Dominic W. Berry

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Positions Held

- **Professor**
  Macquarie University, January 2023 – Present
- **Associate Professor**
  Macquarie University, January 2019 – December 2022
- **Senior Lecturer**
  Macquarie University, October 2015 – December 2018
- **ARC Future Fellow**
  Macquarie University, October 2011 – October 2015
- **Postdoctoral Fellow**
  University of Waterloo, January 2009 – September 2011
- **Research Fellow**
  Macquarie University, September 2006 – December 2008
- **ARC Australian Postdoctoral Research Fellow**
  The University of Queensland, June 2004 – August 2006
- **Macquarie University Research Fellow**
  Macquarie University, January 2003 – June 2004
- **Research Associate**
  Macquarie University, August 2001 – December 2002
- **Tutorial Assistant**
  The University of Queensland, March 1998 – June 2001

Education

Course:	Doctorate of Philosophy
Institution:	The University of Queensland
Field:	Physics
Thesis Title:	Adaptive Phase Measurements
Supervisor:	Prof. Howard Wiseman
Award Date:	February 2002
Attended:	January 1998 – July 2001

Course:	Bachelor of Science, Honours
Institution:	The University of Queensland
Major:	Physics
Thesis Title:	Heating Effects in Optical Trapping
Supervisors:	A/Prof. Norman Heckenberg and Prof. Halina Rubinsztein-Dunlop
Graduation Date:	August 1997
Result:	Class I
Attended:	July 1996 – June 1997

Course:	Bachelor of Science
Institution:	The University of Queensland
Major:	Physics
Graduation Date:	December 1995
Grade Point Average:	6.9/ 7.0
Attended:	January 1993 – December 1995

Research Grants and Contracts

Total of over $6.5 million research income.

Project Title	Investigators	Scheme	Value	Year
Project Lighthouse	DW Berry	Google Sponsored Research Agreement	$1278773 (942967 USD)	2022
Defence acquisition optimisation using quantum algorithms	T Lee, M Kieferova, Y Sanders, G Brennen, DW Berry, D Terno	Defence Innovation Network Pilot Project	$149829	2022
Heisenberg-limited lasers: building the revolution	HM Wiseman, DW Berry, B Huard, A Bienfait, M Mirrahimi	ARC Discovery Project	$512835	2022
Quantum differential equations and learning for flight control	DW Berry	Lockheed Martin contract	$170323 (127849 USD)	2021
Pushing the digital limits in quantum simulation for advanced manufacturing	N Langford, JP Dehollain, D Burgarth, DW Berry	ARC Discovery Project	$659755	2021 2022 2023
Project Lighthouse	DW Berry	Google Sponsored Research Agreement	$636366 (435911 USD)	2020
Enhanced algorithms for optimization and chemistry	DW Berry	Google Quantum Awards program	$150000 (100000 USD)	2020
Optimizing circuits for quantum-enhanced population transfer	DW Berry	Google Quantum Awards program	$152117 (110000 USD)	2019
Quantum algorithms for quantum chemistry	DW Berry, R Babbush	ARC Discovery Project	$465000	2019 2020 2021
Quantum-classical algorithms for linear equations	DW Berry	Lockheed Martin contract	$234240 (186232 USD)	2017
Quantum algorithms for computational physics	DW Berry, G Brennen, A Aspuru-Guzik, AM Childs, J Pachos	ARC Discovery Project	$145200 $145200 $145200	2016 2017 2018
Quantum algorithms for partial differential equations	DW Berry, S Lloyd, A Harrow, AM Childs	IARPA BAA	$586000 (421000 USD)	2016
Robust quantum information and metrology	DW Berry	ARC Future Fellowship	$168083 $139088 $139088 $139088	2010 2011 2012 2013
Resources for quantum networks	DW Berry	ARC Discovery (APD Fellowship)	$71122 $67922 $70422	2004 2005 2006

Theory of resources for quantum networks	DW Berry	Macquarie University Research Fellowship	\$57866 \$62165 \$62165	2003 2004 2005
Remote implementation of operations	DW Berry	Macquarie University Startup Grant	\$6000	2003
Quantum Properties of Distributed Systems (QUPRODIS)	BC Sanders, SD Bartlett, DW Berry	IAP – International S&T Competitive Grants	\$15000 \$15000 \$15000	2003 2004 2005

Citations

My h-index is **43** (from Google Scholar on 1/01/2023), with a total of 7503 citations and 1423 citations just in 2022. The three highest cited papers are:

1. D. W. Berry, G. Ahokas, R. Cleve, and B. C. Sanders, "Efficient quantum algorithms for simulating sparse Hamiltonians", *Communications in Mathematical Physics* **270**, 359 (2007). 652 citations
2. B. L. Higgins, D. W. Berry, S. D. Bartlett, H. M. Wiseman, and G. J. Pryde, "Entanglement-free Heisenberg-limited phase estimation", *Nature* **450**, 393 (2007). 609 citations
3. D. W. Berry, A. M. Childs, R. Cleve, R. Kothari, and R. D. Somma, "Simulating Hamiltonian dynamics with a truncated Taylor series", *Physical Review Letters* **117**, 090502 (2015). 507 citations.

Fellowships, Scholarships, Awards and Competitions

- Maquarie University Excellence in Research Award, 2021
- APS Outstanding Referee, 2013
- Australian Future Fellowship, 2010-2013
- Australian Research Council Postdoctoral Fellowship, 2004-2006
- Macquarie University Research Fellowship, 2003-2005
- APA Scholarship, 1998-2001
- University Medal at the University of Queensland, 1997
- The Duncan McNaughton Scholarship, 1996
- Australian Students Prize for Excellence, 1993
- Year 11 (1991) and Senior Dux (1992) at Wynnum High, 1991-1992
- Junior Dux of Science at Wynnum High, 1990
- Inaugural Mathematics Tournament, gold medal, 1990
- The Australian Mathematical Olympiad, silver certificate, 1992

Research Highlights

- Simulation of quantum systems is one of the most important potential applications of quantum computers, with applications in design of molecules. In 2007 I developed what was then the most efficient known algorithm for simulation [64]. This work now has **652 citations**, and forms the basis for exciting developments in quantum algorithms, including evaluation of NAND trees (A. M. Childs *et al.*, Theory of Computing **5**, 119 (2009)), and solving systems of linear equations (Phys. Rev. Lett. **103**, 150502 (2009)). I also used it to show how to solve differential equations on a quantum computer [23],[40]. This is an application of tremendous importance, because most applications of supercomputers are based on solving large systems of differential equations.

  Since the work in [64], I have developed a series of progressively more advanced techniques for simulation, driving towards the limits of what is theoretically possible [25],[29],[30],[36], [48],[50],[56],[90],[91]. This work has won much acclaim, resulting in talks accepted at

both the two top computer science conferences **STOC** and **FOCS**, as well as four talks accepted at the top quantum information conference, **QIP**.

I collaborated with Alán Aspuru-Guzik at Harvard then University of Toronto to apply these techniques to quantum chemistry [22],[33]. Together with Andrew Childs at University of Maryland, another of the top researchers in quantum algorithms, we won a Discovery Project for this work.

I have also been developing links with industry and the intelligence community for this research. Together with Aram Harrow and Seth Lloyd at **MIT**, I developed a project for this topic for IARPA, which is responsible for leading research to overcome difficult challenges relevant to the United States Intelligence Community. This project was funded for more than half a million dollars.

In 2017 I was funded by Lockheed Martin for another a research project on quantum algorithms, and am now pursuing further research with a second contract from Lockheed. I am now collaborating with Ryan Babbush at Google on the application of these techniques to quantum chemistry [20]. We won a Discovery Project for this work, then Google funded my work with two awards under the Google Quantum Awards program, and a further 4.5 years of funding with a Sponsored Research Agreement.

- I developed, in collaboration with Howard Wiseman and Stephen Bartlett, a method for performing the most accurate possible phase measurements. This method is based on a linear optics implementation of the inverse quantum Fourier transform in quantum computing theory. This brings together techniques from quantum control, quantum metrology, and quantum computing. It was implemented experimentally at Griffith University, and appeared in Nature [61]. This work has been the subject of many reviews and media reports:

  - ▷ Nature Milestones: Photons (2010), chose this paper for the Fundamentals NPG library; one of 11 reprinted papers in Nature Publishing Group journals, covering the period 1926-2010.
    http://www.nature.com/milestones/milephotons/library/fundamentals/index.html
  - ▷ "Quantum physics rules", Australian Research Council inaugural publication, Outcomes: Results of research in the real world '08, p. 60.
  - ▷ "World's most precise ruler created", *Australasian Science*, April 2008, p. 13.
  - ▷ J. L. O'Brien, "Precision Without Entanglement", *Science* **318**, 1393 (2007).
  - ▷ J. P. Dowling, "Kittens catch phase", *Nature* **450**, 362 (2007).
  - ▷ P. Ball, "The most accurate measurement ever made", *Nature News*, 14 November 2007. http://www.nature.com/news/2007/071114/full/news.2007.242.html
  - ▷ S. Trad, "No size too tiny to gauge", *The Australian*, 21 November 2007, p26.
  - ▷ "Quantum physics 'rules' – Australian scientists create world's most accurate 'ruler'", *Physorg*, 26 November 2007. http://www.physorg.com/news115293536.html

Top 10 Publications

(1) R. Babbush, C. Gidney, D. W. Berry, N. Wiebe, J. McClean, A. Paler, A. Fowler, and H. Neven, "Encoding Electronic Spectra in Quantum Circuits with Linear T Complexity", *Physical Review X* **8**, 041015 (2018).
Physical Review X is a new journal that has the highest impact factor (15) of any Physical Review journal. This work introduced a whole host of new improvements for simulating quantum chemistry. 239 citations.

