

Michael Bremner

*Research interests: Computational complexity theory, simulation
of quantum systems, quantum computing architectures*
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Personal details

Full name: Michael John Bremner Birth date: 5th August 1978
Nationality: Australian Languages: English

Education

2001 – 2005 **PhD**, *Department of Physics*, University of Queensland.
Project: Characterizing entangling quantum dynamics.
Supervised by Prof. Michael Nielsen and Prof. Gerard Milburn.
2000 – 2000 **BSc with Honours Class I**, *Department of Physics*, University of Queensland.
Project: Entanglement generation and tests of local realism in quantum optics.
Supervised by Prof. Tim Ralph and Dr Bill Munro.
1997 – 1999 **BSc (Physics)**, University of Queensland.

Positions

2016 – **Professor**, *Centre for Quantum Software and Information, School of Software*, University of Technology, Sydney,
Responsibilities: research, supervision, and administration.
2012 – 2016 **Associate Professor and Future Fellow**, *Centre for Quantum Computation and Intelligent Systems*, University of Technology, Sydney,
Responsibilities: research, supervision, and administration.
2009 – 2012 **Postdoctoral scientist**, *Institute for Theoretical Physics*, Leibniz University of Hannover,
Responsibilities: Research, teaching, supervision, and administration.
Employer: Prof. Reinhard Werner.
2007 – 2009 **Postdoctoral research assistant**, *Department of Computer Science*, University of Bristol,
Responsibilities: Research and administration.
Employer: Prof. Richard Jozsa.
2005 – 2007 **Postdoctoral scientist**, *Institute for Theoretical Physics and the Institute for Quantum Optics and Quantum Information*, University of Innsbruck,
Responsibilities: Research and administration.
Employer: Prof. Hans Briegel.

Research highlights

2015 – 2016 Together with Dr A. Montanaro (Bristol) and Dr D. Shepherd provided the first generalization of the Boson Sampling problem to spin systems (publication 13 below). Specifically, we give an argument that commuting quantum computations cannot be efficiently classically simulated even up to generous additive error bounds. This paper was accepted the prestigious *Physical Review Letters*, the *Conference on Quantum Information Processing* and the *Asian Conference on Quantum Information Science*. This work is being considered for experimental implementation by a number of leading quantum computing teams around the world. This work was also presented at the *Frontiers in Quantum Information and Computer Science Workshop* in Maryland and a yet-to-be-named conference in Tokyo on quantum complexity theory. This work has been cited over **28** times.

- 2010 Together with Prof. R. Jozsa (Cambridge) and Dr D. Shepherd (CESG) I demonstrated that if commuting quantum computations could be classically simulated then the polynomial hierarchy would collapse (publication 12 below). Presented as a contributed talk at the 14th Workshop on Quantum Information Processing (QIP 2011), presented at the 10th Asian Conference on Quantum Information Science (AQIS '10) and also discussed by Scott Aaronson on his *'Shtetl-Optimized'* blog (published by the MIT Technology Review). This paper has been cited more than **133** times.
- 2009 Together with C. Mora (Waterloo) and A. Winter (Bristol) proved that most quantum states, and hence highly entangled states, cannot be used for measurement-based quantum computation (publication 11 below). Published in Phys. Rev. Lett. with an accompanying Physics Viewpoint. Presented as a contributed talk at the 12th Workshop on Quantum Information Processing (QIP 2009) together with a related paper by D. Gross, S. Flammia and J. Eisert. This paper has been cited more than **80** times.
- 2008 Together with D. Shepherd (Bristol) proposed an interactive protocol which strongly suggested commuting quantum computations cannot be classically simulated (publication 10 below). Presented as a contributed talk at the 12th Workshop on Quantum Information Processing (QIP 2009). This work has been cited more than **50** times.
- 2002 Together collaborators from Queensland and MIT proved that any entangling 2-qubit gate, together with single-qubit gates, is a universal gate set for quantum computing by demonstrating a near-optimal method for creating CNOT gates (publication 3 below). This widely used result (**207** citations) has been integrated into many experimental proposals for quantum computing. Recently this method was explicitly experimentally implemented using ion traps (D. Hanneke *et al* Nature Physics **6**, 13 - 16 (2010)).
- 2003 Together with collaborators from Queensland and MIT introduced a resource theory-based approach to studying quantum dynamics (publication 4 below). This paper has received more than **131** citations.
- 2001 – 2005 With collaborators from Queensland, MIT and Caltech demonstrated that all finite-dimensional entangling Hamiltonian dynamics are equivalent up to single particle control operations. It was also shown that all k-local Hamiltonian dynamics together with single particle unitary operations are universal for quantum computation (publications 1, 2, 5, 7 below). The results of publications 1 and 2 were featured in an invited talk by Professor Michael Nielsen at QIP in 2002. Publication 1 was named a key reference in the theory of quantum simulation in the EU's quantum information roadmap (<http://qurope.eu/content/Roadmap>). Collectively these papers have received over **257** citations.

