

# Dr Jonte R Hance

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DOB: 30<sup>th</sup> May 1996

## EDUCATION

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<b>PhD Electrical and Electronic Engineering</b> <i>University of Bristol, Bristol, UK</i> Thesis: <i>The interplay between quantum foundations and quantum technologies</i> UK Quantum Communications Hub/ University of York DTP Scholarship & Stipend Nominated for Faculty Thesis Prize	Oct 2019–Mar 2023
<b>MSci (Hons) Physics and Philosophy</b> <i>University of Bristol, Bristol, UK</i> Classification: First Class Honours	Oct 2014–Jun 2019
<b>A-Levels — A* A B</b> <i>John Hampden Grammar School, High Wycombe, UK</i> Maths, Physics, RS: Philosophy & Ethics	2012–2014
<b>AS-Levels — A B</b> <i>John Hampden Grammar School, High Wycombe, UK</i> Further Maths, Politics	2012–2013
<b>GCSEs — 8 A*s, 4As</b> <i>John Hampden Grammar School, High Wycombe, UK</i>	2010–2012

## EXPERIENCE

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<b>Phoenix Postdoctoral Fellow in Research</b> <i>Hiroshima University, Hiroshima, Japan</i> Researching the interplay between quantum foundations and quantum technologies, with a focus on the interpretation and use of weak values. Awarded prestigious internal research fellowship by Hiroshima University. Hosted by Professor Holger F Hofmann.	Apr 2023–Present
<b>Teaching Assistant (Graduate Teacher Level 1 and 2)</b> <i>University of Bristol, Bristol, UK</i> Courses taught: Quantum Mechanics I (part of <a href="#">PHYS20028</a> ) (Teaching assistant 2021–22); Quantum Mechanics II (part of <a href="#">PHYS20029</a> ) (Teaching assistant 2021–22); <a href="#">EENG25000</a> : Lines and Waves (Teaching assistant 2021–22); <a href="#">EMAT10100</a> : Engineering Mathematics 1 (Senior drop-ins tutor 2020–22); <a href="#">EMAT20200</a> : Engineering Mathematics 2 (Senior drop-ins tutor 2020–22); <a href="#">PHYS11400</a> : Essential Maths for Physics (Seminar tutor 2020–21); <a href="#">PHYS10006</a> : Core Physics I: Mechanics and Matter (Workshop marker 2020–21); <a href="#">PHYS10005</a> : Core Physics II: Oscillations, Waves and Fields (Workshop marker 2020–21)	Sep 2020–May 2022
<b>Postgraduate Researcher</b> <i>Quantum Engineering Technology Laboratories, University of Bristol, Bristol, UK</i> Researching theoretical quantum communication at the University of Bristol’s Quantum Engineering Technology Laboratories, on a full PhD scholarship and stipend funded by the UK’s Quantum Communications Hub/the University of York’s Doctoral Training Partnership (DTP). Currently focusing on quantum counterfactual communication, as well as quantum foundations, and the philosophy of quantum physics. Supervised by Prof John Rarity FRS and Prof James Ladyman. More information available <a href="#">here</a> .	Oct 2019–Mar 2023
<b>Research and Development Consultant</b> <i>dotQuantum, Bristol, UK</i> Developing resources for quantum communication, focused on quantum key distribution, single-photon sources, and quantum networks.	Sep 2018–Dec 2020
<b>Summer Research Intern</b> <i>Quantum Engineering Technology Laboratories, University of Bristol, Bristol, UK</i> Investigated counterfactual communication, first experimentally (measuring weak values using bulk optics), then theoretically. Offered a fully-funded PhD scholarship to pursue further.	2018, 2019

