

20th International Congress of Theoretical and Applied Mechanics, Chicago, USA 27 August-2 September, 2000. Two talks:

G. Tryggvason and B. Bunner. "Direct numerical simulations of bubbly flows."
W. Tauber and G. Tryggvason. "Numerical Simulations of Primary Atomization."

G. Tryggvason. Workshop on Computing Flexible Internal Boundaries in Finite Reynolds Numbers Flows. Invited Talk. Biomechanics and Numerical Simulations of Venous Flow. Ermenonville castle, France, September 7-8, 2000

G. Tryggvason. "Direct Numerical Simulations of Multiphase Flow." Invited Talk. "10th International Conference on Discrete Simulation of Fluid Dynamics," August 21-25, 2000, Santa Fe, New Mexico.

G. Tryggvason & B. Bunner. "Direct Numerical Simulations of Multiphase Flows." First SIAM Conference on Computational Science and Engineering, Washington, D.C. Sept. 21-23, 2000,

The 53nd Annual Meeting of the American Physical Society's Division of Fluid Dynamics, November 19-21, 2000 in Washington, D.C. Four talks:

Mark Stock, Werner J.A. Dahm, and Gretar Tryggvason. "A Three-Dimensional Vortex Sheet Method for Inviscid Flows."

Gretar Tryggvason and Warren Tauber. "Atomization due to Kelvin-Helmholtz Instability."

Nabeel Al-Rawah and Gretar Tryggvason. "Effect of Melt Flow on Dendritic Solidification."

Jie Zhang, S. George Bankoff, Michael Miksis, and Gretar Tryggvason. "Dynamics of an interface in an inclined channel."

G. Tryggvason. "Direct Numerical Simulations of Multiphase Flow." Invited Talk. Multiphase Flow 2001. Orlando, FL March 14-16, 2001

G. Tryggvason. "Direct numerical simulations of multiphase flow." Plenary Lecture. International Workshop on Computational Methods for Continuum Physics and Their Applications. Nanjing, China, May 21-24, 2001.

G. Tryggvason. "Direct numerical simulations of multiphase flow." Keynote Lecture. ICMF—2001 Fourth International Conference on Multiphase Flow. New Orleance, LA, May 27-June 1, 2001.

ICMF—2001 Fourth International Conference on Multiphase Flow. New Orleance, LA, May 27-June 1, 2001. Five contributed talks:

G. Tryggvason and W. Tauber. "Numerical studies of atomization."

M.F.G. Goz, B. Bunner, M. Sommerfeld and G. Tryggvason, "Direct numerical simulation of bidisperse bubble swarms."

S. Homma, J. Koga, S. Matsumoto and G. Tryggvason. "Dynamics of mass transfer for an axisymmetric drop"

A. Esmaeeli and G. Tryggvason, "Direct numerical simulations of boiling flows."

N. Z. Al-Rawahi and G. Tryggvason, "The effect of fluid flow on dendritic solidification."

A.Fernandez and G. Tryggvason. "Effect of Electrostatic Forces on the Phase Distribution in Droplet Suspension." ASME Fluids Engineering Division Summer Meeting, New Orleance, LA, May 29-June 1, 2001.

G. Tryggvason. "Direct numerical simulations of multiphase flow." Invited Lecture. Direct and Large-Eddy Simulations IV. University of Twente, The Netherlands, July 18-20, 2001. (See also book chapters)

Annual Meeting of the American Physical Society, Division of Fluid Dynamics, Abstracts in Bull. Amer. Phys. Soc. San Diego, CA, Nov. 18-20, 2001. Two talks:

M. Stock, W.J.A. Dahm and G. Tryggvason. "A Three-Dimensional Vortex Sheet Method for Large Eddy Simulations."

A. Fernandez and G. Tryggvason "Direct numerical simulation of the electrostatic forces effect on the droplets distribution in a channel flow."

A. Prosperetti and G. Tryggvason. "Task group on computational physics: Summary and Conclusions." Workshop on Scientific Issues in Multiphase Flows: A Roadmap to the Future. University of Illinois, May 7-9. 2002.

G. Tryggvason. "Microbubble turbulent drag reduction: Effect of bubble size and deformation." Friction Drag Reduction Program. DARPA Principal Investigators' Meeting May 30-31, 2002. Denver, CO.

G. Tryggvason. A. Fernandez, J. Lu, and A. Esmaeeli. "Electrohydrodynamics of Droplet Suspensions by Front Tracking Simulations." SIAM Annual Meeting, July 8-12, 2002, Philadelphia, PA.

G. Tryggvason. "Direct Numerical Simulations of Multiphase Flows." Invited Plenary Lecture: ASME Fluids Engineering Division Summer Meeting July 14-18, 2002, Montreal, Quebec, Canada

FEDSM'02 2002 ASME Fluids Engineering Division Summer Meeting July 14-18, 2002, Montreal, Quebec, Canada. Four papers:

- G. Tryggvason FEDSM2002-31384: "Challenges in direct numerical simulations of multiphase flows."
- J. Lu, A. Fernández, and G. Tryggvason FEDSM2002-31217 "Bubbles in Vortical Flows"
- A. Fernández, J. Lu, A. Esmaeeli, and G. Tryggvason. FEDSM2002-31237: "The effect of electrostatic forces on the distribution of drops in a channel."
- M. F. Gös, B. Bunner, M. Sommerfeld, and G. Tryggvason. FEDSM2002-31395: "Microstructure of a bidisperse swarm of spherical bubbles."

Sixth Microgravity Fluid Physics and Transport Phenomena Conference August 14-16, 2002 Cleveland OH. Two posters:

- G. Tryggvason, A. Fernandez, and A Esmaeeli. "Electrostatic effects on droplet suspensions" (Poster presentation)
- R. L. Vander Wal, J. P. Kizito, G. M. Berger, J. I. D. Alexander, and G. Tryggvason. "Splashing droplets" (Poster presentation)

American Physical Society, Division of Fluid Dynamics 55th Annual Meeting November 24-26, 2002; Austin, Texas. Three talks:

- J. Lu, A. Fernandez, and G. Tryggvason. "Effect of Microbubbles on Vortical Flows"
- G. Tryggvason and A. Fernandez. "Electrohydrodynamic Effects on Droplet Suspensions"
- M. Stock, W.J.A. Dahm and G. Tryggvason. "A Three-Dimensional Vortex Sheet Method for Multiphase Flows"

SIAM Conference on Computational Science and Engineering (CSE03) February 10-13, 2003, San Diego, CA. Two talks:

- G. Tryggvason, A. Esmaeeli, and N. Al-Rawahi. "Direct Numerical Simulations of Complex Multiphase Flows"
- A. Fernandez and G. Tryggvason. "Effects of Electrostatic Forces on the Phase

Distribution in Droplet Suspension. Three-Dimensional Numerical Simulations"

G. Tryggvason. Presentation at a DARPA Contractors meeting March 21-22, 2003, San Diego.

Second M.I.T. Conference on Computational Fluid and Solid Mechanics. Boston, June 17-20, 2003. Two talks:

G. Tryggvason, A. Fernández, and J. Lu. "The effect of electrostatic forces on droplet suspensions"

G. Tryggvason, A. Esmaeeli, and N. Al-Rawahi. "Direct numerical simulations of flows with phase change"

FEDSM'03 4th ASME/JSME Joint Fluids Engineering Conference July 6-11, 2003, Honolulu, Hawaii, Two talks:

A. Fernández, J. Lu, and G. Tryggvason. FEDSM2003-45641: "Bubble effects on wall shear in vortical flows"

A. Esmaeeli and G. Tryggvason. FEDSM2003-45174: "Boiling Flows"

G. Tryggvason. Invited Lecturer. "Computational Techniques for Moving Interfaces." August 23 - 28, 2003, Banff International Research Station. Banff, Canada

G. Tryggvason. Invited Talk. Perspectives on Nonlinear Equations and Optimization—Conference in honor of Homer Walker. WPI. Sept 20, 2003

G. Tryggvason. Invited Lectures. Woudschoten Conference of the Dutch-Flemish Numerical Analysis Communities 1 - 3 October 2003, Zeist. The Netherlands (two lectures).

