

# Alastair A. Abbott

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## Employment

- Dec. 2020 – present: **Research scientist (chargé de recherche)**, QINFO team,  
Inria centre at the University Grenoble Alpes, Grenoble, France
- Sept. 2018 – Nov. 2020: **Postdoctoral researcher** at the **University of Geneva**, Switzerland, in the  
group of Nicolas Brunner
- Nov. 2015 – June 2018: **Postdoctoral researcher** at the **Institut Néel (CNRS)**, Grenoble, France,  
in the group of Cyril Branciard

## Education

- 2011 – 2015: **PhD in Computer Science and Physics**  
Joint PhD: Department of Computer Science, University of Auckland, New Zealand; and  
Centre Cavallès, École Normale Supérieure, Paris, France  
Thesis: *Value Indefiniteness, Randomness and Unpredictability in Quantum Foundations*  
Supervisors: Prof. Cristian S. Calude (UoA) and Prof. Giuseppe Longo (ÉNS)
- 2010: **MSc in Computer Science with First Class Honours**  
University of Auckland, New Zealand  
Thesis: *Quantum Random Numbers: Certification and Generation*  
Supervisor: Prof. Cristian S. Calude
- 2009: **BSc(Hons) in Computer Science with First Class Honours**  
University of Auckland, New Zealand  
Dissertation: *De-quantisation in Quantum Computation*  
Supervisor: Prof. Cristian S. Calude
- 2006 – 2008: **BSc in Computer Science and Physics**  
University of Auckland, New Zealand

## Current Research Interests

- **Quantum information:** quantum information processing with indefinite causal orders, certification of quantum resources, quantum cryptography, convex optimisation in quantum information theory
- **Quantum foundations:** quantum causal indefiniteness, entanglement, nonlocality, contextuality, quantum randomness
- **Quantum computing:** extended models of quantum computation (including coherent control), hybrid classical-quantum computation
- **Theoretical computer science:** algorithmic information theory and randomness
- **Philosophy of quantum mechanics:** quantum randomness, quantum causality

## Prizes and Awards

- Department of Computer Science Poster Competition, 2nd place, 2011.
- Demonstrating Prize in Physics, 2009, for best physics lab tutor.
- Montgomery Memorial Prize in Logic, 2009, for the best Honours-year dissertation.
- New Zealand Computer Society Cup and Shield, 2009, for the top overall student in Computer Science.
- J. C. Butcher Prize in Theoretical Computer Science, 2008.
- Senior Prize in Computer Science, 2008.

## Grants

- Scientific Coordinator for Inria Grenoble of ANR AAPG2022 PRC project TaQC (Taming Quantum Causality), 2023–2026; project coordinator: C. Branciard; 470k€.
- Scientific leader for Inria for EU Horizon Europe project QSNP (Quantum Secure Networks Partnership), 2022–2026; project coordinator: V. Pruneri (ICFO); 25M€.
- Coordinator of IRGA 2021 (Initiatives de Recherche à Grenoble Alpes) project CIQuP (Causally Indefinite Quantum Protocols: From Complexity to Applications), 2021–2022; 19k€.
- Collaborator in the EU Marie Curie Actions IRSES (International Research Staff Exchange Scheme) project RANPHYS (Randomness and Irreversibility in Physics), 2011–2015; project coordinator: K. Svozil (TUWien); \$129k NZD.
- University of Auckland Doctoral Scholarship, 2011–2015.
- University of Auckland Masters Scholarship, 2010.
- Faculty of Science Summer Research Scholarship ( $\times 3$ ), 2007, 2008, & 2009.
- Bonded Merit Scholarship, 2007–2009 (New Zealand Government Scholarship).

## Expertise

### Languages

Fluent in English and French, intermediate Russian.

