

Andrew John Daley Curriculum Vitae, October 2013

Personal

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Born: 24 October 1978, Auckland, New Zealand

Citizenship: New Zealand

Languages Spoken: English (Native), German

Marital Status: Single



Physics-Related Employment

Oct 2013- Professor, Department of Physics, University of Strathclyde, Glasgow, Scotland, UK

Jan 2011- Assistant Professor, Department of Physics and Astronomy, University of Pittsburgh, Pittsburgh, Pennsylvania, United States of America.

Oct 2009- Senior Scientist, Institute for Quantum Optics and Quantum Information of the
Dec 2010 Austrian Academy of Sciences, Innsbruck, Austria.

Sep. 2007- Wissenschaftlicher Mitarbeiter Kategorie I, (university position with lecturing and
Sep. 2009 research responsibilities), Institute for Theoretical Physics, University of Innsbruck.

Oct. 2005- Wissenschaftlicher Mitarbeiter Kategorie I [1/2 Position] and Postdoctoral researcher
Aug. 2007 [1/2 Position], Institute for Theoretical Physics, University of Innsbruck.

Sep. 2002- Forschungsassistent (Research Assistant),
Sep. 2005 Institute for Theoretical Physics, University of Innsbruck.

Education

2002-05 PhD in Physics under the supervision of Peter Zoller in the Institute for Theoretical Physics, University of Innsbruck. Thesis *Manipulation and Simulation of Cold Atoms in Optical Lattices* [Title "Dr. rer. nat." conferred 6 September 2005].

2000-01 Master of Science with first class honours in Physics, University of Auckland. Thesis *Action Space Diffusion Resonances for an Atom Optics Kicked Rotor with Decoherence and Amplitude Noise* [Conferred September 2002]

1997-99 Bachelor of Science (majors in Physics and Mathematics), University of Auckland. [Conferred May 2000]

1992-96 Macleans College, Howick, Auckland. University Entrance via NZ University Bursary Examinations.

1990-91 Bucklands Beach Intermediate School, Bucklands Beach, Auckland.

1983-89 Murvale Primary School, Bucklands Beach, Auckland.

Awards

- 2012 National Science Foundation CAREER Award
2009 Boltzmann Prize of the Austrian Physical Society
Sep 2002 Seichi Waki Prize for the best thesis research during MSc, Department of Physics, University of Auckland.
2000-01 University of Auckland Masters Scholarship

Recent Professional service

- 2013 Co-Chair of the FINESSE 2013 Meeting, Queenstown, New Zealand (February 16-20)
2012-13 Guest Editor for focus issue of the New Journal of Physics on “Out-of-Equilibrium Dynamics in Strongly Interacting One-Dimensional Systems”

Current Research Grants

1. Air Force Office of Scientific Research, March 1 2013 – February 28 2015
Non-Equilibrium Many-Body Dynamics and Heating of Quantum Emulators
FA9550-13-1-0093 (Single investigator grant)
Expected Total Funding (over 3 years): US \$393,389
2. DARPA OLE Program (via ARO), November 15 2012 – May 15 2014
Quantum Phases of Matter in Optical Lattices
[Co-PI, as part of the MIT team, PI: Wolfgang Ketterle]
Expected Total Funding (over 1.5 years) for our part of this project: US \$154,500
3. NSF CAREER Award, August 15 2012 – July 31 2017
CAREER: Non-Equilibrium Coherent Many-Body Dynamics with Cold Atoms
(Principal Investigator)
Expected Total Funding (over 5 years): US \$474,819
4. Air Force Office of Scientific Research, March 15 2012 – March 14 2017
Quantum Speedup for Turbulent Combustion Simulations, FA9550-12-1-0057
[Co-PI, PI is Peyman Givi, Swanson School of Engineering, University of Pittsburgh]
Expected Total Funding (over 5 years) for our part of this project: US \$907,765

Previous Research Grants

5. Austrian FWF SFB F40 “FOQUS”, Foundations and Applications of Quantum Science 2009-2012
Project P15: “Many-body physics with cold atoms and molecules” [Co-PI, (PI was M. Baranov)]
Project P16: “Quantum Optics and Quantum Information” [Co-PI, (PI was P. Zoller)]
Total Funding for these two projects (over 4 years): EUR 742,800.00
6. Austrian FWF Project Number I118_N16, 1 June 2007 – 31 May 2010
EuroQUAM_DQS: Quantum simulation using cold atoms in optical lattices
(Principal Investigator)
Total Funding (over 3 years): EUR 101,272.50

