

# GIANLUCA PULITI

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## EDUCATION

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August 2006  
to Present

### University of Notre Dame – Notre Dame, Indiana

- *Master of Science* – Mechanical Engineering – GPA 3.97/4.00
- *Philosophiae Doctor* – Aerospace and Mechanical Engineering
  - Expected graduation date: Summer 2012
  - Tentative thesis title: “Properties of Nanofluids”
  - Advisor: Dr. Samuel Paolucci

August 2001  
to May 2006

### Embry-Riddle Aeronautical University (ERAU) – Daytona Beach, Florida

- *Bachelor of Science*, Aerospace Engineering – GPA 3.93/4.00
- *Bachelor of Science*, Engineering Physics (with Minor in Mathematics) – GPA 3.93/4.00

## TEACHING AND RESEARCH INTERESTS

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Continuum Mechanics  
Statistical Thermodynamics  
Statistical Mechanics

Multi-phase mixtures and flows  
Molecular modeling  
Multi-scale computational methods

Aerodynamics  
Fluid Mechanics  
Heat Transfer

## RELEVANT GRADUATE CLASSWORK

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Numerical Methods  
Computational Fluid Dynamics  
Continuum Mechanics  
Nonlinear Dynamical Systems

Statistical Mechanics  
Fluid Dynamics  
Methods of Molecular Modeling  
Hydrodynamic Stability

Viscous Flow Theory  
Heat Transfer  
Mathematical Methods  
Turbulence

## TEACHING EXPERIENCE

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Fall 2006  
to Present

### Teaching Assistant – University of Notre Dame – Notre Dame, Indiana

Evaluated homework, and exams. Created exams, homework problems, and assisted in curriculum development. Led lectures, and held office hours. The most relevant assisted graduate and undergraduate classes were the following:

- Continuum Mechanics, Dr. Samuel Paolucci
- Computational Fluid Dynamics, Dr. Samuel Paolucci
- Molecular Thermodynamics, Dr. Samuel Paolucci
- Compressible Aerodynamics, Dr. Flint Thomas
- Microparticle Dynamics, Dr. Patrick Dunn
- Hydrodynamic Stability, Dr. Thomas Corke
- Space Systems, Dr. Robert Howland
- Introduction to Engineering Computing, Dr. Robert Howland

### Invited Lectures and Seminars

- Methods of Molecular Modeling, invited lecture at Notre Dame, Fall 2010
- General Relativity, invited lecture at the Liceo Scientifico M. Curie (1,000+ students) in Italy

Fall 2002  
to Spring 2006

### Tutoring – Embry-Riddle Aeronautical University – Daytona Beach, Florida

- Tutored mathematics to engineering students

## RESEARCH EXPERIENCE

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August 2006  
to Present

### University of Notre Dame – Notre Dame, Indiana

- Modeled the thermodynamic and transport properties of nanofluids, fine dispersions of nano-sized solid particles in a liquid. Nanofluids belong to a new class of fluids with enhanced thermo-physical properties and heat transfer performance. However, the physical explanation for this enhancement is still lacking. A broad spectrum of applications in science and engineering can potentially benefit from their use. In the aerospace industry, at least NASA and the Lockheed Martin Corporation have shown interest in nanofluids, and sponsored several projects. The potential market for nanofluids in heat transfer applications is estimated to be over 2 billion dollars per year, and likely to grow even further in the next few years. The novelty of this work is in a fundamental, realistic, and comprehensive approach to the problem of understanding thermodynamic and transport properties of nanofluids through the use of molecular dynamics simulations with accurate potentials to model realistic materials.
- Researched, under a grant from the United States Department of Energy, the feasibility of using ionic liquids with a suspension of nanoparticles in an absorption refrigeration cycle and for CO<sub>2</sub> capture, among other geothermal applications.

Summer 2003  
and Summer 2005

- Designed and implemented an educational simulation tool using Simulink to allow undergraduates to have a visual understanding of the physics behind an absorption refrigeration thermodynamic cycle. The simulation is currently open source, and being used worldwide.
- Researched and implemented a model to provide some basic understanding of the dynamics of combustion, through a simplified mathematical representation of the complicated reaction processes.