Fellowships and grants

- 2017 – 2024 *Australian Research Council Centre of Excellence in Quantum Computation and Communication Technology*: Role: Chief Investigator, Work Package Leader, and Program Manager. I will lead the new UTS node of the CQC2T from 2017. The CQC2T is led by UNSW and includes researchers from other Australian universities such as UQ, ANU, and Melb. At present it is regarded as one of the ARC's most successful CoE. There is a large number of international partner research institutions and industry partners also included in this grant. For instance, UTS node external partners include investigators at Cambridge and MIT. **Approximate ARC contribution: \$33M AUD.**
- 2014 – 2015 *Classical and quantum resource tradeoffs* awarded by the *Lockheed Martin Corporation*. Approximate awarded funds: **\$200k AUD.**
- 2014 – 2020 *New insights in quantum algorithms and complexity*, awarded by the *Engineering and Physical Sciences Research Council, UK*. Chief Investigator: Dr Ashley Montanaro (University of Bristol). Partner Investigators: A/Prof Michael Bremner (UTS) and A/Prof Aram Harrow (MIT). Awarded funds: **\$1.7M AUD.**
- 2011 – 2016 *Supra-classical quantum simulation in physically restricted models of quantum computation* awarded in the Australian Research Council's 2011 Future Fellowship call. Participating organizations: University of Technology, Sydney (administering organization), *University of Cambridge* (host organization), *University of Washington* (host organization). ARC awarded funds approximately **\$580k (Australian dollars)**. UTS contribution approximately \$ 106k. Project ID: FT110101044.

Engagement highlights

- 2013 – 2015 *18th International Conference on Quantum Information Processing (QIP2015)*. I was once of the main local organisers for QIP2015, which was hosted in January 2015 at UTS. QIP is the premier conference on theoretical aspects of quantum information science. My role included: leading the initial bid; coordinating the local organisation partners in the ARC Centre for Excellence for Engineered Quantum Systems at the University of Sydney, University of Queensland and Macquarie University; attaining sponsorship funding; and coordinating the local venue operations. QIP2015 has helped to establish UTS as a major international influence in the field of quantum computation. QIP2015 brought Australian researchers together with researchers from all the leading industrial and higher education research institutions (e.g. IBM, Microsoft, MIT, Caltech, Harvard, Cambridge). Talks were given by Nobel Laureates, researchers from industrial leaders such as Microsoft and IBM, and the most promising up and coming graduate students.
- 2014 *Program committee member* for the conference on the Theory of Quantum Computation, Communication, and Cryptography (TQC 2014). TQC is an annual international conference series in the Theory of Quantum Computation, Communication and Cryptography.
- 2010 – 2012 *Expert reviewer for Information and Communication Technologies in the European Union's 7th Framework Program*. My role was to annually review an international collaborative network involving some of the most acclaimed quantum information scientists in Europe. This included writing an assessment of their annual research activities and interviewing the Chief Investigators with respect to their research outcomes and directions.
- 2010 *Organizing committee member* for the *Collective quantum operations for information technologies workshop*, hosted at the University of Hannover. Approximately 40 participants and invited speakers from: Caltech, Cambridge, ETH, and the Max Planck Institute for Quantum Optics.
- 2007 *Organizing committee member* for the *5th Informal Quantum Information Gathering (IQING 5)*, hosted at the University of Innsbruck. Approximately 100 participants. This was a conference series for leading European early-career researchers in quantum information science.
- 2002 *Organizing committee member* for the *Quantum Information and Computation Summer School*, hosted at the University of Queensland. Approximately 100 participants.

