



Jacob Biamonte

Full Professor, Principal Ministry Research Chair (MEIE)
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Research Identity

I study the minimal physical and mathematical conditions under which quantum systems support universal, programmable, and trainable computation. This program decomposes along three axes—Model, Language, and Training—and unifies contributions spanning Hamiltonian complexity, tensor networks, variational quantum computation, and hardware-aware quantum algorithms.

Higher Education

University of Oxford

Oxford, UK

2010: Doctor of Philosophy in Computer Science
(Doctoral Thesis Prize, Mathematical, Physical & Life Sciences Division)

Moscow Institute of Physics and Technology

Moscow, Russia

2022: Doctor of Science in Mathematical Physics (Habilitation by Thesis)

Employment

ÉTS Montréal, Université du Québec

Montreal, Canada

2024–present: Full Professor, Principal Ministry Chair in Quantum Computing (MEIE)
2024–present: Founding Research Institute Director (Quantum Science and Engineering)

Skolkovo Institute of Science and Technology (established in partnership with MIT)

Moscow, Russia

2022–2023: Professor in Computer Science and in Physics (Tenured)
2019–2023: Founding Head of Deep Quantum Laboratory
2017–2022: Associate Professor in Computer Science and in Physics (Tenure-Line)

Institute for Scientific Interchange (ISI Foundation)

New York/Torino, Italy

2012–2017: Research Leader of the Quantum Science Laboratory

University of Oxford

Oxford, UK

2011–2012: Research Fellow, University of Oxford/National University of Singapore (Joint program)
10/2010–4/2011: Doctoral Thesis Prize Fellow
2009–2012: College Lecturer in Physics, St Peter's College (Part-Time)
2007–2010: Departmental Tutor, Mathematical Institute (Part-Time)
2007–2010: Doctoral Student, Engineering and Physical Sciences Research Council Studentship

Harvard University

Cambridge, Massachusetts

4/2007–9/2007 and 3/2008–10/2008: Fellow

D-Wave Systems, (Early quantum computing company)

Vancouver, British Columbia, Canada

2005–2007: Quantum Applications Scientist
2004–2005: Research Associate

Selected Contributions

1. Model: Universality in Physical Systems

Realizable Hamiltonians for Universal Adiabatic Quantum Computers

J Biamonte and P Love

Physical Review A 78(1):012352 (2008) · DOI: 10.1103/PhysRevA.78.012352

— *The transverse Ising model becomes QMA-complete when augmented by XX couplings.*

— *Featured in Citation Classics, Research Solutions/Scite, 2026.*

Universal Variational Quantum Computation

J Biamonte

Physical Review A (Letter) 103(3):L030401 (2021) · DOI: 10.1103/PhysRevA.103.L030401

— *Editors' Selection: "The author proves that the contemporary variational approach to quantum-enhanced algorithms enables a universal model of quantum computation. This brings the resources required for universal quantum computation closer to contemporary quantum processors."*

2. Language: Computation from Composition

Tensor Network Contractions for #SAT

J Biamonte, J Morton and J Turner

Journal of Statistical Physics 160(5):1389 (2015) · DOI: 10.1007/s10955-015-1276-z

— *Graphical rewrite formulation linking tensor networks, counting complexity, and satisfiability.*

Tensor Networks and Graphical Calculus for Open Quantum Systems

C Wood, J Biamonte and D Cory

Quantum Information and Computation 15:0579 (2015) · DOI: 10.26421/QIC15.9-10-3

— *Compositional tensor-network methods for noisy dynamics and open-system representations.*

3. Training and Hardware-Aware Algorithms

Reachability Deficits in Quantum Approximate Optimization

V Akshay, H Philathong, M Morales and J Biamonte

Physical Review Letters 124:090504 (2020) · DOI: 10.1103/PhysRevLett.124.090504

— *Expressivity gaps restrict reachable states and shape optimization landscapes.*

Simulation of Electronic Structure Hamiltonians using Quantum Computers

J Whitfield, J Biamonte and A Aspuru-Guzik

Molecular Physics 109(5):735 (2011) · DOI: 10.1080/00268976.2011.552441

— *Gate-complexity analysis for electronic-structure simulation on fault-tolerant devices.*