Teaching Experience

- 2011- Assistant Professor, Department of Physics and Astronomy, University of Pittsburgh
- Spring Term 2013: PHYS 1341: Thermodynamics and Statistical Mechanics (Undergraduate Course)
- Fall Term 2012: PHYS 110: Introduction to Physics
(Undergraduate Course for Biology/Chemistry majors, 250 students)
- Spring Term 2012: PHYS 1341: Thermodynamics and Statistical Mechanics (Undergraduate Course)
- Spring Term 2011: PHYS 3716: Advanced Solid State Physics (Graduate course)
- 2005-09 Wissenschaftlicher Mitarbeiter Kategorie I, Institute for Theoretical Physics, University of Innsbruck:
- Summer Semester 2009:
Problem Solving Course: Quantum Mechanics 2 (German, 2 hrs/wk.)
Problem Solving Course: Theoretical Physics 2 [Quantum Mechanics 1] (German, 2 hrs/wk.)
(Note: At the University of Innsbruck, Problem solving courses are independently taught and examined courses that are run in parallel to lecture courses.
Quantum Mechanics 1 and 2 are compulsory courses for all physics students and for all theory students, respectively).
- Winter Semester 2008-09:
Problem Solving Course: Theoretical Physics 2 [Quantum Mechanics 1] (German, 4 hrs/wk.)
- Summer School Lectures 2008:
Summer School on Cold Atoms in Optical Lattices, University of Oxford
(4 lectures on “Theory of Atoms in Optical Lattices”, 2 Problem solving classes)
- Summer Semester 2008:
Lecture: “The Physics of Cold Atoms” (English, 2 hrs/wk.)
(Note: This was a course I prepared myself in 2006, when it was first taught in Innsbruck)
Practical Course (Lectures + Exercises):
“Numerical Methods for Quantum Mechanics” (English, 2 hrs/wk.)
- Winter Semester 2007-08:
Problem Solving Course: Quantum Mechanics 2 (German, 2 hrs/wk.)
Problem Solving Course: Theoretical Physics 2 [Quantum Mechanics 1] (German, 2 hrs/wk.)
- Summer Semester 2007:
Lecture: “The Physics of Cold Atoms” (English, 2 hrs/wk.)
Problem Solving Course: “The Physics of Cold Atoms” (English, 1hr/wk.)
- Winter Semester 2006-07:
Problem Solving Course: Theoretical Physics 2 [Quantum Mechanics 1] (German, 2 hrs/wk.)
- Summer Semester 2006:
Lecture: “The Physics of Cold Atoms” (English, 2 hrs/wk.)
- Winter Semester 2005-06:
Seminar “Current Topics in Quantum Optics and Cold Atoms” (English, 2 hrs/wk.)
- 2003-04 Tutor, Institute for Theoretical Physics, University of Innsbruck.
- Winter Semester 2003-04: Tutorial for Mathematical Methods in Physics 2
- 2002 Limited Term Tutor, Department of Physics, University of Auckland.
- Laboratory demonstration for 2nd and 3rd year courses (+ marking experimental work)
- 15 x 1hr Lectures on “Waves, Sound and Light” for the first year “Basic Concepts in Physics” course. (+ setting assignments, tests, and part of the final examination)
- 3 x 1 hr lectures for the second year “Optics and Electronics” course
- 1 x 2 hr lecture in the second year “Physics in Action” course, on “Bose-Einstein Condensates”
- Tutor on a Field trip for second year introductory geophysics course (April 2002).
- 2000-01 Limited Term Tutor, Department of Physics, The University of Auckland.
- Laboratory demonstration for 2nd and 3rd year courses (+ marking experimental work)
- 1 Lecture in the second year “Physics in Action” course
(on the topic “Laser Cooling and its Applications”)
- Tutor on a field trip for a second year introductory geophysics course (April 2001).

Publications - Recent Preprints

1. J. Schachenmayer, B. P. Lanyon, C. F. Roos, and A. J. Daley, *Entanglement growth in quench dynamics with variable range interactions*, arXiv:1305.6880.
2. J. Schachenmayer, L. Pollet, M. Troyer, and A. J. Daley, *Spontaneous emissions and thermalization of cold bosons in optical lattices*, arXiv:1305.1301.
3. F. Meinert, M. J. Mark, E. Kirilov, K. Lauber, P. Weinmann, A. J. Daley, and H.-C. Nägerl, *Many-body quantum quench in an atomic one-dimensional Ising chain*, arXiv:1304.2628.

