

Bradley Steel

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Australian, born 12 March 1981

CAREER DEVELOPMENT:

I developed a strong understanding of physics through my participation in the international physics Olympiad program. I expanded my skills with an undergraduate degree in science, focusing on majors in physics and cell/molecular biology, as well as studies in mathematics, chemistry and biochemistry. I was invited into the talented student program and during my degree undertook research into the optical properties of butterflies and silverfish.

My Honours and PhD projects were conducted in the Applied Physics department of the University of Sydney. Both projects were interdisciplinary and developed my skills in computational and experimental physics as well as protein chemistry. In my PhD research I showed that two enzymes were inactivated by temperature spikes lasting approximately 40 nanoseconds, and that their inactivation on these fast timescales can be predicted from measurements made over slower timescales. I used vacuum systems for creating thin films, optical methods to create and measure rapid temperature changes, numerical computer simulations of thermal transport, enzyme attachment and activity analysis, and analysis of surface composition and properties.

After submission of my PhD thesis I have applied my experience with enzymes, vacuum systems and surface analysis techniques to the modification of polymer materials for protein attachment, and to optimising the long term storage of surface attached proteins.

My career ambition is to apply physical techniques to the development of technologies within any scientific discipline.

ACADEMIC QUALIFICATIONS:

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|---------------------|---|
| Mar 2002 – Aug 2006 | Doctor of Philosophy
Completed in the School of Physics at the University of Sydney:
Thesis entitled: <i>Protein Responses to Nanosecond Temperature Spikes</i> .
Thesis approved without corrections by all markers (best possible outcome). Markers included Dr Roger Cooke (UCSF) and Professor Hans Coster (UNSW). |
| Feb 1998 – Nov 2001 | Bachelor of Science (Advanced).
First class honours in physics.
Majors in physics and biology (cell biology and genetics).
Minor in applied mathematics.
WAM (Weighted Average Mark) of 78.4. |
| Feb 1996 – Dec 1997 | Higher School Certificate
Completed at Penrith High School
Placed in the top 0.6% of students from NSW, Australia. |

AWARDS AND PRIZES:

Poster prize	Awarded a poster prize for a poster presentation at the 5 th East Asian Biophysics Symposium in Okinawa, Japan 2006.
Physics Olympiad	Australian representative and top Australian qualifier for the 1997 International Physics Olympiad in Sudbury, Canada. Awarded a silver medal.
Scholarships	Australian Postgraduate Award (APA) for 2002 – 2005. Sydney University Alumni Scholarship for 1998 - 2001. Science Foundation for Physics Scholarship No. 3, 2001. Cadbury-Julius Sumner Miller Scholarship, 1999.
University Awards	W.I.B. Smith Prize for experimental physics, 2000. Geoffrey Builder-AWA Prize for experimental physics, 1999. Placed on the Dean's list of excellence in academic performance, 1998.
HSC Physics	Equal first place in NSW HSC Physics in 1997.
NYSF	Selection for and participation in the 1997 National Youth Science Forum.

CURRENT EMPLOYMENT:

Research Fellow at the University of Sydney since September 2006. I am using high energy ion bombardment to modify the surface properties of polyethylene and polystyrene to optimise protein attachment to these surfaces.

PREVIOUS EMPLOYMENT:

Mar 2001 – Oct 2006	<i>The University of Sydney</i> Tutor (2001-2005) and supervisor (2006) of first year physics experimental and tutorial classes.
Apr 1999 – Jan 2001 & Jul 2002 – Feb 2003	<i>PRIOR Education Australia</i> Tutored secondary schools students (year 11-12) in physics and mathematics at all senior levels. Developed learning materials for tutoring programs.
Feb 2001 – Sep 2001	<i>North Shore Coaching College</i> Teacher of a year 11 physics class.
Dec 1997 & Dec 1998	<i>Australian Physics Olympiad</i> Teaching and tutoring of university-level physics, working with year 11 students at the University of Canberra and the A.N.U. This is the selection program for Australian representatives at the International Physics Olympiad.
Jul 1998	<i>30th International Chemistry Olympiad</i> Team guide for the Romanian Chemistry Olympiad team.
Jan 1997-Jan 1998	<i>ASO Sydney</i> Involved in teaching at, organising and running four physics schools for year 10 students, lasting one week each. These schools introduced advanced physics to potential Olympiad students.