## Publications and Presentations

### Papers in Refereed Journals

35. H. Dourdent, **A. A. Abbott**, I. Šupić and C. Branciard, *Network-Device-Independent Certification of Causal Nonseparability*, *Quantum*, *accepted* (2024); [arXiv:2308.12760 \[quant-ph\]](#).
34. **A. A. Abbott**, M. Mhalla and P. Pocreau, *Quantum query complexity of Boolean functions under indefinite causal order*, *Physical Review Research* **6**, L032020 (2024).
33. **A. A. Abbott**, M. Mhalla and P. Pocreau, *Improving social welfare in non-cooperative games with different types of quantum resources*, *Quantum* **8**, 1376 (2024). [Perspective on our paper by G. Scarpa: *Quantum Views* **8**, 82 (2024).]
32. R. Mothe, C. Branciard and **A. A. Abbott**, *Reassessing the advantage of indefinite causal orders for quantum metrology*, *Physical Review A* **109**, 062435 (2024),
31. A. Piveteau, **A. A. Abbott**, S. Muhammad, M. Bourennane and A. Tavakoli, *Weak entanglement improves quantum communication using only product measurements*, *Physical Review Applied* **21**, 034053 (2024).
30. M. Fellous-Asiani, R. Mothe, L. Bresque, H. Dourdent, P. A. Camati, **A. A. Abbott**, A. Auffèves and C. Branciard, *Comparing the quantum switch and its simulations with energetically constrained operations*, *Physical Review Research* **5**, 023111 (2023).
29. H. Dourdent, **A. A. Abbott**, N. Brunner, I. Šupić and C. Branciard, *Semi-Device-Independent Certification of Causal Nonseparability with Trusted Quantum Inputs*, *Physical Review Letters* **129**, 090402 (2022).
28. M. Ioannou, P. Sekatski, **A. A. Abbott**, D. Rosset, J.-D. Bancal and N. Brunner, *Receiver-device-independent quantum key distribution protocols*, *New Journal of Physics* **24**, 063006 (2022).
27. M. Ioannou, M. A. Pereira, D. Rusca, F. Grünenfelder, A. Boaron, M. Perrenoud, **A. A. Abbott**, P. Sekatski, J.-D. Bancal, N. Maring, H. Zbinden and N. Brunner, *Receiver-Device-Independent Quantum Key Distribution*, *Quantum* **6**, 718 (2022).
26. J. Wechs, H. Dourdent, **A. A. Abbott** and C. Branciard, *Quantum circuits with classical versus quantum control of causal order*, *PRX Quantum* **2**, 030335 (2021).
25. A. Tavakoli, E. Zambrini Cruzeiro, R. Uola and **A. A. Abbott**, *Bounding and simulating contextual correlations in quantum theory*, *PRX Quantum* **2**, 020334 (2021).
24. M. M. Taddei, J. Cariñe, D. Martínez, T. García, N. Guerrero, **A. A. Abbott**, M. Araújo, C. Branciard, E. S. Gómez, S. P. Walborn, L. Aolita and G. Lima, *Computational Advantage from the Quantum Superposition of Multiple Temporal Orders of Photonic Gates*, *PRX Quantum* **2**, 010320 (2021).

