JACQUES CAROLAN

Wolfson Biomedical Institute
University College London
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jacquescarolan.github.io

POSITIONS

2021– **Senior Research Fellow, Lab: Neural Computation Lab**
***University College London**, Wolfson Institute for Biomedical Research*
Advisor: Michael Hausser
Award: BBSRC Discovery Fellowship
Themes: neuroscience, neurotechnology, voltage imaging

2019–2020 **Postdoctoral Fellow, Lab: Quantum Photonics**
***University of Copenhagen**, Niels Bohr Institute*
Advisor: Peter Lodahl
Award: Marie Skłodowska-Curie Global Fellowship
Themes: quantum emitter spectroscopy, single photon nonlinearities, optimal control

2016–2019 **Postdoctoral Fellow, Lab: Quantum Photonics Group**
***Massachusetts Institute of Technology**, Research Laboratory of Electronics*
Advisor: Dirk Englund
Award: Marie Skłodowska-Curie Global Fellowship
Themes: silicon photonics, nonlinear optics, quantum machine learning, neural networks

EDUCATION

2011–2015 **Ph.D. Physics**, *University of Bristol*, Bristol, UK
Advisor: Jeremy O'Brien, Anthony Laing, Centre for Quantum Photonics
Title: Universal Linear Optics: Characterisation, Verification and Computation
Award: EPSRC DTA Scholarship

2007–2011 **M.Sci. Physics & Philosophy**, *University of Bristol*, Bristol, UK
Graduated with First Class Honors
MSci Physics Advisor: Jeremy O'Brien
MSci Philosophy Advisor: James Ladyman

TEACHING

01/2019 **MIT IAP 2019 How to Program a Quantum Computer**
Devised and delivered three-part interactive lecture series for MITs independent activities period, attended by over 35 students and alumni. The course explored fundamental concepts in quantum computing through a series of hands-on tutorials, where participants interactively learn by programming a real life quantum computer.

AWARDS

2022 BBSRC Discovery Fellow (£500,00)
2017 Marie Skłodowska-Curie Global Fellowship ($300,000)
2016 66th Lindau Nobel Laureates Meeting
2016 Institute of Physics QEP Doctoral Research Prize Special Commendation
2016 UoB Faculty of Science PhD Commendation
2014 EPSRC ICT Pioneer Finalist
2011 EPSRC DTC Scholarship ($75,000)

PUBLICATIONS

2023 H. Larocque, M. Buyukkaya, C. Errando-Herranz, S. Harper, **J. Carolan**, C. Lee, C. Richardson, G. L. Leake, D. J. Coleman, M. L. Fanto, E. Waks, D. Englund
Tunable quantum emitters on large-scale foundry silicon photonics arXiv:2306.06460

2023 J. Ewaniuk, **J. Carolan**, B. Shastri, N. Rotenberg
Realistic quantum photonic neural networks *Adv. Quant. Tech.* **6**, 3

2023 P. Sund, E. Lomonte, S. Paesani, Y. Wang, **J. Carolan**, N. Bart, A. Wieck, A. Ludwig, L. Midolo, W. Pernice, P. Lodahl, F. Lenzini
High-speed thin-film lithium niobate quantum processor driven by a solid-state quantum emitter *Science Advances* **9**, 19

2022 A. Chanana, H. Larocque, R. Moreira, **J. Carolan**, B. Guha, V. Anant, J. Song, D. Englund, D. J. Blumenthal, K. Srinivasan, M. Davanco
Ultra-low loss quantum photonic circuits integrated with single quantum emitters *Nat. Comm.* **13**, 7693

2022 A. Karsa, **J. Carolan**, S. Pirandola
Quantum channel-position finding using single photons *Physical Review A* **105**, 023705

2022 N. Maraviglia, P. Yard, R. Wakefield, **J. Carolan**, C. Sparrow, L. Chakhmakhchyan, C. Harrold, T. Hashimoto, N. Matsuda, A. K. Harter, Y. N. Joglekar, A. Laing
Photonic quantum simulations of coupled PT-symmetric Hamiltonians *Phys. Rev. Research* **4**, 013051