Supervision

- 2015 – Supervising Dr Peter Rohde at the Centre for Quantum Computation and Intelligent Systems at the University of Technology Sydney. Dr Rohde has been employed using funding from the project *Classical and quantum resource tradeoffs*, funded by the Lockheed Martin Corporation.
- 2015 – Principle supervisor for Ryan Mann, PhD candidate at the Centre for Quantum Computation and Intelligent Systems at the University of Technology Sydney.
- 2010 Fabian Transchel *Quantum Domain Theory*, diploma thesis Leibniz University of Hannover. Supervised together with Prof. Reinhard Werner.

Scholarships and awards

- 2011 Future Fellowship, Australian Research Council.
- 2005 Dean's commendation for an "Outstanding Research Higher Degree thesis", awarded for PhD thesis by the University of Queensland.
- 2001 – 2005 Australian Postgraduate Award, Australian Research Council.
- 1998 – 1999 Scholarships for summer vacation research at the University of Queensland
- 1997 – 1999 Four Dean's commendations for high achievement, University of Queensland.
- 1996 Australian Students Prize – Awarded to the top 500 students in Australia completing high school studies.

Professional and engagement activities

- 2015 I was invited to be a long-term visitor at the Joint Centre for Quantum Information and Computer Science (QuICS) at the University of Maryland in late 2015. The long-term visitor program is bringing international researchers to the QuICS to collaborate with leading scientists at the National Institute of Standards and Technology and the University of Maryland
- 2013 – 2015 *Organising committee* member for the 18th *Conference on Quantum Information Processing*, hosted at the University of Technology Sydney in January 2015. QIP is the premier conference on the theoretical aspects of quantum information and computation science.
- 2014 *Organizer* of the *Sydney Quantum information Theory Workshop 2014*, a one-day workshop to bring together all those working on quantum information science in Sydney. Approximately 40 participants.
- 2013 *Visiting Fellow* at the Isaac Newton Institute for Mathematical Sciences, Cambridge. Participant in the program: Mathematical Challenges in Quantum Information.
- 2013 *Organizer* of the *2013 QCIS Workshop on Quantum Information and Computation*, a one-day workshop approximately 40 participants.
- 2012 – *Assessor* for the Australian Research Council.
- 2010 – 2012 *Expert reviewer* for Information and Communication Technologies in the European Union’s 7th Framework Program.
- 2006 – Prepared annual reports for multinational EU projects and invited to speak at review meetings for the University of Innsbruck (Optical LAttices and QUantum Information, OLAQUI), University of Bristol (Foundational Structures for Quantum Information and Computation, QICS) and Leibniz University of Hannover (COllective QUantum operations for Information Technologies, COQUIT).
- 2010 *Co-organizer* of the first COQUIT workshop in Hannover with approximately 40 participants and invited speakers from institutions including Caltech, Cambridge, ETH, and the Max Planck Institute for Quantum Optics. See http://www.itp.uni-hannover.de/Gruppen/quinfo_coquitworkshop.php.
- 2010 Organized meeting between the Centre for Quantum Photonics and the COQUIT consortium in Bristol.
- 2009 *Invited participant* in the Kavli Institute for Theoretical Physics (at UCSB) program on Quantum Information Science (2009).
- 2007 *Co-organizer* of the *Fifth Informal Quantum INformation Gathering (IQING 5)*, held in Innsbruck with approximately 100 participants.
- 2002 Visiting PhD student at the California Institute of Technology.
- 2002 *Co-organizer* of the *Quantum Information and Computation Summer School*, at the University of Queensland in February 2003. Approximately 100 participants.
- 2001 Visiting PhD student at the Kavli Institute for Theoretical Physics (at UCSB) program on Quantum Information: Entanglement, Decoherence and Chaos.
- 2002 – Referee for leading journals such as: Physical Review Letters, Quantum Information and Computation, Physical Review A, New Journal of Physics, Journal of Physics A, and major conferences including: ICALP, STACS, AQIS, TQC, and the Conference on Quantum Information Processing (QIP.)
- 2001 – Research visits or presentations at a number of the world’s leading research institutions. Some of these include: Caltech, MIT, Cambridge, The Santa Fe Institute, NASA Jet Propulsion Laboratory, Institute for Quantum Computing at the University of Waterloo, University of Vienna, Chinese Academy of Sciences, Sandia National Laboratories, National University of Singapore, ICFO Barcelona, ISI Torino, the Autonomous University of Barcelona, University College London, University of Innsbruck, University of Bristol, University of Glasgow, and The University of Queensland.