Publications - Articles

1. H. Pichler, L. Bonnes, A. J. Daley, A. M. Läuchli, and P. Zoller, *Thermal vs. Entanglement Entropy: A Measurement Protocol for Fermionic Atoms with a Quantum Gas Microscope*, New J. Phys. **15**, 063003 (2013). (arXiv:1302.1187)
2. F. Massel, A. Kantian, A. J. Daley, T. Giamarchi, and P. Törmä, *Dynamics of an impurity in a one-dimensional lattice*, New J. Phys. **15**, 045018 (2013). (arXiv:1210.4270)
3. H. Pichler, J. Schachenmayer, A. J. Daley, and P. Zoller, *Heating dynamics of bosonic atoms in a noisy optical lattice*, Phys. Rev. A **87**, 033606 (2013). (arXiv:1301.2803)
4. H. Pichler, J. Schachenmayer, J. Simon, P. Zoller, and A. J. Daley, *Dressed, noise- or disorder- resilient optical lattices*, Phys. Rev. A **86**, 051605(R) (2012). (arXiv:1205.6189)
5. M. Foss-Feig, A. J. Daley, J. K. Thompson, and A. M. Rey, *Steady-state many-body entanglement of hot reactive fermions*, Phys. Rev. Lett. **109**, 230501 (2012). (arXiv:1207.4741)
6. A. J. Daley, H. Pichler, J. Schachenmayer, and P. Zoller, *Measuring entanglement growth in quench dynamics of bosons in an optical lattice*, Phys. Rev. Lett. **109**, 020505 (2012). (arXiv:1205.1521)
7. M. J. Mark, E. Haller, K. Lauber, J. G. Danzl, A. Janisch, H. P. Büchler, A. J. Daley, and H.-C. Nägerl, *Preparation and spectroscopy of a metastable Mott insulator state with attractive interactions*, Phys. Rev. Lett. **108**, 215302 (2012). (arXiv:1201.1008)
8. W. Yi, S. Diehl, A. J. Daley, and P. Zoller, *Driven-dissipative many-body pairing states for cold fermionic atoms in an optical lattice*, New J. Phys. **14** 055002 (2012). (arXiv:1111.7053)
9. M. J. Mark, E. Haller, K. Lauber, J. G. Danzl, A. J. Daley, and H.-C. Nägerl, *Precision Measurements on a Tunable Mott Insulator of Ultracold Atoms*, Phys. Rev. Lett. **107**, 175301 (2011). (arXiv:1107.1803)
10. R. M. Sandner, M. Müller, A. J. Daley, and P. Zoller, *Spatial Pauli-blocking of spontaneous emission in optical lattices*, Phys. Rev. A **84**, 043825 (2011). (arXiv:1107.3375)
11. A. J. Daley, *Quantum computing and quantum simulation with Group-II atoms*, Quantum Information Processing **10**, **865** (2011). (arXiv:1106.5712)
12. A. J. Daley, J. Ye, and P. Zoller, *State-dependent lattices for quantum computing with alkaline-earth-metal atoms*, Eur. Phys. J. D **65**, 207 (2011). (arXiv:1102.1463)
13. A. Privitera, I. Titvinidze, S.-Y. Chang, S. Diehl, A. J. Daley, and W. Hofstetter, *Loss-induced phase separation and pairing for 3-species atomic lattice fermions*, Phys. Rev. A **84**, 021601(R) (2011). (arXiv:1010.0114)
14. J. Schachenmayer, A. J. Daley, and P. Zoller, *Atomic matter-wave revivals with definite atom number in an optical lattice*, Phys. Rev. A **83**, 043614 (2011). (arXiv:1101.2385)
15. I. Titvinidze, A. Privitera, S.-Y. Chang, S. Diehl, M. Baranov, A. J. Daley, and W. Hofstetter, *Magnetism and domain formation in SU(3)-symmetric multi-species Fermi mixtures*, New Journal of Physics **13**, 035013 (2011). (arXiv:1012.4499)
16. H. Pichler, A. J. Daley, and P. Zoller, *Non-equilibrium dynamics of bosonic atoms in optical lattices: Decoherence of many-body states due to spontaneous emission*, Phys. Rev. A **82**, 063605 (2010). (arXiv:1009.0194)