G. Tryggvason. "ABET's Path to Outcome Assessment." Assessment Conference at the College of the Holy Cross. Nov. 7, 2003. Invited talk originally to be given by President E. A. Parrish of WPI who could not be there.

American Physical Society, Division of Fluid Dynamics 56th Annual Meeting November 23-25, 2003; East Rutherford, New Jersey. Three talks:

J. Lu, A. Fernandez, and G. Tryggvason. "Direct Numerical Simulations of Microbubbles-Induced Drag Reduction"

G. Tryggvason and A. Esmaeeli. "Direct Numerical Simulations of Boiling"

A. Fernandez and G. Tryggvason. "Effects of an electrostatic field on a suspension of drops"

G. Tryggvason. "Educating Mechanical Engineers for the 21st Century." WPI-ASME student section, WPI, February 17, 2004.

G. Tryggvason. Invited Talk. "The Effect of Bubbles on Near-Wall Vortical Flow at a conference on 'Smart Control of Turbulence,'" at the University of Tokyo, Tokyo, Japan, February 28 - March 4, 2004.

G. Tryggvason. "The WPI Global Program," Invited presentation at a symposium on

globalization of engineering education at the ASME International Mechanical Engineering Education Conference, Sheraton Sand Key Resort, Clearwater Beach, FL, March 5-9, 2004:

G. Tryggvason. "Computations of atomization." Invited presentation at a Topical Workshop: Investigating Primary Breakup at the 17th Annual Conference, ILASS - Americas: Institute for Liquid Atomization and Spray Systems, May 16-19, 2004, Arlington, VA

G. Tryggvason. Presentation at the DARPA FDR Program Principal Investigator (PI) Meeting . The Beach Resort, 2600 Sand Dunes Drive, Monterey, CA. May 18-19, 2004.

G. Tryggvason. "Numerical Methods for Multiphase Flows." Invited presentation at a Workshop on "Novel methods for modeling the surface evolution of geomorphic interfaces." MIT, Cambridge MA, May 23-25, 2004.

G. Tryggvason and A. Esmaeeli. "Computations of Boiling Flows." May 31 - June 3, 2004: ICMF-2004: International Conference on Multiphase Flow, Yokohama Pacifico Conference Center, Japan.

N. Al-Rawahi and G. Tryggvason. "Numerical Simulation of the Effect of Convection on Dendritic Solidification," International Conference on Thermal Engineering: Theory and Applications, Paper No. DD2-05, Beirut, Lebanon, May 31- June 4, 2004.

G. Tryggvason and A. Esmaeeli. HT-FED2004-56268: "Computations of Boiling Flows." July 11 - 15, 2004: ASME Heat Transfer/Fluids Engineering Summer Conference, Charlotte, North Carolina, USA, July 11 - 15, 2004

G. Tryggvason. "Direct Numerical Simulations of Complex Flows." Conference on Analysis, Modeling, and Computations of PDE and Multiphase Flows. Honoring J. Glimm's 70th Birthday. SUNY Stony Brook. August 3-5, 2004

G. Tryggvason. "Direct Numerical Simulations of Flows with Phase Change." 6th WCCM (World Congress of Computational Mechanics), Beijing, China September 4 - 10 2004.

G. Tryggvason, J. Lu, S. Biswas, and A. Esmaeeli. "Direct Numerical Simulations of Bubbly Flows." IUTAM Symposium on Computational Approaches to Disperse Multiphase Flow. Chicago, IL, October 4-7, 2004.

American Physical Society, Division of Fluid Dynamics 57th Annual Meeting 2004, November 21-23, Seattle, WA. Two talks:

G. Tryggvason, A. Esmaeeli, S. Biswas. "DNS studies of bubbly flows"
J. Lu, G.Tryggvason. "Direct numerical simulations of drag reduction due to bubble injection into a turbulent channel flow"

G. Tryggvason, A. Esmaeeli, J. Lu, S. Biswas, and S. Homma. Keynote Lecture

"Recent Progress in Computational Studies of Disperse Bubbly Flows." Japan-US Seminar on Two-Phase Flow Dynamics. December 6-11, 2004, Nagahama, Japan

B. Savilonis, H. Johari, G. Tryggvason, D. Olinger, and J. Blandino. "Development of a Unified Thermofluid Curriculum," Proceedings of the 2005 ASEE New England Section Conference, 725-729, April 8-9, 2005.

G. Tryggvason. "Bubble interactions." Keynote Lecture. 43rd European Two-Phase Flow Group Meeting. May 11-13, 2005, Prague, Czech Republic

J. Lu and G. Tryggvason. "DNS of Drag Reduction due to Bubble Injection into Turbulent Flow." 2nd International Symposium on Seawater Drag Reduction. 23-26 May 2005, Busan, Korea.

G. Tryggvason. "Direct Numerical Simulations of Bubbly Flows." Keynote Lecture. Hydrodynamics of Bubbly Flows. Euromech Colloquium and Workshop. June 6-16, 2005. Leiden University, Netherlands.

A. Esmaeeli and G. Tryggvason. Invited talk. Workshop on Multiphase and Reacting Flow Simulations, June 27-28, 2005. Purdue University.

ASME International Mechanical Engineering Congress & Exposition - Orlando, FL, November 15-11, 2005. Two talks:

Tryggvason and A. Fernandez. "Computations of the effect of electric fields on the Motion of Droplets"

G. Tryggvason. "Direct Numerical Simulations of Boiling"

American Physical Society, Division of Fluid Dynamics 58th Annual Meeting (DFD05), Chicago, IL, November 20-22, 2005: Three talks:

J. Lu, S. Biswas, and G. Tryggvason. "Laminar bubbly flow in a vertical channel"

S. Biswas, J. Lu, and G. Tryggvason. "Bubbly wall-layers in a vertical channel"

D. Juric and G. Tryggvason. "Three-dimensional simulation of vapor bubble dynamics in nucleate boiling"

G. Tryggvason. "Computations of the Dynamics of Heterogeneous Continuum Systems," Invited talk at the 18th JSME Computational Mechanics Conference in Tsukuba, Japan. November 20, 2005.

G. Tryggvason. "Educating Engineers for the Challenges of the 21st Century." Invited talk at a joint ASME, EEE and SME meeting at WPI on Feb. 21, 2006

G. Tryggvason. "Direct Numerical Simulations of Multiphase Flows." Invited talk at the Workshop on High end computing for nuclear fission science and engineering. Salt Lake City February 22-23, 2006

P. Quinn, L. Schachterle, G. Tryggvason and R. Vaz. "The WPI Bachelor of Arts degree in 'Liberal and Engineering Studies.'" In *Proceedings of the ASEE New*

England Section 2006 Annual Conference. Worcester, MA, March 17-18, 2006

G. Tryggvason, R. Vaz, P. Davis and N. A. Mello. "Preparing Engineers to Work in a Flat World—The WPI Global Perspective Program." 2006 International Mechanical Engineering Education Conference: Mechanical Engineering Education and Global Industry. Beijing, China, March 31 - April 4, 2006

G. Tryggvason, J. Lu, S. Biswas and A. Esmaeeli. "Studies of Bubbly Channel Flows by Direct Numerical Simulations." Keynote lecture at the Conference on Turbulence and Interactions TI2006, May 29 – June 2, 2006, Porquerolles, France

G. Tryggvason, J. Lu, and S. Biswas, FEDSM2006-98102: "Direct Numerical Simulations of Bubbles in Vertical Channels." 2006 ASME Fluids Engineering Conference. July 17-20, 2006. Miami, Florida

G. Tryggvason. "Studying the dynamics of heterogeneous continuum systems using a Front-Tracking method." Invited talk at Euromech Colloquium 479 Numerical Simulation of Multiphase Flow with Deformable Interfaces. August 14-16th, 2006, The Pier, Scheveningen, The Netherlands