Scientific outreach and public policy engagement

- 2016 Together with Bronwyn Hemsley, Danielle Logue, and James Meese, I co-authored a piece in *The Conversation* entitled *Reimagining NSW: five ways to future-proof NSW’s innovation ecosystem* (<https://theconversation.com/reimagining-nsw-five-ways-to-future-proof-nsws-innovation-ecosystem-62782s>).

- 2016 Invited to give public lecture on *The commercialisation of quantum computing* at the CeBIT Australia 2016 Conference.
- 2014 Interviewed by *Benzinga* on recent experimental advances in quantum computing: "Google vs. IBM: The Quantum Computing Race", 22 September 2014 (<http://www.benzinga.com/top-stories/14/09/4861253/google-vs-ibm-the-quantum-computing-race>).
- 2012 Interviewed in *The Register* on recent advances in quantum algorithms: "What are quantum computers good for?", 17 November 2012 (http://www.theregister.co.uk/Print/2012/11/17/how_to_build_and_use_a_quantum_computer/).
- 2011 Interviewed in *Der Spiegel* on the current status of quantum computing implementations and on recent results by D-Wave Systems (<http://www.spiegel.de/spiegel/print/d-79652733.html>).
- 2004 – Extensively involved in the promotion of quantum information science through "Science 2.0" projects. I currently administer the website mickbremner.org, which evolved from my earlier websites *Brissie to Brizzle* (<http://brissietobrizzle.wordpress.com>) and *Quantumbiodiscs* (<http://quantumbiodiscs.wordpress.com>).
- 2006 – 2008 Extensive involvement in blogging on public policy through my own websites and as a writer for *Larvatus Prodeo* (<http://larvatusprodeo.net> and <http://larvatusprodeo.wordpress.com/>). The Larvatus Prodeo blog was often credited as being one of the most influential blogs in Australian politics between the years 2005 and 2009.
- 2003 Organized and worked on the University of Queensland Physics Department exhibit for Australian National Science Week.
- 1997 – 1998 Founder and inaugural president of PAIN, the University of Queensland's physics student society.
- 1997 – 2000 Organized and participated in numerous public physics demonstration shows.

Teaching experience

- 2011 Lecturer for *Theory of Quantum Computation*, a graduate level class at the Leibniz University of Hannover.
- 2010 Tutor and guest lecturer for *Funktionalanalysis fuer Physiker* (Functional Analysis for Physicists) at the Leibniz University of Hannover. This role included course development and student assesment.
- 2008 Invited talk at the QIPIRC and QAP Quantum Information Spring School in Bristol: *Engineering Interactions*.
- 1999 – 2004 Tutor in multiple undergraduate subjects in the Physics Department at the University of Queensland. Head tutor for *Mechanics and thermal physics I* and *Electromagnetism, optics, relativity and quantum physics I*, with a class size of approximately 200 students.
- 2002 Tutor at the *Quantum Information and Computation Summer School* at the University of Queensland, February 2002.
- 1998 – 1999 Tutor at the Junior Physics Olympiad, hosted at the University of Queensland.

Research publications

Citation data: 16 publications with over 1057 citations according to *Google Scholar Citations*. Average number of citations per paper: 70. h-index: 13. Citation counts are given within bold braces below.

1. J. L. Dodd, M. A. Nielsen, M. J. Bremner, and R. T. Thew. *Universal quantum computation and simulation using any entangling Hamiltonian and local unitaries* Physical Review A (Rapid Communications) **65**, 040301(R) (2002). [arXiv:quant-ph/0106064] (**121**)
2. M. A. Nielsen, M. J. Bremner, J. L. Dodd, A. M. Childs, and C. M. Dawson *Universal simulation of Hamiltonian dynamics for quantum systems with finite-dimensional state spaces* Physical Review A **66**, 022317 (2002). [arXiv:quant-ph/0109064] (**94**)
3. M. J. Bremner, C. M. Dawson, J. L. Dodd, A. Gilchrist, A. W. Harrow, D. Mortimer, M. A. Nielsen, and T. J. Osborne *A practical scheme for quantum computation with any two-qubit entangling gate* Physical Review Letters **89**, 247902 (2002). [arXiv:quant-ph/0207072] (**207**)