(2) D. W. Berry, A. M. Childs, and R. Kothari, "Hamiltonian simulation with nearly optimal dependence on all parameters", in *Proceedings of the 56th Annual IEEE Symposium on Foundations of Computer Science (FOCS 2015)*, pp. 792–809 (2015).
Accepted for the highly prestigious conference FOCS; one referee described this work as a "tour de force". 288 citations.

(3) D. W. Berry, A. M. Childs, R. Cleve, R. Kothari, and R. D. Somma, "Simulating Hamiltonian dynamics with a truncated Taylor series", *Physical Review Letters* **117**, 090502 (2015).
Showed how to perform simulations of quantum systems with exponentially improved precision, using a technique simplified over my work in STOC. 507 citations.

(4) D. W. Berry, A. M. Childs, R. Cleve, R. Kothari, and R. D. Somma, "Exponential improvement in precision for simulating sparse Hamiltonians", in *Proceedings of the 46th Annual ACM Symposium on Theory of Computing (STOC 2014)*, pp. 283–292 (2014).
This work is published in the highly prestigious conference STOC, and shows how to perform quantum simulation with far greater accuracy than previously known. 255 citations.

(5) H. Yonezawa, D. Nakane, T. A. Wheatley, K. Iwasawa, S. Takeda, H. Arao, K. Ohki, K. Tsumura, D. W. Berry, T. C. Ralph, H. M. Wiseman, E. H. Huntington, and A. Furusawa, "Quantum-enhanced optical-phase tracking", *Science* **337**, 1514 (2012).
Experimentally demonstrated how to measure a fluctuating phase highly accurately using squeezed states, based on my earlier theoretical work. 231 citations.

(6) G. Y. Xiang, B. L. Higgins, D. W. Berry, H. M. Wiseman, and G. J. Pryde, "Entanglement-enhanced measurement of a completely unknown phase", *Nature Photonics* **5**, 43 (2011).
Experimentally demonstrated how to use multiple entangled states to achieve an improvement in precision measurement, without needing to rely on initial information. I was lead theoretician on this work. 256 citations.

(7) B. L. Higgins, D. W. Berry, S. D. Bartlett, H. M. Wiseman, and G. J. Pryde, "Entanglement-free Heisenberg-limited phase estimation", *Nature* **450**, 393 (2007).
Demonstrated the most accurate possible phase measurements, as well as a routine required for quantum computing, in optics for the first time. I was lead theoretician, and it was based on my previous theoretical work. 609 citations.

(8) D. W. Berry, G. Ahokas, R. Cleve, and B. C. Sanders, "Efficient quantum algorithms for simulating sparse Hamiltonians", *Communications in Mathematical Physics* **270**, 359 (2007).
Provided the most efficient algorithm for simulation of quantum systems at the time, and now is the basis for a range of important new quantum algorithms. 652 citations.

(9) D. W. Berry and B. C. Sanders, "Optimal remote state preparation", *Physical Review Letters* **90**, 057901 (2003). Showed how to perform remote state preparation with the least possible communication; an essential result needed for the theory of quantum capacities developed by leading researchers such as Charles Bennett. 254 citations.

(10) D. W. Berry and H. M. Wiseman, "Optimal states and almost optimal adaptive measurements for quantum interferometry", *Physical Review Letters* **85**, 5098 (2000).
First developed the sophisticated feedback methods for high-precision interferometric measurements with nonclassical states. These methods are used in the Nature paper above, and many others. 260 citations.

Journal Publications

[1] T. E. O'Brien, M. Streif, N. C. Rubin, R. Santagati, Y. Su, W. J. Huggins, J. J. Goings, N. Moll, E. Kyoseva, M. Degroote, C. S. Tautermann, J. Lee, D. W. Berry, N. Wiebe, and R. Babbush, "Efficient quantum computation of molecular forces and other energy gradients", *Physical Review Research* **4**, 043210 (2022).

[2] P. C. S. Costa, D. An, Y. R. Sanders, Y. Su, R. Babbush, and D. W. Berry, "Optimal scaling quantum linear systems solver via discrete adiabatic theorem", *PRX Quantum* **3**,

040303 (2022).

[3] M. Bagherimehrab, Y. R. Sanders, D. W. Berry, G. K. Brennen, and B. C. Sanders, "Nearly optimal quantum algorithm for generating the ground state of a free quantum field theory", *PRX Quantum* **3**, 020364 (2021).

[4] Y. Su, D. W. Berry, N. Wiebe, N. Rubin, and R. Babbush, "Fault-tolerant quantum simulations of chemistry in first quantization", *PRX Quantum* **2**, 040332 (2021).

[5] J. Lee, D. W. Berry, C. Gidney, W. J. Huggins, J. R. McClean, N. Wiebe, and R. Babbush, "Even more efficient quantum computations of chemistry through tensor hypercontraction", *PRX Quantum* **2**, 030305 (2021).

[6] Z. Huang, P. P. Rohde, D. W. Berry, P. Kok, J. P. Dowling, and C. Lupo, "Photonic quantum data locking", *Quantum*, **5**, 447 (2021).

[7] T. J. Baker, S. N. Saadatmand, D. W. Berry, and H. M. Wiseman, "The Heisenberg limit for laser coherence", *Nature Physics* **17**, 179 (2021).

[8] Y. R. Sanders, D. W. Berry, P. C. S. Costa, L. W. Tessler, N. Wiebe, C. Gidney, H. Neven, and R. Babbush, "Compilation of Fault-Tolerant Quantum Heuristics for Combinatorial Optimization", *PRX Quantum* **1**, 020312 (2020).

[9] I. D. Kivlichan, C. Gidney, D. W. Berry, N. Wiebe, J. McClean, W. Sun, Z. Jiang, N. Rubin, A. Fowler, A. Aspuru-Guzik, H. Neven, and R. Babbush, "Improved Fault-Tolerant Quantum Simulation of Condensed-Phase Correlated Electrons via Trotterization", *Quantum* **4**, 296 (2020).

[10] D. W. Berry, A. M. Childs, Y. Su, X. Wang, and N. Wiebe, "Time-dependent Hamiltonian simulation with L^1-norm scaling", *Quantum* **4**, 254 (2020).

[11] W. Gorecki, D. W. Berry, H. M. Wiseman, and R. Demkowicz-Dobrzanski, "π-corrected Heisenberg limit", *Physical Review Letters* **124**, 030501 (2020).

[12] D. W. Berry, C. Gidney, M. Motta, J. R. McClean, and R. Babbush, "Qubitization of arbitrary basis quantum chemistry leveraging sparsity and low rank factorization", *Quantum* **3**, 208 (2019).

[13] R. Babbush, D. W. Berry, J. R. McClean, and H. Neven, "Quantum simulation of chemistry with sublinear scaling in basis size", *npj Quantum Information* **5**, 92 (2019).

[14] M. Kieferová, A. Scherer, and D. W. Berry, "Simulating the dynamics of time-dependent Hamiltonians with a truncated Dyson series", *Physical Review A* **99**, 042314 (2019).

[15] R. Babbush, D. W. Berry, and H. Neven, "Quantum Simulation of the Sachdev-Ye-Kitaev Model by Asymmetric Qubitization", *Physical Review A* **99**, 040301(R) (2019).

[16] H. T. Dinani, D. W. Berry, R. Gonzalez, J. R. Maze, and C. Bonato, "Bayesian estimation for quantum sensing in the absence of single-shot detection", *Physical Review B* **99**, 125413 (2019).

[17] Y. R. Sanders, G. H. Low, A. Scherer, and D. W. Berry, "Black-box quantum state preparation without arithmetic", *Physical Review Letters* **122**, 020502 (2019).

[18] S. Daryanoosh, S. Slussarenko, D. W. Berry, H. M. Wiseman, and G. J. Pryde, "Experimental optical phase measurement at the exact Heisenberg limit", *Nature Communications* **9**, 4606 (2018).

[19] R. Babbush, C. Gidney, D. W. Berry, N. Wiebe, J. McClean, A. Paler, A. Fowler, and H. Neven, "Encoding Electronic Spectra in Quantum Circuits with Linear T Complexity", *Physical Review X* **8**, 041015 (2018).

[20] D. W. Berry, M. Kieferová, A. Scherer, Y. R. Sanders, G. H. Low, N. Wiebe, C. Gidney, and R. Babbush, "Improved Techniques for Preparing Eigenstates of Fermionic Hamiltonians", *npj Quantum Information* **4**, 22 (2018).

[21] K. T. Laverick, H. M. Wiseman, H. T. Dinani, and D. W. Berry, "Adaptive estimation of a time-varying phase with coherent states: smoothing can give an unbounded improvement over filtering", *Physical Review A* **97**, 042334 (2018).

[22] R. Babbush, D. W. Berry, Y. R. Sanders, I. D. Kivlichan, A. Scherer, A. Y. Wei, P. J. Love, and A. Aspuru-Guzik, "Exponentially More Precise Quantum Simulation of Fermions in the Configuration Interaction Representation", *Quantum Science and Technology* **3**, 015006 (2018).

[23] D. W. Berry, A. M. Childs, A. Ostrander, and G. Wang, "Quantum algorithm for linear differential equations with exponentially improved dependence on precision", *Communications in Mathematical Physics* **356**, 1057 (2017).