August 2001  
to May 2006

### Embry-Riddle Aeronautical University – Daytona Beach, Florida

- Led the aerodynamics and aircraft stability team during the senior design project conducted for Gulfstream under a non-disclosure agreement. Worked on the design of the variable sweep wings for the Gulfstream Quiet Supersonic Jet.
- Competed at the Revolutionary Aerospace System Concept Academic Linkage (RASC-AL) contest, organized by NASA and the National Institute of Aerospace, by participating in the design of a vehicle and mission to Saturn's moon, Enceladus. Led the design of the thermal control subsystem, and of electrostatics and momentum exchange tether.
- Designed the wings of a micro air vehicle, and analyzed their aerodynamics, stability, and control.
- Derived a perturbative solution for a massive, static, spherically-symmetric scalar field in general relativity, Einstein-Klein-Gordon equations; presented work at an international APS conference.
- Focused undergraduate coursework on aerodynamics, aircraft stability and control, and system engineering.

## EMPLOYMENT HISTORY

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Fall 2006  
to Present

**Teaching Assistant** – University of Notre Dame, Notre Dame, Indiana

Summer 2003  
and Summer 2005

**Summer Intern** – University of Notre Dame, Notre Dame, Indiana

Fall 2002  
to Spring 2006

**Tutoring** – Embry-Riddle Aeronautical University, Daytona Beach, Florida

Summer 2003  
and Summer 2004

**Study Abroad Coordinator and ERAU Teacher Assistant** – Società Dante Alighieri, Siena, Italy

## AWARDS AND HONORS

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- **Center of Applied Mathematics Graduate Fellowship**, University of Notre Dame, Academic Year 2009-10 and Summer 2008
- Winner of the **2008 AIAA Foundation Graduate Award**, awarded yearly to 4 students worldwide
- **Plaque for outstanding achievements** from the City of Roseto degli Abruzzi, Italy, August 9, 2006
- **Outstanding Academic Achievement and Leadership Award**, awarded yearly to one student, Student Activities, ERAU, Spring 2005
- **Who's Who** Among Students in American Universities and Colleges, 2005
- First recipient of **The Dalal Memorial Scholarship**, ERAU, April 22, 2004
- ERAU **Dean's List** every semester and nominated to the National Dean's List every year
- **Rosa d'Oro** for outstanding achievements, August 2001, Roseto degli Abruzzi, Italy
- **Honor Societies**
  - Sigma Gamma Tau, Aerospace Engineering
  - Sigma Pi Sigma, Physics
  - Tau Beta Pi, Engineering
  - Omicron Delta Kappa, Leadership

## PUBLICATIONS

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1. Puliti, G., Paolucci, S., Sen, M. (2011). Thermodynamics properties of gold-water nanolayer mixtures using molecular dynamics. *Journal of Nanoparticle Research*, 13(9), 4277-4293. doi: 10.1007/s11051-011-0373-4.
2. Puliti, G., Paolucci, S., Sen, M. (2011). Nanofluids and their Properties. *Applied Mechanics Review*. Submitted.
3. Puliti, G., Paolucci, S., Sen, M. (2011). Thermodynamics properties of a gold-water nanofluid using molecular dynamics. In Preparation.
4. Puliti, G., Paolucci, S., Sen, M. (2011). Transport Properties of Nanofluids. In Preparation.

## INVITED TALKS

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5. Puliti, G., Paolucci, S., Sen, M. Transport Properties of Nanofluid. *47th AIAA Aerospace Sciences Meeting*, January 5-8, 2009, Orlando, FL