4. M. A. Nielsen, C. M. Dawson, J. L. Dodd, A. Gilchrist, D. Mortimer, T. J. Osborne, M. J. Bremner, A. W. Harrow, and A. Hines *Quantum dynamics as a physical resource* Physical Review A **67**, 052301 (2003). [arXiv:quant-ph/0208077] **(131)**
5. M. J. Bremner, J. L. Dodd, M. A. Nielsen and D. Bacon *Fungible Dynamics: There are only two types of entangling multiple-qubit interactions* Physical Review A **69**, 012313 (2004). [arXiv:quant-ph/0307148] **(27)**
6. A. G. White, A. Gilchrist, G. J. Pryde, J. L. O'Brien, M. J. Bremner and N. K. Langford *Measuring two-qubit gates* Journal of the Optical Society of America B, **24**, pp. 172-183 (2007) [arXiv:quant-ph/0308115] **(106)**
7. M. J. Bremner, D. Bacon and M. A. Nielsen *Simulating Hamiltonian dynamics using many-qudit Hamiltonians and local unitary control* Physical Review A **71** 052312 (2005). [arXiv:quant-ph/0405115] **(15)**
8. M. J. Bremner *Characterizing Entangling Quantum Dynamics* PhD thesis, The University of Queensland (2005). **(0)**
9. W. Dür, M. J. Bremner, H.-J. Briegel *Quantum simulation of interacting high dimensional systems: the influence of noise* Physical Review A **78** 052325 (2008). [arXiv:0706.0154] **(23)**
10. D. Shepherd and M. J. Bremner *Temporally unstructured quantum computation* Proceedings of the Royal Society A: Mathematical, Physical and Engineering Sciences **465** 1413-1439 (2009). [arXiv:0809.0847] **(54)**
11. M. J. Bremner, C. Mora and A. Winter *Are random pure states useful for quantum computation?* Physical Review Letters **102** 190502 (2009). [arXiv:0812.3001] **(80)**
12. M. J. Bremner, R. Jozsa and D. Shepherd *Classical simulation of commuting quantum computations implies collapse of the polynomial hierarchy* Proceedings of the Royal Society A: Mathematical, Physical and Engineering Sciences **467**, 459-472 (2011). [arXiv:1005.1407] **(133)**
13. M. J. Bremner, A. Montanaro and D. Shepherd *Average-case complexity versus approximate simulation of commuting quantum computations*, Physical Review Letters **117** 080501 (2016). [arXiv:1504.07999] **(28)**
14. S. Boixo, S. V. Isakov, V. N. Smelyanskiy, R. Babbush, N. Ding, Z. Jiang, M. J. Bremner, J.M. Martinis, H. Neven *Characterizing Quantum Supremacy in Near-Term Devices*, Submitted to Science (2017). [arXiv:1608.00263] **(27)**
15. M. J. Bremner, A. Montanaro and D. Shepherd *Achieving quantum supremacy with sparse and noisy commuting quantum computations*, Quantum **1** 8 (2017). [arXiv:1610.01808] **(9)**
16. A. P. Lund, M. J. Bremner, T. C. Ralph *Quantum sampling problems, BosonSampling and quantum supremacy*, npj Quantum Information **3** 15 (2017). [arXiv:1702.03061] **(2)**

