

Associate Dean (ICT) – University of Adelaide

Faculty of Sciences, University of Adelaide, SA 5005
(2006–present)

Portfolio Focus: Information and Communication Technology (ICT)
Undergraduate student learning experience in ICT
Enabling world class research

Associate Professor (Level-D) – University of Adelaide

Department of Physics and Mathematical Physics, University of Adelaide, SA 5005
(2003–2007)

Research Focus: Strangeness magnetic moment of the proton
Meson electromagnetic form factors
Search for the Pentaquark resonance in Lattice QCD
Hybrid and Exotic Meson Spectroscopy
Quark and Gluon Propagator Structure
Regularisation of chiral effective field theory

Deputy Director – ARC Special Research Centre for the Subatomic Structure of Matter (CSSM)

Faculty of Sciences, University of Adelaide, SA 5005
(2004–present)

Deputy Director (Visualization) – South Australian Partnership for Advanced Computing (SAPAC)

Level 1, Physics Building, University of Adelaide, SA 5005
(2002–present)

Portfolio Focus: Scientific Data Visualization
Parallel Supercomputer Applications Development

Tenured Senior Lecturer (Level-C) – University of Adelaide

Department of Physics and Mathematical Physics, University of Adelaide, SA 5005
(2000–2003)

Research Focus: Chiral symmetry and lattice QCD extrapolations
Creation of the Fat-link Irrelevant Clover (FLIC) lattice fermion action
Baryon electromagnetic form factors
 N^* baryon structure from the lattice
Quark propagator structure

Lecturer (Level-B) – University of Adelaide

Department of Physics and Mathematical Physics, University of Adelaide, SA 5005
(1997–1999)

Research Focus: Mean-field improved lattice QCD actions and odd-parity baryons
Gluon propagator structure from lattice QCD with improved actions

Postdoctoral Research Fellow – University of Washington

Department of Physics, Box 351560, Seattle, WA, 98195, USA
(1995–1996)

Research Focus: New finite-density nuclear-matter QCD sum rules for the nucleon
QCD sum rule validity and Monte-Carlo uncertainty analysis

Visiting Research Associate – TRIUMF

Theory Group, 4004 Wesbrook Mall, Vancouver, B.C., Canada, V6T 2A3
(1994–1995)

Research Focus: Compton scattering from lattice QCD
Finite-density nuclear-matter QCD Sum Rules for vector-mesons
QCD sum rules and $\rho - \omega$ mixing with finite mesonic widths

Postdoctoral Research Associate – The Ohio State University

Department of Physics, 174 West 18th Avenue, Columbus, OH 43210-1106, USA
(1993–1994)

Research Focus: Lattice QCD tests of QCD Sum Rule methods
Chiral nonanalyticities in hadron electromagnetic properties
Finite-density nuclear-matter QCD Sum Rules

Postdoctoral Research Associate – University of Maryland

Department of Physics, College Park, MD 20742, USA
(1991–1993)

Research Focus: Hadron structure from lattice QCD
Lattice field theory methods and techniques
Chiral perturbation theory

NSERC Postdoctoral Research Fellow in Theoretical Physics – TRIUMF

Theory Group, 4004 Wesbrook Mall, Vancouver, B.C., Canada, V6T 2A3
(1989–1991)

Research Focus: The electromagnetic structure of baryons in lattice QCD
Magnetic moment sum rules

Research Grant Funding

- **Australian Partnership for Advanced Computing (APAC) Supercomputer Time Grant Funded 2008 at 1,000,000 CPU Hours.** Approximate monetary value: \$ 2,000,000.
CI: Derek B. Leinweber
“Electromagnetic Structure of Matter”
- **ARC Linkage International Grant – Funded 2007 through 2009 at \$93,000.**
CIs: Anthony G. Williams, Ayse Kizilersu, Derek B. Leinweber, *et al.*
“Advances in Nonperturbative Studies of Subatomic Physics”
- **Australian Partnership for Advanced Computing (APAC) Supercomputer Time Grant Funded 2007 at 737,000 CPU Hours.** Approximate monetary value: \$ 1,474,000.
CI: Derek B. Leinweber
“Electromagnetic Structure of Matter”
- **ARC Discovery Grant – Funded 2006 through 2008 at \$232,000.**
CI: Derek B. Leinweber
“The Essence of QCD Vacuum Structure”
- **ARC Discovery Grant – Funded 2006 through 2008 at \$510,000.**
CIs: Anthony G. Williams, Derek B. Leinweber and Lorenz von Smekal
“Advanced Studies of QCD and the Strong Interaction”
- **ARC Linkage Infrastructure (LIEF) Grant – Funded 2006 at \$560,000.**
CIs: A. G. Williams, M. Buntine, P. Coddington, D. B. Leinweber, F. Vaughan, *et al.*
“South Australian Supercluster Facility”
- **Australian Partnership for Advanced Computing (APAC) Supercomputer Time Grant Funded 2006 at 600,000 CPU Hours.** Approximate monetary value: \$ 1,200,000.
CI: Derek B. Leinweber
“Electromagnetic Structure of the Proton”

- **Australian Partnership for Advanced Computing (APAC) Supercomputer Time Grant Funded 2005 at 700,000 CPU Hours.** Approximate monetary value: \$ 1,400,000.
CI: Derek B. Leinweber
“Electromagnetic Structure of the Proton”
- **University of Adelaide Strategic Research Scheme – Funded 2005 at \$ 12,500**
CI: Derek B. Leinweber
“QCD Vacuum Structure: Symmetry Breaking and Confinement”
- **Australian Partnership for Advanced Computing (APAC) Supercomputer Time Grant Funded 2004 at 339,000 CPU Hours.** Approximate monetary value: \$ 678,000.
CI: Derek B. Leinweber
“Electromagnetic Structure of the Proton”
- **ARC Linkage Infrastructure (LIEF) Grant – Funded 2003 at \$696,005.**
CIs: A. Khurana, *et al.*
“South Australian Virtual Reality Centre (SAVRC)”
- **Australian Partnership for Advanced Computing (APAC) Supercomputer Time Grant Funded 2003 at 480,000 CPU Hours.** Approximate monetary value: \$ 960,000.
CI: Derek B. Leinweber
“Electromagnetic Structure of the Proton”
- **Australian Partnership for Advanced Computing (APAC) Supercomputer Time Grant Funded 2002 at 200,000 CPU Hours.** Approximate monetary value: \$ 400,000.
CI: Derek B. Leinweber
“Electromagnetic Structure of the Proton”
- **ARC Linkage Infrastructure (LIEF) Grant – Funded 2002 at \$500,000.**
CIs: A. G. Williams, M. Buntine, P. Coddington, D. B. Leinweber, F. Vaughan, *et al.*
“South Australian Supercomputing Facility”
- **ARC Discovery Grant – Funded 2002 through 2004 at \$184,239.**
CI: Derek B. Leinweber
“Novel Fermion Actions for Lattice QCD”
- **University of Adelaide Small Grant – Funded 2002 at \$11,400.**
CI: Derek B. Leinweber
“Chiral Perturbation Theory for the Quenched Approximation of QCD”
- **University of Adelaide Small Grant – Funded 2001 at \$10,000.**
CI: Derek B. Leinweber
“Novel Efficient Fermion Actions for Lattice QCD”
- **Sun Microsystems Educational Grant (SEIP) – Funded 2000 at \$2.9 million**
CIs: A. G. Williams, D. B. Leinweber, A. W. Thomas, C. Hamer, and B. McKellar
“National Computing Facility for Lattice Gauge Theory”
- **ARC Research Infrastructure Equipment and Facilities (RIEF) Grant – Funded 2000 at \$480,000***
CIs: A. G. Williams, D. B. Leinweber, A. W. Thomas, C. Hamer, and B. McKellar
“National Computing Facility for Lattice Gauge Theory”
*Additional support from Universities is provided at \$207,000.00

- **ARC Small Grant – Funded 2000 at \$15,500.**
CI: Derek B. Leinweber
“Lattice QCD Simulations of Nucleon Resonances”
- **ARC Small Grant – Funded 1998 at \$10,000 and 1999 at \$10,000.**
CI: Derek B. Leinweber
“Exploring the Nonperturbative Properties of Quantum Chromodynamics (QCD) and their Impact on Modern Nuclear Physics”

Honours and Awards

South Australian Science Excellence Awards Finalist

2008 One of three finalists for Science Educator of the Year (awarded 22/08/08)

Australian Institute of Physics Walter Boas Medal

2007 Awarded for original research making the “most important contribution to physics.”

Fellow of the Australian Institute of Physics

2007 Recognises significant contributions to the field of Physics.

Executive Dean of Sciences Prize for Excellence in Teaching

2007 Awarded for outstanding teaching in undergraduate science at the University of Adelaide to staff with more than five years of teaching experience.