American Physical Society, Division of Fluid Dynamics 59th Annual Meeting (DFD06), Tampa, FL, November 19-21, 2006: Three talks:

J. Lu and G. Tryggvason. "DNS of turbulent bubbly flows in vertical channels"
S. Biswas and G. Tryggvason. "Studies of bubble dispersion"
G. Tryggvason and D. Juric. "Multiscale simulations of nucleate boiling"

G. Tryggvason. A series of four invited "Tutorial Lectures" on "Moving Interface Problems: Methods & Applications." Workshop on Moving Interface Problems and Applications in Fluid Dynamics. Singapore National University. March 12, 2007

G. Tryggvason, J. Lu, and S. Biswas. "DNS of Bubbly Channel Flows." Invited talk at Workshop on Moving Interface Problems and Applications in Fluid Dynamics. Singapore National University, March 13, 2007

G. Tryggvason. "Using DNS to Explore the Dynamics of Heterogeneous Continuum Systems." Invited Talk. Farewell Symposium for Prof.dr.ir. Pieter Wesseling. Delft University of Technology, The Netherlands, June 6, 2007

G. Tryggvason. "Direct Numerical Simulations of Bubbly Channel Flows." Keynote Lecture. IUTAM Symposium on Recent Advances in Multiphase Flows: Numerical and Experimental. Istanbul, Turkey, June 11-14, 2007.

G. Tryggvason. Invited talk. UTRC Workshop on primary atomization. East Hartford CT, June 18, 2007

M. J. Ciaraldi, D. Cyganski, M. A. Demetriou, M. A. Gennert, B. A. Miller, Y. Rong, L. E. Schachterle, K. A. Stafford, and G. Tryggvason. A Robotics Engineering Major. Workshop on Research in Robots for Education Georgia Tech., June 30, 2007.

6th International Conference on Multiphase Flow, ICMF 2007, Leipzig, Germany, July 9 – 13, 2007. Three talks:

D. Juric, S. Shin and G. Tryggvason. "Direct Numerical Simulations of Nucleate Boiling."

J. Lu, S. Biswas and G. Tryggvason. "Direct Numerical Simulations of Bubbly Flows in Vertical Channels."

S. Mortasavi, J. Lu, and G. Tryggvason. "Topology Changes in Front Tracking Simulations of Multiphase Flows."

G. Tryggvason. "Studying the Dynamics of Heterogeneous Continuum Systems Using DNS." Invited talk. NSF Workshop on Cyber-Fluid Dynamics: Frontiers in Research and Education, Arlington, VA, July 19-20, 2007

Y. Rong, G. Tryggvason, R. Vaz, L. Gao, C. Wu, X. Shao. MQP in China: Doing Projects and Beyond. ICEE-2007 Coimbra, Portugal, September 3-7, 2007

G. Tryggvason. "Direct Numerical Simulations of Bubbly Flows." Two invited lectures. September 5-7, 2007. Advanced School on Lagrangian Techniques in Multiphase Flow. Trieste, Italy

G. Tryggvason and J. Li. "Direct Numerical Simulations of Multiphase Flows." Keynote lecture. 10th UK National Heat Transfer Conference, Edinburgh, 10-11 September 2007

G. Tryggvason. "Studying the Dynamics of Heterogeneous Continuum Systems using DNS." Invited lecture. 2007-08 Program on Random Media Opening Workshop, Research Triangle Park, NC, September 23-26, 2007

G. Tryggvason. "Direct Numerical Simulations of Nucleate Boiling." Sandia/NSF Workshop. Albuquerque, NM, October 25 – 26, 2007

G. Tryggvason. Plenary lecture. "Computations of the Dynamics of Heterogeneous Continuum Systems." APCOM'07 in conjunction with EPMESC XI, December 3-6, 2007, Kyoto, Japan.

M. J. Ciaraldi, E. C. Cobb, D. Cyganski, M. Gennert, M. Demetriou, F. Looft, W. R. Michalson, B. Miller, Y. Rong, Professor, L. E. Schachterle, K. Stafford, G. Tryggvason, J. D. Van de Ven. "The New Robotics Engineering BS Program at WPI." *ASEE Annual Conference & Exposition*, Pittsburg, PA, June 22-25, 2008.

G. Tryggvason. Plenary lecture. "Direct Numerical Simulations of Multiphase Flows." ISTP - 19: 19th International Symposium on Transport Phenomena. Reykjavik, Iceland. August 17-20, 2008

G. Tryggvason and J. Lu. "DNS of Bubbly Flows—Recent Progress." US-Japan Seminar on Two-phase Flow Dynamics. Loews Santa Monica Beach Hotel. September 14-18, 2008.

G. Tryggvason, J. Lu, and S. Thomas. IMECE2008-67444 “Direct Numerical Simulations of Nucleate Boiling.” ASME International Mechanical Engineering Congress and Exposition. October 31-November 6, 2008, Boston, MA.

G. Tryggvason, J. Lu, and S. Thomas. "Topological Transitions in Direct Numerical Simulations of Multiphase Flows." American Physical Society, Division of Fluid Dynamics 61th Annual Meeting (DFD08), San Antonio, TX, November 23-25, 2008.

R. Bech, M. DiBlasi, W. R. Michalson, J. Morgan, E. Morrison, D. Praetorius, B. Miller, C. Shaver, C. Randall, J. K. Doyle, M. Gennert, G. Tryggvason, J. D. Van de Ven. Social Networking in the FIRST Robotics Competition Community. Presented at the Northeast Section Conference on April 3-4, 2009, at the University of Bridgeport.

M. Ciaraldi, E. C. Cobb, D. Cyganski, G. Fischer, M. Gennert, M., Demetriou, F. Looft, W. R. Michalson, B. Miller, T. Padir, Y. Rong, K. Stafford, G. Tryggvason, and J. D. Van de Ven. "Robotics Engineering: A New Discipline for a New Century," *ASEE Annual Conference & Exposition,* Austin, TX, June 14-17, 2009.

G. Tryggvason. “DNS of Multiphase Flows Using a Front-Tracking Method.” Invited presentation at an NCAR workshop on Free Boundary Problems, 24 - 25 August 2009, Boulder, Colorado.

G. Tryggvason, S. Thomas, J. Lu and B. Aboulhasanzadeh. "Multiscale Issues in DNS of Multiphase Flows.” American Physical Society, Division of Fluid Dynamics 62th Annual Meeting (DFD09), Minneapolis, Minnesota, November 22-24, 2009.

G. Tryggvason. “New Science: The development of computational fluid dynamics at Los Alamos National Laboratory.” Invited talk at Computational Fluid Dynamics (CFD) Symposium in Honor of Prof. D. Brian Spalding as the Recipient of the 2010 Franklin Medal in Engineering. Villanova University, Villanova, PA, April 28, 2010

G. Tryggvason. “Direct Numerical Simulations of Multiphase Flows.” Invited talk at the 1st Brazilian School on Multiphase Flows. University of São Paulo, São Carlos, Brazil, May 5 - 7, 2010.

G. Tryggvason. “Computing Complex Flows using a Front Tracking Method.” Invited talk at the Workshop on Numerical methods for the solution of PDEs on non-body fitted grids, Maratea, Italy, May 13 - 15. 2010.

7th International Conference on Multiphase Flow, ICMF 2010, Tampa, FL, May 31-June 4, 2010. Two talks & one poster:

G. Tryggvason, S. Thomas, J. Lu, B. Aboulhasanzadeh, and V. Tsengue. “Multiscale Computations of Multiphase Flow.”

S. Homma, M.Y. Yokotsuka, T. Tanaka, J. Koga and G. Tryggvason. “Numerical Simulation of a Compound Droplet by Three–Fluid Front–Tracking Method”

J. Lu and G. Tryggvason. “Progress in DNS of Nucleate Boiling” (poster)

2010 ASEE Annual Conference & Exposition June 20 - 23, 2010, Louisville, KY. Three talks:

R.Beach, M. Gennert, W. Michalson, J. Van de Ven, T. Padir, G. Tryggvason, G. Fischer. AC 2010-615: "Robotics Innovation Competition and Conference (RICC): Building Community Between Academia and Industry through a University level Student Competition."