Presentations

- April 2017 M. J. Bremner *Beyond classical computing via low-depth quantum circuit sampling* invited talk at the Bristol Quantum Information Technologies Workshop.
- January 2017 M. J. Bremner *Achieving quantum supremacy via low-depth quantum circuit sampling* invited presentation at the University of California, Berkeley.
- November 2016 M. J. Bremner *Achieving quantum supremacy via low-depth quantum circuit sampling* invited presentation at the University of Bristol.
- October 2016 M. J. Bremner *Achieving quantum supremacy via low-depth quantum circuit sampling* invited presentation at QSciTech, Macquarie University, Sydney.
- August 2016 M. J. Bremner *Average-case complexity versus approximate simulation of commuting quantum computations* invited talk at the Semi-quantum computing workshop, Waterloo.
- August 2016 M. J. Bremner *The complexity of quantum sampling and supremacy* invited seminar at Google, Los Angeles.
- May 2016 Invited to give public lecture on *The commercialisation of quantum computing* at the CeBIT Australia 2016 Conference, Sydney.
- March 2016 M. J. Bremner (speaker), A. Montanaro and D. Shepherd *Average-case complexity versus approximate simulation of commuting quantum computations* invited seminar in the Department of Physics at University College London.
- January 2016 M. J. Bremner *Commuting Quantum Computation* invited presentation at Google, Los Angeles.

- January 2016 M. J. Bremner (speaker), A. Montanaro and D. Shepherd *Average-case complexity versus approximate simulation of commuting quantum computations* contributed talk at the 19th Conference on Quantum Information Processing (QIP2016), Banff.
- December 2015 *Average-case complexity versus approximate simulation of commuting quantum computations* invited talk at the Workshop Around BQP at the Tokyo Institute of Technology, Tokyo.
- September 2015 *Average-case complexity versus approximate simulation of commuting quantum computations* invited talk at the Workshop on the Frontiers of Quantum Information and Computer Science at the University of Maryland, College Park.
- June 2015 *Average-case complexity versus approximate simulation of commuting quantum computations* invited seminar in the Department of Physics at the University of Queensland, Brisbane.
- April 2015 *Average-case complexity versus approximate simulation of commuting quantum computations* invited seminar at the QISS at Macquarie University, Sydney.
- April 2015 *Constructing classically difficult quantum simulation algorithms* invited seminar at the Sandia National Laboratories - Livermore, USA.
- February 2015 *Constructing classically difficult quantum simulation algorithms* invited speaker at the ARC Centre for Excellence in Quantum Computation and Communication Technology annual workshop.
- October 2014 *Towards a proof of the classical intractability of quantum simulation* invited talk at the Australia-Japan Workshop on Multi-user Quantum Networks, Sydney.
- July 2014 *The quantum computational complexity of quantum simulation* invited tutorial lecture at the Australian Research Council Centre of Excellence in Engineered Quantum Systems Winter School, at Macquarie University, Sydney.
- June 2014 *Towards a proof of the classical intractability of quantum simulation* invited seminar at the University of Glasgow, United Kingdom.
- December 2013 *Towards a proof of the classical intractability of quantum simulation* invited seminar at the University of Bristol, United Kingdom.
- November 2013 *Towards a proof of the classical intractability of quantum simulation* invited colloquium at the Academy of Mathematics and Systems Sciences, Chinese Academy of Sciences, Beijing.
- October 2013 *Towards a proof of the classical intractability of quantum simulation* invited colloquium at the Institute for Quantum Computation at the University of Waterloo, Canada.
- June 2013 *Towards a proof of the classical inapproximability of quantum simulation* invited speaker at the Symposium on Quantum Information Theory, at the Autonomous University of Barcelona, Spain.
- October 2012 *A simple proof of the hardness of approximating Tutte polynomials* invited seminar at Macquarie University, Sydney.
- March 2011 M. J. Bremner (speaker), R. Jozsa and D. Shepherd *Simple quantum circuits that can't be simulated classically* invited seminar at DAMTP University of Cambridge, Cambridge.
- January 2011 M. J. Bremner (speaker), R. Jozsa and D. Shepherd *Easy quantum circuits that can't be simulated classically* invited seminar at QISS Macquarie University, Sydney.
- January 2011 M. J. Bremner (speaker), R. Jozsa and D. Shepherd *Classical simulation of commuting quantum computations implies collapse of the polynomial hierarchy* Contributed talk at Quantum Information Processing '11 (QIP '11), Singapore.
- August 2010 M. J. Bremner (speaker), R. Jozsa and D. Shepherd *Classical simulation of commuting quantum computations implies collapse of the polynomial hierarchy* talk at the 10th Annual Asian conference on Quantum Information Science (AQIS '10), Tokyo
- January 2010 M. J. Bremner, D. Shepherd and R. Jozsa *PostIQP=PP, hence classical simulations of temporally unstructured quantum computations imply a collapse of the Polynomial Hierarchy* poster at QIP 2010
- April 2009 Invited seminar at ICFO Barcelona: *What lies between classical and quantum computation?*
- 2009 M. J. Bremner (speaker), C. Mora, A. Winter *Most states are useless for quantum computation* contributed talk at the IMA conference on Quantum Computing and the Complexity of Quantum Simulation, London
- April 2009 D. Shepherd (speaker) and M. J. Bremner *Instantaneous Quantum Computation* contributed talk at the IMA conference on Quantum Computing and the Complexity of Quantum Simulation, London