## PUBLICATIONS

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<b>Weak values and the past of a quantum particle</b> <i>Phys. Rev. Res.</i> <b>5</b> (2), 023048. <i>First &amp; corresponding author.</i>	Apr 2023
<b>Bell’s theorem allows local theories of quantum mechanics</b> <i>Nat. Phys.</i> <b>18</b> (12), 1382 ( <i>Correspondence</i> ). <i>First and corresponding author.</i>	Oct 2022
<b>What does it take to solve the measurement problem?</b> <i>J. Phys. Commun.</i> <b>6</b> (10), 102001. <i>First &amp; corresponding author.</i>	Oct 2022
<b>Supermeasured: Violating Bell-Statistical Independence without violating physical statistical independence</b> <i>Found. Phys.</i> <b>52</b> (4), 81 (2022). <i>First &amp; corresponding author.</i>	Jul 2022
<b>The wave function as a true ensemble</b> <i>Proc. R. Soc. A</i> <b>478</b> (2262), 20210705 (2022). <i>First &amp; corresponding author.</i>	Jun 2022
<b>The laws of physics do not prohibit counterfactual communication</b> <i>npj Quantum Inf.</i> <b>8</b> (1), 60 (2022).	May 2022
<b>Could wavefunctions simultaneously represent knowledge and reality?</b> <i>Quantum Stud.: Math. Found.</i> <b>9</b> (3), 333–341 (2022). <i>First &amp; corresponding author.</i>	Apr 2022
<b>Comment on “Scheme of the arrangement for attack on the protocol BB84”</b> <i>Optik</i> <b>243</b> 167451 (2021). <i>First &amp; corresponding author.</i>	Oct 2021

<b>Counterfactual Ghost Imaging</b> <i>npj Quantum Inf.</i> 7(1), 88 (2021). <i>First &amp; corresponding author.</i>	Jun 2021
<b>Backscatter and spontaneous four-wave mixing in micro-ring resonators</b> <i>J. Phys. Photonics</i> 3(2), 025003 (2021). <i>First &amp; corresponding author.</i>	Apr 2021
<b>How Quantum is Quantum Counterfactual Communication?</b> <i>Found. Phys.</i> 51(1), 12 (2021). <i>First &amp; corresponding author.</i>	Feb 2021
<b>Exchange-free computation on an unknown qubit at a distance</b> <i>New J. Phys.</i> 23(1), 013004 (2021).	Jan 2021

## PREPRINTS

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<b>Interaction-Free Polarimetry</b> <i>arXiv Preprint-2207.13539</i> . <i>First &amp; corresponding author.</i>	Jul 2022
<b>Comment on “Experimentally adjudicating between different causal accounts of Bell-inequality violations via statistical model selection”</b> <i>arXiv Preprint-2206.10619</i> . <i>First &amp; corresponding author.</i>	Jun 2022
<b>Is the dynamical quantum Cheshire cat detectable?</b> <i>arXiv Preprint-2204.03374</i> . <i>First &amp; corresponding author.</i>	Apr 2022
<b>Comment on “Why interference phenomena do not capture the essence of quantum theory” by Catani et al</b> <i>arXiv Preprint-2204.01768</i> . <i>First &amp; corresponding author.</i>	Apr 2022
<b>Reply to arXiv:2111.13357 (“The Quantum Eraser Non-Paradox”)</b> <i>arXiv Preprint-2112.00436</i> . <i>Corresponding author.</i>	Dec 2021
<b>The quantum eraser paradox</b> <i>arXiv Preprint-2111.09347</i> . <i>Corresponding author.</i>	Nov 2021
<b>Properties of Invariant Set Theory</b> <i>arXiv Preprint-2108.08144</i> . <i>First author.</i>	Aug 2021
<b>Experimental Tests of Invariant Set Theory</b> <i>arXiv Preprint-2102.0779</i> . <i>First &amp; corresponding author.</i>	Feb 2021
<b>Deterministic Teleportation and Universal Computation Without Particle Exchange</b> <i>arXiv Preprint-2009.05564</i>	Sep 2020
<b>Counterfactuality, Definiteness and Bell’s Theorem</b> <i>arXiv Preprint-1909.06608</i> . <i>First &amp; corresponding author.</i>	Sep 2019

## PATENTS

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<b>Improved Cryptographic Method and System</b> <i>Created while working for dotQuantum. Filed 21 December 2018. Patent pending.</i>	gb 1821135.9
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## TALKS