M. Gennert, F. Looft, G. Tryggvason, T. Padir, L. Schacterle. AC 2010-372: "Robotics Engineering: Assessing an Interdisciplinary Program."

J. Schaufeld, G. Tryggvason, M. Banks. AC 2010-426: "Early Exposure to Engineering Innovation and Entrepreneurship."

SIAM Annual Meeting, July 12-16, Pittsburgh, PA. Two talks:

G. Tryggvason: "Simulations of Complex Flows using a Front Tracking Method"

G. Tryggvason and J. Lu: "Multiscale Issues in DNS of Multiphase Flows"

G. Tryggvason. "Using DNS to examine Complex Flows." Invited opening talk at SFB-TRR 75 Doktorandenkolloquium (TU Darmstadt), Nov. 10-12, 2010, Zollernblick Germany.

G. Tryggvason, S. Thomas, J. Lu and B. Aboulhasanzadeh. "Multiscale Issues in DNS of Multiphase Flows." American Physical Society, Division of Fluid Dynamics 63th Annual Meeting (DFD10), Long Beach CA, November 21-23, 2010.

G. Tryggvason. "DNS of Multiphase Flows: Now What?" Invited talk, NCTS Workshop on Fluid-Structure Interaction Problems." National Tsing-Hua University, Hsinchu, Taiwan, May 26-29, 2011.

G. Tryggvason, "Bubbles in turbulent channel flows. " Complex Fluids and Flows in Industry and Nature. Vancouver, BC, Canada, July 13-16, 2011.

ICIAM 2011: Vancouver, BC, Canada, July 18 – 22, 2011: Two talks:

G. Tryggvason, B. Aboulhasanzadeh & J. Lu. Multiscale Modeling in DNS of Multiphase Flows

G. Tryggvason & J. Lu. Direct Numerical Simulations of Multiphase Flows: Challenges and Opportunities

ASME-JSME-KSME Joint Fluids Engineering Conference 2011, Hamamatsu, Shizuoka, Japan, July 24-29, 2011. Three papers:

AJK2011-04004: (Keynote): B. Aboulhasanzadeh, S. Thomas, J. Lu, G. Tryggvason. Multiscale Issues in DNS of Multiphase Flows

AJK2011-17001: A. Nemabakhsh, D. Olinger, I. Hussein, G. Tryggvason. Computational Modeling of Future Wind Power Installationss.

AJK2011-04011: T. V. Vu, H. Takakura, J. C. Wells, S. Homma, G. Tryggvason. Numerical Simulation of the Formation and Breakup of a Compound Jet by Front Tracking/Finite Difference Method.

G. Tryggvason. Specific ITM results: DNS of Multiphase Flows. 1st Annual CASL Round Table Meeting. North Carolina State University, Raleigh, NC August 9-11, 2011

G. Tryggvason and J. Lu. DNS for Multiphase Flow Model Generation and Validation. NURETH-14: The 14th International Topical Meeting on Nuclear Reactor Thermalhydraulics. Toronto. September 25-30, 2011.

64th Meeting of the American Physical Society, Div of Fluid Dynamics, Baltimore, MD, Nov. 20-22, 2011. Four talks:

- G. Tryggvason. DNS And Multi-Scale Modeling Of Multi-Phase Flows. Invited Talk
- S. Dabiri, J. Lu, G. Tryggvason. Effect of Bubble Deformability in Multiphase Turbulent Channel Flows
- J. Lu, G. Tryggvason. Bubble Interaction in Multiphase Turbulent Channel Flows
- B. Aboulhasanzadeh, G.Tryggvason. A Multiscale Approach to Compute Mass Transfer in Bubbly Flows

G. Tryggvason. Multiscale Issues in DNS of Multiphase Flows. Invited Talk. International Conference on Mathematical Modeling in Industry. November 30th – December 2nd, 2011. University of Sao Paulo

50th AIAA Aerospace Sciences Meeting including the New Horizons Forum and Aerospace Exposition 09 - 12 January 2012, Nashville, Tennessee. Two papers:

- AIAA 2012-0373: A. Nematbakhsh, D.J. Olinger, and G. Tryggvason. Development and validation of a computational model for floating wind turbine platforms
- AIAA 2012-0375: D.J. Olinger, E. DeStefano, E. Murphy, S.K. Naqvi, and G. Tryggvason. Scale-model experiments on floating wind turbine platforms

G. Tryggvason. Multiscale Simulations of Multiphase Flows (Featured Poster Presentation). NSF 2012 CBET Grantees Conference. June 6-8, Baltimore, MD

G. Tryggvason, S. Dabiri, B. Aboulhasanzadeh and J. Lu. Multiscale Issues in DNS of Multiphase Flows. 2012 Japan-U.S. seminar on Two-Phase flow Dynamics June 7-12, 2012, Tokyo, Japan

International Conference on Numerical Methods in Multiphase Flow, The Pennsylvania State University, June 12-14, 2012. Two talks and one poster:

- S. Dabiri and G. Tryggvason. Collective Motion of Bubbles Near Vertical Walls (talk)
- B. Aboulhasanzadeh and G.Tryggvason. Study of Mass Transfer in Bubbly Flows Using a Multiscale Approach (talk)
- T. Vu, J. Wells, H. Takakura, S. Homma, and G.Tryggvason. Computations of Breakup Modes of a Compound Jet in a Coflowing System by Front Tracking Method (poster)

2012 Joint Conference of the Engineering Mechanics Institute and 11th ASCE Joint Specialty Conference on Probabilistic Mechanics and Structural Reliability (EMI/PMC 2012). University of Notre Dame, June 17-20, 2012. Two talks:

- B. Aboulhasanzadeh and G. Tryggvason. Study of mass transfer in bubbly flows

using a multiscale approach.
S. Dabiri, J. Lu and G. Tryggvason. Effect of bubble deformability on the turbulent bubbly channel flow

ASME Fluids Engineering Summer Meeting FEDSM2012 July 8-12, 2012, Puerto Rico. Two papers and one plenary talk:

G. Tryggvason, Multiscale Issues in DNS of Multiphase Flows. Invited Plenary Talk.
G. Tryggvason, S. Dabiri and J. Lu. FEDSM2012-72111. DNS studies of turbulent bubbly flows in vertical channels.
A. Nematbakhsh, D. J. Olinger and G. Tryggvason. FEDSM2012-72271. A nonlinear computational model for floating wind turbines.

G. Tryggvason. DNS of multiphase flows, Lunch Talk. Two-Phase Flow Workshop, North Carolina State University, Raleigh, NC. July 12-13, 2012.

G. Tryggvason, S. Dabiri, J. Lu, B. Aboulhasanzadeh. Invited Plenary Talk. DNS of Bubbly Flows in Vertical Channels. 7th International Symposium on Multiphase Flow, Heat Mass Transfer and Energy Conversion (ISMF2012), October 26-30, 2012, Xi'an, China

65th Meeting of the American Physical Society, Division of Fluid Dynamics, San Diego, CA, Nov. 18-20, 2012. Three talks:

J. Lu, S. Dabiri, and G. Tryggvason. DNS of Bubbly Flows in Vertical Channels
G. Tryggvason and J. Lu. Computations of Nucleate Boiling
B. Aboulhasanzadeh and G.Tryggvason. Effect of bubble-bubble interaction on mass transfer in bubbly flow using a multi-scale approach

G. Tryggvason and B. Aboulhasanzadeh. Simulating Mass Transfer in Bubbly Flows using a Hybrid DNS/Embedded Analytical Description Approach. 1st International Conference on Frontiers in Computational Physics: Modeling the Earth System. 16 - 20 December 2012, Boulder, CO.

R. Tryggvason. Direct Numerical Simulations of Multiphase Flow. Invited talk. APS March Meeting. Baltimore, MD, March 20, 2013.