[24] H. T. Dinani and D. W. Berry, "Adaptive estimation of a time-varying phase with a power-law spectrum via continuous squeezed states", *Physical Review A* **95**, 063821 (2017).

[25] L. Novo and D. W. Berry, "Improved Hamiltonian simulation via a truncated Taylor series and corrections", *Quantum Information and Computation* **17**, 0623 (2017).

[26] C. Bonato and D. W. Berry, "Adaptive tracking of a time-varying field with a quantum sensor", *Physical Review A* **95**, 052348 (2017).

[27] Z. Huang, K. R. Motes, P. M. Anisimov, J. P. Dowling, and D. W. Berry, "Adaptive phase estimation with two-mode squeezed-vacuum and parity measurement", *Physical Review A* **95**, 053837 (2017).

[28] S. Roy, D. W. Berry, I. R. Petersen, and E. H. Huntington, "Robust Guaranteed-Cost Adaptive Quantum Phase Estimation", *Physical Review A* **95**, 052322 (2017).

[29] D. W. Berry, A. M. Childs, R. Cleve, R. Kothari, and R. D. Somma, "Exponential improvement in precision for simulating sparse Hamiltonians", *Forum of Mathematics, Sigma* **5** (2017).

[30] D. W. Berry and L Novo, "Corrected quantum walk for optimal Hamiltonian simulation", *Quantum Information and Computation* **16**, 1295 (2016).

[31] K. R. Motes, R. L. Mann, J. P. Olson, N. M. Studer, E. A. Bergeron, A. Gilchrist, J. P. Dowling, D. W. Berry, and P. P. Rohde, "Efficient recycling strategies for preparing large Fock states from single-photon sources: Applications to quantum metrology", *Physical Review A* **94**, 012344 (2016).

[32] H. T. Dinani, M. K. Gupta, J. P. Dowling, and D. W. Berry, "Quantum enhanced spectroscopy with entangled multi-photon states", *Physical Review A* **93**, 063804 (2016).

[33] R. Babbush, D. W. Berry, I. D. Kivlichan, A. Y. Wei, P. J. Love, and A. Aspuru-Guzik, "Exponentially more precise quantum simulation of fermions in second quantization", *New Journal of Physics* **18**, 033032 (2016).

[34] C. Bonato, M. S. Blok, H. T. Dinani, D. W. Berry, M. L. Markham, D. J. Twitchen, and R. Hanson, "Optimized quantum sensing with a single electron spin using real-time adaptive measurements", *Nature Nanotechnology* **11**, 247 (2016).

[35] D. W. Berry, M. Tsang, M. J. W. Hall, and H. M. Wiseman, "Quantum Bell-Ziv-Zakai bounds and Heisenberg limits for waveform estimation", *Physical Review X* **5**, 031018 (2015).

[36] D. W. Berry, A. M. Childs, R. Cleve, R. Kothari, and R. D. Somma, "Simulating Hamiltonian dynamics with a truncated Taylor series", *Physical Review Letters* **114**, 090502 (2015).

[37] D. Hogg, D. W. Berry, and A. I. Lvovsky, "Efficiencies of quantum optical detectors", *Physical Review A* **90**, 053846 (2014).

[38] M. Ringbauer, A. Fedrizzi, D. W. Berry, and A. G. White, "Information causality in the quantum and post-quantum regime", *Scientific Reports* **4**, 6955 (2014).

[39] H. T. Dinani and D. W. Berry, "Loss-resistant unambiguous phase measurement", *Physical Review A* **90**, 023856 (2014).

[40] D. W. Berry, "High-order quantum algorithm for solving linear differential equations", *Journal of Physics A: Mathematical and Theoretical* **47**, 105301 (2014).

[41] A. J. F. Hayes and D. W. Berry, "Swarm optimization for adaptive phase measurements with low visibility", *Physical Review A* **89**, 013838 (2014).

[42] D. W. Berry, R. Cleve, and S. Gharibian, "Gate-efficient discrete simulations of continuous-time quantum query algorithms", *Quantum Information and Computation* **14**, 0001 (2014).

[43] D. W. Berry, M. J. W. Hall, and H. M. Wiseman, "Stochastic Heisenberg Limit: Optimal Estimation of a Fluctuating Phase", *Physical Review Letters* **111**, 113601 (2013).

[44] D.-S. Wang, D. W. Berry, M. C. de Oliveira, and B. C. Sanders, "Solovay-Kitaev Decomposition Strategy for Single-Qubit Channels", *Physical Review Letters* **111**, 130504 (2013).

[45] H. Yonezawa, D. Nakane, T. A. Wheatley, K. Iwasawa, S. Takeda, H. Arao, K. Ohki, K. Tsumura, D. W. Berry, T. C. Ralph, H. M. Wiseman, E. H. Huntington, and A. Furusawa, "Quantum-enhanced optical-phase tracking", *Science* **337**, 1514 (2012).

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[47] M. J. W. Hall, D. W. Berry, M. Zwierz, H. M. Wiseman, "Universality of the Heisenberg limit for estimates of random phase shifts", *Physical Review A* **85**, 041802(R) (2012).

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[50] N. Wiebe, D. W. Berry, P. Høyer, B. C. Sanders, "Simulating quantum dynamics on a quantum computer", *Journal of Physics A: Mathematical and Theoretical* **44**, 445308 (2011).

[51] D. W. Berry and A. I. Lvovsky, "Preservation of loss in linear-optical processing", *Physical Review A* **84**, 042304 (2011).

[52] R. S. Said, D. W. Berry, and J. Twamley, "Nanoscale magnetometry using a single-spin system in diamond", *Physical Review B* **83**, 125410 (2011).

[53] D. W. Berry and A. I. Lvovsky, "Linear-optical processing cannot increase photon efficiency", *Physical Review Letters* **105**, 203601 (2010).

[54] T. A. Wheatley, D. W. Berry, H. Yonezawa, D. Nakane, H. Arao, D. T. Pope, T. C. Ralph, H. M. Wiseman, A. Furusawa, and E. H. Huntington, "Adaptive optical phase estimation using time-symmetric quantum smoothing", *Physical Review Letters* **104**, 093601 (2010).

[55] D. W. Berry, M. Aguado, A. Gilchrist, and G. K. Brennen, "Non-Abelian anyonic interferometry with a multi-photon spin lattice simulator", *New Journal of Physics* **12**, 053011 (2010).

[56] N. Wiebe, D. W. Berry, P. Høyer, and B. C. Sanders, "Higher order decompositions of ordered operator exponentials", *Journal of Physics A: Mathematical and Theoretical* **43**, 065203 (2010).

[57] D. W. Berry, H. Jeong, M. Stobińska, and T. C. Ralph, "Fair-sampling assumption is not necessary for testing local realism", *Physical Review A* **81**, 012109 (2010).

[58] H. M. Wiseman, D. W. Berry, S. D. Bartlett, B. L. Higgins, and G. J. Pryde, "Adaptive measurements in the optical quantum information laboratory", *IEEE Journal of Selected Topics in Quantum Electronics* **15**, 1661 (2009).

[59] D. W. Berry, B. L. Higgins, S. D. Bartlett, M. W. Mitchell, G. J. Pryde, and H. M. Wiseman, "How to perform the most accurate possible phase measurements", *Physical Review A* **80**, 052114 (2009).

[60] B. L. Higgins, D. W. Berry, S. D. Bartlett, M. W. Mitchell, H. M. Wiseman, and G. J. Pryde, "Demonstrating Heisenberg-limited unambiguous phase estimation without adaptive measurements", *New Journal of Physics* **11**, 073023 (2009).

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[65] D. W. Berry, A. I. Lvovsky, and B. C. Sanders, "Efficiency limits for linear optical processing of single photons and single-rail qubits", *Journal of the Optical Society of America B* **24**, 189 (2007).

[66] D. W. Berry, A. I. Lvovsky, and B. C. Sanders, "Interconvertibility of single-rail optical qubits", *Optics Letters* **31**, 107 (2006).

[67] D. W. Berry and M. R. Dowling, "Two qubits can be entangled in two distinct temperature regions", *Physical Review A* **74**, 062301 (2006).

[68] D. W. Berry and H. M. Wiseman, "Adaptive phase measurements for narrowband squeezed beams", *Physical Review A* **73**, 063824 (2006).

[69] D. T. Pope, D. W. Berry, and N. K. Langford, "The practicality of adaptive phase estimation", *Optics and Spectroscopy* **99**, 397 (2005).

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[71] D. W. Berry and B. C. Sanders, "Equivalence between two-mode spin squeezed states and pure entangled states with equal spin", *Journal of Physics A: Mathematical and General* **38**, L205 (2005).

[72] D. W. Berry and B. C. Sanders, "Numerical analysis of the capacities for two-qubit unitary operations", *Physical Review A* **71**, 022304 (2005).

[73] D. W. Berry, "Resources required for exact remote state preparation", *Physical Review A* **70**, 062306 (2004).

[74] D. W. Berry, S. Scheel, C. R. Myers, B. C. Sanders, P. L. Knight, and R. Laflamme, "Post-processing with linear optics for improving the quality of single-photon sources", *New Journal of Physics* **6**, 93 (2004).

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[89] D. W. Berry, H. M. Wiseman, and Z. X. Zhang, "Heterodyne and adaptive phase measurements on states of fixed mean photon number", *Physical Review A* **60**, 2458 (1999).

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[90] D. W. Berry, A. M. Childs, and R. Kothari, "Hamiltonian simulation with nearly optimal dependence on all parameters", in Proceedings of the 56th Annual IEEE Symposium on Foundations of Computer Science (FOCS 2015), pp. 792-809 (2015).