23. G. Rubino, L. A. Rozema, D. Ebler, H. Kristjánsson, S. Salek, P. A. Guérin, **A. A. Abbott**, C. Branciard, Č. Brukner, G. Chiribella and P. Walther, *Experimental quantum communication enhancement by superposing trajectories*, *Physical Review Research* **3**, 013093 (2021).
22. **A. A. Abbott**, J. Wechs, D. Horsman, M. Mhalla and C. Branciard, *Communication through coherent control of quantum channels*, *Quantum* **4**, 333 (2020).
21. R. Uola, T. Kraft and **A. A. Abbott**, *Quantification of quantum dynamics with input-output games*, *Physical Review A* **101**, 052306 (2020).
20. **A. A. Abbott**, R. Silva, J. Wechs, N. Brunner and C. Branciard, *Anomalous weak values without post-selection*, *Quantum* **3**, 194 (2019). [Perspective on our paper by E. Cohen: *Quantum Views* **3**, 27 (2019).]
19. **A. A. Abbott**, C. S. Calude, M. J. Dinneen and R. Hua, *A hybrid quantum-classical paradigm to mitigate embedding costs in quantum annealing*, *International Journal of Quantum Information* **17**, 1950042 (2019).
18. B. Demirel, S. Sponar, **A. A. Abbott**, C. Branciard and Y. Hasegawa, *Experimental test of an entropic measurement uncertainty relation for arbitrary qubit observables*, *New Journal of Physics* **21**, 013038 (2019).
17. J. Wechs, **A. A. Abbott** and C. Branciard, *On the definition and characterisation of multipartite causal (non)separability*, *New Journal of Physics* **21**, 013027 (2019).
16. **A. A. Abbott**, C. S. Calude, M. J. Dinneen and N. Huang, *Experimentally probing the incomputability of quantum randomness*, *Physica Scripta* **94**, 045103 (2019).
15. A. Tavakoli, **A. A. Abbott**, M.-O. Renou, N. Gisin and N. Brunner, *Semi-device-independent characterization of multipartite entanglement of states and measurements*, *Physical Review A* **98**, 052333 (2018).
14. **A. A. Abbott**, J. Wechs, F. Costa and C. Branciard, *Genuinely multipartite noncausality*, *Quantum* **1**, 39 (2017).
13. N. Miklin, **A. A. Abbott**, C. Branciard, R. Chaves and C. Budroni, *The entropic approach to causal correlations*, *New Journal of Physics* **19**, 113041 (2017).
12. **A. A. Abbott** and C. Branciard, *Noise and disturbance of qubit measurements: An information-theoretic characterization*, *Physical Review A* **94**, 062110 (2016).
11. **A. A. Abbott**, C. Giarmatzi, F. Costa and C. Branciard, *Multipartite causal correlations: Polytopes and inequalities*, *Physical Review A* **94**, 032131 (2016).
10. **A. A. Abbott**, P.-L. Alzieu, M. J. W. Hall and C. Branciard, *Tight state-independent uncertainty relations for qubits*, *Mathematics* **4**, 8 (2016).
9. **A. A. Abbott**, C. S. Calude and K. Svozil, *A non-probabilistic model of relativised predictability in physics*, *Information* **6**, 773 (2015).
8. **A. A. Abbott**, C. S. Calude and K. Svozil, *A variant of the Kochen-Specker theorem localising value indefiniteness*, *Journal of Mathematical Physics* **56**, 102201 (2015).
7. **A. A. Abbott**, C. S. Calude and K. Svozil, *Value-indefiniteness observables are almost everywhere*, *Physical Review A* **89**, 032109 (2014).
6. **A. A. Abbott**, C. S. Calude and K. Svozil, *A quantum random number generator certified by value indefiniteness*, *Mathematical Structures in Computer Science* **24**, e240303 (2014).
5. **A. A. Abbott**, C. S. Calude, J. Conder and K. Svozil, *Strong Kochen-Specker theorem and incomputability of quantum randomness*, *Physical Review A* **86**, 062109 (2012).
4. **A. A. Abbott**, M. Bechmann, C. S. Calude and A. Sebal, *A nuclear magnetic resonance implementation of a classical Deutsch-Jozsa algorithm*, *International Journal of Unconventional Computing* **8**, 161 (2012).
3. **A. A. Abbott** and C. S. Calude, *Von Neumann normalisation of a quantum random number generator*, *Computability* **1**, 59 (2012).
2. **A. A. Abbott**, *De-quantisation of the quantum Fourier transform*, *Applied Mathematics and Computation* **219**, 3 (2012).
1. **A. A. Abbott**, *The Deutsch-Jozsa problem: De-quantisation and entanglement*, *Natural Computing* **11**, 3 (2012).

