Patrick Coles

EXPERIENCE

STAFF SCIENTIST
Los Alamos National Laboratory, T-4 division
2017 – Present, Los Alamos, NM, USA
Focus: Quantum Computing Algorithms

POSTDOCTORAL RESEARCHER
Institute for Quantum Computing,
University of Waterloo
2014 – 2017, Waterloo, Ontario, Canada
Advisor: Norbert Lutkenhaus
Focus: Quantum Cryptography and Computing

POSTDOCTORAL RESEARCHER
Centre for Quantum Technologies,
National University of Singapore
2012 – 2014, Singapore, Singapore
Advisor: Stephanie Wehner
Focus: Quantum Information Theory

POSTDOCTORAL RESEARCHER
Department of Physics,
Carnegie Mellon University
2008 – 2012, Pittsburgh, PA, USA
Advisor: Robert Griffiths
Focus: Quantum Foundations

EDUCATION

UNIVERSITY OF CALIFORNIA, BERKELEY
Ph.D. Chemical Engineering
2002 – 2008, Berkeley, CA, USA
Thesis: Spin refrigeration in semiconductors

UNIVERSITY OF CAMBRIDGE
M.Phil. Biochemistry
Churchill Scholar *(only 11 selected in USA)*
2001 – 2002, Cambridge, United Kingdom
Thesis: 3D protein structure via NMR

CASE WESTERN RESERVE UNIVERSITY
B.S. Chemical Engineering
GPA: 4.0 (highest possible GPA)
1997 – 2001, Cleveland, OH, USA

ONLINE COURSE CERTIFICATES
Machine Learning, taught by Andrew Ng
Neural Networks, taught by Geoffrey Hinton
2016 – 2017, Coursera
https://www.coursera.org/

SYNERGISTIC ACTIVITES

- School organizer for LANL Quantum Computing Summer School (2018, 2019)
- Adjunct Assistant Professor in Physics Department at University of New Mexico (2019-Present)

SELECTED PUBLICATIONS

- P. Coles, V. Katariya, S. Lloyd, I. Marvian, M. Wilde “Entropic energy-time uncertainty relation” *Physical Review Letters*. 122: 100401 (2019)
- Y. Subasi, L. Cincio, P. Coles “Entanglement spectroscopy with a depth-two quantum circuit” *Journal of Physics A: Mathematical and Theoretical*. 52: 044001 (2019)
- L. Cincio, Y. Subasi, A. Sornborger, P. Coles “Learning the quantum algorithm for state overlap” *New Journal of Physics*. 20:113022 (2018)
- A. Winick, N. Lutkenhaus, P. Coles “Reliable numerical key rates for quantum key distribution” *Quantum.* 2: 77 (2018)
- P. Coles, M. Berta, M. Tomamichel, S. Wehner “Entropic uncertainty relations and their applications” *Reviews of Modern Physics.* 89: 015002 (2017)
- P. Coles, E. Metodiev, N. Lütkenhaus “Numerical approach for unstructured quantum key

distribution" *Nature Communications.* 7: 11712 (2016)

- D. Soh, C. Brif, P. Coles, N. Lütkenhaus, R. Camacho, J. Urayama, M. Sarovar "Self-referenced continuous-variable QKD protocol" *Physical Review X.* 5: 041010 (2015)
- P. Coles, J. Kaniewski, S. Wehner "Equivalence of wave-particle duality to entropic uncertainty" *Nature Communications*. 5: 5814 (2014)
- P. Coles, M. Piani "Complementary sequential measurements generate entanglement" *Physical Review A: Rapid Communications*. 89: 010302(R) (2014), **Editors' Suggestion**
- P. Coles, R. Colbeck, L. Yu, M. Zwolak "Uncertainty relations from simple entropic properties" *Physical Review Letters*. 108: 210405 (2012)

GRANTS

- Machine learning of quantum algorithms. LDRD Early Career Award. FY18 – FY20.
- Taming defects in quantum computers. LDRD DR. FY18 – FY21.
- Optimization, verification, and reliability of quantum computers. DOE, ASCR. FY18 – FY22.
- Topological phases of quantum matter and decoherence. DOE, BES. FY18 – FY21.
- Disentangling quantum entanglement. DOE, HEP. FY18 – FY20.

Collaborators (in the past 48 months):
Sornborger, Andrew, Los Alamos National Laboratory; Subasi, Yigit, Los Alamos National Laboratory; Zurek, Wojciech, Los Alamos National Laboratory; Lutkenhaus, Norbert, University of Waterloo; Wehner, Stephanie, TU Delft; Tomamichel, Marco, University of Technology Sydney; Berta, Mario, Imperial College London; Wilde, Mark, Louisiana State University; Lloyd, Seth, MIT; Marvian, Iman, Duke University; Kaniewski, Jedrzej, Polish Academy of Sciences;

Graduate and Postdoctoral Advisors and Advisees:
Arrasmith, Andrew, UC Davis; Cerezo, Marco, Los Alamos National Laboratory;