[91] D. W. Berry, A. M. Childs, R. Cleve, R. Kothari, and R. D. Somma, "Exponential improvement in precision for simulating sparse Hamiltonians", in Proceedings of the 46th Annual ACM Symposium on Theory of Computing (STOC 2014), pp. 283–292 (2014).

[92] D. W. Berry, "Qubit channels that achieve capacity with two states", presented at Quantum Communications and Quantum Imaging III, SPIE International Symposium on Optics and Photonics (San Diego, CA, July 31 – August 4, 2005), Proc. SPIE, Vol. 5893, p. 589318.

[93] D. W. Berry, S. Scheel, C. R. Myers, B. C. Sanders, P. L. Knight and R. Laflamme, "Improving single-photon sources via linear optics and photodetection", presented at Fluctuations and Noise in Photonics and Quantum Optics II (Gran Canaria, Spain, 25-28 May 2004), Proc. SPIE, Vol. 5468, pp. 232-243.

Book Chapters

[94] D. W. Berry, G. Ahokas, R. Cleve, and B. C. Sanders, "Quantum Algorithms for Hamiltonian Simulation", invited chapter in Mathematics of Quantum Computation and Quantum Technology, (Chapman & Hall/CRC, 2007).

Unpublished Preprints

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[96] M. E. S. Morales, P. Costa, D. K. Burgarth, Y. R. Sanders, and D. W. Berry, "Greatly improved higher-order product formulae for quantum simulation", arXiv: 2210.15817 (2022).

[97] C. H. Cho, D. W. Berry, and M. H. Hsieh, "Doubling the order of approximation via the randomized product formula", arXiv: 2210.11281 (2022).

[98] L. O. Conlon, T. Vogl, C. D. Marciniak, I. Pogorelov, S. K. Yung, F. Eilenberger, D. W. Berry, F. S. Santana, R. Blatt, T. Monz, P. K. Lam, S. M. Assad, "Approaching optimal entangling collective measurements on quantum computing platforms", arXiv: 2205.15358 (2022).

[99] P. C. S. Costa, D. An, Y. R. Sanders, Y. Su, R. Babbush, and D. W. Berry, "Optimal scaling quantum linear systems solver via discrete adiabatic theorem", arXiv: 2111.08152 (2021).

Errata

[100] D. W. Berry and H. M. Wiseman, "Erratum: Adaptive phase measurements for narrowband squeezed beams [Phys. Rev. A 73, 063824 (2006)]", Physical Review A 87, 019901(E) (2013).

News & Views

[101] D. W. Berry, "Viewpoint: A Random Approach to Quantum Simulation", *Physics* **12**, 91 (2019).

[102] D. W. Berry and H. M. Wiseman, "Quantum photonics: Quantum optics on a chip", *Nature Photonics* **3**, 317 (2009).

Conference Invitations

I receive a very large number of conference invitations, far too many to accept. Below is a selection of the more important invited talks.

- Quantum 2.0 Conference and Exhibition (Boston, 13-16 June 2022).
  "New Methods in Quantum Simulation of Chemistry"
  https://www.optica.org/en-us/events/topical_meetings/quantum/schedule/?day=Monday
- Quantum Australia Conference and Careers Fair (Sydney + Online, 23-25 February 2022).
  I was part of the panel for the Quantum Software discussion on 23 February.
- 21th Asian Quantum Information Science Conference (Tokyo, September 1-4, 2021).
  Y. Su, D. W. Berry, N. Wiebe, N. Rubin, and R. Babbush,
  "Fault-tolerant quantum simulations of chemistry in first quantization"
  http://aqis-conf.org/2021/
- 2021 CECAM-Lorentz workshop: Useful Quantum Computation For Quantum Chemistry (Virtual, February 22-26, 2021).
  D. W. Berry, C. Gidney, W. Huggins, J. McClean, N. Wiebe, and R. Babbush,
  "Efficient quantum computation of chemistry through tensor hypercontraction"
  https://www.lorentzcenter.nl/useful-quantum-computation-for-quantum-chemistry.html
- PRACQSYS 2019: Principles and Applications of Control in Quantum Systems (Hong Kong, December 14-18, 2019). D. W. Berry, W. Gorecki, H. M. Wiseman, and R. Demkowicz-Dobrzanski, "Estimation bounds using Kaiser windows" (Cancelled due to Hong Kong protests.)
  https://sites.google.com/view/pracqsys2019/home
- Coogee'19 Sydney Quantum Information Theory Workshop (Sydney, February 5-8, 2019).
  D. W. Berry, M. Kieferová, A. Scherer, Y. Sanders, G. H. Low, N. Wiebe, R. Babbush, C. Gidney, J. McClean, A. Fowler, H. Neven, A. Childs, and R. Kothari,
  "Quantum chemistry simulation: How low can you go?"
  http://www.physics.usyd.edu.au/quantum/Coogee2019/
- **Keynote speaker:** The 8th Workshop on Quantum Simulation and Quantum Walks (Perth, December 14-16, 2018). D. W. Berry, R. Babbush, C. Gidney, J. McClean, A. Fowler, H. Neven, N. Wiebe, and A. Paler, "Quantum chemistry simulation: How low can you go?" http://www.physics.uwa.edu.au/research/quantum-dynamics-computation/the-8th-workshop-on-quantum-simulation-and-quantum-walk-2018

- AIP Summer meeting (Sydney, December 3-7, 2017).
  K. Laverick, H. M. Wiseman, H. T. Dinani, and D. W. Berry, "Adaptive Estimation of a Time-varying Phase with Coherent States"
  https://www.openconf.org/aip2017/modules/request.php?module=oc_program&action=summary.php&id=150

- Quantum Summit 2017 (Chengdu, October 11-17, 2017).
  D. W. Berry, A. M. Childs, A. Ostrander, and G. Wang, "Quantum algorithm for linear differential equations with exponentially improved dependence on precision"
  http://qmeeting.org/quantum-summit-2017/invited-speakers/

- The 4th biennial China–Australia Quantum Control Workshop (Hefei, September 25-28, 2016).
  D. W. Berry, H. T. Dinani, K. R. Motes, Z. Huang, H. M. Wiseman, P. M. Anisimov, J. P. Dowling, "Advanced in adaptive phase measurement for nonclassical states"
  http://lqcc.ustc.edu.cn/CAQCW16/?pageIndex=2

- Recent Advances in Quantum Metrology (Warsaw, March 2-4, 2016).
  D. W. Berry, M. Tsang, M. J. W. Hall, H. M. Wiseman,
  "Quantum Bell-Ziv-Zakai bounds and Heisenberg limits for waveform estimation"
  http://raqm.phoqus.fuw.edu.pl/

- **Plenary speaker:** International Conference on Quantum Information Processing and Communication (QIPC) (Leeds, September 13-18, 2015).
  D. W. Berry, A. Aspuru-Guzik, A. M. Childs, R. Kothari, R. Cleve, and R. D. Somma, "Advances in quantum algorithms for Hamiltonian simulation"
  QIPC is one of the premier regular conferences on quantum information, and has been held since 2000.
  http://www.qipc2015.leeds.ac.uk/home/plenary-speakers.html

- Last Frontiers in Quantum Information Science 3 (Homer Alaska, June 22-26, 2015).
  D. W. Berry, A. Aspuru-Guzik, A. M. Childs, R. Kothari, R. Cleve, and R. D. Somma, "Advances in quantum algorithms for Hamiltonian simulation"

- Heilbronn Quantum Algorithms Meeting (Bristol, April 13-14, 2015).
  D. W. Berry, A. Aspuru-Guzik, A. M. Childs, R. Kothari, R. Cleve, and R. D. Somma, "Advances in quantum algorithms for Hamiltonian simulation"
  https://www.maths.bris.ac.uk/events/meetings/meeting/index.php?meeting_id=144

- **Keynote speaker:** Quantum Simulations and Quantum Walks 2014 (Durban, November 24-28, 2014). D. W. Berry, A. M. Childs, R. Cleve, R. Kothari, and R. D. Somma, "Hamiltonian simulation with nearly optimal dependence on all parameters"
  http://quantum.ukzn.ac.za/events/QSQW2014

- Australia-Japan Workshop on Multi-user Quantum Networks (Sydney, October 22-24, 2014).
  D. W. Berry, A. M. Childs, R. Cleve, R. Kothari, and R. D. Somma,
  "Exponential improvement in precision for simulating sparse Hamiltonians"
  http://quantum-lab.org/ajw2014.php

- 3rd Biennial China-Australia Quantum Control Workshop (Brisbane, September 29 - October 3, 2014). D. W. Berry, M. Tsang, M. J. W. Hall, H. M. Wiseman,
  "The Heisenberg limit for waveform estimation"
  https://www.griffith.edu.au/conference/china-australia-quantum-control-workshop/speakers2

- Aspen Winter Conference on Advances in Quantum Algorithms and Computation (Aspen, March 9-14, 2014). D. W. Berry, A. M. Childs, R. Cleve, R. Kothari, and R. D. Somma, "Exponential improvement in precision for simulating sparse Hamiltonians"
  http://www.aspenphys.org/physicists/winter/2014/quantum/Participants.html

- American Physical Society March Meeting (Denver, March 3-7, 2014).
  D. W. Berry, A. M. Childs, R. Cleve, R. Kothari, and R. D. Somma,
  "Exponential improvement in precision for simulating sparse Hamiltonians"
  The APS March Meeting is the main conference organised by the American Physical Society, and attracts thousands of participants each year.
  http://meetings.aps.org/Meeting/MAR14/APS_Invited