## Papers in Refereed Conference Proceedings

4. **A. A. Abbott**, C. S. Calude, M. J. Dinneen and R. Hua, *A hybrid quantum-classical paradigm to mitigate embedding costs in quantum annealing – Abridged Version*, In M. Cuffaro and P. Papayannopoulos (eds), Proceedings of the 9th International Workshop on Physics and Computation (Fontainebleau, France, June 26 2018); *ETPCS* **273**, 1 (2018).
3. **A. A. Abbott** and I. Watson, *Ontology-aided product classification: A nearest neighbour approach*, In A. Ram and N. Wiratunga (eds), Proceedings of the 19th International Conference on Case-Based Reasoning (London, UK, September 12–15 2011); *LNAI* **6880**, 348 (2011).
2. **A. A. Abbott** and C. S. Calude, *Von Neumann normalisation and symptoms of randomness: An ap-*

plication to sequences of quantum random bits, In C. S. Calude, J. Kari and I. Petre (eds), Proceedings of the 10th International Conference on Unconventional Computation (Turku, Finland, June 6–10 2011); **LNCS 6714**, 40 (2011).

1. **A. A. Abbott** and C. S. Calude, *Understanding the quantum computational speed-up via de-quantisation*, In S. B. Cooper, E. Kashefi, P. Panangaden (eds), Proceedings of the 6th Workshop on Developments in Computational Models: Causality, Computation, and Physics (Edinburgh, UK, July 9–10 2010); **EPTCS 26**, 1 (2010).

## Book Chapters

2. **A. A. Abbott**, C. S. Calude and K. Svozil, *On the unpredictability of individual quantum measurement outcomes*, In L. D. Beklemishev *et al.* (eds), Fields of Logic and Computation II: Essays Dedicated to Yuri Gurevich on the Occasion of His 75th Birthday; **LNCS 9300**, 69 (Springer, Cham, 2015).
1. **A. A. Abbott**, C. S. Calude and K. Svozil, *A quantum random oracle*, In S. B. Cooper and J. van Leeuwen (eds), *Alan Turing: His Work and Impact*, pp. 206–210, (Elsevier Science, 2013).

## Preprints and Research Reports

2. **A. A. Abbott**, L. Bienvenu and G. Senno, *Non-uniformity in the Quantis random number generator*, **CDMTCS Research Report 472** (2014).
1. **A. A. Abbott** and M. J. Dinneen, *An investigation of algorithms to aesthetically draw Cayley graphs*, **CDMTCS Research Report 318** (2008).

## Edited Proceedings

1. **A. A. Abbott** and D. C. Horsman, *Proceedings of the 7<sup>th</sup> International Workshop on Physics and Computation, Manchester, U.K., 14 July 2016*, **Electronic Proceedings of Computer Science (EPTCS) 214** (2016).

## Journal Guest Editor

1. C. Câmpeanu, L. Staiger, **A. A. Abbott** and M. Ziman, *Frontiers of Computability, Randomness, and Complexity (dedicated to the 70th birthday of Professor Cristian Calude)*, **Theoretical Computer Science C** (2023).

## Vulgarisation and Communication

4. Explorations Quantiques 2050, les récits. Technological analysis of scenarios and their basis in the scientific literature. March 2024.
3. **Interview for the podcast series Decode quantum**, organised and animated by Olivier Ezratty and Fanny Bouton (27 October 2022).
2. Invited blog post (with Prof. Cristian S. Calude) on the website Quantum for Quants about the prospects of near-term quantum computing and hybrid approaches: *The limits of quantum computing* (19 June 2016).
1. Article for a broad audience in the *Asia Pacific Mathematics Newsletter*: **A. A. Abbott**, C. S. Calude and K. Svozil. *On Demons and Oracles*, **Asia Pacific Mathematics Newsletter 2(1)**, 25 (2012).

## Invited Conference Presentations

6. Improving social welfare in non-cooperative games with different types of quantum resources. *Japanese-French Quantum Information Workshop (JFQI)*, Tokyo, Japan, December 2023.
5. The Causal Structure of Quantum Information. *Spring School in Theoretical Computer Science (EPIT)*, CIRM, Marseille, France, May 2021.
4. Coherent Control of Quantum Channels. *The Quantum Information Structure of Spacetime*, Hong Kong, January 2020.
3. Causal Nonseparability in Multipartite Scenarios. *Quantum Maiwar*, Brisbane, Australia, November 2018.
2. Localising Value Indefiniteness with the (Strong) Kochen-Specker Theorem. *Solstice of Foundations: Contextuality Workshop*, Zürich, Switzerland, June 2017.
1. From Preparation to Measurement Through the Eyes of Entropic Uncertainty Relations. *2nd International Conference on Quantum Foundations*, Patna, India, October 2016.