17. S. Diehl, W. Yi, A. J. Daley, and P. Zoller, *Driven Dissipative d-Wave Pairing of Atomic Fermions*, Phys. Rev. Lett. **105**, 227001 (2010). (arXiv:1007.3420)
18. J. Schachenmayer, I. Lesanovsky, A. Micheli, and A. J. Daley, *Dynamical crystal creation with polar molecules or Rydberg atoms in optical lattices*, New J. Phys **12**, 103044 (2010). (arXiv:1003.5858)
19. S. Diehl, M. Baranov, A. J. Daley, and P. Zoller, *Quantum Field Theory for the Three-Body Constrained Lattice Bose Gas -- Part II: Application to the Many-Body Problem*, Phys. Rev. B **82**, 064510 (2010). (arXiv:0912.3196)
20. S. Diehl, M. Baranov, A. J. Daley, and P. Zoller, *Quantum Field Theory for the Three-Body Constrained Lattice Bose Gas -- Part I: Formal Developments*, Phys. Rev. B **82**, 064509 (2010). (arXiv:0912.3192)
21. A. Kantian, A. J. Daley, and P. Zoller, *An eta-condensate of fermionic atom pairs via adiabatic state preparation*, Phys. Rev. Lett. **104**, 240406 (2010). (arXiv:0911.2005)
22. S. Diehl, M. Baranov, A. J. Daley, and P. Zoller, *Observability of Quantum Criticality and a Continuous Supersolid in Atomic Gases*, Phys. Rev. Lett **104**, 165301 (2010). (arXiv:0910.1859)
23. M. Gustavsson, E. Haller, M. J. Mark, J. G. Danzl, R. Hart, A. J. Daley, and H.-C. Naegerl, *Interference of interacting matter waves*, New J. Phys. **12**, 065029 (2010). (arXiv:0812.4836)
24. J. Schachenmayer, G. Pupillo, and A. J. Daley, *Time-dependent currents of 1D bosons in an optical lattice*, New J. Phys. **12**, 025014 (2010). (arXiv:0908.2485)
25. A. W. Glaetzle, K. Hammerer, A. J. Daley, R. Blatt, and P. Zoller, *A single trapped atom in front of an oscillating mirror*, Optics Communications **283**, 758 (2010). (arXiv:0909.1814)
26. A. Kantian, M. Dalmonte, S. Diehl, W. Hofstetter, P. Zoller, and A. J. Daley, *An atomic colour superfluid via three-body loss*, Phys. Rev. Lett **103**, 240401 (2009). (arXiv:0908.3235)
27. Y.-J. Han, Y.-H. Chan, W. Yi, A. J. Daley, S. Diehl, P. Zoller, L.-M. Duan, *Stabilization of the p-wave superfluid state in an optical lattice*, Phys. Rev. Lett. **103**, 070404 (2009). (arXiv:0905.2600)
28. H. Venzl, A. J. Daley, F. Mintert, and A. Buchleitner, *Simulability and regularity of complex quantum systems*, Phys. Rev. E **79**, 056223 (2009). (arXiv:0808.3911)
29. A. V. Gorshkov, A. M. Rey, A. J. Daley, M. M. Boyd, J. Ye, P. Zoller, and M. D. Lukin, *Alkaline-Earth Atoms as Few-Qubit Quantum Registers*, Phys. Rev. Lett **102**, 110503 (2009). (arXiv:0812.3660)
30. A. J. Daley, J. M. Taylor, S. Diehl, M. Baranov, and P. Zoller, *Atomic three-body loss as a dynamical three-body interaction*, Phys. Rev. Lett **102**, 040402 (2009). (arxiv:0810.5153)
31. A. J. Daley, M. M. Boyd, J. Ye, and P. Zoller, *Quantum computing with alkaline earth atoms*, Phys. Rev. Lett. **101**, 170504 (2008). (arXiv:0808.1940)
32. S. Morrison, A. Kantian, A. J. Daley, H. G. Katzgraber, M. Lewenstein, H. P. Büchler, and P. Zoller, *Physical replicas and the Bose-glass in cold atomic gases*, New J. Phys. **10**, 073032 (2008). (arXiv:0805.0488)
33. W. Yi, A. J. Daley, G. Pupillo, and P. Zoller, *State-dependent, addressable subwavelength optical lattices with cold atoms*, New J. Phys. **10**, 073015 (2008). (arXiv:0801.0600)
34. A. J. Daley, P. Zoller, and B. Trauzettel, *Andreev-like reflections with cold atoms*, Phys. Rev. Lett. **100**, 110404 (2008). (arXiv:0710.2914)
35. A. Kantian, A. J. Daley, P. Törmä, and P. Zoller, *Atomic lattice excitons: from condensates to crystals*, New J. Phys **9**, 407 (2007). (arXiv:0707.4668v2)
36. A. Griessner, A. J. Daley, S. R. Clark, D. Jaksch, and P. Zoller, *Dissipative dynamics of atomic Hubbard models coupled to a phonon bath: Dark state cooling of atoms within a Bloch band of an optical lattice*, New J. Phys **9**, 44 (2007). (cond-mat/0612263)
37. A. Griessner, A. J. Daley, S. R. Clark, D. Jaksch, and P. Zoller, *Dark state cooling of atoms by superfluid immersion*. Phys. Rev. Lett **97**, 220403 (2006). (cond-mat/0607254)

38. K. Winkler, G. Thalhammer, F. Lang, R. Grimm and J. Hecker Denschlag, A. J. Daley, A. Kantian, H. P. Büchler and P. Zoller, *Repulsively bound atom pairs in an optical lattice*, Nature **441**, 853 (2006). (cond-mat/0605196)
39. A. J. Daley, S. R. Clark, D. Jaksch, and P. Zoller, *Numerical Analysis of Coherent Many-Body Currents in a Single Atom Transistor*, Phys. Rev. A **72**, 043618 (2005). (quant-ph/0506256)
40. A. Griessner, A. J. Daley, D. Jaksch, and P. Zoller, *Fault-Tolerant Dissipative Preparation of Atomic Quantum Registers with Fermions*, Phys. Rev. A **72**, 032332 (2005). (quant-ph/0502171)
41. A. Micheli, A. J. Daley, D. Jaksch, and P. Zoller, *A Single Atom Transistor in a 1D Optical Lattice*, Phys. Rev. Lett. **93**, 140408 (2004). (quant-ph/0406020)
42. A. J. Daley, C. Kollath, U. Schollwöck, and G. Vidal, *Time-Dependent density-matrix renormalization-group using adaptive effective Hilbert spaces*, J. Stat. Mech.: Theor. Exp. P04005 (2004). (cond-mat/0403313)
43. A. J. Daley, P. O. Fedichev, and P. Zoller, *Single Atom Cooling by Superfluid Immersion: A Non-Destructive Method for Qubits*, Phys. Rev. A **69**, 022306 (2004). (quant-ph/0308129)
44. M.E.K. Williams, M.P. Sadgrove, A.J. Daley, R.N.C. Gray, S.M. Tan, A.S. Parkins, R. Leonhardt, and N. Christensen, *Measurements of Diffusion Resonances for the Atom Optics Quantum Kicked Rotor*, J. Opt. B: Quantum Semiclass. Opt. **6**, 28 (2004). (quant-ph/0208090)
45. P. Rabl, A. J. Daley, P. O. Fedichev, J. I. Cirac, P. Zoller, *Defect-Suppressed Atomic Crystals in an Optical Lattice*, Phys. Rev. Lett. **91**, 110403 (2003). (cond-mat/0304026)
46. A. J. Daley and A. S. Parkins, *Early time diffusion for the quantum kicked rotor with narrow initial momentum distributions*, Phys. Rev. E **66**, 056210 (2002).
47. A. J. Daley, A. S. Parkins, R. Leonhardt and S. M. Tan, *Diffusion Resonances in Action Space for an Atom Optics Kicked Rotor with Decoherence*, Phys. Rev. E **65**, 035201(R) (2002). (quant-ph/0108003)
48. A. J. Daley, A. Girvin, S. A. Kauffman, P. R. Wills and D. Yamins, *Simulation of a Chemical “Autonomous Agent”*, Z. Phys. Chem. **216**, 41 (2002).