G. Tryggvason. Status Report. Workshop on Two Phase Flows. North Carolina State University, May 2, 2013.

G. Tryggvason, B. Aboulhasanzadeh, S. Dabiri, and J. Lu. Multiscale Issues in DNS of Multiphase Flows. The 15th International Topical Meeting on Nuclear Reactor Thermal - Hydraulics, NURETH-15 Pisa, Italy, May 12-17, 2013

Gretar Tryggvason. Multiscale Considerations in DNS of Multiphase Flows. Invited talk FEMTEC 2013. 4th International Congress on Computational Engineering and Sciences Las Vegas, USA, May 19 - 24, 2013

8th International Conference of Multiphase Flow (ICMF), Jeju, Korea, May 26-31, 2013.

Two contributed and one plenary talks:

Gretar Tryggvason. Multiscale Issues in DNS of Multiphase Flows. Plenary Talk.

S. Dabiri and G. Tryggvason. Simulation of rising bubble swarms near vertical walls.

T. V. Vu, G. Tryggvason, J. C. Wells, H. Takakura. Three-phase Computations of Solidification with Volume Change.

M. A. Gennert and G. Tryggvason. Educating the Global Robotics Engineer. ASEE International Forum, Atlanta, GA, June 22, 2013.

ASME Fluids Engineering Summer Meeting FEDSM2013 July 7-11, 2013, Incline Village, NV. Three papers:

S. Dabiri and G. Tryggvason: FEDSM2013-16217: Turbulent bubbly channel flow and its effect on heat transfer

B. Aboulhasanzadeh and G. Tryggvason: FEDSM2013-16315: Capturing subgrid physics in DNS of multiphase flows

A. Nematbakhsh, D. Olinger and G. Tryggvason: FEDSM2013-16494: Nonlinear Simulation of a Spar Buoy Floating Wind Turbine

G. Tryggvason and I. Bolotnov. Role of ITM/DNS in Closure Model Development and Validation. CASL Round Table Virtual Meeting. July 16-18, 2013

66th Meeting of the American Physical Society, Division of Fluid Dynamics, Pittsburgh, Nov. 24-26, 2013. Three talks:

S. Dabiri and G. Tryggvason: Heat transfer in turbulent bubbly flow in channels

G. Tryggvason and J. Lu: Using DNS Data for Modeling of Bubbly Flows

B. Aboulhasanzadeh, S. Dabiri and G. Tryggvason: Multiscale computations of thin films between colliding drops

G. Tryggavson. DNS of Multiphase Flows: What Now? Keynote lecture. The 52nd European Two-Phase Flow Group Meeting (ETPFGM2014). Dresden, Germany, May 7-9, 2014.

G. Tryggvason. Multiscale Considerations in DNS Studies of Multiphase Flows. Keynote Lecture. 22nd Annual Conference of the CFD Society of Canada. University of Toronto, June 1-4, 2014.

Y. Rong, D. Wu, H. Zhao, X. Li, B. Goodwine and G. Tryggvanson. Global Capstone Design Experience in Engineering Education. Joint International Conference on Engineering Education & International Conference on Information Technology (ICEE/ICIT 2014). Riga, Latvia, June 2-6, 2014.

G. Tryggvason, J. Lu, M. Ma, B. Aboulhasanzadeh. Direct Numerical Simulations of Bubbly Multiphase Flows. Invited mini-symposium talk. National Congress on Theoretical and Applied Mechanics, MSU, East Lansing, MI, June 15-20.

G. Tryggvason. Multiscale Aspects of Direct Numerical Simulations of Bubbly Flows. Invited speaker. The Geoff Hewitt Celebration Conference, Imperial College, London,

UK, July 23-25, 2014.

ASME Fluids Engineering Summer Meeting FEDSM2014. Chicago, IL, August 3-7, 2014. Three papers:

A. M. Nejad, D. J. Olinger and G. Tryggvason. FEDSM2014-21168: Numerical Modeling of Kites for Power Generation.

G. Tryggvason and J. Lu. FEDSM2014-21602: The Transient Evolution of Bubbles in Turbulent Channel Flows.

T. V. Vu, G. Tryggvason, S. Homma, J. C. Wells and H. Takakura. FEDSM2014-21899: Numerical Investigations of Drop Solidification by a Front-Tracking Method.

67th Meeting of the American Physical Society, Division of Fluid Dynamics, San Francisco, CA, Nov. 23-25, 2014. Four talks:

J. Lu and G. Tryggvason. Bubble coalescence in channels flows

B. Aboulhasanzadeh, S. Dabiri and G. Tryggvason. Multiscale computations of thin films between colliding drops

S. Piedra, J. Lu, E. Ramos and G. Tryggvason. Numerical study of heat transfer in bubbly flows in channels

M. Ma, J. Lu and G. Tryggvason. DNS and modeling of bubbly flows in vertical channels

G. Tryggvason. Direct numerical simulations of flows with phase change. Invited talk. IUTAM Symposium on Multiphase Flows with Phase Change: Challenges and Opportunities, December 8-11, 2014, Hyderabad, India.

International Symposium on Computational Multiphase Flow. January 14, 2015 Kyoto, Japan. G. Tryggvason, two invited presentations:

DNS of Multiphase Flows: From Pretty Pictures to Precise Predictions

Introduction to PARIS; open-source PArallel Robust Interface Simulator

G. Tryggvason. DNS of Bubbly Flows: Multiscale Issues. Keynote Lecture. IUTAM Symposium on Bubbly Flows, Oaxaca, Mexico, March 9-12, 2015.

G. Tryggvason. Direct Numerical Simulations of Multiphase Flow: Now What? Invited talk. Featured Minisymposium: Modeling and Computing Complex Flows. SIAM Conference on Computational Science and Engineering. Salt Lake City, March 14-18, 2015.

G. Tryggvason. Direct Numerical Simulations of Bubbly Multiphase Flows. Keynote Lecture. US-Japan Seminar on Two-Phase Flow Dynamics, 2015 US-Japan Seminar on Two-Phase Flow Dynamics, Purdue University, West Lafayette, IN, May 10-15, 2015.

G. Tryggvason. DNS Studies of Multiphase Flows. Keynote Lecture. CHT-15, The 6th International Symposium on Advances in Computational Heat Transfer. Rutgers University, Piscataway, May 26-29, 2015

G. Tryggvason, M. Ma and J. Lu. DNS and Modeling of Gas-Liquid Multiphase. 2nd Frontiers in Computational Physics Conference, ETH, Zurich, Switzerland, June 3-5,

2015.

G. Tryggvason, M. Ma and J. Lu. DNS Assisted Modeling of Bubbly Flows in Vertical Channels. 2015 NETL Workshop on Multiphase Flow Science. Lakeview Resort, Morgantown, WV, August 12, 2015.

G. Tryggvason, M. Ma and J. Lu. DNS Assisted Modeling of Bubbly Flows in Vertical Channels. Keynote Lecture. NURETH-16: 16th International Topical Meeting on Nuclear Reactor Thermal Hydraulics, Chicago, IL, August 30-September 4, 2015.

G. Tryggvason. DNS of Gas-Liquid Flows in Vertical Channels. Invited Talk. SPP 1506 Transport Processes at Fluidic Interfaces, Darmstadt, Germany, SPP 1506 Transport Processes at Fluidic Interfaces. October 5-7, 2015

68th Meeting of the American Physical Society, Division of Fluid Dynamics, Boston, MA, Nov. 22-24, 2015. Five talks:

A. Ghasemi, D. Olinger, and G. Tryggvason. Numerical Simulation of Tethered Underwater Kites for Power Generation

J. Lu, and G. Tryggvason. Simulations of Coalescence and Breakup of Interfaces Using a 3D Front-tracking Method

S. Zaleski, D. Fuster, T. A. Arrufat, Y. Ling, M. Cenni, R. Scardovelli, and G. Tryggvason. Realistic simulations of coaxial atomisation

Y. Ling, S. Zaleski, G. Tryggvason, D. Fuster, R. Scardovelli, M. Cenni, and T. Arrufat. DNS of coflowing planar jet atomization: can one reach convergence?