Stephen Cole the Elder Prizes for Excellence in Teaching

2007 Nominated for outstanding teaching in undergraduate courses at the University of Adelaide.

Biographical Profile included in the 25th edition of Marquis Who’sWho in the World

2007 Recognises significant and highly public research contributions to the field of Physics.

Stephen Cole the Elder Prizes for Excellence in Teaching

2006 Nominated for outstanding teaching in undergraduate courses at the University of Adelaide.

Nobel Prize Lecture

2004 Honoured by Prof. Frank Wilczek who presented my QCD vacuum structure animation. Published in *Les Prix Nobel. The Nobel Prizes 2004*, Editor Tore Frängsmyr, [Nobel Foundation], Stockholm, 2005.

Baryons ’95 International Conference

1995 Prize for Best Presentation by a Young Investigator

TRIUMF

1989–91 Natural Sciences and Engineering Research Council of Canada (NSERC) Postdoctoral Fellowship

McMaster University

1985–87 Desmond G. Burns Graduate Scholarships in Theoretical Physics

1983–86 NSERC Postgraduate Scholarships

1983–86 Harry Lyman Hooker Graduate Scholarships

University of Guelph

1983 College of Physical Science Graduation Prize (1st in class)

Highlights of Significant Contributions

- Created lattice-QCD based visualizations and animations of QCD vacuum structure and its response to hadrons that have been featured in the 2004 **Nobel Prize Acceptance Lecture** of Prof. Frank Wilczek, scientific annual reports around the world and in popular international science magazine and newspaper articles.

- Designed and implemented the first comprehensive investigation of spin-0 and spin-1 octet meson electromagnetic form factors in lattice QCD. This work is the first to reveal that the charge distribution of the vector meson is not spherically symmetric but rather has an oblate shape.
- Developed new methods for identifying the power-counting regime of chiral perturbation theory.
- Created a novel formalism based on partially-quenched chiral effective field theory and lattice QCD simulations for determining the strangeness magnetic moment of the nucleon, $G_M^s = -0.046 \pm 0.019 \mu_N$, and strangeness form factor of the nucleon $G_E^s(Q^2 = 0.1\text{GeV}^2) = +0.001 \pm 0.006$ in agreement with the latest experimental measurements but an order of magnitude more precise than the experimental measurements of 2004.
- Revealed the presence of chiral nonanalytic behavior in the magnetic moments of octet and decuplet baryons via numerical simulations of FLIC fermions in the light quark-mass regime of QCD.
- Established the improved convergence properties of Finite-Range-Regularized (FRR) Chiral Perturbation Theory, vital to resolving the chiral extrapolation problem in Lattice QCD.
- Invented a diagrammatic method for the transparent and rapid determination of chiral-expansion coefficients for quenched chiral perturbation theory.
- Created the Fat-Link Irrelevant Clover (FLIC) fermion action; an efficient lattice fermion operator with excellent scaling properties providing near-continuum results at finite lattice spacing and superior chiral properties enabling access to the light quark-mass regime.
- Designed and implemented the first analysis of the mass and renormalization functions of the Overlap-quark propagator. The nature of the AsqTad propagator has also been established with these techniques.
- Resolved the momentum dependence of the Landau gauge gluon propagator in the infrared regime via lattice QCD simulations.
- Designed and implemented the first complete $\mathcal{O}(a^2)$ -improved analysis of the Landau gauge gluon propagator, including an $\mathcal{O}(a^2)$ -improved action and $\mathcal{O}(a^2)$ -improved Landau gauge fixing.
- Illustrated the essential role of chiral nonanalytic behavior in extrapolations of hadronic observables to the light quark-mass regime.
- Developed and tested new parity-projection methods for exploring N^* physics in lattice gauge theory. Implemented the first analysis of $N^{*1/2^-}$ and $N^{*3/2^-}$ low-lying odd-parity nucleon states in lattice QCD.
- Identified an approach establishing the scalar and vector self-energies of the nucleon in finite density nuclear matter, independent of the problematic scalar-scalar four-quark condensates.
- Resolved the behavior of the ρ -meson mass and decay constant in finite density nuclear matter as extracted from QCD Sum Rules.
- Designed and implemented the first Monte-Carlo based uncertainty analysis for the QCD Sum Rule approach to QCD, thus determining the predictive ability of the technique.
- Solved the “pion-proton charge radius problem” in lattice QCD by introducing the use of chiral perturbation theory in extrapolating to physical quark masses.

- Implemented the first *ab initio* investigation of octet and decuplet baryon structure and their electromagnetic transitions. This work was first to emphasize the environment sensitivity of individual quark sector contributions to form factors which are now finally being resolved at Jefferson Laboratory in the USA.
- Established a formalism for isolating and extracting multipole form factors of octet and decuplet baryons, and their electromagnetic transitions.

Publications Overview

- Editor of 4 international conference proceedings.
- Published 4 book chapters.
- Published 100 articles in refereed journals.
- Published 99 articles as refereed conference proceedings.
- Published 10 articles as conference proceedings.
- Published 16 newspaper articles
- Articles have 3613 citations in the SPIRES HEP Database.
- 15 articles are classified as *well-known* with more than 50 citations.
- 3 articles are *very well-known* with more than 100 citations.
- Published articles average 27 citations per paper in the SPIRES HEP Database.
- Hirsch's h-index is 35.

Publications Summary: 2002 to present

Publication Type	Number	Journal/Publisher	Impact Factor
Refereed Book Chapters	4	Lect. Notes Phys.	N/A
Editorial Works	3	Nucl. Phys. B (Proc. Supp.)	5.199
	1	Lect. Notes Phys.	N/A
Refereed Journal Articles	3	Phys. Rev. Lett.	7.072
(Total: 61)	37	Phys. Rev. D	4.896
	1	J. High Energy Phys. (JHEP)	5.393
	1	Nucl. Phys. B	5.199
	4	Phys. Lett. B	5.043
	3	Phys. Rev. C	3.327
	2	Annals Phys.	3.019
	10	Other	
Refereed Conference Proceedings	45	Nucl. Phys. B (Proc. Supp.)*	0.875
(Total: 75)	5	Nucl. Phys. A*	2.155
	25	Other	
Unrefereed Conference Proceedings	4	World Scientific / Other	
Newspaper Articles	16	The Advertiser	
6-Year Total	164	6-Year Total Refereed	136
Career Total	233	Career Total Refereed	199

*Refereed conference proceedings in Nuclear Physics are required to contain new previously unpublished material.

Very Well Known Refereed Publications (100+ Citations)

3. **“Asymptotic scaling and infrared behavior of the gluon propagator”**
D. B. Leinweber, J. I. Skullerud, A. G. Williams and C. Parrinello [UKQCD Collaboration]
Phys. Rev. D **60**, 094507 (1999) 17 pp. [arXiv:hep-lat/9811027]
2. **“Infinite volume and continuum limits of the Landau-gauge gluon propagator”**
F. D. R. Bonnet, P. O. Bowman, D. B. Leinweber, A. G. Williams and J. M. Zanotti
Phys. Rev. D **64**, 034501 (2001) 10 pp. [arXiv:hep-lat/0101013]
1. **“Electromagnetic structure of octet baryons”**
D. B. Leinweber, R. M. Woloshyn and T. Draper
Phys. Rev. D **43**, 1659 (1991) 20 pp.

