Frank Bierbrauer

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Education

- PhD, Mathematics, University of Wollongong, Australia, 2005 (part-time)
  Thesis title: "Mathematical Modelling of Water-Droplet Impact on Hot Galvanised Steel Surfaces"
  Thesis Advisor: Professor Song-Ping Zhu
- MSc, Mathematics, Monash University, Australia, 1995 (part-time)
  Thesis title: "A Theoretical Investigation into Steel Surface Emissivity"
  Thesis Advisor: Andrew J.R. Prentice, Reader in Mathematics
- BSc (Hons), Mathematics, Monash University, Australia, IIA, 1988
- BEd, Secondary Mathematics/Science, University of Tasmania, Australia, 1987
- BAppSc, Physics/Mathematics, University of Tasmania, Australia, 1986

Lecturing/Teaching Experience

Lecturer (current position)
School of Computing, Mathematics & Digital Technology,
Manchester Metropolitan University, 2012-current

- Academic skills for Higher Education
- Linear Algebra and Programming Skills
- Supervising two final year students

Part-time Lecturer
School of Mathematics & Applied Statistics, University of Wollongong, 2005

- Spring session, first year calculus, second year differential equations
- Autumn session, first year calculus and linear algebra, second year engineering mathematics
- Taught both engineering and mathematics students, large class sizes
- Prepared assignments and exam questions, marked assignments

Part-time Lecturer
School of Computing and Mathematics, Deakin University, 1994-1995

- Autumn session, third year dynamical systems and chaos
- Prepared all course materials, assignments, exams, tests

Part-time Tutor
Department of Applied Mathematics, Monash University, 1990-1995
- Second year engineering mathematics, assisted in student problem solving

Senior Tutor
Department of Information and Numerical Sciences, Deakin University, 1988-1989
- Autumn session, first year calculus, algebra, analytical geometry
- Spring session, third year complex variables
- Prepared all course materials: assignments, exam papers, marking, supervision of exams

Teaching Philosophy
See also my "Teaching Statement".

Research Experience & Interests

(See also my "Research Statement")

Academic Positions

Research Fellow
School of Mechanical Engineering, University of Leeds, 2009-2011
- Developing and deploying robust computer code for the accurate simulation of colloidal droplet dynamics and deposition
- Critically valuating of the output of the simulations, including comparison with experimental data
- The parametric study of operating conditions to establish successful printing window.

Advisor: Dr Nik Kapur

Research Associate
School of Mathematics, Cardiff University, 2006-2009
- Developed multiphase flow models for droplet dynamics in complex flows using a marker-particle method
- Developed particle methods for viscoelastic flows using SPH

Advisor: Professor Tim Phillips

Associate Research Fellow
School of Mathematics & Applied Statistics, University of Wollongong, 2005
- Modelled drug release from a swelling hydrogel

Advisor: Dr Mark Nelson

Research Consultant
Department of Mechanical Engineering, University of Wollongong, 2000-2001
- Studied convective heat transfer in the water-jet cooling of steel sheets

Advisor: Associate Professor Wee-King Soh

Research Assistant
Department of Mechanical Engineering, University of Wollongong, 1998-1999
- Evaluated an Eulerian-Lagrangian numerical method applied to convective heat transfer

Advisor: Associate Professor Wee-King Soh

Vacation Scholar
Department of Physics, Monash University, 1994-1995

- Modelled the effect of surface profile on the spectral variation of steel surface emissivity

Advisor: Dr Charles Osborne

Industrial Positions

Research Scientist
BlueScope Steel Research Laboratories, Port Kembla, 2001-2004
- Studied the influence of a taphole clay pedestal as well as the significance of the coke-free layer on fluid flow and heat transfer in a blast furnace

Advisor: Dr Paul Zulli

Research Assistant
BHP Melbourne Research Laboratories, Clayton, 1992-1993
- Obtained analytical solutions to the Beckmann scattering integral for use in temperature measurement in industry

Advisor: Dr John Chen

Vacation Scholar
BHP Melbourne Research Laboratories, Clayton, 1991-1992
- Studied the surface emissivity of oxidised steel

Advisor: Dr John Chen

Research Proposals (see also my website link above)
- Previously prepared for submission to the EPSRC, NERC and Royal Society:
  - *Multi-phase, Multi-scale Mathematical Models of Splash Erosion*
  - *Optimised Mathematical Models for Multi-Physical Systems*
- Other proposals in preparation:
  - *Fluid Dynamical Modelling of Discrete Drop Formation in Industry*
  - *Collapsing Bubble-Jet Erosion of Solid Surfaces*
  - *The Insulation Properties of Aggregates of Natural and Artificial Fibres*

Research Collaborations
2012: Dr Nik Kapur, School of Mechanical Engineering, University of Leeds, UK
- *Critical Pinch-Off in Drop Formation at Capillaries*

2010: Professor Tim Phillips, School of Mathematics, Cardiff University, Wales, UK
- *The Role of Neighbouring Droplets in the Spray Break-Up Process*

Publications

See the "Publications List" for details.