## Regular Conference Presentations

23. Self-testing quantum supermaps, with an application to the quantum switch. *Causalworlds*, Perimeter Institute, Waterloo, Canada, September 2024.
22. Self-testing quantum supermaps, with an application to the quantum switch (poster). *Seefeld Workshop on Quantum Information*, Seefeld in Tirol, Austria, June 2024.
21. Improving social welfare in non-cooperative games with different types of quantum resources. *Central European Quantum Information Processing Workshop (CEQIP)*, Smolenice, Slovakia, September 2023.
20. Quantum Query Complexity of Boolean Functions under Indefinite Causal Order. *Quantum Physics and Logic (QPL)*, Paris, France, July 2023.
19. Device-Independent Quantification of Quantum Resources (poster). *Quantum Communication, Measurement and Computing (QCMC)*, Lisbon, Portugal, July 2022.
18. Optimizing quantum social welfare in non-collaborative games (poster). *Quantum Physics and Logic (QPL)*, Oxford, England, June 2022.
17. Device-Independent Quantification of Quantum Resources (poster). *Vienna Quantum Foundations Conference (VQF-CON)*, Vienna (hybrid), Austria, September 2021.
16. Bounding and simulating contextual correlations in quantum theory. *Quantum Physics and Logic (QPL)*, Gdansk (virtual), Poland, June 2021.
15. Computational Advantage from Quantum Superposition of Multiple Temporal Orders of Gates. *GDR IQFA (Quantum Engineering, Fundamental Aspects to Applications)*, Grenoble (virtual), France, December 2020.
14. Communication through coherent control of quantum channels (poster). *GDR IQFA (Quantum Engineering, Fundamental Aspects to Applications)*, Paris, France, November 2019.
13. Communication through coherent control of quantum channels. *Asian Quantum Information Science Conference (AQIS)*, Seoul, South Korea, August 2019.
12. Indefinite causal relations in multipartite scenarios (poster). *GDR IQFA (Quantum Engineering, Fundamental Aspects to Applications)*, Nice, France, November 2017.
11. Genuinely multipartite noncausality. *Quantum Networks*, Oxford, England, August 2017.
10. Multipartite causal correlations, polytopes and inequalities. *Quantum Networks*, Natal, Brazil, November 2016.
9. Noise and disturbance of qubit measurements: An information-theoretic characterisation. *Quantum Physics and Logic (QPL)*, Glasgow, Scotland, June 2016.
8. A variant of the Kochen-Specker theorem locating value indefiniteness. *Quantum theory: From foundations to technology*, Växjö, Sweden, June 2015.
7. Quantum information inside and outside the quantum. *Weaving the understanding of information*, Vienna, June 2015.
6. Locating value indefiniteness with a variant of the Kochen-Specker theorem. *Randomness in Quantum Physics and Beyond*, Barcelona, Spain, May 2015.
5. Von Neumann normalisation and symptoms of randomness: An application to sequences of quantum random bits. *Unconventional Computation*, Turku, Finland, June 2011.
4. Ontology-aided product classification: A nearest neighbour approach. *New Zealand Computer Science Research Student Conference*, Palmerston North, New Zealand, April 2011.
3. De-quantisation of the quantum Fourier transform. *Workshop on Physics and Computation*, the Nile, Luxor–Aswan, Egypt, September 2010.
2. De-quantisation in quantum computing: An overview and an application to the quantum Fourier transform. *New Zealand Computer Science Research Student Conference*, Wellington, New Zealand, April 2010.
1. The Deutsch-Jozsa problem: De-quantisation and entanglement, *Workshop on Physics and Computation*, Ponta Delgada, Portugal, September, 2009.