M. Ma, J. Lu, and G. Tryggvason. Using DNS and Statistical Learning to Model Bubbly Channel Flow

ICMF-2016 – 9th International Conference on Multiphase Flow. Firenze, Italy, May 22-27, 2016. Three Talks:

G. Tryggvason, J. Lu and M. Ma. DNS Assisted Modeling of Bubbly Flows.

M. Muradoglu and G. Tryggvason. Surfactant Induced Migration of Bubbles and Drops in a Shear Flow

Y. Ling, D. Fuster, G. Tryggvason, and S. Zaleski. A numerical Close-Up on the Spray Formation from a Gas-Liquid Mixing Layer

G. Tryggvason. Numerical Simulations of Complex Multiphase Flows. International Workshop on Fluid-Structure Interaction Problems. Invited Talk. National University of Singapore, 30 May - 3 June, 2016

G. Tryggvason. Direct Numerical Simulations of Complex Multiphase Flows. Invited Talk. BIRS-EPIC Workshop: Enabling Process Innovation through Computations. Banff, Canada, August 8-12, 2016.

G. Tryggvason. DNS Supporting THM Model Development. CASL Thermal Hydraulics Methods Virtual Workshop. September 19-20, 2016.

G. Tryggvason. Challenges and opportunities in fully resolved simulations of multi fluid flows. Center for Compressible Multi-Phase Turbulence-Multiphase Physics Deep-Dive.

St. Petersburg Marriott Clearwater, FL, October 6-7, 2016.

69th Meeting of the American Physical Society, Division of Fluid Dynamics, Portland, OR, Nov. 20-22, 2016. Two talks:

J. Lu and G. Tryggvason. Direct Numerical Simulation of Insoluble Surfactant Effect on Turbulent Channel Bubbly Flows

G. Tryggvason, M. Ma, and J. Lu. DNS assisted modeling of bubbly flows in vertical channels

G. Tryggvason. DNS of Complex Multiphase Flows. Invited Talk. Gordon Research Conference. Galveston, TX, January 8-12, 2017.

B. Magolan, E. Baglietto, C. Brown, I.A. Bolotnov, G. Tryggvason, and J. Lu. Multiphase Turbulence Mechanisms Identification from Consistent Analysis of Direct Numerical Simulation Data. M&C 2017 - International Conference on Mathematics & Computational Methods Applied to Nuclear Science & Engineering, Jeju, Korea, April 16-20, 2017.

G. Tryggvason and J. Lu. DNS Supporting THM Model Development. CASL Thermal Hydraulics Methods Virtual Workshop. June 6-7, 2017.

G. Tryggvason, J. Lu and M. Ma. Direct Numerical Simulations of Bubbly Flows. Japan-US Seminar on Two-Phase Flow Dynamics, Hokkaido University, Sapporo, Hokkaido, Japan, June 22-24, 2017.

G. Tryggvason. Direct Numerical Simulations of Gas-Liquid Flows. JSMF Lecture Course on Multiphase Flow Modeling and Simulation. The University of Tokyo, Institute of Industrial Science, (Komaba-II Campus). June 26, 2017.

G. Tryggvason and J. Lu. DNS studies of the effect of surfactants and coalescence on bubbly upflows in vertical channels. The 3rd International Conference on Numerical Methods in Multiphase Flows. ICNMMF-III. June 26-29 2017, Tokyo, Japan

H. Xia, J. Lu, S. Dabiri and G. Tryggvason. Fully Resolved Numerical Simulations of Fused Deposition Modeling. 14th U.S. National Congress on Computational Mechanics (USNCCM14), Montréal, Canada, July 17-20, 2017.

Other writings

G. Tryggvason, "Numerical Experiments on Slumping Gravity Currents." Woods Hole Oceanographic Institution, Tech. Rep. WHOI-83-41, 207-228 (1983).

G. Tryggvason. "Imbedded Interface Methods." Lecture notes for a short course on Modeling and Computation of Multiphase Flow, Zurich, since 1999. Updated every year.

G. Tryggvason and D. Apelian. "Re-Engineering Engineering Education for the Challenges of the 21st Century." Commentary in JOM: The Member Journal of TMS, October 2006. Reprinted in IEEE Engineering Management Review, 37(1), 2009, 38-43. Also translated into Chinese (China University Teaching, 12 (2008), 84-86.)

M. A. Gennert and G. Tryggvason. “Robotics Engineering: A discipline whose time has come.” IEEE Robotics and Automation Magazine, 16, (2009), 18-20.

Invited Seminars

Woods Hole Oceanographic Institute, 1983.
Brown University, Division of Engineering, 1983.
Los Alamos National Laboratory, 1984.
University of Wyoming, Department of Mathematics, 1984.
Yale University, Division of Mechanical Engineering, 1984.
Courant Institute of Mathematical Sciences, 1984.
Exxon Research and Engineering Company, Annandale, New Jersey, 1984.
University of Houston, Department of Mechanical Engineering, 1985.
Florida State University, Department of Mathematics, 1985.
University of Michigan, Department of Mech Eng & Appl Mech, 1985.
Lawrence Livermore National Laboratory, 1986
University of California, San Diego, Department of Mechanical Engineering, 1986
Caltech, GALCIT, 1986
University of Michigan, Department of Naval Architecture, 1986
Woods Hole Oceanographic Institute, 1986
Woods Hole Oceanographic Institute, 1988
University of Michigan, Program in Ship Hydrodynamics, 1988
Naval Research Laboratory, 1989
University of Michigan, Department of Aerospace Engineering
Minnesota Supercomputer Center, 4/03/91
NASA Lewis Research Center, ICOMP, 5/17/91
University of Iceland, Mathematics Department, 9/19/91
RPI, Department of Mechanical Engineering, 9/27/91
NASA Lewis Research Center 8/11/93.
University of Illinois 9/16/93.
University of California, Davis 2/17/94
Livermore National Laboratory 2/18/94
University of California, Irvine 3/11/94
University of California, San Diego 4/14/94
California Institute of Technology 4/08/94
University of California, Berkeley 5/05/94
Los Alamos National Laboratory 7/28/94
Univ. of Michigan, LaSC Seminar 10/20/95
University of Minnesota 1/13/95
John Hopkins 12/14/95
University of Michigan, Nuclear Engineering, 2/16/96
Tokyo University 8/21/96
Georgia Tech. (new ME curriculum) 12/16/96
Reactor Thermal Hydraulics section, CAE, Grenoble, France.
Series of three lectures, Jan. 21-23, 1997.
IUSTI, University of Provance, Marseille, France, 1/27/97
UCSB, Chemical Engineering. 11/21/97
University of Arizona, 1/29/98