- March 2009 Invited seminar at University College London: *Instantaneous Quantum Computation*
- January 2009 D. Shepherd (speaker) and M. J. Bremner *Instantaneous Quantum Computation* contributed talk at the 12th Workshop on Quantum Information Processing, 2009, Santa Fe.
- January 2009 D. Gross, S. Flammia (speaker), J. Eisert, M. J. Bremner, C. Mora, and A. Winter *Most quantum states are useless for measurement-based quantum computation* contributed talk at the 12th Workshop on Quantum Information Processing, 2009, Santa Fe.
- December 2008 Seminar at the University of Bristol: *Instantaneous Quantum Computation*.
- September 2008 Poster presentation (with D. Shepherd) at the QICS workshop on Foundational Structures for Quantum Information and Computation, Obergurgl Austria: *Instantaneous Quantum Computation*.
- April 2008 Invited talk at Quantum Information Spring School in Bristol: *Engineering Interactions*.
- December 2007 Poster presentation at QEC '07: *Noise in globally controlled quantum computers*.
- March 2007 Invited seminar at University of Bristol: *To what extent can one quantum system simulate another?*
- February 2007 Invited seminar at the Santa Fe Institute: *What are the computational limits of quantum systems?*
- January 2007 Poster presentation at QIP 2007: *Quantum simulation in the presence of noise*.
- January 2007 Invited seminar at the Center for Quantum Computer Technology, Macquarie University: *Simulating Hamiltonian dynamics with noisy quantum systems*.
- November 2006 Seminar talk at the Institute for Quantum Optics and Quantum Information at the University of Vienna: *Simulating Hamiltonian dynamics with noisy quantum systems*.
- September 2006 Invited talk at the OLAQUI review meeting: *New theoretical strategies for quantum computers*.
- May 2006 Poster presentation at the Gordon Research Conference on Quantum Information Science: *Quantum simulation with noisy systems*.
- November 2005 Seminar talk for the quantum information theory group at the University of Duesseldorf: *Simulating many-body Hamiltonians with noisy systems*.
- October 2005 Invited talk OLAQUI project meeting *Simulating many-body Hamiltonians with noisy systems*.
- April 2005 Seminar at the Institute for Quantum Optics and Quantum Information, Innsbruck: *Rivers, beaches, sunshine, and a little bit about Hamiltonian simulation*.
- February 2004 Poster presentation at the annual Australian Center of Excellence for Quantum Computer Technology meeting: *Hamiltonian simulation with many-qudit Hamiltonian interactions*.
- October 2003 Invited speaker for the Australian Institute of Physics, Queensland Branch: *What can be used to make a quantum computer?*
- June 2003 Seminar at the Institute for Quantum Computing at the University of Waterloo: *Fungible dynamics: There are only two types of multiple-qubit interactions*.
- May 2003 Seminar at NASA Jet Propulsion Laboratory: *Fungible dynamics: There are only two types of multiple-qubit interactions*.
- May 2003 Seminar at the Preskill group meeting at Caltech: *Fungible dynamics: There are only two types of multiple-qubit interactions*.
- October 2002 Contributed seminar, 3rd Australian Mathematical Physics Workshop: *Entangling unitary dynamics and universal quantum computers*.
- July 2002 Seminar at the Institute for Quantum Computing at the University of Waterloo: *Entangling unitaries and universal quantum computers*.
- July 2002 Poster presentation at the 6th International Conference on Quantum Communication, Measurement and Computing: *Universal simulation of Hamiltonian dynamics*, together with A. Gilchrist.

June 2002 Contributed seminar, 15th Biennial Congress 2002, Australian Institute of Physics: *Hamiltonian simulation, entanglement and universal quantum computers.*