## Invited Research Seminars

23. QuantAlps Quantum Computing Workshop, Grenoble, 15 November 2023. *Causally Indefinite Quantum Computation*.
22. Journée Scientifique du pôle PEM (UGA), Grenoble, 19 October 2023. *Taming Quantum Causality*.
21. Inria challenge “EQIP” yearly meeting, Strasbourg, 30 November 2022. *Improving social welfare in non-cooperative games with different types of quantum resources*.
20. Laboratoire Kastler Brossel (LKB), “Ateliers du LKB” seminar series, Paris (France), 13 October, 2022. *Causal indefiniteness from quantum control of processes*.

19. Laboratoire d'Informatique de Grenoble (LIG) Research Days, Autrans (France), 22 June 2022. *Quantum control structures in quantum information processing*.
18. QuantAlps kickoff meeting, Grenoble, 25 March 2022. *Certifying Quantum Resources with Minimal Assumptions*.
17. Inria challenge “EQIP” kickoff meeting, Paris, 19 November 2021. *Certification of Dynamical Quantum Resources*.
16. Swiss QSIT (Quantum Science and Technology) General Meeting, Arosa (Switzerland), 5 February 2020. *Quantum Information Processing with Indefinite Causal Orders*.
15. Laboratoire d'Informatique de Grenoble (LIG), 30 January 2020. *Communication through coherently controlled quantum channels*.
14. University of Tokyo (Japan), 26 August 2019. *Quantum circuits with classical and quantum control of causal orders*.
13. Quantum Information Theory Seminar, ETH Zürich, Zürich (Switzerland), 28 May 2019. *Quantum circuits with classical and quantum control of causal orders*.
12. Faculty of Informatics, Università della Svizzera italiana, Lugano (Switzerland), 15 May 2019. *Quantum circuits with classical and quantum control of causal orders*.
11. Institute for Quantum Optics and Quantum Information, University of Vienna (Austria), 9 April 2019. *Quantum circuits with classical and quantum control of causal orders*.
10. Laboratoire de Physique et Modélisation des Milieux Condensés (France), 16 January 2019. *Quantum information beyond the circuit model*.
9. Invited talk in the seminar series “Fondements et implications sociétales de la mécanique quantique”, Institut Néel (France), 29 March 2017. *Randomness, indeterminism and unpredictability in quantum mechanics*.
8. Invited talk in the seminar series “Logique, Informatique, Mathématiques, Raisonnement”, Université Lyon 3 (France), 15 March 2017. *Randomness and unpredictability at the heart of quantum mechanics*.
7. Invited talk in the seminar series “Séminaires de philosophie et Mathématiques: Temps et Hasard”, École Normale Supérieure de Paris (France), 6 February 2017. *Randomness and unpredictability at the heart of the foundations of quantum mechanics*.
6. Talk in seminar the series “Journal Club Foundations”, Institut Néel (France), 8 October 2015. *An introduction to quantum contextuality*.
5. Technical University of Vienna (Austria), 30 May 2015. *A variant of the Kochen-Specker theorem locating value indefiniteness*.
4. École Normale Supérieure (France), 28 November 2014. *Randomness and unpredictability: Their meaning in quantum mechanics*.
3. Technical University of Vienna (Austria), 11 September 2013. *From value indefiniteness to quantum randomness*.
2. University of Bologna (Italy), 11 June 2013. *Strong incomputability of quantum randomness*.
1. Université de Paris 7 Diderot (France), 28 November 2012. *Quantum randomness: In search of an algorithmic description*.

## Other Research Experience

- 2009–2010: *UNSPSC Product Classifier with Case Based Reasoning*. Working on a paid research grant to develop a system to classify consumer products into a class-hierarchy ontology using a Case Based Reasoner with conversational elements.
- 2008–2009: *Diode Laser Modulation to excite Raman transitions between hyperfine-states in Rubidium atoms*. Experimental work with Dr. M. D. Hoogerland in the UoA Quantum Information Laboratory on quantum gates implemented with super-cooled Rubidium atoms.