## CONFERENCE PAPERS AND TECHNICAL TALKS

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6. Puliti, G., Paolucci, S., Powers, J. Analytical and Computational Analysis of the Time Dependent Dynamics of Combustion. *1st Annual MAA Undergraduate Mathematics Conference*, March 27, 2004, Daytona Beach, FL
7. Puliti, G., Vuille, C. Perturbative Solutions of the Einstein Klein-Gordon Equations. *2nd Annual MAA Undergraduate Mathematics Conference*, April 9, 2005, Daytona Beach, FL
8. Puliti, G., Vuille, C. Perturbative Solutions of the Einstein Klein-Gordon Equations. *72nd Annual Meeting of the Southeastern Section of the APS*, November 10-12, 2005, Gainesville, FL
9. Puliti, G., Paolucci, S., Sen, M. Thermodynamic Properties of Ionic Liquids for a Possible Application to an Absorption Refrigeration Cycle. *3rd Annual MAA Undergraduate Mathematics Conference*, April 15, 2006, Daytona Beach, FL
10. Paolucci, S., Puliti, G., Sen, M. Transport Properties of Nanofluids. *2008 ASME International Mechanical Engineering Congress and Exposition*, October 31 - November 6, 2008, Boston, MA
11. Puliti, G., Paolucci, S., Sen, M., Gezelter, D. The Study of Solvation Effects on Thermodynamic Properties of Nanofluids Using Molecular Dynamics. *61st Annual Meeting of the APS Division of Fluid Dynamics*, November 23-25, 2008, San Antonio, TX
12. Puliti, G., Paolucci, S., Sen, M. A Molecular Dynamic Study of Properties of Nanofluids. *10th US National Congress on Computational Mechanics*, July 16-19, 2009, Columbus, OH
13. Paolucci, S., Puliti, G., Sen, M. A Molecular Dynamic Study of Properties of Nanofluids. *2009 ASME International Mechanical Engineering Congress and Exposition*, November 13-19, 2009, Lake Buena Vista, FL
14. Paolucci, S., Puliti, G., Sen, M. A Molecular Dynamic Study of Properties of Nanofluids. *62nd Annual Meeting of the APS Division of Fluid Dynamics*, November 22-24, 2009, Minneapolis, MN
15. Puliti, G., Paolucci, S., Sen, M. Molecular Dynamic Study of Properties of Nanofluids. *ASME-ATI-UIT Conference on Thermal and Environmental Issues in Energy Systems*, pp. 1113-1118, May 16-19, 2010, Sorrento, Italy
16. Puliti, G., Paolucci, S., Sen, M. Molecular Dynamic Study of Properties of Nanofluids: Thermodynamics. *2010 Midwest Thermodynamics and Statistical Mechanics Conference*, June 2-3, 2010, Notre Dame, IN

17. Puliti, G., Paolucci, S., Sen, M. Thermodynamic Properties of Nanofluids. *2010 ASME International Mechanical Engineering Congress and Exposition*, November 12-18, 2010, Vancouver, BC, Canada
18. Puliti, G., Paolucci, S., Sen, M. Properties of Water/Gold Nanofluids. *64th Annual Meeting of the APS Division of Fluid Dynamics*, November 20-22, 2011, Baltimore, MD
19. Puliti, G., Paolucci, S., Sen, M. Study of Thermodynamic and Transport Properties of Water/Gold Nanofluids using Equilibrium Molecular Dynamics. *2012 ASME 3rd Micro/Nanoscale Heat and Mass Transfer International Conference*, March 3-6, 2012, Atlanta, GA

## JOURNAL REVIEWS

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- **Occasional Reviewer** for the following journals:
  - Experimental Thermal and Fluid Science, Elsevier
  - Journal of Nanoparticle Research, Springer

## RELEVANT SKILLS

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- **Languages:** fluent in Italian and English and working knowledge of written Spanish and French
- **Software:** AutoCAD, Pro-E, CATIA, MicroStation, MSC NASTRAN, NE NASTRAN, Comsol, Corel Draw, Microsoft Office Suite, Illustrator, Photoshop, Dreamweaver, Windows, Linux
- **Programming:** Pascal, Basic, C, C++, HTML, CSS, IDL, MFIX, DL-POLY, OpenMD, LaTeX, Maple, Matlab, Simulink, Mathematica, Code V, FORTRAN 77/90

## ACTIVITIES AND LEADERSHIP

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- **Membership**
  - American Society of Mechanical Engineers (ASME)
  - American Institute of Aeronautics and Astronautics (AIAA)
  - American Physical Society (APS)
  - Society for Industrial and Applied Mathematics (SIAM)
  - Society of Automotive Engineers (SAE)
  - Mathematical Association of America (MAA)
  - Order of the Engineer
  - The Mars Society
  - Society of Physics Students (SPS)
  - Albert Einstein Gesellschaft
- **President** of MAA, Embry-Riddle chapter, 2003
- **Co-founded** the Tau Beta Rho Society (future Tau Beta Pi Engineering Honor Society) at ERAU
- **Advisor and coordinator** of the ERAU Study Abroad Program in Italy for two summers in Siena

## PERSONAL INTERESTS

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- Photography, piano, and music theory
- General relativity, astronomy, and astrophotography
- Website design and internet domain management
- Tennis and traveling

## REFERENCES

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<b>Dr. Samuel Paolucci</b> University of Notre Dame <i>Contact available upon request</i>	<b>Dr. Mihir Sen</b> University of Notre Dame <i>Contact available upon request</i>	<b>Dr. James Cunningham</b> Embry-Riddle University <i>Contact available upon request</i>	<b>Dr. Hrvoje Kozmar</b> University of Zagreb <i>Contact available upon request</i>
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