- China-Australia Quantum Control Workshop (Beijing, November 5-8, 2012).
  D. W. Berry, M. J. W. Hall, M. Zwierz, and H. M. Wiseman,
  "Universality of the Heisenberg Limit for Estimates of Random Phase Shifts"

- ONR Entanglement Beyond the Optical Regime (Anaheim, February 8-11, 2010).
  D. W. Berry, G. Y. Xiang, B. L. Higgins, H. M. Wiseman, and G. J. Pryde,
  "Entanglement-enhanced measurement of a completely unknown phase"
  This was an invitation-only event organised by the Office of Naval Research, with the top researchers in the area of quantum metrology.
  https://secure.onr.navy.mil/events/docs/587_Agenda_020310.pdf

- DEX-SMI workshop on quantum statistical inference (Tokyo, March 2-4, 2009).
  D. W. Berry, B. L. Higgins, H. M. Wiseman, S. D. Bartlett, M. W. Mitchell, and G. J. Pryde, "Phase measurements at the theoretical limit"
  http://www.math.nagoya-u.ac.jp/ masahito/workshop/program-NII.html

- **Keynote speaker:** The Principles and Applications of Control in Quantum Systems (PRACQSYS), (Sydney, July 9-13, 2007). B. L. Higgins, D. W. Berry, S. D. Bartlett, H. M. Wiseman, and G. J. Pryde, "Theory of entanglement-free Heisenberg-limited phase estimation"
  http://www.physics.usyd.edu.au/quantum/PRACQSYS2007/agenda.html

- XI International Conference on Quantum Optics (Minsk, May 26-31, 2006). D. W. Berry, "Implementation of multipartite unitary operations with limited resources"
  http://master.basnet.by/icqo2006/Programme.htm

- SPIE International Symposium on Optics and Photonics (San Diego, CA, July 31 – August 4, 2005). D. W. Berry, "Qubit channels that achieve capacity with two states"

- X International Conference on Quantum Optics (Minsk, May 30 – June 3, 2004).
  D. W. Berry, S. Scheel, C. R. Myers, B. C. Sanders, P. L. Knight, and R. Laflamme,
  "Postprocessing single photon sources via linear optics and photodetection"
  http://master.basnet.by/icqo2004/programme.htm

Major Conferences

My work has been accepted at both **STOC** and **FOCS**. These are the two most prestigious conferences in the area of computer science, and are regarded as the equivalent of Science and Nature for the physical sciences. No other quantum information researcher currently at Macquarie University has had their work accepted in **STOC** or **FOCS**. (Professor Igor Shparlinski had work accepted in FOCS, but since then he has moved to University of New South Wales.) In the following the presenting author is underlined.

1. D. W. Berry, A. M. Childs, and R. Kothari, "Hamiltonian simulation with nearly optimal dependence on all parameters", FOCS 2015: 56th Annual Symposium on Foundations of Computer Science (Berkeley, October 18-20, 2015).
http://www.cs.cmu.edu/∼venkatg/focs15-acceptedpapers.html

2. D. W. Berry, A. M. Childs, R. Cleve, R. Kothari, and R. D. Somma, "Exponential improvement in precision for simulating sparse Hamiltonians", STOC 2014: 46th Annual Symposium on Theory of Computing (New York, May 31 – June 3, 2014).
http://www.columbia.edu/∼cs2035/stoc/stoc2014/program.shtml

The most important and prestigious conference in the area of quantum information is **QIP**. **QIP** has a low rate of acceptance (20%), and at **QIP 2021** my work was accepted as a *plenary* talk, one of only 12 plenaries out of over 400 submissions. My work has been accepted for oral presentation at **QIP 11** times, and for poster presentations another 5 times.

3. D. W. Berry, Y. Su, C. Gyurik, R. King, J. Basso, A. Del Toro Barba, A. Rajput, N. Wiebe, V. Dunjko, and R. Babbush, "Quantifying Quantum Advantage in Topological Data Analysis", oral presentation at QIP 2023 – The 26th Conference on Quantum Information Processing (Ghent, February 6-10, 2023).

4. P. C. S. Costa, D. An, Y. R. Sanders, Y. Su, R. Babbush, and D. W. Berry, "Optimal scaling quantum linear systems solver via discrete adiabatic theorem", oral presentation at QIP 2022 – The 25th Conference on Quantum Information Processing (Pasadena, March 7-11, 2022).

5. Y. Su, D. W. Berry, N. Wiebe, N. Rubin, and R. Babbush, "Fault-tolerant quantum simulations of chemistry in first quantization", poster presentation at QIP 2022 – The 25th Conference on Quantum Information Processing (Pasadena, March 7-11, 2022).

6. J. Lee, D. W. Berry, C. Gidney, W. Huggins, J. McClean, N. Wiebe, and R. Babbush, "Efficient quantum computation of chemistry through tensor hypercontraction", **plenary** oral presentation at QIP 2021 – The 24th Conference on Quantum Information Processing (Munich, February 1-5, 2021).

7. Y. R. Sanders, D. W. Berry, P. Costa, L. W. Tessler, N. Wiebe, C. Gidney, H. Neven, and R. Babbush, "Compilation of Fault-Tolerant Quantum Heuristics for Combinatorial Optimization", oral presentation at QIP 2021 – The 24th Conference on Quantum Information Processing (Munich, February 1-5, 2021).

8. M. Bagherimehrab, Y. R. Sanders, D. W. Berry, G. K. Brennen, and B. C. Sanders, "Quasilinear quantum algorithm for generating the ground state of free quantum field theories", poster presentation at QIP 2021 – The 24th Conference on Quantum Information Processing (Munich, February 1-5, 2021).

9. D. W. Berry, C. Gidney, M. Motta, J. R. McClean, and R. Babbush, "Qubitization of arbitrary basis quantum chemistry leveraging sparsity and low rank factorization", oral presentation at QIP 2020 – The 23rd Conference on Quantum Information Processing (Shenzhen, January 6-10, 2020).
http://www.szpclab.com/qip2020#/programDetails

10. R. Babbush, C. Gidney, D. W. Berry, N. Wiebe, J. McClean, A. Paler, A. Fowler, and H. Neven, "Simulating correlated electrons in the surface code with a single T-factory", oral presentation at QIP 2019 – The 22nd Conference on Quantum Information Processing (Boulder, January 14-18, 2019).
http://jila.colorado.edu/qip2019/program.html

11. D. W. Berry, M. Kieferová, A. Scherer, Y. Sanders, G. H. Low, N. Wiebe, J. McClean, H. Neven, C. Gidney, and R. Babbush, "Quantum simulation of chemistry with sublinear scaling in basis size", and G. H. Low and N. Wiebe, "Hamiltonian simulation in the interaction picture", merged oral presentation at QIP 2019 – The 22nd Conference on Quantum Information Processing (Boulder, January 14-18, 2019).
http://jila.colorado.edu/qip2019/program.html

12. D. W. Berry, A. M. Childs, A. Ostrander, and G. Wang, "Quantum algorithm for linear differential equations with exponentially improved dependence on precision", poster presentation at QIP 2017 – The 20th Conference on Quantum Information Processing (Seattle, January 16-20, 2017).
https://stationq.microsoft.com/qip-2017details/

13. D. W. Berry, A. M. Childs, and R. Kothari, "Hamiltonian simulation with nearly optimal dependence on all parameters", oral presentation at QIP 2015 – The 18th Conference on Quantum Information Processing (Sydney, January 12-16, 2015).
http://www.quantum-lab.org/qip2015/AcceptedTalks.php

14. D. W. Berry, R. Cleve, and S. Gharibian, "Exponential improvement in precision for Hamiltonian-evolution simulation", and A. M. Childs, and R. Kothari, "Quantum simulation of sparse Hamiltonians and continuous queries with optimal error dependence", merged oral presentation at QIP 2014 – 17th Conference on Quantum Information Processing (Barcelona, February 03-07, 2014).
http://benasque.org/2014QIP/cgi-bin/program.pl

15. D. W. Berry, R. Cleve, and S. Gharibian, "Gate-Efficient Discrete Simulations of Continuous-Time Query Algorithms", poster presentation at QIP 2013 – 16th Workshop on Quantum Information Processing (Beijing, January 21-25, 2013).
http://conference.iiis.tsinghua.edu.cn/QIP2013/poster-session.html

16. D. W. Berry, R. Cleve, and S. Gharibian, "Discrete simulations of continuous-time query algorithms that are efficient with respect to queries, gates and space", oral presentation at QIP 2012 – 15th Workshop on Quantum Information Processing (Montreal, December 12-16, 2011).
http://www.iro.umontreal.ca/∼qip2012/scientific_e.php

17. D. W. Berry (unable to attend), "Quantum algorithm for solving linear differential equations", poster presentation at QIP 2011 – 14th Workshop on Quantum Information Processing (Singapore, January 10-14, 2011).
http://qip2011.quantumlah.org/scientificprogramme/postersession.php

18. D. W. Berry and A. M. Childs, "The query complexity of Hamiltonian simulation and unitary implementation", oral presentation at QIP 2010 – 13th Workshop on Quantum Information Processing (Zurich, January 15-22, 2010).
http://www.qip2010.ethz.ch/programme

Other Conferences

19. D. W. Berry, Y. Su, C. Gyurik, R. King, J. Basso, A. Del Toro Barba, A. Rajput, N. Wiebe, V. Dunjko, and R. Babbush, "Reducing overhead for quantum advantage in topological data analysis", talk at the 24th Australian Institute of Physics Conference (Adelaide, December 11-16, 2022).