## Teaching and Thesis Supervision

- PhD supervision:
  - Raphaël Le Bihan, “*Compositionality and Applications of Quantum Supermaps*”; UGA 2024–.
  - Maarten Grothuis, “*Exploiting causal indefiniteness in quantum computational models*”, co-supervised with Cyril Branciard; UGA 2023–.
  - Pierre Pocreau, “*Implications of causal indefiniteness for quantum communication*”, co-supervised with Mehdi Mhalla; UGA 2022–.



- Raphaël Mothe, “*Causal indefiniteness and dynamicality in quantum mechanics*”, co-supervised with Cyril Branciard; UGA 2021–2024, defended 18/10/2024.
- Master’s student supervision:
  - Raphaël Le Bihan, “*Compositionality of causally indefinite quantum supermaps*”; ENS Paris Saclay pre-thesis internship, 2024.
  - Pierre Pocreau, “*Query complexity for higher order quantum computation*”; Ensimag M2 Internship, 2022.
  - Elliot Renel, “*Computational advantages with causally indefinite quantum circuits*”; MoSIG M1 Internship, 2022.
  - Raphaël Mothe; ENS Lyon pre-thesis internship, 2021.
  - Pierre Pocreau, “*Improving quantum social welfare by relaxing pseudo-telepathic constraints in non-collaborative games*”; Ensimag M1 Lab project, 2021.
  - Océane Koska, “*Simulation of the superposition of multiple temporal gates orders in quantum circuits*”; Ensimag M1 Lab project, 2021.
  - Eleftherios Tselentis, “*Anomalous Weak Values and Indefinite Causal Order*” (thesis defended October 2019; external Master’s thesis from ETH, Zürich).

- Lecturer (preparing and giving lectures, writing and marking exams) for the following courses (stars indicate organisation of course):

**University of Grenoble Alpes:**

2021, 2022–2024\*: Fundamental Computer Science (graduate, 4<sup>th</sup> year)

**University of Auckland:**

2012, 2013: Principles of Programming (undergraduate, 1<sup>st</sup> year)

- General interest lectures to students:

**Grenoble INP:**

2023: Introduction aux calcul et algorithmes quantiques (Ensimag)  
 2024: Introduction aux calcul et algorithmes quantiques (Grenoble INP, Kaleidoscope 2)

- Teaching assistant (tutorials, marking assignments and exams) for the following courses:

**University of Geneva:**

2020: Quantum Information (graduate, 4<sup>th</sup> year)  
 2018–2020: Mathematical Methods for Physicists (undergraduate, 1<sup>st</sup> year)

**University of Auckland:**

2012, 2013: Mathematical Foundations of Computer Science (undergraduate, 3<sup>rd</sup> year)  
 2009–2012: Advanced Physics Laboratory (undergraduate, 2<sup>nd</sup>, 3<sup>rd</sup> year)  
 2011: Algorithm Design and Analysis (undergraduate, 3<sup>rd</sup> year)  
 2008–2010: UNIX, Operating Systems and Data Communication (undergraduate, 2<sup>nd</sup> year)  
 2008, 2009: Principles of Programming (undergraduate, 1<sup>st</sup> year)  
 2008: Planets, Stars and Galaxies (undergraduate, 1<sup>st</sup> year)  
 2008: First Year Physics Laboratory (undergraduate, 1<sup>st</sup> year)

## Service and Administration

### Conference Organising Committees

- *QuantAlps Days 2024*, Grenoble, France, September–October 2024.
- *QuantAlps Days 2023*, Grenoble, France, October 2023.
- *Workshop on Physics and Computation 2016*, Manchester, UK, July 2016.
- *Workshop on Physics and Computation 2015*, Auckland, New Zealand, August/September 2015.

### Conference Programme Committees

- *Causalworlds 2024*, Waterloo, Ontario, Canada, September 2024.
- *Conference for Young Quantum Information Scientists 2019*, Sopot, Poland 2019.