Media Releases

19. **“Particle research recognised in physics award”**
The Australian Institute of Physics has awarded to Associate Professor Leinweber the 2007 Walter Boas Medal for original research making the “most important contribution to physics.”
Friday, 19 October 2007
By Robyn Mills, Media and Corporate Communications Officer, University of Adelaide
<http://www.adelaide.edu.au/news/print22417.html>
18. **“Original Research Makes Big Impact”**
Derek Leinweber has made world-leading contributions to quantum chromodynamics, the

quantum field theory of the strong force. . .
Friday, 12 October 2007
Australian Institute of Physics
<http://www.aip.org.au/news/155>

17. **“A Quantum Leap”**
Quote in article on advances in Loop Quantum Gravity and the “Big Bounce” by David Derbyshire and Maria Moscaritolo.
The Advertiser Newspaper, 3 July 2007
16. **“‘Quark’ research sheds light on matter”**
Explores the strange-quark charge-distribution radius within the proton.
Thursday 7th September 2006
ABC News Online: sci-tech
http://www.abc.net.au/science/news/scitech/SciTechRepublish_1734952.htm
15. **“Strange Quark Reveals Its Secrets”**
Discusses the role of strange-quarks within the nucleon.
Thursday 7th September 2006
Photonics News and Features article
<http://www.photonics.com/content/news/2006/September/5/84347.aspx>
14. **“Dissecting the atom”**
Probes the strange-quark contribution to proton structure.
Wednesday 6th September 2006
Advertiser Newspaper article, page 14, by Cara Jenkin
13. **“Physicists charged over strange quarks”**
Examines our precise determination of the strange-quark charge-distribution radius within the proton.
Wednesday 6th September 2006
ABC Science Online: News in Science article by Stephen Pincock
<http://www.abc.net.au/science/news/stories/2006/1734251.htm>
http://www.fnal.gov/pub/today/archive_2006/today06-09-07.html
12. **“Leap towards Holy Grail of particle physics”**
Presents our precise determination of the strange-quark charge-distribution radius within the proton.
Wednesday 6th September 2006
Adelaidean September 2006 Issue: News from the University of Adelaide by Robyn Mills
<http://www.adelaide.edu.au/adelaidean/binary1781/September.pdf>
<http://www.adelaide.edu.au/adelaidean/issues/14381/news14390.html>
11. **“Particle physics calculations improved”**
Announces our precise determination of the strange-quark charge-distribution radius within the proton.
Tuesday 5th September 2006
United Press International article
<http://www.upi.com/NewsTrack/view.php?StoryID=20060905-015128-2601r>
<http://news.webindia123.com/news/Articles/Science/20060906/441869.html>
10. **“New clue to world’s tiniest particles”**
Announces our precise determination of the strange-quark charge-distribution radius within the proton.

Monday 4th September 2006

Research Story, Media Release: News from the University of Adelaide by Robyn Mills

<http://www.adelaide.edu.au/news/news14502.html>

<http://www.newswise.com/articles/view/523208/>

Australian Physics, **43**, 176 (2006)

9. **“Cure or Killer - The Nuclear Future”**

Advertiser Newspaper Round Table discussion on uranium enrichment and the nuclear industry with

- Foreign Affairs Minister Alexander Downer
- Mineral Resources Development Minister Paul Holloway
- SA Chamber of Mines Chief Executive Phillip Sutherland
- Australian Conservation Foundation campaign officer David Noonan
- Chris Russell, Advertiser Business Editor
- Paul Starick, Advertiser Chief Reporter
- Cameron England, Advertiser Chief Business Reporter

The Advertiser Newspaper, Pages 42–45, 29 August 2006

<http://www.news.com.au/adelaidenow/story/0,22606,20286646-5003680,00.html>

8. **“World Cup ball to bend more: scientist”**

Discusses the aerodynamics of the new World Cup soccer ball, the Teamgeist

The Age, The Sydney Morning Herald and Yahoo! 7 Sport, 10 June 2006, by Tim Dornin

<http://www.theage.com.au/news/Sport/World-Cup-ball-to-bend-more-scientist/2006/06/10/1149815348622.html>

<http://www.smh.com.au/news/Sport/World-Cup-ball-to-bend-more-scientist/2006/06/10/1149815348622.html>

<http://au.sports.yahoo.com/060606/2/qtiw.html>

7. **“World Cup ball to bend more says SA scientist”**

Discusses the aerodynamics of the new World Cup soccer ball, the Teamgeist

Australian Associated Press - Sports News, 9 June 2006, by Tim Dornin

6. **“Veer it like Viduka”**

Highlights the Science Outside the Square event at Hindmarsh Stadium on 12 June focusing on soccer science and the launch of the DVD “Veer it like Viduka.”

The Advertiser, Page 3, 1 June 2006, by soccer writer Daniel Lato

5. **“Elementary Findings that Matter”**

Features the research of the CSSM

The Independent Weekly issue 15 January 2006 by Karen Phillips

4. **“How Einstein’s dead wrong, relatively speaking”**

Quote in article on the research of Prof. Reg Cahill

The Australian 7 November 2005 by Verity Edwards

http://www.millennium-ark.net/NEWS/05_Sci_Tech/051107.Einstein.wrong.html

3. **“Strange particles a quark of nature”**

Examines the role of strange quarks in proton structure

Thursday 18th August 2005

Adelaidean Issue 6, August 2005: News from the University of Adelaide by Ben Osborne

<http://www.adelaide.edu.au/adelaidean/issues/6201/news6227.html>

2. **“Nobel presence for Derek Leinweber”**
Monday, 20th December 2004
Inside Adelaide: News from around the University of Adelaide by David Ellis
http://www.adelaide.edu.au/inside_adelaide/2004/50/#sto19
1. **“Adelaide Physics Link to Nobel Prize Lecture”**
Friday, 17th December 2004
University of Adelaide News Room by David Ellis
<http://www.adelaide.edu.au/news/news3281.html>

Science Promotion

4. **“Much ado about something” WonderQuest article with April Holladay**
 - Published in the Canadian National Newspaper the *Globe and Mail* on-line at <http://www.theglobeandmail.com/technology/> and archived on April’s web site at <http://www.wonderquest.com/vacuum.htm>
 - Provided scientific expertise and computer-based visualizations to April Holladay who was writing an article exploring the interesting question “What is Vacuum, such as in Space, is there vacuum between the atoms of water molecules? Is Vacuum a squishable-stretchable thing? oooo, this fascinates me.” posed by Andre from Vancouver, Canada.
 - April Holladay’s newspaper column, WonderQuest, appears every second Monday of the month.
3. **“Spiral Arms” Motion Picture Production**
 - Contributed two letterbox animations of QCD Vacuum Structure for the motion picture “Spiral Arms” produced by Olga Antzoulatos and Enrico Lappano.
 - In the chapter, “The Heisenberg Uncertainty Principle,” the animation is narrated by FermiLab Prof. Edward Kolb. “Empty space has a structure. If you had eyes that could view nature on the quantum level, you wouldn’t see the vacuum as a quiescent, quiet empty place. You would see particles coming in and out of the vacuum – a foaming, seething froth.”
 - In the chapter on particles and waves, the animation has the narration, “The quantum idea is that if this is the profile for the electron, it’s not that the electron is somewhere there – the electron is everywhere there. It’s not that it sits somewhere and we have only to measure it better. It really is everywhere with some probability.”
2. **“2006 Ashes Banquet” Cricket DVD Production**
 - Assisted Neil Smith of tav Productions with the creation of a DVD video to entertain 1,400 guests at the 2006 Ashes Banquet in Adelaide, SA on 29 November 2006.
 - Provided expert advice on the research of cricket-ball aerodynamics.
 - Contributed to concept design, writing and performed in video.
 - Advised SA Cricket Association Bowlers, Sean Tait and Greg Blewett on the science of reverse swing.
1. **“Veer it like Viduka” Soccer DVD Production**
 - Assisted Linda Cooper with the SA Government Science Outside the Square project to create a DVD on Soccer Science.

- Designed to entertain 6,000 guests at Hindmarsh Stadium on the eve of Australia's first game in the 2006 World Cup series on 12 June 2006.
- Provided expert advice on the science of soccer-ball aerodynamics.
- Contributed to concept design and performed in video.

Publications – Newspaper Articles

16. “Screaming Magnets”

Derek Leinweber

Could renowned physicist Michael Faraday - as he played around with magnets and coils of wire in his 1831 laboratory - have anticipated the wild screams of Jimi Hendrix's distorted guitar revolutionising the music scene of the '60s?

In the column *Can you Believe it?*, Adelaide Advertiser, Saturday 24 November 2007.

15. “Probably Certain”

Derek Leinweber

Yes, the logic behind the universe is fuzzy. . . Article connects humour writer Douglas Adam's *Infinite Improbability Drive* to the multiple paths a particle explores in quantum mechanics.

In the column *Can you Believe it?*, Adelaide Advertiser, Saturday 1 July 2007.

14. “Carbon Fading”

Derek Leinweber

The world needs to drive a wedge into greenhouse emissions. Here are seven ways to clean up.

In the column *Can you Believe it?*, Adelaide Advertiser, Saturday 19 May 2007.

13. “Time to Ponder”

Derek Leinweber

We all know it's Einstein's greatest idea. But what actually is it?

In the column *Can you Believe it?*, Adelaide Advertiser, Saturday 31 March 2007.

12. “Wired For Quality”

Derek Leinweber

Sometimes it does take a rocket scientist to figure out how to connect the DVD.

In the column *Can you Believe it?*, Adelaide Advertiser, Saturday 17 February 2007.

11. “Cricket in Full Swing”

Derek Leinweber

There's a third way to make a cricket ball move in the air. It's called Contrast Swing.

In the column *Can you Believe it?*, Adelaide Advertiser, Saturday 2 December 2006.

