CURRICULUM VITAE

Nicholas Chancellor

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Education

- Ph.D. in physics, University of Southern California, Los Angeles CA. (enrolled 2008)
  Thesis Adviser: Stephan Haas.
  Awarded: summer 2013

- Bachelors degree in engineering physics, Colorado School of Mines, Golden CO. (2007).

Academic Summary of Graduate Career

- Completed dissertation: "Quantum Computation by Transport: Development and Potential Implementations"

- Completed 64 units for credit with a strong focus on theoretical classes relating to quantum mechanics

- President of the Graduate Association of Students in Physics (GASP) 2011(fall)-2013(spring)

Post Doctoral Experience

- Two and a half years of research at London Centre for Nanotechnology (UCL) performing experimental research on adiabatic quantum processor under direction of Professors Gabriel Aeppli and Andrew Green

- Current research position at Durham University studying hybrid computing under direction of Dr. Viv Kendon

- Will soon be partially funded though a quantum annealing project with Oxford University and British Petroleum, project supervised by Professor Simon Benajamin and Dr. Michael Gutmann

Applied Research Skills

- Proficient in the use of high performance computing clusters for numerical research
- Skilled in the use of Matlab/Octave, Mathematica, and python
- Skilled at use of user interface for D-Wave quantum annealing processor
- Skilled at analyzing and interpreting experimental data
- Skilled at modeling open quantum systems, including a working knowledge of simulating quantum annealing with path integral quantum Monte Carlo
- Experienced at designing new experiments

Awards

- Selected to participate in the 2012 Lindau meeting of Nobel laureates and students

Professional Body Membership

- Member of Institute of Physics (IoP)

Current Research Interests

- Modernizing Quantum Annealing: local search on annealer hardware and its application to constructing hybrid computing methods
- Generalized Hamiltonian Computing: investigation of algorithms which combine the mechanisms of adiabatic quantum computing, quantum annealing, and quantum walks
- Ising Model Embedding and Architectures: new ways to map problems to the Ising model, and new hardware designs based on these methods
- Realization of Physical Models on Quantum Annealing Hardware: Investigating uses of transverse field Ising model annealers for physics simulation
- Open System Effects in Superconducting Hardware: Particular interest on transitions induced by bath interactions and effect on tunneling
- Maximum Entropy Applications in Real Hardware: Use of hardware devices for maximum entropy computation, particularly how to take advantage of quantum mechanics
- New Approaches to Quantum Error Correction: Investigating the gains which can be made by taking a 'coherent parity check' approach to quantum error correction as opposed to traditional approaches

Successful Applications for Scientific Resources

- Wrote a successful application to an open NASA call for experimental access to quantum annealing hardware

Teaching and Supervision Experience

- Currently co-supervise 2 PhD. students
- Supervised an MRes project in summer of 2016
- Supervised general education (non-science students) labs for 3.5 years as a graduate student at USC
- Supervised labs for science and engineering students for one semester at USC
- Have taught level 3 computing for 1 year at Durham, students develop small scale numerical research project
- Have co-supervised three level 4 undergraduate research projects

Works in preparation

1. *Order by Disorder Effect from Control Errors on the D-Wave Chip*
   N. Chancellor, P. J. D. Crowley, T. Duric, W. Vinci, M. H. Amin, A. G. Green, P. A. Warburton, and G. Aeppli
2. *Inference problems with higher locality on a quantum annealing device: From Hamming codes to LDPC and turbo codes* N. Chancellor, S. Zohren, P. A. Warburton, S. C. Benjamin, and S. Roberts