NASA Lewis Research Center, 3/10/98
University of Massachusetts, Amherst (ABET Preparation) 1/21/99
Rutgers University, 2/12/99
UCSD, 1/14/00
John Hopkins, 2/17/00
WPI (Mechanical Engineering) 5/31/00
WPI (Mathematics) 9/15/00
Los Alamos 10/5/00
Brown University (Applied Math) 02/27/01
Princeton University (Chemical Engineering) 02/06/02
Clark University (Physics) 09/26/02
Yale University (Mechanical Engineering) 11/13/02
University of Alberta (Chemical Engineering) 3/01/03
University of Florida (Mechanical and Aerospace Engineering) 3/11/03
RPI (Mathematics) 3/18/03
ETH Zurich, 3/28/03
Knolls Atomic Power Laboratory/GE 8/12/03
University of Delaware (Mechanical Engineering) 10/31/03
SUNY, Stony Brook (Applied Mathematics) 12/3/03
Ritsumeikan University (Civil Engineering), Japan, 12/10/04
Louisiana State University (Mechanical Engineering) 3/4/05
University of Notre Dame (Edison Lecture, Aerospace and Mechanical Engineering) 11/20/05
University of Maryland, College Park ("Leaders of Mechanical Engineering" seminar series, 2/10/06
University of Illinois, Urbana-Champaign (Mechanical Engineering) 5/15/06
University of Massachusetts (Mathematics) 9/26/06
University of Massachusetts (Chemical Engineering) 10/24/06
RPI (Mechanical Engineering) 12/6/06
Institute for High Performance Computing, Singapore 3/15/07
Stanford University, Fluid Mechanics Seminar 4/10/07
Centrum voor Wiskunde en Informatica, Amsterdam. 6/7/07
Brookhaven National Laboratory 10/31/07
SUNY, Stony Brook (Applied Mathematics) 11/1/07
HUST, Wuhan, China. 12/10/07: Educating Engineers for the New Century—Challenges and Opportunities.
University of Iceland, Iceland. 3/6/08: Educating Engineers for the New Century—Challenges and Opportunities.
CUNY, Levich Institute, 9/23/08
New Jersey Institute of Technology (Applied Math), 10/10/08
University of Notre Dame (Aerospace and Mechanical Engineering) 1/29/09
MIT (Nuclear/Mechanical Engineering) 3/19/09
Natik Labs, Sigma Xi lecture: Musings on Energy 4/30/09
Boston University (Mechanical Engineering) 9/11/09
University of Connecticut (Mechanical Engineering) 1/22/10
Purdue University (Computational and Applied Mathematics) 9/24/10
Notre Dame (Appl. and Comput. Math. and Statistics Colloquium) 10/4/10
University of Illinois, Urbana-Champaign (Mechanical Engineering) 1/23/12

Purdue University (PRISM Center) 2/3/12
KAUST, Saudi Arabia, 2/19/12
University of Wisconsin (Lindberg Lecture) 3/1/12
University of Michigan (Mechanical Engineering), 3/20/12
Caltech (Mechanical Engineering), 5/10/12
Peking University (Laboratory for Turbulence & Complex Systems), 9/20/12
Rutgers University (R. Pelz Memorial Lecture, Mechanical Engineering) 1/30/13
Sultan Qaboos University, Oman (one lecture on research; another on education) 2/17/13 and 2/18/13
George Washington University (Mechanical Engineering), 5/6/13
University of Louisville (Mechanical Engineering), 10/11/13
University of Kansas (Aerospace Engineering), 10/28/13
CAE, Saclay, France, 11/3/14
University of Paris VI (Institute for Scientific Computing and Simulation), France, 06/09/15
Argonne National Laboratory, 06/18/15
New Jersey Institute of Technology (Applied Math), 09/11/15
South University of Science and Technology China, Shenzhen, China, SUSTC Lecture Series, 02/22/16
University of California Davis, Dept. of Aerospace and Mechanical Engineering. 03/10/16
CEA—Centre de Saclay, France 6/20/16
Université catholique de Louvain, Belgium, 6/23/16
University of Cyprus, Computational Sciences Laboratory, 2/13/2017
Imperial College London, Department of Chemical Engineering, 2/21/2017
University of Florida, Department of Mechanical and Aerospace Engineering 3/23/2017
University of Washington, Department of Aeronautics & Astronautics. Chair's Distinguished Seminar Series. 5/8/2017

Other Presentations (partial list)

Special Presentation in ETR 592: New Venture Management and Entrepreneurship: "Entrepreneurial Opportunities in Robotics and the Robotics Engineering Major at WPI." September 23, 2009

Dinner Speaker. Raytheon/WPI Systems Engineering Masters Degree Graduation Dinner: "Educating Engineers for the 21st Century." 5/7/09

A WPI/General Dynamics Systems Planning Discussion: "Educating Engineers for the New Century—Challenges and Opportunities." 5/21/09

Presentation to teachers attending a Project Lead The Way Summer Training Institute at WPI. 7/20/09.

New Challenges: Transforming Engineering Education. Invited presentation at the Cal Poly College of Engineering Dean's Advisory Council Meeting, San Luis Obispo, May 7, 2012

Musings on Engineering Education. North America Region CDIO Meeting. University of Notre Dame. November 14-15, 2012

Articles About my Work

Paul Tooby. "Dancing Bubbles, Simulating Multiphase Flow." Envision (the NPACI magazine) Vol. 16 (4), Oct.-Dec. 2000.

Research Grants and Contracts

Institutional Funds:

Numerical Simulations of Instabilities of Fluid Interfaces. Rackham Faculty Grant from the University of Michigan, 1986. $10,000. Duration 1 year.

Computations of Multi-Phase Flows. Phoenix Memorial Foundation at the University of Michigan. $5,000 for summer 1990.

Research maintenance funds from the University of Michigan. $10,000 for summer 1990 and $5,000 for fall 1993.

External Funds:

Numerical Simulations of Instabilities of Fluid Interfaces. National Science Foundation Engineering Initiation Award, MSM-8707646. $60,000. Duration 9/1/87 - 2/28/89.

Program in Ship Hydrodynamics. Office of Naval Research (under the URI program, contract N000184-86-K-0684. P.I.: R. Beck). My part was $263,908. Duration: 9/1/86 - 8/31/91.

A Basic Research Model of Gas Combustion in Turbulent Flow, Phase I. Gas Research Institute Contract No. 5088-260-1692. $246,000. Duration: 6/1/88 - 7/31/90. Co-Principal Investigator with W.J.A. Dahm and R. Krasny.

A Basic Research Model of Gas Combustion in Turbulent Flow, Phase II. Gas Research Institute. $392,112. Duration: 8/1/90 - 7/31/93. (Renewal of Phase I). Co-Principal Investigator with W.J.A. Dahm and R. Krasny.

Studies of Bubbly Flows. Office of Naval Research, contract N00014-91-J-1084. $255,960. Duration: 10/1/90 - 9/30/93.

Numerical Studies of Multi-fluid Systems. National Science Foundation, grant CTS-913214. $193,166. Duration: 5/1/91 - 4/30/94.

A Basic Research Model of Gas Combustion in Turbulent Flow, Phase IIb. Gas Research Institute. $68,816. Duration: 9/1/93 - 8/41/95. (Continuation of Phase II). Co-Principal Investigator with W.J.A. Dahm.

Computational Studies of Drop Collision and Coalesence. National Aeronautics and Space Administration, contract NAG3-1317. $253,090. Duration: 1/1/92 - 6/1/96. (With D. Jacqmin at NASA Lewis Research Center).

Fellowship for Damir Juric. National Aeronautics and Space Administration, contract NGT-51070. $66,000. Duration: 7/1/93 - 6/30/96

Fundamentals of Mold-Free Casting: Experimental and Computational Studies. National Aeronautics and Space Administration, $100,000 for 7/11/94-1/10/96. (Co-PI with S. Ceccio).

A Hierarchi of Reduced Models for Underhood Flows. Ford Motor Company. $51,514. Duration: 6/1/95-5/31/96. (Co-PI with K. Powell).

Ocean Surface Processes. Office of Naval Research (under the URI program. P.I.:J. Vaseki and G. Medows). My part was about $220,000. Duration: 1/5/92 - 6/30/97.

Direct Numerical Studies of Multi-Phase Flows. National Science Foundation. CTC-9503208: $240,000. Duration: 8/1/95-7/31/98.

Computational Investigations of Atomization. Air Force Office of Scientific Research. FA9620-96-1-0356: $257,061. Duration: 7/1/96-6/31/99.

Liquid Droplet Deposition Manufacturing. Graduate student support grant for Hwei N. Che. National Aeronautics and Space Administration, contract NGT3-52319. $66,000. Duration: 8/15/96 - 8/14/99. (Co-PI with S.L. Ceccio.)

Flame Structure Measurements and Modeling: Developing Tools from Basic Research to Meet Gas Industry Needs. Gas Research Institute. $780,138 (most of which went to Dahm and Driscoll for experimental work). Duration: 1/1/97 - 12/31/99. Co-Principal Investigator with W.J.A. Dahm and J. Driscoll.

Advanced Modeling of Multiphase Flow Problems. Chevron Petroleum and Technology Company. Phase 1. $99,814.00. Duration: 12/14/98-1/31/2000. Co-PI with W.J.A. Dahm.