SKILLS AND EXPERIENCE:

Research and investigative skills designing, constructing and using experimental systems and procedures
UV-vis-IR spectroscopy including use of an integrating sphere and FTIR accessories (ATR, variable/grazing angle)
Visible-light ellipsometry
Microscopy (including fluorescence, DIC and brief use of SEM, TEM, AFM and confocal systems)
Plasma sputtering and ion implantation (PI³) in high vacuum systems
Numerical modelling in MATLAB and C++
Optics and high power pulsed lasers
High speed thermometry
Polymer-protein and metal-protein interactions
Enzyme assays, actin-myosin motility assays and protein freeze drying
Supervision of undergraduate student projects
Extensive experience teaching and tutoring physics and mathematics at senior levels

PUBLICATIONS:

Steel BC, McKenzie DR, Bilek MMM, Nosworthy NJ and dos Remedios CG (2006) *Nanosecond responses of proteins to ultra-high temperature pulses*. Biophysics J. **91**, L66-L68.

Steel B, Bilek MM, dos Remedios CG and McKenzie DR (2004) *Apparatus for exposing cell membranes to rapid temperature transients*. Eur. Biophysics J. **33:2**, 117-120.

Steel BC, Bilek MM, McKenzie DR and dos Remedios CG (2002) *A technique for microsecond heating and cooling of a thin (submicron) biological sample*. Eur. Biophysics J. **31:5**, 378-382.

Large MCJ, McKenzie DR, Parker AR, **Steel BC**, Ho K, Bosi SG, Nicorovici N and McPhedran RC (2000) *The mechanism of light reflectance in silverfish*. Proc. R. Soc. Lond A. **457**, 511-518.

PUBLICATIONS IN PREPARATION:

Steel BC, Nosworthy N, Bilek MMM, dos Remedios CG and McKenzie DR. *Optimisation of freeze drying conditions for surface-attached proteins*.

Nosworthy N, **Steel BC**, Bilek MMM, dos Remedios CG and McKenzie DR. *Surface modification increases the stability of freeze dried surface-attached proteins*.

Steel BC, Bilek MMM, McKenzie DR. *Calibration of gold reflectivity for temperature measurement*.

CONSULTANCY REPORTS:

Bosi SG and **Steel BC** (2005) *Solar-Energy Transmittance of Two Specimens of Smooth Chinese Plate Glass supplied by Pilkington*. Consultancy report (for Pilkington Patterned Glass, Pilkington Australia), Applied Physics, School of Physics, University of Sydney.

Bosi SG and **Steel BC** (2005) *Surface Flatness of Four Patterned Glass Sheets*. Consultancy report (for Pilkington Patterned Glass, Pilkington Australia), Applied Physics, School of Physics, University of Sydney.

Bosi SG and **Steel BC** (2003) *Solar-Energy Transmittance Measurements of Identical Glass Trial Samples*. Consultancy report (for Pilkington Patterned Glass, Pilkington Australia), Applied Physics, School of Physics, University of Sydney.

Bosi SG and **Steel BC** (2003) *Test of the Reproducibility of Solar-Energy Transmittance Measurements of a Patterned/Smooth Low-Iron Glass Specimen*. Consultancy

report (for Pilkington Patterned Glass, Pilkington Australia), Applied Physics, School of Physics, University of Sydney.

A series of 7 consultancy reports (not listed separately owing to the similarity of their titles) by Bosi SG and **Steel BC** for Pilkington Patterned Glass, Pilkington Australia, reporting results of periodic optical measurements from the period 2002-2006.

REFERENCES:

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