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<b>Interaction-Free Metrology:</b> IPAQS Heriot-Watt Weekly Theory Talk 25/9/2022 (Invited)
<b>Interaction-Free Polarimetry:</b> Optica Advanced Photonics Congress (APC) 2022 (NpW2G.5); Optica Optical Sensors and Sensing Congress (OSSC) 2022 (STu4G.4)
<b>Supermeasured: Violating Bell-Statistical Independence without violating physical statistical independence:</b> Fundamental Problems in Quantum Physics 2022, University of Trieste ( <a href="#">Invited</a> ); Åskloster Seminar 2022 ( <a href="#">Invited</a> ); Bonn Superdeterminism and Retrocausality Workshop 2022, University of Bonn ( <a href="#">Invited</a> )
<b>Does weak values show the past of a quantum particle?:</b> IOP Photon 2022 (Session 10D, Speaker 4); Bristol Quantum Information and Technology Workshop 2022 (BQIT:22) ( <a href="#">Upgraded Poster Talk</a> ); Deutschen Physikalischen Gesellschaft Conference Heidelberg 2022 ( <a href="#">AGPhil 9.4</a> ); International Conference on Quantum Information and Foundations (ICQIF) 2022 ( <a href="#">SN29</a> )
<b>Backscatter and spontaneous four-wave mixing in micro-ring resonators:</b> IOP Silicon Quantum Information Processing Workshop 2021 (2-minute pitch presentation)
<b>Counterfactual Ghost Imaging:</b> OSA Frontiers in Optics + Laser Science (FiO+LS) 2021 ( <a href="#">FM5C.2</a> ); OSA Optical Sensors and Sensing Congress (OSSC) 2021 ( <a href="#">SW5F.5</a> ); CLEO/Europe-EQEC 2021 ( <a href="#">EB-7.3</a> ); University of Bristol SCEEM PGR Conference 2021
<b>Counterfactuality: From Foundational Issues to Practical Applications:</b> IPAQS Heriot-Watt Weekly Theory Talk 13/1/2022 (Invited); QETLabs/Photonics Bristol Weekly Talk 1/4/2021 (Invited)
<b>How quantum is quantum counterfactual communication?:</b> OSA IONS Exeter Conference 2019

## SKILLS

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<b>Programming:</b> L <sup>A</sup> T <sub>E</sub> X, Wolfram Mathematica (Intermediate), Python (Basic), MatLab (Basic)
<b>Languages:</b> English (Fluent), French (Basic), Italian (Basic), Japanese (Basic)
<b>Other:</b> Microsoft Office, Lumerical, KLayout, Inkscape

## SERVICE & OUTREACH

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**Bonn Superdeterminism and Retrocausality Workshop 2022:** [Session Chair \(Invited\)](#)

**Bristol Quantum Information and Technology Workshop 2022 (BQIT:22):** Programme Committee Lead; Board Member, Session Chair

**Peer Reviewer:** *Physica Scripta* (2); *British Journal for the Philosophy of Science* (1); *Scientific Reports* (3); *Foundations of Physics* (1); *npj Quantum Information* (2); *Studies in the History and Philosophy of Science* (1); *Journal of Physics A: Mathematical and Theoretical* (1)

**Outreach:** Guest Quantum Scientist, [The Quantum Horse: The Pantomime](#); Guest Speaker, [It's About Time Podcast](#); Interviewee, [Quantum City Interview Series \(run by UK National Quantum Technologies Programme\)](#)

## POSTERS

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**Interaction-Free Polarimetry:** CLEO Pacific Rim 2022 (P-CTh6-13); Optica Quantum 2.0 Conference and Exhibition 2022 ([QW2A.18](#))

**Do weak values show the past of a quantum particle?:** Quantum Computing Theory in Practice (QCTiP) 2022; Quantum Information Processing (QIP) 2022