2022 H. Le Jeannic, A. Tiranov, **J Carolan**, T. Ramos, Y. Wang, M. H. Appel, S. Scholz, A. D. Wieck, A. Ludwig, N. Rotenberg, Le. Midolo, J. García-Ripoll, A. S. Sørensen, P. Lodahl
Dynamical photon-photon interaction mediated by a quantum emitter *Nature Physics* **18**, 1191

2021 R. Uppu, L. Midolo, X. Zhou, **J. Carolan**, P. Lodahl
Quantum-dot-based deterministic photon–emitter interfaces for scalable photonic quantum technology *Nature Nanotechnology*

2020 U. Chakraborty, **J. Carolan**, G. Clark, D. Bunandar, G. Gilbert, J. Notaros, M. Watts, D. Englund
Cryogenic operation of silicon photonic modulators based on DC Kerr effect *Optica* **7**, 1385-1390

2020 J. Kim, S. Aghaeimeibodi, **J. Carolan**, D. Englund, E. Waks
Hybrid integration method for on-chip quantum photonics *Optica* **7**, 291-308 (2020)

2020 **J. Carolan**, M. Mohseni, J. P. Olson, M. Prabhu, C. Chen, D. Bunandar, M.Y. Niu, N. C. Harris, F. N. C. Wong, M. Hochberg, S. Lloyd, D. Englund
Variational Quantum Unsampling on a Quantum Photonic Processor *Nature Physics* **16**, 322-327 (2020)

2019 M. Prabhu, C. Roques-Carmes, Y. Shen, N Harris, L. Jing, **J. Carolan**, R. Hamerly, T. Baehr-Jones, M. Hochberg, V Ceperic, J. D. Joannopoulos, D. Englund, M. Soljacic
A Recurrent Ising Machine in a Photonic Integrated Circuit arXiv:1909.13877

2019 **J. Carolan**, U. Chakraborty, N. C. Harris, M. Pant, T. Baehr-Jones, M. Hochberg, D. Englund
Scalable feedback control of single photon sources for photonic quantum technologies *Optica* **6**, 335 (2019)

2019 I. Alonso Calafell, T. Strömberg, D. R. M. Arvidsson-Shukur, L. A. Rozema, V. Saggio, C. Greganti, N. C. Harris, M. Prabhu, **J. Carolan**, M. Hochberg, T. Baehr-Jones, D. Englund, C. H. W. Barnes, P. Walther
Trace-free counterfactual communication with a nanophotonic processor *npj Quantum Information* **5**, 61 (2019)

2019 G. R. Steinbrecher, J. P. Olson, D. Englund, **J. Carolan**
Quantum optical neural networks *npj Quantum Information* **5**, 60 (2019)

2018 N. C. Harris, **J. Carolan**, D. Bunandar, M. Prabhu, M. Hochberg, T. Baehr-Jones, M. L. Fanto, A. M. Smith, C. C. Tison, P. M. Alsing, D. Englund
Linear programmable nanophotonic processors *Optica* **5**, 1623 (2018)

2018 C. Sparrow, E. Martín-López, N. Maraviglia, A. Neville, C. Harrold, **J. Carolan**, Y. N. Joglekar, T. Hashimoto, N. Matsuda, J. L. O'Brien, D. P. Tew, A. Laing
Simulating the vibrational quantum dynamics of molecules using photonics *Nature* **557**, 660 (2018)

2017 D. Hangleiter, **J. Carolan**, K. Thébault
Analogue Quantum Simulation: A Philosophical Prospectus arXiv:1712.05809 (accepted Springer)

2017 M. Gimeno-Segovia, H. Cable, G. J. Mendoza, P. Shadbolt, J. W. Silverstone, **J. Carolan**, M. G. Thompson, J. L. O'Brien and T. Rudolph
Relative multiplexing for minimising switching in linear-optical quantum computing *NJP* **19**, (2017)

2015 **J. Carolan**, C. Harrold, C. Sparrow, E. Martín López, N. J. Russell, J. W. Silverstone, P. J. Shadbolt, N. Matsuda, M. Oguma, M. Itoh, G. D. Marshall, M. G. Thompson, J. C. F. Matthews, T. Hashimoto, J. L. O'Brien, A. Laing
Universal linear optics, *Science* **349**, 711 (2015)