Publications – Contributions to Books and Conference Proceedings

1. A. J. Daley, *Introduction to One-Dimensional Many-Body Calculations with the Time-Evolving Block Decimation Algorithm*, in *Quantum Gases: Finite Temperature and Non-Equilibrium Dynamics (Vol. 1 Cold Atoms Series)*, N.P. Proukakis, S.A. Gardiner, M.J. Davis and M.H. Szymanska, eds. (Imperial College Press, London, 2013).
2. A. J. Daley, *Quantum many-body dynamics of ultracold atoms in a 1D optical lattice*, in *Introduction to Computer Science and Applied Computing*, A. Kendl, S. Schindler (eds.) (Innsbruck University Press, Innsbruck, Austria, 2008).
3. J. Hecker Denschlag and A. J. Daley, *Exotic atom pairs: Repulsively bound states in an optical lattice*, in *Proceedings of the international school of physics, Enrico Fermi, Course CLXIV, Ultra-Cold Fermi Gases* (2006). (cond-mat/0610393)
4. A. J. Daley, A. Kantian, H. P. Büchler, P. Zoller, K. Winkler, G. Thalhammer, F. Lang, R. Grimm and J. Hecker Denschlag, *Repulsively bound atom pairs: Overview, Simulation and Links*, in *Proceedings of the 20th International Conference of Atomic Physics* (Innsbruck, Austria, 2006) (cond-mat/0608721)
5. A. J. Daley, J. I. Cirac, and P. Zoller, *The Development of Quantum Hardware for Quantum Computing*, in *Disappearing Architecture*, (Eds. Georg Flachbart, Peter Weibel), pp.62-77 (Birkhauser, Basel, Switzerland, 2005).
6. A. J. Daley, P. O. Fedichev, P. Rabl, P. Zoller, A. Recati, J. I. Cirac, J. Von Delft, and W. Zwerger, *Spectroscopy of Strongly Correlated Cold Atoms*, in *Proceedings of the XVI International Conference on Laser Spectroscopy*, (Eds. P. Hannaford, A. Sidorov, H. Bachor, and K. Baldwin), pp. 145-152 (World Scientific, Singapore, 2004).