10. “Turbulent Times”

Derek Leinweber

Have you seen the new 2006 World Cup soccer ball? It's called the “Teamgeist” and represents a radical departure from classic soccer-ball design.

In the column *Can you Believe it?*, Adelaide Advertiser, Saturday 10 June 2006.

9. “Surprise attack”

Derek Leinweber

Explores soccer-ball aerodynamics with an emphasis on “the dip” induced by the turbulent to laminar flow transition at the critical speed.

In the column *Can you Believe it?*, Adelaide Advertiser, Saturday 27 May 2006.

8. **“Food for thought”**
Derek Leinweber
Explains the link between greenhouse gases and the Antarctic ozone hole and their effects on Australia’s multibillion-dollar fishing and wine industries.
In the column *Can you Believe it?*, Adelaide Advertiser, Saturday 6 May 2006.
7. **“Feelin’ Hot Hot Hot”**
Derek Leinweber
Links issues of global warming to recent changes in ocean thermohaline circulation.
In the column *Can you Believe it?*, Adelaide Advertiser, Saturday 25 March 2006.
6. **“Swinger’s Delight”**
Derek Leinweber
Probes the mystery of cricket ball swing with an emphasis on the role of humidity.
In the column *Can you Believe it?*, Adelaide Advertiser, Saturday 31 December 2005.
5. **“To be or not to be. The weird, ghostly worlds of Einstein’s mind.”**
Derek Leinweber
Describes, in an engaging manner, the essential idea of non-locality in quantum mechanics and the challenges to realism that Einstein pondered extensively during the emergence of quantum mechanics.
In the column *Can you Believe it?*, Adelaide Advertiser, Saturday 24 December 2005.
4. **“Striving for Gold”**
Derek Leinweber
Reviews the ancient Alchemist’s dream to turn lead into gold and reveals the manner in which it is done with modern-day nuclear physics.
In the column *Can you Believe it?*, Adelaide Advertiser, Saturday 8 October 2005.
3. **“Behind the Seams”**
Derek Leinweber
Explores the aerodynamics behind cricket ball swing, including reverse swing.
In the column *Can you Believe it?*, Adelaide Advertiser, Saturday 10 September 2005.
2. **“Need for Speed”**
Derek Leinweber
Describes what makes a modern supercomputer super.
In the column *Can you Believe it?*, Adelaide Advertiser, Saturday 23 July 2005.
1. **“Explosive Origins”**
Derek Leinweber
Reveals the origin of the elements of the periodic table. We are made of star dust.
In the column *Can you Believe it?*, Adelaide Advertiser, Saturday 2 July 2005.

Radio Interviews

2. **“Aerodynamics of the New 2006 World Cup Soccer Ball, the Teamgeist”**
Featuring “Australia’s Soccer Scientist,” Derek Leinweber.
ABC National News Radio, Australia, 12 June 2006.
1. **“Gluon Vacuum Structure and the Connection of QCD to Cosmology.”**
Derek Leinweber
With Fritz Thorgessln of PM Magazine, Munich, Germany, 10 Jan 2001.

Public Lecture Presentations and Forums

- **“Cure or Killer - The Nuclear Future”**

Advertiser Newspaper Round Table Discussion on the Nuclear Industry.

The Advertiser Newspaper, 31 Waymouth Street, Adelaide, SA 5000.

Round table discussion on uranium enrichment and the nuclear industry with

- Foreign Affairs Minister Alexander Downer
- Mineral Resources Development Minister Paul Holloway
- SA Chamber of Mines Chief Executive Phillip Sutherland
- Australian Conservation Foundation campaign officer David Noonan

published in the The Advertiser 29 August 2006 pages 2, 42–45.

- **“Turbulent Times”**

SA Museum’s “Munch on Science for Lunch” National Science Week Event

South Australian Museum, North Terrace, Adelaide, SA, August 15, 2006

Describes the aerodynamics of sports balls including cricket-ball swing, golf-ball lift and the smooth 2006 World Cup soccer ball, the “Teamgeist.”

- **“Microscopic Matter”**

SA Museum’s “Munch on Science for Lunch” National Science Week Event

South Australian Museum, North Terrace, Adelaide, SA, August 15, 2006

Features animations of proton structure revealed in state of the art supercomputer simulations of Quantum Chromodynamics on a space-time lattice.

- **“From Nanoscience to Space Science”**

University of Adelaide, SA, August 20, 2006.

Describes Faculty of Sciences programs in the School of Chemistry and Physics, and features animations of Quantum Chromodynamics obtained from state of the art supercomputer simulations.

- **“Turbulent Times”**

SA Government’s “Science outside the square” launch of the DVD “Veer it like Viduka.”

Hindmarsh Stadium, Monday 12th June 2006.

Describes the aerodynamics of the 2006 World Cup ball, the “Teamgeist,” representing a radical departure from classic soccer-ball design.

- **“Veer it like Viduka”**

Public lecture at the South Australian Government’s “Science Outside the Square” launch of the DVD “Veer it like Viduka.”

Held at Hindmarsh Stadium for 6,000 attendees, Monday 12th June 2006.

Talk describes the aerodynamics of the 2006 World Cup ball, the “Teamgeist,” representing a radical departure from classic soccer-ball design.

- **“The Origin of Mass”**

South Australian Virtual Reality Centre (SAVRC), University of Adelaide, SA, August 14, 2005.

Features animations of proton structure revealed in state of the art supercomputer simulations of Quantum Chromodynamics on a space-time lattice.

- **“From Nanoscience to Space Science”**

University of Adelaide, SA, August 14, 2005.

Describes Faculty of Sciences programs in the School of Chemistry and Physics, and features animations of Quantum Chromodynamics obtained from state of the art supercomputer simulations.

Plenary Presentations at International Conferences and Workshops

- **YKIS2006**, Yukawa International Seminar on “New Frontiers in QCD – Exotic Hadrons and Hadronic Matter”
Kyoto University, Kyoto, Japan. 20 –24 Nov. 2006
“Exotic Hadrons on the Lattice”
- **CSSM Workshop on QCD and the Strong Interactions**
University of Adelaide, SA 5005, Australia, 25–29 September 2006
“The QCD Vacuum, Centre Vortices and Gluon Flux Tubes”
- **LHP2006**, 3rd International Workshop on Lattice Hadron Physics
Jefferson Lab (TJNAF) Workshop, Newport News, VA. July 31 – August 3, 2006
“The QCD Vacuum, Centre Vortices and Gluon Flux Tubes”
- **Gordon Research Conference: Photonuclear Interactions**
Tilton, NH, July 30 – August 4, 2006
“Strange Quark Form Factor Results from the Lattice”
- **Econophysics Colloquium:**, International Conference on Econophysics
Australian National University, Canberra, Australia, 14-18 November 2005.
“Scale-Free Avalanche Dynamics in the Stock Market”
- **LC2005**, International Workshop on Light-Cone QCD and Nonperturbative Hadron Physics
Joint CSSM, NITP and International Light Cone Advisory Committee (ILCAC) Workshop,
Cairns, Australia, 7–15 July 2005
“Role of Centre Vortices in Dynamical Mass Generation”
- **Baryons '04**, International Conference on the Structure of Baryons
Ecole Polytechnique, Palaiseau, France, October 25-29, 2004.
“Chiral Extrapolations of Lattice QCD Results”
- **PAVI '04**, International Workshop on Parity Violation and Hadronic Structure
Laboratoire de Physique Subatomique et de Cosmologie, Grenoble, France, June 8-11, 2004
“Precise Determination of the Strangeness Magnetic Moment of the Nucleon”
- **QCD Down Under**
Joint CSSM and NITP Workshop, Barossa Valley and Adelaide, Australia, March 11-19,
2004
“Precise Determination of the Strangeness Magnetic Moment of the Nucleon”
- **LHP2003**, 2nd International Workshop on Lattice Hadron Physics
Joint CSSM, NITP, and Jefferson Lab (TJNAF) Workshop, Cairns, Australia, July 22-30,
2003
“Strange Magnetic Moment of the Nucleon from FLIC Fermions”
- **Tokyo-Adelaide Joint Workshop on Quarks, Astrophysics and Space Physics**
Tokyo, Japan, January 6–10, 2003
“FLIC Fermions”