Publications and Preprints

1. *Protecting quantum memories using coherent parity check codes*
   J. Roffe, D.Headley, N. Chancellor, D. Horsman, V. Kendon arχiv:1709.01866 **to be submitted**
2. *Quantum search with hybrid adiabatic-quantum walk algorithms and realistic noise*
   J. G. Morley, N. Chancellor, S. Bose, V. Kendon arχiv:1709.00371 **to be submitted**
3. *Coherent Parity Check Construction for Quantum Error Correction*
   N. Chancellor, A. Kissinger, S. Zohren, J. Roffe, D. Horsman arχiv:1611.08012 **to be submitted**
4. *Modernizing Quantum Annealing II: Genetic Algorithms and Inference*
   N. Chancellor arχiv:1609.05875 **to be submitted**
5. *Experimental Freezing of mid-Evolution Fluctuations with a Programmable Annealer*
   N. Chancellor, G. Aeppli, P. A. Warburton, arχiv:1605.07549 (2016). **will be submitted to a journal pending additional numerical studies**
6. *Circuit design for multi-body interactions in superconducting quantum annealing system with applications to a scalable architecture*
   N. Chancellor, S. Zohren, P. A. Warburton npj Quantum Information **3**, 21 (2017).
7. *Modernizing Quantum Annealing using Local Searches*
   N. Chancellor New Journal of Physics **19**, 023024 (2017).
8. *Quantum walk transport properties on graphene structures*
   H. Bougroura, H. Aissaoui, N. Chancellor, V. Kendon Phys. Rev. A **94**, 062331 (2016).

9. *A Direct Mapping of Max k-SAT and High Order Parity Checks to a Chimera Graph*
N. Chancellor, S. Zohren, P. A. Warburton, S. C. Benjamin, S. Roberts Sci. Rep. **6**, 37107 (2016).

10. *An Overview of Approaches to Modernize Quantum Annealing Using Local Searches*
N. Chancellor, ETPCS Proceedings of the 7th International Workshop on Physics and Computation **214**, pp. 16-21 (2016).

11. *Maximum-Entropy Inference with a Programmable Annealer*
N. Chancellor, S. Szoke, W. Vinci, G. Aeppli, P. A. Warburton, Sci. Rep. **6**, 22318 (2016).

12. *Pfaffian-like ground states for bosonic atoms and molecules in 1D optical lattices*
T. Duric, N. Chancellor, P. J. D. Crowley, P. Di Cintio, A. G. Green, Physical Review B **93**, 085143 (2016).

13. *Interaction-induced anomalous quantum Hall state on the honeycomb lattice*
T. Duric, N. Chancellor, I. F. Herbut, Phys. Rev. B **89**, 165123 (2014).

14. *Quantification and Control of non-Markovian Evolution in Finite Quantum Systems via Feedback*
N. Chancellor, C. Petri, L. Campos Venuti, A. F. J. Levi, S. Haas. Physical Review A **89**, 052119 (2014).

15. *Non-Markovian Equilibration Described by Symmetry Breaking*
N.Chancellor, C. Petri, S. Haas. Phys. Rev. B **87**, 184302 (2013).

16. *Scalable Universal Holonomic Quantum Computing Realized with the Adiabatic Quantum Data Bus and Potential Implementation Using Superconducting Flux Qubits*
N. Chancellor and S. Haas. Phys. Rev. A **87**, 042321 (2013).

17. *Experimental Signature of Programmable Quantum Annealing*
S. Boixo, T. Albash, F. Spedalieri, N. Chancellor, D. A. Lidar. Nature Comm. **4**, 3067 (2013).

18. *Using the J1-J2 Heisenberg Spin Chain as an Adiabatic Quantum Data Bus*
N. Chancellor and S. Haas. New Journal of Physics. **14**, 095025 (2012).

19. *Propagation of Disturbances in Degenerate Quantum Systems*
N. Chancellor and S. Haas. Phys. Rev. B **84**, 035130 (2011).

20. *Local Quenches in Frustrated Quantum Spin Chains: Global Versus Subsystem Equilibration*
M. Diez, N. Chancellor, S. Haas, L. Campos Venuti, P. Zanardi. Phys. Rev. A **82**, 032113 (2010).