20. D. W. Berry and P. Costa, "Quantum algorithm for time-dependent differential equations using Dyson series", talk at the 24th Australian Institute of Physics Conference (Adelaide, December 11-16, 2022).

21. P. C. S. Costa, D. An, Y. R. Sanders, Y. Su, R. Babbush, and D. W. Berry, "Optimal scaling quantum linear systems solver via discrete adiabatic theorem", talk at the 24th Australian Institute of Physics Conference (Adelaide, December 11-16, 2022).

22. Y. Su, D. W. Berry, N. Wiebe, N. Rubin, and R. Babbush, "Fault-tolerant quantum simulations of chemistry in first quantization", invited oral presentation at 21st Asian Quantum Information Science Conference (Tokyo, September 1-4, 2021).

23. J. Lee, D. W. Berry, C. Gidney, W. Huggins, J. McClean, N. Wiebe, and R. Babbush, "Even more efficient quantum computations of chemistry through tensor hypercontraction", talk at the 16th Conference on the Theory of Quantum Computation, Communication and Cryptography (Latvia, July 5-8, 2021).

24. J. Lee, D. W. Berry, C. Gidney, W. Huggins, J. McClean, N. Wiebe, and R. Babbush, "Even more efficient quantum computations of chemistry through tensor hypercontraction", talk at the 20th Asian Quantum Information Science Conference (Sydney, December 7-9, 2020).

25. Y. R. Sanders, D. W. Berry, P. Costa, L. W. Tessler, N. Wiebe, C. Gidney, H. Neven, and R. Babbush, "Compilation of Fault-Tolerant Quantum Heuristics for Combinatorial Optimization", talk at the 20th Asian Quantum Information Science Conference (Sydney, December 7-9, 2020).

26. Y. Sanders, G. H. Low, A. Scherer, and D. W. Berry, "Black-box quantum state preparation without arithmetic", long talk at the 19th Asian Quantum Information Science Conference (Seoul, August 19-23, 2019).

27. N. Saadatmand, Travis Baker, D. W. Berry, and H. Wiseman, "The Heisenberg limit for laser coherence", long talk at the 19th Asian Quantum Information Science Conference (Seoul, August 19-23, 2019).

28. D. W. Berry, R. Babbush, C. Gidney, J. McClean, A. Fowler, H. Neven, N. Wiebe, and A. Paler, "Encoding Electronic Spectra in Quantum Circuits with Linear T Complexity", talk at the 23rd Australian Institute of Physics Conference (Perth, December 9-13, 2018).

29. D. W. Berry, R. Babbush, C. Gidney, J. McClean, A. Fowler, H. Neven, N. Wiebe, and A. Paler, "Encoding Electronic Spectra in Quantum Circuits with Linear T Complexity", plenary talk at the 18th Asian Quantum Information Science Conference (Nagoya, September 8-12, 2018).

30. D. W. Berry, A. M. Childs, A. Ostrander, and G. Wang, "Quantum algorithm for linear differential equations with exponentially improved dependence on precision", oral presentation at the 17th Asian Quantum Information Science Conference (Singapore, September 4-8, 2017).

31. H. T. Dinani, D. W. Berry, and H. M. Wiseman, "Adaptive estimation of time-varying phase with power-law spectrum", oral presentation at APPC-AIP Congress (Brisbane, December 4-8, 2016).

32. D. W. Berry and L. Novo, "Corrected quantum walk for optimal Hamiltonian simulation", oral presentation at APPC-AIP Congress (Brisbane, December 4-8, 2016).

33. R. Babbush, D. W. Berry, I. Kivlichan, A. Wei, D. Southwood, P. Love and A. Aspuru-Guzik, "Higher-Efficiency Quantum Algorithms for Simulation of Chemistry", long talk at the 16th Asian Quantum Information Science Conference (Taipei, August 29 – September 2, 2016).

34. H. T. Dinani, M. Gupta, D. W. Berry, and J. Dowling, "Quantum enhanced absorption spectroscopy", oral presentation at CLEO/Europe – EQEC 2015 (Munich, June 21-25, 2015).

35. D. W. Berry, M. Tsang, M. J. W. Hall, and H. M. Wiseman, "The Heisenberg limit for a varying phase", oral presentation at the Australian Institute of Physics Congress (Canberra, December 7-11, 2014).

36. H. T. Dinani and D. W. Berry, "Loss-resistant unambiguous phase measurement", oral presentation at the Australian Institute of Physics Congress (Canberra, December 7-11, 2014).

37. M. Ringbauer, A. Fedrizzi, D. W. Berry, and A. G. White, "Quantum correlations beyond Tsirelson's bound", oral presentation at CLEO: Conference on Lasers and Electro-Optics (San Jose, June 8-13, 2014).

38. D. W. Berry, R. Cleve, and R. D. Somma, "Hamiltonian simulation with complexity polylogarithmic in the error", oral presentation at the 13th Asian Quantum Information Science Conference (Chennai, August 25-30, 2013).

39. H. T. Dinani and D. W. Berry, "Loss resistant phase measurement", poster presentation at Quantum Information Processing and Communication International Conference (Florence, June 30 – July 5, 2013).

40. D. W. Berry, M. J. W. Hall, and H. M. Wiseman, "Ultimate Limits to Quantum-Enhanced Optical Phase Tracking", oral presentation at CLEO: Conference on Lasers and Electro-Optics (San Jose, June 9-14, 2013).

41. D. W. Berry, M. J. W. Hall, M. Zwierz, and H. M. Wiseman, "Universality of the Heisenberg limit", oral presentation at the 20th Australian Institute of Physics Congress (Sydney, December 9-13, 2012).

42. D. W. Berry, R. Cleve, and S. Gharibian, "Gate-Efficient Discrete Simulations of Continuous -Time Query Algorithms", oral presentation at the 12th Asian Quantum Information Science Conference (Suzhou, August 23-26, 2012).

43. M. J. W. Hall, D. W. Berry, M. Zwierz, and H. M. Wiseman, "Universality of the Heisenberg Limit for Estimates of Random Phase Shifts", oral presentation at the Quantum Electronics and Laser Science Conference (San Jose, May 6-11, 2012).

44. D. W. Berry, "Quantum Algorithm for Solving Linear Differential Equations", oral presentation at the 11th Asian Quantum Information Science Conference (Busan, August 23-30, 2011).

45. D. W. Berry and A. I. Lvovsky, "Conservation of Vacuum in an Interferometer", oral presentation at the Quantum Electronics and Laser Science Conference (Baltimore, May 1-6, 2011).

46. H. Yonezawa, D. Nakane, T. A. Wheatley, K. Iwasawa, S. Takeda, H. Arao, D. W. Berry, T. C. Ralph, H. M. Wiseman, E. Huntington, and A. Furusawa, "Squeezing-enhanced adaptive optical phase estimation ", oral presentation at Quantum Electronics and Laser Science Conference (Baltimore, May 1-6, 2011).

47. D. W. Berry and A. I. Lvovsky, "Conservation of Vacuum in an Interferometer", oral presentation at the APS March meeting (Dallas, March 21-25, 2011).

48. D. W. Berry, G. Y. Xiang, B. L. Higgins, H. M. Wiseman, and G. J. Pryde, "Entanglement-enhanced measurement of a completely unknown phase", oral presentation at the Quantum Electronics and Laser Science Conference (San Jose, May 16-21, 2010).

49. D. Nakane, T. A. Wheatley, D. W. Berry, H. Yonezawa, H. Arao, D. T. Pope, T. C. Ralph, H. M. Wiseman, E. H. Huntington, and A. Furusawa, "Adaptive Optical Phase Estimation", oral presentation at the Quantum Electronics and Laser Science Conference (San Jose, May 16-21, 2010).

50. D. W. Berry and A. M. Childs, "The complexity of implementing $N \times N$ black-box unitaries is $O(N^{3/4})$", oral presentation at the 9th Asian Conference on Quantum Information Science (Nanjing, August 26-29, 2009).

51. D. W. Berry, B. L. Higgins, H. M. Wiseman, S. D. Bartlett, M. W. Mitchell, and G. J. Pryde, "Theory for Heisenberg Limited Phase Measurement", oral presentation at the 18th National AIP Physics Congress (Adelaide, November 30 – December 5, 2008).

52. D. W. Berry, H. Jeong, M. Stobińska, and T. C. Ralph, "The CHSH-Bell inequality and Tsirelson's bound with postselection", oral presentation at the Quantum Electronics and Laser Science Conference (San Jose, May 4-9, 2008).

53. B. L. Higgins, H. M. Wiseman, G. J. Pryde, D. W. Berry, and S. D. Bartlett, "Entanglement-Free, Heisenberg-Limited Phase Measurement", oral presentation at the Quantum Electronics and Laser Science Conference (San Jose, May 4-9, 2008).

54. T. A. Wheatley, E. H. Huntington, D. W. Berry, H. M. Wiseman, and T. C. Ralph, "Quantum Optical Adaptive Phase Estimation of Sidebands", oral presentation at the Quantum Electronics and Laser Science Conference (San Jose, May 4-9, 2008).

55. D. W. Berry, B. L. Higgins, S. D. Bartlett, H. M. Wiseman, and G. J. Pryde, "Entanglement-free Heisenberg-limited phase estimation", oral presentation at Noise Information & Complexity @ Quantum Scale (Erice, November 4-10, 2007).