- **Gordon Research Conference: Photonuclear Interactions**
Tilton, NH, August 18–23, 2002
“Real Hadron Phenomenology from Lattice QCD”
- **LATTICE 2002**, 20th International Symposium on Lattice Field Theory
MIT, Cambridge, Massachusetts, 24-29 Jun 2002
“Panel Discussion on Chiral Extrapolation of Physical Observables”
- **QNP 2002**, International Conference on Quarks and Nuclear Physics
Julich, Germany, 9-14 Jun 2002
“FLIC Fermions and Hadron Phenomenology”
- **Workshop on Physics at the Japan Hadron Facility**
Joint CSSM / JHF / NITP Workshop, Adelaide, Australia, 14-21 Mar 2002
“Hadron Resonance Phenomenology from Lattice QCD”
- **LHP2001**, 1st International Workshop on Lattice Hadron Physics
Joint CSSM, NITP, and Jefferson Lab (TJNAF) workshop, Cairns, Australia. July 9 – 18, 2001.
“Quenched Chiral Perturbation Theory for Baryon Electromagnetic Form Factors”
- **Workshop on Lepton Scattering, Hadrons and QCD**
Joint CSSM, NITP workshop, Adelaide, Australia, March, 2001
“Hadron Physics from Lattice QCD”
- **International Workshop on Parity Violation in Atomic, Nuclear and Hadronic Systems**
Trento, Italy, June 5–17, 2000.
“Lattice QCD Calculations of the Strange Magnetic Form Factor of the Nucleon”
- **Few Body 2000**, XVIth International Conference on Few-Body Problems in Physics
National Taiwan University, Taipei, Taiwan. March 6–10, 2000
“Lattice QCD Calculations of Hadron Structure: Constituent Quarks and Chiral Symmetry”
- **QNP 2000**, International Conference on Quarks and Nuclear Physics
Adelaide, Australia. February 21–25, 2000
“Theoretical Perspective on the Strangeness Magnetic Form Factor”
- **Workshop on Hadronic Physics with Photon Beams**
Joint CSSM, NITP, and Jefferson Lab (TJNAF) workshop, Adelaide, Australia. February 16–18, 2000.
“Glueballs,” “Hybrids,” “Four-Quark” Mesons and “Molecular” Hadrons
- **Light-Cone ’99**, Workshop on Light-Cone QCD and Nonperturbative Hadron Physics
CSSM, Adelaide, Australia. December 13–22, 1999.
“Visualizations of the QCD Vacuum”
- **Gordon Research Conference: Photonuclear Interactions**
Tilton, NH, July 26–30, 1998
“Odd-Parity Baryon Resonances on the Lattice”
- **Workshop on Symmetries in the Strong Interaction**
CSSM, University of Adelaide, April 14-25, 1997.
“Improved Lattice Actions”
“Strangeness in the Nucleon from Lattice QCD”
“QCD Sum Rules for Skeptics”

- **ELSA and MAMI Workshop** on Electromagnetic Interactions
September 1–6, 1996. Bosen, Germany.
“The Electromagnetic Structure of Baryons from Lattice QCD”
- **Argonne Theory Institute**, QCD Based Studies of Hadron Spectroscopy and Interactions
July 22–26, 1996. Argonne, IL.
“QCD Sum Rules: From “Art” to Science”
- **Institute for Nuclear Theory**, University of Washington.
Workshop on “QCD Sum Rules for Nuclear Systems at Finite Density and Temperature.”
Sept. 30 – Oct. 1, 1994. Seattle, WA.
“Testing QCD Sum Rule Techniques on the Lattice”
- **Institute for Nuclear Theory**, Crystal Mountain Resort.
Workshop on “Probing Nucleon Structure by Real and Virtual Compton Scattering.”
Sept. 24–30, 1994.
“First Thoughts on Lattice QCD Investigations of Compton Scattering”

Keynote Presentations at National and International Conferences

- **Australian Institute of Physics National Congress 2005**
Invited Keynote Address
Australia National University, Canberra, 1st February 2005
“Visually Revealing the Secrets of QCD”
- **17th International Conference on Few-Body Problems in Physics (Few-Body 2003)**
Duke University/TUNL, Durham, NC, June 5–10, 2003
“Observing Chiral Nonanalytic Behavior with FLIC Fermions”

Conference Presentations and Workshops

- **23rd International Symposium on Lattice Field Theory (LATTICE 2005)**
Trinity College, Dublin, Ireland, 25–30 July 2005
“Power Counting Regime of Chiral Extrapolation and Beyond”
- **20th International Symposium on Lattice Field Theory (LATTICE 2002)**
Boston, Massachusetts, 24–29 June 2002
“FLIC Overlap Fermions and Topology”
- **Workshop on Lepton Scattering, Hadrons and QCD**
Joint CSSM and NITP workshop, Adelaide, Australia. March 26 – April 6, 2001.
“Meson Cloud Considerations in the Strange Magnetic Moment of the Nucleon from Lattice QCD”
- **Australian Institute of Physics Congress**
Adelaide, Australia, December, 2001.
“Quantum Monte Carlo Studies in Lattice Gauge Theory”
- **Lattice '99**. International Conference on Lattice Field Theory.
Pisa, Italy. June 29–July 3, 1999.
“Hadron Properties Beyond the Chiral Perturbative Regime”

- **Workshop on Lattice QCD**
CSSM, University of Adelaide, December 7–18, 1998.
“Nucleon Strangeness with Improved Uncertainties”
- **Lattice '98**. International Conference on Lattice Field Theory.
Boulder, Colorado. July 13–18, 1998.
“Modeling the Gluon Propagator”
- **Workshop on Scientific Parallel Computing**
CSSM, University of Adelaide, October 14, 1997.
“Numerical Simulations of Quantum Chromodynamics”
- **PANIC '96**, 14th International Conference on Particles and Nuclei.
May 22–28, 1996. Williamsburg, VA.
“Light Hadron Masses on Coarse Lattices with Improved Actions”
“QCD Equalities for Baryon Current Matrix Elements”
- **Baryons '95**, 7'th International Conference on the Structure of Baryons.
Oct. 3–7, 1995. Santa Fe, NM.
“New QCD Sum Rules for In-Medium Nucleons”
- **HYP94**. International Conference on Hypernuclear and Strange Particle Physics.
July 4–8, 1994. Vancouver, BC.
“Essential Strangeness in Nucleon Magnetic Moments”
- **Lattice '93**. International Conference on Lattice Field Theory.
October 12–16, 1993. Dallas, TX.
“A Few Points on Point-to-Point Correlation Functions”
- **Lattice '93**. International Conference on Lattice Field Theory.
October 12–16, 1993. Dallas, TX.
“Baryon Electromagnetic Structure:
Shedding Light on Models and their Mechanisms”
- **Institute for Nuclear Theory**, University of Washington.
July 25 – August 13, 1993. Seattle, WA.
Workshop on “Phenomenology and Lattice QCD.”
- **Canadian Association of Physicists Congress**. Simon Fraser University.
June 13–16, 1993. Burnaby, BC.
“New Insights into Baryon Electromagnetic Structure from Lattice QCD”
- **Baryons '92**, Yale University.
June 1–4, 1992. New Haven, CT.
“Baryon Electromagnetic Structure from Lattice QCD”
- **1992 Joint April Meeting of the APS and the AAPT**.
April 20–24, 1992. Washington, DC.
“Highlights of a Lattice QCD Analysis of Decuplet Baryon Structure”
- **Lattice '90**. International Conference on Lattice Field Theory.
October 8–12, 1990. Tallahassee, FL.
“On the Electromagnetic Properties of the Baryon Octet”

Supervision Summary

- Graduated 15 Postgraduate students. Currently supervising 5 Postgraduate students.
- One Graduate won the Postgraduate Alumni University Medal for best Ph.D. thesis in U. Adelaide.
- Three Graduates won the Faculty of Sciences Woolhouse Prize for best Ph.D. thesis in Sciences.
- Four Graduates deemed to have best Physics Ph.D. thesis in South Australia.
- Graduated 10 Honours students. Currently supervising 2 Honours students.
- Supervised 37 students in Summer-Research and Course-Work Projects.

Postgraduate Student Supervision

- **Ahmed El Bakry Mahmoud** – Ph.D. Program – full time 2007 to present
Lattice QCD
- **Peter Moran** – Ph.D. Program – full time 2007 to present
QCD Vacuum Structure from Lattice QCD
Electromagnetic Form Factors
Centre Vortex Phenomenology
- **Selim Mahbub** – Ph.D. Program – full time 2006 to present
Hadron Phenomenology from Lattice QCD
- **Jonathan Carroll** – Ph.D. Program – full time 2006 to present
Hadronic Physics and Stellar Models
- **John Hedditch** – Ph.D. Program – full time 2002 to 2007 – **Graduated**
SA Gold Bragg Nomination & Woolhouse Prize
Postgraduate Alumni University Medal
Correlation Matrix Analysis of Nucleon Resonances
Hybrid Meson Spectroscopy and Exotics
Electromagnetic Form Factors of Mesons
Postdoctoral Position: University of Queensland, Brisbane
- **Ben Lasscock** – Ph.D. Program – full time 2003 to 2007 – **Graduated**
CSSM Doctoral Prize
Vacuum Response to Colour Sources
Correlation Matrix Analysis of Nucleon Resonance Spectrum
Pentaquark Baryon Spectroscopy
Postdoctoral Position: Theory Center, Jefferson Lab, Newport News, VA, USA.
- **Marco Bartolozzi** – Ph.D. Program – full time 2003 to 2006 – **Graduated**
SA Gold Bragg Nomination & Woolhouse Prize
Econophysics: Self-Organized Criticality and Stock Market Dynamics
Postdoctoral Position: Research Scientist, Grinham Managed Funds, Crows Nest, NSW
- **Sharada Boinepalli** – Ph.D. Program – full time 2003 to 2006 – **Graduated**
Covariance Matrix Analyses of Electromagnetic Form Factors
Postdoctoral Position: Surface Ship Combat Systems, Maritime Operations, DSTO.