2014 **J. Carolan**, J. D. A. Meinecke, P. J. Shadbolt, N. J. Russell, N. Ismail, K. Wörhoff, T. Rudolph, M. G. Thompson, J. L. O'Brien, J. C. F. Matthews, A. Laing
On the experimental verification of quantum complexity in linear optics *Nat. Photon.* **8**, 621 (2014)

BOOKS

2022 D. Hangleiter, **J. Carolan**, K. Thébault
Analogue Quantum Simulation: A New Instrument for Scientific Understanding Springer Publishing, New York

INVITED TALKS

06/2021 Applied Biotechnology Seminar *Francis Crick Institute, UK*
10/2020 Neural Computation Seminar *UCL, UK [remote]*
08/2020 Q-FARM Seminar *Stanford, USA [remote]*
08/2020 Neurotechnology Seminar *Columbia, USA [remote]*
07/2020 Neurotechnology and Biophysics Seminar *Rockefeller, USA [remote]*
07/2020 IEEE Photonics Chapter Webinar *Ottawa, Canada [remote]*
06/2020 Photonics For Quantum 2 *Rochester Institute of Technology, USA [remote]*
05/2020 Photonics North *Niagara Falls, USA [remote]*
03/2020 ECE Seminar *Boston University, USA*
03/2020 ECE Seminar *University of Maryland, USA*
02/2020 EECS Seminar *Berkeley, USA*
02/2020 EE & Physics Seminar *Columbia, USA*
02/2020 ECE Seminar *University of Pennsylvania, USA*
12/2019 Complex Photonic Systems Seminar *University Twente, Netherlands*
10/2019 Quantum Techniques in Machine Learning *KAIST, Korea*
09/2019 SPIE Security + Defense *Strasbourg, France*
08/2019 Neurotechnology and Biophysics Seminar *Rockefeller, USA*
05/2019 Applied Physics Seminar *Stanford, USA*
04/2019 ITAMP Seminar *Harvard, USA*
01/2019 Photonics For Quantum *Rochester Institute of Technology, USA*
11/2018 MIT Centre for Ultracold Atoms Seminar Series *Harvard, USA*
11/2018 USTC Quantum Seminar *Shanghai, China*
11/2018 2018 International Young Scientists Forum on Optics and Photonics *Wuhan, China*
11/2018 Nature Conference on Nanophotonics and Integrated Photonics *Nanjing, China*
07/2018 Analogue Experimentation Workshop *Bristol University, UK*
07/2018 Quantum Optics Seminar *Imperial College, UK*
06/2018 Nils Bohr Institute Quantum Optics Seminar *University of Copenhagen, Denmark*
06/2018 DTU Fotonik Seminar *Danish Technical University, Denmark*
03/2018 Bristol Quantum Information Technologies *Bristol University, UK*
09/2017 PICQUE Integrated Quantum Photonics *Sapienza Università di Roma, Italy*
06/2017 iQuISE Seminar *Massachusetts Institute of Technology, USA*
10/2016 Quantum Innovators *Institute for Quantum Computing, Canada*
08/2016 Semi-Quantum Computing workshop *Institute for Quantum Computing, Canada*
11/2015 Optics and Quantum Electronics Seminar *Massachusetts Institute of Technology, USA*
11/2015 Processing for Quantum Computing Workshop *TU Delft, Netherlands*
03/2015 University of Mainz Colloquium *Universität Mainz, Germany*
03/2015 University of Bonn Physics Colloquium *Universität Bonn, Germany*
11/2015 Quantum Simulation and Quantum Walks 2014 *KwaZulu University, South Africa*

PATENTS

2021 Scalable integration of hybrid optoelectronic and quantum optical systems into photonic circuits, *US11054590B1*
2020 Quantum Optical Neural Networks, *US2020037234A1*
2020 Scalable Feedback Control of Single-Photon Sources for Photonic Quantum Technologies, *US2020015051A1*
2019 Apparatus and methods for optical neural network, *US20190294199A1*