**Counterfactual Ghost Imaging:** Conference on Lasers and Electro-Optics (CLEO) 2021 ([JTU3A.14](#)); Bristol Quantum Information and Technology Workshop 2021 (BQIT:21)

**Wavefunctions can Simultaneously Represent Knowledge and Reality:** Vienna Quantum Foundations 2021; IOP Quantum, Atomic and Molecular Physics (QuAMP) 2021

**How quantum is quantum counterfactual communication?:** Bristol Quantum Information and Technology Workshop 2020 (BQIT:20)

**Modal, Truly Counterfactual Communication with On-Chip Demonstration Proposal:** QMATH Masterclass on Continuous Variable Quantum Communication and Computation 2019; OSA Quantum Information and Measurement (QIM) V 2019; Bristol Quantum Information and Technology Workshop 2019 (BQIT:19); OSA IONS KOALA 2018

## AWARDS

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**University of Bristol PLUS Award:** Awarded Academic Year 2021/22

**Institute of Physics Trusted Reviewer:** Awarded 2021

**University of Bristol SCEEM PGR Conference 2021:** 3<sup>rd</sup> Place Presentation Prize

**UK Quantum Communications Hub/ EPSRC University of York Doctoral Training Partnership:** Full PhD Scholarship & Stipend (with Travel Grant)

**IONS KOALA Conference 2018:** Best Poster Presentation Prize; Travel Grant

**John Hampden Grammar School Full Colours (Honours):** Awarded 2014 for representing the school in debating and public speaking.

**John Hampden Grammar School Half Colours (Honours):** Awarded 2013 for representing the school in debating and public speaking.

**Bar National Mock Trial Competition 2012/13:** Regional Heat Winner, National Final Participant (role: defence barrister)

**John Hampden Grammar School Junior Colours (Honours):** Awarded 2012 for representing the school in debating and public speaking.

**National Public Speaking Competition for Schools 2011/12:** Runner Up (First Round—3rd Heat); Best Chairperson (Second Round—Branch Final)

**Duke of Edinburgh's Bronze Award:** Awarded 2011

**Rotary International Youth Speaks Competition 2011:** District 1090 Heat Senior Section Winner

## COURSES

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IOP Peer Review Excellence Programme

OSA Reviewer Certification Course

[PGCert Academic Practice Unit AFACM0019: Engaging Higher Education Students in their Learning \(University of Bristol, 30 credits\)](#)

[First Aid at Work QA Level 3 Award \(Acorn Health and Safety FAO2\)](#)

Bristol Futures Open Course in Innovation and Enterprise

[2019 Masterclass on Continuous Variables for Quantum Communication and Computation \(QMATH, University of Copenhagen/European Quantum Technology Flagship\)](#)

[Phot1x: Silicon Photonics Design, Fabrication and Data Analysis \(edX\)](#)

[009x: Stochastic Processes: Data Analysis and Computer Simulation \(edX\)](#)

## MEMBERSHIPS

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**Advance HE:** Associate Fellow (AFHEA)

**Institute of Physics:** Member (MInstP)

**Member of:** [Samy Maroun Center for Space, Time and the Quantum](#); [Philosophy of Physics Society](#); [British Society for the Philosophy of Science](#); [Optica \(formerly OSA\)](#); [International Society for Relativistic Quantum Information](#); [American Physical Society \(APS\)](#)

## EXTRA-CURRICULAR

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**University Fire Warden, First Aider:** 2020–Now, University of Bristol

**Freeman:** 2018–Now, City of London Corporation; Worshipful Company of Clockmakers

**Sound Designer/Engineer:** 2018–20, University of Bristol Stage Technicians' Association

**Company Director:** 2017–22, Kings Court (Bristol) Management Co. Ltd

**Society Treasurer:** 2017–19; 2021–22, University of Bristol Pantomime Society

**Society President:** 2017–18, Paradox (University of Bristol Physics and Philosophy Society)

**Deputy Head Boy:** 2013–14, John Hampden Grammar School

**Beaver Scout Leader:** 2010–14, 1<sup>st</sup> Bourne End Scout Group