Computational Investigations of Atomization. Air Force Office of Scientific Research. F49620-99-1-0314. $50,000

Computations of Droplet/Flow Interactions in Sprays. Air Force Office of Scientific Research -AASERT grant. $124,216. Duration: 9/1/97-8/31/00.

U.S. Germany Cooperative Research: Analysis and Modeling of Turbulence Phenomena in Bubble Columns. National Science Foundation Grant INT-9726759. $24,460. Duration 3/15/98-2/29/00

Advanced Modeling of Multiphase Flow Problems. Chevron Petroleum and Technology Company. Phase 2. $49,791. Duration: 2/1/2000-7/31/2000. (Co-PI with W.J.A. Dahm.)

Advanced Modeling of Multiphase Flow Problems Phase III. Chevron. $65,004. Duration: 01/01/01 - 12/31/01. (Co-PI with W.J.A. Dahm.)

NAG3-2162 and NAG3-2583: Computations of Boiling in Microgravity. National Aeronautics and Space Administration. $356,000. Duration: 2/10/98-2/9/02.

NAG3-2332 and NAG3-2545: Computational modeling of the effect of secondary forces on the phase distribution in dispersed multiphase channel flow. National Aeronautics and Space Administration. Originally awarded to University of Michigan at $360,000 for 5/1/00-11/30/03 (NAG3-2332). When I moved to WPI the remaining funds were awarded to WPI at $290,000 for 2/7/01-2/6/04 (NAG3-2545).

Micro-bubble and Micro-bubble/Polymer Turbulent Drag Reduction. DARPA BAA 00-38. P.I. M. Maxey, Brown University. Tryggvason is Co-Investigator. The WPI part was $157,337 for 15 months.

Micro-bubble and Micro-bubble/Polymer Turbulent Drag Reduction Phase II. DARPA BAA 00-38. P.I. M. Maxey, Brown University. Tryggvason is Co-Investigator. The WPI part was $100,000 for 7/1/02-9/1/03.

Computations of Spray Cooling. Parker Hannifin Corporation, Co-PI (PI.: A. Esmaeeli). $15,000.

Advanced Modeling of Multiphase Flow Problems Phase IIIb. Chevron. $71,235. Duration: 01/01/02 - 12/31/02. (Co-PI with W.J.A. Dahm.)

NAG3-2535: Splatting drops. NASA. PI.: R. Vander Wal, NASA Glen Research Center. Tryggvason is Co-Investigator. The WPI part was $44,000 for 3/1/00-11/30/03.

DE-FG02-03ER46083: Investigations of Bubbly Flows using Direct Numerical Simulations. Department of Energy. $380,756 for 9/1/03-2/28/07 (no cost extension to 12/31/07).

Multiscale Physical Modeling for Microbubble Drag Reduction at High Reynolds Numbers DARPA Subcontract to the Pennsylvania State University, PI.: R. Kunz). The WPI part was $158,246 for 11/03/03-12/31/04.

NNC04GA75G: Droplets Impacting upon Liquid Films: A study of Coalescence, Jetting, Bubble Entrapment and Splashing. NASA. Co-Investigator (PI.: R. Vander Wal at NASA). The WPI part was $82,163 for 1/29/2004-11/30/2007.

NNC05GA26G: Studies of Forced Convection Boiling by Direct Numerical Simulations. NASA. $241,992 for 03/22/05-9/30/06 (no cost extension to 6/30/07).

CTS-0522581: Multiscale simulations of multiphase systems. National Science Foundation. $40,000 for 09/01/05-08/31/06.

Development of 1st generation subscale models/correlations for the adapted S-gamma model. AREVA, Inc. $52,942. 07/01/06-12/31/06.

Direct Numerical Simulations of Nucleate Flow Boiling. Contract 619042, Sandia National Laboratory (NSF-Sandia collaborative program). $320,000. 10/1/06-09/31/09.

CBET-0853579: An Integrated Study of Floating Wind Turbines. National Science Foundation, $299,991. for 07/01/09-06/30/12. PI.: D. Olinger, Co-PI.: G. Tryggvason.

CBET- 0853396: Collaborative Research: Fuel Droplet Disruption under Locally Supersonic Conditions. National Science Foundation, $50,000. 09/01/09-08/31/10.

Modeling of flow in a nozzle. Cymer, Inc. $15,000 for July 2010.

CBET – 1033478: Multiscale simulations of multiphase systems. National Science Foundation. $300,000 for 7/15/10-6/30/13. Transferred to University of Notre Dame as CBET – 1132410 (no-cost extension to 6/30/14).

CBET-1033812: An Integrated Study of Ground Tethered Energy Systems. National Science Foundation. $296,050.00 for 09/01/10-08/31/13. PI.: D. Olinger, Co-PI.: G. Tryggvason and I. Hussein

Consortium for Advanced Simulation of Light Water Reactors—CASL. DOE Nuclear Energy Innovation Hub, lead by ORNL. Approx. dates: 7/1/10-6/30/15. My part is $75,000 per year (plus additional $25,000 for the second and fifth year).

Center for Shock Wave-processing of Advanced Reactive Materials. NNSA's Predictive Science Academic Alliance Program II (PSAAP II) agreement. $10,000,000 for five years. Start date Fall 2013. PI.: S. Paolucci. Tryggvason is one of eight co-investigators and the Associate Director for the Center.

CBET 1336130: Hydrokinetic Energy Harvesting Using Tethered Undersea Kites. National Science Foundation $303,201.00 for 1/1/2014-12/31/2016. PI.: D. Olinger, Tryggvason is a PI on a subcontract to the University of Notre Dame for $35,993.

CBET 1335913: Multiscale Simulations of Multiphase Flows. National Science Foundation $338,679. 00 for 9/1/2013-8/31/2017 (including one year no-cost extension). PI.: G. Tryggvason. Co-PI.: S. Dabiri.

Consortium for Advanced Simulation of Light Water Reactors—CASL. DOE Nuclear Energy Innovation Hub, lead by ORNL. Phase II: Approx. dates: 7/1/15-6/30/20. My part is $100,000 per year.

CBET-1705474: Japan-US.S. Seminar on Two-Phase Flow Dynamics, June 22-24, 2017. National Science Foundation. $15,000 for 7/1/2017-6/30/2018

Direct grants of large amount of computer time from various sources, including the San Diego Supercomputer Center, NPACI (at SDSC, Maui, and U of M.), NASA, and others. Many awards, starting 4/1/86.

Fundraising for educational activities and departmental infrastructure at WPI

WPI Manufacturing Engineering Program — Haas Technical Education Center. $400,000. Lufkin Foundation, 2001. With D. R. Rodino, W.W. Durgin, C. Brown and others.

Planning Revisions in the Mechanical Engineering Program at WPI. National Science Foundation. $99,960 for 09/01/03-08/31/04. PI.: Tryggvason. Co-PIs: C. Brown; A. Hoffman; Z. Hou; D. Olinger.

MEMS Laboratory and graduate fellowship. $400,000. Lufkin Foundation, 2004. With D. R. Rodino, R. J. Pryputniewicz, W.W. Durgin and others.

EEC 0750192: Social Networking in the FIRST Robotics Competition Community. National Science Foundation. $189,500.00 for 10/01/07-9/30/10. PI.: G. Tryggvason. Co-PIs. J. Skorinko, C. Randall, J. Doyle, and M. Gennert.

CNS 0722218: CPATH CB: Building Community via Robotics Innovations Competition and Conference. National Science Foundation. $359,761.00 for 07/15/07-06/14/10. PI. M. Gennert. Co-PIs.: G. Tryggvason and D. Cyganski.

KEEN Program Development Grant: Developing an Innovation and Entrepreneurial Mindset at WPI. Kern Family Foundation. PIs G. Tryggvason and J.J. Schaufeld. $50,000 for 6/1/08-5/31/10.

In my capacity as a department chair/head I have sometimes served as a “surrogate” PI for grants and contracts, usually because the original PI moved. Those are not included in the above list.

Updated 07/7/2017