Relevant Skills

Teaching Skills
- Able to teach both large, class sizes in excess of 200, and small tutorial classes requiring individual attention
- Able to prepare and set course materials for both a given course structure as well as new courses based on personal research
- Teaching evaluation demonstrated high: subject preparedness, desire to aid student learning, helpfulness in answering student questions
- A strong desire to enhance student enjoyment of mathematics as well as its practical benefits in real world problems such as in engineering

Research Skills

- Strong communication skills as evidenced by lecturing and the presentation of conference papers
- A proven ability as a valued team member necessary in, for example, the research groups at BlueScope Steel Research Laboratories
- A capacity to engage in independent research and competently report its findings as demonstrated through industrial research reports as well as published conference and journal articles
- The ability to analyse a given task and the organisation necessary for its completion as required in lecturing and research
- A strong work ethic and ability to adapt to new work environments as shown in industrial research

Computational/Software Skills

- Some experience with Matlab, Excel
- Competent in the use of Fortran77/90, Mathematica and Maple
- Familiar with parallel programming in High Performance Fortran
- Competent with commercial software, fluid flow: CFX-4, graphics: TecPlot
- Knowledge of LaTex, PowerPoint, Publisher and PhotoShop
- Familiar with Microsoft, OS and Unix environments
- Familiar with programming in Assembler and machine code
- Able to quickly develop and understanding of new codes and packages

Other

- Able to speak, read and write the German language

Presentations

Conferences

BAMC 2013, The British Applied Mathematics Colloquium, University of Leeds, Leeds, UK, 9-12 April, 2013.

- *Non-Contact Temperature Measurement in Industry – Analytical Solutions for the Emissivity of Oxidised Steel Surfaces*

AMIS 2012, Multiphase Flow in Industrial and Environmental Engineering, Universite de Savoie, Le Bourget du Lac, France, 19-22 June 2012

- *Drop Pinch-Off for Discrete Flows from a Capillary*

GSK Process Modeling Conference, Ware, UK, June 2010

- *Modelling the Drop Formation Process*

ILASS `08 European Conference on Liquid Atomization and Spray Systems, Como, Italy, Sept. 2008

- *Modelling Spray Impingement Onto Flat, Rigid Walls Using an Eulerian-Lagrangian Method*
- *Secondary Atomisation: Simulation of Droplet Break-Up in Disturbed Flow Fields*

ICFD International Conference on Computational Fluid Dynamics, Reading, UK, Mar. 2007

- *The Numerical Prediction of Droplet Deformation and Break-Up Using the Godunov Marker-Particle Projection Scheme*

ASME 2001 International Mechanical Engineering Congress and Exposition, New York, USA, Nov. 2001

- *An Eulerian-Lagrangian Immersed Interface Method for the Cooling of a Hot Steel Strip by an Axisymmetric Water-Jet*

ICHT'01 International Symposium on Advances in Computational Heat Transfer, Palm Cove, Queensland, Australia, May 2001

- *Application of the Eulerian-Lagrangian Method to Water-Jet Cooling of a Hot Moving Strip*

The 1994 Asia Pacific Microwave Conference, Japan, Dec. 1994

- *An Analytic Solution of the Beckmann Scattering Integral with Application to Temperature Measurement in Industry*

The 1993 Asia Pacific Microwave Conference, Taiwan, Oct. 1993

- *Study on the Surface Emissivity of Oxidised Steel Using a Three-Layer Model*

Workshops

- Free-Surface and Interface Problems Workshop, Oxford, UK, 14-15th September 2012
- The Splash and Free Surface Flow Workshop, Melbourne, Australia, June 1995
    - *Water Drop Impact on Hot Galvanised Steel Surfaces*

Professional Development

- Modelling and Computation of Multiphase Flows, Swiss Federal Institute of Technology (ETH), Zurich, Switzerland, 15-19 Feb. 2010.
- I have extended my mathematical knowledge by attending MAGIC (Mathematics Access Grid Instruction and Collaboration) video conferencing courses on: linear operators in mathematical physics and category theory.

Awards

- Australian Postgraduate Award Industry, PhD Scholarship, Australian Government linkage with industry (BHP), 1995-1998
- Recipient of Edward Corbould Research Fund, Astronomical Association of Queensland, 1990

Professional Affiliations

- Associate Member of the Institute for Mathematics and its Applications
- Member of the relief teachers association in Tasmania, Australia
- Registered to teach in Tasmania and Victoria, Australia

External Refereeing

CFD**:** *International Journal for Numerical Methods in Fluids*

Editing

Co-Editor in the following books:

- A. Ben-Naim, *Entropy and the Second Law: Interpretations and Misinterpretations*, World Scientific Publishing, London, 2012
- A. Ben-Naim, *Alices Adventures in Molecular Biology*, World Scientific Publishing, London, 2013.
- A. Ben-Naim, *The Protein Folding Problem and its Solution,* World Scientific Publishing, London, 2013
- A. Ben-Naim, *Statistical Thermodynamics: a textbook with applications to the life sciences*, World Scientific, to appear in 2014.

Scientific Outreach Activities

Invited public lecture at Swansea University, April 2008.

- *The Two Mathematics of Leonardo*, *implications for a mathematical education.*

Invited public lecture at Monash University, March 1995.

- *Solar System Formation: the modern Laplacian theory*