56. D. W. Berry, "Remote implementation of multipartite unitary operations", poster presentation at AIP Congress, (Brisbane, December 3-8, 2006).

57. D. W. Berry, H. M. Wiseman, and E. Huntington, "Adaptive Phase Measurements for Narrowband Squeezed Beams", oral presentation at the Quantum Electronics and Laser Science Conference (Long Beach, May 21-26, 2006).

58. D. W. Berry, "Qubit channels that achieve capacity with two states", poster presentation at the Australasian Conference on Optics, Lasers and Spectroscopy (Rotorua, December 5-9, 2005).

59. D. W. Berry, "Qubit channels that achieve capacity with two states", poster presentation at the ERATO conference on Quantum Information Science (Tokyo, August 26-30, 2005).

60. M. G. Raymer, A. C. Funk, and D. W. Berry, "Secure quantum key distribution using squeezed macroscopic light pulses", oral presentation at the SPIE International Symposium on Optics and Photonics (San Diego, July 31 – August 4, 2005).

61. D. W. Berry, S. Scheel, C. R. Myers, B. C. Sanders, P. L. Knight and R. Laflamme, "Improving single photon sources via linear optics and photodetection", oral presentation at Fluctuations and Noise in Photonics and Quantum Optics II (Gran Canaria, Spain, 25-28 May 2004).

62. D. W. Berry, S. Scheel, C. R. Myers, B. C. Sanders, P. L. Knight, and R. Laflamme, "Postprocessing single photon sources via linear optics and photodetection", oral presentation at the Quantum Electronics and Laser Science Conference (San Francisco, May 16-21, 2004).

63. A. C. Funk, M. G. Raymer, and D. W. Berry, "Experimental demonstration of secure quantum key distribution using macroscopic non-classical optical pulses", oral presentation at the Quantum Electronics and Laser Science Conference (San Francisco, May 16-21, 2004).

64. D. W. Berry, S. Scheel, C. R. Myers, B. C. Sanders, P. L. Knight, and R. Laflamme, "Improving single photon sources via linear optics and photodetection", oral presentation at the Australasian Conference on Optics, Lasers and Spectroscopy (Melbourne, December 1-4, 2003).

65. D. W. Berry and B. C. Sanders, "Numerical analysis of capacities for two-qubit unitary operations", poster presentation at the 4th European QIPC Workshop (Oxford, July 13-17, 2003).

66. D. W. Berry and B. C. Sanders, "Quantum Teleportation and Entanglement Swapping for Systems of Arbitrary Spin", oral presentation at the Quantum Electronics and Laser Science Conference (Long Beach, May 19-24, 2002).

67. D. W. Berry and B. C. Sanders, "Quantum teleportation and entanglement swapping for systems of arbitrary spin", oral presentation at the Australasian Conference on Optics, Lasers and Spectroscopy (Brisbane, December 3-6, 2001).

68. D. W. Berry and H. M. Wiseman, "Adaptive measurements and Optimal states for Quantum Interferometry", oral presentation at the Quantum Electronic and Laser Science Conference (Baltimore, May 6-11, 2001).

69. D. W. Berry and H. M. Wiseman, "Adaptive measurements and optimal states for quantum interferometry", oral presentation at the 14th National Congress of the Australian Institute of Physics (Adelaide, December 10-15 2000).

70. D. W. Berry, N. R. Heckenberg, and H. Rubinsztein-Dunlop, "Strong heating effects in optical trapping", oral presentation at the Australasian Conference on Optics, Lasers and Spectroscopy (Christchurch, December 14-17, 1998).

Service

- I serve on the Quantum Expert Advisory Panel for TfNSW (Transport for NSW) for their new quantum technology initiative.
  https://www.transport.nsw.gov.au/data-and-research/quantum-technology
- I am on the Technical Advisory Committee for the Sydney Quantum Academy.
- Conference program committees:
  - ▷ QIP 2023 – the 26th Workshop on Quantum Information Processing. QIP is the most important conference in the area of quantum information.
    https://indico.cern.ch/event/1175020/page/26159-program-committee
  - ▷ QCE 2022 – 2022 IEEE International Conference on Quantum Computing & Engineering (QCE).
    https://qce.quantum.ieee.org/2022

- ▷ TQC 2022 – 17th Conference on the Theory of Quantum Computation, Communication and Cryptography.
  https://tqc2022-conference.iquist.illinois.edu/people/
- ▷ 14th Pacific Rim Conference on Lasers and Electro-Optics (CLEO).
  https://www.cleopr2020.org/committees/program-commitees/
- ▷ QCTIP 2019 – Quantum Computing Theory in Practice.
  https://www.bristolmathsresearch.org/meeting/qctip/
- ▷ TQC 2018 – The Conference on the Theory of Quantum Computation, Communication and Cryptography.
  https://www.tqc2018.org/
- ▷ QCMC 2018 – The International Conference on Quantum Communication, Measurement and Computing.
  http://qcmc18.phys.lsu.edu/committees.htm
- ▷ TQC 2017 – The Conference on the Theory of Quantum Computation, Communication and Cryptography.
  http://tqc2017.lip6.fr/committees.html
- ▷ QIP 2016 – the 19th Workshop on Quantum Information Processing.
  http://ucalgary.ca/qip2016/home/committees
- ▷ AQIS'16 – the 16th Asian Quantum Information Science Conference.
  http://aqis-conf.org/2016/committees/

- Since the start of 2019 I have been an editor for the Nature Publishing Group journal npj Quantum Information.

- From 30 March 2015 to 2019 I was an editor for the Nature Publishing Group journal Scientific Reports.

- To build public outreach, on July 20, 2015 I gave a public lecture to the Australian Computer Society titled "QUANTUM COMPUTING – What Can You Do with a Quantum Computer?".
  https://www.acs.org.au/insightsandpublications/news-archive/2015/72331.html

- In 2013 I produced a 23 minute video explaining the basics of quantum computing, which I posted to YouTube.
  http://www.youtube.com/watch?v=8fku9iryXGY

- My talk at Microsoft Research on Hamiltonian simulation is on YouTube.
  https://www.youtube.com/watch?v=hgfIVCJrur8

- My talk at QIP 2015 is on YouTube.
  https://www.youtube.com/watch?v=wQB6z-7R-Io

- On September 4-12, 2013, I gave a series of three lectures on introductory quantum algorithms for the Department of Computer Science, as well as the Department of Physics and Astronomy.

- On June 18-21, 2013 I gave a series of three invited lectures on methods for quantum algorithms at the Thirteenth Annual Canadian Summer School on Quantum Information (CSSQI), held at the Institute for Quantum Science and Technology (IQST) at the University of Calgary.

- Since 2014 I have organised the seminars for QSciTech. In 2015 I changed the format to the new Quantum Frontiers seminar series, with seminars from prominent researchers from around Australia, such as Andrew Doherty, Peter Drummond, and Jon Dowling.

- I help with the Macquarie University open days, providing academic advising.

- In 2010 I acted as an examiner for a PhD thesis for the University of Adelaide.
- In 2016 acted as a PhD thesis examiner for the University of Western Australia.
- In the first semester of 2007 I organised problem solving sessions on quantum information.
- I frequently referee for many journals, and in 2013 was selected as an outstanding referee by the American Physical Society (http://journals.aps.org/OutstandingReferees). One paper I refereed (and made crucial suggestions to) now has over 1000 citations. Journals I have refereed for include:
  - ▷ Nature & Nature Photonics
  - ▷ Physical Review Letters & Physical Review A
  - ▷ Communications in Mathematical Physics
  - ▷ Quantum Information and Computation
  - ▷ IEEE Transactions on Information Theory
  - ▷ Journal of the Optical Society of America B
  - ▷ Journal of Physics A & B
  - ▷ New Journal of Physics
  - ▷ Physics Letters A
  - ▷ Optics Communications
  - ▷ International Journal of Quantum Information

Teaching Experience

2022

- PHYS7905 Quantum Information and Computation, MRes/PhD S1, 25 students
  Role: I am a lecturer, covering the material in the first half of the unit. This subject is for MRes students as well as students who are part of the Sydney Quantum Academy (SQA), and the majority of the students are external students from other universities from the SQA.
- PHYS3810 Professional Physics, Third year
  Role: I helped organise the student placements for this second semester unit in S1.

2021

- PHYS2910/3910 Advanced Physics II/III, Second/Third year S2, 15 students
  Role: I am running the second semester part of this full-year unit for Advanced Physics students.
- PHYS7905/8905 Quantum Information and Computation, MRes/PhD S1, 17 students
  Role: Lecturer; in 2021 I developed a significant amount of new material covering introductory quantum information concepts other than quantum algorithms. This is because quantum algorithms are covered in a different SQA unit.
- PHYS3810 Professional Physics, Third year
  Role: I helped organise the student placements for this second semester unit in S1.

2020

- PHYS2910/3910 Advanced Physics II/III, Second/Third year S2, 20 students
  Role: I am running the second semester part of this full-year unit for Advanced Physics students.
- PHYS3130 Quantum Mechanics and Atomic Physics, Third year S1, 25 students
  Role: This is the equivalent subject to PHYS303 in 2017-2019. This year I am a lecturer.
- PHYS7905/8905 Quantum Information and Computation, MRes/PhD S1, 5 students
  Role: This subject is PHYS7905 for MRes students, and PHYS8905 for PhD students who are part of the Sydney Quantum Academy. It is the equivalent subject to PHYS714 in previous years. This year I am a lecturer.