- **Ian Cloet** – Ph.D. Program – full time 2003 to 2006 – **Graduated**
 Finite Range Regularised Chiral Perturbation Theory
 Open Channel Physics in Delta Magnetic Form Factors
Postdoctoral Position: Argonne National Laboratory, Argonne, IL, USA
- **Maria Parappilly** – Ph.D. Program – full time 2003 to 2006 – **Graduated**
 Nonperturbative Gluon and Quark Propagators in Full QCD
Postdoctoral Position: Lecturer, Flinders University, SA
- **Ross Young** – Ph.D. Program – full time 2001 to 2004 – **Graduated**
SA Gold Bragg Nomination & Woolhouse Prize
 Finite Range Regularized Chiral Effective Field Theory
 Quenched Chiral Perturbation Theory
 Unquenching Baryon Masses and Magnetic Form Factors
Postdoctoral Position: Jefferson Lab, Newport News, VA, USA with Tony Thomas.
- **Jon Ashley** – M.Sc. Program – full time 2002 to 2004 – **Graduated**
 Chiral Extrapolation of Electromagnetic Form Factors
Postdoctoral Position: Musician, Melbourne, VIC, Australia.
- **Waseem Kamleh** – Ph.D. Program – full time 2000 to 2003 – **Graduated**
SA Gold Bragg Nomination
 FLIC-Overlap Fermions
 Mass and Renormalization Functions of the FLIC-Overlap Propagator
 Dynamical FLIC-Fermion Simulations via the Hybrid Monte Carlo (HMC) Algorithm
Postdoctoral Position: School of Mathematics, Trinity College, Dublin 2, Ireland with Mike Peardon.
- **James Zanotti** – Ph.D. Program – full time 1999 to 2002 – **Graduated**
SA Gold Bragg Nomination
 Novel Fat-Link Fermion Actions
 Nucleon Resonances from Lattice QCD
 Off-Axis Anisotropic Static Quark Potential in HPF
 Study of Two-Loop Scaling in Nonperturbative QCD
Postdoctoral Position: John von Neumann-Institut für Computing NIC/DESY, 15738 Zeuthen, Germany, with Gerrit Schierholz. Currently at University of Edinburgh, UK.
- **Frederic Bonnet** – Ph.D. Program – full time 1998 to 2002 – **Graduated**
 Pseudo-heatbath $\mathcal{O}(a^2)$ -Improved Anisotropic Gauge Field Generation in HPF
 APE Smearing and Cooling in HPF
 Overlap Fermion Quark Propagator
Postdoctoral Position: University of Regina, Regina, SA, Canada with Randy Lewis.
- **Sundance Bilson-Thompson** – Ph.D. Program – full time 1998 to 2002 – **Graduated**
 Derivation of $\mathcal{O}(a^4)$ -Improved QCD Operators
 Highly-Improved Cooling and Smearing in High Performance Fortran (HPF)
 Nahm Transform on the Lattice
Postdoctoral Position: Seoul National University, South Korea with Weonjong Lee. Currently at the Perimeter Institute, Canada.
- **Stewart Wright** – Ph.D. Program – full time 1998 to 2002 – **Graduated**
 Chiral Behavior of the Rho Meson in Lattice QCD
 The Sigma Commutator from Lattice QCD
 Baryon Masses from Lattice QCD: Beyond the Perturbative Chiral Regime

Postdoctoral Position: University of Liverpool, UK with Chris Michael. Currently Manager, Model Risk Review, Westpac Banking Corporation, Sydney.

- **Daniel Kusterer** – Masters Program – full time 2001 – **Exchange Student**
Eigenmode Correlations of the Hermitian Wilson Dirac Operator
Diploma Thesis Student: Universität Tübingen, Germany with Kurt Langfeld.
- **Emily Hackett-Jones** – Masters Program – full time 2000 to 2001 – **Graduated**
Chiral Extrapolations of Octet Baryon Magnetic Moments and Charge Radii
Postgraduate Student: Cambridge University, UK.
- **Patrick Bowman** – Ph.D. Program – full time 1998 to 2000 – **Graduated**
 $\mathcal{O}(a^2)$ -Improved Conjugate-Gradient-Accelerated Landau-Gauge Fixing
 $\mathcal{O}(a^2)$ -Improved Gluon Propagator in Coordinate and Momentum Space
Postdoctoral Position: Florida State University, USA with Urs Heller.

Honours Student Supervision

- **Jonathan Hall** – full time 2007
Quenched and Unquenched Chiral Effective Field Theory of Vector Mesons
- **Peter Moran** – full time 2006
Influence of Dynamical Fermions on the Topological Structure of QCD
- **Sebastian Wende** – full time 2005
Wavelet Transform Analysis of the Multi-fractal Nature of Time Series
- **James Chappell** – full time 2005
Superstatistics Distributions Underlying Financial Time Series
- **Ryan Coad** – full time 2003
Nonperturbative Quark Propagator in Laplacian Gauge
- **Mariuz Hoppe** – full time 2003
Baryon Mass Spectrum of FLIC-Overlap Fermions
- **Ian Cloet** – full time 2002
Delta Baryon Magnetic Moments in Padé-Improved Chiral Perturbation Theory
- **Ben Lasscock** – full time 2002
Lattice Scale Determinations via the Static Quark Potential Sommer Scale
- **Ben Crouch** – full time 2001
Meson-Baryon Couplings for Nucleon Resonances
- **John Hedditch** – full time 2001
Parallel Tree-Code for the N-Body Problem

Associated Postdoctoral Research Fellows

- **Dr Ben Lasscock** – full time 2006 to present
Magnetic Polarizabilities in the Background Field Formalism
Centre Vortex Phenomenology

- **Dr Alan O’Cais** – full time 2006 to present
All-to-all propagator techniques
Centre Vortex Phenomenology
- **Dr Andre Sternbeck** – full time 2006 to present
Quark, gluon and ghost propagators
- **Dr Ping Wang** – full time 2003 to 2005
Partially-quenched finite-range regularised chiral effective field theory
Chiral SU(3) Quark Mean-Field Model
Liquid-Gas Phase Transition of Strange Hadronic Matter
- **Dr Waseem Kamleh** – full time 2003 to 2004
FLIC-Overlap Fermions
Dynamical FLIC-Fermion Simulations via the Hybrid Monte Carlo (HMC) Algorithm
- **Dr Danielle Morel** – full time 2002 to 2004
Chiral Extrapolation of Baryon Resonance Masses
- **Dr Patrick Bowman** – full time 2002 to 2003
Laplacian and Landau Gauge Quark and Gluon Propagators
- **Dr James Zanotti** – full time 2002 to 2003
Chiral Properties of Baryon Electromagnetic Form Factors via FLIC Fermions
- **Dr Jianbo Zhang** – full time 2000 to 2005
Baryon Electromagnetic Form Factors Correlation Functions
Overlap Fermion Quark Propagator and Topology
Nonperturbative Renormalization
- **Dr Jon Ivar Skullerud** – full time 1997 to 1999
Baryon Electromagnetic Form Factors Correlation Functions
Overlap Fermion Quark Propagator and Topology

Teaching Experience

- **Physics 1A – Thermodynamics** – Year level one, first semester.
 - Duties:** Thermodynamics coordinator. Present six one-hour lectures each week. Prepare MyUni quizzes, assignment questions, tutorial problems and associated solutions. Set and mark the final exam.
 - Material:** Ideal gas temperature, 0th law, expansion of materials, specific heat, latent heat, heat transfer, radiation, 1st law, kinetic theory, P - V - T & thermodynamic processes.
 - Innovations:** Increased relevance through real-life demonstrations of thermodynamics. Stimulated interest by linking thermodynamic convection to Chaos and illustrating the Lorenz attractor via advanced computer visualization techniques.
- **Classical Fields and Mathematical Methods II** – Year level two, second semester.
 - Duties:** Subject coordinator. Present two one-hour lectures each week. Present two one-hour tutorials fortnightly. Prepare and grade tests and the final exam.
 - Material:** Integration, Gauss and Stokes’ theorem, Laplace and Poisson equations, Boundary value problems, Generalized functions, Tensors and rotations.
 - Innovations:** Introduced “Conceptual Mediation” techniques to improve students’ adoption of new concepts. Stimulated interest and understanding using advanced visualization.

