

**Justyna Czerwinska, Ph.D.**

*Institute of Fundamental Technological Research, Polish Academy of Science*

*[justyna@ippt.gov.pl](mailto:justyna@ippt.gov.pl)*

*[czerwins@deas.harvard.edu](mailto:czerwins@deas.harvard.edu)*

*EDUCATION*

**PhD, Mechanics - 1999**

**Specialization in Fluid Mechanics**

**Institute of Fluid Flow Machinery, Polish Academy of Sciences, Gdansk, Poland**

Thesis: "An effect of the curved passage depth on the shock induced separation flow structure."

*Advisor : prof. P. Doerffer*

**Diploma Aeronautics and Aerospace - 1997**

**von Karman Institute for Fluid Dynamics, Belgium**

Thesis: "Numerical study of boundary layer shock interaction."

*Advisor : prof. G. Degrez*

**MS, Technical Physics and Applied Mathematics - 1994**

**Specialization in Fluid Mechanics,**

**Technical University of Gdansk, Poland**

Thesis: "One dimensional study of the viscous gas with the thermal conductivity in the shock tube "

*Advisor : prof. M.E. Klonowska*

*RESEARCH*

**Mico- and nano-fluidics;** development of numerical simulation techniques, dissipative particle dynamics, direct simulation Monte Carlo; modeling of solid liquid interaction (slip condition); DNA in shear flow and two-phase flow in micro-devices.

**Unstructure meshes;** Voronoi tessellation, moving meshes algorithms

**Boundary layer shock wave interaction in transonic and hypersonic flows;** shock induced separation structures, turbo-machinery flows, three- and two-dimensional numerical analysis.

**Topological analysis of the elementary flow structures;** mathematical analysis, visualization methods.

**Two phase flows;** swirl flows, theoretical models, Saffman-Taylor instability.

**Numerical methods;** numerical schemes for PDEs, parallelization, turbulence modeling, stochastic PDES

**Condensation;** theoretical models and numerical computations.

**Shock wave structure;** calculations of the shock tube unsteady flows.

*EMPLOYMENT*

**Technical University of Dresden, Germany**

Institute of Fluid Mechanics, Department of Mechanical Engineering, Senior Researcher **2002 - 2005**

**Technical University of Dresden, Germany**

Center for High Performance Computing, Visiting Researcher **2000 -2002**

**Institute of Fluid Flow Machinery, Polish Academy of Sciences, Gdansk, Poland**

Transonic Flows and Numeric Methods Group, Research Assistant **1996-2000**

**Institute of Fluid Flow Machinery, Polish Academy of Sciences, Gdansk, Poland**

Research Assistant, Numerical Methods Group **1994-1996**

### *TEACHING*

**Technical University of Dresden, Germany**

Turbulence Modeling **2002-2004**

**Technical University of Gdansk, Poland**

Lecturer, Gas Dynamics **1994-1996**

Student Project Supervisor, Computational Fluid Dynamics **1994-2000**

**Technical University of Dresden, Germany**

Last year student thesis:

“*Mixing mechanism in micro-channel*”, S. Jebauer

“*Numerical modelling of micro-bubbles*”, H. Metzkes

“*Mesosopic models of fluid -DNA interaction*”, W. Brühan

### *GRANTS*

**ABB Atom, Sweden;** “Two phase swirl flow in reactor design,” 1996.

**European Science Foundation;** “3D computation in industrial flows,” travel grant to perform research at the Turbulence and Transition Group, German Aerospace Establishment (DLR), Goettingen Germany, February 1998.

**Polish German Collaboration;** “Transonic flows in turbo-machinery,” grant to perform research at the Industrial Aerodynamics Group, German Aerospace Establishment (DLR), Goettingen Germany, June & December 1998.

**German Committee for Research (DFG);** ‘Numerical simulation and investigation of micro-channel flows with immersed nano-structures based on the Dissipative Particle Dynamics method’, part of priority program 1164 "Nano- and Microfluidics" - 2003 – 2005.

**German Committee for Research (DFG);** ‘Micro- and Nano –fluidics simulation’, collaboration with prof. H. Stone, Harvard University (444/USA/1/05)

## *PROFESSIONAL EXPERIENCE*

**Short term stays:** Harvard University, Cambridge MA, USA, January, March, July, August 2005, March, April, August, September 2006

**Invited talks:** University of California Berkeley, California Institute of Technology, University of California Santa Barbara, Stanford University, Harvard University, USA.

**Summer Schools:** “Multiscale modelling” ETH –Zurich, Switzerland - 2003

**Reviewer:** Physical Review Letters, Bulletin of Polish Academy of Science, Technological Science

**Thesis advisor:** 3<sup>rd</sup> ZARM 2004 Student Thesis Award U. Salecker “2-d Voronoi tessellation of curved channel geometries”

### **Current collaboration:**

**prof. H. A. Stone**, Division of Engineering and Applied Science, Harvard University, “*Brownian Particles Transport Phenomena Through Membranes*”

**prof. T. Kaxiras**, Physics Department, Harvard University, “*Mesoscale Modelling of Fluid-Solid Interaction*”

**prof. S. Yip**, Nuclear Engineering Department, MIT, “*Modelling of Thermal Effects in Nanofluids to Enhanced Cooling Processes*”

**prof. P. Doerffer**, IMP PAN, Gdansk, Poland, “*Microfluidics Effects in Effusive Cooling Problems*”

### **Professional memberships:**

American Physical Society; Society of Industrial and Applied Mathematics;

American Society of Mechanical Engineering – committee member for CFD; microfluidics;

Member of National Nanotechnology Infrastructure Network, <http://www.nnin.org/>;

Member of Center for Nanofluids at MIT, <http://web.mit.edu/nse/nanofluids/>