Invited Talks at Conferences

1. *Many-body decoherence and thermalisation of cold quantum gases in optical lattices*, 534. WE-Heraeus-Seminar on Quantum Many-Body Dynamics in Open Systems, Bad Honnef, Germany, April 5 (2013).
2. *Non-equilibrium dynamics, thermalisation, and heating of cold atoms in optical lattices*, APS March Meeting Invited Talk, Boston, Massachusetts, March 31 (2012).
3. *Non-equilibrium dissipative dynamics of cold atoms in optical lattices* FINES 2011 Meeting, Heidelberg, Germany, 20 September 2011.
4. *Non-equilibrium dynamics and heating of cold atoms in optical lattices* New Laser Scientists Meeting, Rochester, United States of America, 28 October 2010.
5. *Many-body state preparation and heating in optical lattices* Ultracold Quantum Gases Beyond Equilibrium workshop, Natal, Brazil, 27 September 2010.
6. *An atomic colour superfluid via three-body loss* International Ruperto-Carola-Symposium on "Hybrid Quantum Systems", Heidelberg, Germany, 15 May 2010.
7. *An Atomic colour superfluid via three-body loss* CECAM Workshop "Ab-initio Modeling of Cold Gases", Zurich, Switzerland, November 11 2009.
8. *Adiabatic state preparation and an atomic eta-condensate* Condensed matter physics of cold atoms workshop, KITPC, Beijing, China, October 15 2009.
9. *Quantum computing with group II atoms* Ultracold Group II Atoms Workshop, University of Maryland, College Park, Maryland, USA, September 17 2009.
10. *Time-dependent DMRG, three-body loss, and an atomic colour superfluid* Finite temperature, Non-equilibrium Superfluid Systems Meeting, Durham, United Kingdom, September 15 2009.
11. *Ultracold atoms in optical lattices, and quantum computing with alkaline earth atoms* Austrian Physical Society and Swiss Physical Society Conference, Innsbruck, Austria, September 2 2009.
12. *Atomic three-body loss as a dynamical three-body interaction*, SCALA Network meeting, Cortina, Italy, February 19 2009.
13. *Time-dependent dynamics of cold atoms in optical lattices and t-DMRG*, Cold Atom Theory Workshop, Queenstown, New Zealand, December 12 2008.
14. *Dynamics with three body loss in an optical lattice*, Symposium of the Jack Dodd-Dan Walls Centre for Photonics and Ultra-Cold Atoms, Queenstown, New Zealand, December 9 2008.
15. *Atomic Lattice Excitons*, International Conference on Spontaneous Coherence in Excitonic Systems, Cambridge, England, 10 September 2008.
16. *Dark State Raman Cooling of Atoms in Optical Lattices with a Phonon Reservoir*, Cooling and Thermodynamics of Quantum Systems Workshop, Zfat (Safed), Israel, 28 August 2007.
17. *Dark State Cooling of Atoms in Optical Lattices and the Quantum Boltzmann Master Equation*, Non-Equilibrium Behaviour in Superfluid Gases at Finite Temperature Workshop, Sandbjerg, Denmark, 13 June 2007
18. *Fault Tolerant Dissipative Preparation of Atomic Quantum Registers with Fermions*, Cortona BEC 2005 Workshop, Cortona, Italy, 30 October 2005.

Invited Colloquia and Seminars

1. *Many-body decoherence, heating, and thermalisation of cold atoms in optical lattices*, Ghent University, Ghent, Belgium, May 24 (2013).
2. *Many-body decoherence, heating, and thermalisation of cold atoms in optical lattices*, ETH Zurich, Zurich, Switzerland, May 10 (2013).
3. *Exploring non-equilibrium many-body dynamics with cold atoms*, Physics Colloquium, University of Strathclyde, Glasgow, Scotland, UK, May 1 (2013).
4. *Non-equilibrium many-body dynamics with cold atoms in optical lattices*, R G. Herb Condensed matter seminar, University of Wisconsin, Madison WI, March 14 (2013).
5. *Quantum Simulators - a new means of exploring many-body dynamics* Physics Colloquium, University of Auckland, Auckland, New Zealand, February 12 (2013).
6. *Non-equilibrium many-body dynamics with cold atoms in optical lattices*, Georgetown University Physics Colloquium, Washington DC, USA, October 16 (2012).
7. *Measuring entanglement in quench dynamics for bosons in an optical lattice*, University of Vienna, Vienna, Austria, June 21 (2012).
8. *Non-equilibrium many-body dynamics and heating of cold atoms in optical lattices*, Institute for Theoretical Physics, LMU Munich, Munich, Germany, June 20 (2012).
9. *Measuring entanglement in quench dynamics for bosons in an optical lattice*, University of Frankfurt, Frankfurt, Germany, June 11 (2012).
10. *Non-equilibrium many-body dynamics and heating of cold atoms in optical lattices*, Rice University, Houston, Texas, April 26 (2012).