- PHYS3810 Professional Physics, Third year
  Role: I helped organise the student placements for this second semester unit in S1. This is the same unit as PHYS311 in previous years.

2019

- PHYS311 Professional Physics, Third year S2, 17 students
  Role: I helped to start this new subject, which is a PACE and capstone unit. This year I am convenor, so organise the student placements, as well as the workshops and oral presentations.
- ASTR378 General Relativity, Third year S2, 16 students
  Role: convenor
- PHYS303 Quantum Mechanics and Atomic Physics, Third year S1, 20 students
  Role: convenor
- PHYS701 Mathematical Methods in Physics, MRes S1, 6 students
  Role: I teach the component of the course on differential equations, as well as the Mathematica labs. I originally started teaching this subject in 2008, and wrote extensive notes. Each year I have made further improvements to these notes, based on the student feedback. In the TEDS surveys the students have particularly noted how helpful the notes are. This course is on mathematical methods in physics, and the course is organised so each lecture is followed by a tutorial. This helps the students to quickly gain experience in applying the techniques taught in the lectures.

2018

- ASTR378 General Relativity, Third year, S2, 19 students
  Role: lecturer
- PHYS714 Quantum Information and Technology, MRes, S2, 4 students
  Role: convenor
- PHYS311 Professional Physics, Third year, S2, 22 students
  Role: Running third workshop and oral presentations, supervising students in work placements.
- PHYS303 Quantum Mechanics and Atomic Physics, Third year S1, 32 students
  Role: convenor
- PHYS701 Mathematical Methods in Physics, MRes S1, 11 students
  Role: convenor

2017

- ASTR378 General Relativity, Third year, S2, 17 students
  Role: lecturer
- PHYS714 Quantum Information and Technology, MRes, S2, 2 students
  Role: convenor
- PHYS311 Professional Physics, Third year, S2, 16 students
  Role: This was the first year I taught this PACE unit. I supervised two pairs of students in work placements, ran the third workshop and organised the oral presentations.
- PHYS303 Quantum Mechanics and Atomic Physics, Third year, S1, 30 students
  Role: I was convenor for this new unit, and gave the lectures for the quantum mechanics component. The quantum mechanics component was previously part of PHS301.
- PHYS701 Mathematical Methods in Physics, MRes, S1, 3 students
  Role: convenor
- PHYS201 Classical and Quantum Oscillations and Waves, Second year, S1, 50 students
  Role: tutor for Python labs

2016

- ASTR378 General Relativity, Third year, S2, 20 students
  Role: I gave lectures in this unit for the first time. I prepared extensive notes for the subject, as well as preparing weekly tutorials, assignments, and the final exam.
- PHYS714 Quantum Information and Technology, MRes, S2, 4 students
  Role: I taught half the masters level course on quantum information for the first time. I gave lectures on the theoretical foundations of quantum information leading up to quantum algorithms. I also set projects for the students.
- PHYS301 Electromagnetism and Quantum Physics, Third year, S1, 28 students
  Role: I taught this unit for the first time. I was convenor, and gave the lectures for the quantum mechanics component.
- PHYS701 Mathematical Methods in Physics, MRes, S1, 6 students
  Role: convenor
- PHYS143 Physics IB, First year, S2, 281 students
  Role: tutor
- PHYS140 Physics IA, First year, S1, 217 students
  Role: tutor

2015

- PHYS701 Mathematical Methods in Physics, MRes, S1, 3 students
  Role: convenor
- PHYS143 Physics IB, First year, S1, 249 students
  Role: I ran tutorials and organised two junior tutors.

2014

- PHYS701 Mathematical Methods in Physics, MRes, S1, 5 students
  Role: convenor

2013

- PHYS701 Mathematical Methods in Physics, MRes, S1, 11 students
  Role: convenor

2012

- PHYS490 Physics honours full time, 7 students
  Role: I taught half of the Mathematical Methods component of the fourth year honours degree. Note that honours was a single unit.

2008

- PHYS490 Physics honours full time, 8 students
  Role: I taught half of the Mathematical Methods component of the fourth year honours degree for the first time. I wrote a large set of lecture notes, of more than 60 pages. I set assignments and one half of the exam.

2007

- PHYS490 Physics honours full time, 4 students
  Role: I gave lectures and set assignment questions for the quantum information part of the fourth year honours unit.

2003

- PHYS490 Physics honours full time, 2 students
  Role: I taught a component of the fourth year honours unit at Macquarie University in 2003. I gave a series of lectures on Fourier analysis, set assignments and set an exam question.

2002

- PHYS480 Physics honours, 3 students
  Role: I gave a lecture on quantum algorithms as part of the honours unit at Macquarie University in 2002.

2001

- I was a Tutorial Assistant at the University of Queensland in 1999-2001, and organised the laboratory component of a course on engineering physics. I wrote the laboratory manual, organised tutors to supervise the experiments and supervised experiments myself. The laboratory manual I wrote was still in use several years later.

Supervision Experience

Philipp Schleich
Enrolled September 2022 – Present
Philipp Schleich is doing a Cotutelle between Macquarie and University of Toronto with Alán Aspuru-Guzik. His project is on how to simulate differential equations on quantum computers.

Mauricio Morales
Enrolled April 2020 – Present
Mauricio (Mauro) Morales is a student jointly supervised with Michael Bremner at UTS. His project is on how to derive higher-order product formulae for Hamiltonian simulation.

Louis Tessler
Enrolled 1 July 2019 – Present
Louis Tessler is doing a PhD in quantum algorithms, specialising in quantum optimisation. He recently completed his MRes in this topic.

Mária Kieferová
Enrolled 29 May 2017 – June 2019
I supervised the Cotutelle student Mária Kieferová in a project on quantum algorithms. She is now a lecturer and Sydney Quantum Academy fellow at UTS.

1. She has developed methods for performing quantum simulation of time-dependent Hamiltonians with exponential precision, and this work is published in Physical Review A [14].

2. She developed methods for preparing antisymmetrised states for quantum simulation of fermions [20].

3. She helped write the review article "Quantum chemistry in the age of quantum computing" which was published in Chemical Reviews.

4. She has developed techniques for implementing quantum algorithms for solving linear systems of equations using quantum signal processing with two qubits. She tested this algorithm online on the Rigetti quantum processor.

Zixin Huang
In 2017 I was an auxiliary supervisor for the University of Sydney student **Zixin Huang**. I supervised her in a project on quantum phase estimation which led to a publication in Physical Review A [27]. She is went to work in the group of Pieter Kok, and is now a Sydney Quantum Academy fellow at Macquarie.

Hossein Tavakoli Dinani
Enrolled 13 September 2012 – 14 March 2016, Graduation 20 September, 2016
He now has a CONICYT fellowship at Pontificia Universidad Católica de Chile. At the beginning of his PhD candidature I taught him how to perform CUDA parallel programming for GPUs, and he performed advanced research in quantum metrology using CUDA. I guided him through multiple sub-projects, which resulted in three publications, and three presentations at conferences.

1. One sub-project, which has results published in Physical Review A [39], is on methods for creating loss-resistant states and performing adaptive measurements with multiple states. He presented this work at the AIP Congress in 2014, and QIPC 2013.

2. He has shown how to use swarm optimisation for NV centre magnetometry, and we have collaborated with researchers at Delft University of Technology to achieve experimental demonstration. This work was published in Nature Nanotechnology [34].

3. He determined optimal states for metrology where both the loss and phase information are used to estimate a transition frequency. This work was published in Physical Review A [32], and he presented the work at CLEO/Europe. This work is in collaboration with Jonathan Dowling.

4. He examined methods of adaptive measurements with squeezed states for phase variation with a range of spectra. This work appeared in Physical Review A [24].

Teaching Training

- In 2017 I participated in the HDR Supervision Enhancement Program (SEP) workshop "Thesis by Publication".
- In 2016 I participated in the HDR SEP workshop "Doctoral supervision in virtual spaces".
- In 2015 I participated in the LTC workshop SEP Update: Examining a Thesis. This was primarily to learn about the examination process, and what makes an excellent thesis, as my PhD student was about to begin writing his thesis. It was also because I have previously examined a thesis, and the requirements for assessment were not made clear.
- In 2014 I attended the LTC Workshop – How to 'Flip' your Classroom and Encourage Active Learning. I was motivated to attend this course by issues that were raised in the FILT course, about ways to encourage active learning. I attended this workshop to learn more about the flipped classroom model, which may be a useful way of encouraging active learning. Based on the course I decided that it may be very time consuming to organise, and the advantage for teaching Physics is not clear. Therefore I am not currently planning to use this method, but am keeping it in mind for the future.
- In 2013 I completed the course Foundations in Learning and Teaching (FILT), a comprehensive 5-day course that explores many aspects of teaching practice. As part of this I attended a lecture from one of my colleagues (Alexei Gilchrist), and took notes of his methods to further enhance my teaching practice. I also had him attend some of my lectures, and give feedback. I wrote a detailed FILT reflection, analysing what I had learnt from this exercise, as well as synthesising what I had learnt from the course, and examining my professional development needs.
- In 2012 I attended the HDR SEP Initial Workshop. That was when I started supervising my PhD student, Hossein Dinani, so this workshop helped me to learn effective ways to get him started on the project. In addition, I was interested to discuss how to strike the right balance between giving students help, and allowing them to develop as an independent researcher.
- In 2014 I attended the LTC workshop SEP Update: Supervising to Completion. This was because my PhD student Hossein Dinani was completing in 2016. In this workshop I learnt about techniques for managing completion of his project to ensure that he completes successfully.