- **Computational Physics III** – Year level three, first semester.

Duties: Curriculum creator. Present two one-hour lectures each week.
Create and present weekly tutorials and model program solutions.
Prepare and grade tests and the final exam.

Material: Computational physics coding tactics in Fortran-95, Numerical Integration, Data Interpolation, Integration of Ordinary Differential Equations, Optimization of Functions and Data Fitting, Monte Carlo Simulations.

Innovations: The emphasis is on the development of coding tactics that facilitate the creation of clear correct solutions. The tactics take full advantage of the modern language structures of Fortran 95. The course uses the most advanced numerical methods available. The solutions are robust providing a clear pathway to leading-edge research problems.

- **Quantum Mechanics III** – Year level three, first semester.

Duties: Subject coordinator. Present three one-hour lectures each week.
Prepare and grade assignments and the final exam.

Material: Postulates of Q.M., Dirac bra-ket notation, Symmetry and conservation, Angular momentum, Schrodinger equation in 3 dimensions, Perturbation theory and the Fine structure of hydrogen.

Innovations: Introduction of computer generated animations of 3D volume rendered plots of wave functions to stimulate interest and increase understanding.

- **Relativistic Quantum Mechanics & Particle Physics** – Honours level, first semester.

Duties: Subject coordinator. Present two one-hour lectures each week.
Prepare and grade assignments and the final exam.

Material: Dirac equation, Lorentz transformations, Antimatter, Parity, Charge conjugation, Gyromagnetic ratio, Klein-Gordon and Dirac central potential solutions, Symmetry and conservation in Particle Physics, Standard model of the universe

Innovations: Incorporate recent developments at the cutting-edge of particle physics including neutrino oscillations, Higgs bosons, exotic hadrons and strangeness in the proton.

Service to Discipline – International

International Advisory Committee	International Symposium on Lattice Field Theory	2007–present
Chair ILDG Board	International Lattice DataGrid (ILDG) Board	2007
International Advisory Committee	International Light Cone Advisory Committee (ILCAC)	2005–present
International Advisory Committee	Conference on Few-Body Problems in Physics Third Asia-Pacific Conference Thailand. July 25 – 29, 2005	2004–2005
Chair LC2005 Organizing Committee	Workshop on Light-Cone QCD and Nonperturbative Hadron Physics 2005 (LC2005) Joint CSSM and NITP workshop Cairns, Australia. July 7 – 15, 2005	2004–2005
Organizing Committee	Workshop on Lattice Hadron Physics (LHP2003) Joint CSSM, NITP, and Jefferson Lab (TJNAF) workshop Cairns, Australia. July 22 – 30, 2003	2002–2003
Organizing Committee	Workshop on Lattice Hadron Physics (LHP2001) Joint CSSM, NITP, and Jefferson Lab (TJNAF) workshop Cairns, Australia. July 9 – 18, 2001	2000-2001
Organizing Committee	International Conference on Quark Nuclear Physics Joint CSSM and NITP conference University of Adelaide, February, 2000	1999-2000
Chief Organizer	International Workshop on Lattice QCD University of Adelaide, December 7–18, 1998	1998
Referee	European Physical Journal A Physica A Physical Review Letters Nuclear Physics B Physics Letters B Physical Review C, D	2007–present 2005–present 2001–present 2001–present 2000–present 1991–present
Referee	Australian Research Council US Department of Energy US National Science Foundation	1997–present 1992–present 1992–present

Service to Discipline – National

Topic Chair	Nuclear and Particle Physics (NUPP) Australian Institute of Physics (AIP) 2008 Congress	2007–present
Board Member	Australian Institute for High Energy Physics (AUSHEP)	2007–present
Deputy Director	ARC Special Research Centre for the Subatomic Structure of Matter (CSSM) University of Adelaide	2004–present
SA Representative	Australian Institute of Nuclear Science and Engineering	2003–present
Invited Presenter	Convention of Australian Science Teachers Association (CONASTA) “Virtual Reality Up Close”	2006
Management Committee	National Computing Facility for Lattice Gauge Theory	2000–2004
Thesis Examiner	Mustaq Loan University of New South Wales	2003
Thesis Examiner	Maria Samaras University of New South Wales	2000
Organizing Committee	14th National Congress of the Australian Institute of Physics University of Adelaide, December	2000

Administration, Service, and Leadership in the University

Head of School	School of Chemistry & Physics University of Adelaide	2008–present
Board Member	Academic Board University of Adelaide	2008–present
Associate Dean (ICT)	Faculty of Sciences University of Adelaide	2006–2008
Committee Participant	Executive Steering Committee for IT (ESCIT) Strategic Directions University of Adelaide	2006–2008
Committee Participant	IT Facilitation Committee University of Adelaide	2006–2008
Committee Participant	Technology in Education Committee University of Adelaide	2007–2008
RQF Coordinator	Matter and Its Interactions University of Adelaide	2007
RQF Panel Participant	Mathematical & Information Sciences & Tech. University of Adelaide	2007
Board Member	Faculty of Sciences Board University of Adelaide	2006–present
Science Writer	The Advertiser Newspaper Column: <i>Can You Believe It?</i> Faculty of Sciences University of Adelaide	2005–present
Founding Deputy Director (Visualization)	South Australian Partnership for Advanced Computing (SAPAC) serving University of Adelaide Flinders University, and University of South Australia	2002–present
Program Coordinator	High-Performance Computational Physics HPCP(Hons), University of Adelaide	2005–present
Chair, Student Liaison Committee	Discipline of Physics University of Adelaide	2006
Strategic Marketing Committee	Faculty of Sciences University of Adelaide	2005–2006
Curriculum Committee	Department of Physics University of Adelaide	2005–present
School Library Committee	School of Chemistry and Physics University of Adelaide	2004–2006
Seminar Coordinator	Revealing Every ALgorithm (REAL) Lattice Gauge theory CSSM, University of Adelaide	2003–present

Administration, Service, and Leadership in the University (Cont.)

Chief Organizer	CSSM Open Day Exhibits University of Adelaide	1999–present
CSSM Presenter	High School Groups Approximately 100 students each year	1999–present
Chief Examiner	Foundation Studies Program Eynesbury College, Adelaide, SA	1998–present
Invited Presenter	Siemens Science Experience “Virtual Reality Up Close”	2006–present
Vertical Structuring Committees	Electromagnetism and Quantum Mechanics Discipline of Physics University of Adelaide	2005
Named Degree Co-founder	High-Performance Computational Physics School of Chemistry and Physics University of Adelaide	2003
Level II Coordinator	Dept. Physics and Math. Physics University of Adelaide	2001–2003
Curriculum Committee	Dept. Physics and Math. Physics University of Adelaide	2001–2003
Web Page Developer	Dept. Physics and Math. Physics University of Adelaide	1998–2003
Deputy Director	Centre for High-Performance Computing and Applications (CHPCA) University of Adelaide	2001
Committee Participant	Faculty of Science Communication and Promotions Liaison Committee University of Adelaide	2001
Invited Presenter	Siemens Science Experience	2000 and 2001
Committee Participant	Visual Identity Reference Group University of Adelaide	2000
Invited Presenter	National Youth Science Forum	2000
Invited Presenter	Physics Olympians	2000
Invited Presenter	Country Teacher Campus Visit	1999–2000
Chair	Australian Institute of Physics South-Australia Branch	1999–2000
Invited Presenter	Science Scholars Program	1999
Invited Presenter	Switched on to Science	1998 and 1999
Chief Organizer	Workshop on Scientific Parallel Computing University of Adelaide, October 14, 1997	1997