11. *Non-equilibrium dissipative dynamics and heating of cold atoms in optical lattices*, Max Planck Institute for Quantum Optics, Garching, Germany, December 13 (2011).
12. *Why dissipation, loss, and heating are not necessarily a bad thing for cold atoms*, JILA Colloquium, JILA, Boulder, Colorado, October 27 (2011).
13. *Non-equilibrium many-body dynamics and heating of cold atoms in optical lattices*, Group seminar, JILA, Boulder, Colorado, October 19 (2011).
14. *Non-equilibrium many-body dynamics and heating of cold atoms in optical lattices* University of Massachusetts at Amherst, Amherst, MA, USA, April 13 2011.
15. *Non-equilibrium many-body dynamics and heating of cold atoms in optical lattices* Center for Ultracold Atoms seminar, MIT, Cambridge, MA, USA, March 8 2011.
16. *Non-equilibrium many-body dynamics with cold atoms in optical lattices* Institute for Applied Physics, University of Darmstadt, Darmstadt, Germany, November 23 2010.
17. *Quantum simulation with cold atoms in optical lattices* Massey University (Albany Campus), Auckland, New Zealand, August 11 2010.
18. *Many-body state preparation and heating in optical lattices* University of Otago, Dunedin, New Zealand, August 4 2010.
19. *An atomic colour superfluid via three-body loss* Ludwig-Maximilians-University Munich, July 13 2010.
20. *Many-body state preparation and heating in optical lattices* Aalto University School of Science and Technology, Helsinki, Finland, June 23 2010.
21. *Non-equilibrium many-body dynamics with cold atoms in optical lattices* LENS, University of Florence, Florence, Italy, 23 April 2010.
22. *Quantum Simulation and Quantum Computing with Cold Atoms in Optical Lattices* Physics Department Seminar, University of Auckland, Auckland, New Zealand, December 18 2009.
23. *Non-equilibrium dynamics with three-body loss in an optical lattice* Ludwig-Maximilians-University Munich, Munich, Germany, November 27 2009.
24. *Three-body loss and three-body interaction in a three-component Fermi Gas* University of Frankfurt, Frankfurt, Germany, July 7 2009.
25. *Atomic Three-body loss as a dynamical three-body interaction* National Institute for Standards and Technology, Gaithersburg, Maryland, USA, May 13 2009.
26. *Cold Quantum Gases and LEO II* 4th Workshop of the “Platform Scientific Computing”, University of Innsbruck, Innsbruck, Austria, May 11 2009.
27. *Exploring many-body dynamics with cold atoms in optical lattices* University of Graz, Graz, Austria, April 27 2009.
28. *Three-body loss as a dynamical three-body interaction* Max Planck Institute for Quantum Optics, Garching, Germany, April 2 2009.
29. *Three-body loss as a dynamical three-body interaction* University of Aarhus, Aarhus, Denmark, January 14 2009.
30. *Dynamics with three-body loss in an optical lattice* University of Frankfurt, Frankfurt, Germany, November 17 2008.
31. *Exploring coherent many-body dynamics with cold atoms in optical Lattices* Massachusetts Institute of Technology, Cambridge, Massachusetts, USA, 23 July 2008
32. *Exploring many-body dynamics with Cold Atoms in Optical Lattices* LENS, University of Florence, Florence, Italy, 10 June 2008
33. *Classical Simulation of quantum many-body systems in 1D* Mathematics Colloquium, Institute for Mathematics, University of Innsbruck, Austria, 27 May 2008
34. *Exploring many-body dynamics with Cold Atoms in Optical Lattices* Faculty of Physics, University of Vienna, Vienna, Austria, 21 May 2008
35. *Exploring many-body dynamics with Cold Atoms in Optical Lattices* Quantum Dynamics Seminar, University of Heidelberg, Heidelberg, Germany, 23 April 2008
36. *Exploring many-body dynamics with Cold Atoms in Optical Lattices* Department of Physics, University of Pisa, Pisa, Italy, 11 March 2008
37. *Exploring many-body dynamics with Cold Atoms in Optical Lattices* Joint Quantum Institute Seminar, University of Maryland, College Park, MD, USA, 25 February 2008
38. *Exploring many-body dynamics with Cold Atoms in Optical Lattices* ITAMP / Harvard University, Cambridge, MA, USA, 14 February 2008
39. *Cold Atoms in Optical Lattices - A toolbox for study of many-body quantum systems* University of Freiburg, Freiburg, Germany, 22 January 2008.
40. *New Elements of the Optical lattice toolbox for many-body quantum systems* University of Stuttgart, Stuttgart, Germany, 4 December 2007.
41. *Dark State Cooling of Atoms in an Optical Lattice by Superfluid Immersion* University of Basel, Basel, Switzerland, 27 April 2007.
42. *Dark State Cooling of Atoms in an Optical Lattice by Superfluid Immersion* Max-Planck-Institut für Physik komplexer Systeme, Dresden, Germany, 4 April 2007.

43. *Dark State Cooling of Atoms in an Optical Lattice by Superfluid Immersion*
Quantum Optics Group, Department of Physics, University of Auckland, Auckland, New Zealand, 20 December 2006.
44. *Repulsively Bound Atomic Pairs and Controlled Dissipation in Optical Lattices*
National University of Singapore, Singapore, 21 February 2006.
45. *Repulsively Bound Atomic Pairs and Controlled Dissipation in Optical Lattices*
Department of Physics, University of Auckland, Auckland, New Zealand, 8 February 2006.
46. *Repulsively Bound Atomic Pairs and Controlled Dissipation in Optical Lattices*
Department of Physics, University of Otago, Dunedin, New Zealand, 1 February 2006.
47. *Repulsively Bound Pairs and Controlled Dissipation in Optical Lattices*
RWTH Aachen, Aachen, Germany, 10 January 2006.
48. *New Extensions of the Optical Lattices Toolbox: Controlled Dissipation and the Single Atom Transistor*
University of Leiden, Leiden, The Netherlands, 19 December 2005.
49. *Optical Lattices and the Single Atom Transistor*
University of Auckland, Auckland, New Zealand, 17 December 2004.
50. *Efficient Classical Simulation of 1D Quantum Systems using Vidal's Method*
National Institute for Standards and Technology, Gaithersburg, Maryland, USA, 3 December 2004.
51. *New Elements of the Optical Lattices Toolbox: Dissipation via Phonons and the Single Atom Transistor*
National Institute for Standards and Technology, Gaithersburg, Maryland, USA, 30 November 2004.
52. *Phonons for dissipation in Optical lattices: Qubit Cooling and Register Initialisation*
LENS, University of Florence, Florence, Italy, 14 October 2004.
53. *Efficient Classical Simulation of Quantum Systems using Vidal's Method*
University of Kaiserslautern, Kaiserslautern, Germany, 19 April 2004.
54. *Ultracold Atoms in Optical Lattices: Atomic Crystals and Atomic Qubit Cooling*
University of Auckland, 17 December 2003.
55. *Efficient Classical Simulation of Quantum Systems - The Vidal Method*
T. U. Wien, Vienna, Austria, 24 November 2003.