— *In the Web of Science Top 1% Highly Cited Papers in Physics.*

— *Longuet-Higgins Paper Prize, Taylor & Francis, 2012.*

4. Field Synthesis

Complex Networks from Classical to Quantum

J Biamonte, M Faccin and M De Domenico

Communications Physics 2 (2019) · DOI: 10.1038/s42005-019-0152-6

— *Framework relating network science and quantum information.*

— *Editors' Selection; 2019 Anniversary Collection.*

Quantum Machine Learning

J Biamonte et al.

Nature 549 (2017) · DOI: 10.1038/nature23474

— *Perspective Article.*

— *In the Web of Science Top 0.1% Highly Cited Papers in Physics.*

Publication Data¹

Publication Authorship Category		Count
Total entries	85	
Single author		11
First author with collaborator(s)		15
Last author	35	
Number of papers with over 100 citations		22
Impact Indicator		Value
Hirsch-index		46
i10-index		74
Total citations	15.1k	
Total citations in prior year		3.4k

Teaching and Pedagogy

I translate research into graduate training in quantum information, tensor networks, and quantum computing through active-learning course design, hands-on practice, and research-led training pipelines.

Formal Supervision and Mentorship

1. PhD Students supervised as primary advisor: 9
2. MSc Students supervised as primary advisor: 4
3. Postdoctoral Fellows supervised: 9
4. Senior Research Scientists supervised: 2

Secondary advisory roles, part time and visiting mentorships are reported from p. 7.

Scientific Team Building

1. Established and trained research teams comprising over 20 direct reports
2. Established an administrative team to help faculty-driven research programs
3. Guided laboratory students and postdocs to secure and administer fellowships totaling \$1.52M

Research Fundraising (2012–present)

1. Government/Public Sector Funding: \$7.31M
2. Industrial Projects: \$5.79M
3. Private/Foundation Grants: \$844.5K

¹Retrieved from Google Scholar, March 2025.

Selected Service & Committee Work

1. 2022: Elected to serve on the Academic Promotion and Tenure Committee as the Computational Sciences Subject Matter Expert
2. 2021: Invited to serve as the national theory lead in a decade-long, multi-partner national quantum computing initiative
3. Served on admissions and student evaluation panels and 5 times as an external thesis reviewer
4. 2018: External Evaluator of the Vienna Center for Quantum Science and Technology, Vienna, Austria
5. Associate Editor, *ACM Transactions on Quantum Computing*

Visiting and Affiliate Programs

2023–2024: NASA Academic Mission Services; Research Institute for Advanced Computer Science (USRA)
NASA Ames Research Center, Mountain View, California

2023–2024: Simons Institute for the Theory of Computing
University of California, Berkeley, Berkeley, California

2015–2018: Institute for Quantum Computing
University of Waterloo, Waterloo, Ontario, Canada

Awards, Fellowships & Honors

Included in the World's Top 2% Scientists Ranking for the Field of Physics (Elsevier-Stanford, 2024)

Type	Institute	Year(s)
Elected Fellow	Institute of Physics, London, UK	2023
Higher Education Academy Fellowship	Advance HE, York, UK	2023
Plenary Invited Lecture Series	École Polytechnique Fédérale de Lausanne (EPFL) Lausanne, Switzerland	2022
Trusted Reviewer Award Journal of Physics A: Mathematical and Theoretical	Institute of Physics Publishing, Bristol, UK	2020
USERN Medal in Formal Sciences	Universal Scientific Education and Research Network Reggio Calabria, Italy	2018
Edward Shapiro Lecture Series	Pennsylvania State University	2015
Longuet-Higgins Paper Prize	Taylor & Francis, London, UK	2012
Doctoral Thesis Prize	Mathematical and Physical Sciences Division University of Oxford, UK	2010
Doctoral Studentship	Engineering & Physical Sciences Research Council, Swindon, UK	2007–2010
Ronald McNair Scholar	Post-Baccalaureate Achievement Program Portland State University, Portland, Oregon	2004