- *Workshop on Physics and Computation 2017*, Fayetteville AR, USA, June 2017.
- *Workshop on Physics and Computation 2016*, Manchester, UK, July 2016.
- *Workshop on Physics and Computation 2015*, Auckland, New Zealand, August/September 2015.
- *Workshop on Physics and Computation 2011*, Turku, Finland, June 2011.

## Direction and Steering Committees

- Governing board of **TIQuA** (2022–)
- Governing board of **QuantAlps** (2022–)
- Steering committee of **QuantAlps** (for research axis “Quantum Information and Software” and joint-lead of the “Quantum Communication” federative project; 2022–)

## Evaluation Committees

- Selection committee for Inria CRCN and ISFP recrutement competitions, Inria Saclay Centre, 2024.
- Selection committee for Assistant Professor (MCF) in Quantum Computing, CentraleSupélec, 2024.
- Selection committee for LANEF and La Fondation Nanosciences PhD scholarships, UGA, 2021.

## PhD Defence Committees

- Don Jean-Baptiste Anoman, “*Contributions relatives à la génération quantique d’aléa*”, Université de Limoges, 2 December 2021.

## PhD Individual Monitoring Committees (CSI)

- Julien Lamiroy, Université Paris Saclay, 2024–2027.
- Julien Bertrand, “*Generation of photon triplets*”, Université Grenoble Alpes, 2022–2025.

## External evaluator for research funding

- **DIM QuanTIP** (Quantum Technologies in Paris Region), PhD and Postdoc Fellowships, 2023–2024.
- **FNRS ANS Mandate PhD Research Fellowships**, 2024.

## Referee for Journals and Conferences

- Referee for the Communications: *Nature Communications*, *APS Journals (PRL, PRX, PRA)*, *New Journal of Physics*, *Quantum*, *npj Quantum Information*, *Proceedings of the Royal Society A*, *Scientific Reports*, *Journal of Mathematical Physics*, *Journal of Physics Communications*, *Quantum Information Processing*, *Optica*, *Photonics Research*, *Canadian Journal of Physics*, *Fundamenta Informaticae*, *Mathematical Structures in Computer Science*, *Natural Computing*, *Theoretical Computer Science*, *Classical and Quantum Gravity*, *Algorithms*.
- Referee for the conferences: *LICS*, *SIGGRAPH*, *BIID*, *QIP*, *QPL*, *TAMC*, *TQC*, *Causalworlds*.
- IOP Trusted Reviewer.

## Outreach, Networking and General Service Presentations

6. **Annual conference of the Informatics Society of France (SIF)**, Grenoble 6–7 April 2023. *L’informatique quantique : une révolution pour l’informatique du futur ?*.
5. **Panorama des technologies quantiques** (day organised by Minalogic), Grenoble, 4 October, 2022. *Les défis de l’informatique quantique dans un monde bruité*.
4. Lecture in celebration of 20 years of the “Informatique” programme at Polytech Grenoble, 30 September 2022. *L’informatique quantique : une révolution pour l’informatique ?*
3. **IM2AG Round Table on Quantum Information** (UGA), Grenoble, 19 May 2022. *Recherche et formation à Grenoble*.
2. **Vers une révolution quantique** (ADIRA Event), Grenoble, 5 May 2022. *QuantAlps – Faire de Grenoble l’épicentre du quantique en région AURA*.
1. Presentation of CEA-List @Grenoble, Grenoble, 20 October 2021. *Les enjeux du quantique*.



## Miscellaneous

- 2022: Member of the jury for the [Quantum Hackathon by QuantX](#), 1–2 October 2022.
- 2022–: Organisation of the QuantAlps research seminars on Quantum Information and Computing.
- 2020–2021: Organisation of the regular series of lectures on Quantum Computing as part of the QuEnG (Quantum Engineering Grenoble) network.
- 2013–2015: Proofreading and editing for the New Zealand Mathematical Society Newsletter.