Contributed Conference Talks

1. *Decoherence and heating of two species fermions in optical lattices*
APS DAMOP Meeting, Quebec City, Quebec, Canada, June 7 2012.
2. *Interplay of spontaneous emissions and thermalisation of cold atoms in optical lattices*
APS DAMOP Meeting, Quebec City, Quebec, Canada, June 6 2012.
3. *Non-equilibrium dissipative dynamics and heating of cold atoms in optical lattices*
APS DAMOP Meeting, Atlanta, GA, USA, June 16 2011.
4. *Non-equilibrium many-body dynamics and heating of cold atoms in optical lattices*
APS March Meeting, Dallas, TX, USA, March 22 2011.
5. *Many-body state preparation and heating in optical lattices*
EuroQUAM 2010: Cold Quantum Matter - Achievements and Prospects, Ischgl, Austria, 14 September 2010.
6. *Dissipative dynamics with quantum trajectories and the TEBD algorithm,*
Workshop on Tensor Networks 2010, Garching, Germany, 28 January 2010.
7. *Time-dependent many-body dynamics with cold atoms in optical lattices,*
Quantum control Workshop, Wolfgang Pauli Institute, Vienna, Austria, 27 February 2009.
8. *Andreev-like reflections with cold atoms*
ESF EuroQUAM network meeting, Barcelona, Spain, 8 April, 2008.
9. *New Elements of the Optical Lattices Toolbox: Phonon Cooling, Exact Time Dependent Calculations, and Excitons*
OLAQUI Meeting, Innsbruck, Austria, October 2005.
10. *Atomic Qubit Cooling by Superfluid Immersion*
Young Atom Opticians Meeting, Innsbruck, Austria, March 2004.
11. *Atomic Qubit Cooling by Superfluid Immersion*
Quantum Computing with Atoms, Ions, and Photons, QUEST and CONQUEST network meeting, La Thuile, Italy, March 2004.
12. *Atomic Crystals and Atomic Qubit Cooling in an Optical Lattice*
Australasian Conference on Optics, Lasers and Spectroscopy, Melbourne, Australia, December 2003.
13. *Defect-Suppressed Atomic Crystals in an Optical Lattice*
SFB Meeting, Vienna, Austria, May 2003.
14. *Defect-Suppressed Atomic Crystals in an Optical Lattice*
Ringberg Meeting on Quantum Optics and Quantum Information, Tegernsee, Germany, May 2003.
15. *Diffusion Rates Across the Classical - Quantum transition for a Kicked Rotor with Ultracold Atoms*
New Zealand Institute of Physics Conference, Wellington, New Zealand, July 2001.
16. *A Technique for the Measurement of Benchmark Inelastic Electron Scattering Cross Sections at Near-Threshold Energies,*
Australian Gaseous Electronics Meeting, Armidale, Australia, February 2000.

Other Interests - Music

I have wide ranging interests in music, and I particularly enjoy performing in bands, where my primary instrument is the trumpet. My experience includes:

Mar 2004-Dec 2010 1st Trumpet in the Uni Big Band Innsbruck.

Nov 2002-Dec 2010 1st Trumpet / 1st Flugelhorn in the Musikkappelle Allerheiligen, Innsbruck, Austria.

During this time I have also played concerts in several other groups, including The Feuerwehrmusik Innsbruck, Musikkappelle Pradl, Salinenmusik Hall, and the Kons-Jazz Big Band of the Tirolean conservatorium.

Aug 2005-Jan 2007 Trumpet section of "Feierwehr Tirol", a small wind music ensemble.

Feb 1997-Sep 2002 Member of the Trumpet section in the Rodger Fox Big Band. Highlights of my experiences during this time included performances in January 1999 at the International Association of Jazz Educators conference in Anaheim, California, and in September 2000 at the Monterey Jazz Festival, in Monterey, California. We also performed many New Zealand tours with guest artists such as Randy Crawford, Kevin Mahogany, and Bill Cunliffe.

I was part of the recording of 4 CDs during this time including the 2000 album *Aint that the truth*, which won the best jazz album of the year award at the New Zealand music awards in March 2001.

August 1996 Lead Trumpet for the New Zealand High Schools' Jazz Orchestra.

1996 Passed Trinity College Grade 6 examination in Pianoforte.

Other Interests - Sports

- I maintain a keen interest in several sports, especially cricket and rugby.

- I was heavily involved in playing indoor cricket in social teams from Feb 1999 - Sep 2002.

- I ran in the Innsbruck Stadtlauf (10 km), 4 May 2003, 23 April 2006, 6 May 2007, 4 May 2008, 2 May 2009, 8 May 2010 (Best time 42:54), and as part of a relay team in the Munich Marathon (10km), 12 October 2008.