Research Collaborations

Country	Institution	Department	Person
Australia	University of New South Wales	Physics	Chris Hamer
	Adelaide University	Computer Science	Paul Coddington
Canada	Carleton University	Physics	Stephen Godfrey
	University of British Columbia	Physics	Javed Iqbal
	TRIUMF	Theory Group	Richard Woloshyn
	York University	Applied Mathematics	Kim Maltman
Germany	Johannes Gutenberg-Uni. Mainz	Institut fuer Kernphysik	Jambul Gegelia
	Johannes Gutenberg-Uni. Mainz	Institut fuer Kernphysik	Stefan Scherer
	Universität Tübingen	Theoretische Physik	Daniel Kusterer
	Universität Tübingen	Theoretische Physik	Kurt Langfeld
Ireland	Trinity College	Theoretical Physics	Jonivar Skullerud
New Zealand	Massey University	Inst. of Fundamental Sciences	Tony Signal
	Massey University		Fu-Guang Cao
	Massey University	Physics	Francois Bissey
	Massey University		Patrick Bowman
Taiwan	National Taiwan University	Physics	Ding Hui Lu
UK	Swansea University	Physics	Chris Allton
USA	American Physical Society	Physical Review	Urs Heller
	University of Connecticut	Physics	Gerald Dunne
	George Washington University	Physics	Frank Lee
	Jefferson Laboratory	Theory Group	Wally Melnitchouk
	Jefferson Laboratory	Theory Group	David Richards
	University of Kentucky	Physics	Keh-Fei Liu
	University of Kentucky	Physics	Terrence Draper
	University of Maryland	Physics	Tom Cohen
	New Mexico State University	Physics	Matthias Burkardt
Ohio State University	Physics	Richard Furnstahl	

Departmental Colloquia

- **Johannes Gutenberg-Universität**, Institut für Kernphysik Colloquium
28 September 2004, Mainz, Germany
“Visually Revealing the Secrets of QCD”
- **George Washington University**, Department of Physics Colloquium
20 September 2004, Washington DC, USA
“Visually Revealing the Secrets of QCD”
- **Jefferson Laboratory**, Physics Division Colloquium
27 August 2004, Newport News, VA, USA
“Visually Revealing the Secrets of QCD”
- **Massey University**, Department of Physics Colloquium
26 November 2003, Palmerston North, New Zealand
“Visualizations of Quantum Chromodynamics”

- **University of Melbourne**, Department of Physics Colloquium
13 August 2003, Melbourne, Australia
“Visualizations of Quantum Chromodynamics”
- **Centre for Quantum Computer Technology, The University of Queensland**, Department of Physics Colloquium
27 June 2003, St. Lucia, Australia
“Visualizations of Quantum Chromodynamics”
- **McMaster University**, Department of Physics Colloquium.
February 21, 2001, Hamilton, ON
“Visualizations of Proton Structure”
- **Rensselaer Polytechnic Institute**, Department of Physics Colloquium.
January 31, 2000, Troy, NY
“Visualizations of Quantum Chromodynamics”
- **Flinders University**, Department of Physics Colloquium.
June 21, 1999, Adelaide, Australia
“Visualizations of Quantum Chromodynamics”
- **Florida International University**, Department of Physics Colloquium.
April 3–4, 1997, Miami, Florida
“Unlocking the Secrets of Nonperturbative QCD”
- **University of Regina**, Department of Physics Colloquium.
March 24–5, 1997, Regina, SK, Canada
“QCD Sum Rules: From “Art” to Science.”
“Unlocking the Secrets of Nonperturbative QCD”
- **Indiana University**, Department of Physics Colloquium.
March 10–12, 1997, Bloomington, Indiana
“Unlocking the Secrets of Nonperturbative QCD”
- **North Carolina Central University**, Department of Physics Colloquium.
February 12–13, 1997, Durham, North Carolina
“Unlocking the Secrets of Nonperturbative QCD”
- **York University**, Department of Physics Colloquium.
February 15, 1994, North York, ON Canada
“Shedding Light on the Structure of the Proton.”
- **Carnegie-Mellon University**, Department of Physics Colloquium.
February 7, 1994, Pittsburgh, PA
“Shedding Light on the Structure of the Proton.”
- **University of Western Ontario**, Applied Mathematics and Physics Colloquium.
January 27, 1994, London, ON Canada
“Shedding Light on the Structure of the Proton.”
- **University of Guelph**, Department of Physics Colloquium.
January 25, 1994, Guelph, ON Canada
“Shedding Light on the Structure of the Proton.”
- **McMaster University**, Department of Physics Colloquium.
January 19, 1994, Hamilton, ON Canada
“Shedding Light on the Structure of the Proton.”

- **Dalhousie University**, Department of Physics Colloquium.
November 13, 1991, Halifax, Nova Scotia, Canada
“Where are the Quarks in the Proton and What are They Doing There?”
- **University of Ohio**, Department of Physics Colloquium.
November 1, 1991, Athens, OH Canada
“Where are the Quarks in the Proton and What are They Doing There?”
- **TRIUMF**, Colloquium.
October 4, 1990, Vancouver, BC Canada
“A Pedagogical Overview of Lattice QCD”

Invited Seminars and Collaborations

- **Johannes Gutenberg-Universität**, Institut für Kernphysik Seminar.
30 September 2004, Mainz, Germany
“Precise Determination of the Strangeness Magnetic Moment of the Nucleon”
- **University of Maryland**, Theory Group Seminar.
16 September 2004, College Park, MD, USA
“Visually Revealing the Secrets of QCD”
- **Jefferson Laboratory**, Theory Seminar.
30 August 2004, Newport News, VA, USA
“Precise Determination of the Strangeness Magnetic Moment of the Nucleon”
- **University of Melbourne**, Department of Physics Seminar.
12 August 2003, Melbourne, Australia
“Chiral Physics Phenomenology from Lattice QCD”
- **Florida State University**, Department of Physics Seminar.
February 14, 2001, Tallahassee, Florida
“Visualizations of the QCD Vacuum”
- **Rensselaer Polytechnic Institute**, Department of Physics Seminar.
February 1, 2000, Troy, New York
“Hadron Structure from Lattice QCD”
- **University of Colorado**, Nuclear Physics Laboratory Seminar.
February 5–12, 1997, Boulder, Colorado
Collaborative visit with Frank Lee. Presentation of:
“Strangeness in the Nucleon from Nonperturbative QCD”
- **York University**, Physics Seminar Series.
April 16–19, 1996, Toronto, ON Canada
“QCD Sum Rules: From “Art” to Science” Parts 1 and 2.
“Strangeness in the Nucleon”
- **University of Pittsburgh**, Nuclear Physics Seminar.
February 1, 1996, Pittsburgh, PA
“The Truth About QCD Sum Rules for the Nucleon”
- **Argonne National Laboratory**, Nuclear Theory Seminar.
January 25, 1996 Argonne, IL
“The Truth About QCD Sum Rules for the Nucleon”

- **University of Washington**, Nuclear Theory Group.
Feb. 13–15, 1995. Seattle, WA.
“The Predictive Ability of QCD Sum Rules”
- **Saint Mary’s University**, Collaborative meeting with Malcolm Butler and Roxanne Springer. August 1–5, 1994. Halifax, NS.
Exploring chiral nonanalyticities in baryon magnetic moments.
- **University of Washington**, Nuclear Theory Group.
April 21, 1994. Seattle, WA.
“The Physics of QCD Correlation Functions”
- **University of Kentucky**, Theory Group Seminar.
November 1–4, 1993. Lexington, KY.
“QCD Sum Rules and Short Time Correlation”
“QCD Sum Rule Technology and its Limits”
- **Argonne National Laboratory**, Nuclear Theory Seminar.
April 1, 1993. Argonne, IL.
“The Inquisition of the Untouchables: A Lattice QCD Inquiry of the Quark Substructure of Baryons”
- **Duke University**, Nuclear Theory Seminar.
March 4, 1993. Durham, NC.
“What can Lattice QCD teach us about Baryon Structure?”
- **Ohio State University**, Nuclear Theory Seminar.
Feb. 1, 1993. Columbus, OH.
“New Insights into Baryon Electromagnetic Structure from Lattice QCD”
- **Indiana University Cyclotron Facility**, Nuclear Theory Seminar.
July 27–29, 1992. Bloomington, IN.
“Baryon Electromagnetic Structure from Lattice QCD”
- **University of Kentucky**, Collaborative meeting with K. Liu, T. Draper, B. Li and R. Woloshyn.
July 13–24, 1992. Lexington, KY.
- **CEBAF**, Theory Group Seminar.
May 11–13, 1992. Newport News, VA.
“Baryon Electromagnetic Structure from Lattice QCD”
- **University of Maryland**, Nuclear Theory Group Seminar.
March 15, 1991. College Park, MD.
“The Electromagnetic Structure of Baryons”
- **Simon Fraser University**, Theory Group Seminar.
March 1, 1991. Burnaby, BC.
“The Quark Substructure of Baryons”
- **University of British Columbia**, Theoretical Physics Seminar.
November 13, 1990. Vancouver, BC.
“The Electromagnetic Structure of Octet Baryons”
- **TRIUMF**, Theory Group Seminar.
February 1989. Vancouver, BC.
“QCD Sum Rule Analysis of Spin-Orbit Splitting in Baryons”